VENICE AUXILIARY PUMPING PLANT

(SCH #2015111038)

DRAFT ENVIRONMENTAL IMPACT REPORT

PREPARED FOR:

ENGINEERING
CITY OF LOS ANGELES

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Acronyms and Abbreviations

µg/m^3	micrograms per cubic meter
A	amp
AAQS	Ambient air quality standards
AB	Assembly Bill
ADA	Americans with Disabilities Act
APN	Assessor Parcel Number
AQMPs	Air quality maangement plans
AR4	Fourth Assessment Report
ARB	California Air Resources Board
B.P.	Before Present
Basin	South Coast Air Basin
BAU	business-as-usual
BSA	Biological Survey Area
CAA	Clean Air Act
CAAQS	California ambient air quality standards
CBC	California Building Code
CBSC	California Building Standards Code
CAL Green Code	California Green Building Standards Code
CalEEMod	California Emissions Estimator Model
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CCAA	California Clearn Air Act
CCC	California Coastal Commission
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CDP	Coastal Development Permit
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CH_4	methane
CIS	Coastal Interceptor Sewer
City	City of Los Angeles
CMP	Congestion Management Program
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Commission	California Coastal Commission
CRHR	California Register of Historical Resources

CRPR	California Rare Plant Rank
CTCs	county transportation commissions
CWA	Clean Water Act of 1977
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
DCP	Department of City Planning
DPM	Diesel particulate matter
E3	Energy + Environmental Economics
EIR	environmental impact report
EO	executive orders
EOO	Emergency Operations Organization
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESHA	Environmentally Sensitive Habitat Area
FHWA	Federal Highway Administration
g/bhp-hr	grams per brake-horsepower hour
GEO	geotechnical engineering group
GER	geotechnical engineering report
GHG	greenhouse gas
GIS	georgraphic information system
GPFE	General Plan Framework Element
GWh	gigawatt-hours
GWP	global warming potential
H2S04	sulfuric acid
HCM	Historic-Cultural Monument
HFCs	hydrofluorocarbons
HNO3	nitric acid
HP	horsepower
HSC	Health and Safety Code
HTP	Hyperion Treatment Plant
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
I	Interstate
ICF	ICF
ICO	Interim Control Ordinance
IG	Industrial General
IL	Light Industrial
in/s	inches per second
IPCC	Intergovernmental Panel on Climate Change
Kcf	kips per cubic foot
kHz	kilohertz
KOPs	key observation points

kVA	thousand volt-amps
kW	kilowatt
LABOE	Los Angeles Bureau of Engineering
LADOT	Los Angeles Department of Transportation
LADWP	Los Angeles Department of Water and Power
LAGBC	Los Angeles Green Building Code
LAMC	Los Angeles Municipal Code
LAX	Los Angeles International Airport
LCFS	Low-Carbon Fuel Standard
LCP	Local Coastal Program
L_{dn}	day/night noise level
L_{eq}	equivalent sound level
LOS	level of service
LST	localized significance threshold
MATES	Multiple Air Toxics Exposure Study
MBTA	Migratory Bird Treaty Act
Metro	Los Angeles County Metropolitan Transportation Authority
mgd	million gallons per day
MMBTU	million British thermal units
MMT	million metric tons
Mobility Plan 2035	Mobility Element of the General Plan
MPH	miles per hour
MPO	Metropolitan Planning Organization
MW	megawatt
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
N2	nitrogen
NO	Nitric oxide
NO2	Nitrogen dioxide
NOA	Notice of Availability
NOD	Notice of Determination
NOP	Notice of Preparation
NOP/IS	Notice of Preparation/Initial Study
NRHP	National Register of Historic Places
O_2	oxygen
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Governor's Office of Planning and Research
OS	Open Space

Pb	lead
PCE	passenger car equivalency
PCN	pre-Construction Notification
PDR	Preliminary Design Report
PFCs	perfluorocarbons
Plan	Plan for a Healthy Los Angeles
PM	Particulate matter
PM 2.5	microns in diameter or less
PM 10	microns in diameter or less
Porter-Cologne	Porter-Cologne Water Quality Control Act
ppb	parts per billion
ppm	parts per million
ppt	parts per trillion
PPV	peak particle velocity
PRC	Public Resources Code
Proposed Project	Venice Auxiliary Pumping Plant Project
PSF	per square foot
PTE	permission to enter
RCDG	Residential Citywide Design Guidelines
RCNM	Roadway Construction Noise Model
ROG	reactive organic gases
RTP	regional transportation plan
RTP/SCS	Regional Transportation Plan/Sustainable Communities Strategy
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCCIC	South Central Coastal Information Center
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Officer
SIP	State Impementation Plan
SO_2	Sulfur dioxide
SOC	Statement of Overriding Considerations
SPL	sound pressure level
SR	State Route
SRA	Source Receptor Area
SSMP	Sewer System Management Plan
SWRCB	State Water Resources Control Board
TACs	toxic air contaminants
TCR	Tribal Cultural Resource
TDH	total dynamic head
TIA	traffic impact analysis
TSP	Transportation Specific Plan

UDS	Urban Design Studio
UNFCCC	United Nations Framework Convention on Climate Change
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Gerological Survey
V	volts
V/C	volume to capacity
VAPP	Venice Auxiliary Pumping Plant
VCP	Venice Community Plan
VDFM	Venice Dual Force Main
Venice LCP LUP	Venice Local Coastal Program Land Use Plan
Venice Specific Plan	Venice Coastal Zone Specific Plan
VFD	variable frequency drives
VLCP	Venice Local Coastal Program
VMT	Vehicle-miles-traveled
VPP	Venice Pumping Plant
WRCCs	Western Regional Climate Centers
WTCP	Worksite Traffic Control Plan
ZNE	zero net energy
µPa	micropascals

Introduction and Background

This Environmental Impact Report (EIR) evaluates the proposed Venice Auxiliary Pumping Plant (VAPP or Proposed Project) in the City of Los Angeles community of Venice, Los Angeles County, California. Per the California Environmental Quality Act (CEQA), the City of Los Angeles (City), Department of Public Works, Bureau of Engineering (LABOE) is the Lead Agency. This Executive Summary is intended to provide an overview of the Proposed Project and its environmental effects. As noted in Table ES-1, with the exception of noise and vibration impacts generated during construction, and secondary impacts on surrounding land uses related to construction noise and vibration, all impacts would be reduced to less than significant with adherence to standard regulatory and permit requirements or implementation of identified project design features and mitigation measures. Nevertheless, despite the application of mitigation measures, construction-related noise and vibration impacts are considered significant and unavoidable. Given this condition, the City will be required to prepare findings and a Statement of Overriding Considerations (see Chapter 1, Introduction of this EIR for more details) for these remaining significant and unavoidable environmental impacts.

The City owns and operates the Venice Pumping Plant (VPP) (Pump Station No. 646), located at 140 Hurricane Street in the Los Angeles community of Venice, adjacent to the Ballona Lagoon and the Grand Canal. The VPP is the City's largest pumping plant and it is considered a critical facility for conveying sewage from its tributary area (see below). The facility was designed and built in 1957 and was last upsized and upgraded in 1987. Two duty and three backup pumps currently serve the facility. The VPP collects sewage from the City's Coastal Interceptor Sewer (CIS), which serves the communities of Topanga, Pacific Palisades, Brentwood, Venice, and Mar Vista. It also serves the City of Santa Monica and parts of Los Angeles County. Sewage is pumped south to the City's Hyperion Treatment Plant (HTP), located in Playa del Rey. Unlike other portions of the City's sewage collection and conveyance system, there are currently no diversions for bypassing the facility or associated CIS for required maintenance or in the event of an emergency. Moreover, the existing VPP is essentially built out and has no additional space for required back up pumps and associated equipment to ensure system reliability.

During dry-weather flows (no rain), the two duty pumps generally pump an average of 20 million gallons per day (mgd) of sewage. During wet-weather flows (rain), depending on conditions, all five pumps may be needed simultaneously to convey sewage influent from the collection area to the HTP. During certain years, flows during wet-weather conditions have reached 50 mgd and on several occasions, during extreme weather events (e.g., 1990s and 2000s), the flows exceeded the combined and simultaneous pumping capacity of the facility, resulting in near-miss events, which would have required emergency discharges directly to the Grand Canal and Ballona Lagoon or overflows into the surrounding street network. To address these issues, LABOE began planning and designing projects that would upgrade and enhance the CIS and VPP (see Chapter 2, Project Description of this Environmental Impact Report [EIR]), including the Proposed Project.

Proposed Project Summary

Implementation of the Proposed Project, which entails the construction of a new pumping plant adjacent to the existing VPP, would provide redundancy and ensure reliability of the sewer collection system. It would also allow the sewer system to handle extreme weather (e.g., El Niño), along with sea-level rise and corresponding and increases in groundwater levels that exacerbate infiltration conditions, both for the existing and planned conveyance system. With upgraded system redundancy and reliability, the potential for near misses and/or catastrophic system failures would be reduced. As part of the Proposed Project, a number of system improvements would be implemented both above and below ground, including a new electrical building, housing the control system and employee workstations; three new pumps and associated generator; sewer pipe connections to the CIS, including construction of a submerged diversion structure beneath the Grand Canal; and parking, public art, and green open space. Combined, the five existing pumps at the VPP and the three new pumps would have a rated capacity of 87 mgd (i.e., five duty pumps and three standby). All pumps would have a similar capacity and be functionally equivalent. Please see Chapter 2, Project Description for a more detailed description of the Proposed Project.

Figure ES-1, Project Vicinity Map, shows the location for the Proposed Project in relation to the City and adjacent cities and communities. The Project Site is within the Venice Community Planning Area and Council District 11. As noted in Figure ES-2, Project Location Map, the Project Site comprises three undeveloped residential lots located next to the existing VPP (see Chapter 2, Project Description of this EIR for addresses and Assessor Parcel Numbers). The three construction Laydown Areas that will be used for materials and equipment storage and for the construction staging during the anticipated two year construction period are also shown in Figure ES-2. The Project Site is within the Coastal Zone and therefore within the jurisdiction of the California Coastal Commission. Adjacent to the Project Site is an Environmentally Sensitive Habitat Area (ESHA), which is associated with the Grand Canal and Ballona Lagoon. The Venice Canal System is also City of Los Angeles Historic Cultural Monument No. 270 and part of the Venice Historic Canal District (ZI–2370).

Project Objectives

The Proposed Project is intended to meet the following Project objectives:

- Prevent potential impacts on human and environmental health caused by sewage spills from the existing VPP during extreme wet-weather events;
- Increase reliability to the system by providing redundancy to pumping capacity to improve system reliability and to allow regular service and maintenance activities to take place without compromising the City's ability to maintain pumping capacity and minimize the risk of sewage overflows; and
- Address future risks related to climate change, including increased storm intensities and sea-level rise, which have the potential to result in flows that would be beyond the capacity of the existing VPP.

Project Characteristics

The Proposed Project would be built on three vacant lots with a total combined area of approximately 12,076 square feet. As shown in Figure ES-3, Site Plan, the Proposed Project would include a number of improvements:



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Figure ES-1
Project Vicinity Map
Venice Auxiliary Pumping Plant Project



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Figure ES-2
Project Location Map (with Existing and Temporary Pedestrian/Vehicular Access)
Venice Auxiliary Pumping Plant Project

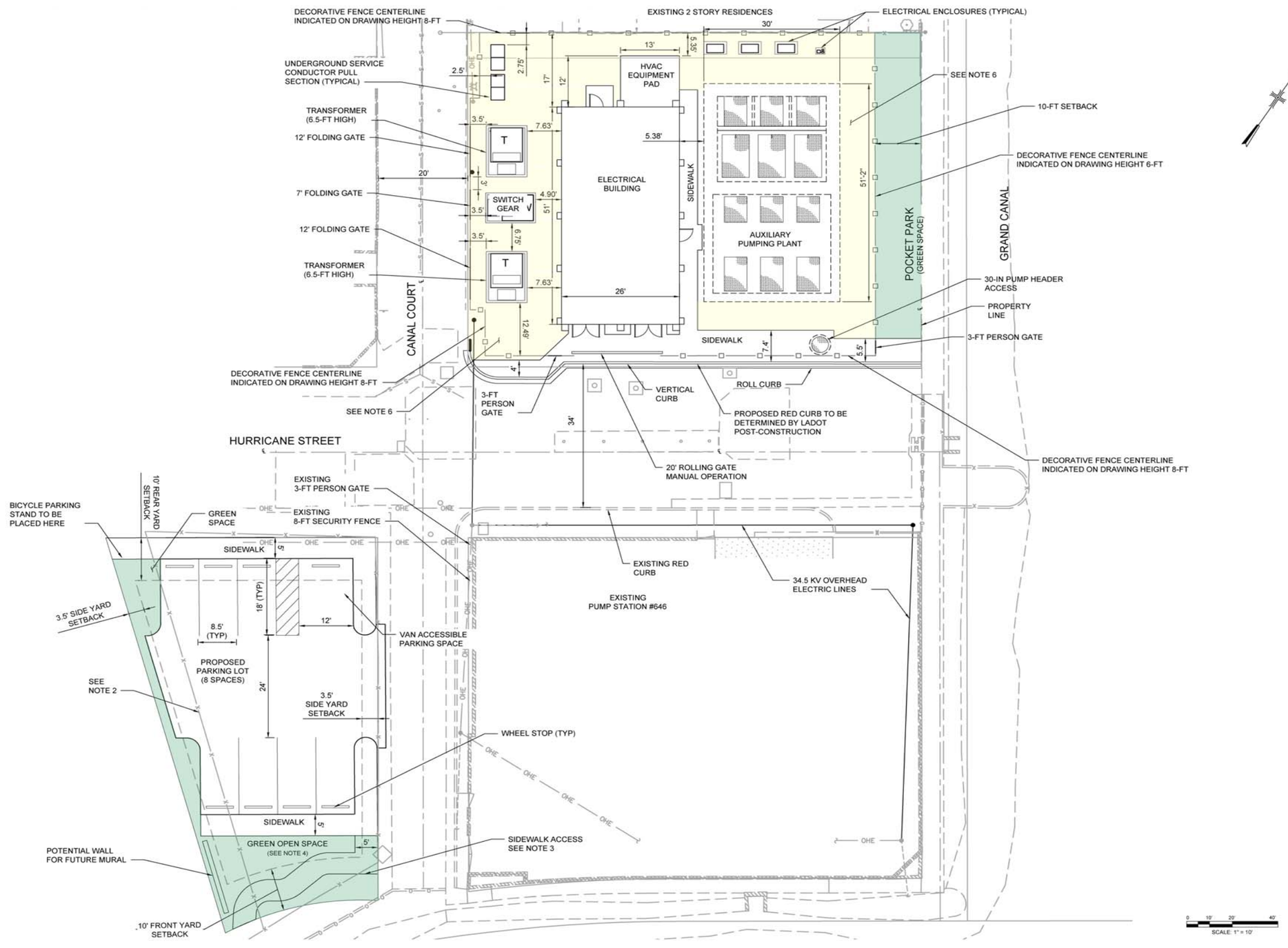

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Figure ES-3
Site Plan
Venice Auxiliary Pumping Plant Project

- One building, two stories and approximately 32 feet in height, with a total of 2,500 square feet, that will house the operational control center for the plant, related electrical equipment, and employee workstations;
- Three 18- million-gallon-per-day (mgd) submersible pumps, constructed underground;
- Electrical equipment, uutility connections, instrumentation and controls, transformers, and generators;
- A 17- by 17-foot submerged diversion structure on the CIS, the top of which would be below the lowest elevation of the Grand Canal and buried underneath it;
- Concrete wet well, influent piping and a sluice gate;
- A new 66-inch sewer to connect VAPP to the new diversion structure;
- Fencing with blinds and vegetation for screening the VAPP building;
- Parking – a total of eight parking spaces will be provided at 128 Hurricane Street to allow for employee, delivery/visitor, and public parking, including the replacement of coastal parking,; and
- Landscaping, public art and open space at 128 Hurricane Street.

Project Schedule

Construction is anticipated to begin in March 2018 and last approximately two years. To minimize impacts on the surrounding community, streamline construction activities, and minimize overall Project cost, the City is planning to schedule construction of the VAPP immediately after completion of the Venice Dual Force Main (VDFM), which is planned to start construction in winter 2016 and end in winter 2019.

Required Approvals

Table ES-1, Required Permits for Venice Auxiliary Pumping Plant Project, lists the anticipated permits required for the Proposed Project.

Comments Received on the Notice of Preparation

In accordance with Section 15082 of the State CEQA Guidelines, LABOE prepared a Notice of Preparation/Initial Study (NOP/IS) for the Proposed Project on November 12, 2015. The NOP was circulated for 30 days. The comment period ended on December 18, 2015.

Table ES-1. Required Permits for Venice Auxiliary Pumping Plant Project

Agency	Permit/Requirement	Issue
Local		
City of Los Angeles Department of Public Works	Local Coastal Development Permit	Coastal access, construction within coastal zone, habitat disturbance, parking and traffic during construction
City of Los Angeles	Specific Plan Project Permit	Compliance with the Venice

Agency	Permit/Requirement	Issue
Planning Department	Compliance	Coastal Specific Plan. Also consistency with the Venice Local Coastal Program Land Use Plan
City of Los Angeles Planning Department	Public Benefits Project Permit	Section 14 of the Los Angeles Municipal Code. Public Benefit permit with Alternative Compliance for Public Facilities and Park/Recreation uses
City of Los Angeles Planning Department	Los Angeles Municipal Code Adjustment for Yards	Relief for encroachment more than 6 feet into the rear yard
City of Los Angeles Planning Department	Conditional Use Permit for Parking	Relief for encroachment more than 6 feet into the rear yard
Los Angeles County Department of Public Works/Department of Beaches and Harbors	Encroachment permit	Access and use of parcel for Laydown Area 2
City of Culver City, Planning Department	Temporary Use Permit	Temporary stockpile of soil (up to 7,700 cubic yards) for Laydown Area 3
Regional		
Los Angeles Regional Water Quality Control Board (RWQCB)	National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Pollution Prevention Plan permit	Water quality and placement of discharges associated with dewatering activities; no permit required for discharges to sewer (general permit saves time with RWQCB)
RWQCB	401C section certification	State water quality certification prior to an issuance of U.S. Army Corps of Engineers (USACE) nationwide permit
South Coast Air Quality Management District	Permit to construct and operate	Air quality, additional portable generator(s), and any modifications to odor dispersion stack
State		
California Coastal Commission	State Coastal Development Permit	Coastal access, construction within coastal zone, habitat disturbance, parking and traffic during construction

Agency	Permit/Requirement	Issue
California Department of Conservation, Division of Oil, Gas, and Geothermal Resources	A construction notification form should be submitted to the division prior to any activity	Project is within boundaries of the Playa del Rey oil field, which contains numerous plugged and abandoned oil wells
State of California Department of Health Services	Project review for compliance with Title 22, Section 64630 (conducted through County Environmental Services Division)	Separation of water and sewer mains
California Office of Historic Preservation	Consultation	Historic status of Grand Canal
Federal		
USACE	Section 10 permit	Pipeline construction under navigable waters
USACE	Section 404	Could fall under Nationwide Permit NWP 12, Utility Line Activities, and require Pre-Construction Notification (PCN)
National Marine Fisheries Service	Consultation notification	Impacts on aquatic and marine life
U.S. Fish and Wildlife Service	Notification through Section 10 process	Impacts on habitat (i.e., least tern)

The NOP was also published in the *Los Angeles Times* and *The Argonaut* and made available on the LABOE website. Over 1,300 copies of this notice were circulated to members of the public, local and state agencies, and other interested parties to solicit comments on the Proposed Project. A total of 19 comment letters were received from agencies, tribes, interested organizations and the public. In addition, two scoping meetings were held on December 3rd and December 8th, 2015 within the local community.

Public comments submitted during the scoping period expressed concerns regarding the following issues (not listed in any particular order):

- Project Need
- Alternatives
- Air Quality
- Biological Resources
- Cultural Resources
- Hydrology and Water Quality
- Noise and Vibration
- Traffic

The public comment letters are included in Appendix A (Notice of Preparation/Initial Study) of this EIR.

Issues Raised

A summary of comments received and issues raised during the scoping meeting period is provided in Table ES-2, VAPP Comments Received on Notice of Preparation/Initial Study. This table includes issues identified and discussed in comment letters and orally at public meetings, and identifies the location in which the issues area addressed in the Draft EIR, as applicable.

Table ES-2. VAPP Comments Received on Notice of Preparation/Initial Study

Number	Commenter	Agency/Interested Party	Date of Correspondence	Summary of Issues	Section of Environmental Impact Report Where Issue Is Addressed
Federal Agencies					
1	Jessica Vargas, Regulatory Project Manager	Department of the Army Los Angeles District, U.S. Army Corps of Engineers	December 9, 2015	• As work on this project could fall within the Grand Canal, this activity may require a U.S. Army Corps of Engineers permit.	Sections 3.3 (Biological Resources) and 3.7 (Hydrology and Water Quality)
State Agencies					
2	Dianna Watson, IGR/CEQA Branch Chief	California Department of Transportation	December 8, 2015	• A traffic study should be prepared. Please refer the project's traffic consultant to Caltrans' traffic study guide Website: http://www.dot.ca.gov/hq/tpp/offices/ocp/igr ceqa files/tisguide.pdf • A Congestion Management Plan should be included. If the County's Congestion Monitoring Plan (CMP) is used to evaluate the impacts, the consultant should demonstrate that the methods and procedures used are compatible and are in compliance with TIS guidelines. The Highway Capacity Manual method must be used in analyzing traffic impacts on freeway off-ramps including queuing along ramps and ramp intersections. The ICU method recommended in CMP is not acceptable for evaluating the impacts on State transportation system. The DEIR should consider all State transportation facilities located within zone recommended by TIS guidelines. All exceptions or variations should be approved by Caltrans. • Future conditions, including project and project plus cumulative traffic generated up to General Plan build out year should be included. • Discussion of mitigation measures as appropriate, including sharing of mitigation costs.	Section 3.10 (Transportation/Traffic)
3	Loni Adams, Marine Environmental Scientist	California Department of Fish and Wildlife	December 9, 2015	• The impacts to the canal appear to be temporary.	Sections 3.3 (Biological Resources) and 3.7 (Hydrology and Water Quality)
Native American Groups					
4	Andrew Salas, Chairman	Gabrieleno Indians Gabrieleño Band of Mission Indians – Kizh Nation	November 30, 2015	• Project is located in a highly sensitive area; Believes there is a high likelihood for discovering human remains given the proximity to the nearby Play Vista site and requests that one of their Native American monitors be used during ground disturbance activities to protect any cultural resources that may be found during construction.	Section 3.4 (Cultural Resources)
5	John Tommy Rosas		November 24, 2015	• No comment.	No response required.
6	Caitlin B. Gulley Tribal Historic and Cultural Preservation Officer	Fernandeño Tataviam Band of Mission Indians	December 1, 2015	• Indicates that the Proposed Project is outside of both boundaries of the traditional Tataviam territory map provided to the City of Los Angeles and therefore, does not wish to consult on the Proposed Project.	No response required.
Local Agencies					
7	Gail Farber, Director of Public Works	County of Los Angeles Department of Public Works and Department of Beaches and Harbors	December 17, 2015	• Would like the opportunity to review the traffic impact analysis and the DEIR prior to the release of the document to the public for potential impacts to County intersections and roadways in the area including impacts during the construction phase. • Any construction traffic control measures or detours that will impact traffic in the unincorporated County community of Marina del Rey would need to be evaluated and discussed in the environmental document. • It should be noted in the DEIR that a construction permit, including the preparation of a traffic control plan, will be required for installation of any traffic control, temporary lane closures, or lane transitions placed by the	Section 3.10 (Transportation/Traffic) and Chapter 2 (Project Description)

Number	Commenter	Agency/Interested Party	Date of Correspondence	Summary of Issues	Section of Environmental Impact Report Where Issue Is Addressed
				project in the County's jurisdiction. • The DEIR should also disclose a proposed construction schedule that has been coordinated with the Departments of Public Works and Beaches and Harbors for potential conflicts with other County projects and special events in the Marina. • The EIR shall include discussions regarding the possible use of Lot F, which is owned by the County of Los Angeles, for construction staging purposes. These discussions shall address how the staging needs for the VAPP project correlate to the staging needs of the City's Venice Dual Force Main project that will also be taking place in Lot F for an extended period of time. The EIR shall also indicate that a right-of-entry permit from the Department of Beaches and Harbors will be needed for the use of any County-owned lots.	
Interested Parties/Public					
Public Scoping Meeting – December 3, 2015					
8	Steve Bradbury	Public	Public Testimony	• Concerned about duration of project given that the recently completed Venice Manifold Project (VMP) took longer than expected. • No mitigation for truck noise during the VMP. • Poor communication with residents on the VMP and the site and area was dirty with lots of dust generated. • Parking was a problem during the VMP. • Concerned about the closure of Hurricane Street and reduced property values due to presence of the project. This will also eliminate his views. • Additional explanation is needed regarding why Hurricane Street needs to be closed off. • The project has been in the planning stage for some time, but this has not been communicated to the residents.	Chapter 2 (Project Description) and Sections 3.2 (Air Quality), 3.9 (Noise & Vibration), and 3.10 (Transportation/Traffic)
Public Scoping Meeting – December 8, 2015					
9	Ms. Morrill-Borassi	Public	Public Testimony	• Would like to understand why this project was not included in the VMP. • Concerned that proposed open space amenities will not be implemented, due to resident opposition. • Would like to know if a car wash will be provided due to all of the construction activities. • Would like to know what mitigation measures are proposed for noise. • Concerned about parking.	Chapter 2 (Project Description) and Sections 3.2 (Air Quality) and 3.9 (Noise and Vibration), and 3.10 (Transportation/Traffic)
10	Bob Debiase	Public	Public Testimony	• Concerned about noise and vibration generated from equipment. • Would like to understand the need for the project.	Chapter (Project Description) and Section 3.9 (Noise and Vibration)
11	Mike Borassi	Public	Public Testimony	• Would like to know if the project is necessary or preventive.	Chapter 2 (Project Description)
12	Walter Lamb	Public	November 20, 2015	• The EIR should analyze impacts to natural resources, including to native birds and other wildlife.	Section 3.3 (Biological Resources)
13	Arthur Pugsley, Senior Attorney	Los Angeles Waterkeeper	December 7, 2015	• EIR should provide an expanded discussion of why the Project is needed and its role in the broader LABOE efforts to manage its sewage and stormwater systems. • Proposes the inclusion of an additional project objective in the Environmental Impact Report to address water recycling in both the short- and medium-term. • Proposes the inclusion of a an alternative entailing pumping to a destination for treatment and use as recycled water, and/ or an alternative to ultimate ocean discharge of the water pumped through the Venice pumps. • The EIR should explain efforts of LABOE to coordinate with other City departments to ensure project design promotes current City administration's sustainability goals. • Include a discussion of construction and permanent impacts to the Grand Canal, other nearby environmentally sensitive habitat areas, and rare species habitat. • The EIR should also detail the Low Impact Design methods being taken to ensure infiltration of stormwater from	Chapter 2 (Project Description) and Sections 3.3 (Biological Resources), 3.7 (Hydrology and Water Quality), 3.8 (Land Use and Planning), 3.10 (Transportation/Traffic), Chapter 4 (Alternatives)

Number	Commenter	Agency/Interested Party	Date of Correspondence	Summary of Issues	Section of Environmental Impact Report Where Issue Is Addressed
				the project site itself. • The EIR should discuss cumulative impacts related to the loss of parking and direct and indirect impacts on coastal access from reduced parking supply.	
14	Daniel P Whalen and Sharon McQueen	McQueen-Whalen Revocable Trust	November 25, 2015	• The Proposed Project is incompatible with the current residential zoning, is located adjacent to Environmentally Sensitive Habitat Area, and should be located to "U" zoned location and should not be allowed to proceed. • Vacation of Hurricane Street should not be allowed since it would restrict coastal access. • Indicates that 11 environmental resource areas and mandatory findings of significance were identified to result in potentially significant impacts, but no mitigation measures were identified. • Indicates that the project is not compatible with the current zoning and surrounding community, it degrades the environmental habitat, it diminishes an historical resource, it violates California Coastal Commission standards for coastal access, and will adversely affect the quality of life (views, traffic, light, odor, noise, etc.) for the surrounding residents.	Chapter 2 (Project Description) and Sections 3.8 (Land Use and Planning), 3.10 (Transportation/Traffic), 3.1 (Aesthetics), 3.2 (Air Quality), and 3.9 (Noise and Vibration)
15	Barbara Brunasso	Public	November 17, 2015	• Questions the need for the project. • Requests further clarification on capacity needs and how the project relates to the One Water LA 2040 Plan (Plan) and other conservation plans for the greater Los Angeles Area. Would like to know if cost for project would be covered through the Plan. • Would like to know if a study has been undertaken regarding the cost and efficiency of refurbishing and limited expansion of current Venice Pumping Plant to provide additional reliability and supplement capacity. • Requests information on the economic gains to the community, including local construction workers, and others. • Indicates that cultural events will be sacrificed due to the cost of construction of the project and requests a dollar amount for this. • Requests information and/or clarification on where and when increased congestion will occur and to avoid peak periods and how long project will take to complete. • Concerned about the potential for odors during construction and requests that these activities be undertaken during summer. • Request explanation of why vacation of Hurricane Street is needed and the length of the road needed.	Chapter 2 (Project Description), Sections 3.2 (Air Quality), 3.8 (Land Use and Planning), 3.10 (Transportation/Traffic), and Chapter 4 (Alternatives)
16	Clare Bronowski	Public	November 30, 2015	• Requests that the LABOE undertake careful construction and restoration mitigation measures to ensure that the project does not impact the sensitive canal and canal bank area. • Concerned that LABOE does not understand the ecologically sensitive residential neighborhood and cites the recent street and drainage projects undertaken that did not consider aesthetic and ecological issues. • Requests that LABOE review the Grand Canal Master Plan to understand what is required and/or should be included in the restoration efforts associated with the project. • Indicates that the project site, including Laydown Areas are zoned • RW2-1 and as such, industrial uses are not permitted. Therefore, LABOE must undertake a zone change with the City's Planning Department. As part of that process, conditions and measures to ensure compatibility with existing neighborhood character need to be included. • Plans and visual representation of the proposed plant need to be provided, since these were not included in the Notice of Preparation. • Concerned about the existing visual aesthetics of the Venice Pumping Plant Station and notes that landscaping including planting in the planters is not maintained. • Indicates that a process is needed to ensure that the visual impact of the new project, as well as landscaping and screening of the existing plant, is mitigated with good design and neighborhood compatible features. • Indicates that the existing Venice Pumping Plant creates odors and additional measures need to be taken to control this issue. • Indicates that vacation of Hurricane Street will remove scarce neighborhood street parking and must be	Chapter 2 (Project Description) and Sections 3.1 (Aesthetics), 3.2 (Air Quality), 3.3 (Biological Resources), 3.8 (Land Use & Planning), and 3.10 (Transportation/Traffic)

Number	Commenter	Agency/Interested Party	Date of Correspondence	Summary of Issues	Section of Environmental Impact Report Where Issue Is Addressed
				mitigated. • Request mitigation to address increased pedestrian access along walkway at the existing Venice Pumping Plant. • Request that loss of pedestrian and vehicular access on Hurricane include improved pedestrian access from Washington as well as improvements such as fencing and native vegetation in the canal area.	
17	Gary Wells	Public	November 17, 2015	a) Indicates that he is building a single-family home on northern parcel of the area identified in NOP as Laydown Area 2 and is processing permits through the California Coastal Commission. He is not granting access to or use of the property to LABOE.	Chapter 2 (Project Description).
18	Michael Rosenfield	Public	November 16, 2015	b) Would like to know what is planned for Laydown Area 2.	Chapter 2 (Project Description)
19	William Boyd	Public	November 18, 2015	c) Will fuel oil storage be included or will they be powered by natural gas? Concerned about cumulative impacts from related projects, loss of pedestrian access.	Chapter 3 (Project Description) and Sections 3.10 (Transportation/Traffic) and 3.6 (Cumulative Impacts)

Issues to Be Resolved

Issues to be resolved by the Los Angeles Department of Public Works, Bureau of Engineering (LABOE), include the following:

- Determine whether the EIR adequately describes the environmental impacts of the Proposed Project;
- Determine whether the recommended mitigation measures should be adopted or modified;
- Determine whether additional mitigation measures need to be applied to the Proposed Project; and
- Consider the information contained in the administrative record, created during the environmental review process, and determine whether to approve the Proposed Project

Summary of Environmental Impacts

Impacts Determined to Require No Further Consideration in This EIR

As discussed in Appendix A and Chapter 5, Other Environmental Considerations of this Draft EIR, the Proposed Project was determined to have no impact or less than significant impacts with regard to the following impact thresholds, which are, therefore, not analyzed in this Draft EIR:

- Agriculture and Forestry Resources
- Hazards and Hazardous Materials
- Mineral Resources
- Population and Housing
- Public Services
- Recreation

Chapter 5 discusses impacts to these resource areas.

Impacts Determined to Be Less than Significant

The analysis contained in the Draft EIR determined that the Proposed Project would result in less than significant or less than significant impacts after mitigation is implemented for the following resources:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils

- Greenhouse Gas Emissions
- Hydrology and Water Quality & Service Systems
- Land Use and Planning (operation only, for secondary noise and vibration impacts)
- Noise and Vibration (operation only, for noise and vibration)
- Transportation/Traffic
- Energy (except cumulative)

These impacts are evaluated in detail in Chapter 3 of this Draft EIR and are summarized in Table ES-3 at the end of this Executive Summary.

Significant Unavoidable Impacts

Noise and vibration during construction, even with the application of mitigation measures would remain significant and unavoidable. In addition, secondary impacts on surrounding land uses related to noise and vibration would also be significant and unavoidable, during construction only. These impacts would occur only during the duration of construction, which is anticipated to last 24 months. The Proposed Project would result in significant unavoidable impacts related to tsunami and sea level rise during operation.

Cumulative Impacts

Cumulative noise and vibration impacts during construction would be significant and unavoidable, even with the application of mitigation measures. In addition, cumulative impacts related to energy are considered potentially significant. All other environmental resource areas analyzed in the document have either no cumulative impacts, or the cumulative impacts are less than significant.

Significant Irreversible Environmental Changes that Would Be Caused by the Proposed Project Should It Be Implemented

Implementation of the Proposed Project would commit nonrenewable (e.g., petroleum) or slowly renewable (e.g., timber) resources during Project construction and operation. In order to construct the Proposed Project, machinery, equipment, materials (e.g., lumber, sand, gravel) and workers would be required, representing an irreversible commitment of some of these resources. Similarly, during operation, some of these resources (e.g., energy, electricity) would again be needed, representing a long-term commitment and permanent investment. The consumption and use of some of these resources would limit their availability for future generations. In addition, construction of the Proposed Project would also irreversibly change existing views to and from the Grand Canal and Ballona Lagoon for both visitors and residents. However, assuming that these commitments would occur in accordance with the adopted goals, policies, and implementation measures of the City of Los Angeles General Plan, Venice Local Coastal Program, Venice Community Plan, and Venice Local Coastal Specific Plan, as a matter of public policy, such commitments would be acceptable. The Proposed Project would also provide important redundancy in pumping capacity for system reliability and safety and ensure that the VPP can adequately perform during wet weather flows. Therefore, the significant irreversible changes have been deemed acceptable in light of the Proposed Project's overall benefits.

Growth-Inducing Impacts

The overall objective of the Proposed Project is to reduce the risk of sewage spills by providing redundancy and system reliability for the existing VPP wastewater collection system. The Proposed Project would also allow the system to handle future risks related to climate change, including increased storm intensities, which have the potential to result in extreme wet weather flows that would be beyond the capacity of the existing VPP. In addition, the Proposed Project is not intended to facilitate growth but instead address existing deficiencies in the system that have been identified and planned for through the City of Los Angeles' normal infrastructure assessment practices. Therefore, the Proposed Project is not considered growth inducing.

Alternatives and the Environmentally Superior Alternative

As noted in Chapter 4 (Comparison of Alternatives) of this EIR, on December 1, 2015 and on June 11, 2016, LABOE and its design team conducted Project Development Team meetings to develop, evaluate, and screen Project alternatives. This was undertaken in order comply with CEQA and to develop a reasonable range of alternatives for consideration in the EIR. Including the mandatory No Project/No Build alternative, a total of six build alternatives were developed and included the following:

- No Project/No Build
- Construct Venice Auxiliary Pumping Plant and Permanently Vacate Hurricane Street between Canal Court and Esplanade
- Use of Temporary At-grade Pumps with External Piping at Venice Pumping Plant and/or Along Hurricane Street
- Build new Plant on Proposed Site and Decommission and Demolish existing Venice Pumping Plant
- Expand Existing Venice Pumping Plant and Install Pumps and Piping Below-grade
- Construct VAPP Underground at Proposed Project Site Location with Control Room Located Off-site
- Construct Auxiliary Pumping Plant at Alternate Location along Coastal Interceptor Sewer

An analysis of these alternatives determined that the No Project/No Build alternative, Proposed Project, and Construct Venice Auxiliary Pumping Plant and Permanently Vacate Hurricane Street between Canal Court and Esplanade alternative should be evaluated in the EIR, while the remaining alternatives were identified as infeasible and rejected from further evaluation. The analysis then evaluated and compared the No Project/No Build and Construct Venice Auxiliary Pumping Plant and Permanently Vacate Hurricane Street between Canal Court and Esplanade alternatives and determined that the No Project/No Build was the Environmentally Superior Alternative. Pursuant to CEQA regulations (see CEQA Guidelines Section 15126.6(e)(2)), when the No Project Alternative is identified as the environmentally superior alternative, the EIR shall also identify an environmentally superior alternative from among the other alternatives. To determine which of the other alternatives would be environmentally superior, the analysis focused on those Proposed Project

impacts identified as significant and unavoidable. Based upon the analysis contained in Chapter 4, Comparison of Alternatives of this EIR, the Proposed Project was determined to be the Environmentally Superior Alternative.

Summary of Impacts and Mitigation Measures

Table ES-3 contains a summary of impacts by environmental resource area, the significance determination before mitigation, required mitigation measures (if any), and any remaining impacts after mitigation is applied.

Table ES-3. Summary of Environmental Impacts

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Aesthetics			
AES –1-7. Aesthetics. Construction would result in temporary visual impacts due to the presence of construction equipment, staging areas, exposed excavation areas, associated construction fencing, and temporary cofferdam. Dust from excavation and construction equipment would also be generated. Vegetation on the west bank would be removed. However, no important visual features would be removed and vegetation on the west bank of the canal would be replaced (see Mitigation Measure MM-BIO-3 below). Once operational, the major visible built elements would include an electrical building up to 32 feet in height and security walls. Other project elements would be minimally visible. No natural open space would be graded or developed. The Proposed Project would provide additional green and open space and access to the Grand	Less than Significant	**MM AES-1: Construction Staging/Stockpiled Materials and Equipment.** LABOE or its construction contractor shall be the responsible party for providing temporary construction fencing along the periphery of active construction areas to screen as much of the construction activity as possible from view at the street level. To minimize views of stockpiled materials and idle construction equipment in staging areas and reduce visual clutter and disorder, Project construction staging areas shall be enclosed or screened from view at the street level with appropriate screening materials. The contractor shall provide daily visual inspections to ensure that areas immediately surrounding the construction staging areas are free from construction-related clutter and graffiti and maintained in a clean and orderly manner throughout the construction period. Graffiti shall be painted over, masked out, or cleaned off within 24 hours after notification by the Project inspector. **MM AES-2: Nighttime Construction Activities.** Should emergency construction activities occur at night, LABOE or its construction contractor shall ensure that lighting will be directed away from surrounding sensitive land uses, particularly residences, and toward the specific location intended for illumination. Lighting associated with construction activities or for security purposes shall be shielded to minimize glare and spill light around sensitive land uses in the surrounding area. **MM AES-3: Final Design**. LABOE shall ensure that all Proposed Project structures will be designed to minimize their visual presence. Where site and design allow, the Project elements shall incorporate design and location features that minimize the size of the structures and provide setbacks from adjoining street frontages, screening, and/or architectural treatments that are appropriate to the design setting where visible from the public	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Canal. Project elements would not substantially alter the visual quality and/or character of the site.		right-of-way at street level. Where necessary, structures shall be designed and built to the satisfaction of the City Engineer/City Architect and in compliance with all applicable design guidelines, policies, and development standards, as discussed Section 3.1.1, *Regulatory Setting*. **MM-BMP-AES-1: Resident Vouchers for Window Washing and Car Washes during Construction.** LABOE or its construction contractor will implement best available control measures, as required by SCAQMD Rule 403 regarding fugitive dust, and other relevant regulations related to controlling dust from construction activities. However, to minimize any aesthetic impact construction dust may have on nearby neighboring cars and resident windows, the Public Affairs Office of the Department of Public Works shall provide vouchers to immediately adjacent residents for window washing and car washes, as appropriate.	
VIEWS-1-4. Obstruction of Views. Construction and operation of the Proposed Project would not create permanent blockage of visual resources or substantially diminish the nature and quality of recognized or valued private and public views. Temporary construction activities could diminish visual quality or character and, thus, valued views of the immediate area. Operation of the Proposed Project would not substantially diminish or alter valued views throughout the Project area.	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
SHADE-1. *Shading*. Construction and operation of the Proposed Project would not cast shadows that would affect shade-sensitive viewers.	Less than Significant	No mitigation measures are required.	Less than Significant
LIGHT-1 & LIGHT 2. *Nighttime Illumination*. Nighttime lighting at the construction site could be required, which could result in a temporary shift in ambient illumination levels as a result of project sources and spillover of light from project lighting. Operation of the Proposed Project would not introduce substantial illumination, relative to existing conditions and new lighting would be directed away from sensitive receptors.	Less than Significant	Implement MMAES-2, as noted above.	Less than Significant
Cumulative Impacts. Neither the related projects (see Chapter 1, Introduction [Table 1-1, Related Projects List] of this EIR) nor the Proposed Project are expected to adversely affect visual character and quality, nor result in effects that are potentially cumulatively significant.	Less than Significant	No mitigation measures are required.	Less than Significant
Air Quality			

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
AQ-1. Conflict with air quality plan. The Proposed Project would comply with Consistency Criterion 1 and 2. The Proposed Project would not conflict with or obstruct implementation of the Air Quality Management Plan (AQMP).	Less than Significant	No mitigation measures are required.	Less than Significant
AQ-2. Violate air quality standard or contribute to air quality violation. The Proposed Project would contribute to regional air pollutant emissions during short-term construction. As shown in Table 3.2-6, maximum daily Project-related criteria pollutant emissions would not exceed SCAQMD construction-period regional thresholds for any pollutant. Consequently, the impact of construction-related emissions on regional air quality would not violate any air quality standard or contribute substantially to an existing or projected air quality violation. The impact of construction-related emissions on local air quality would not violate any air quality standard or contribute substantially to an existing or projected air	Less than Significant	**MM AQ-1:** All off-road diesel-powered construction equipment greater than 50 horsepower will meet Tier 3 emission standards. All construction equipment will be outfitted with ARB best available control technology devices. Any emissions-control device used by the contractor will achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by ARB regulations. A copy of each unit's certified tier specification, best available control technology documentation, and ARB or SCAQMD operating permit will be provided at the time of mobilization of each applicable unit of equipment.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
quality violation. With regards to localized emissions, as seen in Table 3.2-7, the Proposed Project would exceed the localized significance threshold (LST) for PM10 emissions.			
AQ-3. Result in cumulatively considerable net increase of criteria pollutant for which the region is non-attainment. Construction-period emissions would be short term in nature and occur over 24 months, with no long-term construction-related emissions	Less than Significant	No mitigation measures are required.	Less than Significant
AQ-4. Expose sensitive receptors to substantial pollutant concentrations. As discussed above, mitigation has been incorporated to ensure that the Proposed Project would not result in an exceedance of LST such that significant impacts on sensitive receptors would result. The TAC exposure period for sensitive receptors would be substantially less than the 30-year exposure assumed for residential cancer risks in South Coast Air Quality Management District (SCAQMD) guidance (SCAQMD 2015).	Less than Significant	Implement MM AQ-1, as noted above.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
AQ-5. Create objectionable odors affecting a substantial number of people. During the construction period, site preparation and excavation could involve the short-term generation of odors in the vicinity of the Project Site, mostly related to diesel exhaust from construction equipment and excavation within the Grand Canal associated with the coffer dam and stockpiling of this soil within Laydown Areas 1 and 3. No operational odors would occur.	Less than Significant	No mitigation measures are required.	Less than Significant
Cumulative Impacts. Given that each of the related projects would be required to mitigate any of its impacts and comply with Rule 403, impacts would not be cumulatively considerable and would not conflict with or obstruct implementation of the SCAQMD AQMP. The Proposed Project in combination with related projects are not expected to result cumulatively considerable increase in pollutant emissions and would not conflict with or obstruct implementation of the SCAQMD AQMP.	No impact	No mitigation measures are required.	No impact

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Biological Resources			
BIO-1. Special-Status Plants. Wooly seablight (*Suaeda taxifolia)* may be affected by construction along the canal banks. Other special-status species were observed in the study area but are currently absent within the disturbance footprint.	Potentially Significant	**MM BIO-1:** To confirm the presence/absence of special-status plant species within the disturbance footprint, a special-status plant survey shall be completed prior to construction. The focused survey shall be conducted by a qualified biologist during the appropriate blooming period, or when the plant is readily identifiable, prior to the start of construction activities. If any sensitive non-listed plant species is found, then the individuals will be clearly identified and avoidance measures shall be utilized to the extent practical.	Less than Significant
BIO-1. Special-Status Wildlife. The following species, which have a low to moderate potential to occur in the project area, could be affected during construction, if present: El Segundo blue butterfly, Belding's savannah sparrow, Light-footed clapper rail, and California Least tern.	Potentially Significant	Implement MM BIO-1, as noted above and: **MM BIO-2:** A qualified biologist shall monitor all vegetation removal and ground-disturbing activities, such as staging and grading, for the duration of the Project to ensure that practicable measures are being employed to avoid incidental disturbance of habitat outside the Project footprint and to survey for sensitive wildlife species. When vegetation removal and ground-disturbing activities are not occurring, as-needed monitoring at the Project Site shall occur. Monitoring logs, as appropriate depending on Project activities, shall be maintained for the duration of construction activities. **MM BIO-3:** The disturbance footprint within the Grand Canal shall be restored by seeding and/or container plant installation following construction. Restoration shall be performed in coordination with CCC, USACE, and RWQCB as required during the permitting phase. **MM BIO-4:** Work crews shall properly dispose of all garbage in covered containers to avoid attracting predators (such as crows and ravens) that could contribute indirectly to depredation of California least tern eggs and chicks in the nearby nesting colony. **MM BIO-5:** Water quality shall be monitored by the qualified biologist or a water quality specialist to ensure that no substantial increases in turbidity occur during construction. The contractor shall ensure compliance with RWQCB Section 401	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
		Water Quality Certification, USACE Section 404 authorization, applicable water-quality related Best Management Practices, and the Project Storm Water Pollution Prevention Plan.	
BIO-1. Nesting Birds. Construction of the Proposed Project could affect nesting birds protected under the Migratory Bird Treaty Act and California Fish and Game Code Sections.	Potentially Significant	Implement MM BIO-2**,** MM BIO-4, and MM BIO-5, as noted above and: **MM BIO-6:** If construction commences during the bird breeding season (February 15 through August 31), a preconstruction survey for nesting birds shall occur within three days prior to construction activities by an experienced avian biologist. The survey shall occur within all suitable nesting habitat within the Project impact area and a 500-foot buffer. If nesting birds are found, an avoidance area shall be established in consultation with the resource agencies as appropriate by a qualified biologist around the nest until a qualified avian biologist has determined that young have fledged or nesting activities have ceased. The Project Site shall be re-surveyed if there is a lapse in construction activities for more than seven days during the bird breeding season.	Less than Significant
BIO-1. Raptor Foraging. Construction of the Proposed Project is not expected to adversely affect raptor foraging habitat.	Less than Significant	Implement MM BIO-2**,** MM BIO-4, MM BIO-5, and MM BIO-6, as noted above.	Less than Significant
BIO-1. Essential Fish Habitat. No designated Essential Fish Habitat is present within the study area.	No Impact	No mitigation measures are required.	No Impact
BIO-2. Vegetation Communities. The Project would result in a total of 0.37 acre of short-term temporary direct impacts to vegetation communities (excluding developed areas). These impacts would occur during the construction phase only	Potentially Significant	Implement MM BIO-2 and MM BIO-3**,** as noted above and: **MM BIO-7:** Construction limits shall be demarcated using environmentally sensitive area silt fencing, which shall be installed under the supervision of a qualified biologist prior to the commencement of work. Construction personnel shall strictly limit their activities, vehicles, equipment, and construction materials to the Project footprint, including designated staging areas, and routes of travel. The construction	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
and no operational impacts would occur.		areas shall consist of the minimal area necessary to complete the Proposed Project. The fencing shall remain in place until the completion of all construction activities. **MM BIO-9:** The temporary work area within Grand Canal within mudflat/open water shall be returned to pre-construction grade and contours following construction.	
BIO-2. Environmentally Sensitive Habitat Areas (ESHAs). The Grand Canal and Ballona Lagoon are classified as an ESHA. Construction of the Proposed Project could result in direct and indirect temporary impacts on this designated ESHA due to the loss of individuals or reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community.	Potentially Significant	Implement MM-BIO-7, as noted above, and: **MM BIO-8:** Existing functions and values in ESHA shall be protected, enhanced, and restored as necessary to previous undisturbed conditions in accordance with applicable USACE, RWQCB, CCC, or City of Los Angeles requirements.	Less than Significant
BIO-3 Interfere with Species Behaviors. Increased light exposure from temporary construction lighting and increased sedimentation could diminish long-term species survival.	Potentially Significant	Implement MM-BIO-1, MM-BIO-2, MM-BIO-4, MM-BIO-5, MM-BIO-6, and MM-BIO-7, as noted above.	
BIO-4. Aquatic Resources: The Project occurs within the jurisdiction of several agencies including, but not limited to, U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and California	Potentially Significant	Implement Mitigation Measures BIO-3, BIO-5, and MM BIO-9, as noted above.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Coastal Commission (CCC) and would result in temporary direct and indirect impacts to aquatic resources, including an existing wetland habitat. These impacts are significant without mitigation. Applicable permits from resource agencies would be obtained during the permitting phase prior to construction and all permit conditions and avoidance and minimization measures will be implemented.			
BIO-5. Wildlife Corridors: Because the study area does not contain any identified wildlife corridors, it would not result in interference with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species.	Less than Significant	No mitigation measures are required.	Less than Significant
Cumulative Impacts. Neither the related projects (see Chapter 1, Introduction [Table 1-1, Related Projects List] of this EIR) nor the Proposed Project are expected to result in substantial adverse effects on biological resources, nor result in effects that are potentially cumulatively significant, after implementation of proposed	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
mitigation measures.			
Cultural Resources			
CUL-1. Archaeological Resources. The potential for encountering archaeological resources during construction is low. However, in the unlikely event that archaeological resources are present on the Project Site, construction activities could disturb, damage, or degrade those resources.	Potentially Significant	**MM CUL-1: Unanticipated Discovery.** In the unlikely event that any prehistoric artifact of historic period materials or bone, shell, or nonnative stone is encountered during construction, work shall be immediately stopped, the area secured, and work relocated to another area until the found materials can be assessed by a qualified archaeologist. Examples of such cultural materials might include historical trash pits containing bottles and/or ceramics; or structural remains or concentrations of grinding stone tools such as mortars, bowls, pestles, and manos; chipped stone tools such as projectile points or choppers; and flakes of stone not consistent with the immediate geology such as obsidian or fused shale. The contractor shall stop construction within 30 feet of the exposure of these finds until a qualified archaeologist can be retained to evaluate the find (see 36 CFR 800.11.1 and 14 CCR 15064.5(f)). If the resources are found to be significant, they shall be avoided or impacts shall be mitigated consistent with Section 106 or State Historic Preservation Officer Guidelines.	Less than Significant
CUL-2 & CUL-4. Tribal Cultural Resources (TCRs). There are no known TCRs within the Project footprint; therefore, no construction or operational impacts are anticipated.	Less than Significant	No mitigation measures are required.	Less than Significant
CUL-3. Historical Resources. Construction would require that a temporary cofferdam be placed in the Grand Canal, which is the only historical resource in the study area. The cofferdam would be removed pending completion of construction activities and	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
the diversion structure installed under the Grand Canal and would not protrude into the water surface and would be entirely buried. No operational impacts would occur to the Grand Canal.			
Cumulative Impacts. Neither the related projects (see Chapter 1, Introduction [Table 1-1, Related Projects List] of this EIR) nor the Proposed Project are expected to adversely affect cultural resources, nor result in effects that are potentially cumulatively significant.	Less than Significant	No mitigation measures are required.	Less than Significant
Geology and Soils			
GEO-1. Seismic Hazards. During construction and operation, the Project Site could be subject to significant seismic ground shaking from regional faults; however the VAPP would be designed in conformance with the City of Los Angeles Building Code, which would reduce potential ground shaking hazards. Due to presence of uncertified fill soils, seismically related ground failure, including liquefaction, could occur on the Project Site.	Potentially Significant	**MM GEO-1: Liquefaction Considerations.** Given the data presented in Section 3 of the *Geotechnical Engineering Report – Venice Auxiliary Pumping Plant*, December 14, 2015, and the results of the liquefaction calculations, potential liquefaction induced settlements on the order of 1.75 inches are estimated for the site. A potential liquefaction induced differential settlement of 1 inch is estimated between the proposed structures and the pipe header. These potential liquefaction induced settlements shall be considered and accounted for in the design of the Proposed Project. Mat foundations are recommended for support of the Project structures, with the understanding that the foundation would be susceptible to liquefaction-induced settlements. Mat foundations for the wetwell/valve structure and diversion structures shall be founded on jet-grouted columns constructed within the natural soils. The mat foundation for the electrical building shall be founded on compacted fill soil. Mat foundations shall be designed and constructed to bear at a depth of at least 24 inches below the	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
		lowest adjacent grade. Mat foundations can be designed for an allowable bearing capacity of 1,500 pounds per square foot (psf). A coefficient of vertical subgrade reaction, for a 1-foot-square loaded area, of 100 kips per cubic foot (kcf) may be used for design of the mats. Total static settlement of the proposed foundations, designed and constructed in accordance with the recommendations presented herein, shall not exceed 1 inch. Differential static settlement shall not exceed one-half of the total settlement. Resistance to lateral loads can be provided by friction at the base of the foundation and passive earth pressure. A coefficient of friction of 0.35 may be assumed with dead-load forces. An allowable passive lateral earth pressure of 250 psf per foot of depth up to a maximum of 2,500 psf may be used for sides of the foundation poured against undisturbed natural soil or properly compacted fill. The allowable passive pressure may be increased by 33% of lateral loading due to wind or seismic forces.	
GEO-2. Unstable Soils. The Project Site is not located within an earthquake-induced landslide hazard zone and it does not contain lateral spreading, subsidence, or collapse hazards. The Project Site is subject to liquefaction hazard.	Less than Significant	Implement MM GEO-1, as noted above.	Less than Significant
GEO-3. Expansive Soils. The Project Site is not located on expansive soils.	Less than Significant	No mitigation measures are required.	Less than Significant
HAZ-1.Release of Hazardous Materials. The parcel located at 128 Hurricane Street lies within the administrative boundaries of the Playa Del Rey Oil Field. One oil well 'McDonald 2' and the Project	Potentially Significant	**MM HAZ-1a: Soil and Soil Vapor Subsurface Investigation**. Prior to construction, a soil and soil vapor subsurface investigation shall be conducted by a qualified environmental consultant specializing in the identification and handling of hazardous materials. The subsurface investigation may include, but would not be limited to: d) A scope of work consisting of Pre-Field Activities, such as	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Site is located within a methane zone.		preparation of a Health and Safety Plan (HASP), determining and marking sampling/boring locations and obtaining utility clearance, and Field Activities, such as identifying appropriate sampling procedures, health and safety measures, chemical testing methods, and quality assurance/quality control (QA/QC) procedures in accordance with the ASTM Standard. e) Necessary permits for boring advancement. f) A Sampling and Analysis Plan (SAP) in accordance with the scope of work. g) Laboratory analyses conducted by a State-certified laboratory. h) Disposal process including transport by a State-certified hazardous material hauler to a State-certified disposal or recycling facility licensed to accept and treat hazardous waste. **MM HAZ-1b: Confirmation of Oil Well Abandonment**. Prior to construction, the applicant shall obtain confirmation via DOGGR of the proper abandonment of oil well 'McDonald 2'. If re-abandonment of McDonald 2 was not performed to current DOGGR requirements, the applicant shall seek the assistance of a qualified environmental consultant to abandon the oil well to current standards. **MM HAZ-2: Methane Encroachment**. If the analytical results of the subsurface investigation under Mitigation Measure HAZ-1a determine that methane encroachment has the potential to affect VAPP operational activities, the environmental consultant shall provide recommendations during construction of the proposed project to mitigate long term potential impacts.	
Cumulative Impacts. Neither the related projects (see Chapter 1, Introduction [Table 1-1, Related Projects List] of this EIR) nor the Proposed Project are	Less than Significant	See MM GEO-1 above. No other mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
expected to result in adverse effects related to geology and soils, nor result in effects that are potentially cumulatively significant, after implementation of mitigation measures.			
Greenhouse Gas Emissions			
GHG-1. Generation of GHGs: Construction of the Proposed Project would result in GHG emissions from fuel combustion associated with heavy-duty construction equipment, construction workers' vehicle trips, material deliveries, and trips by haul trucks. GHG emissions resulting from Project implementation would not exceed SCAQMD's 10,000-metric-ton threshold, and impacts would be less than significant.	Less than Significant	No mitigation measures are required.	Less than Significant
GHG-2. Potential for Conflict with GHG Reduction Plans: Implementation of the Proposed Project would not generate GHGs that would exceed existing conditions and the interim SCAQMD threshold or applicable plans.	Less than Significant	No mitigation measures are required.	Less than Significant
Cumulative impacts: GHGs and climate change are cumulatively considerable, even though the contribution	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
may be individually limited (SCAQMD 2008). SCAQMD methodology and thresholds are thus cumulative in nature. As discussed above, the Proposed Project would not exceed the threshold of significance. Therefore, the Proposed Project would not contribute to a cumulatively significant impact related to GHG emissions and climate change.			
Hydrology and Water Quality			
HYRDO-1. Water Quality. Construction activities, such as grading and excavation, could increase the potential for erosion and sediment transport via stormwater runoff (or wind) to the storm drain system and ultimately to the Grand Canal other nearby water bodies, adversely affecting water quality. The construction of a temporary cofferdam in the Grand Canal would require installation of sheeting that would disturb existing sediments in the Grand Canal, which could also impair water quality. Compliance with existing regulations and permit requirements would minimize potential impacts.	Potentially Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
No operational impacts would result.			
HYDRO-2. Erosion. See discussion above under *HYDRO-1. Water Quality*. No operational impacts would result.	Potentially Significant	No mitigation measures are required.	Less than Significant
HYDRO-3. Alter Existing Drainage Patterns Resulting in On- or Off-site Flooding. Dewatering of the site would be required, although the exact amount is not known at this time. In addition, construction of the cofferdam in the Grand Canal could substantially alter flows. Compliance with existing regulations and permit requirements would minimize potential impacts. No operational impacts would result.	Potentially Significant	No mitigation measures are required.	Less than Significant
HYDRO-4. Stormwater Drainage Systems. Construction and operation of the Proposed Project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.	Less than Significant	No mitigation measures are required.	Less than Significant
HYDRO-5. Degrade Water	Potentially Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Quality. Both land side and in-water construction activities could result in a discharge of contaminated sediments, removed vegetation, trash, and other metals and hydrocarbons. In addition, although no known contaminated sediments are located at the Project Site, excavated soils may become accidentally contaminated in the event of a construction-related spill and could enter the Grand Canal, Ballona Lagoon, and Ballona Creek (associated with Laydown Area 3 in Culver City), Compliance with existing regulations and permit requirements would minimize potential impacts. No operational impacts would result.			
HYDRO-6. Flooding and 100-year Flood Hazard Areas. Construction and operation of the Proposed Project would not place structures that would impede or redirect flood flows within a 100-year flood hazard area. Placement of a temporary cofferdam in the Grand Canal during construction would not increase flows above the channel banks during storm	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
events, including the 100-year, 24-hour storm.			
HYDRO-7. Contribute to inundation by Seiche, Tsunami, Sea Level Rise or Mudflow. Construction of the Proposed Project would not contribute to inundation by seiche, tsunami, sea level rise, or mudflow. However, the existing VPP and the Proposed VAPP are currently located in a tsunami hazard zone and are already vulnerable to inundation by tsunami impacts. Also, due to their location adjacent to tidal water bodies (i.e. the Pacific Ocean, Grand Canal and Ballona Lagoon), that could rise due to sea level rise and storm surges, the VPP and the Proposed VAPP are vulnerable to flooding from 100-year storm events during operation.	Less than Significant (construction) Significant and Unavoidable	No mitigation measures are required. **MM-HYDRO- 1**: The City of Los Angeles Department of Sanitation shall prepare a Tsunami Response and Action Plan designed for the VPP/VAPP facility by 2020. At a minimum, the plan shall identify and implement specific measures related the VPP/VAPP which are designed to 1) reduce impacts to the facility in the event of a tsunami and/or with future sea level rise conditions and 2) identify what actions are needed at the VPP/VAPP facility and within the wastewater infrastructure system to accelerate the recovery period of the VPP/VAPP facility in the event that a tsunami or major storm event disabled the facilities. These measures shall be implemented at the VAPP by 2022. The action plan could include the following measures: • Evaluate the potential for installing temporary flood barriers as needed when sufficient notice is given; • Evaluate the use of watertight enclosures to further protect electrical equipment, instrumentation and controls before completing final design of the VAPP facility and other LA Sanitation wastewater facilities located within local coastal areas, as appropriate.	Less than Significant (construction) Significant and Unavoidable
HYDRO-8. Instability from Erosion. See discussion above under *HYDRO-1. Water Quality*. No operational impacts would result.	Less than Significant	No mitigation measures are required.	Less than Significant
HYDRO-9.Accelerate Wind and Water Erosion. See discussion above under *HYDRO-1. Water Quality*. No operational impacts would result.	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
HYDRO-10. Create pollution, contamination or nuisance that would violate a water quality standard. See discussion above under *HYDRO-1. Water Quality*. No operational impacts would result.	Less than Significant	No mitigation measures are required.	Less than Significant
HYDRO-11. Cause flooding during the projected 50-year developed storm event. See section above under *HYDRO-6. Flooding and 100-year Flood Hazard Areas*. No operational impacts would result.	Less than Significant	No mitigation measures are required.	Less than Significant
HYDRO-12. Affect Amount of Water Body Surface Water. Construction and operation of the Proposed Project would not substantially reduce or increase the amount of surface water in a water body.	Less than Significant	No mitigation measures are required.	Less than Significant
HYRDO-13. Surface Water Movement. Construction and operation of the Proposed Project would not result in permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow.	Less than Significant	No mitigation measures are required.	Less than Significant
Cumulative Impacts. Neither the related projects (see Chapter 1, Introduction [Table 1-1, Related Projects List] of this EIR) nor the	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Proposed Project are expected to adversely affect water quality or hydrology, nor result in effects that are potentially cumulatively significant.			
Land Use and Planning			
PLNG-1. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project.: Construction and operation of the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) The Proposed Project would be required to obtain permits and other discretionary actions (see Table 2-1 in Chapter 2, Project Description of this EIR) prior to construction and operation, which would reduce impacts. Because the Proposed Project would represent a new use, it will need to be designed and constructed in a manner that is in keeping with the character of the existing neighborhood and as	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
identified in the City's Municipal Code and other applicable design guidelines.			
PLNG-2. Be inconsistent with the adopted land use/density designation in the Community Plan, redevelopment plan or specific plan for the site: The Proposed Project would not be inconsistent with the adopted land use/density designation in the Community Plan, as shown in Table 3.8-2 (see Section 3.8 [Land Use & Planning] of this EIR).	Less than Significant	No mitigation measures are required.	Less than Significant
PLNG-3. Be inconsistent with the General Plan or adopted environmental goals or policies contained in other applicable plans: Table 3.8-2 (see Section 3.8 [Land Use & Planning] of this EIR) describes impacts related to whether the Proposed Project is inconsistent with the General Plan or adopted environmental goals or policies contained in other applicable plans. As shown in this table, all impacts would be less than significant.	Less than Significant	No mitigation measures are required.	Less than Significant
PLNG-4. Extent of the area that would be impacted, the nature and degree of impacts, and the type of land uses within that area: The	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Proposed Project represents a continuation of the Public Facility use, which was present in the 1950s and was the first urban use in the neighborhood. In addition, the Public Benefits Project section of the Los Angeles Municipal Code permits its construction under its current zoning and general plan land use designations.			
PLNG-5. The number, degree, and type of secondary impacts to surrounding land uses: The analysis contained in this EIR has determined that all impacts, with the exception of construction-related noise and vibration, can be mitigated to less than significant levels with standard regulatory requirements or the implementation of mitigation measures. In the case of construction-related noise and vibration impacts, these would be significant and unavoidable during the construction period, which is expected to last 24 months.	Secondary Impacts (Construction): Significant, due to significant and unavoidable impacts related to construction noise and vibration Secondary Impacts (Operations): Less than Significant	Secondary impacts on surrounding land uses would result from significant construction noise and vibration impacts. MM NOI-1 and MM NOI-2 are required to reduce these impacts. However, even with the application of these mitigation measures, the impacts remain significant and unavoidable. Secondary impacts on surrounding land uses related to noise during operations are addressed with MM NOI-3, which reduces operational noise levels created by building equipment, MM AES-3, which ensures that all Proposed Project structures will be designed to minimize their visual presence, and MM GEO-1, which helps prevent seismically related ground failure, including failure related to liquefaction.	Secondary Impacts (Construction): Significant and Unavoidable; Secondary Impacts (Operations): Less than Significant
Cumulative Impacts. Neither the related projects (see Chapter 1, Introduction [Table 1-1, Related Projects	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
List] of this EIR) nor the Proposed Project are expected to adversely affect land use and planning, nor result in effects that are potentially cumulatively significant.			
Noise and Vibration			
NOI-1. Construction Noise. Construction of the Proposed Project would not result in significant short-term impacts associated with construction-related traffic driving to and from the Project Site or intermittent construction-related noise generated by activities at nearby storage/laydown area(s) outside the Project Site at vacant lots adjacent to the Grand Canal and Ballona Lagoon. However, construction activities would exceed the existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use. This impact cannot be completely eliminated and would remain potentially significant and unavoidable after implementation of mitigation.	Potentially Significant	**MM NOI-1: Prepare and Implement a Construction Noise Control Plan to Reduce Construction Noise at Noise-Sensitive Land Uses**. To reduce the significant construction noise impacts, the Los Angeles Bureau of Engineering (LABOE) and Contractor shall develop a noise control plan that includes the implementation of the following noise reduction measures during construction: a) Construction activities shall occur only between 8:00 a.m. to 6:00 p.m. Monday through Saturdays. No construction activity shall occur on national holidays or at any time on Sundays. The use of the pile driver, grader and jackhammer construction equipment shall be limited to the hours of 9 a.m. to 3:30 p.m. Haul trucks can only access the site through local neighborhood streets from 9 a.m. to 4 p.m. Construction personnel shall not be permitted on the Project Site (including laydown and storage areas), and material or equipment deliveries and collections shall occur outside of these hours. b) All piles, including sheeting, shall be installed and extracted using vibration- and percussive-free methods. c) To minimize unavoidable noise, LABOE and/or its Contractor shall maintain good communication with the surrounding community regarding the schedule, duration, and progress of the construction. Residents at properties within 500 feet of construction activities shall be notified 72 hours in advance of the planned activities prior to the start of work. The notification shall advise that there will be loud noise associated with the construction, and shall	Significant and Unavoidable

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
		state the date, time, and expected duration of the planned activities. The notification shall provide a telephone contact number for affected parties to ask questions and/or relay concerns. d) To the extent practicable, temporary noise barriers with a minimum height of 20 feet shall be employed around the Project Site. Openings in the barriers shall be kept to the minimum necessary for access of vehicles, equipment, and construction material. These barriers shall be constructed as follows. ○ From commercially available acoustical panels lined with sound-absorbing material (the sound-absorptive faces of the panels shall face the construction equipment); or, ○ From acoustical blankets hung over or from a supporting frame. The blankets shall provide a minimum sound transmission class rating of 28 and a minimum noise-reduction coefficient of 0.80 and shall be firmly secured to the framework with the sound-absorptive side of the blankets oriented toward the construction equipment. The blankets shall be overlapped by at least 6 inches at seams and taped so that no gaps exist. The largest blankets available shall be used in order to minimize the number of seams. The blankets shall be draped to the ground to eliminate any gaps at the base of the barrier. e) For noise-generating equipment that cannot be shielded by site perimeter barriers, localized noise barriers or enclosures shall be employed wherever feasible. The height and location of these barriers/enclosures shall be designed to block the line of sight between the equipment and the surrounding homes. f) LABOE/Contractor shall retain the services of an acoustical/noise consultant to prepare a Noise Monitoring Plan. ○ This shall be a site-specific plan for monitoring and reporting construction noise levels in the community to evaluate the Contractor's performance.	

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
		○ Based on the details of the Contractor's specific construction schedule, the plan shall develop construction noise goals, in terms of the 1-hour Leq, that should be achieved for each phase of construction with the inclusion of feasible and practicable noise abatement measures. ○ If noise monitoring indicates the applicable noise goals have been exceeded, steps shall be taken to promptly implement any additional effective abatement measures that are feasible and/or practicable. g) To the fullest extent practicable, the quietest available type of construction equipment shall be used. Newer equipment is generally quieter than older equipment. The use of electric-powered equipment is typically quieter than diesel- or gasoline-powered equipment, and hydraulic-powered equipment is typically quieter than pneumatic-powered equipment. h) All construction equipment used on the Proposed Project that is regulated for noise output by a local, state, or federal agency shall comply with such regulation while in the course of Project activity and use on site. i) All construction equipment shall be properly maintained. (Poor maintenance of equipment may cause excessive noise levels.) j) All construction equipment shall be equipped with properly operating and maintained mufflers, air-inlet silencers where appropriate, and any other shrouds, shields, or other noise-reducing features that meet or exceed original factory specifications. k) All construction equipment shall be operated only when necessary, and shall be switched off when not in use. Idling inactive construction equipment for prolonged periods (i.e., more than 2 minutes) shall not be permitted. l) The use of noise-producing signals, including horns, whistles, alarms, and bells, shall be for safety warning purposes only.	

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
		m) No Project-related public address or music system shall be audible at any adjacent residential receptor. n) Construction employees shall be trained in the proper operation and use of the equipment. (Careless or improper operation or inappropriate use of equipment can increase noise levels. Poor loading, unloading, excavation, and hauling techniques are examples of how a lack of adequate guidance and training may lead to increased noise levels.) o) Stationary noise sources such as generators and compressors shall be positioned as far as possible from noise sensitive areas. p) Construction equipment shall be stored on the Project Site or designated laydown areas while in use, to the extent feasible. This will eliminate noise associated with repeated transportation of the equipment to and from the site. q) To the extent possible, haul roads shall not be designated through noise-sensitive areas.	
NOI-2 & 3. Construction Vibration. Construction of the Proposed Project would result in ground-borne vibration that would exceed the thresholds developed both for potential annoyance at nearby homes and for potential vibration damage at nearby structures. This impact cannot be completely eliminated and would remain potentially significant and unavoidable after implementation of mitigation.	Potentially Significant	Implement MM NOI-1, as noted above. **MM NOI-2: Implement ground-borne vibration control measures to reduce construction-generated vibration**. To reduce the significant construction vibration impacts, LABOE/Contractor shall implement the following vibration reduction measures during Project construction: a) All piles, including sheeting, shall be installed and extracted using vibration- and percussive-free methods. b) LABOE and/or Contractor shall retain a qualified structural or geotechnical engineer to conduct pre-construction surveys of adjacent neighboring structures (including photographing and/or videotaping) to document existing building conditions for future comparison if any vibration-related damage is suspected or results from construction-related activities. c) If considered appropriate by the structural/geotechnical engineer, monitoring shall be conducted during construction to check for vibration-related damage from equipment	Significant and Unavoidable (annoyance impacts only)

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
		during its use. Such monitoring may include vibration measurements obtained inside or outside of the buildings, or other tests and observations deemed necessary.	
NOISE-3 & 4. Operational Noise. Operation of the Proposed Project could produce noise levels propagating to neighboring properties that could be high enough to raise ambient noise levels by 5 dB CNEL or more.	Potentially Significant	**MM NOI-3: Design Project facilities to reduce noise from all mechanical and electrical equipment to levels that comply with applicable regulations.** To reduce the significant operational noise impacts to less than significant, noise control features shall be included during the final architectural and engineering design phase of the Project, to reduce overall operational noise levels from all Project-related sources to within 5 dB CNEL of existing ambient noise levels in the surrounding community (53 to 57 dB CNEL, as described in Table 3.9-6), and to comply with Chapter XI of the City of Los Angeles Municipal Code (i.e., restrict noise level increases, relative to the existing 1-hour L_{eq}, to 5 dBA or less). The City shall retain an acoustical/noise consultant to evaluate the design and provide recommendations for specific noise-control features, as necessary, feasible, and practicable, based on the final equipment selections and specifications for the Project. Such noise control features may include, but are not limited to, the following: a) Selecting equipment with lower sound power levels. b) Adjusting the location of equipment items within the Project Site to increase the distance from the closest sensitive receptors and/or increase acoustical shielding provided by intervening structures, where practicable and feasible. c) Shielding noise-generating equipment with screens, acoustical panels, enclosures, or block walls. d) Using sound-rated doors, windows, and access hatches at the electrical building and subterranean vault. e) Adding sound-absorptive materials to interior spaces to reduce buildup of reverberant noise levels. f) Designing ventilation systems with acoustical louvres, intake and exhaust silencers, and other features to control exterior noise propagation from interior sources.	Less than Significant
Cumulative Impacts. Impacts associated with noise and	Potentially Significant (construction only)	Implementation of MM NOI-1 and MM NOI-2 (previously described above).	Significant and Unavoidable

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
vibration during construction were determined to be significant and unavoidable. Cumulative impacts during operation would be less than significant.			(construction only)
Transportation/Traffic			
TRANS-1. *Exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness:* The construction traffic impacts associated with the Project would be short-term in nature and limited to the period of time when construction activity is taking place. The primary off-site impacts resulting from the movement of construction trucks would include a short-term and intermittent lessening of roadway capacities due to the slower movements and larger turning radii of the trucks compared to passenger vehicles. Implementation of the Proposed Project would not exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
components of the circulation system			
TRANS-2. Conflict with an applicable congestion management program: The Proposed Project would add up to an estimated 58 daily truck trips related to excavation, material deliveries and worker commutes during the construction phase of the Proposed Project. As such, the Project would not trigger a CMP analysis and implementation of the Proposed Project would not result in a potentially significant impact related to an applicable congestion management program.	Less than Significant	No mitigation measures are required.	Less than Significant
TRANS-3. Result in inadequate emergency access: Construction-related activities have the potential to result in temporary and periodic inadequate emergency access. Wherever possible, delivery trucks would be brought onto the Project Site and be loaded and unloaded within the perimeter fence of the construction site. The roadways surrounding the Project Site would remain	Potentially Significant	**MM TRANS-1: Construction Worker Shuttles.** Construction workers would park at an off-site location and be shuttled to and from the Project Site each workday on 10 to 15-passenger shuttles or vans. While no specific off-site location has been identified at this time, it would likely lie within five miles of the Project Site. The selected contractor would be required to identify and secure a suitable location. In general, work is planned to occur between 8:00 a.m. and 6:00 p.m., and worker shuttles are expected to depart the site by 6:00 p.m. **MM TRANS-2: Coordination with Emergency Service Providers.** Coordinate with emergency service providers (police, fire, ambulance and paramedic services) to provide advance notice of any lane closures, construction hours and changes to local access and to identify alternative routes where	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
accessible during operation of the Proposed Project. Operational impacts would be less than significant.		appropriate.	
TRANS-4. . Result in In-Street Construction Impacts: Based on City of Los Angeles guidelines, VAPP construction activity would not result in any significant traffic impacts on study area streets because the maximum number of daily Project trips is estimated to be 108 1-way trips, which is below the minimum threshold volume considered significant. The Proposed Project would not result in in-street construction impacts related to temporary loss of access and impacts. The Proposed Project would not result in in-street construction impacts related to temporary loss of bus stops or rerouting of bus lines. A portion of Hurricane Street and Canal Court would be temporarily closed. This impact could be adverse during peak hours, but is not considered to be significant because of the temporary nature of the construction activities.	Less than Significant	No mitigation measures are required.	Less than Significant
Cumulative Impacts.	Less than significant.	No mitigation measures are required.	Less than significant.

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
With regards to cumulative traffic impacts during construction, of the eight related projects (see Chapter 1, Table 1-1) only two (Via Dolce Park and Venice Dual Force Main), have identified construction schedules that would overlap with VAPP. As shown in Table 3.10-1, two of the six study intersections were projected to operate at unacceptable levels of service of E or F during one or both peak hours. Construction traffic generated by the two related projects could result in additional congestion at these and other intersections in the project area. As discussed in the VAPP construction impact analyses above, the Proposed Project could generate up to 48 daily vehicle trips during the construction period. Those vehicle trips, combined with the construction vehicle trips due to the related projects, could cumulatively exacerbate already congested conditions at study area intersections. However, the impacts due to construction traffic would be temporary, and as noted above, the City of Los Angeles considers			

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
construction-related traffic impacts adverse but not significant because such impacts, while sometimes inconvenient, are only temporary.			
Energy			
ENERGY-1. New off-site energy supply facilities and distribution infrastructure: No new or expanded sources of energy or infrastructure would be required to meet the energy demand under construction. Under operation, energy consumption would be a nominal addition to the regular energy use.	Less than Significant	No mitigation measures are required.	Less than Significant
ENERGY-2. Whether needed infrastructure was anticipated by adopted plans: Given the extensive network of fueling stations throughout the Project vicinity, the existing fuel infrastructure is expected to accommodate the increased construction-period demand for fuel introduced by the Proposed Project. The proposed Project is consistent with wastewater provisions contained in the Framework Element of the City of Los Angeles General Plan. The Bureau of	Less than Significant	No mitigation measures are required.	Less than Significant

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
Engineering has programmed the Proposed Project as part of its Wastewater – Collection System Program. The Los Angeles Department of Water and Power (LADWP) has adopted the Power Integrated Resource Plan to manage the electricity needs of the city's inhabitants, which includes energy used for wastewater pumping.			
ENERGY-3. Degree to which the project design and/or operations incorporate energy conservation measures: All equipment would be used in compliance with the manufacturer's specifications. As such, construction of the Proposed Project is not expected to result in the wasteful or inefficient use of energy. The Proposed Project would be as efficient as possible and would include variable frequency drives on for the pumps for maximum efficiency and the electrical building would be constructed in compliance with the City's Building Code, including its Green Building Code.	Less than Significant	No mitigation measures are required.	Less than Significant
Cumulative Impacts: The natural gas and fuel use that would result from Project	Potentially Significant	No mitigation measures are available.	Significant and Unavoidable.

Environmental Impact	Significance Before Mitigation	Mitigation Measures	Significance after Mitigation
implementation would be negligible relative to the regional market. However, the increase electricity consumption associated with the Proposed Project in combination with future projects within LADWP's service area may require new electricity transmission infrastructure or the rehabilitation of existing electricity infrastructure to meet the increased demand and maintain adequate levels of service. Where LADWP has identified specific individual projects that are required to meet future projected regional cumulative demands and determined that construction or operation of those projects would result in significant impacts to the environment, then the cumulative impact of the Proposed Project and other projects in the LADWP service area would be considered significant.			

Chapter 1
Introduction

This chapter presents background information for the proposed Venice Auxiliary Pumping Plant (VAPP) Project (Proposed Project), including:

- The authority of the lead agency, the City of Los Angeles Bureau of Engineering (LABOE), to prepare this Draft Environmental Impact Report (EIR);
- The purpose of the environmental review process;
- The scope, content, and intended uses of the Draft EIR;
- Public outreach efforts during the California Environmental Quality Act (CEQA) process;
- Key principles guiding the preparation of this Draft EIR; and
- Related projects considered when analyzing the potential for cumulative environmental impacts.

1.1 Background and Project Overview

The City of Los Angeles (City) owns and operates the Venice Pumping Plant (VPP) (Pump Station No. 646), located at 140 Hurricane Street in the Los Angeles community of Venice. The largest of the City's pumping plants, the VPP is considered a critical facility for conveying sewage. The facility was built in 1957 and expanded and upgraded in 1987. Two duty and three backup pumps currently serve the facility. The VPP collects sewage from the City's Coastal Interceptor Sewer (CIS), which serves the communities of Topanga, Pacific Palisades, Brentwood, Venice, and Mar Vista. It also services Santa Monica and parts of Los Angeles County. Sewage from the CIS is pumped south via the VPP to the City's Hyperion Treatment Plant, located in Playa del Rey. Unlike other portions of the City's sewage collection and conveyance system, there are currently no diversions for bypassing the facility or associated CIS for required maintenance or in the event of an emergency. Moreover, the existing VPP is essentially built out and has no additional space for the additional backup pumps and associated equipment required to ensure future system reliability.

During dry-weather flows (when no rain occurs), the two duty pumps serve the facility and pump about 20 million gallons per day (mgd) of sewage. During wet-weather flows (rain), as much as 50 mgd of sewage may be pumped by the facility, requiring all five pumps to be in operation simultaneously. On several occasions, during extreme weather events (e.g., 1990s and 2000s), the flows exceeded the combined simultaneous pumping capacity of the facility, resulting in near-miss events, which would have required emergency discharges directly to the Grand Canal and Ballona Lagoon or overflows into the surrounding street network. To address these issues, LABOE and LA Sanitation began planning and designing projects that would upgrade and enhance the CIS and VPP (see Chapter 2, Project Description), including the proposed VAPP project.

As currently proposed (see Figure 2-4, Site Plan, in Chapter 2), the VAPP would include construction of an auxiliary pumping facility on two vacant City-owned parcels, located adjacent to the VPP. The new facility would provide additional reliability and be sized to supplement the pumping capacity of the VPP, for a combined ultimate peak-flow capacity of 87 mgd, reflecting wet-weather flows during

a 10-year storm event. The facility would also allow regular service and maintenance activities to occur without creating concern that pumping capacity during these times would not be adequate to handle increased wet-weather flows. With upgraded system redundancy and reliability, the potential for near misses and/or catastrophic system failures during maintenance periods would be reduced.

As part of the Proposed Project, a number of system improvements would be implemented, both above and below ground, including a new electrical building, housing the control system and employee workstations; three new underground and submersed pumps; a backup generator; sewer pipe connections to the CIS, including construction of a diversion structure beneath the Grand Canal; and parking, public art, and open space. Combined, the five existing pumps at the VPP and the three new pumps would have a rated capacity of 87 mgd (i.e., five duty pumps and three standby). All pumps would have a similar capacity and be functionally equivalent. Please see Chapter 2 for a more detailed description of the Proposed Project.

Construction is anticipated to begin in February 2018 and last approximately 2 years.

1.2 Purpose and Intended Use of This EIR

The purpose of this Draft EIR is to inform decision-makers and the general public of the potential environmental impacts that could result from the Proposed Project. An EIR is the most comprehensive form of environmental documentation under CEQA and the State CEQA Guidelines. It provides the information needed to assess the environmental consequences of a proposed project, to the extent feasible. EIRs are intended to provide an objective, factually supported full-disclosure analysis of the environmental consequences associated with a proposed project that has the potential to result in significant, adverse environmental impacts. An EIR is one of the various decision-making tools used by a lead agency to consider the merits and disadvantages of a project that is subject to its discretionary authority.

CEQA requires the decision-making body to balance, as applicable, the economic, legal, social, or other benefits of the project against the unavoidable environmental risks when determining whether to approve the project. If the specific economic, legal, social, or other benefits of the project outweigh the unavoidable significant environmental impacts, the significant environmental impacts may be considered acceptable, and the lead agency will adopt a Statement of Overriding Considerations (SOC). When the lead agency approves a project that will result in significant impacts, as identified in the EIR, but the impacts are not avoided or substantially lessened, the SOC is the document that contains the specific reasons that support the agency's decision, based on the Final EIR and/or other information in the administrative record. The SOC must be supported by substantial evidence in the record, including findings. In addition, pursuant to Section 21081.6 of CEQA, when approving a project, public agencies must also adopt a mitigation monitoring plan or program for changes that were incorporated into the project or made a condition of project approval to mitigate or avoid significant environmental impacts.

The project owner is LA Sanitation. LABOE is responsible for obtaining the required environmental and planning permits and approvals as well as designing and constructing the Proposed Project. A description of the Proposed Project is provided in Chapter 2 of this Draft EIR.

The Proposed Project requires certain discretionary approvals from the City of Los Angeles and other public agencies (see below and Chapter 2). Therefore, the Proposed Project is subject to environmental review requirements under CEQA.[1] The City of Los Angeles is the lead agency under CEQA for the Proposed Project.

As described in Sections 15121(a) and 15362 of the State CEQA Guidelines, an EIR is an informational document that informs public agency decision-makers and the public of the significant environmental effects of a project, identifies possible ways to minimize the significant effects, and describes reasonable alternatives to the project. The purpose of this Draft EIR, therefore, is to focus the discussion on those potential effects of the Proposed Project on the environment that the lead agency has determined may be significant. In addition, feasible mitigation measures are recommended, when applicable, to reduce or avoid significant environmental impacts.

The EIR is prepared by and under the direction of LABOE, which also has primary responsibility for recommending approval of and implementing the Proposed Project. Project approval and certification of the EIR must be considered by the Los Angeles City Council.

As shown in Figure 1-1, EIR Process Overview, an EIR is prepared in three key stages. The CEQA process is initiated when the lead agency identifies a proposed project. The lead agency then normally prepares an Initial Study to identify the preliminary environmental impacts of the Proposed Project. The Initial Study for the VAPP project determined that the Proposed Project could have significant environmental impacts that would require further study and implementation of mitigation measures. Therefore, the lead agency has decided to prepare an EIR. A Notice of Preparation (NOP) is prepared to notify public agencies and the general public that the lead agency is starting the preparation of an EIR for the Proposed Project. The NOP and Initial Study are circulated for a 30-day review and comment period. During this review period, the lead agency requests comments from agencies, interested parties, stakeholders, and the general public on the scope and content of the environmental information to be included in the Draft EIR.

Figure 1-1. EIR Process Overview



[1] Public Resources Code Sections 21000–21189.3.

After the close of the 30-day review and comment period, the lead agency continues the preparation of the Draft EIR and associated technical studies (if any). Once the Draft EIR is complete, a Notice of Availability (NOA) is prepared to inform agencies and the general public of the document and the locations where the document can be reviewed. The Draft EIR and NOA are circulated for a 45-day review and comment period to provide agencies and the general public an opportunity to review and comment on the adequacy of the analysis and the findings regarding potential environmental impacts of the Proposed Project.

After the close of the 45-day review and comment period, responses to all comments received on the Draft EIR are prepared. The lead agency prepares a Final EIR, which incorporates the Draft EIR or a revision to the Draft EIR, Draft EIR comments and a list of commenters, and responses to comments. In addition, the lead agency must prepare the findings of fact for each significant effect identified; the SOC, if there are significant impacts that cannot be mitigated; and a mitigation monitoring and reporting program to ensure that all proposed mitigation measures are implemented.

The Board of Public Works will consider the Final EIR and make a recommendation to the Los Angeles City Council, as the governing body of the City of Los Angeles, regarding certification of the Final EIR and project approval. The City Council may certify and approve the Final EIR or may choose to not approve the project.

During the environmental review and project approval process, people and/or agencies may address the Board of Public Works and City Council regarding the Proposed Project. Public notification of agenda items for the Board of Public Works are available here:

http://bpw.lacity.org/Agendas.html

City Council agenda items are posted 72 hours prior to the public meeting. The City Council agenda can be obtained by visiting the City Council:

City Hall
200 North Spring Street
John Ferraro Council Chamber, Room 340
Los Angeles, CA 90012

Alternatively, agendas can also be accessed via the Internet at the following location:

http://lacity.org/city-government/elected-official-offices/city-council/council-calendar

Within 5 days of project approval, the LABOE will file a Notice of Determination (NOD) with the County Clerk. The NOD will be posted by the County Clerk within 24 hours of receipt. This begins a 30-day statute of limitations on legal challenges to the CEQA approval by the lead agency. The ability to challenge the approval in court may be limited to those persons who objected to the approval of the Proposed Project and issues that were presented to the lead agency by any person in writing during the public review and comment periods regarding the EIR.

The Final EIR is used by the recommending bodies (LABOE) and the final decision-makers (City Council) to weigh the environmental impacts against the benefits of the Proposed Project.

1.3 Scope and Content of the Draft EIR

In accordance with the requirements of CEQA, the City prepared an Initial Study (see below), dated November 12, 2015, which identified the topics to be analyzed in the EIR. The Initial Study is contained in Appendix A (Notice of Preparation/Initial Study) of this Draft EIR.

Because the analysis contained in the Initial Study determined that the Proposed Project would result in less-than-significant or no impacts related to agriculture and forestry resources, hazards and hazardous materials, mineral resources, population and housing, public services, and recreation, no further analysis is required in the EIR. Therefore, the focus of this EIR has been limited to the following environmental impact areas:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use and Planning
- Noise and Vibration
- Transportation/Traffic
- Utilities and Service Systems[2]
- Energy

It should be noted, however, that the required sections and analysis, per CEQA (see Section 1.5, below), are included in this Draft EIR.

1.3.1 Notice of Preparation/Initial Study

In accordance with Section 15082 of the State CEQA Guidelines, LABOE prepared a Notice of Preparation/Initial Study (NOP/IS) for the Proposed Project on November 12, 2015. The NOP was circulated for 30 days. The comment period ended on December 18, 2015. The NOP was also published in the *Los Angeles Times* and *The Argonaut*.

This notice was circulated to members of the public, local and state agencies, and other interested parties to solicit comments on the Proposed Project. Concerns raised in response to the NOP were considered during preparation of this Draft EIR (see Table ES-2 in the Executive Summary of this Draft EIR). The NOP, comment letters received, and Initial Study are presented in Appendix A of this Draft EIR.

[2] This environmental parameter is addressed in Section 3.7, Hydrology and Water Quality, of this Draft EIR.

The NOP was sent to the California Governor's Office of Planning and Research, State Clearinghouse, for further responsible and trustee agency distribution and issuance of a state identification number, which will be referenced on all subsequent correspondence regarding the project.

The NOP/IS was made available at local public facilities, including the Venice – Abbot Kinney Memorial Branch Library, Lloyd Taber – Marina del Rey Library, and the Playa Vista Branch Library, as well as the LABOE web site, http://eng.lacity.org/techdocs/emg/venice_aux_pumping_plant.htm.

Comment letters regarding the NOP were received from the following agencies, groups, and individuals:

- U.S. Army Corps of Engineers (Department of the Army, Los Angeles District)
- California Department of Transportation, District 7
- California Department of Fish and Wildlife
- Gabrieleno Band of Mission Indians – Kizh Nation
- John Tommy Rosas
- Fernandeno Tataviam Band of Mission Indians
- County of Los Angeles Department of Public Works and Department of Beaches and Harbors
- Steve Bradbury
- Morrill Borassi
- Bob Debiase
- Mike Borassi
- Walter Lamb
- Los Angeles Waterkeeper (Arthur Pugsley)
- McQueen-Whalen Revocable Trust (Daniel P. Whalen and Sharon McQueen)
- Barbara Brunasso
- Clare Bronowski
- Gary Wells
- Michael Rosenfield
- William Boyd

1.3.2 Public Outreach Efforts

To solicit public input on the issues proposed for consideration in the EIR, two scoping meetings were held. The December 3, 2015, meeting was at 6:00 p.m. at Venice Foursquare Church, 1400 Riviera Avenue, Venice, CA 90291. The December 8, 2015, meeting was at 6:00 p.m. at Abbot Kinney Memorial Branch Library, 501 South Venice Boulevard, Venice, CA 90291. The purpose of the scoping meetings was to provide information regarding the Proposed Project and the CEQA process and receive public comments regarding the scope and content of the Draft EIR. The comments made at the scoping meeting included concerns about biological resources, hydrology and water quality, noise, air quality, and traffic (see Appendix A of this Draft EIR).

1.4 Responsible and Trustee Agencies and Project Approvals

Under CEQA, a responsible agency is a public agency, other than the lead agency, that has responsibility to carry out or approve a project (Public Resources Code [PRC] Section 21069). A trustee agency is a state agency that has jurisdiction by law over natural resources that are held in trust for the people of the State of California (PRC Section 21070).

The following agencies may be required to provide project approvals and/or permits (see also Table 2-1, Required Permits for Venice Auxiliary Pumping Plant in Chapter 2, Project Description, of this EIR):

- City of Los Angeles
- County of Los Angeles
- City of Culver City
- Los Angeles Regional Water Quality Control Board
- South Coast Air Quality Management District
- California Coastal Commission
- California Department of Conservation, Division of Oil, Gas, and Geothermal Resources
- State of California Department of Health Services
- California Office of Historic Preservation
- U.S. Army Corps of Engineers
- National Marine Fisheries
- U.S. Fish and Wildlife Service

1.5 Organization of the Draft EIR

This Draft EIR conforms to the content requirements stated in Sections 15120 through 15132 of the State CEQA Guidelines. A list of the document's chapters, including and a brief description of their content, is provided here to assist the reader in locating information.

Executive Summary: Located at the front of this document, the Executive Summary provides a brief description of the Proposed Project, including an overview of the impact analysis, recommended mitigation measures, and net residual impact.

Chapter 1: Introduction: The Introduction provides general background information regarding project development and the need for the Proposed Project, along with information regarding the purpose of CEQA and this Draft EIR, including the Draft EIR scoping process; the availability of documents; and the Draft EIR review process.

Chapter 2. Project Description: Chapter 2 presents a statement of the Proposed Project's objectives, a description of the location and setting of the Proposed Project, a detailed description of the Proposed Project's physical characteristics, and related information on phasing and implementation.

Chapter 3. Environmental Impact Analysis: This chapter analyzes the potential impacts (direct and indirect) that could occur as a result of implementation of the Proposed Project. The impact discussion is organized by topical issue (i.e., issues that have been found to have the potential to result in significant impacts).

Chapter 4. Comparison of Alternatives: The Comparison of Alternatives includes a discussion of the proposed alternatives and provides the comparative merits of each alternative.

Chapter 5. Other Environmental Considerations: Chapter 5 evaluates the contextual impacts related to growth-inducing effects and cumulative growth. Impacts found not to be significant and unavoidable adverse impacts are also summarized.

Chapter 6. Persons Consulted: This chapter lists those persons who were consulted to obtain the information that was used in the preparation of this Draft EIR.

Chapter 7. List of Preparers: This chapter lists the persons who prepared this Draft EIR.

Chapter 8. References: This chapter lists the sources of information that were referenced for the analyses contained within this Draft EIR.

1.6 Related Projects

In combination with the VAPP, the related projects described below will provide system reliability and redundancy and allow influent flows from the CIS to be bypassed to the Venice Dual Force Main (VDFM) during extreme weather events or an unforeseen emergency.

1.6.1 Venice Dual Force Main

The VDFM is a new 54-inch-diameter force main in the vicinity of the VPP and proposed VAPP. The new pipeline alignment will cross the Grand Canal from the VPP, extend northerly along Hurricane Street to Marquesas Way, then continue southerly along Via Marina before crossing the Marina Del Rey and Ballona Creek channels to the CIS Diversion Structure on Vista del Mar near Waterview Street. The new force main will operate as a parallel system in conjunction with the existing 48-inch force main to meet the peak wet-weather flow demands experienced at the VPP and add operational flexibility and reliability. The City anticipates finishing construction on the VDFM by 2019.

1.6.2 VPP Manifold Replacement Project

The VPP Manifold Replacement Project was recently completed (August 2015) within Hurricane Street. That project consisted of removing the existing manifold structure located within Hurricane Street, between Canal Court and the Esplanade, and installing a new 60-inch steel manifold with connections to the VPP, the existing 48-inch force main, and stub-outs at both ends for connection to the future 54-inch VDFM and planned VAPP.

1.6.3 Venice Pumping Plant Generator Replacement

The project includes demolition of the existing diesel-fueled standby engine/generators and procurement/installation of two new 750-kilowatt (kW) generators and one new 1,500 kW generator with ancillary controllers, transfer switches, exhaust and cooling systems, and fluid storage.

Table 1-1 is the related projects list for the Proposed Project.

1.7 Key Principles Guiding Preparation of This Draft EIR

1.7.1 Forecasting

In this Draft EIR, LABOE has made its best effort to predict and evaluate the reasonable, foreseeable, direct, indirect, and cumulative environmental impacts of the Proposed Project and alternatives. CEQA does not require LABOE to engage in speculation about impacts that are not reasonably foreseeable (CEQA Guidelines Sections 15144, 15145). In these instances, CEQA does not require a worst-case analysis.

1.7.2 Reliance on Environmental Thresholds and Substantial Evidence

The identification of environmental impacts as significant or less than significant is one of the important functions of an EIR. Although impacts determined to be less than significant need only be acknowledged as such, an EIR must identify mitigation measures for any impact identified as significant. In preparing the document, LABOE has based its conclusions about the significance of environmental impacts on identifiable thresholds, specifically those from the State CEQA Guidelines (Appendix G) and *L.A. CEQA Thresholds Guide,* and has supported these conclusions with substantial scientific evidence. It should be noted that the thresholds of significance contained within the Draft EIR reflect only those that were not previously eliminated in the Initial Study (see Appendix A of this Draft EIR). As such, only those remaining thresholds not addressed in the Initial Study and derived from CEQA Appendix G and the *L.A. CEQA Thresholds Guide* are evaluated.

1.7.3 Disagreement Among Experts

It is possible that evidence that might raise disagreements will be presented during the public review of this EIR. Such disagreements will be noted and will be considered by the decision makers during the public hearing process. In accordance with the provisions of CEQA Guidelines, any conflict of evidence and expert opinions on an issue concerning the environmental impacts of the Proposed Project—when LABOE knows of these controversies in advance—has been identified in the Draft EIR. The Draft EIR has summarized conflicting opinions and included sufficient information to allow the public and decision-makers to make an informed judgment about the environmental consequences of the Proposed Project.

Table 1-1. Related Projects List

	Project Name	Type of Project	Description	Status	Start Date	Completion Date	Distance
1.	Via Dolce Park	Park	Construction of a 6,400-square-foot park adjacent to the Grand Canal.	Planned	8/30/2017	6/1/2018	0.2 mi
2.	Marina Beach General Improvements Project	Beach/Park	Refurbishment of existing restroom building, installation of Americans with Disabilities Act (ADA) upgrades, replacement of covered group picnic shelter/shade structures, resurfacing of waterfront promenade, and installation of bioswale planters.	Planned	1/2017	6/2017	0.37 mi
3.	Via Marina Street Improvement Project	Infrastructure	Roadway resurfacing; curb, gutter, and sidewalk repair; and new landscaping in medians.	Contingent on funding			0.5 mi
4.	Admiralty Way at Via Marina Roadway Project	Infrastructure	Reconfiguration of existing 'T' intersection to create additional left-turn pockets. Work to include reconstruction of medians, sidewalks, curbs, and gutters; relocation of catch basins, streetlights, and two bus pads; traffic signal upgrade; and striping.	Contingent on funding			0.4 mi
5.	Venice Dual Force Main	Infrastructure	New 54-inch-diameter force main sewer that will operate as a parallel system in conjunction with the existing 48-inch force main to meet peak wet-weather flow demands experienced at VPP. Valve vaults to be constructed and discharge piping manifold at VPP to be replaced.	Planned	9/2016	11/30/2019	0.0 mi
6.	Washington Boulevard at Venice Canals, Culvert Rehabilitation	Infrastructure	Rehabilitation of five (110-foot by 36-inch) concrete culverts; repair of voids beneath roadway; reconstruction of sidewalks, curbs, and gutters; and street resurfacing.	Planned	3/2/2016	8/31/2016	0.34 mi

	Project Name	Type of Project	Description	Status	Start Date	Completion Date	Distance
7.	Venice Pumping Plant Vibration Rehabilitation, Phase 2	Infrastructure	Rehabilitation to reduce vibration levels at the VPP.	Under Construction	1/13/2016		0.01 mi
8.	Venice Pumping Plant Generators Replacement	Infrastructure	Demolition of existing diesel-fueled standby engine/generators and procurement/installation of two new 750 kW generators and one new 1,500 kW generator with ancillary controllers, transfer switches, exhaust and cooling systems, and fluid storage.	Planned	10/2/2016	1/31/2020	0.01 mi

Source: http://boe.lacity.org/uprs/report/ProjectInfoReport.cfm?k=5430&dmy=15746
http://eng.lacity.org/projects/vpp/VDFM%20FAQ%20Feb%202015.pdf http://dpw.lacounty.gov/pdd/MarinaDelRey/inc_ProjectMap.cfm
http://dpw.lacounty.gov/pdd/MarinaDelRey/docs/FC_marinadelrey_base3x5.pdf
Accessed: August 10, 2016.

1.8 Review of the Draft EIR

This Draft EIR will be circulated for review and comments from the public and other interested parties, agencies, and organizations for over 45 calendar days, beginning on October 27, 2016, and closing on December 8, 2016. A public meeting on the Proposed Project will be held on November 17, 2016, at the Venice Foursquare Church. A notice regarding the public review period and time and location for the meeting will be published in the *Los Angeles Times* and *The Argonaut* prior to the public hearing date.

During the public comment period, all comments or questions about the Draft EIR should be addressed to:

Dr. Jan Green Rebstock, Environmental Supervisor II
Los Angeles Bureau of Engineering
Environmental Management Group
1149 South Broadway, Suite 600, Mail Stop 939
Los Angeles, CA 90015-2213
Email: jan.green.rebstock@lacity.org

Following public review of the Draft EIR, a Final EIR will be prepared in response to comments received during the public review period. The Board of Public Works will consider the project and make recommendations to the Los Angeles City Council, the governing body of the City of Los Angeles, regarding certification of the Final EIR and project approval. The City Council may certify and approve the Final EIR or may choose not to approve the project.

The Final EIR will be available for public review at least 10 days prior to its certification (State CEQA Guidelines Section 15088(b)). All responses to comments submitted on the EIR by public agencies will be provided to those agencies at least 10 days prior to final action on the project. The City Council will make findings regarding the extent and nature of the impacts, as depicted in the Final EIR.

During the environmental review and project approval process, people and/or agencies may address the Board of Public Works and City Council regarding the Proposed Project. Public notification of agenda items for the Board of Public Works is available here:

http://bpw.lacity.org/Agendas.html

City Council agenda items are posted 72 hours prior to the public meeting. The City Council agenda can be obtained by visiting the City Council:

City Hall
200 North Spring Street
John Ferraro Council Chamber, Room 340
Los Angeles, CA 90012

Alternatively, agendas can also be accessed by Internet at the following location:

http://lacity.org/city-government/elected-official-offices/city-council/council-calendar

Within 5 days of project approval, LABOE will file a NOD with the State Clearinghouse and County Clerk. The NOD will be posted by the County Clerk within 24 hours of receipt. This begins the 30-day statute of limitations on legal challenges to CEQA approval by the lead agency. The ability to challenge the approval in court may be limited to those persons who objected to approval of the Proposed Project and issues that were presented to the lead agency by any person in writing during the public review and comment periods for the EIR.

Chapter 2
Project Description

This chapter presents the project description for the proposed Venice Auxiliary Pumping Plant (VAPP) Project (Proposed Project), including:

- Project objectives, project location, environmental setting, surrounding land uses, zoning, and land use designations;
- Project background, project overview, project description, and operational requirements;
- Aboveground facilities, parking, belowground facilities, odor control, utilities and services;
- Landscape drainage, site security, circulation, parking and pedestrian, and green space;
- Operations and maintenance and construction stages; and
- Relationships to other projects and project schedule.

2.1 Project Objectives

The Proposed Project is intended to meet the following objectives:

- Prevent potential impacts on human and environmental health caused by sewage spills from the existing VPP during extreme wet-weather events;
- Increase reliability to the system by providing redundancy to pumping capacity to improve system reliability and allow regular service and maintenance activities to take place without compromising the ability of the City to maintain pumping capacity and minimize the risk of sewage overflows; and
- Address future risks related to climate change, including increased storm intensities and sea-level rise, which have the potential to result in flows that would be beyond the capacity of the existing VPP.

2.2 Project Location

The Project Site comprises three undeveloped residential lots, zoned Residential Water Ways (RW2-1), a total of 12,076.5 square feet. All three lots are owned by the City of Los Angeles and located next to the existing VPP. The addresses are 3813 and 3817 South Esplanade (Assessor's Parcel Numbers [APNs] 4225-008-904 and 4225-008-904, respectively) (north parcels) and 128 Hurricane Street (APN 4225-010-016) (west parcel). The three lots are not contiguous; however, their functions are integrative and needed to operate the VPP and VAPP as one facility. The west parcel comprises a single oblong lot west of the VPP that measures 85 by 60 feet. The north parcels, comprising two abutting parcels located north of the VPP, are approximately 90 feet long and 70 feet wide combined. Canal Court separates the VPP from the west parcel. Hurricane Street separates the VPP from the north parcels. The VPP manifold is underneath this portion of Hurricane Street (between Canal Court and Esplanade).

Figure 2-1, Project Vicinity Map, shows the location for the proposed VAPP in relation to the City and adjacent cities and communities. The Project Site is within the Ballona Lagoon West sub area of the Venice Community Planning Area and Council District 11.

Figure 2-2, Project Location Map, shows the three construction Laydown Areas that will be used for materials and equipment storage and for construction staging during the anticipated 2-year construction period. Laydown Area 1 is located at 128 Hurricane Street, which is already part of the Project Site. Laydown Area 2 is comprised of two lots that are located at 3819 and 3821 Via Dolce (APNs 4225-013-153 and 4225-013-904, respectively). This site is approximately 6,979 square feet (combined) in size is located across the Venice Grand Canal, east of the Project Site and is accessed from Via Dolce. Laydown Area 3 (APN 4296-001-270) is located at 9940 Jefferson Boulevard in Culver City, which is approximately 7 miles east of the Project Site. Laydown Area 3 is owned by the City of Los Angeles and approximately 198,735 square feet in size.

2.3 Environmental Setting

As shown in Figure 2-2, Project Location Map, the front eastern property lines of 3813 and 3817 South Esplanade abut the Venice Grand Canal and are bounded by Canal Street to the west, Hurricane Street to the south, and multi-family residential to the north. The 128 Hurricane Street southern property line abuts Ballona Lagoon and is bounded by Hurricane Street to the north, Canal Court to the east, and multi-family residential to the west. The Esplanade, which is publicly accessible, connects the Ballona Lagoon trail with the California Coastal Trail at Washington Boulevard, 1,830 feet north of the Project Site. The Project Site is located within the California Coastal Zone. The Grand Canal and Ballona Lagoon (components of the Venice Canal System) are designated as Environmentally Sensitive Habitat Areas (ESHAs) by the California Coastal Commission, County of Los Angeles, and City of Los Angeles. The Venice Canal System, located adjacent to the Project Site, is a City of Los Angeles Historic-Cultural Monument (No. 270) and part of the Venice Historic Canal District (ZI–2370). The Project Site is also located within City Council District 11 and the Venice Community Planning Area (Ballona Lagoon West). The Project Site is classified as being within a liquefiable zone, a tsunami inundation zone, and a methane zone. The 128 Hurricane Street parcel is the site of an abandoned oil well and the overall Project Site is within the Playa del Rey oil/gas field and near other plugged and/or abandoned wells. Applicable plans include the Venice Local Coastal Plan Land Use Plan, Venice Specific Plan, and Coastal Corridor Transportation Specific Plan. The Proposed Project is subject to local City of Los Angeles Residential Design Standards and the Cultural Affairs Public Works Improvement Arts Program.

The VPP is one of five City-owned and operated pumping plants and part of the Hyperion Treatment Plant (HTP) service area (see Figure 2-3, Hyperion System). The HTP is located on a 144-acre site adjacent to Santa Monica Bay, southwest of Los Angeles International Airport (LAX) and approximately 4 miles south of the VPP. The area served by the HTP covers approximately 328,000 acres of the Los Angeles metropolitan area. The HTP, the largest treatment facility in the City, was designed and constructed to be a high-rate secondary treatment facility. The HTP provides primary treatment for all influent flow. The HTP is also the City of Los Angeles' main treatment facility for recycled water. Hyperion Treatment Plant is a recycled water source for the West Basin Municipal Water District, a public agency that provides recycled water from Hyperion to the cities of Carson, El Segundo, Gardena, Hawthorne, Hermosa Beach, Inglewood, Manhattan Beach, Lawndale, Redondo Beach, and unincorporated areas of Los Angeles County within its service area, as well as the cities of Torrance and Los Angeles, which are outside of its service area.



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Figure 1
Project Vicinity Map
Venice Auxiliary Pumping Plant Project



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Figure 2-2
Project Location Map (with Existing and Temporary Pedestrian/Vehicular Access)
Venice Auxiliary Pumping Plant Project

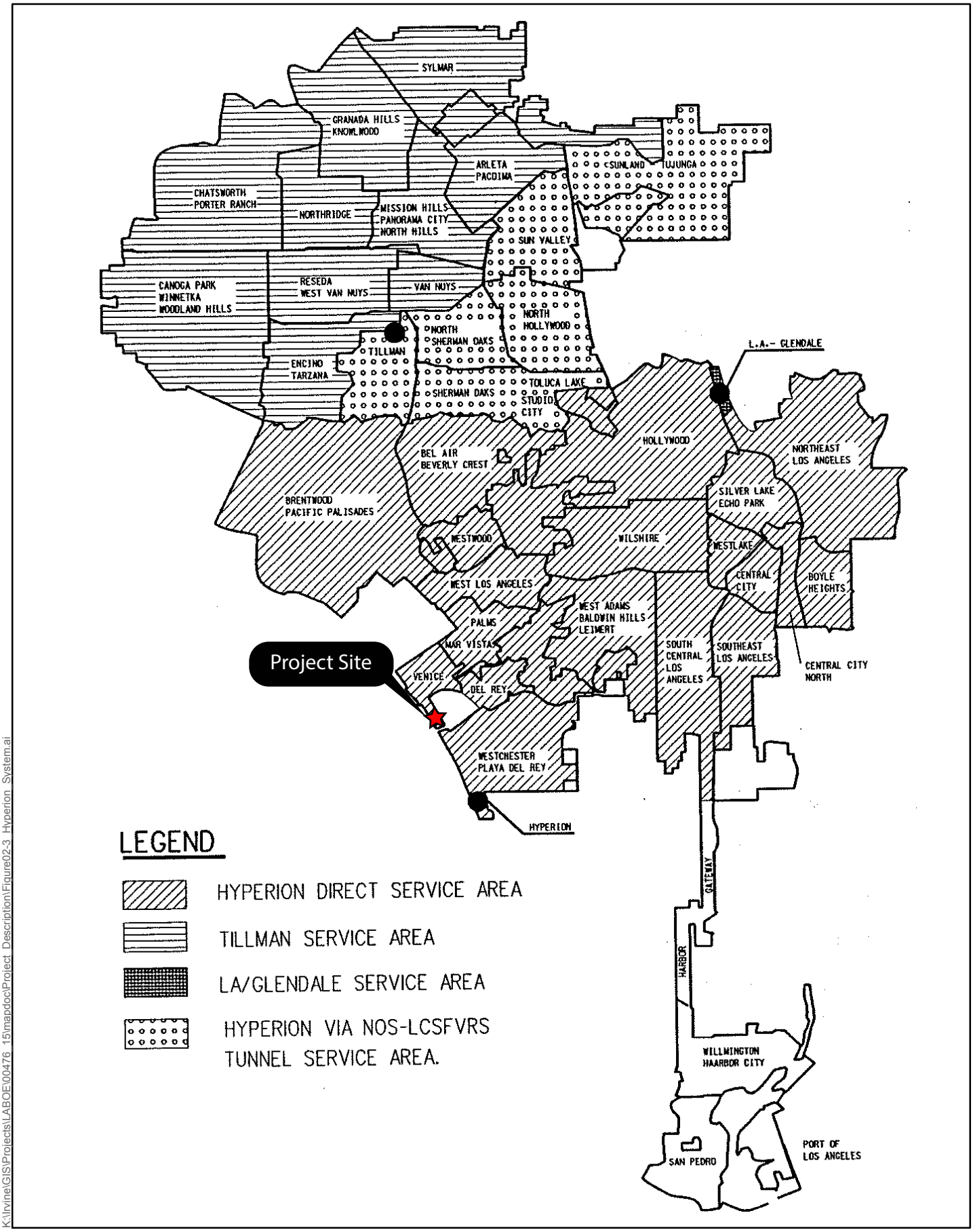

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Figure 2-3
Hyperion System
Venice Auxiliary Pumping Plant Project

The HTP receives sewage from five major interceptor sewer systems, including the Coastal Interceptor Sewer (CIS). The CIS runs parallel to the coastal area of the City and includes a collection service area that encompasses the communities of Topanga, Pacific Palisades, Brentwood, Venice, and Mar Vista. It also services Santa Monica and parts of Los Angeles County. The CIS conveys untreated sewage flows from the collection area to the VPP via a 48-inch force main. Because of inadequate hydraulic head (liquid pressure), sewage flows from the CIS that enter the VPP must be continuously pumped in order to reach the HTP. The VPP is the City's largest pumping plant. Within the immediate vicinity of the VPP, the CIS parallels the Grand Canal. An emergency sewer discharge pipe is located within the Grand Canal. In an emergency, flows can be diverted to the Ballona Lagoon.

2.4 Surrounding Land Uses

The Project Site is highly urbanized within the Ballona Lagoon West sub-area of Venice, north of Ironside Street. It contains a mix of residential, open space, and public facility land uses. The Proposed Project is considered infill development. North and west of 3813 and 3817 South Esplanade are single and multi-family residential uses. To the east is the Venice Canal System, which is designated as open space. To the south is the VPP, which is a public facilities land use.

The 128 Hurricane Street parcel is bounded by the Ballona Lagoon to the south, Hurricane Street to the north, multi-family residential to the west, and Canal Court and the VPP to the east.

2.5 Land Use Designation and Zoning

The Project Site is currently vacant, comprising three unimproved lots. These are zoned under the City of Los Angeles Planning and Zoning Code as RW2–1; the City of Los Angeles Venice Community Plan land use designation is Residential/Medium Residential (see Section 3.8, Land Use and Planning, for more details). Laydown Area 3 in Culver City is zoned Industrial General (IG).

2.6 Background

The City owns and operates the VPP (Pump Station No. 646), located at 140 Hurricane Street in the Los Angeles community of Venice, adjacent to Ballona Lagoon and the Grand Canal. The plant is the City's largest pumping plant and considered a critical facility for conveying sewage from its tributary area (described above). It also serves as the control facility for all pumping stations that operate in the City. The facility, designed and built in 1957, includes a control facility and five pumps (two duty and three backup). The VPP has two levels, one above ground and one below, for equipment, emergency generators, and a control center. The facility is manned and operated 24 hours per day, 7 days per week by system operators by six employees (two per shift). Two off-street parking spaces are available for deliveries and the operator(s). The entire facility is gated and closed to the public. The VPP is also equipped with an exhaust fan that discharges vapors through an existing stack. In addition, wet wells (holding sumps for sewage) and associated pumps are located underground, within a sealed and enclosed facility, to minimize odor discharges. The facility was last upsized and upgraded in 1987. At that time, five new pumps were installed (two duty and three backup). The existing VPP is essentially built out and has no

additional space for required backup pumps and associated equipment necessary to convey sewage flowing during peak wet-weather events, including the emergency generators that would be needed to run the pumps in the event of a power failure.

As noted above, the VPP pumps sewage from the City's CIS collection area to the HTP. There are currently no sewage diversions for bypassing the pumping plant. Therefore, unlike other portions of the City's sewage conveyance system where diversions are in place to minimize demand and reliance upon pumping plants, the CIS currently has no redundant or parallel facilities that can be used to redirect flows from these communities.

Flows enter the VPP from a single 66-inch reinforced concrete sewer pipe depressed approximately 18 feet below ground within the Grand Canal that discharges into two existing wet wells. Wet well No. 1 serves Pumps 1 through 4, and wet well No. 2 serves Pump 5. Each of the five 400-horsepower dry-pit centrifugal pumps has a design capacity of 18 million gallons per day (mgd) at 100 feet total dynamic head (TDH) (total amount of pressure when sewage is flowing in the system). The pumps are served by a new 60-inch manifold that connects to a 48-inch force main. From the VPP, flows are pumped south, under the Marina del Rey channel, and then to the HTP, which is located just south of LAX in Playa del Rey. Because of the 60-foot elevational difference between Venice (low point) and Playa del Rey (high point), the VPP must continuously pump the flows in order to avoid sewage backups.

During dry-weather flows (no rain), two duty pumps generally pump an average of 20 mgd of sewage. During wet-weather flows (rain), depending on conditions, all five pumps may be needed simultaneously to convey sewage influent from the collection area to the HTP. This is because the system is not closed and can be affected by infiltration (i.e., from storm drains and groundwater). During certain years, flows during wet-weather conditions have reached 50 mgd. When operating simultaneously, the five pumps are capable of pumping some 14,000 gallons per minute.

Due to their continuous use, the pumps require regular maintenance and therefore need to be taken off-line to be serviced and repaired. The pumps have had several maintenance issues in the past. At times, two pumps have been out of service for extended periods during wet-weather flows. To provide the required capacity at the pumping plant during such events, the City rents portable pumps to supplement the existing pumps. However, pumps that are capable of handling solids are uncommon in the required sizes and difficult to rent. Therefore, the City incurs significant costs when additional pumps are needed. Furthermore, the portable aboveground pumps result in noise and odor impacts on the surrounding neighborhood when temporarily in operation. To provide for redundancy and ensure adequate pumping capacity when the pumps are temporarily out of service, the City needs a total of eight (i.e., three additional) pumps.

There have been several occasions, beginning in the 1990s and extending through the early 2000s, when influent flows to the VPP during periods of wet weather nearly exceeded the combined pumping capacity (90 mgd) of all five pumps while working simultaneously. This resulted in a near miss of sewage spill into the Grand Canal and Ballona Lagoon because the wet wells and pumps were almost entirely inundated by sewage. Exceeded sewer capacity would have required emergency discharges directly to the Grand Canal and Ballona Lagoon or overflows into the surrounding street network. Because of these conditions, the City of LABOE, began planning and designing projects that would upgrade and enhance the CIS and VPP. These projects include the VPP Manifold Replacement Project, which was completed in August 2015, the Venice Dual Force Main (VDFM) Project, construction of which will begin in late 2016, and the proposed VAPP project.

2.7 Project Overview

Implementation of the Proposed Project, which entails the construction of a new pumping plant adjacent to the existing VPP, would provide redundancy and ensure reliability for the sewer collection system. Project implementation would also allow the sewer system to accommodate sewage flows during extreme weather (e.g., El Niño) as well as sea-level rise, along with corresponding increases in groundwater levels that exacerbate infiltration conditions, both for the existing and planned conveyance system. The potential for near misses and/or catastrophic system failures would be significantly reduced with upgraded sewer system redundancy and reliability. As described below, a number of system improvements would be implemented both above and below ground, including a new electrical building, housing the control system and employee workstations; three new pumps and associated generator; connections to the VPP; and parking, public art, and green space. Combined, the five existing pumps at the VPP and the three new pumps would have a rated capacity of 87 mgd (i.e., five duty pumps and three standby). All pumps would have a similar capacity and be functionally equivalent.

2.8 Proposed Project

The Proposed Project would be built on three vacant lots with a total combined area of approximately 12,076 square feet. As shown in Figure 2-4, Site Plan, the Proposed Project would include a number of improvements:

- One building, two stories and approximately 32 feet in height, with a total of 2,500 square feet that will house the operational control center for the plant, related electrical equipment, and employee workstations;
- Three 18 mgd submersible pumps, constructed underground;
- Electrical equipment, utility connections, instrumentation and controls, transformers, and generators;
- A 17- by 17-foot submerged diversion structure on the existing CIS, the top of which would be below the lowest elevation of the Grand Canal and buried underneath it;
- Concrete wet well, influent piping and a sluice gate;
- A new 66-inch sewer to connect VAPP to the new diversion structure;
- Fencing with blinds and vegetation for screening the VAPP building;
- Parking – a total of eight parking spaces will be provided at 128 Hurricane Street to allow for employee, delivery/visitor, and public parking, including the replacement of coastal parking; and
- Landscaping and Open Space at 128 Hurricane Street.

2.8.1 Operational Requirements

The VPP and VAPP combined will have an ultimate peak flow capacity of 87 mgd, based on the ultimate wet-weather flows (10-year storm event). The City's peak wet-weather modeling results established this flow rate (*Development of a Conceptual Plan for an Auxiliary Pumping Facility Alternative for the Venice Pumping Plant* [Carollo 2014]). The basis of design for the VAPP is summarized as follows:

- Ultimate Peak Wet-Weather Flow: 87 mgd (design based on 10-year storm event)
- Ultimate Peak Dry-Weather Flow: 71 mgd
- Current Peak Wet-Weather Flow: 55 mgd (January 6, 2009)
- Current Peak Dry-Weather Flow: 36 mgd
- Minimum Low Dry-Weather flow: 15 mgd (design)

The VAPP will have three submersible pumps available to operate at all times with variable frequency drives (VFD) that have the ability to adjust motor speed to match discharge flows. Sufficient overlap of pump operating ranges will be provided so that each pump flow condition will allow for the most efficient pump operation.

The VPP and the VAPP will act as one large wet well connected via the influent sewer. They will operate independently however, with separate controls. The VAPP can be isolated from the influent sewer by a slide gate located at the entrance to the wet well. The VPP does not have the capabilities to be isolated and taken off-line and as such, for wet well maintenance, a temporary plug will be required at the upstream manhole. The control system will provide the ability to operate each pumping plant independently if one of the pumping plants needs to be taken off-line for maintenance. The ideal operations scenario for the VPP and VAPP will be to operate and maintain a constant water surface level using the VFDs and a set of pump operational parameters depending on the flow level.

2.8.2 Aboveground Facilities

The Proposed Project includes a two-story electrical and control building along the west side of Project Site, adjacent to Canal Court (see Figure 2-4, Site Plan) and associated employee and visitor/delivery parking for the new building located at 128 Hurricane Street. The building would be two stories, about 32 feet in height, 50 feet in length, and 2,500 square feet (both levels combined) in area. The building would include spaces for an electrical equipment room and a generator room on the first floor. In addition to a state-of-the-art control station, the second floor would include workstations for computer operators, a restroom, mechanical room, and server rooms. Heating, ventilation, and air-conditioning equipment for the electrical building would be located north of the building.

The preliminary building design includes perimeter walls constructed of reinforced concrete, with a cool roofing system (PVC membrane or similar) above the second level. Proposed finishes include architectural stamped concrete, reveals, and impressions; metal awnings over each of the exterior doors and sustainable roofing (Sika Décor or similar); and painted surfaces with colors that blend in with the surrounding neighborhood. Windows would be required for occupied spaces on the second level; all windows would be energy-efficient dual-glazed units. The exterior conceptual design would be enhanced to include architectural features that are in keeping with the architecture, massing, and materials that are currently present on the adjacent residential structures.

The VAPP electrical system would include a small diesel-fueled standby generator to provide power for critical loads in the event of a loss of power from the Los Angeles Department of Water and Power (LADWP) and the inability of existing VPP standby generators to provide power to the VAPP. The standby generator would be located in an enclosed room on the first floor; an intake and exhaust louver would provide the proper cooling for the generator. Because of the location of the electrical building within a residential neighborhood, acoustic louvers would also be installed. The VAPP generator would provide up to 24 kilowatts (kW) of power at 120/240 volts (V) for lighting,

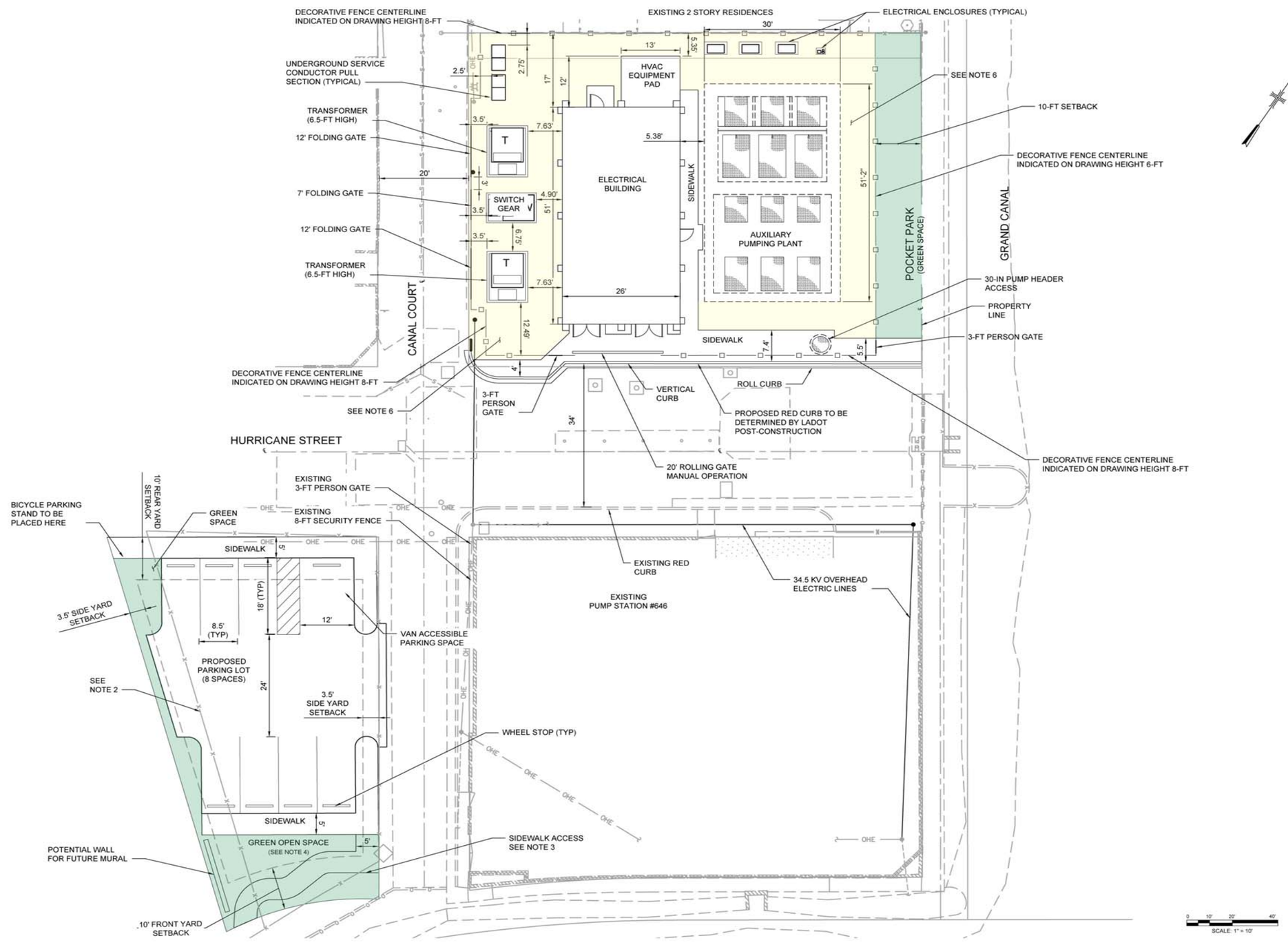

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Figure 2-4
Site Plan
Venice Auxiliary Pumping Plant Project

the Supervisory Control and Data Acquisition system, the security/access control system, and air conditioning for the VAPP control room. The VAPP generator would have an integral storage tank that would hold enough fuel for up to 8 hours of run time at full load.

2.8.3 Parking

Parking for the Proposed Project would be provided on the 128 Hurricane Street lot. There would be a total of eight parking spaces. Per the Venice Specific Plan and the Venice Local Coastal Program Land Use Plan, the Proposed Project would require at least five project-dedicated parking spaces, four for the project, and one for Beach Impact Zone parking. Existing on-street parking spaces along Hurricane Street on the south side of the new VAPP lot would be removed and replaced on the 128 Hurricane Street lot to be consistent with the California Coastal Act.

2.8.4 Public Art

This Proposed Project may include a public art installation on the 128 Hurricane Street lot. All City capital improvement projects whether funded by Council controlled or proprietary departments must comply with the City of Los Angeles Public Works Improvements Arts Program. The program was established to connect all City capital improvement projects with the opportunity to create art installed at facilities, to enhance amenities, assist with the restoration of historic features and provide community art services throughout the City. The program is managed by the Department of Cultural Affairs (DCA) and its General Manager. All public art projects are reviewed by the Public Art Committee and recommended for approval by the Cultural Affairs Commission.

2.8.5 Belowground Facilities and Diversion Structure within the Grand Canal

At the northeast corner of the Project Site, adjacent to the Esplanade, three 18 mgd submersible pumps and a valve and metering vault are proposed (see Figure 2-4, Site Plan). The three submersible pumps would withdraw sewage from a wet well through a new 66-inch sewer pipe and discharge into a common header that would serve both the VPP and VAPP. Each force main (48-inch and 54-inch) could then be isolated by ball valves that would be controlled at the VAPP. Under normal operation, the VAPP and VPP would operate as a single functional pump station, with their respective wet wells hydraulically linked through similar elevations and an even flow split. Access would be limited to the structure that would house the pumps and vault. Sealed hatches would provide access for maintenance and minimize odors.

As noted above, the existing 66-inch CIS sewer pipe that serves the VPP is located within the Grand Canal. To minimize disruptions to the VPP, a diversion structure would be constructed to allow flows to be diverted to the VAPP. The diversion structure would be below the grade of the Grand Canal, by approximately 18 feet, and would not protrude aboveground into the Canal and would be buried beneath it. The structure would allow flows to be diverted to either the VAPP or VPP. A gate would also be provided at the inlet of the VAPP to allow isolation for maintenance purposes.

Influent piping would be provided from the new diversion structure to the new wet well. The lined concrete cylinder pipe would be protected from corrosion caused by hydrogen sulfide. The VAPP piping would connect to the new VPP replacement manifold that was recently constructed in Hurricane Street with use of a 42-inch flange at its west end. From there, the piping would continue back to the new valve vault at the VAPP.

2.8.6 Odor Control

As noted above, the existing VPP is equipped with an exhaust fan that discharges vapors through an existing stack. The wet well and associated pumps are sealed and located underground. Field investigation of the ventilation fan shows that the flange that connects the fan to the dispersion stack is displaced, and odors can exit through the gap at the joint. To remedy this, the fan and flanges would be replaced with compatible equipment. In addition, a slide gate at the entrance to the VAPP wet well from the influent pipe would be installed to deter odors. Any odors in the CIS piping will be confined to that system and handled as they normally are at the VPP. When the VAPP is in operation, the head spaces of the wet wells will be linked by the 66-inch sewer, and the exhaust fan will be able to service the entire system. No additional odor control measures are anticipated.

During construction of the coffer dam within the Grand Canal, sediment that contains organic material would be extracted which could result in odors when removed from the ground if not properly handled. Once these materials are removed, they would be temporarily stored in Laydown Areas 1 and 3. Various odors may be emitted from the sediment piles during construction that may impact the sensitive receptors in the project area. However, best management practices will be used to address any potential odors.

2.8.7 Utilities and Services

For VAPP operation, electricity, potable water, and sewer service utilities would be required. Each of these is discussed in greater detail below.

2.8.7.1 Electricity and Standby Power

Because the VAPP would be working separate from, yet in conjunction with, the VPP, the electrical power supply to VAPP would be independent from the VPP. As such, the Proposed Project would require two additional 480 V services from LADWP, providing an added degree of reliability and avoiding dependence on existing VPP step-down transformers and switchgear for utility power. Two existing 34.5 kV primary circuits that serve the VPP would be used because of their proximity. A new 34.5 kV switching cabinet, two new 34.5 kV–480 V three-phase pad-mounted transformers, and two new exterior secondary (480 V) cable pull sections, all owned and maintained by LADWP, would be installed for the new services at the VAPP. The 480 V three-phase power would be accepted from the LADWP pad-mounted transformers, with a switchgear located inside the VAPP electrical building. A main-tie arrangement would be provided to utilize either transformer, if necessary, and fully power the VAPP. Each main breaker would have an LADWP meter for revenue accounting and a digital meter for local monitoring/connectivity to the control system. The VAPP switchgear would distribute 480 V to the VAPP pump motor controllers and a motor control center.

Standby power for VAPP pumping operations would be provided by existing VPP standby generators in addition to a new generator (previously described above). The existing VPP 480 V switchgear, which receives and manages VPP standby generator power, would be utilized to provide standby power to the VAPP electrical system. Two 480 V, 1,600-amp (A) power circuit breakers would be installed in the existing VPP switchgear and connected to the VAPP 480 V switchgear. Removal of two 1,200 A power circuit breakers from the existing VPP switchgear would be necessary to facilitate installation of the new 1,600 A power circuit breakers. These new 1,600 A power circuit breakers would be manually operated and normally closed.

2.8.7.2 Potable Water and Sanitary Sewer

Potable water would be provided for equipment wash down purposes and a restroom that would be located in the electrical building. Sanitary sewer service would be provided for wash down and lavatory water.

2.8.8 Landscaping and Drainage

Because a minimal amount of open area would be present at the VAPP site, landscaping would largely be limited to 0.75-inch gravel or crushed stone for erosion and dust control. Depending on space availability and infrastructure requirements, the planting of shrubbery and trees may also be possible. The specific locations and species would be evaluated and then included in a landscape plan that would be prepared during final design.

On the 128 Hurricane Street lot, following completion of project construction, the construction laydown site would be converted to a publicly accessible site with public art, parking, and green open space. The specific locations and species of plantings within the open green space would also be identified in a landscape plan that would be prepared during final design.

New stormwater drainage facilities associated with the Proposed Project would be constructed entirely within the Project Site. These may include storm drains, inlets, downspouts, catch basins, and overland sheet flow and low-impact development features.

2.8.9 Site Security

As with the existing VPP, the entire VAPP site would be secured with fencing and/or concrete walls. Signage at an access-controlled entry/exit gate would denote the area that is closed to the public. In addition, an access control and video surveillance system would be provided to protect operators while working between the two sites and provide remote monitoring. Perimeter security lighting would also be installed within the VAPP site. It is anticipated that nighttime lighting sources would face inside away from sensitive receptors and be similar to those on the adjacent VPP site. All lighting would adhere to applicable plans and ordinances.

2.8.10 On- and Off-site Circulation, Parking, and Pedestrian Access

Pacific Avenue, Hurricane Street, Via Dolce, and Marquesas Way will provide access to the Project Site, including construction Laydown Areas. Hurricane Street between Canal Court and Esplanade would be closed to public traffic during construction; however, these roadways would remain accessible during operation of the Proposed Project and preserve Coastal Access (see Figure 2-2, Project Location Map). Parking would be eliminated permanently but relocated to the 128 Hurricane Street lot. A total of eight parking spaces would be provided on the 128 Hurricane Street lot for employees and deliveries/visitors (five) and relocation of existing on-street parking spaces at the terminus of Hurricane Street (three).

Pedestrian access to the Esplanade and associated Grand Canal and Ballona Lagoon from Hurricane Street would be temporarily eliminated during construction (up to 2 years). However, alternative access to these areas would be available via existing routes along Canal Court and Galleon Street or Esplanade. During operation, pedestrian access would continue to be available from Hurricane Street, Canal Court, and the 128 Hurricane Street lot, and coastal access would be maintained.

2.8.11 Open Space

The Proposed Project would include Open Space, as required by the Venice Specific Plan and would be incorporated into the project design on the VAPP site and at the 128 Hurricane Street lot. Although the exact design of the Open Space has not been finalized, Figure 2-4, Site Plan contains a preliminary design. As currently envisioned, a total of 3,639 square feet of open space would be provided on the VAPP site and a total of 787 square feet would be provided for public use on the 128 Hurricane Street lot. Some type of public art may also be incorporated into the 128 Hurricane Street lot.

2.8.12 Operations and Maintenance

Once operational, the VAPP would augment the existing capacity of the VPP. However, the VAPP would also enhance capacity so that a combined ultimate peak flow of 87 mgd could be accommodated and processed through the VPP and VAPP. This capacity would be capable of accommodating wet-weather flows from a 10-year storm event. During operations, the Proposed Project would require two full-time employees (per shift) who would work three consecutive 8-hour shifts, 7 days per week.

Maintenance requirements for VAPP equipment are anticipated to be similar to those for VPP. The main focus would be the three submersible pumps, which would be accessed from hatches to the wet well. It is anticipated that each pump would need to be inspected annually. This would require short-term use of equipment and machinery over 2 or 3 days as well as construction workers to remove, inspect, and service the pumps. Additionally, in instances when pumps need to be removed for maintenance purposes, temporary, short-term closure of Hurricane Street east of Canal Court to Esplanade and fronting both VAPP and VPP may be required. As noted above, this temporary closure is anticipated to occur twice yearly for up to 2 weeks. Access to the diversion structure would be provided from a manhole that would connect it to the wet well. No access from the Grand Canal would be required during these regularly scheduled maintenance activities.

2.8.13 Construction

Construction of the Proposed Project is anticipated to begin in March 2018 and last approximately two years. Construction would begin with initial site preparation, which would enable machinery and equipment to access and work within the site. Once the site is prepared, construction phasing would involve six distinct stages in two separate areas, as outlined below and shown in Figure 2-2, Project Location Map, which shows the locations where access would be temporarily restricted to the public and the location of the three proposed laydown areas.

- Area 1 – Vacant lot at 128 Hurricane Street, immediately west of the VPP and adjacent to Ballona Lagoon. This site is approximately 4,345 square feet and would be used as a construction laydown area.
- Area 2 – Two vacant lots across from and east of the Grand Canal at Via Dolce. This site, accessed from Via Dolce, is approximately 6,150 square feet and could be used for materials and equipment storage.
- Area 3 – A vacant lot located at 9940 Jefferson Boulevard, Culver City will be used for soil stockpiling; the lot measures approximately 198,735 square feet.

Standard construction equipment would be used, including compactors, bulldozers, front loaders, trenchers, construction cranes, water trucks, dump trucks, and delivery trucks that would bring construction-related materials to the site. Construction access to the Project Site would be via Pacific Avenue, Hurricane Street, Via Dolce, and Marquesas Way. Construction workers would be required to park off-site and then travel to and from the site by shuttle. No construction worker or equipment parking would be allowed along Hurricane Street or on adjacent streets. Access to Laydown Area 3 in Culver City would be achieved via Hurricane Street, Pacific Avenue, Washington Boulevard, Lincoln Boulevard, and other streets such as Sepulveda Boulevard, and Jefferson Boulevard. The final haul route will be selected in consultation with the Los Angeles Department of Transportation (LADOT) and the City of Culver City.

During construction, some perimeter lighting may be required, both on the Project Site and in Laydown Areas 1 and 2, for security purposes. Lighting would, however, be directed on-site and away from sensitive receptors (residences and the Grand Canal) to minimize any spillover effects. Security fencing would be erected around all laydown areas prior to construction activities.

2.8.13.1 Stage 1

Prior to initiating construction, security fencing would be erected around Laydown Area 2 (APNs 4225-013-153 and 4225-013-904), across from and east of the Grand Canal, and at Laydown Area 3, in Culver City (APN 4296-001-270). The Project Site and Laydown Area 1 (APN 4225-010-016) are currently fenced. A portion of Hurricane Street and Canal Court would be temporarily closed (see Figure 2-2, Project Location Map). Shoring would be installed around the Project Site, after which excavation to a depth of approximately 25 feet and dewatering of the site would occur. At this stage of construction, pedestrian access along the Esplanade, Ballona Lagoon, and the Grand Canal would be maintained at Canal Court. However, pedestrian access to the Grand Canal from Hurricane Street would be temporarily eliminated; pedestrians would be diverted to Galleon Street to the north (see Figure 2-2, Project Location Map).

2.8.13.2 Stage 2

Upon completion of excavation at the VAPP site, the bottom of the excavated site would be sealed and prepared for the above - and below - ground structure and related facilities. Preliminary earthwork plans indicate that the Proposed Project would require approximately 10,000 cubic yards of soil to be excavated, of which approximately 2,300 cubic yards would be stockpiled at Laydown Area 1. The remaining 7,700 cubic yards of soil would be exported off-site and stockpiled at Laydown Area 3, resulting in a total of 2,970 total one-way truck trips. Laydown Area 2 (across Grand Canal), given the slope and access constraints, may be used only as needed for equipment and materials storage. Laydown Area 1 will be the primary laydown area and storage site. For backfill at the VAPP, a total of 2,300 cubic yards of soil would be utilized from Laydown Area 1 and 3,850 cubic yards from Laydown Area 3. The total truck trips associated with transporting the 3,850 cubic yards of soil from Laydown Area 3 to the VAPP would be 1,486 total one-way truck trips. Once the VAPP is completed, the remaining total of 3,850 cubic yards of soil stockpiled at Laydown Area 3 would be disposed of at the Sunshine Canyon Landfill or similar facility, resulting in a total of 1,486 total one-way truck trips. The estimates presented here of total truck trips include an allowance of 35% for soil expansion and less-than-full loads, and assume that soil is transported in trucks with a capacity of seven cubic yards. Water pumped from the site would be disposed of in a manner consistent with Regional Water Quality Control Board regulations.

Proposed grading for the site would slope away from the electrical building and pumping plant for a minimum of 5 feet and then be directed via swales or similar surface features toward the east property boundary. This would follow the existing drainage pattern for the majority of the site.

2.8.13.3 Stage 3

Construction of the underground facilities associated with the proposed VAPP, including the three new pumps, the wet well, valve vault, meter vault, and piping, would occur during this stage. These facilities would be constructed at a maximum depth of approximately 25 feet below ground. Upon installation of the underground features, the site would be backfilled and compacted with the existing stockpiled soil contained within Laydown Area 1.

2.8.13.4 Stage 4

Within the Grand Canal, a new sewer diversion structure, approximately 23 by 95 feet, would be installed at a depth of approximately 18 feet below ground at the canal and then sealed. To facilitate the installation of the diversion structure, a temporary coffer dam would be installed. Water flowing in the Grand Canal would be diverted around the cofferdam structure so that excavation could occur without inundation. With excavation completed, the diversion structure would be constructed in place, and then sealing would occur. Excavated materials would be hauled from the site and stockpiled at either Laydown Area 1 or Laydown Area 3 or transported to an approved area landfill; upon completing of installation and sealing, The Grand Canal would be backfilled using the stockpiled excavated material and the coffer dam removed. Ultimately, the diversion structure would be entirely underneath the Grand Canal. Construction of the cofferdam, placement of the diversion structure, and backfill and soil compaction within the Grand Canal would last approximately 4 to 6 months. During that time, the Esplanade on the west side of the Grand Canal would be temporarily closed between the northern boundary of the Project Site and approximately 95 feet south of the existing VPP (see Figure 2-2, Project Location Map).

2.8.13.5 Stage 5

During this stage a modular diversion structure will be installed over the CIS, feeding the new wet well to divert sewage flows. The pipe would then be connected, and a seal would be inserted into the shell. Backfill and soil compaction would be completed, and the Grand Canal channel bottom would be restored to its original elevation.

2.8.13.6 Stage 6

This final stage would involve sealing the diversion structure, removing all shoring steel, and allowing flows to resume to pre-construction conditions within the Grand Canal. The Esplanade would be re-opened to pedestrian access on the west side of the Grand Canal. Construction of surface improvements at the Project Site would then occur. This would include constructing an approximately 32-foot-high electrical building, installing two new 480 V LADWP transformers, and providing public access and landscaping improvements.

2.9 Relationship to Other Projects

The projects noted below, in combination with the proposed VAPP and VPP, will provide system reliability and redundancy and allow influent flows from the existing 66-inch CIS pipe to be bypassed to the VDFM during extreme weather events or an unforeseen emergency.

2.9.1 Venice Dual Force Main

The VDFM is a new 54-inch-diameter force main in the vicinity of the VPP and proposed VAPP. The new pipeline alignment will cross the Grand Canal from the VPP, extend northerly along Hurricane Street to Marquesas Way, then continue southerly along Via Marina before crossing the Marina Del Rey and Ballona Creek channels to the CIS Diversion Structure on Vista del Mar near Waterview Street. The new force main will operate as a parallel system in conjunction with the existing 48-inch force main to meet the peak wet-weather flow demands experienced at the VPP and add operational flexibility and reliability. The City anticipates finishing construction on the VDFM by 2019.

2.9.2 VPP Manifold Replacement Project

The VPP Manifold Replacement Project was recently completed (August 2015) within Hurricane Street. That project consisted of removing the existing manifold structure located within Hurricane Street, between Canal Court and the Esplanade, and installing a new 60-inch steel manifold with connections to the VPP, the existing 48-inch force main, and stub-outs at both ends for connection to the future 54-inch VDFM and planned VAPP.

2.9.3 Venice Pumping Plant Generator Replacement

The project includes demolition of the existing diesel-fueled standby engine/generators and procurement/installation of two new 750- kW generators and one new 1,500 kW generator with ancillary controllers, transfer switches, exhaust and cooling systems, and fluid storage.

2.10 Responsible Agencies and Project Approvals

Table 2-1, Required Permits for Venice Auxiliary Pumping Plant Project, lists the anticipated permits required for the Proposed Project. The need for these permits will be verified through agency correspondence during the CEQA process.

Table 2-1. Required Permits for Venice Auxiliary Pumping Plant Project

Agency	Permit/Requirement	Issue
Local		
City of Los Angeles Department of Public Works	Local Coastal Development Permit	Coastal access, construction within coastal zone, habitat disturbance, parking and traffic during construction
City of Los Angeles Planning Department	Specific Plan Project Permit Compliance	Compliance with the Venice Coastal Specific Plan. Also consistency with the Venice Local Coastal Program Land Use Plan
City of Los Angeles Planning Department	Public Benefits Project Permit	Section 14 of the Los Angeles Municipal Code. Public Benefit permit with Alternative Compliance for Public Facilities and Park/Recreation uses
City of Los Angeles Planning Department	Los Angeles Municipal Code Adjustment for Yards	Relief for encroachment more than 6 feet into the rear yard
City of Los Angeles Planning Department	Conditional Use Permit for Parking	Relief for encroachment more than 6 feet into the rear yard
Los Angeles County Department of Public Works/Department of Beaches and Harbors	Encroachment permit	Access and use of parcel for Laydown Area 2
City of Culver City, Planning Department	Temporary Use Permit	Temporary stockpile of soil (up to 7,700 cubic yards) for Laydown Area 3
Regional		
Los Angeles Regional Water Quality Control Board (RWQCB)	National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Pollution Prevention Plan permit	Water quality and placement of discharges associated with dewatering activities; no permit required for discharges to sewer (general permit saves time with RWQCB)
RWQCB	401C section certification	State water quality certification prior to an issuance of U.S. Army Corps of Engineers (USACE) nationwide permit
South Coast Air Quality Management District	Permit to construct and operate	Air quality, additional portable generator(s), and any modifications to odor dispersion stack
State		
California Coastal Commission	State Coastal Development Permit	Coastal access, construction within coastal zone, habitat disturbance, parking and traffic during construction

Agency	Permit/Requirement	Issue
California Department of Conservation, Division of Oil, Gas, and Geothermal Resources	A construction notification form should be submitted to the division prior to any activity	Project is within boundaries of the Playa del Rey oil field, which contains numerous plugged and abandoned oil wells
State of California Department of Health Services	Project review for compliance with Title 22, Section 64630 (conducted through County Environmental Services Division)	Separation of water and sewer mains
California Office of Historic Preservation	Consultation	Historic status of Grand Canal
Federal		
USACE	Section 10 permit	Pipeline construction under navigable waters
USACE	Section 404	Could fall under Nationwide Permit NWP 12, Utility Line Activities, and require Pre-Construction Notification (PCN)
National Marine Fisheries Service	Consultation notification	Impacts on aquatic and marine life
U.S. Fish and Wildlife Service	Notification through Section 10 process	Impacts on habitat (i.e., least tern)

2.11 Project Schedule

Construction is anticipated to begin in March 2018 and last approximately two years. To minimize impacts on the surrounding community, streamline construction activities, and minimize overall project cost, the City is planning to schedule construction of the VAPP immediately after completion of the VDFM, which is planned to start construction in winter 2016 and end in winter 2019.

Chapter 3
Environmental Impact Analysis

3.1 Aesthetics

This section addresses the potential for the Venice Auxiliary Pumping Plant (VAPP or Proposed Project) to result in impacts on aesthetic resources. The purpose of this analysis is to establish a baseline for evaluating visual resources in the project area and determine if a significant change in the visual environment would occur as a result of the Proposed Project. Project components reviewed in this section include all proposed visible features as well as construction techniques. The analysis discusses the potential for the Proposed Project to result in construction and operational impacts. The Proposed Project is evaluated with respect to a viewer's expected sensitivity and expectations and reviewed for consistency with applicable planning policies. Levels of impact are determined in accordance with the guidelines provided in the *L.A. CEQA Thresholds Guide*. Mitigation measures, where applicable, are recommended to avoid or minimize significant visual impacts. As noted in the analysis below, direct and indirect impacts associated with aesthetics during construction and operation would be less than significant. However, as described in Section 3.1.4, in an effort to reduce perceived effects as much as practicable, several mitigation measures have been recommended for incorporation into the project.

The Proposed Project would include construction of a pumping facility on a vacant site at the northeast corner of Hurricane Street and Canal Court, adjacent to the existing Venice Pumping Plant (VPP). The Project Site comprises three undeveloped residential lots and are described in Chapter 2, Project Description. The Project Site is surrounded on the north and west by residential buildings and on the east by the Venice Grand Canal and residential buildings. Ballona Lagoon is south of the Project Site.

3.1.1 Regulatory Setting

This section describes existing regulations that are applicable to the Proposed Project related to aesthetics and visual character, including the California Scenic Highways Program, California Coastal Act, Venice Community Plan, Venice Coastal Zone Specific Plan, Venice Local Coastal Program Land Use Plan, Los Angeles Municipal Code, Citywide General Plan Framework Element, City of Los Angeles Walkability Checklist, Citywide Design Guidelines, and the Public Art, Architecture, Landscape, and Urban Design Review Guidelines.

3.1.1.1 Federal

There are no federal regulations pertaining to aesthetics and visual resources that are applicable to the Proposed Project.

3.1.1.2 State

California Scenic Highways Program

The California Department of Transportation (Caltrans) established and implemented the California Scenic Highway Program to protect and enhance the natural scenic beauty of California highways and adjacent corridors through special conservation treatment (Caltrans 2008).

Caltrans defines a State Scenic Highway as any freeway, highway, road, or other public right-of-way that "traverses an area of outstanding scenic quality, containing striking views, flora, geology, and other unique natural attributes" (Caltrans 2008).

Once a highway has been designated as a state or national scenic highway, or a scenic corridor, special consideration must be given whenever a project proposes to develop the surrounding area.

California Coastal Act

The California Coastal Act of 1976 was adopted after state voters approved Proposition 20 in 1972. A key factor that led to the passage of this landmark legislation was the visible deterioration of the coastal environment as well as development pressures from a growing population (California Coastal Act 2014).

Section 30251 of the act is pertinent to visual resources preservation, stating:

> The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas and, where feasible, to restore and enhance visual quality in visually degraded areas. New development in highly scenic areas such as those designated in the California Coastline Preservation and Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting.

Section 30253 states, in part, that new development within the Coastal Zone shall

> …where appropriate, protect special communities and neighborhoods that, because of their unique characteristics, are popular visitor destination points for recreational uses.

3.1.1.3 Local

Urban Design Studio

The function of the Department of City Planning's (DCP's) Urban Design Studio (UDS) is to offer a progressive Urban Planning approach that integrates required design guidelines and design standards from applicable land use and planning policies into the design of projects. The UDS offers guidance in the form of consultations with staff that combines principles of good urban design through innovative policies to help projects comply the City of Los Angeles' Planning and Zoning Code. The VAPP has several code based design guidelines and standards derived from the following policies that shaped the design and layout of the Project Site.

Los Angeles Municipal Code

The Los Angeles Municipal Code (LAMC) sets forth regulations and standards regarding the allowable types, densities, heights, and designs for new development projects. In particular, Chapter 1 of the LAMC, General Provisions and Zoning, provides development standards for the various zoning districts in the City of Los Angeles. In addition, the LAMC also sets forth the following specific regulations regarding lighting:

> **Chapter 1, Article 2, Section 12.21, General Provisions, Paragraph A, Section 5, Part (k),** restricts light spill onto adjacent properties and provides minimum luminance levels for safety within and around parking facilities.

Chapter 1, Article 7, Section 17.08 C, states that plans for street lighting shall be submitted to and approved by the Bureau of Street Lighting for subdivision maps.

Chapter 9, Article 3, Section 93.0117, states that no exterior light source may cause more than two foot-candles of lighting intensity or generate direct glare onto exterior glazed windows or glass doors; elevated habitable porch, deck, or balcony; or any ground surface intended for uses such as recreation, barbecue or lawn areas or any other property containing a residential unit or units.

Chapter 1, Article 2, Section 12.09.5, regulates the RW2-1 Zone – Rear yards and states that There shall be a rear yard of not less than 15 feet in depth. Notwithstanding any provisions of this article to the contrary, the rear lot line is that line opposite and most distant from the lot line separating the narrowest canal frontage of the lot from the navigable public canal or waterway.

Venice Community Plan

The Venice Community Plan is one of 35 community plans that make up the Land Use Element of the City of Los Angeles General Plan. As part of the General Plan, the Venice Community Plan, among other purposes, guides development within the area to create a healthful and pleasant environment. Chapter III, Land Use Policies and Programs, is the Land Use Element of the General Plan for the community plan area, which covers approximately 2,061 acres and is located in the western portion of Los Angeles. Chapter III includes a number of objectives and policies that address the visual aspects of new development, including protecting views of wetlands, bluffs, and distinctive visual resources from surrounding public streets and Open Space areas; using landscaping and plant materials to screen and soften visually obtrusive elements; and designing public works improvements with use of the least environmentally disturbing methods. Chapter V, Urban Design, of the community plan provides broad urban design objectives for each district in the area. The design policies and guidelines presented in Chapter V complement existing regulations contained in the adopted specific plans within the community plan area. These design policies and standards ensure that residential, commercial, and industrial projects as well as public spaces and rights-of-way incorporate specific elements of good design. The intent is to promote a stable and aesthetically pleasant environment. In commercial corridors, the emphasis is on the provision and maintenance of the visual continuity of streetscapes and the creation of an environment that encourages both pedestrian and economic activity. In multi-family residential areas, the emphasis is on the promotion of architectural design that enhances the appearance of structures and contributes to the quality of life, living conditions, and neighborhood pride of the residents. In industrial areas, the intent is to improve compatibility between industrial uses and non-industrial uses and encourage quality industrial development.

Venice Coastal Zone Specific Plan

One of the purposes of the Venice Coastal Zone Specific Plan (Venice Specific Plan) is to protect, maintain, enhance, and where feasible, restore the overall visual quality of views to and along the ocean and scenic coastal areas and their natural and man-made resources. It also regulates all aspects of development, including use, height, density, setback, buffer zone, and other factors so that it is compatible with the character of the existing community. It provides for the consideration of aesthetics and scenic preservation and enhancement; and protects environmentally sensitive areas.

The Venice Specific Plan has development regulations that include development standards for each subarea of Venice. The overall project area is located in the Ballona Lagoon West Bank Subarea and Laydown Area 2 is located in the Ballona Lagoon (Grand Canal) East Bank Subarea. The 128 Hurricane St site, which is both Laydown Area 1 and part of the Project Site is located in the Ballona Lagoon West Bank Subarea. As noted in the Venice Specific Plan, whenever the provisions of this Specific Plan differ from the provisions in Chapter 1 of the LAMC, (with regard to use, density, lot area, floor area ratio, building or structure heights, setbacks, yards, buffers, parking, drainage, fences, landscaping, design standards, light, trash, and signage), the provisions of the Venice Specific Plan will supersede the other regulations. Similarly, whenever the Venice Specific Plan is silent, the regulations of the LAMC will apply. It should be noted that although the Venice Specific Plan has been adopted by the Los Angeles City Council, it has not been certified as the Land Implementation Plan portion of the Venice LCP by the California Coastal Commission.

Venice Local Coastal Program Land Use Plan

The Venice Local Coastal Program Land Use Plan (Venice LCP LUP) was prepared for development to comply with the California Coastal Act of 1976 within the Venice Coastal Zone. The Venice LCP LUP was established as the Land Use Plan of the Venice LCP, intended to be used to plan for the preservation and enhancement of its coastal environment. The Venice LCP LUP contains information of the kinds, location, and intensity of land uses, the applicable resource protection, development policies and where applicable, a listing of implementation policies. It also addresses issues related to coastal development and design and seeks to develop facilities that will serve the needs of coastal visitors and City residents as well as preserve and enhance coastal overviews, key viewpoint areas, and Open Space. The Venice LCP LUP was certified by the California Coastal Commission. The Venice LCP was not wholly certified, therefore this LUP is only used on a local level and entitled through either a Venice Coastal Development Permit or a Venice Specific Plan Project Permit Compliance Review.

City of Los Angeles Walkability Checklist

The 2008 Walkability Checklist for Entitlement Review was developed by the City DCP's UDS to encourage the planning staff, project proponents, and community stakeholders to pursue high-quality urban designs that provide enhanced pedestrian movement, access, comfort, and safety, both in the public right-of-way and on private properties. It specifies urban design guidelines that are generally applicable to all projects that require discretionary approval for new construction. The walkability checklist consists of objectives, goals, and implementation strategies regarding various design elements, which are intended to improve the pedestrian environment, protect neighborhood character, and promote high-quality urban form. Topics such as sidewalks, crosswalks/street crossings, on-street parking, utilities, building orientation, off-street parking and driveways, on-site landscaping, building façades, and building signage and lighting are addressed and should be considered in the design of a project.

Citywide General Plan Framework Element

The 2009 City of Los Angeles General Plan Framework Element provides a series of goals, policies, and objectives that pertain to urban design topics throughout the City of Los Angeles. With respect to the evaluation of aesthetics and views (i.e., the identification and evaluation of key visual resources and a determination as to the degree of visual impact that would be attributable to the project), the Framework Element's Urban Form and Neighborhood Design chapter establishes the goal of creating a livable city (i.e., a city with strong neighborhoods, walkability, a network of

attractive public spaces, affordability, and regional connections) for existing and future residents with interconnected, diverse neighborhoods (Goal 5A). Also within the Framework Element, the Open Space and Conservation chapter calls for the use of Open Space to enhance community and neighborhood character (Objective 6.2). The policies in this chapter recognize that there are communities where Open Space and recreational resources are currently in short supply and, therefore, suggests that pedestrian-oriented streets and small parks, where feasible, might serve as important resources for meeting the Open Space and recreational needs of residents (Policy 6.2.1).

Citywide Design Guidelines

The 2011 Citywide Design Guidelines were adopted by the City Planning Commission for use in reviewing applications for commercial, multi-family, mixed use, and industrial projects. The Citywide Design Guidelines are intended to implement the 10 Urban Design Principles of the City's Framework Element. The principles address mobility and transit access in the public right-of-way, green streets, neighborhood character, and improved equity and opportunity. These principles are a statement of the City's vision for the future of Los Angeles. They provide guidance for new development and encourage projects to complement existing urban forms in order to enhance the built environment in Los Angeles. The intended purpose of one principle is to develop inviting and accessible transit areas, which would be done by augmenting the streetscape environment with pedestrian amenities and reducing visual clutter.

Residential Citywide Design Guidelines

The Proposed Project is located within a single and multi-family residential area. As such, the Residential Citywide Design Guidelines (Residential Guidelines), which address multi-family residential/commercial mixed-use standards are the most appropriate and applicable guidelines. As noted in the Residential Guidelines, multi-family development in the City of Los Angeles varies across a wide spectrum of typologies, from low-density small lot subdivisions in suburban areas to high-density, mixed-use buildings in urban regional centers. Each typology presents unique challenges and opportunities. The Residential Guidelines are intended to address some of the most common, overarching challenges in designing multi-family developments encountered across the City. The prime areas of opportunity for attaining high quality design in multi-family and mixed-use projects include: maximizing sustainability in multi-family developments, establishing height and massing transitions from multi-family uses to commercial uses or less dense single-family residential; considering the pedestrian as the cornerstone of design over automobilecentric design; establishing landscaping and Open Space as essential design concepts from the outset of a project; and highlighting the role that quality building design can play in creating visually interesting and attractive multifamily buildings by contributing to existing neighborhood character and creating a "sense of place." The Residential Guidelines are intended for developers and architects as well as for advisory and decision-making bodies when evaluating a project.[1]

3.1.1.4 City of Los Angeles Administrative Code

The City of Los Angeles Administrative Code is used to assist City offices, departments, and other governmental agencies with their functions, and serves as the official source for information about ordinances enacted by the City of Los Angeles that regulate administrative processes.

[1] Source: http://www.urbandesignla.com/resources/docs/ResidentialCitywideDesignGuidelines/hi/ResidentialCitywideDesignGuidelines.pdf. Accessed August 24, 2016.

Section 19.85 Public Works Improvements Arts Program - Public Art, Architecture, Landscape, and Urban Design Review Guidelines

The mayor-appointed Cultural Affairs Commission serves as an advisory body to the City's Cultural Affairs Department. The Cultural Affairs Commission approves the design of structures to be built on or over City property, or directly affecting public land or rights-of-way, and reviews and accepts works of public art proposed for acquisition by the City. The Cultural Affairs Commission exercises its discretion in accordance with the June 2008 Public Art, Architecture, Landscape, and Urban Design Review Guidelines. Projects submitted for review are subject to one of four guideline categories (public art, architecture, landscape architecture, or urban design), but it is acknowledged that all the guidelines are mutually supportive and should be considered together in the design of any development within or affecting the public realm. The issues addressed within each guideline category are outlined below.

Urban Design: Critical assessment of place, incremental development of a vibrant and hospitable public realm, pedestrian primacy, street envelope, building massing and site disposition, city lighting and streetscape amenities, new media, and mandatory preliminary early review.

Landscape: Natural systems, urban plant ecology, Open Space networks and corridors, variety of gathering spaces, site boundaries, new media, and mandatory preliminary early review.

Architecture: Encourage evocative design, ensure public realm improvement and activity, design buildings with ample Open Space and landscape, establish pedestrian-friendly site circulation, enhance defensible perimeters, provide façade interest, consider public lighting opportunities, promote sustainability, integrate the public art component early on, incorporate high-quality signage, wayfinding and graphic components, and encourage and provide preliminary early review.

Public Art: Artist-focused, expansive selection process; distinguish public artist selection from traditional design procurement; art panel qualifications; develop and expand the public artist pool; early artist selection; art and architecture process integration; artist independence; art maintenance; temporary public art projects; media and advanced technologies; multiple sites and portable art; and articulation of artistic intent.

3.1.2 Environmental Setting

The visual setting for the Proposed Project is defined below in terms of (a) visual character and quality within the larger community and throughout the study area; (b) scenic resources, scenic vistas, scenic corridors, and other visual resources within the larger community and throughout the study area; and (c) viewer groups potentially affected by the Proposed Project.

3.1.2.1 Defining Quality and Character of Visual Resources

Visual Character. The visual character of a view is described by the topography, land uses, scale, form, and natural resources in the view. Visual character is based on defined attributes such as physical traits—including form, color, line and texture (pattern elements)—as well as pattern character traits and the dominance, scale, and diversity or continuity of visual elements.

Visual Quality. Visual quality is based, in part, on the viewer's values and notions about what constitutes a quality setting. The three criteria that are used to define visual quality are listed below.

- *Vividness* is the visual power or memorability of landscape components as they combine in distinctive visual patterns.
- *Intactness* is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements. It can be present in well-kept urban and rural landscapes as well as in natural settings.
- *Unity* is the visual coherence and compositional harmony of the landscape considered as a whole. It frequently attests to the careful design of individual human-made components in the landscape.

As a general rule, high-quality views are found to have topographic relief, a variety of vegetation, rich colors, impressive scenery, and unique natural and/or built features. Medium-quality views have interesting but minor landforms, some variety in vegetation and color, and/or moderate scenery. Low-quality views contain uninteresting features, little variety in vegetation and color, uninteresting scenery, and/or common elements.

Visual Character and Quality of the Venice Community

The community of Venice is home to approximately 45,000 residents, and the Venice Community Plan Area includes an estimated 2,061 acres of land (City of Los Angeles 2009). Located in the western portion of Los Angeles, the community includes Venice Beach and the Venice Boardwalk, which stretch from Marina Court on the north to Yawl Street on the south. The community is generally bounded on the north by Marine Court and Dewey Street (adjoining the city of Santa Monica). It extends in an irregular fashion from the Pacific Ocean eastward to Walgrove Avenue, Beethoven Street, and Del Rey Avenue, bordering the Palms-Mar Vista-Del Rey Community Plan Area, parts of Culver City, and Los Angeles County land in Marina Del Rey. The coastline extends to the northern and southern limits of Venice, and the beach is used as a regional recreational resource.

Elements of urban design range from beach foregrounds and other natural landscapes to built structures and associated landscaped areas. Much of the area is developed with a variety of land uses that are typical of beach communities. The predominant land use in the community is residential. The majority of the multi-family development is medium and high medium density and located west of Lincoln Boulevard, extending to the coastline and southward from Washington Boulevard within the Marina Peninsula. Approximately 7 percent of the land is designated for commercial uses (City of Los Angeles 2009). The majority of commercial facilities are small scale in character and serve the local population. A more intense commercial area is located on the western edge of the community, adjoining Lincoln Boulevard, and within the Oxford Triangle. This area contains movie theaters, a large hotel, and a variety of restaurants and other retail uses. The remainder of the commercial uses are generally located at street intersections (e.g., around the Windward Circle) or along major arterials such as Lincoln Boulevard, which is an auto-oriented commercial strip. Of the community's total area, approximately 3 percent is designated for manufacturing and industrial uses. Other concentrations of designated industrial and light manufacturing uses are found along Main Street, from Abbot Kinney Boulevard to Dewey and Navy Streets.

The ESHAs in the Venice Coastal Zone include Ballona Lagoon and Grand Canal south of Washington Boulevard, the Venice Canals north of Washington Boulevard, habitat buffer areas on the east and west banks of Ballona Lagoon, and the California least tern nesting areas, as identified on the ESHA

map in the Venice LCP LUP Land Use Plan (City of Los Angeles 2015). The Venice Canals, along with the adjacent Ballona Lagoon, support some of the last remaining pockets of coastal wetland habitat in Los Angeles County. The Venice Canals are part of the Ballona Lagoon sea water system and connected with Ballona Lagoon via Grand Canal. Ballona Lagoon is an easily accessible natural area of estuarine and intertidal habitat. The lagoon is also rich in invertebrate and fish species, some of which are easily observable from the shore. Mudflats in Ballona Lagoon are especially important to shorebirds and waterfowl, which forage there in the fall and winter.

Visual character throughout the community of Venice varies by location and the relative position of the viewer. Visual quality in the community of Venice ranges from low to high quality, depending on the presence of visual resources and the distance, speed, and angle of the viewer, amongst other variables. As typified by the key views shown in Figures 3.1-2A and 3.1-3A, views throughout the project area are mostly medium-quality views of minor landforms, with some variety in vegetation and color and/or moderate overall scenery. The views captured in the selected key views and in viewsheds, as well as lines of sight throughout the immediate project vicinity, particularly those where Ballona Lagoon/Grand Canal (the primary visual resources in the project area) form a large portion of the foreground or middleground, have moderate intactness. They combine fairly well-kept urban features and natural settings, are somewhat free from encroaching elements (i.e., lampposts, etc.), and, thus, maintain an overall moderate level of visual integrity. The same views are moderately vivid; the juxtaposition of water, landscape features, and surrounding man-made elements, such as residential buildings, form partially distinctive and memorable visual patterns. As such, views throughout the project area are also fairly unified, given the visual coherence and compositional harmony of the human-built components and natural features present in the visual setting. For the highest quality views in the immediate project vicinity, Ballona Lagoon/Grand Canal and associated landscape features dominate the viewshed; manmade features and street trees create visual diversity and form a somewhat continuous horizontal line pattern that provides a mostly residential backdrop for the visual setting. The existing VPP is visible throughout the immediate project vicinity as well, where its approximately 50-foot-tall stack serves as a prominent visual feature. The stack could constrain sightlines to other visual resources throughout the project area, depending on the location and angle of the viewer. Viewers with higher exposure and sensitivity to the project area would be accustomed to the vertical presence of the VPP's central stack and other man-made features. Views found throughout the project area are encapsulated in Key Views 1 and 2 (shown below). They form a fairly colorful ocular palette, contain a range of visual textures, and provide moderate scenic relief to viewer groups. As such, views throughout the project area are mostly medium quality.

Scenic Resources, Scenic Vistas, Scenic Corridors, and Other Visual Resources

SR-2, the only official State Scenic Highway (as defined by Caltrans) in Los Angeles County, is located approximately 33 miles northeast of the community of Venice. A segment of SR-1, also known as PCH, is designated as an eligible State Scenic Highway; a portion of SR-1 traverses the community of Venice (Caltrans 2011). The southern terminus of the eligible portion is located at the intersection of SR-1 (known as Lincoln Boulevard at this intersection) and Venice Boulevard, which is approximately 2 miles northeast of the Project Site. Other Designated Scenic Highways in the project area, as inventoried in the Mobility Plan 2035, include Culver Boulevard and Vista del Mar. Culver Boulevard, between Vista del Mar and the Ballona Creek, features views of the Ocean and Marina, as well as the Ballona Wetlands (depending on the position and angle of the viewer). Vista Del Mar, between Culver Boulevard and Imperial Highway, features sand dune and ocean views (depending

on the position and angle of the viewer). Culver Boulevard and Vista del Mar are approximately 1.4 miles south of the Proposed Project, on the south side of Marina del Rey and the Ballona Creek.

The Venice Local Coastal Program Land Use Plan designates special marine and land habitat areas, wetlands, lagoons, and estuaries within the local Coastal Zone that are of vital interest and sensitivity. The scenic and visual qualities of these areas and other coastal areas are considered resources of public importance. Ballona Lagoon/Grand Canal and associated waterways are zoned as Open Space (OS). This designation serves to protect recreational, residential, and scenic uses of the area while providing for other uses that would benefit the public without significant impairment of the recreational and residential uses. Standards, regulations, and development guidelines provided in applicable plans regulating development in the study area determine the height limits, setbacks, and the other design criteria necessary to ensure the appropriate scale of development and protect public views. The vacant lot proposed for construction of the VAPP and the site where the existing VPP is located are designated as Lots Fronting ESHAs. Ballona Lagoon and Grand Canal are the ESHAs; the lots are located just east of the Habitat Protection Buffer Strip, which lines the east and west sides of Ballona Lagoon from just south of Hurricane Street and west of the Project Site to its southern terminus at Via Marina.

No other officially designated scenic resources, vistas, or corridors have been identified within the immediate project vicinity. The primary visual resources throughout the project area are Ballona Lagoon and Grand Canal. Secondary visual resources include their associated landscape features, biological habitat areas, and street trees.

3.1.3 Environmental Impact Analysis

The discussion below identifies potential project impacts and the measures that would be required to mitigate impacts that are found to be potentially significant.

3.1.3.1 Methodology

This analysis generally follows the methodology outlined in the *Visual Impact Assessment for Highway Projects* (Federal Highway Administration [FHWA] 2015), which is considered an accepted standard for evaluating the visual effects associated with highway, railroad, and a wide range of nontransportation-related projects.

Determining Quality and Character of Visual Resources

The assessment of visual character is based on defined attributes such as physical traits—including form, color, line, and texture (pattern elements)—as well as pattern character traits and the dominance, scale, and diversity or continuity of visual elements.

Determining the quality of a view is based, in part, on the viewer's values and notions about what constitutes a quality setting. In an effort to establish an objective framework, this analysis applies the evaluative criteria (i.e., vividness, intactness, and unity, as described in Section 3.1.2.1) and qualitative rankings (low, medium, and high, also described in Section 3.1.2.1) presented in the FHWA guidelines. This method should correlate with public judgments of visual quality well enough to predict those judgments and can also help identify specific methods for mitigating each impact that may occur as a result of a project.

Viewer Groups and Assessing Viewer Response

Viewer response comprises two elements: *viewer sensitivity* and *viewer exposure*. *Viewer sensitivity* is both the viewer's concern for scenic quality and the viewer's response to change in the visual resources that make up the view. *Viewer exposure* is a measurement of the number of viewers exposed to the resource change as well as the frequency of the viewing opportunity, type of viewer activity, duration of the view, speed at which the viewer moves, and position of the viewer.

There are two basic groups of viewers present in the project area, as well as several sub-groups: (1) viewers associated with specific buildings (e.g., residents) and (2) mobile viewers (e.g., commuting motorists, pedestrians, sightseers). Residential viewers typically have the highest level of sensitivity to visual quality and changes to visual quality because of their familiarity with the view over a period of time, investment in the area, and sense of ownership of the view. Other viewers, with exceptions, usually have low or average sensitivity to visual quality or change. These include people on the local roadway system, such as commuting motorists and pedestrians. If they are traveling simply to get from one place to another for work reasons or while doing errands, their sensitivity would normally be average. However, when motorists are traveling for pleasure, or sightseers are present, it is likely that they would be somewhat more sensitive to their surroundings. The level of sensitivity increases, based on the level of familiarity the person has with the visual setting and the viewer's concern for scenic quality (e.g., Venice residents who regularly walk the Ballona Lagoon or Grand Canal versus persons who seldom visit). High viewer exposure heightens the importance of early consideration of design, art, and architecture and their roles in managing the visual resource effects of a project.

Few qualitative standards exist to guide analysts when determining impacts on visual resources. To help establish objective baseline conditions, photographs were taken of key views in the project area, as shown in Figures 3.1-2A and 3.1-3A.

Key Views

A key view is a point from which a select view is analyzed from the perspective of potential key viewer groups. Two key views have been selected that most clearly convey the visual setting. As mentioned, key views represent the perspective of the primary viewer groups, those that could be affected by the project.

A view is considered key if at least one of the following circumstances applies:

- Visual resources are present, regardless of the quality of the view. The sensitivity of the affected viewer group is medium or high, and the duration of the view is long term.
- The quality of the view is medium or high, regardless of whether visual resources are present. The sensitivity of the viewer group is medium or high, and the duration of the view is long term.
- The view is distinct, clear, and unobstructed from the street to adjacent businesses and viewed regularly by a large number of commuters. In this case, the viewer sensitivity would be medium, and the view would be long term.

Figures 3.1-2A and 3.1-3A capture the selected key views of the existing visual setting within the project area; these are identified by the location and direction of view. Figures 3.1-2B and 3.1-3B, which follow, capture the key views that could noticeably change as a result of the project; these use simulations to show the same views as Figures 3.1-2A and 3.1-3A but with project features included (see Section 3.1.3, Environmental Impact Analysis).

As noted above, two key views have been selected to document the visual character and quality of the project area and reflect the perspective of sensitive viewers (e.g., residents) and viewer groups. All key observation points (KOPs) have been evaluated using "before-and-after" visual simulations. The KOPs identified for this analysis are listed below.

- **Key View 1: Pacific Avenue (looking north, toward the Project Site).** The foreground of the view comprises a pedestrian landing, landscaped areas, and biological habitat adjacent to Ballona Lagoon and the Lagoon itself. The middleground comprises Ballona Lagoon, residential buildings of up to three stories, and adjacent trees and greenscaped areas. As one moves from the middleground to the background, the existing VPP and residential buildings of varying height, which form a horizontal line pattern and the backdrop for lines of sight from this view, are visible, as is the Lagoon's confluence with the Grand Canal.
- **Key View 2: Marquesas Way (looking southwest, toward the Project Site).** The foreground of this view comprises the Grand Canal. The middleground includes the existing VPP, the proposed vacant site for the VAPP, and adjacent residential buildings. The background depicts additional adjacent residential buildings, adjacent trees/landscaping, and partial keystoning (e.g., succession of buildings in a line) down Hurricane Street.

The location and angle of the key view photographs relative to the immediate project vicinity is mapped below in Figure 3.1-1. Key Views 1 and 2 are shown thereafter in Figures 3.1-2A and 3.1-3A.

3.1.3.2 Screening Analysis

As noted in Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A (Notice of Preparation/Initial Study) of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in Appendix G of the CEQA Guidelines and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.1.3.3 Thresholds of Significance

The criteria used to determine the significance of an impact on aesthetics are based on the *L.A. CEQA Thresholds*. A project would normally have a significant impact on aesthetics if it could result in significant impacts related to the following:

1. AES-1. The number or relative proportion of existing features or elements that substantially contribute to the valued visual character or image of a neighborhood, community, or localized area that would be removed, altered, or demolished.
2. AES-2. The amount of natural Open Space to be graded or developed.
3. AES-3. The degree to which proposed structures in natural Open Space areas would be effectively integrated into the aesthetics of the site through appropriate design, etc.
4. AES-4. The degree of contrast between proposed features and existing features that represent the area's valued aesthetic image.
5. AES-5. The degree to which a proposed zone change would result in buildings that would detract from the existing style or image of the area because of density, height, bulk, setbacks, signage, or other physical elements.

Figure 3.1-1: Location and Angle of Selected Key Views



Source: ICF International, 2016.

Figure 3.1-2A: Key View 1 – Pacific Avenue (Looking North, toward the Project Site)



Source: ICF International, 2016.

Figure 3.1-2B: Simulated View from Pacific Avenue (Looking North, toward the Project Site)

Existing



Simulation



Source: ICF International, 2016.

Figure 3.1-3A: Key View 2 – Marquesas Way (Looking Southwest, toward the Project Site)



Source: ICF International, 2016.

Figure 3.1-3B: Simulated View from Marquesas Way (Looking Southwest, toward the Project Site)

Existing



Simulation



Source: ICF International, 2016.

6. AES-6. The degree to which the project would contribute to the area's aesthetic value.
7. AES-7. Applicable guidelines and regulations.

Obstruction of Views

1. VIEWS-1. The nature and quality of recognized or valued views (e.g., natural topography, settings, human-made or natural features of visual interest, resources such as mountains or the ocean).
2. VIEWS-2. Whether the project affects views from a designated scenic highway, corridor, or parkway.
3. VIEWS-3. The extent of obstruction (e.g., total blockage, partial interruption, minor diminishment).
4. VIEWS-4. The extent to which the project affects recognized views available from a length of a public roadway, bike path, or trail as opposed to a single fixed vantage point.

Shading

1. SHADE-1. Whether shadow-sensitive uses would be shaded by project-related structures for more than 3 hours between 9 a.m. and 3 p.m. Pacific Standard Time (between late October and early April) or for more than 4 hours between 9 a.m. and 5 p.m. Pacific Daylight Time (between early April and late October).

Nighttime Illumination

1. LIGHT-1. The change in ambient illumination levels as a result of project sources.
2. LIGHT-2. The extent to which project lighting would spill off the Project Site and affect adjacent light-sensitive areas.

3.1.3.4 Construction Impacts

The analysis below describes the direct and indirect impacts on aesthetics as a result of the Proposed Project during construction. The analysis evaluate the overall aesthetic character and quality and the existing visual environment. Key Views, associated visual simulations, and other resources are used in order to establish the visual setting, identify visual resources throughout the project area(s), and identify potential visual intrusions that could occur as a result of construction. As noted in the analysis below, all impacts would be less than significant and no mitigation measures are required. However, although not required, during construction, mitigation measures or best management practices (BMPs) (related to dust generated during construction) are recommended to further reduce and minimize impacts and are discussed below.

AES-1. The number or relative proportion of existing features or elements that substantially contribute to the valued visual character or image of a neighborhood, community, or localized area that would be removed, altered, or demolished.

Construction activities associated with the Proposed Project, because of their short-term nature, would have no long-term effect on the existing features or elements that substantially contribute to the visual character or image of the neighborhood, community, or project area. Although, proposed construction would result in a temporary disturbance because of the presence of construction

equipment, staging areas, exposed excavation areas and the temporary cofferdam that would be visible to nearby viewers. However, there would be no long-term effect on the scenic or primary visual resources, as identified above in Section 3.1.2, *Environmental Setting*, because none of the existing features or contributing elements, such as Ballona Lagoon, would be removed, altered, or demolished as a result of construction. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

AES-2. The amount of natural Open Space to be graded or developed.

Construction would require grading and excavation at the Project Site and a portion of the west bank of the Grand Canal in the location of the temporary cofferdam in order to construct the diversion structure. The Project Site is currently undeveloped; it contains no natural Open Space that would be graded or developed. However, the west bank of the Grand Canal contains some native and non-native plant communities. As part of U.S. Army Corps of Engineers permit requirements, and consistent with **Mitigation Measure MM-BIO-3** (revegetation of the disturbance footprint associated with the west bank of the Grand Canal) any disturbance to the west bank of the Grand Canal would need to be restored. Therefore, because this area would be restored to its pre-project conditions, impacts on open space would be **less than significant**, and no mitigation measures are required.

AES-3. The degree to which proposed structures in natural Open Space areas would be effectively integrated into the aesthetics of the site through appropriate design, etc.

The Project Site would not be located in a natural Open Space area. However, the Project Site is located adjacent to a state, county, and City-designated ESHA, as identified within the Venice Local Coastal Program Land Use Plan. Construction activities would not involve integrating structures into existing natural Open Space areas other than construction of the diversion structure, which would be constructed below the Grand Canal and would not protrude into the water column. However, the presence of construction vehicles, the cofferdam and the necessary materials for construction that would be present in the Grand Canal would create a temporary visual intrusion in an area designated as Open Space. Nonetheless, due to the temporary nature of construction, and because the Grand Canal and west bank would be restored to their pre-project conditions (see **Mitigation Measure MM-BIO-3**), impacts would be **less than significant,** and no mitigation measures are required.

AES-4. The degree of contrast between proposed features and existing features that represent the area's valued aesthetic image.

As mentioned above, because of the short-term nature of construction activities, no long-term effect on the area's valued aesthetic image is expected. Though visual intrusions would occur due to the presence of construction vehicles/materials, associated fencing, and the placement of the cofferdam within the Grand Canal, the temporary nature of construction, and because the Grand Canal and west bank would be restored to their pre-project conditions (**see Mitigation Measure MM-BIO-3**), these impacts would be **less than significant**, and no mitigation measures are required.

AES-5. The degree to which a proposed zone change would result in buildings that would detract from the existing style or image of the area because of density, height, bulk, setbacks, signage, or other physical elements.

The Proposed Project does not require a zone change from its current zone of RW2-1 (Residential Water Ways) to PF (Public Facilities) because the use qualifies as a Public Benefit Project so no zone

change is required. The Public Benefit Project is not being pursued to accommodate greater or taller structures than surrounding structures and, therefore, would not otherwise detract from the existing style or image of the area as a result of changes related to density, height, bulk, setback, signage, or other physical elements. The vertical elements proposed as part of the Proposed Project (up to approximately 32 feet) are consistent with surrounding land uses, and compliance with applicable City regulations and standards would ensure that appropriate density, height, bulk, etc., would be adhered to as part of the facility's design. Therefore, **no impacts** would occur, and no mitigation measures are required.

AES-6. The degree to which the project would contribute to the area's aesthetic value.

Construction activities, which are expected to begin in early 2018 and last approximately two years, would not contribute to the area's aesthetic value. During construction, site preparation and grading activities, construction staging, barricade installation, and the placement of structures and signage would be required to secure the construction site. Construction activities would also include the installation of a temporary cofferdam within the Grand Canal, which would temporarily diminish the visual quality or character of the immediate area. Similarly, the delivery and stockpiling of construction materials and the placement of construction equipment on the Project Site might also temporarily diminish the visual quality or character of the immediate area. However, although not required, **Mitigation Measures MM-AES-1** (screening of construction staging and stockpile areas) **and MM-AES-2** (directing nighttime lighting away from sensitive receptors) are recommended to further reduce aesthetic impacts during construction. Therefore, the Proposed Project would contribute to the area's aesthetic value would be **less than significant**, and no mitigation measures are required.

AES-7. Applicable guidelines and regulations.

All project construction would be completed in conformance with applicable City regulations and standards and therefore, impacts would be **less than significant**, and no mitigation measures are required.

Obstruction of Views

VIEWS-1. The nature and quality of recognized or valued views (e.g., natural topography, settings, human-made or natural features of visual interest, resources such as mountains or the ocean).

As discussed in Section 3.1.2, *Environmental Setting*, the primary visual resources in the project area are Ballona Lagoon and Grand Canal. Project construction would not result in a long-term effect on the nature or quality of valued public views in the immediate project vicinity. However, as discussed above, temporary construction activities could diminish visual quality or character and, thus, valued views of the immediate area. During construction, site preparation and grading activities, construction staging, barricade installation, and the placement of structures and signage would be required to secure the construction site. Construction activities would also include the installation of a temporary cofferdam within the Grand Canal, which would temporarily diminish the nature and quality of recognized or valued views in the immediate area. Similarly, the delivery and stockpiling of construction materials and the placement of construction equipment on the Project Site might also temporarily diminish the nature and quality of recognized or valued views. Once construction is complete, valued views and the primary visual resources therein (Ballona Lagoon and/or Grand Canal) would be preserved and restored to their pre-project conditions, as required in **Mitigation**

Measure MM-BIO-3 (see above). Therefore, impacts would be temporary, and as such, **less than significant**, and no mitigation measures are required.

VIEWS-2. Whether the project affects views from a designated scenic highway, corridor, or parkway.

Certification of the Venice Local Coastal Program Land Use Plan (Venice LUP) is currently pending approval by the California Coastal Commission. However, although it has not been certified, the LUP nevertheless addresses issues related to coastal development and design that preserve and enhance coastal views, viewpoint areas, and Open Space. In that capacity, the LUP identifies Ballona Lagoon and Grand Canal as ESHAs for their recreational, residential, and scenic uses. No other officially designated scenic resources, vistas, corridors or eligible/officially designated State or County Scenic Highways have been identified within the project viewshed by Caltrans or within the Mobility Plan 2035. As discussed in Section 3.1.2, *Environmental Setting*, because no officially designated scenic highways, corridors, or parkways have been identified within the immediate project vicinity, **no impacts** would occur, and no mitigation measures are required.

VIEWS-3. The extent of obstruction (e.g., total blockage, partial interruption, or minor diminishment).

Project construction would result in a temporary minor diminishment and partial obstruction of views in the immediate project vicinity. Standard construction equipment would be used including compactors, bulldozers, front loaders, trenchers, construction cranes, water trucks, dump trucks, and delivery trucks that would bring construction-related materials to the site. This equipment, vehicle traffic, and the presence of construction workers would obstruct views in the area and result in minor diminishment and partial obstruction of views throughout the project area. However, large, overhead cranes would not be required; therefore, views of visual resources would not be substantially obstructed by this type of construction equipment or similar types of equipment, nor would the presence of construction equipment result in total blockage. Partial interruption and/or minor diminishment would occur in places with sightlines to Ballona Lagoon and/or Grand Canal, depending on the location, distance, speed, and angle of the viewer. Residential viewer groups and regular visitors to the lagoon and canal would be more sensitive to this type of temporary visual intrusion than recreationists or local commuters. However, project construction would not permanently block these visual resources or substantially diminish the nature and quality of recognized or valued private and public views. Because construction activities and the presence of construction equipment would be temporary, and because the project areas would be restored to pre-project conditions, no long-term obstruction of views, including those depicted in Key Views 1 and 2, as shown in Figure 3.1-2A and Figure 3.1-3A, would occur. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

VIEWS-4. The extent to which the project affects recognized views available from a length of a public roadway, bike path, or trail, as opposed to a single fixed vantage point.

As discussed above, the presence of construction materials and equipment would alter existing views, and project construction would result in temporary, minor visual intrusions. However, upon completion of construction of the Proposed Project, recognized views would be preserved and maintained. Roadway users on Marquesas Way and Via Dolce would have more fleeting views of the project area, which would lessen any temporary impacts. From the bike path and trail that connects

Hurricane Street to Pacific Avenue (south of the Proposed Site), access to which would be limited during construction because of temporary closures near Hurricane Street (see Figure 2-2 in Chapter 2, Project Description) to accommodate construction activities, views of the Proposed Site are limited due to the presence of the existing pumping plant, which mostly blocks the project area (as depicted in Figure 3.1-2A). Therefore, any impacts would be temporary, and as such, are **less than significant, and no mitigation measures are required.**

Shading

SHADE-1. Whether shadow-sensitive uses would be shaded by project-related structures for more than 3 hours between 9 a.m. and 3 p.m. Pacific Standard Time (between late October and early April) or for more than 4 hours between 9 a.m. and 5 p.m. Pacific Daylight Time (between early April and late October).

Construction is not expected to require large cranes or other major construction-related structures and equipment that would cast large shadows. Standard construction equipment would be used, including compactors, bulldozers, front loaders, trenchers, construction cranes, water trucks, dump trucks, and delivery trucks to bring construction-related materials to the site. Similarly, the vertical elements proposed as part of the project (greater than 32 feet), which would be under construction, would not cast shadows that would affect shade-sensitive uses or viewers. Therefore, impacts would be **less than significant** during construction of the Proposed Project. No mitigation is required.

Nighttime Illumination

LIGHT-1. The change in ambient illumination levels as a result of project sources.

Ambient illumination near the existing Project Site includes light emitted from residences on Hurricane Street, Canal Court, and Marquesas Way/Via Dolce; on-site lighting at the existing pumping plant; lampposts; and headlights from vehicle traffic. Of the land uses in the immediate project vicinity, the residences on Hurricane Street, Canal Court, and Marquesas Way/Via Dolce, would be the most light sensitive. During construction, some perimeter lighting may be required, both on the Project Site and in Laydown Areas 1 and 2, for security purposes.

If nighttime lighting at the construction site is required, lighting would be directed downward/on-site, away from sensitive receptors (residences), and spillover light would be minimized to the greatest extent practicable, but could be potentially significant. However, through compliance with Articles 1 and 9 of the LAMC, significant changes in ambient illumination levels as a result of project construction activities are not expected to occur. Though construction lighting may be somewhat visible to sensitive receptors, it would not be a significant nuisance for nearby residents due its directional orientation, which would minimize spill effects. Moreover, **Mitigation Measure MM-AES-2** (requiring the contractor to direct nighttime lighting away from sensitive receptors) would assist in reducing this impact. As such, since any construction lighting would adhere to LAMC requirements, and would be limited to the construction period, impacts would be **less than significant with implementation of Mitigation Measure MM-AES-2.**

LIGHT-2. The extent to which project lighting would spill off the Project Site and affect adjacent light-sensitive areas.

As mentioned above, if nighttime lighting at the construction site is required, lighting would be directed downward, and spillover light would be minimized to the greatest extent practicable.

Therefore, it is expected that project lighting would not spill off the Project Site and significantly affect adjacent light-sensitive areas. Construction lighting would not be a significant nuisance for nearby residents. As such, impacts would be **less than significant**, and no mitigation measures are required.

3.1.3.5 Operational Impacts

The section below discusses potential impacts associated with on-going and permanent operation of the Proposed Project related to overall aesthetic character and quality and the existing visual environment. Key views, associated visual simulations, and other resources are used to establish the visual setting, identify visual resources throughout the project area, and identify potential visual intrusions that could occur as a result of operation. It should be noted that the analysis does not address Laydown Area 3 located in Culver City since all stockpiled soil would be removed from this site once construction of the VAPP is completed. As noted in the analysis below, all impacts would be less than significant, and no mitigation measures are required. However, although not required, during operation, a mitigation measure is recommended to further reduce and minimize impacts and is discussed below.

Aesthetics

AES-1. The number or relative proportion of existing features or elements that substantially contribute to the valued visual character or image of a neighborhood, community, or localized area that would be removed, altered, or demolished.

The major visible built elements of the Proposed Project include the electrical building (up to 32 feet in height), Open Spaces (located along the eastern side of the VAPP and adjacent parcel to the southwest), landscaping and benches, pathways, public viewing and pedestrian access areas, as well as fencing with blinds and vegetation for screening. Other project elements, including sewer lines, utility connections, transformers, generators, and a diversion structure, would be minimally visible, subterranean, and/or submerged beneath the Grand Canal and, therefore, would not be present in the viewsheds throughout the immediate project vicinity. Photo simulations of the VAPP, once built, are provided in Figures 3.1-2B and 3.1-3B and illustrate the expected changes in the visual setting compared with existing conditions as a result of the Proposed Project. The built features, as shown in Figures 3.1-2B and 3.1-3B, would not remove, alter, or demolish existing features or elements that contribute to the visual character of the project area, primarily Ballona Lagoon and Grand Canal. From Key View 1, built features would be minimally present. From Key View 2, built features would not interfere with existing features that contribute to the project area's visual character. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

AES-2. The amount of natural Open Space to be graded or developed.

The Project Site is currently undeveloped. It contains no natural Open Space that would be graded or developed, except the west bank of the Grand Canal where the diversion structure would be constructed below ground and would not visibly protrude into the water column. As noted above and required under **Mitigation Measure MM-BIO-3**, this portion of the bank would be restored to its pre-existing contours and restored with native plant communities in compliance with U.S. Army Corps of Engineers permit requirements. Moreover, the Proposed Project would provide additional Open Space and pedestrian access to the Grand Canal. Therefore, **no significant impacts** on open space would occur, and no mitigation measures are required.

AES-3. The degree to which proposed structures in natural Open Space areas would be effectively integrated into the aesthetics of the site through appropriate design, etc.

The Project Site would not be located in a natural Open Space area. However, the Project Site is located adjacent to a state, county, and City-designated ESHA, as identified within the LUP. As shown in Figure 3.1-3B, the VAPP would be setback from Grand Canal and Ballona Lagoon. It would include, in compliance with the policies and regulations outlined in this section and throughout the EIR related to height, massing and setback, appropriate design features, which would be subject to review and approval by the project design team and City Engineer/City Architect. As such, the visible built elements of the Proposed Project would generally be in keeping with development in the immediate project vicinity that is adjacent to the ESHA. Therefore, it would be effectively integrated into the aesthetics of the project area. As such, impacts related to the degree to which proposed structures in natural Open Space areas would be effectively integrated into the aesthetics of the site through appropriate design, etc., would be less than significant and no mitigation measures are required. However, although not required, **Mitigation Measure MM-AES-3** (compliance with City-required design guidance), which requires structures to be designed and built to the satisfaction of the Department of City Planning and the City Engineer/City Architect and in compliance with all applicable design guidelines, policies, and development standards, is recommended to further reduce any aesthetic impacts and/or inconsistencies between the Proposed Project and the surrounding areas.

AES-4. The degree of contrast between proposed features and existing features that represent the area's valued aesthetic image.

As shown in Figure 3.1-2B, from Key View 1, which is located on Pacific Avenue (looking north, toward the Project Site), the VAPP would be minimally perceptible and visually unobtrusive. Governing land use policies and design guidelines would ensure that visible project elements would be appropriate to the surrounding development with respect to density, height, and setbacks; would be required to incorporate visual treatments to be in keeping with the existing visual setting and environment; and would be situated next to the existing VPP, as shown in Figure 3.1-3B. Furthermore, under **Mitigation Measure MM-AES-3**, structures shall be designed and built to the satisfaction of the Department of City Planning and the City Engineer/City Architect. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

AES-5. The degree to which a proposed zone change would result in buildings that would detract from the existing style or image of the area because of density, height, bulk, setbacks, signage, or other physical elements.

As discussed above, the Proposed Project would not require a zone change from its current zone of RW2-1 to PF because the Proposed Project qualifies as a Public Benefit Project and no zone change is required (see discussion above). A Public Benefit Project is not being pursued to accommodate greater or taller structures than surrounding structures and, therefore, would not otherwise detract from the existing style or image of the area as a result of changes related to density, height, bulk, setback, signage, or other physical elements. The vertical elements proposed as part of the project (up to approximately 32 feet) would be consistent with surrounding land uses, and compliance with applicable City regulations and standards would ensure that appropriate density, height, bulk, etc., would be adhered to as part of the facility's design. Built features associated with the Proposed Project are shown in Figures 3.1-2B and 3.1-3B. Therefore, **no impacts** would occur, and no mitigation measures are required.

AES-6. The degree to which the project would contribute to the area's aesthetic value.

Built elements of the Proposed Project include an electrical building (up to approximately 32 feet in height), security walls, and Open Spaces and landscaping. The Open Spaces, landscaping and aesthetically treated walls would enhance visual quality and would contribute to the overall cohesion and continuity of the Proposed Project with adjacent buildings and the Ballona Lagoon and Grand Canal by providing color and scenic relief. Though visible, Proposed Project elements would not substantially alter the visual quality and/or character of the project's visual setting because of the project's adherence to applicable design guidelines, as discussed in Section 3.1.1, *Regulatory Setting*. Views throughout the immediate project vicinity would still be of medium quality, maintaining variety with respect to vegetation and color. Similarly, viewsheds throughout the immediate project vicinity would retain their intactness through a combination of well-kept urban features and natural settings, which would continue to be somewhat free of encroaching man-made elements. The project area would also retain its vividness because the Proposed Project's built elements would preserve the juxtaposition of water and landscape features with surrounding elements, such as residential buildings and the existing VPP. Overall, the project area would remain fairly unified, and the Proposed Project would not substantially compromise the visual coherence, line patterns, or overall scenery.

As a result of the additional Open Space and pedestrian access to the Grand Canal, the response from viewer groups, including residents, recreationists, local commuters, etc., is expected to be moderate and positive. Though viewer exposure and sensitivity would be higher for more accustomed viewer groups (i.e., residences and frequent visitors), given the nature and quality of existing viewsheds and the presence of the existing VPP, the Proposed Project would not substantially diminish or alter the aesthetic value of the project area. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

AES-7. Applicable guidelines and regulations.

The Proposed Project would be implemented in conformance with applicable City regulations and standards (see Chapter 2, Project Description, and Section 3.8, Land Use and Planning, of this EIR) and therefore, impacts related to applicable guidelines and regulations would be less than significant, and no mitigation measures are required. However, although not required, implementation of **Mitigation Measure MM-AES-3**, which requires structures be designed and built to the satisfaction of the City Engineer/City Architect and in compliance with all applicable design guidelines, policies, and development standards, would help to further reduce and minimize visual impacts.

Obstruction of Views

VIEWS-1. The nature and quality of recognized or valued views (e.g., natural topography, settings, human-made or natural features of visual interest, resources such as mountains or the ocean).

As discussed in Section 3.1.2, *Environmental Setting*, the primary visual resources in the project area are Ballona Lagoon and Grand Canal. Built features associated with the Proposed Project would not compromise the nature and/or quality of recognized or valued views. Project elements would be built in accordance with the applicable standards and guidelines and would be designed to be minimally apparent and in keeping with the surrounding visual environment, as discussed above

(and below) and shown in Figures 3.1-2B and 3.1-3B. Thus, valued views and views to/from the primary visual resources therein (Ballona Lagoon and/or Grand Canal) would be preserved. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

VIEWS -2. Whether the project affects views from a designated scenic highway, corridor, or parkway.

The Ballona Lagoon and Grand Canal are designated by the state, county, and City as an ESHA for their recreational, residential, and scenic uses. No other officially designated scenic resources, vistas, corridors, or eligible/officially designated State or County Scenic Highways have been identified within the project viewshed. As discussed in Section 3.1.2, *Environmental Setting*, because no officially designated scenic highways, corridors, or parkways have been identified by Caltrans or within the Mobility Plan 2035 in the immediate project vicinity, **no impacts** would occur, and no mitigation measures are required.

VIEWS -3. The extent of obstruction (e.g., total blockage, partial interruption, or minor diminishment).

As shown in Figure 3.1-2B, from Key View 1, the Proposed Project would be minimally perceptible and visually unobtrusive. In accordance with governing design guidelines and land use policies, visible project elements would be appropriate with respect to density, height, and setback and would be provided with visual treatments to be in keeping with the existing visual setting and environment. Views to/from primary and secondary visual resources, including Ballona Lagoon, would be unobstructed and preserved. As shown in Figure 3.1-3B, from Key View 2, the Proposed Project would partially block existing views. Although the VAPP would obstruct views of existing residential buildings, which are not considered visual resources, it would preserve views of the Grand Canal. Additionally, the aesthetically treated fencing and other landscape features included in the Proposed Project would enhance visual quality from this view. As a result of the additional Open Spaces and pedestrian access to Grand Canal and Ballona Lagoon, the response from viewer groups, including residents, recreationists, local commuters, etc., is expected to be moderate and positive. Though viewer exposure and sensitivity would be higher for more accustomed viewer groups (i.e., residences and frequent visitors), given the nature and quality of existing viewsheds and the presence of the existing VPP, the Proposed Project would not substantially diminish or alter valued views throughout the area. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

VIEWS -4. The extent to which the project affects recognized views available from a length of a public roadway, bike path, or trail, as opposed to a single fixed vantage point.

Built features associated with the Proposed Project would not result in impacts on recognized views from a length of a public roadway, bike path, or trail, such as those represented in Key View 1. Project elements would be built in accordance with applicable standards and guidelines and designed in keeping with the surrounding visual environment (e.g. scale, size, density, height, setback, etc.), as discussed above and shown in Figures 3.1-2B and 3.1-3B. Thus, recognized views from a length of a public roadway, bike path, or trail would be preserved. Therefore, impacts would be **less than significant**, and no mitigation is required.

Shading

SHADE-1. Whether shadow-sensitive uses would be shaded by project-related structures for more than 3 hours between 9 a.m. and 3 p.m. Pacific Standard Time (between late October and early April) or for more than 4 hours between 9 a.m. and 5 p.m. Pacific Daylight Time (between early April and late October).

In compliance with applicable plans and regulations, the scale and massing of visual elements associated with the Proposed Project would not result in shadows that would significantly affect shade-sensitive uses. The potential for the Proposed Project to cast new shadows or create shade would be limited and similar to that of existing uses/facilities within the project's viewshed. Projects with structural elements in excess of 60 feet in height (relative to nearby shade-sensitive uses) are required to determine the number of hours shadow-sensitive uses would be shaded by these elements. Since built elements associated with the VAPP would not exceed approximately 32 feet, no further analysis is required. Thus, impacts would be **less than significant** during operation, and no mitigation measures are required.

Nighttime Illumination

LIGHT-1. The change in ambient illumination levels as a result of project sources.

As discussed above, ambient illumination near the existing Project Site includes light emitted from residences on Hurricane Street, Canal Court, and Marquesas Way/Via Dolce; on-site lighting at the existing pumping plant; lampposts; and headlights from vehicle traffic. Perimeter security lighting would also be installed within the VAPP site, which would face inside, away from sensitive receptors, and be similar to those on the adjacent VPP site. Because substantial illumination, relative to existing conditions, would not be introduced by the Proposed Project, and because new lighting would be directed away from sensitive receptors, the Proposed Project would not significantly alter ambient light levels. Lighting would be installed in accordance with the LAMC, which would minimize the potential for spillover effects. Therefore, impacts would be **less than significant** during operation, and no mitigation measures are required.

LIGHT-2. The extent to which project lighting would spill off the Project Site and affect adjacent light-sensitive areas.

Nighttime lighting would be installed in accordance with the LAMC and the potential for spillover effects would be minimized. Therefore, it is expected that project lighting would not result in substantial adverse impacts on adjacent light-sensitive areas. Lighting would not be a significant nuisance for nearby residents. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

3.1.4 Mitigation Measures

Although the analysis above determined that no significant aesthetic or visual construction or operational-related impacts would occur, and no mitigation is required (excepting **Mitigation Measure MM-BIO-3** [discussed above]), in an effort to reduce perceived effects as much as practicable, several mitigation measures have been recommended for incorporation into the Proposed Project and are included below.

MM-AES-1: Construction Staging/Stockpiled Materials and Equipment. LABOE or its construction contractor shall be the responsible party for providing temporary construction fencing along the periphery of active construction areas to screen as much of the construction activity as possible from view at the street level.

To minimize views of stockpiled materials and idle construction equipment in staging areas and reduce visual clutter and disorder, project construction staging areas shall be enclosed or screened from view at the street level with appropriate screening materials. The contractor shall provide daily visual inspections to ensure that areas immediately surrounding the construction staging areas are free from construction-related clutter and graffiti and maintained in a clean and orderly manner throughout the construction period. Graffiti shall be painted over, masked out, or cleaned off within 24 hours after notification by the project inspector.

MM-AES-2: Nighttime Construction Activities. Should emergency construction activities occur at night, LABOE or its construction contractor shall ensure that lighting will be directed away from surrounding sensitive land uses, particularly residences, and toward the specific location intended for illumination. Lighting associated with construction activities or for security purposes shall be shielded to minimize glare and spill light around sensitive land uses in the surrounding area.

MM-AES-3: Final Design. LABOE shall ensure that all Proposed Project structures will be designed to minimize their visual presence. Where site and design allow, the project elements shall incorporate design and location features that minimize the size of the structures and provide setbacks from adjoining street frontages, screening, and/or architectural treatments that are appropriate to the design setting where visible from the public right-of-way at street level. Where necessary, structures shall be designed and built to the satisfaction of the City Engineer/City Architect and in compliance with all applicable design guidelines, policies, and development standards, as discussed Section 3.1.1, *Regulatory Setting*.

MM-BMP-AES-1: Resident Vouchers for Window Washing and Car Washes during Construction. LABOE or its construction contractor will implement best available control measures, as required by SCAQMD Rule 403 regarding fugitive dust, and other relevant regulations related to controlling dust from construction activities. However, to minimize any aesthetic impact construction dust may have on nearby neighboring cars and resident windows, the Public Affairs Office of the Department of Public Works shall provide vouchers to immediately adjacent residents for window washing and car washes, as appropriate.

3.1.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts related to aesthetics would occur as a result of the Proposed Project.

3.1.6 Cumulative Impacts

The study area for the cumulative impacts analysis is limited to locations that have clear sightlines to the built elements proposed as part of the Proposed Project. Typically, the study area boundaries extend approximately 0.25 miles from the project perimeter. Due to varying and constrained sightlines throughout the project vicinity, the study area for this cumulative impacts analysis are as follows: Galleon Street serves as the approximate northern border, Via Dolce/Marquesas Way create

a visual border on the east, Pacific Avenue creates a visual border to the west, and to the south, sightlines extend to/from the Project Site to approximately the intersection of Pacific Avenue and Ketch Street.

A list of related projects (see Chapter 1, Table 1-1) was reviewed as part of this cumulative impacts analysis. Of the total list of eight projects, three are within the project's cumulative viewshed—the Venice Dual Force Main, Venice Pumping Plant Vibration Rehab Phase 2 (under construction), and Venice Pumping Plant Generators Replacement Projects. Despite their proximity, these projects are and would only replace existing infrastructure and would consist of subterranean built elements. Therefore, they are not expected to adversely affect visual character and quality, nor result in effects that are potentially cumulatively significant.

Thus, because the Proposed Project would result in less-than-significant impacts, and would be designed and built to the satisfaction of the Department of City Planning and the City Engineer/City Architect and in compliance with all applicable design guidelines, policies, and development standards, it is not expected to result in or contribute to significant cumulative visual impacts.

3.2 Air Quality

This section discusses air quality in relation to the VAPP or Proposed Project. The section includes a discussion of regulatory requirements, the existing air quality within the Project area, and evaluates the potential for air quality impacts to occur as a result of Project construction and operation. As noted in the analysis below, impacts during both construction and operation would be less than significant and no mitigation measures are required. Supporting technical information and analyses are included as Appendix B (Air Quality Emissions and Greenhouse Gas Calculations) of this EIR.

3.2.1 Regulatory Setting

A review of the various federal, state, regional, and local government regulatory requirements was conducted to identify regulations that applicable to the Proposed Project relative to air quality. This section summarizes the various regulatory requirements that are relevant to the Proposed Project.

At the federal level, the U.S. Environmental Protection Agency (EPA) is responsible for implementation of the Clean Air Act (CAA). Some portions of the CAA (e.g., certain mobile-source and other requirements) are implemented directly by EPA; others (e.g., stationary-source requirements) are implemented by state and local agencies.

Responsibility for regulating air quality in California is shared between the California Air Resources Board (ARB) and the regional air quality districts. Areas of control for the regional districts are set by ARB, which divides the state into air basins (see Figure 3.2-1 for the boundaries of the South Coast Air Basin relative to the Proposed Project). ARB has establishes and runs programs for cleaner air ranging from research and regulation to enforcement and education. Specifically, ARB:

- Establishes and enforces emission standards for motor vehicles, fuels and consumer products.
- Has new authority to control climate change emissions.
- Establishes health-based air quality standards.
- Conducts research.
- Monitors air quality.
- Identifies and establishes control measures for toxic air contaminants.
- Provides compliance assistance for businesses.
- Produces education and outreach programs and materials.
- Oversees and assists local air quality districts, which regulate most non-vehicular sources of air pollution (ARB 2009).

The Proposed Project lies within the Los Angeles County portion of the South Coast Air Basin (Basin), which is under the jurisdiction of South Coast Air Quality Management District (SCAQMD). SCAQMD has jurisdiction over an area of approximately 10,743 square miles, including all of Orange County; Los Angeles County, except for the Antelope Valley; the non-desert portion of western San Bernardino County; and the western and Coachella Valley portions of Riverside County. The Basin is a sub-region of SCAQMD's jurisdiction.

SCAQMD is responsible for preparing the portion of the State Implementation Plan (SIP) applicable within its boundaries; adoption of control regulations for stationary sources; and implementation of indirect source and transportation control measures (e.g. employee ridesharing rules).

- Issuance of Permits: Under state law and district rules, every piece of equipment that emits or controls air pollution must have a permit to operate from the local air district. The equipment cannot be constructed without a district permit to construct. The district staff must issue the permit if the equipment will comply with all emission limitations in district rules.
- Enforcement: Permit requirements and district rules can be enforced by districts through actions for civil penalties (up to $75,000 per day of violation for individuals and up to $1 million per day for corporations), by local prosecutors through actions for misdemeanor criminal penalties, and by either seeking injunctive orders or orders of abatement.
- Hearing Boards: Hearing Boards in each district are authorized to issue temporary variances to sources having difficulty complying with air pollution rules. Hearing Boards can also hear appeals of permit decisions by the district staff, and can issue orders for abatement (SCAQMD, no date).

A discussion of the relevant air pollutants that are subject to regulatory control are discussed below, followed by a discussion of plans, policies, and regulations at the federal, state, and local level relevant to the Proposed Project.

3.2.1.1 Relevant Air Pollutants

Criteria Pollutants

The federal and state governments have established national ambient air quality standards (NAAQS) and California ambient air quality standards (CAAQS), respectively, for six criteria pollutants: ozone, carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM), which consists of PM 10 microns in diameter or less (PM10) and PM 2.5 microns in diameter or less (PM2.5).

Ozone and NO_2 are considered regional pollutants because they (or their precursors) affect air quality on a regional scale; NO_2 reacts photochemically with reactive organic gases (ROGs) to form ozone, and this reaction occurs at some distance downwind of the source of pollutants. Pollutants such as CO, SO_2, and Pb are considered to be local pollutants that tend to accumulate in the air locally. Particulate matter is considered to be a local as well as a regional pollutant.

The primary pollutants of concern in the study area are ozone (including nitrogen oxides), CO, and PM. Principal characteristics surrounding these pollutants are discussed below. Toxic air contaminants (TACs) are also discussed, although no air quality standards exist for these pollutants. The descriptions of criteria pollutants below are based on the Final Program Environmental Impact Report prepared for the 2012 SCAQMD Air Quality Management Plan (SCAQMD 2012).

Ozone

Ozone (O_3), a colorless gas with a sharp odor, is a highly reactive form of oxygen. High ozone concentrations exist naturally in the stratosphere. Some mixing of stratospheric ozone downward through the troposphere to the earth's surface does occur; however, the extent of ozone transport is limited. At the earth's surface in sites remote from urban areas, ozone concentrations are normally very low (e.g., from 0.03 ppm to 0.05 ppm).

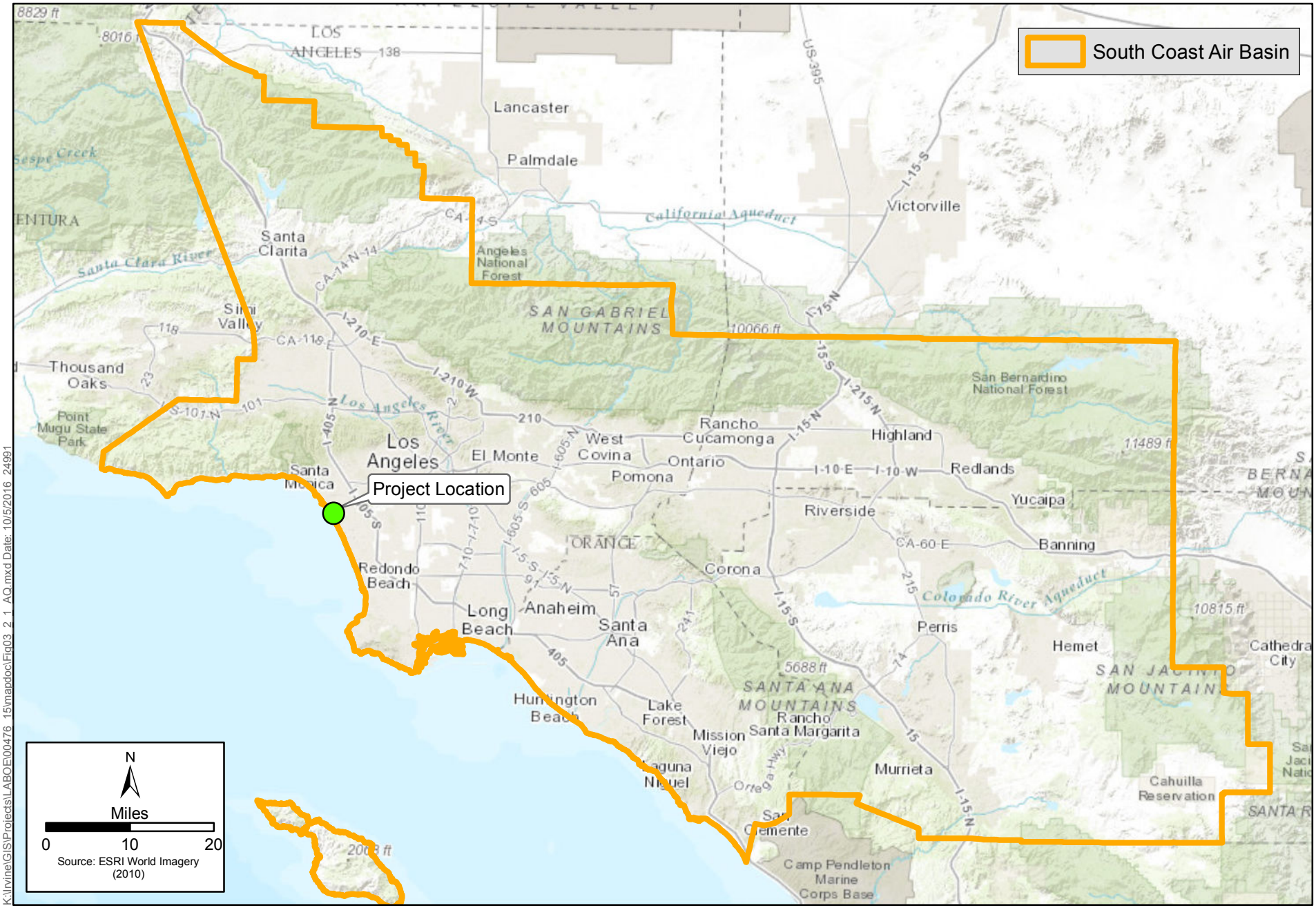

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Figure 3.2-1
South Coast Air Basin
Venice Auxiliary Pumping Plant Project

While ozone is beneficial in the stratosphere because it filters out skin-cancer-causing ultraviolet radiation, it is a highly reactive oxidant. It is this reactivity that accounts for its damaging effects on materials, plants, and human health at the earth's surface. The propensity of ozone for reacting with organic materials causes it to be damaging to living cells and ambient ozone concentrations in the Basin are frequently sufficient to cause health effects. Ozone enters the human body primarily through the respiratory tract and causes respiratory irritation and discomfort, makes breathing more difficult during exercise, and reduces the respiratory system's ability to remove inhaled particles and fight infection. Individuals exercising outdoors, children and people with preexisting lung disease, such as asthma and chronic pulmonary lung disease, are considered to be the most susceptible subgroups for ozone effects.

Short-term exposures (lasting for a few hours) to ozone at levels typically observed in southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes. In recent years, a correlation between elevated ambient ozone levels and increases in daily hospital admission rates, as well as mortality, has also been reported. An increased risk for asthma has been found in children who participate in multiple sports and live in high ozone communities. Elevated ozone levels are also associated with increased school absences. Ozone exposure under exercising conditions is known to increase the severity of the abovementioned observed responses. Animal studies suggest that exposures to a combination of pollutants that include ozone may be more toxic than exposure to ozone alone. Although lung volume and resistance changes observed after a single exposure diminish with repeated exposures, biochemical and cellular changes appear to persist, which can lead to subsequent lung structural changes.

Nitrogen Oxides

NO_2 is a reddish-brown gas with a bleach-like odor. Nitric oxide (NO) is a colorless gas, formed from the nitrogen (N_2) and oxygen (O_2) in air under conditions of high temperature and pressure which are generally present during combustion of fuels; NO reacts rapidly with the oxygen in air to form NO_2. NO_2 is responsible for the brownish tinge of polluted air. The two gases, NO and NO_2, are referred to collectively as NOx. In the presence of sunlight, NO_2 reacts to form nitric oxide and an oxygen atom. The oxygen atom can react further to form ozone, via a complex series of chemical reactions involving hydrocarbons. Nitrogen dioxide may also react to form nitric acid (HNO3) which reacts further to form nitrates, components of PM2.5 and PM10.

Population-based studies suggest that an increase in acute respiratory illness, including infections and respiratory symptoms in children (not infants), is associated with long-term exposures to NO_2 at levels found in homes with gas stoves, which are higher than ambient levels found in southern California. Increase in resistance to air flow and airway contraction is observed after short-term exposure to NO_2 in healthy subjects. Larger decreases in lung functions are observed in individuals with asthma and/or chronic obstructive pulmonary disease (e.g., chronic bronchitis, emphysema) than in healthy individuals, indicating a greater susceptibility of these sub-groups. More recent studies have found associations between NO_2 exposures and cardiopulmonary mortality, decreased lung function, respiratory symptoms and emergency room asthma visits. In animals, exposure to levels of NO2 considerably higher than ambient concentrations results in increased susceptibility to infections, possibly due to the observed changes in cells involved in maintaining immune functions. The severity of lung tissue damage associated with high levels of ozone exposure increases when animals are exposed to a combination of ozone and NO_2.

Carbon Monoxide

CO is a colorless, odorless, relatively inert gas. It is a trace constituent in the unpolluted troposphere, and is produced by both natural processes and human activities. In remote areas far from human habitation, carbon monoxide occurs in the atmosphere at an average background concentration of 0.04 ppm, primarily as a result of natural processes such as forest fires and the oxidation of methane. Global atmospheric mixing of CO from urban and industrial sources creates higher background concentrations (up to 0.20 ppm) near urban areas.

The major source of CO in urban areas is incomplete combustion of carbon-containing fuels, mainly gasoline. According to the 2007 AQMP, in 2002, the inventory baseline year, approximately 98 percent of the CO emitted into the Basin's atmosphere was from mobile sources. Consequently, CO concentrations are generally highest in the vicinity of major concentrations of vehicular traffic. CO is a primary pollutant, meaning that it is directly emitted into the air, not formed in the atmosphere by chemical reaction of precursors, as is the case with ozone and other secondary pollutants. Ambient concentrations of CO in the Basin exhibit large spatial and temporal variations due to variations in the rate at which CO is emitted and in the meteorological conditions that govern transport and dilution. Unlike ozone, CO tends to reach high concentrations in the fall and winter months. The highest concentrations frequently occur on weekdays at times consistent with rush hour traffic and late night during the coolest, most stable portion of the day.

Particulate Matter

Of great concern to public health are the particles small enough to be inhaled into the deepest parts of the lung. Respirable particles (particulate matter less than about 10 micrometers in diameter) can accumulate in the respiratory system and aggravate health problems such as asthma, bronchitis, and other lung diseases. Children, the elderly, exercising adults, and those suffering from asthma are especially vulnerable to adverse health effects of PM10 and PM2.5.

A consistent correlation between elevated ambient PM10 and PM2.5 levels and an increase in mortality rates, respiratory infections, number and severity of asthma attacks, and the number of hospital admissions has been observed in different parts of the United States and various areas around the world. Studies have reported an association between long-term exposure to air pollution dominated by PM2.5 and increased mortality, reduction in life-span, and an increased mortality from lung cancer.

Daily fluctuations in fine particulate matter concentration levels have also been related to hospital admissions for acute respiratory conditions, to school and kindergarten absences, to a decrease in respiratory function in normal children, and to increased medication use in children and adults with asthma. Studies have also shown lung function growth in children is reduced with long-term exposure to particulate matter. In addition to children, the elderly, and people with pre-existing respiratory and/or cardiovascular disease appear to be more susceptible to the effects of PM10 and PM2.5.

Sulfur Oxides

SO_2 is a colorless gas with a sharp odor. It reacts in the air to form sulfuric acid (H_2SO_4), which contributes to acid precipitation, and sulfates, which are components of PM10 and PM2.5. Most of the SO_2 emitted into the atmosphere is produced by burning sulfur-containing fuels. Exposure of a few minutes to low levels of SO_2 can result in airway constriction in some asthmatics. All asthmatics

are sensitive to the effects of SO_2. In asthmatics, increase in resistance to air flow, as well as reduction in breathing capacity leading to severe breathing difficulties, is observed after acute higher exposure to SO_2. In contrast, healthy individuals do not exhibit similar acute responses even after exposure to higher concentrations of SO_2.

Lead

Lead in the atmosphere is present as a mixture of a number of lead compounds. Leaded gasoline and lead smelters have been the main sources of lead emitted into the air. Due to the phasing out of leaded gasoline, there was a dramatic reduction in atmospheric lead in the Basin over the past three decades.

Fetuses, infants, and children are more sensitive than others to the adverse effects of lead exposure. Exposure to low levels of lead can adversely affect the development and function of the central nervous system, leading to learning disorders, distractibility, inability to follow simple commands, and lower intelligence quotient. In adults, increased lead levels are associated with increased blood pressure.

Lead poisoning can cause anemia, lethargy, seizures, and death. It appears that there are no direct effects of lead on the respiratory system. Lead can be stored in the bone from early age environmental exposure, and elevated blood lead levels can occur due to breakdown of bone tissue during pregnancy, hyperthyroidism (increased secretion of hormones from the thyroid gland), and osteoporosis (breakdown of bone tissue). Fetuses and breast-fed babies can be exposed to higher levels of lead because of previous environmental lead exposure of their mothers.

Toxic Air Contaminants

Although NAAQS and CAAQS exist for criteria pollutants, no ambient standards exist for Toxic Air Contaminants (TACs). Many pollutants are identified as TACs because of their potential to increase the risk of developing cancer or because of their acute or chronic health risks. For TACs that are known or suspected carcinogens, the ARB has consistently found that there are no levels or thresholds below which exposure is risk-free. Individual TACs vary greatly in the risks they present. At a given level of exposure, one TAC may pose a hazard that is many times greater than another. TACs are identified and their toxicity is studied by the California Office of Environmental Health Hazard Assessment (OEHHA). TACs include air pollutants that can produce adverse human health effects, including carcinogenic effects, after short-term (acute) or long-term (chronic) exposure. Examples of TAC sources include industrial processes, dry cleaners, gasoline stations, paint and solvent operations, and fossil fuel combustion sources (including diesel particulate matter[DPM]). For certain TACs, a unit risk factor can be developed to evaluate cancer risk. For acute and chronic health risks, a similar factor, called a Hazard Index, is used to evaluate risk.

3.2.1.2 Applicable Regulations

Federal

The CAA establishes the National Ambient Air Quality Standards (NAAQS) for maximum concentrations of a particular pollutant and specifies future dates for achieving compliance, it was first enacted in 1963, but has been amended numerous times in subsequent years (1967, 1970, 1977, and 1990). The CAA identifies two types of national ambient air quality standards. Primary standards provide public health protection, including protecting the health of "sensitive"

populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The CAA mandates that the state submit a State Implementation Plan (SIP) for regions that fail to meet the standards. The plans must include pollution control measures that demonstrate how the standards will be met. The City of Los Angeles is within the South Coast Air Basin, which is designated as a nonattainment area for certain pollutants that are regulated under the CAA.

The 1990 amendments to the CAA identify specific emissions-reduction goals for areas that fail to meet the NAAQS. These amendments require both a demonstration of reasonable further progress toward attainment and incorporation of additional sanctions for failure to attain or meet interim milestones. The sections of the CAA that would most substantially affect development of the Proposed Project include Title I (Nonattainment Provisions) and Title II (Mobile-Source Provisions). Title I provisions were established with the goal of attaining the NAAQS for criteria pollutants. Table 3.2-1 shows the NAAQS that are currently in effect for each criteria pollutant. The NAAQS were amended in July 1997 to include an 8-hour standard for O_3 and adopt a standard for PM2.5. The 8-hour ozone NAAQS was further amended in October 2015. EPA will designate ozone attainment and nonattainment areas in late 2017.

State

The California Clean Air Act (CCAA), signed into law in 1988, requires all areas of the state to achieve and maintain the CAAQS by the earliest practical date. The CAAQS incorporate additional standards for most of the criteria pollutants and set standards for other pollutants recognized by the state. In general, the California standards are more health protective than the corresponding NAAQS. California has also set standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles that are not included in the NAAQS. The Basin is in compliance with the California standards for sulfates, hydrogen sulfide, visibility-reducing particles, and vinyl chloride. As is the case with the NAAQS, compliance dates for attainment of the CAAQS have been set according to the severity of the violation of the standards. Table 3.2-1 details the current NAAQS and CAAQS, and Table 3.2-2 provides the Los Angeles County portion of the Basin's attainment status with respect to NAAQS and CAAQS.

Toxic Air Contaminants

With respect to criteria pollutants, federal and/or state ambient air quality standards (AAQS) represent the exposure level (with an adequate margin of safety) deemed safe for humans. No AAQS exist for TACs because no exposure level has been deemed safe for humans. Pollutants are identified as TACs because of their potential to increase the risk of developing cancer or their acute or chronic health risks. For TACs that are known or suspected carcinogens, ARB has consistently found that there are no levels or thresholds below which exposure is risk free. Individual TACs vary greatly in the risk they present. At a given level of exposure, one TAC may pose a hazard that is many times greater than another. For certain TACs, a unit risk factor can be developed to evaluate cancer risk. For acute and chronic health risks, a similar factor, called a Hazard Index, is used to evaluate risk. In the early 1980s, ARB established a statewide comprehensive air toxics program to reduce exposure to air toxics. The Toxic Air Contaminant Identification and Control Act (Assembly Bill [AB] 1807) created California's program to reduce exposure to air toxics. The Air Toxics "Hot Spots" Information and Assessment Act (AB 2588) supplements the AB 1807 program by requiring a statewide air toxics inventory,

Table 3.2-1. Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS[a]	NAAQS[b]
Ozone (O_3)	1 hour	0.09 ppm[c]	—
	8 hour	0.070 ppm	0.070 ppm
Carbon Monoxide (CO)	1 hour	20 ppm	35 ppm
	8 hour	9.0 ppm	9 ppm
Nitrogen Dioxide (NO_2)	1 hour	0.18 ppm	100 ppb
	Annual Arithmetic Mean	0.030 ppm	53 ppb
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm	75 ppb
	24 hour	0.04 ppm	0.14 ppm
Respirable Particulate Matter (PM10)	24 hour	50 µg/m^3 [c]	150 µg/m^3
	Annual Arithmetic Mean	20 µg/m^3	—
Fine Particulate Matter (PM2.5)	24 hour	—	35 µg/m^3
	Annual Arithmetic Mean	12 µg/m^3	12.0 µg/m^3
Sulfates	24 hour	25 µg/m^3	—
Lead (Pb)	30 day average	1.5 µg/m^3	—
	Calendar quarter	—	1.5 µg/m^3
	Rolling 3-Month Average	—	0.15 µg/m^3
Hydrogen Sulfide	1 hour	0.03 ppm	—
Vinyl Chloride	24 hour	0.01 ppm	—

Notes:
[a] The CAAQS for O_3, CO, SO_2 (1-hour and 24-hour), NO_2, PM_{10}, and $PM_{2.5}$ are values not to be exceeded. All other California standards shown are values not to be equaled or exceeded.
[b] The NAAQS, other than O_3 and those pollutants using annual arithmetic mean, are not to be exceeded more than once a year. The O_3 standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than 1.
[c] ppm = parts per million by volume; ppb = parts per billion; µg/m^3 = micrograms per cubic meter.
Source: California Air Resources Board, 2015a.

Table 3.2-2. Federal and State Attainment Status for the Los Angeles County Portion of the South Coast Air Basin

Pollutants	**Federal Classification**	**State Classification**
O_3 (1-hour standard)	—	Nonattainment
O_3 (8-hour standard)	Nonattainment, Extreme	Nonattainment
PM10	Attainment/Maintenance	Nonattainment
PM2.5	Nonattainment	Nonattainment
CO	Attainment/Maintenance	Attainment
NO_2	Attainment/Maintenance	Attainment
SO_2	Attainment	Attainment
Pb	Nonattainment	Attainment

Note that only the Los Angeles County portion of the South Coast Air Basin is nonattainment for NAAQS Pb. The remainder of the Basin is attainment.
Sources: ARB 2013b; EPA 2015; ICF, 2016.

notification of people exposed to a significant health risk, and facility plans to reduce these risks (ARB 2010). AB 2588 requires local air districts like SCAQMD to designate high, intermediate, and low priority categories and report on facilities that may pose a risk to the public.

To date, ARB has identified 21 TACs and adopted EPA's list of hazardous air pollutants as TACs. In August 1998, ARB identified diesel exhaust particulate matter (DPM) emissions as a TAC (ARB 1998). In September 2000, ARB approved a comprehensive diesel risk reduction plan to reduce emissions from both new and existing diesel-fueled engines and vehicles. The goal of the plan was to reduce DPM emissions and the associated health risk by 75 percent by 2010 and by 85 percent by 2020 (ARB 2000).

Local

South Coast Air Quality Management District

SCAQMD has adopted a series of air quality management plans (AQMPs), which are components of the SIP developed to meet the CAAQS and NAAQS in nonattainment areas. These plans require, among other emissions-reducing activities, control technology for existing sources, control programs for area sources and indirect sources, an SCAQMD permitting system that allows no net increase in emissions from any new or modified (i.e., previously permitted) emissions sources, and transportation control measures. The most recent AQMP is the 2012 AQMP, adopted by SCAQMD's Governing Board on December 7, 2012. ARB approved the 2012 AQMP on January 25, 2013, and the plan was submitted to EPA as a revision to the California SIP (ARB 2013a). The 2012 AQMP addresses CAA requirements and includes a 24-hour PM2.5 plan; additional 8-hour O_3 measures, with a vehicle-miles-traveled (VMT) offset demonstration; and a 1-hour O_3 attainment demonstration with VMT offset demonstration. SCAQMD is in the process of developing the 2016 AQMP, which will be primarily focused on addressing the ozone and PM2.5 standards. SCAQMD released the Draft 2016 AQMP for public review in June 2016 and SCAQMD's Governing Board will consider adoption of the Final 2016 AQMP in December 2016.

SCAQMD published the *CEQA Air Quality Handbook* in November 1993[1] to help local governments analyze and mitigate project-specific air quality impacts. This handbook provides standards, methodologies, and procedures for conducting air quality analyses as part of CEQA documents prepared within its jurisdiction. In addition, SCAQMD published two additional guidance documents, *Localized Significance Threshold Methodology for CEQA Evaluations* (2003, revised 2008) and *Particulate Matter (PM) 2.5 Significance Thresholds and Calculation Methodology* (2006). These publications provide guidance for evaluating localized effects from mass emissions during construction. Both were used in the preparation of this analysis (SCAQMD 2006, 2008a).

Through the attainment planning process, SCAQMD develops rules and regulations to address the sources of air pollution in the Basin (SCAQMD 2015a). The majority of emissions sources associated with the Proposed Project are from electricity, generated by facilities associated with the Los Angeles Department of Water and Power (LADWP) and therefore, the Proposed Project is not subject to SCAQMD stationary-source rules, such as Regulation XIII (New Source Review), Rule 1401 (New Source Review of Toxic Air Contaminants), and Rule 431.2 (Sulfur Content of Liquid Fuels). Nevertheless, the Proposed Project is subject to the adopted SCAQMD rules and regulations listed below, including rules regarding the backup generator.

[1] Section updates provided on SCAQMD's website: http://www.aqmd.gov/ceqa/hdbk.html

SCAQMD Rule 402—Nuisance. This rule prohibits the discharge of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; endanger the comfort, repose, health, or safety of any such persons or the public; or cause, or have a natural tendency to cause, injury or damage to business or property. Odors are regulated under this rule.

SCAQMD Rule 403—Fugitive Dust. This rule prohibits emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area that remains visible beyond the property line of the emission's source. During construction of the Proposed Project, best available control measures identified in the rule would be required to minimize fugitive dust emissions from earthmoving and grading activities. These measures would include site pre-watering and re-watering as necessary to maintain sufficient soil moisture content.

SCAQMD Rule 1108—Cutback Asphalt. This rule specifies VOC content limits for cutback asphalt, a liquid petroleum product used during road construction activities.

SCAQMD Rule 1470—Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines. This rule specifies requirements for stationary diesel engines, including emergency standby generators. It requires owners or operators of emergency standby generators to keep monthly logs of usage, limits maintenance and testing to 20 hours per year, and requires emission rates to not exceed 0.40 grams per brake-horsepower hour (g/bhp-hr).

Southern California Association of Governments

The Southern California Association of Governments (SCAG) is the regional planning agency for Los Angeles, Orange, Ventura, Riverside, San Bernardino, and Imperial counties. SCAG addresses regional issues related to transportation, the economy, community development, and the environment, and is the federally-designated metropolitan planning organization (MPO) for a majority of the region and the largest MPO in the nation. As required by federal and state law, SCAG develops plans pertaining to transportation, growth management, hazardous waste management, housing, and air quality. SCAG data are used in the preparation of air quality forecasts and the consistency analysis included in the AQMP.

City of Los Angeles

The Air Quality Element of the City's General Plan (adopted by City Council on November 24, 1992) specifies goals, objectives, and policies to maintain clean air within the City and achieve consistency with regional air quality planning by SCAQMD and SCAG and to minimize health risks posed by air pollution sources (City of Los Angeles 1992).

The City does not have the authority to directly regulate air quality; however, the City addresses nuisances, including odors. The City has developed a Sewer System Management Plan (SSMP) (2015), which addresses odors generated from sewer gases. The SSMP includes an odor complaint contact number and tracking of occurrences via a geographic information system (GIS) management database, which allows quick identification and visualization of problem areas that can be prioritized for inspection, maintenance, and repairs. The City has a four-pronged approach to odor control: regular maintenance, system-wide treatment, site-specific corrective action, and capital improvement, including new and state-of-the-art odor control facilities. Most odor problems are resolved by regular cleaning or site-specific treatments. The City has also built permanent odor treatment facilities at strategic locations along major interceptors. These new odor facilities capture hydrogen sulfide through the use of fans and treat sewer gases using highly advanced treatment technologies.

3.2.2 Environmental Setting

3.2.2.1 Regional Setting

Regional Climate

The Project Site is within the Los Angeles Basin, which covers approximately 6,745 square miles and is bounded by the Pacific Ocean to the west and south and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. The Basin includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties, in addition to the San Gorgonio Pass area in Riverside County. The terrain and geographical location determine the distinctive climate of the Basin, which is a coastal plain with connecting broad valleys and low hills.

The Basin lies in the semi-permanent high-pressure zone of the eastern Pacific. As a result, the climate is mild and tempered by cool sea breezes. The usually mild climatological pattern is interrupted infrequently by periods of extremely hot weather, winter storms, or Santa Ana winds. The extent and severity of the air pollution problem in the Basin is a function of the area's natural physical characteristics (weather and topography), as well as human-made influences (development patterns and lifestyle). Factors such as wind, sunlight, temperature, humidity, rainfall, and topography all affect the accumulation and dispersion of pollutants throughout the Basin, making it an area of high pollution potential.

Regional Air Quality

The greatest air pollution impacts in the Basin occur from June through September. These are generally attributed to the large amount of pollutant emissions, light winds, and shallow vertical atmospheric mixing. This condition frequently reduces pollutant dispersion, thereby causing elevated air pollution levels. Pollutant concentrations in the Basin vary with location, season, and time of day. O_3 concentrations, for example, tend to be lower along the coast, higher in the near inland valleys, and lower in the far inland areas of the Basin and adjacent desert.

With regards to attainment status, The Los Angeles County portion of the Basin fails to meet national standards for O_3, PM10, PM2.5, and lead and state standards for O_3, PM10, and PM2.5. In addition, the Los Angeles County portion of the Basin is considered a maintenance area for national CO, NO_2, and PM10 standards.

With regards to TACs, SCAQMD has completed ambient air monitoring and evaluation studies in the Basin, called Multiple Air Toxics Exposure Study (MATES). The most recent is the MATES IV study, released to the public in May 2015. The MATES IV study concluded that the average carcinogenic risk throughout the Basin attributed to TACs is approximately 1,023 in one million. About 68.2% of all risk is attributed to diesel particulate matter (DPM) emissions, but DPM showed a 70% reduction compared to MATES III (SCAQMD 2015b).

3.2.2.2 Local Setting

Local Climate

Data from the closest climate monitoring station—Western Regional Climate Center's (WRCC's) Santa Monica Pier Station (approximately 3 miles north of the Project Site)—were used to characterize Project vicinity climate conditions. Over the period of record (1937-2015), summer

high and low temperatures average 71°F and 61°F, while the winter high and low temperatures average 64°F and 50°F, respectively. Rainfall varies widely from year to year, with an annual average of 13 inches, with the majority of rainfall falling between December and March (WRCC 2016a).

The closest wind monitoring station is the Santa Monica Airport wind monitoring station, which is approximately 3 miles north of the Project Site. Wind patterns in the Project vicinity arise primarily from the southwest with an average speed of 6 miles per hour (WRCC 2016a).

Local Air Quality

In order to monitor local air quality, SCAQMD, divides the Basin into air monitoring areas, and maintains a network of air quality monitoring stations. The Project Site is in the Northwest Coastal LA County Monitoring Area (Source Receptor Area [SRA] 2). The monitoring station within SRA 2 is the West Los Angeles-VA Hospital monitoring station (ARB 70091) near Wilshire Boulevard and Sawtelle Boulevard, 5 miles north of the Project Site. Criteria pollutants monitored at the West Los Angeles-VA Hospital monitoring station include O_3, CO, and NO_2.

Because not all criteria pollutants are monitored at the West LA-VA monitoring station, additional monitoring data have been provided from the Los Angeles-Westchester Parkway monitoring station (ARB 70111) and the Compton-700 North Bullis Road monitoring station (ARB 70112). The Los Angeles-Westchester Parkway monitoring station, located 2.5 miles south of the Project Site in SRA 3, is the closest monitoring station to the Project Site and provides additional setting detail, including PM10 data. The Compton-700 North Bullis Road monitoring station, located 16 miles southeast of the Project Site, is the closest monitoring station that monitors PM2.5. Table 3.2-3 shows air quality monitoring data in the project area.

Table 3.2-3. Ambient Background Concentrations from the West Los Angeles-VA Hospital (ARB 70091), Los Angeles – Westchester Parkway (ARB 70111) and Compton – 700 N Bullis Road (ARB 70112) Monitoring Stations

Pollutant Standards	2012	2013	2014
1-Hour Ozone (O_3) - West Los Angeles-VA Hospital (ARB 70091)			
State Maximum Concentration (ppm)	0.093	0.088	0.116
Number of Days Standard Exceeded			
CAAQS 1-hour Standard (> 0.09 ppm)	0	0	1
8-Hour Ozone (O_3) - West Los Angeles-VA Hospital (ARB 70091)			
State Maximum Concentration (ppm)	0.074	0.076	0.095
National Maximum Concentration (ppm)	0.073	0.075	0.094
National Fourth-Highest Concentration (ppm)	0.067	0.065	0.085
National Design Value (ppm)	0.065	0.062	0.067
Number of Days Standard Exceeded			
CAAQS 8-hour Standard (> 0.070 ppm)	0	0	4
NAAQS 8-hour Standard (> 0.075 ppm)	1	1	6
Carbon Monoxide (CO) - West Los Angeles-VA Hospital (ARB 70091)			
Maximum Concentration 8-hour Period (ppm)	1.15	N/A	N/A
Number of Days Standard Exceeded			
NAAQS 8-hour Standard (≥ 9 ppm)	0	N/A	N/A
CAAQS 8-hour Standard (≥ 9.0 ppm)	0	N/A	N/A

Pollutant Standards	2012	2013	2014
Nitrogen Dioxide (NO_2) - West Los Angeles-VA Hospital (ARB 70091)			
Maximum National 1-hour Concentration (ppm)	0.0613	0.0512	0.0639
Maximum State 1-hour Concentration (ppm)	0.061	0.051	0.063
Annual Average Concentration (ppm)	N/A	N/A	N/A
Number of Days Standard Exceeded			
CAAQS 1-Hour Standard (0.18 ppm)	0	0	0
NAAQS 1-Hour Standard (100 ppb)	0	0	0
Suspended Particulates (PM10) - Los Angeles – Westchester Parkway (ARB 70111)			
Maximum State 24-hour Concentration (µg/m^3)	30.0	37.0	45.0
Maximum National 24-hour Concentration (µg/m^3)	31.0	38.0	46.0
State Annual Average Concentration (µg/m^3)	21	21	22
Number of Days Standard Exceeded			
CAAQS 24-hour Standard (> 50 µg/m^3)	0	0	0
NAAQS 24-hour Standard (> 150 µg/m^3) *(Estimated)*	0	0	0
Suspended Particulates (PM2.5) - Compton – 700 N Bullis Road (ARB 70112)			
Maximum National 24-hour Concentration (µg/m^3)	51.2	52.1	35.8
24-hour Standard 98th Percentile (µg/m^3)	30.3	24.3	30.9
National Annual Average Concentration (µg/m^3)	11.6	11.9	12.6
State Annual Average Concentration (µg/m^3)	11.7	N/A	N/A
Number of Days Standard Exceeded			
NAAQS 24-hour Standard (> 35 µg/m^3)	1	1	1

ppm = parts per million; ppb = parts per billion; µg/m^3 = micrograms per cubic meter; NA = data not available.
Sources: ARB 2015b; EPA 2015c; ICF, 2015.

Monitoring data show the following trends for pollutant concentrations: the 1-hour O_3 state standard was exceeded one time at the West LA-VA station; the 8-hour O_3 federal and state standards were exceeded multiple times at the West LA-VA station; and the 24-hour PM2.5 federal standard was exceeded once per year at the Compton station. There were no violations of the PM10 federal standard, CO federal or state standards, or NO_2 state standard. In general, pollutant concentrations are lower in the Project vicinity compared to other inland parts of the Basin due to the limited amount of nearby industrial uses in addition to the presence of regular coastal breezes that disperse pollutants.

3.2.2.3 Local Health Risk

According to SCAQMD inhalation cancer risk data from MATES IV, the Project area is within a cancer risk zone of approximately 747 in one million (SCAQMD 2016). For comparison, the cancer risk shown in the previous MATES study, MATES III, showed an average cancer risk of approximately 749 in one million. Overall, emissions have decreased within the Basin and air quality has improved since MATES III (SCAQMD 2015c).

3.2.2.4 Sensitive Receptors and Locations

SCAQMD defines sensitive receptor locations as residential, commercial, and industrial land use areas as well as other locations where sensitive populations may be located. Other sensitive receptor locations include schools, hospitals, convalescent homes, day care centers, and other locations where children, chronically ill individuals, or other sensitive persons could be exposed (SCAQMD 2005a).

Sensitive receptors within the Project vicinity include the surrounding residences, particularly the multi-family residences directly to the north, west, and east of the Proposed Project Site. The closest sensitive receptor is the multi-family residential complex to the north of the Project Site along Canal Court, which abuts the Project Site boundary. Other sensitive receptors include an elementary school, an elderly housing facility, and a convalescent home that are within the Project vicinity.

3.2.2.5 Odors

As discussed in Chapter 2 (Project Description), the existing VPP is equipped with an exhaust fan that discharges vapors through an existing stack, but field investigation of the ventilation fan shows that the flange that connects the fan to the dispersion stack is displaced, and odors can exit through the gap at the joint. Also, the use of aboveground rental pumps necessary during repairs to the existing pumps have been known to temporarily produce odors in the Project area.

3.2.2.6 Naturally Occurring Asbestos

Disturbance of rock and soil that contains naturally-occurring asbestos (NOA can result in consequent exposure to the public. Asbestos most commonly occurs in serpentine rock, and its parent material, ultramafic rock. Construction activities in areas known to contain ultramafic rocks may expose workers and the general public to NOA. According to the California Department of Conservation, the Basin does not contain NOA, except for Catalina Island where small ultramafic rock occurrences are present (SCAQMD 2005c).

3.2.3 Environmental Impact Analysis

3.2.3.1 Methodology

Construction Emissions

Construction of the Proposed Project would result in the short-term generation of criteria pollutant and TAC emissions. Mass daily combustion exhaust, fugitive dust (PM10 and PM2.5), and fugitive off-gassing paving emissions were estimated using SCAQMD's California Emissions Estimator Model (CalEEMod), version 2013.2.2 (SCAQMD 2013). CalEEMod estimates criteria pollutant and greenhouse gas (GHG) emissions associated with construction and operation of land use development projects. Each phase of construction would result in combustion exhaust emissions from on-site construction equipment, haul truck travel, material deliveries, and construction workers' commutes. The site preparation and grading/excavation phases would include fugitive dust and hauling emissions associated with up to 10,000 cubic yards of soil and asphalt removal, and it is assumed that the materials would be hauled off-site in trucks with a capacity to carry 7 cubic yards. Approximately 7,700 cubic yards would be stockpiled off-site and, once tested, approximately half of the volume would be brought to a local landfill, such as Sunshine Canyon Landfill located in Los Angeles for permanent storage. Construction equipment for each phase of construction was provided by the Project designer (Arcadis), with the exception that CalEEMod defaults were used for the architectural coating phase, which is based on Project acreage and building size. It was assumed that up to 20 workers would be required on the site for the foundation and building construction period. Construction is anticipated to begin in March 2018 and would take approximately 24 months to complete. Table 3.2-4 shows a summary of construction assumptions that were used to estimate construction-period emissions.

Table 3.2-4. Summary of Construction Assumptions

Construction Activity	Assumption
Construction Start Date	March 2018
Construction Duration	24 months
Equipment	Air Compressors Cement and Mortar Mixers Crane Concrete/Industrial Saws Forklifts Graders Pavers Rollers Excavators Tractors/Loaders/Backhoes Rubber Tired Dozers Bore/Drill Rigs Plate Compactors
Initial Off-Haul Excavation Materials	10,000 cubic yards
Stockpiled at Laydown Area 3 (Culver City)	*7,700 cubic yards (1,485 truck round trips)*
Stockpiled at Laydown Area 1	*2,300 cubic yards (444 truck round trips)*
Excavation Materials Returned to Site from Laydown Area 3	3,850 cubic yards (743 truck round trips)
Excavation Materials Sent to a Local Landfill from Laydown Area 3	3,850 cubic yards (743 truck round trips)
Due to the narrow street widths in the project vicinity, it was assumed that trucks with a capacity of 7 cubic yards would be used. This analysis also assumes a 35% allowance for soil expansion and less-than-full loads. Additional details related to construction assumptions are included in Appendix B of this EIR.	

Regarding localized effects, SCAQMD's localized significance threshold (LST) methodology was developed to aid in the analysis of construction associated with land use development projects. LSTs represent the maximum emissions from a project that are not expected to cause or contribute to an exceedance of the most stringent applicable federal or state ambient air quality standard, and are developed based on the ambient concentrations of that pollutant for each source receptor area and distance to the nearest sensitive receptor. The LST methodology directs analyses to focus on emissions from mobile construction equipment (i.e., excavators, graders, backhoes, generators, etc.) and stationary sources (i.e., natural gas furnaces, emergency generators, etc.). The LST methodology and lookup tables are not designed to evaluate localized impacts from mobile sources traveling over roadways. Therefore, the LST analysis only includes those emissions that would occur on-site, and does not include emissions from construction vehicle travel on public roadways.

In modeling emissions, it was assumed that the site preparation and grading phases would occur separately and that the building construction, asphalt paving, and architectural coatings phases would occur concurrently. For the purposes of this analysis, fugitive dust emissions assume compliance with SCAQMD Rule 403. According to SCAQMD guidance, Rule 403 would reduce fugitive

dust emissions by 61 percent by watering three times per day (SCAQMD 2013). Emissions are presented at the daily time scale (i.e., pounds per day [lbs/day]) and compared with SCAQMD's thresholds discussed in Section 3.2.4.2, below. All emissions calculation worksheets and air quality modeling output files are provided in Appendix B of this EIR.

Although diesel trucks would be used during the construction period, the vast majority of haul trips would be performed during the site preparation and grading/excavation phases, limited to approximately 6 months. This is shorter than the 30-year exposure assumed for residential cancer risks in SCAQMD guidance (SCAQMD 2015). Consequently, cancer risks related to the toxic air contaminants released during the construction period have not been quantified.

Odors are addressed in a qualitative manner, identifying the elements of Project construction or operation that have the potential to result in objectionable odors in the Project vicinity.

Operational Emissions

CalEEMod was also used to quantify impacts related to Project operation, including trips by employees, who would staff the plant 24 hours per day, 7 days a week, with two employees on-site per 8-hour shift. In addition, the modeling accounted for the energy use of the operational facility.

Project operation would involve occasional trips from those performing maintenance work on the submersible pumps, which would occur at least once annually. In addition, Project implementation may also require the occasional use of a 24-kW diesel generator to be used to provide backup power to VAPP in the event of loss of power. Due to their infrequency, maintenance activities and use of the generator were not quantified.

Regarding localized effects, SCAQMD's LST methodology was developed to aid in the analysis of operations associated with land use development projects. It directs analyses to focus on criteria pollutant emissions from stationary sources (i.e., natural gas furnaces, emergency generators, etc.) and mobile equipment (i.e., forklifts) operating on-site. The LST methodology and lookup tables are not designed to evaluate localized impacts from mobile sources traveling over roadways or to analyze the effects of TACs on nearby receptors. Therefore, the LST analysis only includes those criteria pollutant emission sources that would occur on-site, and does not include emissions from motor vehicles traveling on roadways. However, to provide a conservative analysis, the LST analysis does include emissions from on-site truck activity associated with idling on-site. Emissions from on-site sources would occur on the entire site. Although the site is smaller than one acre, a one-acre site is assumed herein, as this is the smallest site size for which LST thresholds are published. Further, because emissions would occur throughout the entire site, receptor distance was taken from the center of the Project Site, as opposed to the edges for the construction site. Therefore, a 25-meter (82 feet) receptor distance was utilized for the operational analysis herein, which is the shortest distance available in SCAQMD's LST methodology. Because Project operation would result in a minimal increase in the number of vehicle trips and would not increase congestion or reduce vehicle speeds at an intersection or roadway within a ¼-mile distance of a sensitive receptor, the potential for localized exceedances of the California 1-hour or 8-hour CO standard is considered negligible and is not addressed below. All emissions calculation worksheets and air quality modeling output files are provided in Appendix B of this EIR.

As discussed above, based on the limited number of diesel truck trips associated with Project maintenance activities and the infrequency of use of the 24-kW diesel generator, the health effects of toxic air contaminants, including DPM, were not quantified. Odors are addressed in a qualitative

manner, identifying the elements of Project construction and operation that have the potential to result in objectionable odors in the Project vicinity.

Cumulative Impacts

In assessing cumulative construction impacts, the *L.A. CEQA Thresholds Guide* recommends the analysis review the related projects list and identify those projects with construction schedules that would coincide with the schedule of the Proposed Project. The *Thresholds Guide* recommends estimating the potential emissions from the related projects that would occur during construction of the Proposed Project, based on available information and, using the methodology above, determine the combined emissions for the Proposed and related projects.

In assessing cumulative operational impacts, the *L.A. CEQA Thresholds Guide* recommends the analysis review the list of related projects to identify those that would have pollutant or odor emissions. Based on the related projects, the analysis will determine the potential impacts of all such projects, together with the Proposed Project.

Similarly, SCAQMD recommends that Proposed Project be examined within the scope of the existing setting and that the examination take into account new and planned similar and nearby projects (SCAQMD 1993). Moreover, SCAQMD recommended the cumulative impact discussion consider consistency with the VMT and emission reduction targets and measures within the most recent AQMP (SCAQMD 1993). Further, SCAQMD thresholds have been established to support the AQMP and ensure attainment of the NAAQS and CAAQS. Therefore, an exceedance of SCAQMD threshold levels must be considered a significant cumulative impact and an adverse cumulative consequence.

The discussion below identifies potential Project impacts and the measures that would be required to mitigate impacts that are found to be potentially significant.

3.2.3.2 Screening Analysis

As noted in Section Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study) of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in CEQA Appendix G and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis are addressed in this EIR.

3.2.3.3 Thresholds of Significance

State Significance Thresholds

The criteria used to determine the significance of an impact on air quality are based on Appendix G of the CEQA Guidelines (as well as those identified in the *L.A. CEQA Thresholds Guide* and the thresholds established by SCAQMD, which are discussed below under Regional and Local Significance Thresholds). According to Appendix G, a project would normally have a significant impact on air quality if it could result in:

- **AQ-1.** Conflict with or obstruct implementation of the applicable air quality plan;
- **AQ-2.** Violate any air quality standard or contribute substantially to an existing or projected air quality violation;

- **AQ-3.** Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);
- **AQ-4.** Expose sensitive receptors to substantial pollutant concentrations; or
- **AQ-5.** Create objectionable odors affecting a substantial number of people.

Regional and Local Significance Thresholds

Construction Emissions

As stated in the *L.A. CEQA Thresholds Guide* (2006), the City has not adopted a citywide significance threshold for construction emissions. Rather, it is the responsibility of the lead City department to determine the appropriate standards; in the absence of a department policy, the *Thresholds Guide* defers to SCAQMD's *CEQA Air Quality Handbook* and/or EPA's AP-42 emission factors and assessment methodologies. The *Thresholds Guide* reprints guidance from the *CEQA Air Quality Handbook* to assist in the evaluation of Project impacts, as determined appropriate by each lead agency (SCAQMD 1993). Project-related factors to be used in a case-by-case evaluation of significance include the following factors (B.1. Construction Emissions):

- Combustion Emissions from Construction Equipment:
  - Type, number of pieces and usage for each type of construction equipment;
  - Estimated fuel usage and type of fuel (diesel, natural gas) for each type of equipment; and
  - Emission factors for each type of equipment.
- Fugitive Dust
- Grading, Excavation, and Hauling
  - Amount of soil to be disturbed on-site or moved off-site;
  - Emission factors for disturbed soil;
  - Duration of grading, excavation and hauling activities;
  - Type and number of pieces of equipment to be used; and
  - Projected haul route.
- Heavy-Duty Equipment Travel on Unpaved Roads
  - Length and type of road;
  - Type, number of pieces, weight and usage of equipment; and

    Type of soil.
- Other Mobile Source Emissions
  - Number and average length of construction worker trips to Project Site, per day; and
  - Duration of construction activities.

In addition, SCAQMD's *CEQA Air Quality Handbook* contains a Screening Table for Construction based on construction emissions occurring over a three-month (quarterly) period (*CEQA Air Quality*

Handbook 1993*:* pages 6-12). Given SCAQMD's regulatory role in the Basin, the significance thresholds and analysis methodologies established by SCAQMD are relied upon to make determinations regarding air quality impacts. The significance thresholds and analysis methodologies outlined in SCAQMD's *CEQA Air Quality Handbook*, *Localized Significance Threshold Methodology for CEQA Evaluations*, and *Particulate Matter (PM) 2.5 Significance Thresholds and Calculation Methodology* (2006) guidance documents were used in evaluating Project impacts. Specifically, SCAQMD construction and mass emissions thresholds identified in Table 3.2-5 were used for the regional assessment of criteria pollutants herein.

Table 3.2-5. SCAQMD Significance Thresholds (pounds per day)

	VOC	NO_X	CO	SO_2	PM10	PM2.5	Pb[a]
Construction							
Localized Significance Thresholds [b]	--	103	562	--	4.0	3.0	--
Regional Significance Thresholds	75	100	550	150	150	55	3
Operations							
Localized Significance Thresholds [b]	--	103	562	--	1.0	1.0	--
Regional Significance Thresholds	55	55	550	150	150	55	3

[a] The Proposed Project would result in no lead emissions during construction or operations. As such, lead emissions are not evaluated herein.

[b] Localized thresholds for construction and operations are based on a 1-acre Project Site and 25-meter distance to receptors within SRA 2. SCAQMD has not developed LSTs for VOC, SO_2, or Pb emissions.

Source: SCAQMD 2015e, 2015d; ICF, 2016.

With respect to localized emissions, SCAQMD has developed LSTs and mass rate look-up tables to help public agencies analyze the Project-related effects of pollutants on nearby receptors. The LSTs are based on the size or total area of the emissions source, the ambient air quality in each SRA where the emissions sources are located, and the distance to nearby sensitive receptor locations. The Project Site encompasses approximately 0.25 acre within the Northwest Los Angeles County Coastal Monitoring Area (SRA 2). Although the site is located adjacent to multi-family residences and the site is smaller than 1 acre, the analysis of impacts is based on a 25-meter receptor distance and a 1-acre site, the most conservative LSTs developed by SCAQMD.

Operational Emissions

According to the *L.A. CEQA Thresholds Guide* (2006) a Proposed Project would normally have a significant impact from project operations if any of the following would occur (B.2. Operational Emissions):

- Operational emissions exceed 10 tons per year of volatile organic gases or any of the daily thresholds as identified in SCAQMD's *CEQA Air Quality Handbook*;
- Either of the following conditions would occur at an intersection or roadway within one-quarter mile of a sensitive receptor:
    - The Proposed Project causes or contributes to an exceedance of the California 1-hour or 8-hour CO standards of 20 or 9.0 parts per million (ppm), respectively; or

- The incremental increase due to the project is equal to or greater than 1.0 ppm for the California 1-hour CO standard, or 0.45 ppm for the 8-hour CO standard.

- The Proposed Project creates an objectionable odor at the nearest sensitive receptor.

Toxic Air Contaminants

According to the *L.A. CEQA Thresholds Guide* (2006), the determination of significance related to Toxic Air Contaminants shall be made on a case-by-case basis, considering the following factors (B.3. Toxic Air Contaminants):

- The regulatory framework for the toxic material(s) and process(es) involved;
- The proximity of the toxic air contaminants to sensitive receptors;
- The quantity, volume and toxicity of the contaminants expected to be emitted;
- The likelihood and potential level of exposure; and
- The degree to which project design will reduce the risk of exposure.

Additionally, consistent with SCAQMD guidelines, for the purposes of this EIR, the Proposed Project would have a significant impact from TACs if:

- Project-related emission sources, both stationary and mobile, emit carcinogenic or TACs that individually or cumulatively exceed the maximum incremental cancer risk of 10 in 1 million (1.0 x 10-5) or an acute or chronic Hazard Index of 1.0 (SCAQMD 2005b, 2015c).
- Hazardous materials associated with on-site stationary sources result in an accidental release of air toxic emissions or acutely hazardous materials, posing a threat to public health and safety (SCAQMD 1993).

Asbestos

SCAQMD also recommends a discussion of naturally occurring asbestos when siting sensitive land uses, particularly school sites. If a project would be located in an area moderately likely to contain NOA, then the impact shall be considered potentially significant without implementation of measures to reduce potential NOA exposure and resultant human health effects. Accordingly, NOA impacts in this analysis are considered significant if the project is located in an area moderately likely to contain NOA and fails to comply with all applicable NOA control measures. As discussed above, the Basin does not contain NOA, except for Catalina Island where small ultramafic rock occurrences are present (SCAQMD 2005c). **Thus, no impacts related to NOA would occur as a result of Project implementation, and no further discussion is required.**

3.2.3.4 Construction Impacts

The analysis below describes the temporary direct and indirect impacts on air quality anticipated as a result of the Proposed Project during construction.

AQ-1. Would the Project conflict with or obstruct implementation of the applicable air quality plan?

Construction activities are considered consistent with the AQMP if they are in compliance with SCAQMD rules, such as Rule 403, which the Proposed Project would be. The Proposed Project would

not conflict with or obstruct implementation of the AQMP and therefore, **impacts would be less than significant and no mitigation measures are required.**

AQ-2. Would the Project violate any air quality standard or contribute substantially to an existing or projected air quality violation or expose sensitive receptors to substantial pollutant concentrations?

The Proposed Project would contribute to regional air pollutant emissions during short-term construction. An analysis of the construction-related effects of the Proposed Project is presented below.

Construction of the Proposed Project has the potential to create air quality impacts through the combustion emissions from heavy-duty construction equipment, construction workers' vehicle trips, material deliveries, and trips by heavy-duty haul trucks. In addition, earthwork activities would result in fugitive dust emissions, and emissions from grading, excavation and hauling on paved and unpaved roads. Paving operations would release VOCs from off-gassing (release of airborne particles). Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation, and, for dust, the prevailing weather conditions. The assessment of construction air quality impacts considers each of these potential sources and accounts for the factors identified in the thresholds that must be considered (detailed assumptions for each of these factors used in the analysis are presented in Appendix B of this EIR). Fugitive PM10 and PM2.5 emissions estimates take into account compliance with SCAQMD Rule 403.

Regional construction-related emissions are shown in Table 3.2-6. The construction analysis, which utilized CalEEMod, assumes that the site preparation and grading phases would occur separately and that the building construction, asphalt paving, and architectural coatings phases would occur concurrently. The maximum day for NO_X, CO, PM10, and PM2.5 emissions are expected to occur during the grading phase. The maximum day for VOC/ROG emissions is expected to occur when the building construction/paving/coatings phases occurs. As shown in Table 3.2-6, maximum daily Project-related criteria pollutant emissions would not exceed SCAQMD construction-period regional thresholds for any pollutant. Consequently, the impact of construction-related emissions on regional air quality would not violate any air quality standard or contribute substantially to an existing or projected air quality violation and as such, **impacts would be less than significant and no mitigation measures are required.**

Project construction would emit localized pollutants through the on-site use of heavy-duty construction equipment as well as fugitive dust from ground-disturbing activities. These localized emissions could expose nearby sensitive receptors to substantial pollutant concentrations.

With regards to localized emissions, localized construction-related emissions are shown in Table 3.2-7. The maximum day for VOC and SO_X emissions are expected to occur when building construction, paving, and architectural coatings would potentially overlap. The maximum day for NO_X, CO, PM10, and PM2.5 emissions is expected to occur during the grading phase. As shown in Table 3.2-7, localized emissions during construction would exceed the LST for PM10. With the implementation of **Mitigation Measure AQ-1**, which would require the use of Tier 3 construction equipment, emissions would be below the LST for PM10. Construction-period emissions with the implementation of **Mitigation Measure AQ-1** are shown in Table 3.2-8. **Consequently, the impact of construction-related emissions on local air quality would not violate any air quality standard or contribute substantially to an existing or projected air quality violation and as such, would be less than significant with the implementation of Mitigation Measure AQ-1.**

Table 3.2-6. Estimate of Regional Construction Emissions (pounds per day)

Construction Phase	VOC	NO_X	CO	SO_X	PM10	PM2.5
Site Preparation	2	19	12	< 1	1	1
Grading and Excavation	4	38	33	< 1	5	3
Building Construction	2	19	13	< 1	1	1
Paving	1	7	8	< 1	1	< 1
Coating	8	2	2	< 1	< 1	< 1
Maximum Concurrent Daily Emissions	**10**	**38**	**33**	**< 1**	**5**	**3**
SCAQMD Regional Construction Threshold	75	100	550	150	150	55
Exceed Significance Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

Source: CalEEMod modeling by ICF, 2016 (Appendix B of this EIR).

Table 3.2-7. Estimate of Localized Construction Emissions (pounds per day)

Construction Phase	VOC	NO_X	CO	SO_X	PM10	PM2.5
Site Preparation	2	19	12	< 1	1	1
Grading and Excavation	3	29	22	< 1	4.4	3.0
Building Construction	2	18	12	< 1	1	1
Paving	1	7	7	< 1	< 1	< 1
Coating	8	2	2	< 1	< 1	< 1
Maximum Concurrent Daily Emissions	**10**	**29**	**22**	**< 1**	**4.4**	**3.0**
SCAQMD Localized Significance Threshold	N/A	103	562	N/A	4.0	3.0
Exceed Significance Threshold?	N/A	**No**	**No**	N/A	**Yes**	**No**

N/A: Not applicable; SCAQMD has no localized significance thresholds for VOC or SO_X
Source: CalEEMod modeling by ICF, 2016 (Appendix B of this EIR).

Table 3.2-8. Estimate of Localized Construction Emissions Mitigated with Tier 3 Equipment (pounds per day)

Construction Phase	VOC	NO_X	CO	SO_X	PM10	PM2.5
Site Preparation	0	9	13	< 1	< 1	< 1
Grading and Excavation	1	13	18	< 1	3.5	2.2
Building Construction	1	12	15	< 1	1	1
Paving	< 1	5	7	< 1	< 1	< 1
Coating	8	1	2	< 1	< 1	< 1
Maximum Concurrent Daily Emissions	**10**	**18**	**23**	**< 1**	**3.5**	**2.2**
SCAQMD Localized Significance Threshold	N/A	103	562	N/A	4	3
Exceed Significance Threshold?	N/A	**No**	**No**	N/A	**No**	**No**

N/A: Not applicable; SCAQMD has no localized significance thresholds for VOC or SO_X
Source: CalEEMod modeling by ICF 2016 (Appendix B of this EIR).

Diesel trucks would be used during the construction period, resulting in emissions of TACs, particularly DPM. Although DPM would be emitted during the construction period, the period of exposure to residents neighboring the site would be limited to approximately 6 months when most of the diesel trucks hauling materials would be used. This is shorter than the 30-year exposure assumed for residential cancer risks in SCAQMD guidance (SCAQMD 2015). Given that neither the regional nor the localized emissions thresholds would be exceeded with the implementation of **Mitigation Measure AQ-1**, as shown in Tables 3.2-6 through 3.2-8, above, emissions emanating from the Project Site would not violate any air quality standard. **In addition, emissions would not contribute substantially to an existing or projected air quality violation or expose sensitive receptors to substantial pollutant concentrations and as such, impacts would be less than significant.**

AQ-3. Would the Project result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard?

As discussed above, the Basin is a federal nonattainment area for ozone, PM2.5, and Pb and state nonattainment area for ozone, PM10, and PM2.5. As shown in Table 3.2-6, emissions of regional pollutants during the construction-period would not exceed SCAQMD thresholds. Given that SCAQMD's thresholds were developed to ensure that impacts at the Project level would not hinder regional attainment, the Proposed Project would not result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is nonattainment. Furthermore, construction-period emissions would be short-term in nature and would occur over 24 months, with no long-term construction-related emissions. **Impacts would be less than significant, and no mitigation measures are required.**

AQ-4. Would the Project expose sensitive receptors to substantial pollutant concentrations?

As shown in Table 3.2-8, construction of the Proposed Project, with the implementation of **Mitigation Measure AQ-1**, would not result in an exceedance of LSTs such that significant impacts on sensitive receptors would occur. The TAC exposure period for sensitive receptors would be substantially less than the 30-year exposure assumed for residential cancer risks in SCAQMD

guidance (SCAQMD 2015). **Therefore, impacts related to sensitive receptors during the construction period would be less than significant.**

AQ-5. Would the Project create objectionable odors affecting a substantial number of people?

During the construction period, site preparation and excavation activities could involve the short-term generation of odors in the vicinity of the Project, mostly related to diesel exhaust from construction equipment. No odors during the connection of the diversion structure to the Coastal Interceptor Sewer located within the Grand Canal or while testing the three submersible pumps are expected to occur, since these activities would occur underground within the sealed valve and metering vault.

During construction of the coffer dam within the Grand Canal, sediment that contains organic material would be extracted which could result in odors when removed from the ground if not properly handled. Once these materials are removed, they would be temporarily stored in Laydown Areas 1 and 3. Various odors may be emitted from the sediment piles during construction that may impact the sensitive receptors in the Project area. However, best management practices will be used to address any potential odors. During the dewatering process, there could be some localized odor when the dewatered dredge material kept onsite on Laydown Area 1 and when it is transferred from the site to Laydown Area 3 via haul trucks. Since the haul truck trailers would be lined to prevent incidental seepage and covered during transport, significant odor impacts are not expected to occur during the handling and transportation of dewatered dredge material. As such, construction odors not result in a **less-than-significant impact and no mitigation measured are required**.

Implementation of the following best management practices would help ensure that potential odors emitted during construction activity would be contained and dispersed to minimize any odor impacts:

- A methodology for phased or staged operations to minimize the amount of sediment stored locally.
- Monitoring with a field olfactometer may occur to establish threshold levels at which additional measures must be incorporated to limit total odors.
- Utilization of lime stabilization (or similar technology) may be used to speed the dewatering process for the sediment layer which contains organic material. Lime enables the contractor to raise the pH level to 12 to contain odors and suppress microbiological decay of the organic material to objectionable gas products. Procurement and local storage of an oxidizing chemical that can be applied in liquid form to treat stored sediment, if needed.
- Displaying signage with the on-site construction supervisor's contact information for area residents to phone in odor complaints.

3.2.3.5 Operational Impacts

AQ-1. Would the Project conflict with or obstruct implementation of the applicable air quality plan?

Criteria for determining consistency for the AQMP are defined in the *CEQA Air Quality Handbook* (SCAQMD 1993). There are two key indicators of consistency:

Consistency Criteria No. 1: ***Whether the project will not result in an increase in the frequency or severity of existing air quality violations or cause or contribute to new violations, or delay timely attainment of air quality standards or the interim emission reductions specified in the AQMP*****.**

Consistency Criterion No. 1 refers to violations of NAAQS and CAAQS. SCAQMD recommends an air quality modeling analysis be performed to identify Project impacts. In order to be found consistent with Consistency Criterion No. 1, the analysis will need to demonstrate that Project emissions will not increase the frequency or severity of existing violations or cause or contribute to new violations. As discussed above, Project construction (Table 3.2-6 through Table 3.2-8) and operation (Table 3.2-9, and Table 3.2-10) would result in emissions that would not exceed regional and localized thresholds crafted to bring the area into attainment (regional thresholds) and to ensure no violations of NAAQS and CAAQS occur locally (localized thresholds). Therefore, the Project complies with Consistency Criterion No. 1.

Table 3.2-9. Estimate of Regional Operational Emissions (pounds per day)

Operational Element	VOC	NO_X	CO	SO_X	PM10	PM2.5
Area	< 1	<1	<1	<1	<1	<1
Energy	< 1	< 1	< 1	< 1	< 1	< 1
Mobile	< 1	< 1	< 1	< 1	< 1	< 1
Maximum Daily Emissions	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**
SCAQMD Regional Operational Threshold	75	100	550	150	150	55
Exceed Significant Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

Source: CalEEMod modeling by ICF 2016 (Appendix B of this EIR).

Table 3.2-10. Estimate of Localized Operational Emissions (pounds per day)

Operational Element	VOC	NO_X	CO	SO_X	PM10	PM2.5
Area	< 1	< 1	< 1	< 1	< 1	< 1
Energy	< 1	< 1	< 1	< 1	< 1	< 1
Mobile	< 1	< 1	< 1	< 1	< 1	< 1
Maximum Daily Emissions	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**
SCAQMD Localized Operational Threshold	N/A	103	562	N/A	1.0	1.0
Exceed Significant Threshold?	N/A	**No**	**No**	N/A	**No**	**No**

N/A: Not applicable; SCAQMD has no localized significance thresholds for VOC or SO_X
Source: CalEEMod modeling by ICF 2016 (Appendix B of this EIR).

Consistency Criteria No. 2: ***Whether the project will exceed the assumptions in the AQMP or increments based on the year of project build-out and phase.***

SCAQMD is required, pursuant to the CAA, to reduce emissions of criteria pollutants for which the Basin is in nonattainment status. SCAQMD's most recent plan to achieve air quality standards is the 2012 AQMP, adopted by SCAQMD's Governing Board on December 7, 2012. The 2012 AQMP outlines a comprehensive control strategy to meet the requirement for expeditious progress toward

attainment of the 24-hour PM2.5 NAAQS in 2014 through all feasible control measures. The 2012 AQMP also includes specific measures for implementing the O_3 strategy from the 2007 AQMP and attaining the 8-hour ozone standard by 2023 (SCAQMD 2013).

The AQMP strategies are based, in part, on regional population, housing, and employment projections prepared by the region's cities and counties. In essence, if a project is consistent with applicable planning documents, then the project is consistent with the AQMP. The Proposed Project is subject to the City of Los Angeles General Plan. Among the components of the General Plan, the Framework Element discusses the goals, objectives, and policies with respect to wastewater, which include the following:

- Goal 9A: Adequate wastewater collection and treatment capacity for the City and in basins tributary to City-owned wastewater treatment facilities.
    - Objective 9.2: Maintain the wastewater collection and treatment system, upgrade it to mitigate current deficiencies, and improve it to keep pace with growth as measured by the City's monitoring and forecasting efforts.
        - Policy 9.2.2: Maintain wastewater treatment capacity commensurate with population and industrial needs.
        - Policy 9.2.4: Continue to implement programs to upgrade the wastewater collection system to mitigate existing deficiencies and accommodate the needs of growth and development.

The Proposed Project is consistent with the wastewater goals, objectives, and policies identified in the Framework Element of the General Plan. The Bureau of Engineering has programmed the Proposed Project as part of its Wastewater – Collection System Program (City of Los Angeles 2016).

Pursuant to SCAQMD guidelines, because the Project would be consistent with the governing land use document, which is the City's General Plan, the Proposed Project is considered consistent with the region's AQMP. Therefore, the Project complies with Consistency Criterion No. 2. As such, because the Project complies with the applicable plans and associated goals, objectives, and policies, the Project would not increase violations or lead to new violations and Project-related emissions accounted for in the AQMP, developed to bring the Basin into attainment status for all nonattainment pollutants and precursors thereof. Therefore, impacts are considered **less than significant; no mitigation measures are required.**

AQ-2. Would the Project violate any air quality standard or contribute substantially to an existing or projected air quality violation or expose sensitive receptors to substantial pollutant concentrations?

Once operational, the Proposed Project would result in the long-term generation of criteria pollutant emissions associated with commute trips of employees working at the site, natural gas combustion for space and heating, and area sources associated with consumer products (cleaning supplies, kitchen aerosols, cosmetics, toiletries), architectural coatings, landscaping of the Open Space area, as well as periodic backup generator testing. Operations-related emissions are shown in Table 3.2-7 and indicate that maximum daily Project-related criteria pollutant emissions would not exceed SCAQMD operations-period thresholds for any pollutant. Consequently, the impact of operations-related emissions would be **less than significant; no mitigation measures are required.**

As shown in Table 3.2-8, localized emissions during operations would not exceed the appropriate LSTs for the Project with the implementation of **Mitigation Measure AQ-1**. Consequently, the impact of operations-related localized emissions **would be less than significant; no mitigation measures are required.**

SCAQMD's *CEQA Air Quality Handbook* recommends an evaluation of CO standards when volume-to-capacity (V/C) ratios at affected intersections or roadways are increased by 2 percent or more at intersections with a level of service (LOS) of C or worse (SCAQMD 1993). As noted in the Project Description (see Chapter 2 of this EIR), two employees would be required for Project operation at any given time for a total of 6 employees per 24-hour day. Thus, the 6 regular round trips associated with the Proposed Project would not increase V/C ratios such that an exceedance of CO standards would occur since these would be minor in nature and would not exceed an established traffic threshold. Therefore, the Proposed Project would not cause or contribute to an exceedance of the California 1-hour or 8-hour CO standards of 20 or 9.0 parts per million (ppm) or result in an incremental increase due to the Project is equal to or greater than 1.0 ppm for the California 1-hour CO standard or 0.45 ppm for the 8-hour CO standard. Consequently, the impact of operations-related CO emissions would be **less than significant; no mitigation measures are required.**

As shown in Table 3.2-7, operational emissions of VOC would be less than 1 pound per day, which is below the 10-ton annual threshold as identified in SCAQMD's *CEQA Air Quality Handbook* (SCAQMD 1993).

Emissions of TAC, particularly DPM, would likely be released during Project operation associated with maintenance vehicles and equipment as well as through the emergency use and testing of the diesel-powered backup generator. Maintenance and inspection activities would be conducted on an as-needed basis, assumed to be at least once per year. The generator would serve as back-up power in the event of power loss. Due to the infrequency of maintenance activities and generator use, substantial emissions of TACs are not anticipated and would be short-term in duration. Thus, operational impact emissions would be **less than significant; no mitigation measures are required.**

AQ-3. Would the Project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

As discussed above, the Basin is a federal nonattainment area for ozone, PM2.5, and Pb and state nonattainment area for ozone, PM10, and PM2.5. As shown in Table 3.2-7, emissions of regional pollutants would not exceed SCAQMD thresholds. Given that SCAQMD's thresholds were developed to ensure that impacts at the Project level would not hinder regional attainment, the Project would not result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is nonattainment. Therefore, regional pollutant emission impacts would be **less than significant; no mitigation measures are required.**

AQ-4. Would the Project expose sensitive receptors to substantial pollutant concentrations?

As shown in Table 3.2-9, operation of the Proposed Project would not result in an exceedance of LSTs such that significant impacts on sensitive receptors would occur. With the exception of the infrequent use of the back-up diesel-powered generator, localized TAC emissions would be minimal during project operation. Therefore, operational impacts related to sensitive receptors would be **less than significant; no mitigation measures are required.**

AQ-5. Would the Project create objectionable odors affecting a substantial number of people?

According to the ARB and SCAQMD's *CEQA Air Quality Handbook*, land uses associated with odor complaints typically include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting areas, refineries, landfills, dairies, and fiberglass molding facilities. Although the Proposed Project does not treat wastewater, wastewater is pumped at the site within enclosed pipe and associated underground facilities, and thus the Project has the potential to generate odors.

The existing VPP is equipped with an exhaust fan that discharges vapors through an existing stack and field investigation of the ventilation fan shows that the flange that connects the fan to the dispersion stack is displaced, and odors can exit through the gap at the joint. To remedy this, the fan and flanges would be replaced with compatible equipment as a component of the Proposed Project. In addition, a slide gate at the entrance to the VAPP wet well (where the three submersible pumps would be located) from the influent pipe would be installed to deter odors. Any odors in the piping would therefore be confined to that system. When the VAPP is in operation, the head spaces of the wet wells would be linked by the 66-inch sewer, and the exhaust fan would be able to service the entire system. Given that the Proposed Project would eliminate the existing gap between the existing fan and the dispersion stack, nuisance odors from the existing VPP and Proposed Project would improve. Also, because the Proposed Project would replace rental aboveground pumps that have been known to produce odors in the Project vicinity with underground facilities, the Proposed Project would result in an improvement in odors. Furthermore, the Proposed Project adds redundancy and reliability to the system, thereby reducing the risk of emergency discharges of sewage directly into the Grand Canal and Ballona Lagoon or overflows into the surrounding street network during periods of wet weather, which could create objectionable odors.

Based on the elimination of the gap between the fan and the dispersion stack, replacement of temporary aboveground pumps with underground facilities, and the increased reliability to reduce emergency risks, the Proposed Project is expected to result in improvements related to odors. Therefore, operation of the Proposed Project would not create objectionable odors affecting a substantial number of people, and impacts would be **less than significant; no mitigation measures are required.**

3.2.4 Mitigation Measures

The following mitigation measure would be implemented to reduce impacts related to the construction-period of the PM10 LST. With the implementation of mitigation, impacts would be less than significant.

MM AQ-1. All off-road diesel-powered construction equipment greater than 50 horsepower will meet Tier 3 emission standards. All construction equipment will be outfitted with ARB best available control technology devices. Any emissions-control device used by the contractor will achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similarly sized engine as defined by ARB regulations. A copy of each unit's certified tier specification, best available control technology documentation, and ARB or SCAQMD operating permit will be provided at the time of mobilization of each applicable unit of equipment.

3.2.5 Significant Unavoidable Adverse Impacts

There would be no significant unavoidable adverse impacts related to air quality.

3.2.6 Cumulative Impacts

Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. The study area for cumulative effects on localized air quality is the area within 0.5 mile of the Project Site, and the study area for regional air pollutants is the Basin. The Project vicinity experiences exceedances of state and federal ambient air quality standards as a consequence of past and present projects and is subject to continued nonattainment status by reasonably foreseeable future projects.

Construction of the projects identified in the related projects list in Chapter 1, Introduction (see Table 1-1 of this EIR) could overlap with the construction of the Proposed Project. In this case, emissions would occur concurrently with those resulting from construction of the Proposed Project. Given that each of the projects will be required to mitigate its impacts and comply with Rule 403, impacts would not be cumulatively considerable and would not conflict with or obstruct implementation of SCAQMD's AQMP.

Operation of the Proposed Project could coincide with construction or operation of the projects identified in Chapter 1. With the exception of the Via Dolce Park and the Marina Beach General Improvements projects, all related projects are infrastructure projects that would not generate vehicle trips. The Via Dolce Park and the Marina Beach General Improvements projects are not expected to result in substantial trip generation; the Via Dolce Park would be small and generally used by local residents within walking distance of the park and the Marina Beach project would represent marginal improvements that would attract a minimal number of new trips to the Project area. Given the importance of vehicle emissions in overall emissions of projects, the Proposed Project in combination with related projects are not expected to result in cumulatively considerable increase in pollutant emissions and would not conflict with or obstruct implementation of SCAQMD's AQMP

SCAQMD has prepared, and periodically updates, the Basin's regional AQMP that sets forth a comprehensive and integrated program that will lead the Basin into compliance with the federal and state air quality standards. The Proposed Project would be consistent with the AQMP, which is intended to bring the Basin into attainment for all criteria pollutants.[2] Furthermore, construction-period emissions would be below SCAQMD regional and localized thresholds during construction

[2] CEQA Guidelines Section 15064(h)(3) states "A lead agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program (including, but not limited to, water quality control plan, air quality attainment or maintenance plan, integrated waste management plan, habitat conservation plan, natural community conservation plan, plans or regulations for the reduction of greenhouse gas emissions) that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which the project is located. Such plans or programs must be specified in law or adopted by the public agency with jurisdiction over the affected resources through a public review process to implement, interpret, or make specific the law enforced or administered by the public agency. When relying on a plan, regulation or program, the lead agency should explain how implementing the particular requirements in the plan, regulation or program ensure that the project's incremental contribution to the cumulative effect is not cumulatively considerable. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding that the project complies with the specified plan or mitigation program addressing the cumulative problem, an EIR must be prepared for the project."

with the implementation of **Mitigation Measure AQ-1** (see Table 3.2-6 through Table 3.2-8) while operational emissions would be below SCAQMD regional and localized operational thresholds (see Table 3.2-9 and Table 3.2-10). The Proposed Project would comply with SCAQMD rules and regulations, including Rule 403 (Fugitive Dust Control) and Rule 1108 (Cutback Asphalt), during construction as well as all other adopted AQMP emissions control measures to minimize emissions and impacts on nearby sensitive receptors.

Per SCAQMD rules and mandates, as well as the CEQA requirement that significant impacts be mitigated to the extent feasible, these same requirements (i.e., Rule 403 compliance, the implementation of all feasible mitigation measures, and compliance with adopted AQMP emissions control measures) would also be imposed on all projects Basin-wide, including all nearby projects. For the reasons identified above (Project consistency with the AQMP, less-than-significant Project emissions, compliance with SCAQMD Rules, and the CEQA requirement that related projects mitigate impacts), Project emissions would not be cumulatively considerable during short-term construction or long-term operations.

3.3 Biological Resources

This section describes the affected environment and regulatory setting for the biological resources and jurisdictional areas of the Project Site and associated study area (see below). It also describes the potential impacts that would result from implementation of the Venice Auxiliary Pumping Plant (VAPP or Proposed Project) on these resources and provides mitigation measures, where necessary, to reduce or avoid such impacts. The environmental setting information and analysis in this section is summarized from the *Biological Resources and Habitat Assessment* and *Jurisdictional Delineation Report* (January 2016). These technical reports are hereby incorporated by reference and included as Appendices C and D, respectively of this EIR.

Within this section, the term "study area" refers to the Project Site plus an additional 500-foot buffer area surrounding the Project Site (see Figures 1-3 in Appendix C of this EIR). Special-status species referred to in this section include those plants and wildlife species listed as threatened or endangered under federal or state endangered species acts (California Department of Fish and Wildlife [CDFW] 2015a), plant species designated by the California Native Plant Society (CNPS) with a California Rare Plant Rank (CRPR) or other plants of local concern (CNPS 2015), and wildlife that is designated as a California Species of Special Concern, as defined by CDFW (CDFW 2015a).

The biological resources and jurisdictional delineation were conducted to provide recommendations for design and construction of the VAPP at the Project Site. Thus, the recommendations presented in these reports will be incorporated into project design and construction plans and specifications, and address biological resources and jurisdictional issues, including special-status plants and wildlife, threatened and endangered plants and wildlife, sensitive plant communities, essential fish habitat, non-listed special-status animals, nesting birds, raptor foraging, wildlife corridors, environmentally sensitive habitat areas, and jurisdictional areas, including waters of the United States and California and wetlands. As noted in the analysis below, with the implementation of mitigation measures, direct and indirect impacts associated with biological resources and to jurisdictional areas during construction or operation would be less than significant.

3.3.1 Regulatory Setting

A review of the various federal, state, regional, and local government regulatory requirements was conducted to identify regulations that provide protection of biological resources and wetlands. This section summarizes the various regulatory requirements that are relevant to the Proposed Project.

3.3.1.1 Federal Laws

Endangered Species Act of 1973 (16 U.S.C. Sections 1531 to 1543)

The Endangered Species Act of *1973* (ESA) and subsequent amendments provide guidance for the conservation of federally listed species and the habitats upon which they depend.

Prohibited Acts (ESA Section 9)

ESA Section 9 prohibits the "take" of any fish or wildlife species listed under ESA as threatened or endangered, unless otherwise authorized by federal regulations. "Take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. There are two processes, ESA Section 7 and ESA Section 10, whereby take can be allowed for activities when they are incidental to an otherwise legal activity.

Interagency Consultation and Biological Assessments (ESA Section 7)

ESA Section 7 provides a means for authorizing take of threatened or endangered species by federal agencies and applies to actions that are conducted, permitted, or funded by a federal agency. It requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS), as appropriate, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species. If a proposed project "may affect" a listed species or destroy or modify critical habitat, the lead agency is required to prepare a biological assessment evaluating the nature and severity of the potential effect.

Habitat Conservation Plans (ESA Section 10)

ESA Section 10 requires obtaining an Incidental Take Permit from the USFWS, for non-federal activities that might incidentally harm (or "take") endangered or threatened wildlife. In order to obtain a permit, a Habitat Conservation Plan must be developed to offset any harmful effects the proposed activity might have on the species.

Section 404 of the *Clean Water Act of 1977* (33 U.S.C. Sections 1251 to 1376)

The Clean Water Act of 1977 (CWA) serves as the primary federal law protecting the quality of the nation's surface waters, including wetlands. Under Section 404, the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA) regulate the discharge of dredged and fill materials into the waters of the United States. These waters are primarily defined as navigable waterways or water features (including wetlands) that have a significant nexus to navigable waters. Project sponsors must obtain authorization from USACE for all discharges of dredged or fill materials into waters of the United States before proceeding with a proposed activity. Individual Section 404 permits may only be issued for a least environmentally damaging practicable alternative. Compliance with CWA Section 404 requires compliance with several other environmental laws and regulations. The USACE cannot issue an individual permit or verify the use of a general permit until the requirements of National Environmental Policy Act of 1969 (NEPA), ESA, the Coastal Zone Management Act (CZMA) and the National Historic Preservation Act (NHPA) have been met. Additionally, no permit can be issued or verified until a water quality certification, or waiver of certification, has been issued pursuant to CWA Section 401.

Protection of Wetlands (Executive Order 11990)

Executive Order 11990 (*Federal Register*, Volume 42, Number 26 [May 24, 1977], p. 3) aims to avoid direct or indirect support of new construction in wetlands when a practicable alternative is available. If wetland effects cannot be avoided, all practicable measures to minimize harm must be included.

Coastal Zone Management Act (16 U.S.C. Section 1451 et seq.)

The CZMA encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. Participation in the CZMA is voluntary, however, it makes federal financial assistance available to any coastal state, tribe, or territory that is willing to develop and implement a comprehensive coastal management program.

Fish and Wildlife Coordination Act (16 U.S.C. Sections 661 to 667e et seq.)

The Fish and Wildlife Coordination Act applies to any federal project where any body of water is impounded, diverted, deepened, or otherwise modified. Project proponents are required to consult with USFWS and the appropriate state wildlife agency.

Migratory Bird Treaty Act (MBTA) (16 U.S.C. Sections 703 to 712)

The Migratory Bird Treaty Act (MBTA) protects migratory birds and their parts (including eggs, nests, and feathers). The MBTA prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. Projects that are likely to result in the taking of birds protected under the MBTA will require the issuance of take permits from the USFWS. Activities that would require such a permit would include, but not be limited to, removal of nests, eggs, and feathers.

Protection of Migratory Bird Populations (Executive Order 13186)

Executive Order 13186 (*Federal Register*, Volume 66, Number 11 [January 17, 2001], p. 4) directs each federal agency taking actions that have or may have adverse impact on migratory bird populations to work with USFWS to develop a memorandum of understanding that will promote the conservation of migratory bird populations. This includes avoiding and minimizing adverse impacts on migratory bird resources when conducting agency actions, restoring and enhancing migratory bird habitats, and preventing or abating the pollution or detrimental alteration of the environment for the benefit of migratory birds.

Invasive Species (Executive Order 13112)

Executive Order 13112 (*Federal Register*, Volume 64, Number 25 [February 8, 1999], p. 3) requires federal agencies to work cooperatively to prevent and control the introduction and spread of invasive plants and animals.

3.3.1.2 State Laws

California Coastal Act (Public Resource Code Division 20, Section 30000 et seq.)

The California Coastal Act is the state's Coastal Zone Management Program, as referenced under the CZMA, above. The California Coastal Act defines the "coastal zone" of California as extending generally 1,000 feet (305 meters) inland from the coast and 3 miles (5 kilometers) seaward. In certain areas, the inland boundary can extend up to 5 miles (8 kilometers). The California Coastal Act requires a Coastal Development Permit (CDP) from either the Coastal Commission or the City Engineer, as a local permit issuing agency. For this project, the work within the Grand Canal will require a state CDP, while work outside of the canal will require both state and local CDPs.

Porter-Cologne Water Quality Control Act (California Water Code Division 7)

The Porter-Cologne Water Quality Control Act (Porter-Cologne) established nine Regional Water Quality Control Boards (RWQCBs). These boards oversee water quality on a day-to-day basis at the local and/or regional level, and prepare and update water quality control plans. The RWQCBs also issue Section 401 water quality certifications under the federal Clean Water Act. Porter-Cologne also grants ultimate authority to the State Water Resources Control Board (SWRCB) over state water rights and water quality policy.

California Fish and Game Code

California Endangered Species Act (Sections 2050 to 2085)

The California Endangered Species Act (CESA) establishes the policy of the state to conserve, protect, restore, and enhance threatened or endangered species and their habitats, by protecting "…all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation." It mandates that state agencies do not approve a project that would jeopardize the continued existence of these species if reasonable and prudent alternatives are available that would avoid a jeopardy finding. There are no state agency consultation procedures under CESA. For projects that would affect species that are federally and state-listed, compliance with the federal ESA satisfies CESA if CDFW determines that the federal incidental take authorization is consistent with CESA under Section 2080.1. For projects that would result in take of a species that is state-listed only, the project sponsor must apply for a take permit in accordance with Section 2081(b).

California Native Plant Protection Act (Sections 1900 to 1913)

The California Native Plant Protection Act requires all state agencies to utilize their authority to carry out programs to conserve endangered and rare native plants. It prohibits importation, take, and sale of such plants. The CESA defers to the California Native Plant Protection Act of 1977 (California Fish and Game Code Sections 1900–1913), which ensures that state-listed plant species are protected.

Bird Nesting Protections (Sections 3503 and 3503.5)

Bird Nesting Protections state that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. To avoid violation of the take provisions, it is generally required that project-related disturbance at active nesting territories be reduced or eliminated during the nesting cycle.

Fully Protected Species (Sections 3511, 4700, 5050, 5515)

Four sections of the *California Fish and Game Code* list 37 fully protected species (California Fish and Game Code Sections 3511, 4700, 5050, and 5515) and prohibit take or possession "at any time" of the species listed, with few exceptions, and state that "…no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to 'take' the species," …and that no previously issued permits or licenses for take of the species shall have any force or effect…" for authorizing take or possession.

3.3.2 Environmental Setting

This section describes the environmental setting or conditions related to biological resources and jurisdictional areas within the project study area. This information is intended to assist in the evaluation and conclusions of the impact analysis provided below and in the formation of required mitigation measures.

3.3.2.1 Vegetation/Land Use Types

The study area is composed of ornamental vegetation associated with developed and/or disturbed lots surrounding the Grand Canal and Ballona Lagoon, both of which contain native plant communities with varying composition of non-native species. Table 3.3-1 summarizes the vegetation communities within the study area. The location of each vegetation community within the study area can be found in Figure 3 in Appendix C of this EIR.

Table 3.3-1. Vegetation Communities/Land Use/Land Conditions within the Study Area

Vegetation Community/Land Use/Land Condition	Acres
Developed	24.60
Disturbed/Ruderal	0.18
Open Water	3.13
Southern Coastal Salt Marsh	0.86
Coastal Brackish Marsh	0.16
Southern Foredunes	0.43
Southern Coastal Bluff Scrub	0.35
Total	**29.74**
Source: ICF, 2015.	

Developed and Disturbed/Ruderal

Developed lands within the study are associated with the residential structures and surface roads and include ornamental vegetation typically associated with the developed areas such as Mexican fan palm (*Washingtonis robusta*), acacia (*Acacia* sp.), eucalyptus (*Eucalyptus* sp.), Peruvian pepper tree (*Schinus molle*), iceplant (*Carpobrotus* sp.), and myoporum (*Myoporum* sp.). The disturbed/ruderal vegetation type consists of both native and non-native annual and perennial plant species such as iceplant, garland chrysanthemum (*Glebionis coronaria*), telegraphweed (*Heterotheca grandifolia*), cheeseweed (*Malva parviflora*), Bermuda grass (*Cynodon dactylon*), and Australian saltbush (*Atriplex semibaccata*).

Open Water

Open Water consists of the tidal influenced Grand Canal and Ballona Lagoon. Grand Canal opens to Marina Del Rey Marina approximately 4,000 feet to the south through a flood gate system under Via Marina road. Mudflats occur within the tidally influenced portions of the Biological Survey Area (BSA) and exposed areas of mudflats fluctuate with tide action. A small strip of exposed mudflat occurs within the project footprint during low tides within this habitat type.

Southern Coastal Salt Marsh

This vegetation type was identified within the tidal zone of the Grand Canal and Ballona Lagoon and is dominated by native wetland species such as pickleweed (*Sarcocornia pacifica*), batis (*Batis maritima*), wooly seablight (*Suaeda taxifolia*), spearscale (*Atriplex prostrata*), and fleshy jaumea (*Jaumea carnosa*). Wooly seablight is a CNPS CRPR List 4.2 species (plants of limited distribution). Within the wetland-upland interface, species such as salt grass (*Distichilis spicata*), five-hooked bassia (*Bassia hyssopifolia*), beach bur (*Ambrosia chamissonis*), and alkali heath (*Frankenia salina*) are present.

Coastal Brackish Marsh

This vegetation type was identified immediately above the tidal zone of the Grand Canal and Ballona Lagoon. This area is dominated by species such as alkali heath, salt grass, five-hooked bassia, wooly seablight, beach bur, alkali heliotrope (*Heliotropium curassavicum*), and deerweed (*Acmispon glaber*). The lower portion of this area transitions to wetland species such as pickleweed, batis, and fleshy jaumea.

Southern Foredunes

This vegetation type was identified on the western side of Ballona Lagoon within the southwestern portion of the study area. This area is dominated by upland coastal dune and maritime sage scrub species. Dominant species observed on the western side of the lagoon include beach bur, deerweed, bluff buckwheat (*Eriogonum parviflora*), red sand verbena (*Abronia maritima*[1]), beach evening primrose (*Camissonia cheiranthifolia*), southwestern spiny rush (*Juncus acutus* ssp. *leopoldii*[2]), telegraphweed (*Heterotheca grandifolia*), and Watson's saltbush (*Atriplex watsonii*).

Southern Coastal Bluff Scrub

This vegetation type was identified on the eastern side of Ballona Lagoon. Dominant species observed in this area include southwestern spiny rush, California encelia (*Encelia californica*), California sagebrush (*Artemisia californica*), prickly-pear cactus (*Opuntia littoralis*), and lemonade berry (*Rhus integrifolia*).

3.3.2.2 Plants

Most plant species that were observed within the study area are considered common within the study area vicinity and include a mix of native and non-native species. However, three special-status species were determined to be present within the study area: wooly seablite, southwestern spiny rush, and red sand verbena, each of which is CNPS CRPR List 4.2 species. In addition, suitable habitat for other special-status plant species is present within the study area and is discussed in more detail in Section 3.3.2.5, Special-Status Species. Appendix C of this EIR provides a list of all plant species observed on the Project Site during the habitat assessment.

Common native plant species observed during the habitat assessment included the following species: lemonade berry (*Rhus integrifolia*), California sagebrush(*Artemisia californica*), California encelia (*Encelia californica*), telegraphweed (*Heterotheca grandifolia*), alkali heath (*Frankenia*

[1] *Abronia maritima* is designated as a CNPS CRPR 4.2 species.
[2] *Juncus acutus* is designated as a CNPS CRPR 4.2 species.

salina), alkali heliotrope(*Heliotropium curassavicum*), prickly-pear cactus (*Opuntia littoralis*), saltwort, deerweed (*Acmispon glaber*), salt grass (*Distichilis spicata*), gut weed (*Ulva intestinalis*), sea lettuce (*Ulva lactuca*), western ragweed (*Ambrosia psilostachya*), ragweed (*Ambrosia* sp.), coastal goldenbush (*Isocoma menziesii*), beachwort (*Batis maritima*), mouse-ear chickweed (*Cerastium* sp.), Parish's pickleweed (*Arthrocnemum subterminale*), big saltbush (*Atriplex lentiformis*), saltbush (*Atriplex* sp.), Pacific pickleweed (*Salicornia pacifica*), pickleweed (*Salicornia* sp.), salt dodder (*Cuscuta salina*), vetch (*Vicia* sp.), suncup (*Camissonia* sp.), seacliff buckwheat (*Eriogonum parvifolium*), nightshade (*Solanum* sp.), and brittlegrass (*Setaria* sp.).

Common non-native species observed during the habitat assessment included: Mexican fan palm (*Washingtonis robusta*), acacia (*Acacia* sp.), eucalyptus (*Eucalyptus* sp.), Australian saltbush(*Atriplex semibaccata*), Bermuda grass (*Cynodon dactylon*), flax-leaved horseweed (*Erigeron bonariensis*), five-hooked bassia, cheeseweed, baby sun-rose (*Aptenia cordifolia*), fat-hen (*Atriplex prostrata*), hottentot fig (*Carpobrotus* sp.), Lamb's quarters (*Chenopodium album*), whitestem filaree (*Erodium moschatum*),spotted spurge (*Euphorbia maculate*), crown daisy (*Glebionis coronaria*), grass poly (*Lythrum hyssopifolia*), Ngaio tree (*Myoporum laetum*), Brazilian pepper tree (*Schinus terebinthifolius*), sowthistle (*Sonchus* sp.), and puncturevine (*Tribulus terrestris*).

3.3.2.3 Wildlife

Wildlife species observed within the study area are considered common to the general project vicinity. The majority of species recorded were birds such as mallard (*Anas platyrhynchos*), mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), white-throated swift (*Aeronautes saxatalis*), barn swallow (*Hirundo rustica*), cliff swallow (*Petrochelidon pyrrhonota*), northern rough-winged swallow (*Stelgidopteryx serripennis*), black phoebe (*Sayornis nigricans*), American crow (*Corvus brachyrhynchos*), common raven (*Corvus corax*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), osprey (*Pandion haliaetus*), American coot (*Fulica americana*), black-bellied plover (*Pluvialis squatarola*), willet (*Tringa semipalmata*), whimbrel (*Numenius phaeopus*), marbled godwit (*Limosa fedoa*), and belted kingfisher (*Ceryle alcyon*). Marine invertebrates observed included buckshot barnacles (*Chthalamus* spp.), blue mussel (*Mytilus edulis*), California horn snail (*Cerithidea californica*), California mussel (*Mytilus californianus*), checkered limpet (*Lottia strigatella*), Gould's bubble snail (*Bulla gouldiana*), and Pacific oyster (*Ostrea lurida*). Marine vertebrates observed included California corbina (*Menticirrhus undulates*) and topsmelt (*Atherinops affinis*). Additional marine invertebrates observed within the Grand Canal include commonly occurring bivalves, mollusks, and crustaceans (LADPW 2005).

Appendix C of this EIR provides a list of all wildlife species observed on the Project Site during the habitat assessment.

Suitable habitat for several special-status wildlife species is present within the study area and is discussed in more detail in Section 3.3.2.5, Special-Status Species.

3.3.2.4 Federal and State Jurisdictional Aquatic Resources

Within the jurisdictional delineation study area (see Appendix D of this EIR), two named features that could be subject to the jurisdiction of the USACE, RWQCB/EPA, and the California Coastal Commission (CCC) were delineated: Ballona Lagoon and Grand Canal. These two features are treated as one for the purpose of this document. USACE and RWQCB potential jurisdictional areas within the study area total approximately 0.929 acre of Section 404 non-wetland waters of the

United States/Section 401 non-wetland waters of the state and 0.075 acre of Section 404 wetland waters of the United States and Section 401 wetland waters of the state. Additionally, 0.793 acre of potential USACE Section 10 waters of the United States was mapped in the study area. Potential CCC jurisdiction within the study area totaled approximately 0.929 acre of one-parameter wetlands.

3.3.2.5 Special-Status Species

Special-status species are plants and animals that are legally protected under the CESA, the federal ESA, or other regulations, as well as species considered sufficiently rare by the scientific community to qualify for such listing.

Special-Status Plants and Sensitive Vegetation Communities

A total of 47 special-status plant species were evaluated to have a potential to occur within the geographical vicinity of the project area. Thirteen are identified as federally and/or state threatened and endangered plant species, but are absent based on the absence of suitable habitat within the study area, the species being extirpated from the region, and/or recent negative floristic surveys for the Venice Tide Gate Project (LADPW 2005) and at the adjacent Ballona Wetlands. Thirty-four federal and/or state non-listed special-status plants were reviewed to have a potential to occur within the geographical vicinity of the project area. Three were determined to be present and include woolly seablite, southwestern spiny rush, and red sand verbena; identified as CNPS CRPR 4.2 species.

Three sensitive vegetation communities as defined by CDFW occur within the project vicinity: Southern Coastal Bluff Scrub, Southern Coastal Salt Marsh, and Southern Dune Scrub. Each of these communities occurs within the study area; however, only Southern Coastal Salt Marsh occurs within the disturbance footprint (see Figure 3.3-1).

Special-Status Wildlife

A total of 37 special-status wildlife species were evaluated to have potential to occur within the geographical vicinity of the project area. Twenty two are identified as federally and/or state listed wildlife species and three were identified to have a low potential to occur or low to high potential to breed or forage and include the federally endangered El Segundo blue butterfly, state endangered Belding's savannah sparrow, federally endangered, state endangered, and state fully protected light-footed clapper rail, and federally and state endangered California least tern. There are 15 non-listed special-status species reviewed to have some potential to occur within the geographical vicinity of the project area (CDFW 2015a). None of these species are judged to have a potential for occurrence based on current habitat conditions within the study area.

No USFWS-designated critical habitat for federally threatened and/or endangered wildlife species is present and there is no essential fish habitat is known occur in the study area.

3.3.2.6 Nesting Birds

All developed and undeveloped portions of the study area contain suitable nesting habitat for a variety of avian species including, but not limited to, those species observed during the habitat assessment (see Appendix C of this EIR)

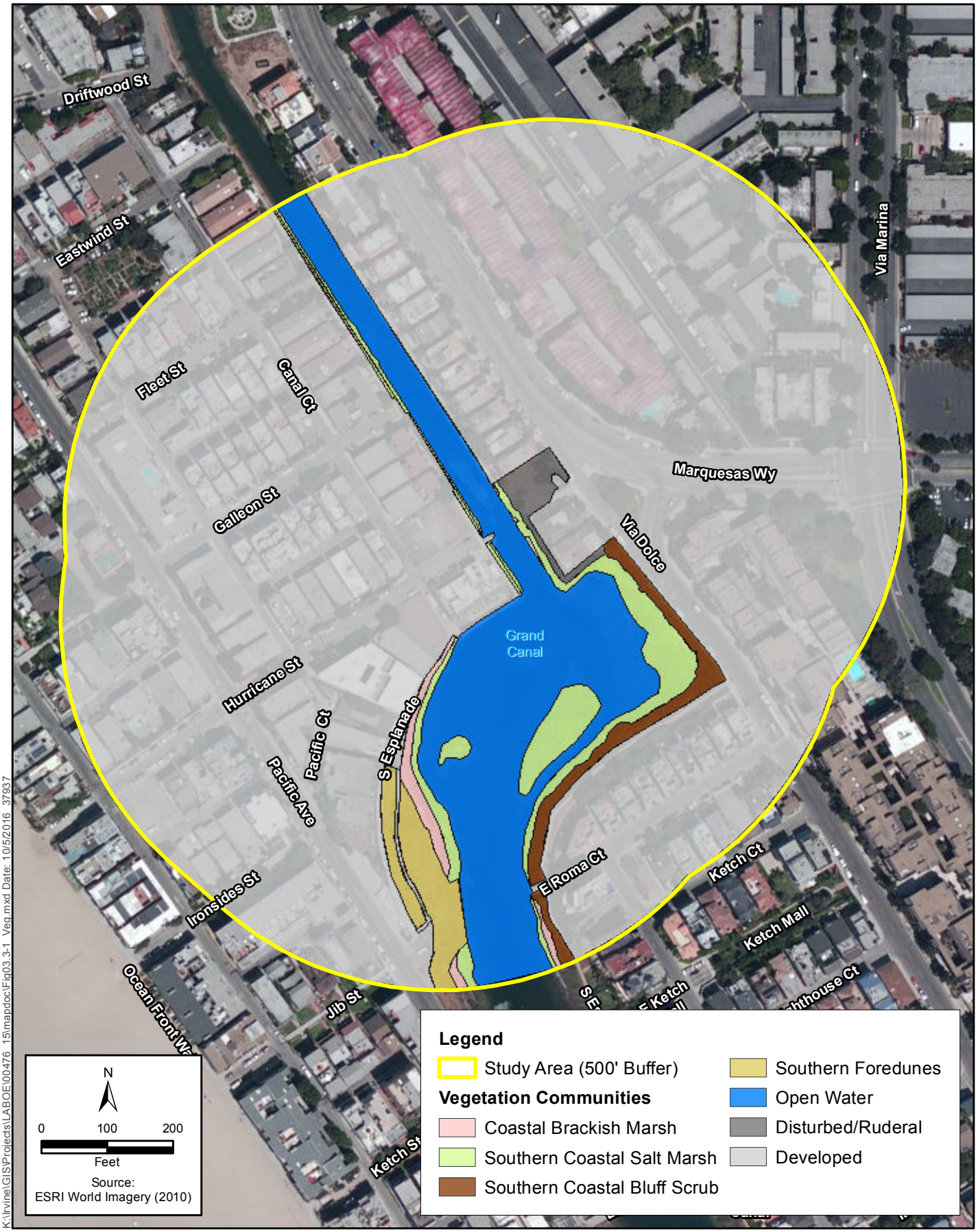

Figure 3.3-1
Vegetation Communities
Venice Auxiliary Pumping Plant Project

3.3.2.7 Raptor Foraging

The study area was evaluated for its potential to support raptor foraging activities. Due to the lack of expansive open areas, the study area would generally not be considered high quality raptor foraging habitat, although it provides foraging opportunities for some raptors that occupy developed areas.

3.3.2.8 Wildlife Corridors

No traditional wildlife corridors linking two regional habitats are identified within the study area as a result of the surrounding urban development and lack of habitat connectivity and upstream hydrological connectivity to any other aquatic resource. However, Grand Canal and Ballona Lagoon provide refuge and foraging habitat for aquatic species and these canals function in part as a partial wildlife corridor despite no upslope connectivity. Therefore, Grand Canal and Ballona Lagoon are treated here as a type of wildlife corridor.

3.3.2.9 Environmentally Sensitive Habitat Areas

The Grand Canal and Ballona Lagoon are classified as an ESHA by the CCC and County of Los Angeles because of their plant and wildlife resources within the local ecosystem. Portions of the Ballona Lagoon have been restored and have increased the functions and values of biological resources within the portion of the ESHA where the project is proposed (Hamilton 2010).

3.3.3 Environmental Impact Analysis

3.3.3.1 Methodology

Potential significant impacts associated with the Proposed Project were identified from the *Biological Resources and Habitat Assessment* and *Jurisdictional Delineation Report* (January 2016). These reports presented findings, conclusions, and recommendations concerning development of the Project Site that were based on an analysis of the existing biological resources and jurisdictional areas contained within the study area and which could be affected by the Proposed Project during construction and operation.

Direct impacts occur when sensitive biological resources are altered through project implementation, such as through vegetation removal, habitat modifications, and injury or death of wildlife species. Indirect impacts may occur from elevated levels of noise or lighting, changes in surface water hydrology, or increased erosion or sedimentation. These types of indirect impacts can affect vegetation communities or their potential use by sensitive wildlife species.

The discussion below identifies potential project impacts and the measures that would be required to mitigate impacts that are found to be potentially significant.

3.3.3.2 Screening Analysis

As noted in Section Chapter 1., Introduction (of this Draft EIR), the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study] of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in CEQA Appendix G and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.3.3.3 Thresholds of Significance

The criteria used to determine the significance of an impact on biological resources are based on *L.A. CEQA Thresholds Guide*. A project would normally have a significant impact on biological resources if it could result in:

- **BIO-1.** The loss of individuals, or the reduction of existing habitat, of a state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat;
- **BIO-2.** The loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community;
- **BIO-3.** Interference with habitat such that normal species behaviors are disturbed (e.g., from the introduction of noise, light) to a degree that may diminish the chances for long-term survival of a sensitive species;
- **BIO-4.** The alteration of an existing wetland habitat; or
- **BIO-5.** Interference with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species.

3.3.3.4 Construction Impacts

The analysis below describes the temporary and permanent short-term and long-term direct and indirect impacts on vegetation communities and other sensitive biological resources anticipated as a result of the Proposed Project during construction.

BIO-1. Would the project result in the loss of individuals, or the reduction of existing habitat, of a state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat?

The analysis below address potential impacts that could occur to biological resources and essential fish habitat during construction related to the loss or reduction of sensitive species and associated habitats as well as critical habitat important to their life cycle.

Special-Status Plants

Woolly seablite, southwestern spiny rush, and red sand verbena, each of which is classified as a CNPS CRPR List 4.2 species (plants of limited distribution) were observed in the study area, but are currently absent within the disturbance footprint, and as a result, no impacts on individuals or populations are anticipated. *Suaeda taxifolia,* a CRPR List 4.2 species, is in a location, which may be affected by construction along the canal banks, as shown in Figure 3 (see Appendix C of this EIR). If these species were to inhabit the disturbance footprint during construction, then impacts would be potentially significant. **Mitigation Measure MM-BIO-1** (see Section 3.3-4), which requires completion of special-status plant surveys prior to initiating construction, will ensure the project will not have a substantial adverse effect, either directly or through habitat modifications, or result in the loss of individuals, or the reduction of existing habitat, of a local, state or federally listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat. Therefore, impacts on special-status plants would be **less than significant with mitigation incorporated.**

Special-Status Wildlife

Four special-status wildlife species could be affected during construction of the Proposed Project, as discussed below.

El Segundo Blue Butterfly

The likelihood of occurrence of El Segundo blue butterfly within the project limits is low, based on the lack of lack of suitable habitat and host plant sea cliff buckwheat (*Eriogonum parviflora*). It is possible that stray individuals could temporarily occupy the adjacent restoration area along the western portion of Ballona Lagoon outside of the project footprint; however, no temporary direct or indirect impacts would occur given the disturbance footprint is approximately 390 feet northeast from the closest habitat containing the host plant. As such, there is a low probability of direct or indirect temporary impacts on this species during construction. In the event this species is present in the host plant during construction, impacts would be potentially significant. Although the host plant sea cliff buckwheat (*Eriogonum parvifolium*) is not a sensitive species, **Mitigation Measure MM-BIO-1**, conducting special-status plant surveys prior to initiating construction, would ensure that no host plants have established within the disturbance footprint prior to construction.

No permanent direct or indirect impacts on El Segundo blue butterfly are anticipated during construction based on the lack of suitable habitat and host plant sea cliff buckwheat (*Eriogonum parviflora*), within the project footprint.

Mitigation Measure MM-BIO-2, monitoring of all vegetation removal and ground-disturbing activities for the duration of the project to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species, would ensure that no temporary impacts would occur to El Segundo blue butterfly. Therefore, impacts on special-status wildlife would be **less than significant with mitigation incorporated.**

Belding's Savannah Sparrow

Belding's savannah sparrow has a moderate potential to forage within the study area due to the nearby population at Ballona Wetlands, although the species has not been observed within Ballona Lagoon or Grand Canal and no records of occurrence are known within the study area (CNDDB 2015). As such, direct or indirect temporary impacts on this species could potentially occur during construction.

Implementation of **Mitigation Measure MM-BIO-2**, which requires monitoring of all vegetation removal and ground-disturbing activities for the duration of the project to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species, would reduce this impact to less than significant levels. Therefore, impacts on special-status wildlife would be **less than significant with mitigation incorporated.**

Light-Footed Clapper Rail

Light-footed clapper rail has a low potential to forage within the study area due to the nearby population at Ballona Wetlands; however, the study area is relatively isolated, lacks quality habitat, and this species has not been observed within Ballona Lagoon or the Grand Canal and no records of occurrence within the study area are known (CNDDB 2015). Nevertheless, direct or indirect temporary impacts on this species could potentially occur during construction.

Mitigation Measure MM-BIO-2, monitoring of all vegetation removal and ground-disturbing activities for the duration of the project to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species, would ensure that no temporary impacts would occur to light-footed clapper rail.

No permanent direct or indirect impacts on light-footed clapper rail would occur as a result of the project during construction due to restoration of the disturbance footprint following construction.

Mitigation Measure MM-BIO-3, restoration of the disturbance footprint following construction, would ensure that permanent direct impacts would be less than significant.

Impacts on special-status wildlife would be **less than significant with mitigation incorporated.**

California Least Tern

California least tern has a less than reasonable potential to breed within the study area due to lack of suitable habitat; nearby suitable and protected breeding grounds are located approximately 0.6 miles from the study area. This species is well known to forage within the study area, however.

As such, construction has the potential to adversely affect this species temporarily. Installation of the cofferdam could cause an increase in turbidity that could have temporary indirect impacts on California least tern foraging either by reducing local prey availability and/or by reducing visibility of prey in the vicinity. Any construction activities conducted during the California least tern nesting season when terns are present could also cause temporary impacts in the form of noise and increased human disturbance that may attract tern predators such as the American crow and common raven. These predators could result in nest predation within the tern colony. Impacts on this species could be potentially significant.

Mitigation Measures MM-BIO-2, monitoring of all vegetation removal and ground-disturbing activities for the duration of the project to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species, MM-BIO-4 properly dispose of all garbage, MM-BIO-5 monitor water quality, and MM-BIO-6 conduct a nesting bird survey during the breeding season, would ensure that impacts on foraging California least tern would be **less than significant**.

No permanent direct or indirect impacts on California least tern would occur as a result of the project during construction due to restoration of the disturbance footprint following construction.

Mitigation Measure MM-BIO-3, restoration of the disturbance footprint following construction, would ensure that permanent direct impacts would be **less than significant**.

Nesting Birds

The study area and disturbance footprint support marginally suitable habitat for nesting birds. As such, direct and indirect temporary impacts on nesting species within the study area could potentially occur during construction. The areas to be affected during construction support potential nesting habitat for ground-nesting birds, such as black-necked stilt (*Himantopus mexicanus*) and killdeer (*Charadrius vociferous*), as well as habitat for a few species that commonly nest in structures and trees in developed areas. Impacts on nesting birds protected under the Migratory Bird Treaty Act and California Fish and Game Code Sections could be potentially significant if construction activity takes place during the bird breeding season.

Implementation of **Mitigation Measure MM-BIO-6**, which requires a nesting bird survey to be conducted during the nesting bird season and prior to any disturbance within the study area to document the presence or absence of nesting birds, would ensure that no temporary impacts would occur to nesting birds.

Following construction, the project disturbance footprint within Grand Canal would be restored to original conditions. In addition, **Mitigation Measures MM-BIO-2**, which requires monitoring of all vegetation removal and ground-disturbing activities for the duration of the project to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species, would be implemented. Implementation of **Mitigation Measures MM-BIO-4**, properly dispose of all garbage, MM-BIO-5, monitor water quality, and MM-BIO-6, conduct a nesting bird survey during the breeding season, would also ensure that permanent impacts on nesting birds would be **less than significant with mitigation incorporated** should the project occur during the nesting season.

Raptor Foraging

Raptors such as osprey, Cooper's hawk, and red-tailed hawk are generally not expected to nest within the study area due to the disturbed and developed nature of the project; however, limited foraging habitat does occur for some raptor species. Because the project impacts within natural habitats would be limited to a relatively small and defined portion of the Grand Canal and to a lesser extent Ballona Lagoon within the context of an urban environment and are temporary in nature, they are not considered significant. Implementation of **Mitigation Measures MM-BIO-2**, monitoring of all vegetation removal and ground-disturbing activities for the duration of the project to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species, MM-BIO-4 properly dispose of all garbage, MM-BIO-5 monitor water quality, and MM-BIO-6 conduct a nesting bird survey during the breeding season, would ensure that impacts on raptors would be **less than significant**.

Essential Fish Habitat

No designated Essential Fish Habitat is present within the study area; therefore**; no impacts** would occur during construction and no mitigation is required.

BIO-2. Would the project result in the loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community?

The analysis below addresses potential impacts that could occur on vegetation communities and ESHA during construction, resulting in the loss of individuals or the reduction of existing habitat, locally designated species, natural habitat, or plant community.

Vegetation Communities

Temporary and permanent direct impacts on vegetation communities resulting from construction activities are quantified in Table 3.3-2. These impacts are considered significant. Implementation of **Mitigation Measures, MM-BIO-2** monitoring of all vegetation removal and ground-disturbing activities for the duration of the project to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species, BIO-3 restoration of the disturbance footprint following construction, MM-BIO-7 construction limits will be identified using silt fencing, and

MM-BIO-9 restoration of mudflat, would reduce the potential that the Proposed Project would cause the loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community. Therefore, impacts on this sensitive vegetation community would be **less than significant with mitigation incorporated.**

Table 3.3-2. Temporary and Permanent Impacts on Vegetation Communities/Land Use/Land Conditions within the Study Area

Vegetation Community/Land Use/Land Condition	Temporary Impacts (acres)	Permanent Impacts (acres)
Developed	0.17	0.27
Disturbed/Ruderal	0.12	-
Open Water	0.06	
Southern Coastal Salt Marsh	0.02	-
Coastal Brackish Marsh	0.003*	-
Southern Foredunes	-	-
Southern Coastal Bluff	-	-
Total	**0.37**	**0.27**

*Temporary impacts are negligible and this community would be avoided during project construction. Mitigation Measures MM-BIO-2, BIO-3, and 7 would also be implemented.
Source: ICF, 2016.

Environmentally Sensitive Habitat Areas

The Grand Canal and Ballona Lagoon are classified as an ESHA by the CCC and County of Los Angeles because of their plant and wildlife resources within the local ecosystem. Direct and indirect temporary impacts on the ESHA as a result of project construction could be significant. Implementation of **Mitigation Measures MM-BIO-7**, construction limits will be identified using silt fencing, and MM-BIO-8, existing and potential values in ESHA shall be protected, enhanced, and restored as necessary to previous undisturbed conditions, would limit the potential that project construction would result in the loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community. No permanent impacts would occur as a result of the Proposed Project. Therefore, impacts on the ESHA would be **less than significant with mitigation incorporated.**

BIO-3. Would the project result in an interference with habitat such that normal species behaviors are disturbed (e.g., from the introduction of noise, light) to a degree that may diminish the chances for long-term survival of a sensitive species?

The Proposed Project includes temporary direct impacts on the Grand Canal, its banks, and adjacent undeveloped lots to be used as construction laydown areas (see Chapter 2, Figure 2-2, of this EIR). The Grand Canal would also receive increased light exposure from temporary construction lighting that will be installed to prevent incursion into the construction area. Temporary indirect impacts may occur during construction and include increased sedimentation as a result of installation and removal, minor alteration of surface water hydrology within the Grand Canal from the coffer dam, construction noise and lighting, as well as dust and other particulates that may become airborne

during construction. These impacts could be significant and could diminish the chances of long-term survival of a sensitive species. However, with implementation of **Mitigation Measures MM-BIO-1**, conducting special-status plant surveys prior to initiating construction, **MM-BIO-2**, monitoring of all vegetation removal and ground-disturbing activities for the duration of the project to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species, **MM-BIO-4**, properly dispose of all garbage, **MM-BIO-5**, monitor water quality, **MM-BIO-6**, conduct a nesting bird survey during the breeding season, and **MM-BIO-7**, construction limits will be identified using silt fencing, impacts would be reduced to **less than significant with mitigation incorporated** during construction**.**

BIO-4. Would the project result in the alteration of an existing wetland habitat?

The Proposed Project would occur within the jurisdiction of several agencies including, but not limited to, USACE, RWQCB, and CCC and would result in temporary direct and indirect impacts on aquatic resources, including an existing wetland habitat through the construction of the components within the Grand Canal (see Figure 3.3-2). These impacts would be significant. No permanent direct or indirect impacts would occur because all impacts would be below grade and the original grade would be restored to pre-construction conditions. Table 3.3-3 below quantifies temporary impacts on jurisdictional waters and wetlands regulated by each of the agencies. Applicable permits from resource agencies would be obtained during the permitting phase prior to construction and all permit conditions and avoidance and minimization measures would be implemented. **Mitigation Measures MM-BIO-3**, restoration of the disturbance footprint following construction, **MM-BIO-5** monitor water quality, and **MM-BIO-9**, restoration of mudflat, would reduce project impacts to a less than significant level. Therefore, impacts associated with alteration of an existing wetland habitat would be **less than significant with mitigation incorporated.**

Table 3.3-3. Temporary Impacts on Aquatic Resources (acres)

Study Area Feature	USACE Section 404 Non-Wetland Waters of the United States/ RWQCB Section 401 Non-Wetland Waters of the State	USACE Section 404 Wetland Waters of the United States/RWQCB Section 401 Wetland Waters of the State	USACE Section 10 Navigable Waters of the United States	CCC One-Parameter Wetlands
Ballona Lagoon and Grand Canal	0.092	0.012	0.056	0.092
Total	**0.092**	**0.012**	**0.056**	**0.092**

Source: ICF, 2016.

BIO-5. Would the project result in an interference with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species?

Construction of the Proposed Project would include installation of a cofferdam that would partially block the Grand Canal; however, hydrological connectivity between upstream and downstream would remain in place throughout construction. Because the study area does not contain any identified wildlife corridors, it would not result in interference with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species. Therefore, impacts on wildlife corridors would be **less than significant.**

3.3.3.5 Operational Impacts

The analysis below describes the temporary and permanent short-term and long-term direct and indirect impacts on vegetation communities and other sensitive biological resources anticipated as a result of project operation.

BIO-1. Would the project result in the loss of individuals, or the reduction of existing habitat, of a state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat?

The analysis below address potential impacts that could occur to biological resources and essential fish habitat during operation related to the loss or reduction of sensitive species and associated habitats as well as critical habitat important to their life cycle. As noted below, no impacts on special-status plants and wildlife or essential fish habitat would occur and therefore, no mitigation is required. **Less-than-significant impacts** on nesting birds and raptor foraging habitat would occur, and no mitigation is required.

Special-Status Plants and Wildlife

No impacts would occur to special-status plants (i.e., woolly seablite, southwestern spiny rush, and red sand verbena) or special-status wildlife (i.e., El Segundo blue butterfly, Belding's savannah sparrow, light-footed clapper rail, and California least tern) because the Project Site would be paved and include landscaping and open space uses that would not contain suitable habitat for these species. As a result, no impacts on individuals or populations would occur. The Grand Canal bank, which would be disturbed by construction of the diversion structure, would be restored to include native plant communities and species, based upon agency permit requirements. This would enhance the overall potential habitat for these species. Therefore, operation of the Proposed Project would not have a substantial adverse effect, either directly or through habitat modifications, or result in the loss of individuals, or the reduction of existing habitat, of a local, state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat. Therefore, **no impacts** on special-status plants would result, and no mitigation is required.

Nesting Birds

Less-than-significant impacts on nesting birds would occur during operation. The study area supports marginally suitable habitat for nesting birds, including ground-nesting birds, such as black-necked stilt and killdeer, as well as a habitat for a few species that commonly nest in structures and trees in developed areas. As discussed in Section 4.1 (Aesthetics), there are no trees proposed at the VAPP and landscaping would be limited due to operational and access needs. Although the landscaping and design for the proposed open space area has not been finalized, it is anticipated that some trees, landscaping, and grassy areas would be included. Because any tree trimming proposed within the open space area would need to occur in compliance with the *Migratory Bird Treaty Act* and *California Fish and Game Code* sections, impacts would be less than significant. Also, the additional habitat resulting from restoration of the Grand Canal slope that would be disturbed by construction of the diversion structure may provide additional habitat for ground-nesting birds. Therefore, impacts on nesting birds would be **less than significant**; no mitigation is required.



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Figure 3.3-2
USACE/RWQCB Jurisdictional Delineation Results Map
Venice Auxiliary Pumping Plant Project

Raptor Foraging

As indicated above, raptors are generally not expected to nest within the study area due to the disturbed and developed nature of the project and only limited foraging habitat is present. Because additional habitat resulting from restoration of the Grand Canal slope disturbed by construction of the diversion structure would be in place during operation, some additional foraging opportunities would result and would therefore be considered beneficial. As such, impacts on raptors would be **less than significant**; no mitigation is required**.**

Essential Fish Habitat

No designated Essential Fish Habitat is present within the study area; therefore; **no impacts** would occur during operation; no mitigation is required.

BIO-2. Would the project result in a loss of individuals or reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community?

No impacts on vegetation communities or an ESHA would occur during operation since none would be removed or adversely affected. Although the landscaping plan for the open space area has not been developed, the use of some native plants will be required in the plant palette. This would assist to ensure that the Proposed Project would not cause the loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community. It would also contribute to the overall habitat quality and quantity of the ESHA. Therefore, impacts on this sensitive vegetation community or ESHA would be **less than significant,** and no mitigation is required.

BIO-3. Would the project result in an interference with habitat such that normal species behaviors are disturbed (e.g., from the introduction of noise, light) to a degree that may diminish the chances for long-term survival of a sensitive species?

No natural habitats would experience direct permanent impacts during operation with the exception of habitat within Grand Canal and Ballona Lagoon that could be subject to permanent lighting installed on the new facility. Lighting at the VAPP and adjacent open space area may increase the amount of permanent ambient light within the Grand Canal and Ballona Lagoon. An increase in light could expose wildlife to increased detection and predation and could also deter some wildlife from utilizing the immediate area around the proposed facility lighting. However, the increase in ambient light resulting from operation of the project would be less than significant given the existing ambient light from surrounding residences and public infrastructure. The Proposed Project would be subject to City of Los Angeles lighting requirements and those contained in the Venice Community Plan (VCP) and Venice Local Coastal Program (VLCP), which would reduce the amount of ambient light spillover into the canal. Conditions contained in those documents require that lighting be maintained on-site and no spillover occur on adjacent sensitive land uses. Therefore, operation of the Proposed Project would result in **less-than-significant** impacts and would not diminish the chances for long-term survival of a sensitive species.

BIO-4. Would the project result in the alteration of an existing wetland habitat?

No impacts on an existing wetland habitat would occur during operation of the Proposed Project because none would be removed or altered as a result of project operations; therefore, the project would result in **less-than-significant** impacts with no mitigation is required**.**

BIO-5. Would the project result in an interference with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species?

The study area consists of a partial wildlife corridor and contains aquatic habitat connected to Marina Del Rey that provides refuge and foraging habitat. Project operation would not result in interference with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species because all facilities within the Grand Canal would be below existing grade. Therefore, impacts on wildlife corridors would be **less than significant**, and no mitigation is required.

3.3.4 Mitigation Measures

The following mitigation measures were developed to avoid or minimize the Proposed Project's potential impacts on biological resources and jurisdictional areas and are also contained in Appendix C of this EIR.

MM-BIO-1: Special-Status Plant Surveys

To confirm the presence or absence of special-status plant species within the disturbance footprint, a special-status plant survey shall be completed prior to construction. The focused survey shall be conducted by a qualified biologist during the appropriate blooming period, or when the plant is readily identifiable, prior to the start of construction activities. If any sensitive non-listed plant species is found, then the individuals shall be clearly identified and avoidance measures shall be utilized to the extent practical.

MM-BIO-2: Monitoring During Vegetation Removal

A qualified biologist shall monitor all vegetation removal and ground-disturbing activities, such as staging and grading, for the duration of the project to ensure that practicable measures are being employed to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species. When vegetation removal and ground-disturbing activities are not occurring, as-needed monitoring at the Project Site shall occur. Monitoring logs, as appropriate depending on project activities, shall be maintained for the duration of construction activities.

MM-BIO-3: Restoration of Vegetation within Grand Canal

Regarding the disturbance footprint within the Grand Canal, habitat along the bank shall be restored to its original condition by seeding, cuttings and/or container plant installation following construction. Habitat restoration shall be performed in coordination with regulating agencies (CCC, USACE, and RWQCB) and as required by agency permits. A habitat restoration plan shall be prepared and submitted to the Environmental Management Group for review and approval, prior to submittal to the agencies. The plan will include a native plant palette, and establishment period, as well as success criteria and monitoring requirements. In addition, a monetary contribution will be provided to the Grand Canal Restoration Project fund for wider restoration of the canal banks.

MM-BIO-4: Covered Disposal Containers

Work crews shall properly dispose of all garbage in covered containers to avoid attracting predators (such as crows and ravens) that could contribute indirectly to depredation of California least tern eggs and chicks in the nearby nesting colony.

MM-BIO-5: Water Quality Monitoring During Construction

Water quality shall be monitored by the qualified biologist or a water quality specialist to ensure that no substantial increases in turbidity occur during construction. The contractor shall ensure compliance with RWQCB Section 401 Water Quality Certification, USACE Section 404 authorization, applicable water-quality related Best Management Practices, and the project Storm Water Pollution Prevention Plan.

MM-BIO-6: Nesting Bird Survey

If construction commences during the bird breeding season (February 15 through August 31), a preconstruction survey for nesting birds shall occur within three days prior to construction activities by an experienced avian biologist. The survey shall occur within all suitable nesting habitat within the project impact area and a 500-foot buffer. If nesting birds are found, an avoidance area shall be established in consultation with the resource agencies as appropriate by a qualified biologist around the nest until a qualified avian biologist has determined that young have fledged or nesting activities have ceased. The Project Site shall be re-surveyed if there is a lapse in construction activities for more than seven days during the bird breeding season.

MM-BIO-7: Silt Fencing at Construction Limits

Construction limits shall be identified using silt fencing, which shall be installed under the supervision of a qualified biologist prior to the commencement of work. Construction personnel shall strictly limit their activities, vehicles, equipment, and construction materials to the project footprint, including designated staging areas, and routes of travel. The construction areas shall consist of the minimal area necessary to complete the Proposed Project. The fencing shall remain in place until the completion of all construction activities.

MM-BIO-8: ESHA Protection

Existing functions and values in ESHA shall be protected, enhanced, and restored as necessary to previous undisturbed conditions in accordance with applicable USACE, RWQCB, CCC, or City of Los Angeles permits and requirements.

MM-BIO-9: Restoration of Mudflats within Grand Canal

The temporary work area within Grand Canal within mudflat/open water shall be returned to pre-construction grade and contours following construction.

3.3.5 Significant Unavoidable Adverse Impacts

There are no significant unavoidable adverse impacts that would result with implementation of the Proposed Project either during construction or operation. All impacts would be less than significant with mitigation incorporated.

3.3.6 Cumulative Impacts

Based upon a review of Table 1-1, Related Projects List (see Chapter 1, Introduction of this EIR), none of these projects have resulted in, or are likely to result in, significant impacts to biological resources in the vicinity of the Proposed Project, either individually or cumulatively. With the implementation of the proposed mitigation measures identified above for the Proposed Project, no significant effects would occur on biological resources and no other known projects in the vicinity of the Proposed Project that, when considered together, would result in significant adverse impacts to the wildlife and habitats in the vicinity of the Project Site. Therefore, cumulative impacts related to biological resources would be less than significant.

3.4 Cultural Resources

This section identifies cultural resources present within the project area, evaluates the potential project-related impacts on those resources, and provides mitigation measures, as applicable. The survey of cultural resources was conducted under the provisions of Section 15064.5 of the California Environmental Quality Act (CEQA) Guidelines. The environmental setting information and analysis in this section are summarized from the *Cultural Resources Screening Memorandum*, 2015 and *AB 52 Consultation.* These technical reports are hereby incorporated by reference and included as Appendices E and F, respectively, of this environmental impact report (EIR).

As noted in the analysis below, with the implementation of a mitigation measure, direct and indirect impacts associated with cultural resources during construction and operation would be less than significant.

3.4.1 Regulatory Setting

Cultural resources fall within the jurisdiction of several levels of government. State and local jurisdictions provide the framework for the identification, documentation, and protection of such resources. The National Historic Preservation Act (NHPA), CEQA, California Public Resources Code (PRC) Section 5024, City of Los Angeles Cultural Heritage Ordinance (Los Angeles Administrative Code Section 22.130), and State Health and Safety Code (HSC) Section 7050.5/PRC Section 5097.9 are the primary laws that govern and affect the preservation of cultural resources of national, state, regional, and local significance.

3.4.1.1 National Register of Historic Places

To determine whether an undertaking could affect National Register of Historic Places– (NRHP-) listed or eligible properties, cultural resources (including archaeological, historical, and architectural properties) must be inventoried and evaluated for listing in the NRHP. For projects involving a federal agency, cultural resource significance is evaluated in terms of eligibility for listing in the NRHP. In order for a property to be considered to be included in the NRHP, it must meet the criteria for evaluation set forth in 36 Code of Federal Regulations (CFR) Part 60.4, as follows.

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of design, setting, materials, workmanship, feeling, association, and:

a. That are associated with events that have made a significant contribution to the broad patterns of our history; or

b. That are associated with the lives of persons significant in our past; or

c. That embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master or that possess high artistic values or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d. That have yielded, or may be likely to yield, information important in prehistory or history.

Among other criteria considerations, a property that has achieved significance within the last 50 years is not considered eligible for inclusion in the NRHP unless certain exceptional conditions are met.

3.4.1.2 State

California Environmental Quality Act

In accordance with Section 21084.1 of CEQA, the Proposed Project would have a significant adverse environmental impact if it, "causes a substantial or potentially substantial adverse change in the significance of an historical resource." Paleontological resources are also provided protection as historical resources, as discussed in State CEQA Guidelines Section 15064.5(a)(3).

Section 21084.1 defines historical resources as any resource listed or determined eligible for listing in the California Register of Historical Resources (CRHR). Properties listed or determined eligible for listing in the NRHP, such as those identified in the Section 106 process, are automatically listed in the CRHR, pursuant to 14 California Code of Regulations (CCR) Section 4851 (a)(1). Therefore, all historic properties under federal preservation law are automatically historical resources under state preservation law. Historical resources are also presumed to be significant if they are included in a local register of historical resources or identified as significant in a qualified historical resource survey.

State law in Title 14, CCR Section 4850, defines historical resource as follows:

> Any object, building, structure, site, area, place, record, or manuscript that is historically or archaeologically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural history of California.

For the purposes of CEQA, historical resource is further defined under PRC Section 15064.5 as a "resource listed, or determined eligible for listing, in the California Register."

Section 15064.5 of the State CEQA Guidelines sets forth the criteria and procedures for determining significant historical resources and the potential effects of a project on such resources. Generally, the lead state agency shall consider a historical resource to be historically significant if the resource meets any of the criteria for listing in the CRHR.

City statutes and guidelines specify how historical resources are to be managed in the context of projects such as the Proposed Project. Archival and field surveys must be conducted, and identified historical resources must be inventoried and evaluated against the Secretary of Interior Standards.

California Register of Historical Resources

NHPA mandated the selection and appointment in each state of a State Historic Preservation Officer (SHPO). Each SHPO is tasked with, among other duties, maintaining an inventory of historic properties. In California, the state legislature established additional duties for the SHPO. These include the maintenance of the CRHR. Established by PRC Section 5024.1(a) in 1992, the CRHR serves as "an authoritative guide in California to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent feasible, from substantial adverse change." According to PRC Section 5024.1(c), the CRHR criteria broadly mirror those of the NRHP. The CRHR criteria are found at PRC Section 5024.1(c) as follows.

An historical resource must be significant at the local, state, or national level, under one or more of the following four criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States; or
2. It is associated with the live of persons important to local, California, or national history; or
3. It embodies the distinctive characteristics of a type, period, region, or method or construction, or represents the work of a master, or possesses high artistic values; or
4. It has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

The minimum age criterion for the CRHR, as with the NRHP, is 50 years. Properties less than 50 years of age may be eligible for listing in the CRHR if it can be demonstrated that sufficient time has passed to understand its historical importance. In addition to meeting one or more of the historical significance criteria, the resource must possess integrity. Integrity is defined as "the authenticity of an historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance."

There are several ways for resources to be included in the CRHR. A resource can be listed in the CRHR based upon a nomination and public consideration process. Additionally, a resource that is subject to a discretionary action by a governmental entity will be evaluated for eligibility for the CRHR. As previously stated, properties listed in or formally determined eligible for listing in the NRHP are automatically listed in the CRHR.

California Environmental Quality Act—Tribal Cultural Resources

Recent legislation known as Assembly Bill 52 amended CEQA to add another category of cultural resource—Tribal Cultural Resources (TCRs). TCRs are defined as follows.

(a) "Tribal cultural resources" are either of the following:

(1) Sites, features, places, and objects with cultural value to descendant communities or cultural landscapes, that are any of the following:

(A) Included in the California Register of Historical Resources.

(B) Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1.

(C) A resource deemed to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1.

(2) Sacred places including, but not limited to, Native American sanctified cemeteries, places of worship, religious or ceremonial sites, or sacred shrines that meet either of the following criteria:

(A) Listed on the California Native American Heritage Commission's Sacred Lands File pursuant to Section 5097.94 or 5097.96 for which a Native American tribe has submitted sufficient evidence demonstrating that the sacred places are of special religious or social significance to the Native American tribe or contain known graves and cemeteries of Native Americans.

(B) Listed or determined pursuant to criteria set forth in subdivision (g) of Section 5024.1 to be eligible for listing in the California Register of Historical Resources.

(b) A cultural landscape that meets the criteria of subdivision (a) is a tribal cultural resource to the extent that the landscape is geographically defined in terms of the size and scope of the landscape.

(c) A historical resource described in Section 21084.1, a unique archaeological resource as defined in subdivision (g) of Section 21083.2, or a "nonunique archaeological resource" as defined in subdivision (h) of Section 21083.2 may also be a tribal cultural resource if it conforms with the criteria of subdivision (a).

State Health and Safety Code, Section 7050.5/California Public Resources Code, Section 5097.9

State Health and Safety (HSC) Code Section 7050.5 and PRC Section 5097.9 contain provisions for the treatment of human remains contained in archaeological sites. Under HSC Section 7050.5, if human remains are discovered during any project activity, the county coroner must be notified immediately. If human remains are exposed, HSC Section 7050.5 states that no further disturbance shall occur until the county coroner has made the necessary findings as to origin and disposition pursuant to PRC Section 5097.98. Construction must halt in the area of the discovery of human remains, the area of the discovery shall be protected, and consultation and treatment shall occur as prescribed by law. If the remains are determined by the coroner to be Native American, the coroner is responsible for contacting the Native American Heritage Commission (NAHC) within 24 hours. NAHC, pursuant to Section 5097.98, will immediately notify those persons it believes to be most likely descended from the deceased person so they can inspect the burial site and make recommendations for treatment or disposal.

3.4.1.3 Local

City of Los Angeles Cultural Heritage Ordinance

The City of Los Angeles maintains a list of all sites, buildings, and structures that have been designated through the Cultural Heritage Ordinance as Historic-Cultural Monuments (HCMs).

Historic-Cultural Monument

Section 22.171.7 of the Cultural Heritage Ordinance states that an HCM is any site (including significant trees or other plant life on the site), building, or structure of particular historic of cultural significance to the city, including historic structures or sites in which the broad cultural, economic, or social historic of the nation, state, or community is reflected or exemplified; or that is identified with historic personages or with important events in the main currents of national, state, or local history; or that embodies the distinguishing characteristics of an architectural type specimen, inherently valuable for a study of a period, style, or method of construction; or a notable work of a master builder, designer, or architect whose individual genius influenced his or her age.

Any person may apply for the proposed designation of HCM, and the Cultural Heritage Commission determines whether or not the proposed designation merits consideration. If the Commission recommends approval of the application and it is included in the list of HCMs, no permit for the demolition, substantial alteration, or relocation of an HCM may be issued (Section 22.171.14) unless:

1. The Superintendent of Building or City Engineer determines that the demolition, relocation, or substantial alteration is necessary in the interest of the public health, safety or general welfare;
2. The substantial alteration complies with the Secretary of the Interior's Standards for Rehabilitation;

3. The substantial alteration protects and preserves the historic and architectural qualities and the physical characteristics that make the site, building, or structure a designated HCM; and
4. The proposed action is in compliance with CEQA (PRC Section 21000 et seq.).

City of Los Angeles Conservation Element

The Conservation Element of the City of Los Angeles General Plan (adopted September 2001) is designed to enhance, preserve, and protect the city's existing natural resources and other resources. The Conservation Element specifically addresses archaeological and paleontological resources in Section 3 of Chapter 2. The Conservation Element's paleontological objective is to "protect the city's archaeological and paleontological resources for historical, cultural, research and/or educational purposes." Moreover, its policy is to "continue to identify and protect significant archaeological and paleontological sites and/or resources known to exist or that are identified during land development, demolition or property modification activities."

3.4.2 Environmental Setting

The residences in the general vicinity of the Project Site date from 1964 to 2000 and are a mix of two- to three-story, single- and multi-family residences; there is a very large apartment complex at 3726 Via Dolce to the east of the Project Site. In addition to the mix of construction periods, the neighborhood displays a mix of architectural styles.

No sites or other resources are known from the immediate project area that are categorized as TCRs. The village sites and cemetery areas at Ballona Wetlands probably do meet this definition, but these areas are more than 2 miles southeast of the Project Site. There are also no known paleontological resources located on-site or within the immediate area. The Venice Canal System, including the Grand Canal is a City of Los Angeles Historic-Cultural Monument and is located adjacent to the Project Site.

3.4.2.1 Geological Setting

The project area is on the western margin of the boundaries of Ballona Lagoon, a broad, swampy marsh that existed in the area until twentieth century development (USGS 1896, 1924, 1934). This area is within the Southwest Sewer Subregion of the Framework EIR Element of the General Plan. The geologic formation underlying the project area is tentatively identified as clay and sand of existing marshlands (Dibblee 2007). These sediments are Holocene in age, and are less than 10,000 years old. Sediment in the project area may also derive from beach dune sands deposited along the lee of the Pacific Ocean, which are also Holocene in age (Dibblee 2007).

3.4.2.2 Prehistoric Background

The prehistoric occupation of Southern California is divided chronologically into four temporal phases, or horizons (Moratto 1984). Horizon I, or the Early Man Horizon, began at the first appearance of people in the region (approximately 12,000 years ago) and continued until about 5000 B.C. Although little is known about these people, it is assumed that they were semi-nomadic and subsisted primarily on game.

Horizon II, also known as the Millingstone Horizon or Encinitas Tradition, began around 5000 B.C. and continued until about 1500 B.C. The Millingstone Horizon is characterized by widespread use of milling stones (manos and metates), core tools, and few projectile points or bone and shell artifacts.

This horizon appears to represent a diversification of subsistence activities and a more sedentary settlement pattern. Archaeological evidence suggests that hunting became less important and that reliance on collecting shellfish and vegetal resources increased (Moratto 1984).

Horizon III, the Intermediate Horizon or Campbell Tradition, began around 1500 B.C. and continued until about A.D. 600–800. Horizon III is defined by a shift from the use of milling stones to increased use of mortar and pestle, possibly indicating a greater reliance on acorns as a food source. Projectile points become more abundant and, together with faunal remains, indicate increased use of both land and sea mammals (Moratto 1984).

Horizon IV, the Late Horizon, which began around A.D. 600–800 and terminated with the arrival of Europeans, is characterized by dense populations; diversified hunting and gathering subsistence strategies, including intensive fishing and sea mammal hunting; extensive trade networks; use of the bow and arrow; and a general cultural elaboration (Moratto 1984).

About 1 mile south of the project area is Ballona Wetlands, the remains of a major marshland that has been much studied by archaeologists. Several major prehistoric sites have been found within Ballona Wetlands, including extensive villages. The location of these sites includes the Westchester bluffs south of the wetlands, and raised terraces at the edge of the Ballona Wetlands overlooking Ballona Creek. The mouth of Ballona Wetlands, a setting similar to the project area, does not encompass any known sites.

3.4.2.3 Ethnographic Background

The project area lies within the territory of the Gabrielino Native American people (Bean and Smith 1978). The Gabrielino are characterized as one of the most complex societies in native Southern California, second perhaps only to the Chumash, their coastal neighbors to the northwest. This complexity derives from their overall economic, ritual, and social organization (Bean and Smith 1978:538; Kroeber 1925:621).

The Gabrielino, a Uto-Aztecan (or Shoshonean) group, may have entered the Los Angeles Basin as recently as 1500 Before Present (B.P.). In early protohistoric times, the Gabrielino occupied a large territory including the entire Los Angeles Basin. This region encompasses the coast from Malibu to Aliso Creek, parts of the Santa Monica Mountains, the San Fernando Valley, the San Gabriel Valley, the San Bernardino Valley, the northern parts of the Santa Ana Mountains, and much of the middle to the lower Santa Ana River. They also occupied the islands of Santa Catalina, San Clemente, and San Nicolas. Within this large territory were more than 50 residential communities with populations ranging from 50 to 150 individuals. The Gabrielino had access to a broad and diverse resource base. This wealth of resources, coupled with an effective subsistence technology, well-developed trade network, and ritual system, resulted in a society that was among one of the most materially wealthy and culturally sophisticated cultural groups in California at the time of contact.

3.4.2.4 Historic Background

Spanish occupation of California began in 1769, at San Diego. Mission San Gabriel was established in the Los Angeles Basin in 1771 and the Los Angeles Pueblo was established as a civilian settlement on September 4, 1781. This village housed 44 people, with a military guard of four soldiers (Dillon 1994).

Mexico rebelled against Spain in 1810, and by 1821 Mexico, including California, achieved independence. In 1833, Mexico declared an end to the Missions and secularized the religious order's land holdings. The Mexican Republic began to grant private land to citizens to encourage immigration to California. Huge land grant ranchos took up large sections of land in California. The project area was included in Rancho La Ballona, granted to Agustin Machado and Felipe Talamantes in 1839.

Cattle ranching came to overshadow the agricultural economy in the region during the Mexican Period, and industries and trade grew around this shift. San Pedro, south of Los Angeles, became a major port for export of tallow and hides to Boston and Europe.

At the conclusion of the Mexican-American War in 1848, Alta California was ceded to the United States. Four years later, in October 1852, the Hispanic families owning Rancho La Ballona filed their claims with the Land Commission for the confirmation of their grant. As required by U.S. law, the Rancho La Ballona grant was surveyed by Henry Hancock in 1858. The grant rancho lasted until 1865, when Agustin Machado died, and numerous heirs were granted small parcels.

The land boom of the 1880s heavily affected Los Angeles. Throughout the 1890s and into the early 1910s and 1920s, as the old ranchos were bought up and subdivided by new Euroamerican owners, the cities of Santa Monica, Culver City, Venice, and Inglewood and the communities of Playa del Rey, and Westchester were platted and the land quickly sold off. The railroad came through the area in the 1890s. In 1892, the California Central Railroad, Santa Fe Railroad's local subsidiary, completed a spur line from old "Port Ballona" tracks to Ocean Park. By the end of the century, the line was known as the Southern California Railroad.

The following section is excerpted from the historic context prepared for the *Venice Community Plan Area Historic Resources Survey Report* in support of SurveyLA (Historic Resources Group 2015).

> …The project area was first developed at the turn of the 20th century. In 1891, tobacco magnate and real estate developer Abbot Kinney and his business partner, Francis G. Ryan, purchased a 1.5 mile-long strip of beachfront land located south of Santa Monica. The 275-acre parcel had originally comprised a portion of Rancho La Ballona and was initially settled by the Machado and Talamantes families in the early 1800s. The northern third of the acreage was located in the city of Santa Monica. However, the remainder of the land, located south of present-day Marine Street, was situated in county territory and consisted of wetlands, with sand dunes and marshes that often flooded in the winter.
>
> Kinney and Ryan turned their attention to the northern portion of the tract, where they developed a resort community which eventually came to be known as Ocean Park. Abbot Kinney would likely have dedicated his career to developing Ocean Park; however, in 1898, Francis Ryan died suddenly at the age of 47. Kinney eventually acquired three new business partners in 1902: Alexander Fraser, Henry Gage, and George Merritt Jones. Competition from other developers motivated Kinney and his partners to make improvements to the community of Ocean Park and to expand their development further south into the land comprising present-day Venice… The majority of the land was subdivided as part of the Golden Bay tract, which was recorded in May 1902. The land to the south, extending from Brooks Court down to Westminster Court, was also subdivided by Kinney, Fraser, Gage, and Jones as the Country Club tract, recorded in April 1903…
>
> …Further inland, to the east of Main Street, development occurred in a piecemeal fashion. Individual developers purchased blocks of land from larger tracts, such as the Santa Fe and Ocean Tracts, and subdivided them into smaller parcels which were more suitable for residential development. In this way, developers were able to capitalize on the area's proximity to nearby Ocean Park amenities. Notable inland residential subdivisions included the Ocean Park Villa Tract and the Ocean Park Villa Tract No. 2, both of which were developed in 1903 near the Ocean Park Country Club. Retired banker

and real estate developer E.J. Vawter also purchased a block of land which he developed as a botanical estate dedicated to the cultivation of carnations. The property's prior use was commemorated when Vawter later subdivided the land for residential development as the Carnation Tract.

By 1904, Kinney found himself at odds with his partners. Among other matters, the four men disagreed on how the unincorporated wetlands comprising the southern portion of their holdings should be developed. Abbot Kinney believed that to successfully develop the unincorporated area, it would be necessary to create an independent municipality south of Marine Street. The four men decided to dissolve their partnership and go their separate ways; Kinney won a coin toss employed to divide up the company's assets and selected the southern portion of the tract. Several months later, those residents living south of Marine Street, in the unincorporated portion of the Ocean Park development, voted to establish the separate city of Ocean Park. It was within this community that Abbot Kinney created his most successful development, Venice of America…

…In 1905, a subdivision map was recorded for the Venice of America tract which reflected Abbot Kinney's initial plans for his new development. The plan for the tract was comprehensive and included areas dedicated to recreational, commercial, and residential properties. At the beach, a 1,400-foot pier was constructed. Included among its various attractions were an auditorium, a dance hall, and a nautical-themed restaurant that resembled a ship. A hot saltwater plunge was situated on the beach just north of the pier; in 1908 the plunge was expanded to become the Venice Surf Bathhouse. A boardwalk was planned along present-day Ocean Front Walk, which was noted on Kinney's presentation map as the "Pacific Promenade." Windward Avenue, which extended from the beach to the Bathing Lake and canals further east, was intended to serve as the primary commercial corridor. Visitors and tourists arriving in Venice via streetcar disembarked at Windward, which provided their first glimpse of Abbot Kinney's "Venice-of-America." As a result, Windward Avenue played an important role in establishing the character of Kinney's development in Venice.

In an effort to create a cohesive aesthetic in keeping with his vision for the resort town, Kinney stipulated that all building exteriors in the Venice business district be constructed "in harmony with the 'Venetian Renaissance' style." He commissioned architects Norman Marsh and Clarence Russell to design the principal buildings for Venice; the two men modeled their designs after Italy's Piazza San Marco, whose buildings featured enclosed colonnaded walkways. In keeping with Kinney's vision for a town which resembled the Italian original, the residential area of Venice –known as the "canal district" –was distinguished by a network of man-made saltwater canals. The lateral canals in the residential area led to the Grand Canal, which emptied directly into the sea. As much of the land on which Venice was constructed was situated below sea level, the canal waters were controlled by the rising and falling of ocean tides, which flushed the waterways. Distinctive arched footbridges, designed by Italian metal sculptor Felix Peano, spanned the canals and connected the four islands of residential lots. In anticipation of the influx of visitors which would likely vastly exceed the available accommodations, land had also been set aside south of the Grand Canal for the erection of a tent city, where rustic "cottages with canvas sides"–or as Kinney noted on his presentation map, "Venetian Villas"–could be rented for overnight stays…

…Although the canals were still under construction, Venice of America officially opened to the public on July 4, 1905. By this time, several key commercial buildings had been completed, including the Bank of Venice at the intersection of Windward and Pacific avenues. Early buildings were designed in the Mediterranean Revival style, reflecting Kinney's mandate, and featured elaborate arcades which extended along the north side of Windward Avenue from Ocean Front Walk to Pacific Avenue. The Mediterranean Revival style continued to be employed for new construction through the early 1920s; however, by the end of the decade, examples of commercial vernacular buildings were introduced to the district…

…Following a successful opening season, in 1906 Abbot Kinney began to expand the city services in Venice. Construction commenced on a city hall (now designated a City Historic-Cultural Monument) and a fire station, which was designed by John Gabrovck and completed that same year. An Edison Electric Company facility was later constructed in 1910…

> …By 1907, the Venice of America development had become the nexus of the city of Ocean Park. In fact, the area's success and its potentially negative impact on the surrounding business developments of Ocean Park was keenly felt by Ocean Park businessmen, sparking resentment and discord. It was these "conflicting business interests," as Jeffrey Stanton describes, that triggered a feud between the two entities. "The basic problem," Stanton observes, "was that two rival communities were growing up in one municipality."
>
> After months of real estate and political battles, Abbot Kinney launched a campaign to "dis-incorporate" Venice of America from the surrounding community of Ocean Park. While community sentiment within Venice of America was clearly in Kinney's favor, his efforts failed to muster the two-thirds majority required to prevail in the public election. Venice of America remained a part of the Ocean Park community; in 1911, the entire community was renamed Venice…
>
> …While business development may have been controversial, residential developers in surrounding areas of Ocean Park began to devise ways to capitalize on the resort's success. Soon, a second set of six canals appeared just to the south of Venice of America. Developed by the Short Line Beach Company in 1905-1906, the subdivision was known as the Venice Canal Subdivision. The Short Line Beach Company continued to divide land further south down the peninsula, as did the Los Angeles Pacific Railroad Company and Kinney's former business partners. The Silver Strand tract, developed by Alexander Fraser, Henry Gage, and George Merritt Jones in 1905, featured lots oriented around a Grand Canal spanned by bridges… Although the peninsula was originally subdivided by several different developers, the streets were later renamed in 1964 to reflect a nautical theme; east-west streets along the peninsula are arranged alphabetically from north to south…

The project area reflects this later period of development and subdivision. Although there may have been some residential development in the vicinity of the project area previous to 1964, the earliest building is the Venice Pumping Plant, which dates from the late 1950s. Residential development is spotty, beginning in the mid-1960s and continuing on through 2000.

3.4.2.5 Identification and Evaluation of Cultural Resources

Methodology

Archaeological Resources

The study area was defined as those parcels that would encompass all project components (see Figure 2-2, Project Location Map, in Chapter 2 [Project Description] of this EIR), including temporary construction activities. In order to identify and evaluate archaeological resources, a records search and pedestrian field survey were conducted. Additional background research was conducted to establish the context and setting of the project area.

Tribal Cultural Resources

NAHC was contacted on November 2, 2015 with a request for a Sacred Lands File search and a list of Native American contacts for the area. Once this list was received, the City contacted by letter or e-mail the groups on the NAHC list and a City-maintained list. A total of two replies were received, from the Gabrieleño Band of Mission Indians – Kizh Nation and the Fernandeño Tataviam Band.

Historical Resources

The study area was defined as those parcels immediately adjacent to the Project Site described in the project description (see Figure 2-2, Project Location Map, in Chapter 2 [Project Description] of this EIR) and would encompasses all project components, including temporary construction activities. The study area includes residential properties on Canal Court, Hurricane Street, Marquesas Way, and Via Dolce, and encompasses a section of the Venice Grand Canal.

In order to identify and evaluate historical resources, a multi-step methodology was utilized. Record searches for previous documentation of identified historic resources were conducted, including listings in the NRHP, determinations of eligibility for NRHP listings, and the City of Los Angeles' historic resource inventories. An intensive survey, including photography and background research, was then made of the study area. Additional background and site-specific research was conducted in order to evaluate the properties within their historic context. CRHR and City of Los Angeles criteria were employed to assess the significance of the properties.

Survey Results

The records search included a review of all available archaeological and historical resources reports and site records concerning properties directly bordering the entire project area and a 0.5-mile surrounding record search area. Two studies were previously conducted within portions of the project area. No archaeological sites have been previously recorded within the boundaries of the project area; one City of Los Angeles HCM is present in the project area, the Venice Canal System, HCM #270; and furthermore, there no TCR's are on the site. Two historic cultural resources are encompassed in the 0.5-mile buffer area—the Venice Canal Historic District and the Warren Wilson Beach House.

The cultural resources survey process undertaken for the Proposed Project was conducted per SHPO instructions, which gives a 45-year threshold for surveying properties for significance. Those properties that were of post-1970 construction (under 45 years of age) were not documented unless they potentially exhibited "exceptional" importance.[1]

Archaeological Resources

A records search was conducted on September 1, 2015, at the South Central Coastal Information Center (SCCIC) at California State University, Fullerton. SCCIC is a branch of the California Historical Resources Information Center, which maintains California's official records of previously recorded cultural resource studies and recorded archaeological sites for Ventura, Los Angeles, Orange, and San Bernardino Counties. The SCCIC records search included the project area and a 0.5-mile buffer.

No archaeological resources are recorded in the project area.

A review of SCCIC's records indicates that 15 previous cultural resource studies have been conducted within a 0.5-mile radius of the project. Of these, two studies are included the project area; for those studies, no resources were recorded within the project area boundaries. Most studies observed no prehistoric or historic archaeological resources or isolated artifacts. Moreover, the 13 studies within the 0.5-mile buffer area produced positive results for just two cultural resources. However, the search indicated that no prehistoric archaeological sites are included on the Archaeological Determination of Eligibility list.

A comprehensive archaeological pedestrian survey of the project footprint was conducted on August 20, 2015. This area was surveyed in order to inspect for and identify any previously undiscovered cultural resources. The pedestrian survey consisted of walking transects 3 meters (10 feet) apart in an east/west orientation. Ground surface visibility was fair with the surface somewhat obscured by vegetation, resulting in approximately 80% surface visibility. No archaeological resources were identified during the field survey.

[1] As defined in the National Register Bulletin, p. 42 (Criterion Consideration G: Properties That Have Achieved Significance within the Past Fifty Years).

Tribal Cultural Resources

NAHC reviewed its Sacred Lands File and indicated in a letter sent to ICF International (ICF) on November 3, 2015 that there were Native American resources recorded in the area. However, the site numbers provided were all for sites in Ballona Wetlands, not the project area. NAHC recommended contacting six Native American groups in the area. The City contacted by letter or e-mail nine groups from contacts on the NAHC list and a City-maintained list.

Groups contacted are listed below.

- Gabrielino Tongva Indians of California Tribal Council
  Robert F. Dorame, Tribal Chair, Cultural Resources
- Tongva Ancestral Territorial Tribal Nation
  John Tommy Rosas, Tribal Administrator
- Fernandeño Tataviam Band of Mission Indians
  Rudy Ortega Jr., President
- Gabrieleño Band of Mission Indians – Kizh Nation
  Andrew Salas, Chairperson
- Gabrielino-Tongva Tribe
  Linda Candelaria, Co-Chairperson
- Gabrielino/Tongva Nation
  Sam Dunlap, Cultural Resources Director
- Gabrielino/Tongva San Gabriel Band of Mission Indians
  Anthony Morales, Chairperson
- San Fernando Band of Mission Indians
  John Valenzuela, Chairperson
- Soboba Band of Luiseño Indians
  Joseph Ontiveros, Cultural Resource Director

The Gabrieleño Band of Mission Indians – Kizh Nation replied on November 30, 2015, stating that the area is sensitive and in the location of a village known to have existed in Ballona Wetlands. Native American monitoring was recommended for the project; no evidence was provided that the project footprint itself is within a TCR.

A response was received from the Fernandeño Tataviam Band on December 1, 2015 stating that the project area was outside of Tataviam territory, and that the Band did not wish to consult on the project. The Soboba Band replied on December 21, 2015, stating that it had no specific concerns about the project. The Soboba Band stated that it defers to Gabrielino representatives closer to the project.

Historical Resources

Within the study area, there are no NRHP-listed properties, no buildings were determined eligible for listing in the NRHP or the CRHR, and one property is listed as a HCM. As previously stated, properties listed in or formally determined eligible for listing in the NRHP are automatically listed in the CRHR.

The Venice Canal System, HCM #270, was designated on July 15, 1983; the Grand Canal is included as part of this historical resource. The Venice Canal System was designated as an HCM for its association with "an historic personage," specifically, as the creation of developer Abbot Kinney. Therefore, the Venice Canal System is important as an achievement of Kinney; it is not eligible as an HCM for reflecting the broad cultural, economic, or social history of the nation, state, or community; for embodying characteristics of an architectural type specimen inherently valuable for a study of a period, style, or method of construction; or for being a notable work of a master builder, designer, or architect whose individual genius influenced his or her age.

While portions of the Grand Canal north of Washington Street are associated with the NRHP-listed Venice Canal District, the portion of the Grand Canal within the study area is not within the NRHP-listed historic district boundaries and was intentionally omitted when the district was nominated to the NRHP in 1980.

Of the six parcels immediately adjacent to the Project Site, only two contain any buildings or structures that were constructed prior to 1970. Please see Table 3.4-1 below for a list of properties in the study area.

Table 3.4-1: Properties in the Study Area

APN	Street Address	Date of Construction
4225008009	3809 S. Esplanade (3809 Gran Corso), Los Angeles, CA 90292	1977
4225008036	129 Hurricane Street, Los Angeles, CA 90292	1992
4225010017	120 Hurricane Street, Los Angeles, CA 90292	1968
4225010900	140 E. Hurricane Street (134 E. Hurricane, 3901 S. Esplanade), Los Angeles, CA 90292	Circa 1956–60 (1957)
4225013157	3811 Via Dolce, Los Angeles, CA 90292	1989
4225013152	3815 S. Via Dolce, Los Angeles, CA 90292	2000

Building dates were acquired using the Zoning Information and Map Access System, additional information available at City of Los Angeles Department of Building and Safety online (http://ladbs.org/LADBSWeb/online-building-records.jsf), and at City of Los Angeles Office of Historical Resources.

Two buildings meet the age criteria, neither one of which has previously been evaluated for eligibility to the Los Angeles HCM list, CRHR, or NRHP. In researching the history of the development of this community, the Historic Resources Survey Report for the Venice Community Plan Area, prepared as part of the SurveyLA process undertaken by the City of Los Angeles Department of City Planning's Office of Historic Resources, was consulted. Additional research was conducted in January and February 2015 at HistoricPlacesLA.com, the Los Angeles Public Library online research databases, including its Photo Collection, the Department of Water & Power Photo Archive, and the California Index.

120 Hurricane Street was constructed in 1968. It is a two-story, multi-family residence that was designed in a Contemporary style with some fanciful decorative balcony entablature. It has a stucco exterior and a flat roof, and the open bay garage is located on the first story of the primary façade. The primary façade faces north onto Hurricane Street. Above the bay openings are two concrete balconies with metal balustrades, metal posts, and arched openings. Between the balconies is a

single roundel window. The south elevation overlooks the Ballona Wetlands and the associated pedestrian walkway. The second story of the south elevation has a cantilevered balcony with the same balustrade design as the north elevation. The balcony shelters a first-floor patio area. There is a wood picket fence surrounding the small backyard. Most of the visible windows appear to be original, multi-pane metal sash. There have been some replacement windows, including sliding doors to the balconies.



Looking southwest at 120 Hurricane Street, from the corner of Canal Court and Hurricane Street. Photo taken on August 19, 2015 (ICF).

This property likely retains integrity from the original period of construction; however, it does not embody the distinctive characteristics of a type, period, or method of construction. The Contemporary style of this property is common to both the area and the era, and the arched openings of the balconies do not indicate the work of a master or the presence of high artistic value. Research did not indicate that this individual property has an association with any persons or events that are important or have made significant contributions to the broad patterns of local or regional history. Therefore, 120 Hurricane Street is not eligible for the CRHR under Criteria A, B, or C.

The Venice Pumping Plant is surrounded by a 6-foot high wall with a concrete base and metal siding perched on top, portions of which were constructed in 2013. Located in the residential neighborhood within the Ballona Lagoon West subarea of Venice, the building is surrounded on two sides by water. On the east is the Grand Canal and on the south is the Ballona Wetlands. The property wall abuts the pedestrian sidewalk that separates the property from the water. An original building permit was not located during the research phase; other sources have indicated a general building period between 1956 and 1960, while the project description (see Chapter 2) states that it was constructed in 1957. The industrial building is two stories, with a smooth concrete exterior that is bare of decoration save horizontal groves approximately 4 feet apart. It has an irregular footprint.

The property itself houses a control facility, five pumps, a control center, emergency generators, and other associated equipment. This property was most recently upgraded in 1987.



Looking northwest at 140 Hurricane Street: Venice Pumping Plant. View from Via Dolce. Photo taken on August 19, 2015 (ICF).

No original photographs of the property were located during the research phase and, therefore, it is not clear how much integrity remains from the original period of construction. Many industrial civic buildings, such as pumping plants and switching stations, were designed in popular architectural styles in Los Angeles between the 1910s and the 1950s, but there is no indication that the Venice Pumping Plant's architecture style was specifically associated with its type or period of construction. Although this is considered to be the largest of the City's pumping plants, no written documentation that discusses the importance of its size and/or location was discovered during the research phase. There is no indication that this property was designed specifically to relate to its location, or to reflect its particular use. It is unknown who designed or engineered this property, except that it was constructed by the Department of Public Works. Research did not indicate that this individual property has an association with any persons or events that are important or have made significant contributions to the broad patterns of local or regional history. Therefore, the Venice Pumping Plant is not eligible for the CRHR under Criteria A, B, or C.

3.4.3 Environmental Impact Analysis

This section outlines the methodology, evaluation, and impacts for archaeological and historical resources. It is intended to assist in the evaluation and conclusions of the impact analysis provided below and in the formation of required mitigation measures.

3.4.3.1 Screening Analysis

As noted in Section Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study] of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in CEQA Appendix G and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.4.3.2 Thresholds of Significance

City of Los Angeles CEQA Thresholds Guide

The 2006 *L.A. CEQA Thresholds Guide* states that the following impact significance factors shall apply to archaeological and historical resources.

Archaeological Resources

The project would have a significant impact on archaeological resources if it could disturb, damage, or degrade an archaeological resource or its setting that is found to be important under the criteria of CEQA because it:

- Is associated with an event or person of recognized importance in California or American prehistory or of recognized scientific importance in prehistory;
- Can provide information that is both of demonstrable public interest and useful in addressing scientifically consequential and reasonable archaeological research questions;
- Has a special or particular quality, such as the oldest, best, largest, or last surviving example of its kind;
- Is at least 100 years old and possesses substantial stratigraphic integrity; or
- Involves important research questions that historical research has shown can be answered only with archaeological methods.

Historical Resources

The project would have a significant impact on historical resources if it would result in a substantial adverse change in the significance of a historical resource. A substantial adverse change in significance occurs if the project involves:

- Demolition of a significant resource;
- Relocation that does not maintain the integrity and significance of a significant resource;
- Conversion, rehabilitation, or alteration of a significant resource that does not conform to the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings; or
- Construction that reduces the integrity or significance of important resources on the site or in the vicinity.

CEQA Appendix G

In accordance with Appendix G of the State CEQA Guidelines, the project would have a significant impact related to cultural resources if it would:

- Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5;
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5; or
- Disturb any human remains, including those interred outside of formal cemeteries.

Tribal Cultural Resources

The project would have a significant impact related to TCRs if it would:

- Cause a substantial adverse change in the significance of a site, feature, place, cultural landscape, sacred place, or object with cultural value to a California Native American Tribe that is listed or determined eligible for listing on the California Register of Historical Resources, listed on a local historical register, or otherwise determined by the lead agency to be a tribal cultural resource.

3.4.3.3 Construction Impacts

The analysis below describes the temporary and permanent impacts on cultural resources as a result of the Proposed Project during construction.

Archaeological Resources

CUL-1. Would the project disturb, damage, or degrade an archaeological resource or its setting, or otherwise cause a substantial adverse change in the significance of an archaeological resource?

No archaeological resources have been recorded in the project area. A survey of the project area located no archaeological resources. Research determined that this area was marshland and beach dunes adjacent to the outlet of Ballona Creek at the Pacific Ocean prior to modern development; this setting is unlikely to have preserved prehistoric archaeological resources due to constant erosion and deposition. These marshland and beach dune sediments have been substantially altered by twentieth century development, as the project area has been leveled and filled to create part of the community of Venice and the associated canals. Based on the setting and the level of previous disturbance, the potential for construction activities to disturb, damage, or degrade an archaeological resource or its setting is low. However, in the unlikely event that previously undisturbed archaeological resources are encountered during construction, impacts to these resources could be significant. With implementation of Mitigation Measure MM-CUL-1, which requires stopping work and treating any cultural resources that are discovered, impacts to archaeological resources would be reduced to **less than significant with mitigation**.

CUL-2. Would the project disturb any human remains, including those interred outside of formal cemeteries?

No human remains are known to exist in the project area, and the location does not encompass any formal cemeteries. Because the Project Site is situated on beach sands and marshland clays, there is a very low potential for prehistoric human remains to be present. While the uncovering of human

remains is not anticipated, if they are discovered, HSC Section 7050.5 requires that further disturbances and activities shall cease in any area or nearby area suspected to overlie remains, and the county coroner be contacted. Pursuant to PRC Section 5097.98, if the remains are thought to be Native American, the coroner shall notify NAHC, who shall then notify the Most Likely Descendant. Further provisions of PRC Section 5097.98 are to be followed as applicable.

Therefore, through compliance with existing regulations, impacts on human remains due to construction of the Proposed Project would be **less than significant** and no mitigation measures are required.

Historical Resources

CUL-3. Would the project result in a substantial adverse change in the significance of a historical resource due to demolition, relocation, conversion, rehabilitation, or alteration of a historical resource?

The Proposed Project includes the construction of a permanent submerged diversion structure that would connect the Coastal Interceptor Sewer, located in the Grand Canal, to the proposed VAPP. A temporary cofferdam in the Grand Canal would need to be constructed in order to make this connection. The Grand Canal, which is the only historical resource in the study area, meets HCM criteria for designation for its association with Abbot Kinney and the development of the "Venice of America." Although a coffer dam would be situated in the Grand Canal during the construction phase of the Proposed Project, it would not result in a substantial adverse change in the significance of this historical resource. The Grand Canal is significant for its association with Abbot Kinney, and this association would not be affected by the temporary submersion of a structure in the Canal itself. The temporary cofferdam would not remain in the water following construction of the diversion structure, which would be completely submerged below the bottom of the Grand Canal. Therefore, impacts during construction would be **less than significant** and no mitigation measures are required.

Tribal Cultural Resources

CUL-4. Would the project cause a substantial adverse change in the significance of a site, feature, place, cultural landscape, sacred place, or object with cultural value to a California Native American Tribe that is listed or determined eligible for listing on the California Register of Historical Resources, listed on a local historical register, or otherwise determined by the lead agency to be a tribal cultural resource?

TCR consultations were completed. No responses received from Native American groups suggest there are TCRs in the project footprint. No sites or other resources are known in the immediate project area that could be categorized as TCRs. The lack of known TCRs and the low potential for discovery of such resources indicates that construction would not affect TCRs and cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5.

No TCRs containing human remains and no human remains in general are known to exist in the project area, and the location does not encompass any formal cemeteries. Because the Project Site is situated on beach sands and marshland clays, there is a very low potential for prehistoric human remains to be present. While the uncovering of human remains is not anticipated, if they are discovered, HSC Section 7050.5 requires that further disturbances and activities shall cease in any

area or nearby area suspected to overlie remains, and the county coroner be contacted. Pursuant to PRC Section 5097.98, if the remains are thought to be Native American, the coroner shall notify NAHC, who shall then notify the Most Likely Descendant. Further provisions of PRC Section 5097.98 are to be followed as applicable. Therefore, through compliance with existing regulations, construction impacts on any TCRs containing human remains would be **less than significant** and no mitigation measures are required.

3.4.3.4 Operational Impacts

The analysis below describes the temporary and permanent impacts on cultural resources anticipated as a result of the Proposed Project during operation. The analysis below evaluates potential impacts, based upon the applicable threshold of significance.

Archaeological Resources

CUL-1. Would the project disturb, damage, or degrade an archaeological resource or its setting, or otherwise cause a substantial adverse change in the significance of an archaeological resource?

Operation of the project would not involve any ground-disturbing activities. Therefore, there would be no potential to disturb, damage, or degrade an archaeological resource or its setting. **No operational impacts** on archeological resources would occur and no mitigation measures are required.

CUL-2. Would the project disturb any human remains, including those interred outside of formal cemeteries?

No human remains are known to exist in the project area, and the location does not encompass any formal cemeteries. Because the Project Site is situated on beach sands and marshland clays, there is a very low potential for prehistoric human remains to be present. As a consequence and because operation of the project would not involve any ground-disturbing activities, **no operational impacts** on human remains would occur and no mitigation measures are required.

Historical Resources

CUL-3. Would the project result in a substantial adverse change in the significance of a historical resource due to demolition, relocation, conversion, rehabilitation, or alteration of a historical resource?

The only historical resource in the study area is the Grand Canal, which meets the HCM criteria for designation for its association with Abbot Kinney and the development of the "Venice of America." Once constructed, the diversion structure within the Grand Canal would be located below grade and would not protrude within the water column. Operation of the Proposed Project would not involve activities that could result in the demolition, relocation, conversion, rehabilitation, or alteration of the Grand Canal. Therefore, **no impacts** during operation would occur and no mitigation measures are required.

Tribal Cultural Resources

CUL-4. Would the project cause a substantial adverse change in the significance of a site, feature, place, cultural landscape, sacred place, or object with cultural value to a California Native American Tribe that is listed or determined eligible for listing on the California Register of Historical Resources, listed on a local historical register, or otherwise determined by the lead agency to be a tribal cultural resource?

As noted above, no responses that have been received from Native American groups suggest there are TCRs in the project footprint. No sites or other resources are known in the immediate project area that could be categorized as TCRs. Additionally, operation of the project would not involve ground disturbing activities; therefore, operation of the project would not disturb prehistoric human remains. Therefore, the project is **not likely to cause a substantial adverse change** in the significance of a TCR and no mitigation measures are required.

3.4.4 Mitigation Measures

The following mitigation measure was developed to avoid or minimize the Proposed Project's potential impacts on cultural resources and is also contained in Appendices E and F of this EIR.

MM-CUL-1: Unanticipated Archaeological and/or Tribal Cultural Resource Discoveries

In the unlikely event that any prehistoric artifact of historic period materials or bone, shell, or nonnative stone is encountered during construction, work shall be immediately stopped, the area secured, and work relocated to another area until the found materials can be assessed by a qualified archaeologist. Examples of such cultural materials might include historical trash pits containing bottles and/or ceramics; or structural remains or concentrations of grinding stone tools such as mortars, bowls, pestles, and manos; chipped stone tools such as projectile points or choppers; and flakes of stone not consistent with the immediate geology such as obsidian or fused shale. If the Archeologist determines that an artifact may qualify as a tribal cultural resource, a Native American monitor shall be consulted. The contractor shall stop construction within 30 feet of the exposure of these finds until a qualified archaeologist can be retained to evaluate the find (see 36 CFR 800.11.1, 14 CCR 15064.5(f) and PRC § 21084.3 (b).) If the resources are found to be significant, they shall be avoided or impacts shall be mitigated consistent with Section 106, State Historic Preservation Officer Guidelines, and/or Assembly Bill 52.

3.4.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on archaeological, historical or tribal cultural resources would occur.

3.4.6 Cumulative Impacts

3.4.6.1 Archaeological Resources

The Proposed Project would result in no operational impacts on archaeological resources. Based on the setting and the level of previous disturbance, the potential for construction activities to disturb, damage, or degrade an archaeological resource or its setting is low. Additionally, if archaeological resources are encountered, Mitigation Measure MM-CUL-1 would reduce potential project-related

construction impacts to less than significant. The incremental effects of the Proposed Project, after mitigation, would not contribute to a significant adverse cumulative impact on archaeological resources.

3.4.6.2 Tribal Cultural Resources

The Proposed Project would have no impacts on TCRs, because no such resources are present within the project footprint, based on information received to date. Therefore, the project would not contribute to a significant adverse cumulative impact on TCRs.

3.4.6.3 Historical Resources

The only potential impacts to a historical resource (the Grand Canal) would occur during construction and those impacts would be less than significant. Consequently the study area for cumulative impacts would encompass other projects in the area that could affect the canal. Based upon a review of projects contained within Table 1-1, Related Projects List (see Chapter 1, Introduction of this EIR), none of the projects listed, including the Venice Dual Force Main would (which would be constructed underneath the Grand Canal [at Esplanade and Hurricane Street]) would result in significant cumulative effects on the Grand Canal. Similarly, the Proposed Project would also not result in significant cumulative effects on the Grand Canal.

3.5 Geology and Soils

This section describes the affected environment and regulatory setting for the geologic and soil characteristics of the Project Site. This section also describes the potential geologic and soil impacts that would result from implementation of the Proposed Project and, where necessary to reduce potentially significant impacts, provides mitigation measures to reduce such impacts to less than significant levels. The environmental setting information and analysis in this section is summarized from the geotechnical engineering report (GER) prepared for the Project Site by the Geotechnical Engineering Group (GEO) of the City of Los Angeles Department of Public Works, Bureau of Engineering (LABOE), in December 2015. This technical report (Geotechnical Engineering Report – Venice Auxiliary Pumping Plant, December 14, 2015) is hereby incorporated by reference and included in Appendix G of this Environmental Impact Report (EIR). Information pertaining to locations of abandoned oil wells is based on the *Phase I Environmental Site Assessment (128 Hurricane Street)* (Phase I ESA) prepared by Ninyo & Moore in May 2016 (see Appendix K of this EIR).

This geotechnical investigation was conducted to provide recommendations for design and construction of the Venice Auxiliary Pumping Plant (VAPP or Proposed Project) at the Project Site. Thus, the recommendations presented in the 2015 GER would be incorporated into project design and construction to address issues related to the following: surficial soils, site preparation, site earthwork, foundations, retaining walls, slabs-on-grade, cement type, and corrosion measures. As recommended in the 2015 GER, a representative of the City's GEO would provide observation and testing services during site earthwork and construction of foundations and review the preliminary foundation and earthwork plans and specifications. For groundwater control and discharge, the representative would review proposals for shoring and jet grouting. In addition, to address the on-site abandoned oil well located at 128 Hurricane Street, soil and soil vapor subsurface investigations and confirmation of oil well abandonment would be required. As noted in the analysis below, with adherence with standard construction requirements and the implementation of mitigation measures, direct and indirect impacts associated with geology and soils during construction or operation would be less than significant.

3.5.1 Regulatory Setting

This section describes existing regulations related to geology and soils that are applicable to the Proposed Project and discusses those can be used to determine impacts and consistency with applicable requirements.

3.5.1.1 California Building Standards Code

The California Building Standards Commission is responsible for coordinating, managing, adopting, and approving building codes in California. In January 2014, the 2013 California Building Standards Code (CBSC) went into effect, updating all prior codes under California Code of Regulations (CCR) Title 24. Among the components of the CBSC are the California Building Code (CBC), Building Standards Administrative Code, Residential Building Code, and Green Buildings Standards Code.

The CBC, which has been incorporated by reference into the City of Los Angeles Municipal Code, applies to building design and construction and is based on the federal Uniform Building Code

(UBC), which is used widely throughout the country. The CBC has been modified for conditions in California. It contains numerous provisions that are more stringent than those in the UBC because of California's seismic and environmental conditions. According to Section 1.1 of the CBC, the provisions of the CBC apply to "the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout the State of California," except when modified by local ordinance.

3.5.1.2 Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act, passed in 1990, addresses earthquake hazards from nonsurface fault rupture, including hazards related to liquefaction and seismically induced landslides. The purpose of the Seismic Hazards Mapping Act, which went into effect in 1991, is to identify and map seismic hazard zones. Such mapping helps cities and counties when preparing the safety elements of their general plans and encourages land use management policies and regulations that reduce seismic hazards. The Seismic Hazards Mapping Act has resulted in the publication of maps that delineate Liquefaction Zones and Earthquake-Induced Landslide Zones of Required Investigation (State of California Department of Conservation, California Geological Survey 2011). The Project Site is located within a Liquefaction Seismic Hazard Zone but not within a Landslide Seismic Hazard Zone.

3.5.2 Environmental Setting

This section describes the environmental setting or conditions related to geology, soils, and seismicity as well as associated hazards that could affect the Project Site, workers, visitors, or public. The information in this section is used in preparing the evaluation and conclusions of the impact analysis as well as determining the required mitigation measures.

3.5.2.1 Regional Geology

The VAPP site is located within the Los Angeles Basin part of the Peninsular Ranges geomorphic province, which extends from Southern California to the southern tip of Baja California. This province is characterized by elongated northwest-trending mountain ridges separated by straight-sided sediment-filled valleys. The northwest trend is further displayed in the dominant structural features of the province, including the Newport-Inglewood fault zone.

The Project Site is located in an alluviated lowland area in the west portion of the Los Angeles Basin, a northwest-trending alluviated plain about 50 miles long and 20 miles wide. The basin is bound on the north by the Santa Monica Mountains and the Elysian, Repetto, and Puente Hills and on the east and southeast by the Santa Ana Mountains and San Joaquin Hills. This aerially extensive alluviated plain slopes southward and seaward; however, in the vicinity of the Project Site, the plain is interrupted by the Baldwin Hills and Beverly Hills. The Baldwin Hills are the northern extension of the Newport-Inglewood structural block, which has uplifted the Baldwin Hills, Dominquez Hills, and Signal Hill, located to the south.

The Los Angeles Basin is underlain by a deep structural depression. Parts of this depression have been filled with sediments discontinuously since the Late Cretaceous (starting about 85 million years ago). Starting in the middle Miocene (about 20 million years ago), the basin, which extended to the Ventura Basin, continuously subsided as sediments were deposited. The buried basement surface has relief of as much as 4.5 miles over a distance of 8 miles (Yerkes et al. 1965).

3.5.2.2 Local Geologic Setting

The Marina Del Rey and Venice areas were once a large wetland marsh that was fed by the meandering Ballona Creek, which drained into the Santa Monica Bay near the current location. The 1924 U.S. Geological Survey (USGS) map of the Venice quadrangle shows the Project Site adjacent to a large lowland marsh area northeast of the Grand Canal. The elevation of the Project Site is approximately 5 feet above sea level. Surficial geologic exposures are all Quaternary sedimentary units.

3.5.2.3 Stratigraphy

Artificial fill soils exist within the Project Site as the result of previous construction on the site. In general, the depth of fill is expected to be on the order of 3 to 4 feet within the Project Site. The fill materials generally consist of silty sand and sand with some construction debris.

More detailed descriptions of the soils can be found in the boring logs presented in Appendix G of this Draft EIR.

3.5.2.4 Faulting and Seismicity

The Project Site lies within Seismic Zone 4 (highest potential for seismic activity) of the 2010 CBC. Primary seismic hazards that could affect the site include ground motion or shaking, ground surface rupture along faults, liquefaction, and earthquake-induced landslides.

3.5.2.5 Oil Fields and Methane

According to the State of California, Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR), Well Finder website (DOGGR, 2016), the site lies within the administrative boundaries of the Playa Del Rey Oil Field. One oil well, the 'McDonald 2' was observed on site, with American Petroleum Institute (API) number 03713842. The well is plugged and abandoned originally in 1932. As described in the Phase I ESA (see Appendix K of this EIR), the well may have been re-abandoned in 2002 to current DOGGR standards, but it is not known whether re-abandonment activities were completed. Numerous oil wells, most of which are plugged and abandoned, were observed within one mile of the site. The presence of a historical oil well on site represents a REC (recognized environmental condition). In addition to being within the boundaries of the Playa Del Rey Oil Field, according to the City of Los Angeles Zoning Information and Map Access System (ZIMAS); the project site also lies within a methane zone. This was also identified as a REC in the Phase I ESA.

3.5.2.6 Ground Motion

Given the current understanding of the geologic framework of the area, the seismic hazard that is expected to have the highest probability of affecting the site is ground shaking or motion resulting from an earthquake occurring along any of several major active or potentially active faults in

Southern California. Known regional faults that could produce significant ground shaking at the site include the Malibu Coast, Santa Monica, Palos Verdes, and Newport-Inglewood faults, among others and are shown in Figure 3.5-1. According to the City of Los Angeles' ZIMAS, the closest fault to the Project Site is the Santa Monica Fault, which is approximately 6.7 miles away.

Ground motion parameters were determined for the site using the USGS 2008 Probabilistic Seismic Hazard Analysis Interactive Deaggregation web tool. Program input included site longitude and latitude, a 10% probability of exceedance in 50 years, and an average shear wave velocity of 230 meters per second for the upper 100 feet of subsurface. Using these parameters, a peak ground acceleration of 0.4g (acceleration of gravity) was determined for the site. The program also calculated a mean earthquake magnitude of 6.7 at a distance of 20.5 kilometers (12.7 miles) from the site.

3.5.2.7 Other Seismic Hazards

Lateral Spreading

Seismically induced lateral spreading is the lateral movement of earth materials due to ground shaking. It differs from slope failure in that complete ground failure from a large earth movement does not occur because of the relatively low gradient of the ground surface. Lateral spreading is demonstrated by near-vertical cracks and predominantly horizontal movement of the soil mass. The GER prepared for the Proposed Project did not identify lateral spreading as an issue of concern for the Project Site.

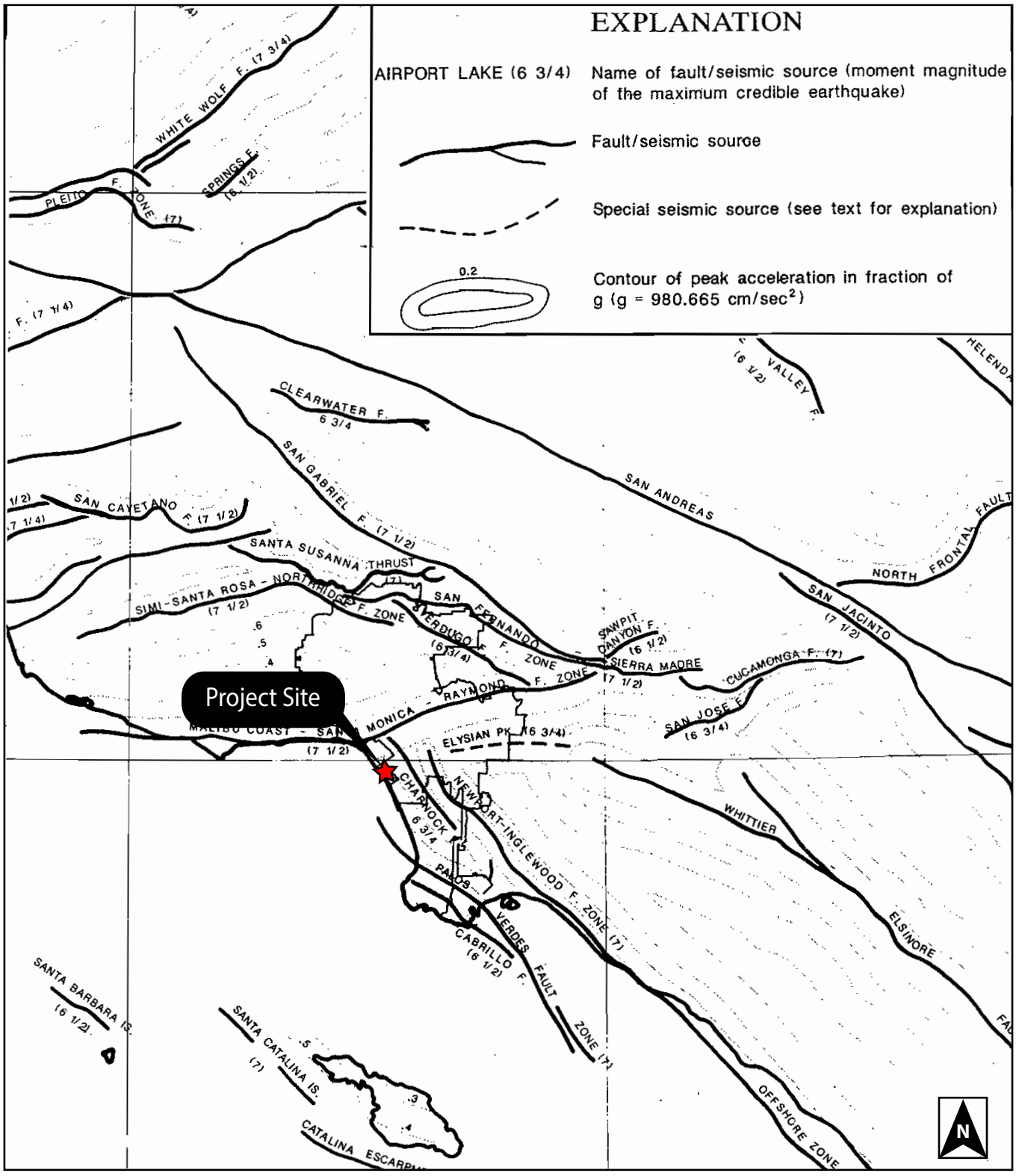
Liquefaction

According to the State of California Seismic Hazard Zones Map, the Site is located within an area that has potential for liquefaction. Liquefaction is a process that occurs when saturated sediments are subjected to repeated strain reversals during a seismic event. The strain reversals cause an increase in pore water pressure such that the internal pore pressure approaches the overburden pressure, and the shear strength approaches a low residual value. Liquefied soils are subject to flow, consolidation, or excessive strain. Liquefaction typically occurs in loose to medium-dense sand and silty sand soils below the groundwater table. Predominately fine-grained soils, such as silts and clays, are less susceptible to liquefaction.

Liquefaction analyses were performed for a ground acceleration of 0.43g (two-thirds the maximum considered earthquake-geometric mean ground acceleration of 0.642g). The analyses were performed for the deepest rotary wash boring, RW-2 (see Appendix G of this EIR), located near the center of the site, and with consideration of soil particle size and plasticity information obtained through laboratory testing as well as the measured and anticipated high groundwater levels. Potential liquefaction-induced settlements on the order of 2 inches were calculated for the Project Site and 1 inch between the proposed structures and the pipe header (associated with the diversion structure).

3.5.2.8 Other Hazards

An on-site geotechnical investigation conducted in 2006 identified petroleum hydrocarbons in the soil adjacent to two on-site concrete vaults. Petroleum hydrocarbon analytical results in the upper 2 feet of soil resulted in concentrations of up to 6,500 parts per million. The purpose of the concrete vaults is unknown. Furthermore, there was no documentation summarizing the removal of the vaults and/or contaminated soil.



Source: Peak Acceleration from Maximum Credible Earthquack in California, Maulchin and Jones, 1990, CALTRANS

Scale
One Inch = 16 Miles

Figure 3.5-1
Peak Acceleration From Maximum Credible Earthquake
Venice Auxiliary Pumping Plant Project

As part of the Phase I ESA, Ninyo & Moore conducted a preliminary vapor encroachment screening (pVES) to identify potential chemicals of concern (COCs) that could migrate (as vapors) onto the project site as a result of contaminated soil and/or groundwater in nearby properties. The potential for Vapor Encroachment Conditions (VEC) beneath the project site was evaluated and based on the concentration of petroleum hydrocarbons detected in soil on the site in 2006, the presence of a historical oil production well and the presence of the site within a methane zone. The Phase I ESA determined that a VEC likely exists beneath the site.

3.5.3 Environmental Impact Analysis

3.5.3.1 Methodology

Potential significant impacts associated with the Proposed Project were identified from the GER prepared by LABOE in December 2015 and the Phase I ESA prepared by Ninyo & Moore in May 2016. The GER and ESA Phase I presented findings, conclusions, and recommendations concerning development of the Project Site that were based on an engineering analysis of the geotechnical properties of the subsurface conditions (described above).

The discussion below identifies potential project impacts and the measures that would be required to mitigate impacts that are found to be potentially significant.

3.5.3.2 Screening Analysis

As noted in Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study] of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and the corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.5.3.3 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, a project would normally have a significant impact related to geology and soils if it would:

GEO-1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

- Strong seismic ground shaking;
- Seismically related ground failure, including liquefaction;

GEO-2. Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse; or

GEO-3. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

Additionally, due to environmental concerns described in sections 3.5.2.5 and 3.5.2.8 in the project area, in accordance with Appendix G of the State CEQA Guidelines, a project would normally have a significant impact related to hazards and hazardous materials if it would:

HAZ-1. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous chemicals into the environment.

3.5.3.4 Construction Impacts

During construction of the proposed Project, construction workers, equipment, and structures that are under construction could be exposed to the geologic and soils hazards described below.

GEO-1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking and/or seismically related ground failure, including liquefaction.

Although the Project Site is not located on or near a known active fault (see Figure 3-5.1), it could be subject to significant seismic ground shaking from regional faults and therefore, impacts are considered potentially significant related to strong ground shaking hazard. However, the VAPP would be designed by California-licensed professional civil and structural engineers, and construction work would be performed by licensed professional contractors who would comply with all required safety standards to reduce the risk of seismic hazards during construction. The Proposed Project would also be required to conform to the City of Los Angeles Building Code, which considers seismic risk associated with building construction and design requirements. Therefore, the Proposed Project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking and as such, **impacts are considered less than significant and no mitigation measures are required.**

The analysis of the Project Site in the GER indicates that the primary geotechnical issue of concern is related to the uncertified fill soils and the potential for liquefaction. Impacts related to seismically related ground failure, including liquefaction, at the Project Site are therefore considered potentially significant. Potential liquefaction-induced settlement would be on the order of up to 2 inches for the Project Site and 1 inch between the proposed structures and the pipe header. In addition, the Project Site is located in an area identified as having fill material, generally consisting of silty sand and sand with some construction debris, which could expand when saturated. However, the Proposed Project design and construction would incorporate the geotechnical engineering recommendations prescribed in the 2015 GER that assessed the potential for liquefaction at the Project Site and developed recommendations to address this issue. The recommendations focus on surficial soils, site preparation, site earthwork, foundations, retaining walls, slabs-on-grade, cement type, and corrosion measures. **In particular, Mitigation Measure MM-GEO-1 (supporting project structures on concrete mat foundations) would reduce these impacts to less than significant.**

Further, a representative of the City's GEO would review plans and specifications to ensure the proper interpretation and application of these recommendations prior to start of construction and provide observation and testing services to determine if any supplemental recommendations are warranted. Thus, all grading, excavation, and foundation construction would be performed under the observation and testing of the geotechnical engineer or representative of the GEO, as outlined in the 2015 GER. Designs and plans would also be reviewed, per local, state, and federal laws. **Given these measures and the application of Mitigation Measure MM-GEO-1, all impacts associated with seismically related ground failure, including failure related to liquefaction, would be less than significant with mitigation.**

GEO-2. Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

Please see the discussion of seismically related impacts and the conclusions above associated with liquefaction. As noted in that analysis, **impacts were determined to be less than significant with Mitigation Measure MM-GEO-1**. In addition, the Initial Study (see Appendix A) and the GER (see Appendix G) determined that the Project Site is not within a zone of earthquake-induced landslide potential, as shown by the State of California Seismic Hazard Zones Map, nor is it located on a slope. The GER also did not identify lateral spreading, subsidence, or collapse as issues of concern. Therefore, geologic and seismic hazards (excepting liquefaction) identified for the Project Site are less than significant related to an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. As such, impacts would be **less than significant, and no mitigation measures are required.**

GEO-3. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

As noted above, the GER indicated that the Project Site is located in an area that has been identified as having fill material, generally consisting of silty sand and sand with some construction debris, which could expand when saturated. It did not, however, identify on-site soils as any of those identified in Table 18-1-B of the UBC. Impacts related to expansive soils were previously addressed above in the analysis regarding the potential for liquefaction. As noted in that analysis, the geologic and seismic hazards identified for the Project Site would be reduced by employing required standard engineering practices, including CBC standards, as well as the geotechnical engineering recommendations in the design and construction of the Proposed Project. Adherence to those provisions and standards would reduce risks related to creating substantial risks to life or property due to the presence of expansive soils, including those identified in Table 18-1-B of the UBC (1994). Therefore, potential impacts would be **less than significant, and no mitigation measures are required.**

HAZ-1. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous chemicals into the environment.

As previously stated, the 128 Hurricane Street site lies within the administrative boundaries of the Playa Del Rey Oil Field. One oil well 'McDonald 2' was observed on site, with American Petroleum Institute (API) number 03713842. The well was originally plugged and abandoned in 1932. However, as mentioned above, the well may have been re-abandoned in 2002, but it is not known whether re-abandonment activities were completed. Numerous oil wells, most of which are plugged and abandoned, were observed within one mile of the site. In addition to being within the boundaries of an oil field, the site also lies within a methane zone (according to the City of Los Angeles ZIMAS website). As such, the project would have the potential to result in impacts associated with releases of methane or oil from the abandoned oil well during excavation activities. **Mitigation Measure MM-HAZ-1** would reduce potentially significant impacts to less than significant.

Additionally, an on-site geotechnical investigation conducted in 2006 identified petroleum hydrocarbons in the soil adjacent to two concrete vaults. There was no documentation summarizing

the removal of the vaults and contaminated soil, thus there is potential for exposure to contaminated soil during construction activities. **Mitigation Measure MM-HAZ-1** would reduce potentially significant impacts to less than significant.

Lastly, the potential for VEC beneath the project site was evaluated. Based on the concentration of petroleum hydrocarbons detected in soil on the site in 2006, the presence of a historical oil production well and the presence of the site within a methane zone, the Phase I ESA determined that a VEC likely exists beneath the site and which is considered a potentially significant impact. **Mitigation Measure MM-HAZ-1** would reduce potentially significant impacts to less than significant.

3.5.3.5 Operational Impacts

Once the VAPP is completed and operational, LABOE personnel, visitors, and structures on the site could be exposed to the geologic and soils hazards, as described below.

GEO-1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking and/or seismically related ground failure, including liquefaction.

As noted previously, the Project Site is located within Southern California, a seismically active region that is capable of generating earthquakes (including ground shaking) of considerable magnitude. Although the proposed Project is not located near an active fault (see Figure 3.5-1), movement along active regional faults could generate an earthquake that would be capable of causing damage to buildings and infrastructure located on site and therefore, impacts are potentially significant. The Project Site could also experience liquefaction, including up to 2 inches for structures and up to 1 inch associated with the pipe header, and these impacts are also considered potentially significant. However, the City of Los Angeles Building Code and CBC requires that structures built in the City and state, respectively, be constructed to address the seismic nature of their areas. In addition, the GER has evaluated and considered these factors in the construction and operation of the proposed Project and has identified standard engineering measures and recommendations to address these known regional and localized conditions. As identified within the GER, project implementation does have the potential to result in significant geologic and seismic hazard impacts, including seismically-induced liquefaction. The geologic and seismic hazards identified for the Project Site for employees and visitors would therefore be potentially significant. These can be reduced to less than significant levels, however, through adherence to the City of Los Angeles Building Code and CBC requirements and the implementation of **Mitigation Measure MM-GEO-1**. As such, adherence to these standards and measure would reduce the risks posed by potential hazards from strong seismic ground shaking and/or seismically related ground failure, including failure related to liquefaction, to an acceptable level. Therefore, impacts would be **less than significant and no additional mitigation measures beyond Mitigation Measure MM-GEO-1 are required**.

GEO-2. Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

Please see the discussion of seismically related impacts and the conclusions above associated with liquefaction. As noted in that analysis, impacts were determined to be less than significant with **Mitigation Measure MM-GEO-1**. In addition, the Initial Study (see Appendix A of this EIR) and the

GER (see Appendix G of this EIR) determined that the Project Site is not within a zone of earthquake-induced landslide potential, as shown by the State of California Seismic Hazard Zones Map, nor is it located on a slope. The GER also did not identify lateral spreading, subsidence, or collapse as issues of concern. Therefore, geologic and seismic hazards (excepting liquefaction) identified for the Project Site are less than significant related to an on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. Therefore, potential impacts would be **less than significant, and no mitigation measures are required.**

GEO-3. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

Please see the discussion of expansive soil–related impacts and conclusions above for construction. As noted in that analysis, the GER indicated that the site is located in an area that has been identified as having fill material, generally consisting of silty sand and sand with some construction debris, which could expand when saturated, potentially resulting in significant impacts. It did not, however, identify the on-site soils as any of those identified in Table 18-1-B of the UBC. Moreover, the analysis related to expansive soils (i.e., related to liquefaction) determined that the geologic and seismic hazards identified for the project study area would be reduced by employing required standard engineering practices, including CBC standards, as well as the geotechnical engineering recommendations in the design and construction of the proposed Project. Adherence to those provisions and standards would reduce risks related to creating substantial risks to life or property due to the presence of expansive soils, including those identified in Table 18-1-B of the UBC (1994). Therefore, potential impacts would be **less than significant and no mitigation measures are required.**

HAZ-1. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous chemicals into the environment

As mentioned, the proposed project is located within a City of Los Angeles ZIMAS methane zone. As such, long term operations of the proposed project could encounter potential impacts related to the encroachment/seepage of methane into the VAPP structure and as such, impacts are considered potentially significant. However, implementation of **Mitigation Measure MM-HAZ-2** would reduce potential impacts to less than significant.

3.5.4 Mitigation Measures

The following mitigation measure was developed to avoid or minimize potential impacts on the proposed Project related to geology and soils. It should be noted that there are also specific recommendations contained in the *Geotechnical Engineering Report – Venice Auxiliary Pumping Plant*, December 14, 2015 (see Appendix G of this EIR) and *Phase I Environmental Site Assessment (128 Hurricane Street)*, May 2016 (see Appendix K of this EIR).

Mitigation Measure MM-GEO-1 noted below has been abbreviated. The complete text is provided in Appendix G of this EIR.

MM-GEO-1: Liquefaction Considerations

Given the data presented in Section 3 of the *Geotechnical Engineering Report – Venice Auxiliary Pumping Plant*, December 14, 2015, and the results of the liquefaction calculations, potential

liquefaction induced settlements on the order of 1.75 inches are estimated for the site. A potential liquefaction induced differential settlement of 1 inch is estimated between the proposed structures and the pipe header. These potential liquefaction induced settlements shall be considered and accounted for in the design of the Proposed Project.

Mat foundations are recommended for support of the project structures, with the understanding that the foundation would be susceptible to liquefaction-induced settlements. Mat foundations for the wetwell/valve structure and diversion structures shall be founded on jet-grouted columns constructed within the natural soils. The mat foundation for the electrical building shall be founded on compacted fill soil. Mat foundations shall be designed and constructed to bear at a depth of at least 24 inches below the lowest adjacent grade. Mat foundations can be designed for an allowable bearing capacity of 1,500 pounds per square foot (psf). A coefficient of vertical subgrade reaction, for a 1-foot-square loaded area, of 100 kips per cubic foot (kcf) may be used for design of the mats.

Total static settlement of the proposed foundations, designed and constructed in accordance with the recommendations presented herein, shall not exceed 1 inch. Differential static settlement shall not exceed one-half of the total settlement.

Resistance to lateral loads can be provided by friction at the base of the foundation and passive earth pressure. A coefficient of friction of 0.35 may be assumed with dead-load forces. An allowable passive lateral earth pressure of 250 psf per foot of depth up to a maximum of 2,500 psf may be used for sides of the foundation poured against undisturbed natural soil or properly compacted fill. The allowable passive pressure may be increased by 33% of lateral loading due to wind or seismic forces.

MM-HAZ-1a: Soil and Soil Vapor Subsurface Investigation.

Prior to construction, a soil and soil vapor subsurface investigation shall be conducted by a qualified environmental consultant specializing in the identification and handling of hazardous materials. The subsurface investigation may include, but would not be limited to:

- A scope of work consisting of Pre-Field Activities, such as preparation of a Health and Safety Plan (HASP), determining and marking sampling/boring locations and obtaining utility clearance, and Field Activities, such as identifying appropriate sampling procedures, health and safety measures, chemical testing methods, and quality assurance/quality control (QA/QC) procedures in accordance with the ASTM Standard.
- Necessary permits for boring advancement.
- A Sampling and Analysis Plan (SAP) in accordance with the scope of work.
- Laboratory analyses conducted by a State-certified laboratory.
- Disposal process including transport by a State-certified hazardous material hauler to a State-certified disposal or recycling facility licensed to accept and treat hazardous waste.

MM-HAZ-1b: Confirmation of Oil Well Abandonment.

Prior to construction, the applicant shall obtain confirmation via DOGGR of the proper abandonment of oil well 'McDonald 2'. If re-abandonment of McDonald 2 was not performed to current DOGGR requirements, the applicant shall seek the assistance of a qualified environmental consultant to abandon the oil well to current standards.

MM-HAZ-2: Methane Encroachment.

If the analytical results of the subsurface investigation under Mitigation Measure HAZ-1a determine that methane encroachment has the potential to affect VAPP operational activities, the environmental consultant shall provide recommendations during construction of the proposed project to mitigate long term potential impacts.

3.5.5 Significant Unavoidable Adverse Impacts

With implementation of the mitigation measure identified above, no significant and unavoidable adverse impacts related to geology and soils would occur as a result of the Proposed Project.

3.5.6 Cumulative Impacts

The study area for potential cumulative geology and soil impacts consists of the Project Site and the immediate surrounding area, which encompasses the related projects identified in Chapter 2, Project Description. This study area was selected because it encompasses neighborhoods with similar geologic conditions and areas that could be affected by cumulative soil impacts (e.g., cumulative geology, seismically and soil-related impacts).

In general, the proposed Project, in combination with the related projects, would not contribute to significant cumulative geologic impacts because all geologic/seismic impacts would be generally site specific. Project-related impacts deal primarily with hazards at the Project Site that are speculative in nature (e.g., the possibility of an earthquake, liquefaction, landslide). The proposed and related projects would not change the geologic properties of the area. There would continue to be some level of seismic and other geologic risks during operation of the proposed and related projects because of their locations within a seismically active region; however, these risks would not increase or decrease as a result of the proposed and related projects. Additionally, similar to the Proposed Project, the related projects would be subject to applicable seismic standards, safety requirements, and standard design specifications to keep the potential risk of damage from seismic and other geologic hazards to an acceptable level. Therefore, construction and operation of the Proposed and related projects would not result in cumulatively considerable impacts with respect to geology, seismicity, or soils, and no mitigation measures are required.

3.6 Greenhouse Gas Emissions

This section describes the applicable laws and regulations, existing conditions, and impact analysis for greenhouse gas (GHG) emissions. As noted below, construction and operation of the Venice Auxiliary Pumping Plant (VAPP; Proposed Project) would generate both short- and long-term emissions, but these would be less than significant and no mitigation measures are required.

3.6.1 Regulatory Setting

3.6.1.1 Federal

Although federal legislation related to GHG emissions has been introduced and regulations have been promulgated, there is currently no comprehensive policy regarding GHG emissions at the federal level.

Massachusetts et al. v. U.S. Environmental Protection Agency (2007)

Twelve U.S. states and cities, including California, in conjunction with several environmental organizations, sued the U.S. Environmental Protection Agency (EPA) to regulate GHGs as a pollutant, pursuant to the federal Clean Air Act (CAA). The Supreme Court ruled that the plaintiffs had standing to sue, finding that GHGs fit within the CAA's definition of a pollutant, and EPA's reasons for not regulating GHGs were insufficiently grounded.

As a result of the Supreme Court's ruling, on December 7, 2009, the EPA signed the Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the CAA.

- Under the Endangerment Finding, the EPA found that the current and projected concentrations of the six key well-mixed GHGs, CO_2, methane (CH_4), nitrous oxide (N_2O), perfluorinated carbons (PFCs), sulfur hexafluoride (SF_6), and hydrofluorocarbons (HFCs), in the atmosphere threaten the public health and welfare of current and future generations.
- Under the Cause or Contribute Findings, EPA found that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare.

Although EPA has yet to issue specific regulations regulating GHG emissions, the EPA Administrator's findings were the first step toward future regulations that are currently under development.

EPA Clean Power Plan (2014)

On June 2, 2014, the EPA, under President Obama's Climate Action Plan, proposed a Clean Power Plan, which would be the first to establish national GHG limits for the electric power industry. The proposed rule contains state-specific emission-reduction goals and will help cut carbon pollution from the power sector by 30% from 2005 levels by 2030.

3.6.1.2 State

California has adopted statewide legislation to address issues related to various aspects of climate change and GHG emissions mitigation. Much of this establishes a broad framework for the state's long-term GHG emissions-reduction and climate change adaptation program. The governor of California has also issued several executive orders (EO) related to the state's evolving climate change policy. Of particular importance to local governments is the direction provided by the 2008 California Assembly Bill (AB) 32 Scoping Plan, which recommends that local governments should reduce their GHG emissions to a level consistent with state goals (i.e., 15% below current levels).

In the absence of federal regulations, GHG emissions are generally regulated at the state level and typically approached by setting emissions-reduction targets for existing sources of GHG emissions, establishing policies to promote renewable energy and increase energy efficiency, and developing statewide action plans. Summaries of key policies, legal cases, regulations, and legislation at the state level relevant to the Proposed Project are provided below. Key statewide GHG regulations that are directly applicable to the Proposed Project are also included below.

Assembly Bill 32, the Global Warming Solutions Act of 2006/2011

AB 32 codified the state's GHG emissions target by requiring California's global warming emissions to be reduced to 1990 levels by 2020. Since being adopted, the California Air Resources Board (ARB), the California Energy Commission, the California Public Utilities Commission, and the California Building Standards Commission have been developing regulations that will help the state meet the goals of AB 32 and EO S-03-05. The scoping plan for AB 32 identifies specific measures to reduce GHG emissions to 1990 levels by 2020 and requires ARB and other state agencies to develop and enforce regulations and other initiatives to reduce GHG emissions. Specifically, the scoping plan articulates a key role for local governments by recommending that they establish GHG emissions-reduction goals for both their municipal operations and the community that are consistent with those of the state (i.e., approximately 15 percent below current levels (ARB 2008).

Executive Order S-03-05 (2005)

The goal of EO S-03-05 is to reduce California's GHG emissions to (1) 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80 percent below 1990 levels by 2050. In 2006, this goal was further reinforced with the passage of AB 32.

Executive Order B-30-15

Signed on April 29, 2015, EO B-30-15 set a goal of reducing GHG emissions to 40 percent below 1990 levels by 2030. The intent is for the state to achieve this interim goal in advance of AB 32's emissions target of 80 percent below 1990 levels by 2050.

California Senate Bill 97

California Senate Bill (SB) 97 required the Governor's Office of Planning and Research (OPR) to develop recommended amendments to the California Environmental Quality Act (CEQA) Guidelines for addressing GHG emissions (OPR 2008). The amendments became effective on March 18, 2010, and included amendments to the CEQA Guidelines addressing the analysis and mitigation of GHG emissions. Those CEQA Guidelines amendments clarified several points, including the following:

- Lead agencies must analyze the greenhouse gas emissions of proposed projects and reach a conclusion regarding the significance of those emissions. (See CEQA Guidelines § 15064.4.)
- When a project's greenhouse gas emissions may be significant, lead agencies must consider a range of potential mitigation measures to reduce those emissions. (See CEQA Guidelines § 15126.4(c).)
- Lead agencies must analyze potentially significant impacts associated with placing projects in hazardous locations, including locations potentially affected by climate change. (See CEQA Guidelines § 15126.2(a).)
- Lead agencies may significantly streamline the analysis of greenhouse gases on a project level by using a programmatic greenhouse gas emissions reduction plan meeting certain criteria. (See CEQA Guidelines § 15183.5(b).)
- CEQA mandates analysis of a proposed project's potential energy use (including transportation-related energy), sources of energy supply, and ways to reduce energy demand, including through the use of efficient transportation alternatives. (See CEQA Guidelines, Appendix F.)

California Senate Bill (SB) 375, Sustainable Communities and Climate Protection Act of 2008

SB 375 requires metropolitan planning organizations (MPOs) to incorporate a "sustainable communities strategy" (SCS) in their regional transportation plans (RTPs) that will achieve the GHG emissions-reduction targets that were set by ARB in February 2011. SB 375 also includes provisions for streamlined CEQA review for some infill projects, such as transit-oriented development. However, those provisions will not become effective until an SCS is adopted. The final targets require the Southern California Association of Governments (SCAG) to identify strategies to reduce per capital GHG emissions from passenger vehicles by approximately 8 percent by 2020, 18 percent by 2035, and 21% by 2040 compared with base-year (i.e., 2005) emissions.

California Green Building Standards Code and Title 24 (2010)

The Green Building Standards Code (CALGreen) applies to the planning, design, operation, construction, use, and occupancy of newly constructed buildings and requires the installation of energy- and water-efficient indoor infrastructure for all new projects beginning after January 1, 2011. CALGreen also requires newly constructed buildings develop a waste management plan and divert at least 50 percent of the construction materials generated during project construction.

Administrative regulations to CALGreen Part 11 and the California Building Energy Efficiency Standards were adopted in 2013 and took effect on January 1, 2014. The 2013 Building Energy Efficiency Standards are 25 percent more efficient than previous standards for residential construction. Part 11 also established voluntary standards that became mandatory in the 2010 edition of the code, including planning and design for sustainable site development, energy efficiency, water conservation, material conservation, and internal air contaminants. The standards offer builders better windows, insulation, lighting, ventilation systems, and other features that reduce energy consumption in homes and businesses.

The next set of energy efficiency standards will be the 2016 Building Energy Efficiency Standards, which are currently going through the rule-making process. These are expected to be adopted in 2016 and take effect on January 1, 2017. According to the California Energy Commission (CEC), single-family homes built to the 2016 standards will use about 28 percent less energy for lighting,

heating, cooling, ventilation, and water heating than those built to the 2013 standards. While the 2016 standards do not require zero net energy (ZNE) buildings, the 2019 standards are expected to take the final step toward achieving ZNE for newly constructed residential buildings throughout California. Later standards are expected to require ZNE for newly constructed commercial buildings.

Cap and Trade (2012)

On October 20, 2011, ARB adopted the final cap-and-trade program for California. The California cap-and-trade program is a market-based system with an overall emissions limit for affected sectors. Examples of affected entities include carbon dioxide suppliers, in-state electricity-generators, hydrogen production, petroleum refining, and other large-scale manufacturers and fuel suppliers. The cap-and-trade program is currently regulating more than 85% of California's emissions. Compliance requirements began according to the following schedule: (1) electricity generation and large industrial sources (2012); (2) fuel combustion and transportation (2015). Cap-and-trade allowance auction proceeds are used to fund a variety of investments. The first 3-year investment plan prioritizes (1) sustainable communities and clean transportation (including low-carbon freight equipment with specific emphasis on efforts that would be beneficial for disadvantaged communities located near ports, railyards, freeways, and distribution centers), (2) energy efficiency and clean energy, and (3) natural resources and waste diversion (ARB 2013a).

California Senate Bill (SB) 350 (2015)

SB 350 (De Leon, also known as the "Clean Energy and Pollution Reduction Act of 2015") was approved in 2015 and includes key provisions to require the following by 2030: (1) a renewable portfolio standard of 50% and (2) a doubling of efficiency for existing buildings.

3.6.1.3 Local

South Coast Air Quality Management District

The South Coast Air Quality Management District (SCAQMD) is responsible for comprehensive air pollution control in the greater Los Angeles area. To provide guidance to local lead agencies on determining significance for GHG emissions in their CEQA documents, the SCAQMD staff is convening an ongoing GHG CEQA Significance Threshold Working Group. Members of the working group include government agencies implementing CEQA and representatives from various stakeholder groups that provide input to the SCAQMD staff on developing GHG CEQA significance thresholds.

On December 5, 2008, the SCAQMD Governing Board adopted the staff proposal for an interim GHG significance threshold for projects where the SCAQMD is lead agency. At present, SCAQMD offers no regulations or thresholds for non-SCAQMD lead agency projects; however, many agencies have used the interim GHG significance threshold identified by SCAQMD in their CEQA documents.

Southern California Associated Governments (SCAG)

Regional Transportation Plan/Sustainable Communities Strategy

SCAG is required by federal law to prepare and update a 20-year long-range Regional Transportation Plan/Sustainable Communities Strategy. Key laws and requirements drive the plan including the Clean Air Act and California Senate Bill 375. Several areas in the SCAG region have

been designated as nonattainment or maintenance areas for one or more transportation-related criteria pollutants. The federal Clean Air Act, requires SCAG's 2016 RTP/SCS to meet all federal transportation conformity requirements, including: regional emissions analysis, financial constraint, timely implementation of transportation control measures, and interagency consultation and public involvement. Additionally, SB 375 requires that the RTP also include a Sustainability Community Strategy, which outlines growth strategies that better integrate land use and transportation planning and help reduce the state's greenhouse gas emissions from cars and light trucks. For the SCAG region, the California Air Resources Board (ARB) has set greenhouse gas reduction targets at eight percent below 2005 per capita emissions levels by 2020, and 13 percent below 2005 per capita emissions levels by 2035.

City of Los Angeles

Green LA: An Action Plan to Lead the Nation in Fighting Global Warming

The City of Los Angeles (City) released its climate action plan, *Green LA: An Action Plan to Lead the Nation in Fighting Global Warming*, in May 2007. The plan sets forth a goal of reducing GHG emissions in the city to 35 percent below 1990 levels by 2030. This voluntary plan identifies more than 50 action items, which are grouped into focus areas, to reduce emissions. The emphasis is on municipal facilities and operations of which the Proposed Project would play a part.

ClimateLA

ClimateLA is an implementation program that provides detailed information about each action item discussed in the Green LA framework (City of Los Angeles 2008). Action items range from harnessing wind power for electricity production to implementing energy-efficient retrofits in City buildings, converting the City's fleet vehicles to cleaner and more-efficient models, and reducing water consumption. Some actions affect only municipal facilities, such as retrofitting City Hall with high-efficiency lighting systems, while others facilitate changes in the private sector (e.g., through rebates for the purchase of energy-efficient appliances). ClimateLA is a living document, reflecting a process of ongoing learning and continuous improvement as technology advances and City departments develop expertise in the methods for lowering GHG emissions.

Sustainable City pLAn, 2015

The Sustainable City pLAn, introduced by Mayor Eric Garcetti in April 2015, identifies goals and strategies for improving Los Angeles' sustainability as it relates to the environment, the economy, and equity. With respect to GHGs, the plan commits to increasing solar power generation and energy efficiency. In addition, it accelerates the City's commitment to attaining GHG reductions, with goals that would reduce GHG emissions levels by 45 percent by 2025, 60 percent by 2035, and 80 percent by 2050 compared with 1990 baseline emissions. The plan also puts forth the goal of improving GHG efficiency[1] by 55 percent by 2025 and 75 percent by 2035 relative to 2009 levels. Other targets identified in the plan include reducing the number of vehicle miles traveled per capita by 5 percent by 2025 and 10 percent by 2035 and increasing the number of trips made by walking, biking, or transit by 35 percent by 2025 and 50 percent by 2035.

[1] GHG efficiency is measured by the amount of GHGs emitted per dollar of economic productivity.

Los Angeles Department of Water and Power: Power Integrated Resource Plan

Released to the public in December 2014, the Power Integrated Resource Plan identifies a portfolio of power generation resources and power system assets to meet the City's future energy needs, with the lowest cost and risk possible, consistent with the Los Angeles Department of Water and Power's (LADWP's) environmental priorities and reliability standards. Updates in the 2014 Power Integrated Resource Plan include new energy efficiency programs to achieve 15 percent energy efficiency savings by 2020, a Demand Response Implementation Plan with a goal to achieve 506 megawatts (MW) of demand response by 2026, and an energy storage procurement target of 178 MW by 2021 to support increased levels of renewable energy. As stated in the 2014 IRP, LADWP has increased the proportion of its electricity coming from renewable sources from 3 percent in 2003 to 23 percent in 2014, and additional increases are forthcoming.

3.6.2 Environmental Setting

A GHG is any gas that absorbs infrared radiation in the atmosphere. This absorption traps heat within the atmosphere, maintaining the earth's surface temperature at a level higher than would be the case in the absence of GHGs. GHGs include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and halogenated chlorofluorocarbons. Naturally occurring GHGs include water vapor, CO_2, CH_4, N_2O, and O_3. Human activities add to the levels of most of these naturally occurring gases. Increasing levels of GHGs in the atmosphere result in an increase in the temperature of the earth's lower atmosphere, a phenomenon that is commonly referred to as "global warming." Warming of the earth's lower atmosphere induces a suite of additional changes, including changes in global precipitation patterns; ocean circulation, temperature, and acidity; global mean sea level; species distribution and diversity; and the timing of biological processes. These large-scale changes are collectively referred to as "global climate change."

The Intergovernmental Panel on Climate Change (IPCC) has been established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change and its potential impacts and provide options for adaptation and mitigation. As the leading authority on climate change science, IPCC's best estimates are that average global temperature rise between 2000 and 2100 could range from 0.5°F to 8.6°F (IPCC 2013). Large increases in global temperatures, as high as 8.6°F, could have massive deleterious impacts on natural and human environments. IPCC has concluded that "human influence on the climate system is clear and growing, with impacts observed across all continents and oceans. Many of the observed changes since the 1950s are unprecedented over decades to millennia. The IPCC is now 95 percent certain that humans are the main cause of current global warming" (IPCC 2014: v).

Since the industrial revolution began in approximately 1750, the concentration of CO_2 in the earth's atmosphere has increased from 270 parts per million (ppm) to roughly 391 ppm. Atmospheric concentrations of CH_4 and N_2O have similarly increased since the beginning of the industrial age. Since 1880, the global average surface temperature has increased by 1.5°F, the global average sea level has risen by nearly 190 millimeters (since 1901), and northern hemisphere snow cover (data available since 1920) has decreased by nearly 3 million square kilometers (IPCC 2013). These recently recorded changes can be attributed with a high degree of certainty to increased concentrations of GHGs in the atmosphere. Sinks of CO_2 (which remove rather than emit CO_2) include uptake by vegetation and dissolution into the ocean. Global GHG emissions greatly exceed the removal capacity of natural sinks. As a result, concentrations of GHGs in the atmosphere are increasing (California Energy Commission 2006).

GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants (TACs). Criteria air pollutants and TACs occur locally or regionally, and local concentrations respond to locally implemented control measures. The long atmospheric lifetimes of GHGs allow them to be transported great distances from sources and become well mixed, unlike criteria air pollutants. Climate change is the cumulative result of GHG emissions and GHG emissions are the cause, on a cumulative basis, of the significant adverse environmental impacts of global climate change.

3.6.2.1 Definition of Greenhouse Gases

The GHGs listed by the IPCC (CO_2, CH_4, N_2O, HFCs, PFCs, and sulphur hexafluoride [SF_6]) (2013) are discussed in this section in order of abundance in the atmosphere. California law and the State CEQA Guidelines contain a similar definition of GHGs (Health and Safety Code Section 38505(g); 14 California Code of Regulations Section 15364.5). Water vapor, the most abundant GHG, is not included in this list because its natural concentrations and fluctuations far outweigh its anthropogenic (human-made) sources.[2] The sources and sinks[3] of each of these gases are discussed in detail below. Generally, GHG emissions are quantified and presented in terms of metric tons of carbon dioxide equivalent (CO_2e) emitted per year. The primary GHGs associated with the project are CO_2, CH_4, and N_2O. HFCs, PFCs, and SF_6 are associated primarily with industrial processes and, thus, are not discussed herein.

To simplify reporting and analysis, GHGs are commonly defined in terms of global warming potential (GWP). The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2e. The GWP of CO_2 is, by definition, 1. The GWP values used in this report are based on IPCC Fourth Assessment Report (AR4) and United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines and defined in Table 3.6-1, below (IPCC 2007). The AR4 GWP values are used in ARB's California inventory and the most recent AB 32 Scoping Plan estimate update (ARB 2014a).

Table 3.6-1. Lifetime, Global Warming Potential, and Abundance of Several Significant GHGs

Gas	Global Warming Potential (100 years)	Lifetime (years)[a]	Atmospheric Abundance
CO_2 (ppm)	1	50–200	394
CH_4 (ppb)	25	9–15	1,893
N_2O (ppb)	298	121	326

[a] Defined as the half-life of the gas.
ppm = parts per million; ppb = parts per billion
Sources: Myhre et al. 2013; Blasing 2014; ARB 2014a.

[2] Although water vapor plays a substantive role in the natural greenhouse effect, the change in GHGs in the atmosphere due to anthropogenic actions is enough to upset the radiative balance of the atmosphere and result in global warming.
[3] A sink removes and stores GHGs in another form. For example, vegetation is a sink because it removes atmospheric CO_2 during respiration and stores the gas as a chemical compound in its tissues.

CO_2 is the most important anthropogenic GHG. It accounts for more than 75 percent of all GHG emissions emitted by humans. Its atmospheric lifetime of 50 to 200 years ensures that atmospheric concentrations of CO_2 will remain elevated for decades, even after mitigation efforts to reduce GHG concentrations are promulgated (IPCC 2007). The primary sources of anthropogenic CO_2 in the atmosphere include fossil fuel usage (including motor vehicle fuels and coal power plants), gas flaring, cement production, and land use changes (including deforestation).

CH_4, the main component of natural gas, is the second-most abundant GHG and has a GWP of 25 (IPCC 2007). Sources of anthropogenic emissions of CH_4 include growing rice, raising cattle, natural gas combustion, landfill outgassing, and coal mining (National Oceanic and Atmospheric Administration 2005).

N_2O is a powerful GHG, with a GWP of 298 (IPCC 2007). Anthropogenic sources of N_2O include agricultural processes (e.g., fertilizer application), nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions. N_2O is also used in rocket engines and racecars and as an aerosol spray propellant. In the United States, more than 70 percent of N_2O emissions are related to agricultural soil management practices, particularly fertilizer applications.

3.6.2.2 GHG Emissions Sources

More than 97 percent of U.S. GHG emissions result from burning fossil fuels. Although many nations, including the U.S., regularly monitor and report GHG emissions, federal legislation to reduce global emissions has not been adopted, although it is the subject of much debate. EPA is presently pursuing the regulation of GHGs through the federal CAA, following a U.S. Supreme Court ruling that clarified its authority under the CAA to do so. Many states, including California, as a prominent leader, have passed legislation to reduce GHG emissions. California's GHG regulatory framework is discussed in the *Regulatory Setting* section.

Greenhouse Gas Inventories

A GHG inventory is a quantification of all GHG emissions and sinks within a selected physical and/or economic boundary. GHGs can be inventoried on a large scale (i.e., for global and national entities) or a small scale (i.e., for a particular building or person). Although many processes are difficult to evaluate, several agencies have developed tools to quantify emissions from certain sources.

U.S. Greenhouse Gas Emissions Inventory

EPA estimates that total U.S. GHG emissions for 2013 amounted to 6,673 million metric tons (MMT) of CO_2e, which represents a 2.0 percent increase compared with 2012 levels but a 9.0 percent decrease from 2005 levels and a 5.9 percent decrease from 1990 levels. The largest contributors to U.S. GHG emissions in 2013 were electricity generation (31 percent), transportation (27 percent), and the industrial sector (21 percent). Emissions in the electricity generation, transportation, residential, commercial, and industrial sectors consist primarily of CO_2 (82 percent of emissions). GHG emissions from agriculture consist predominantly of CH_4 and N_2O. In general, industrial and, to a lesser extent, commercial emissions in the U.S. have declined over the last decade, while emissions in other sectors, such as transportation, have grown steadily. U.S. GHG emissions are responsible for approximately 16 percent of the global total (EPA 2015).

California Greenhouse Gas Emissions Inventory

In 2013, total California GHG emissions were estimated to be 459.3 $MMTCO_2e$. The transportation sector accounted for approximately 37 percent of total emissions, followed by electricity generation (20 percent), the industrial sector (23 percent), commercial and residential sources (12 percent), agriculture (8 percent), and other sources (6 percent) (ARB 2015).

Annual statewide GHG emissions inventories provide an important tool for establishing historical emission trends and tracking California's progress toward the 2020 goal. From 2000 to 2013, GHG emissions decreased by 2.0 percent. In addition, California's per capita GHG emissions have generally decreased over the last 12 years, going from 14.0 metric tons of CO_2e per person in 2001 to 12.0 in 2013, a 14 percent decrease (ARB 2015).

City of Los Angeles Greenhouse Gas Emissions Inventory

In 2004, total community-wide GHG emissions were greater than 50 $MMTCO_2e$, roughly the same amount as that of Sweden. The transportation sector accounted for approximately 47 percent of total emissions, followed by electricity generation (approximately 32 percent), natural gas use (9 percent), and the burning of other industrial fuels (12 percent) (City of Los Angeles 2008). The City's *Green LA: An Action Plan to Lead the Nation in Fighting Global Warming* includes more than 50 actions for reducing city-wide GHG emissions as well as measures for adapting to the effects of climate change. The City's goal is to reduce GHG emissions to 35 percent below 1990 levels by 2030 (City of Los Angeles 2007).

3.6.2.3 Local Setting

The Bureau of Sanitation is responsible for operating and maintaining one of the world's largest wastewater collection and treatment systems. More than 6,500 miles of sewers serve more than 4 million residential and business customers in Los Angeles as well as 29 contracting cities and agencies. These sewers are connected to the City's four wastewater and water reclamation plants, which process, on average, 550 million gallons per day (mgd). Wastewater treatment operations (processes) are very energy intensive. Such operations, including associated buildings, consume the second-largest amount of electricity among City departments and generate 12.9 percent of all indirect GHG emissions. Wastewater operations, including associated buildings, are ranked fifth among City departments in natural gas usage (City of Los Angeles 2008).

The existing pumps at VPP consume approximately 6.5 million kWh per year.[4] Based on the carbon intensity of LADWP's electricity for 2013, the existing GHG consumption of the existing facility is approximately 3,300 metric tons annually (see Appendix B [Air Quality Emissions and Greenhouse Gas Calculations] of this EIR).

[4] Assumes an annualized 36-mgd wastewater flow.

3.6.3 Environmental Impact Analysis

3.6.3.1 Methodology

Construction

Project construction would be a source of GHG emissions. Such emissions would result from earth moving, the use of heavy equipment, and vehicle use as well as land clearing, ground excavation, and cut-and-fill activities. Construction-period GHG emissions were quantified by using CalEEMod (version 2013.2.2) annual outputs. CalEEMod has been approved by SCAQMD for emissions estimations within the South Coast Air Basin. Consistent with SCAQMD-recommended methodology, total construction-period emissions were amortized over a 30-year period, the assumed life of the Proposed Project, then added to the opening-year GHG emissions total to determine tons per year.

Operation

CalEEMod annual outputs were also used to determine operational GHG emissions. Based on information provided by the project design team (Arcadis), the proposed pumps at VAPP would be more efficient than the existing pumps at VPP. Because the Proposed Project would create redundancy for increased system reliability, the additional pumping capacity would not be needed except during wet-weather events. Assuming an annualized 36-mgd flow for the combined VPP and VAPP facility, there would be little change in overall energy consumption related to pumping. However, there would be an increase in energy consumption related to the operational control room, which would consume approximately 570,000 kWh per year (Arcadis 2016). Additional electricity consumption was assumed based on CalEEMod defaults (see Appendix B of this EIR).

3.6.3.2 Screening Analysis

As noted in Section Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study] of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in CEQA Appendix G and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.6.3.3 Thresholds of Significance

State CEQA Guidelines Section 15064.4 provides guidance to lead agencies for determining the significance of impacts from GHG emissions. Section 15064.4(a) states that a lead agency should make a good-faith effort that is based, to the extent possible, on scientific and factual data to describe, calculate, or estimate the amount of GHG emissions that would result from a project. State CEQA Guidelines Section 15064.4(b) also states that, when assessing the significance of impacts from GHG emissions, a lead agency should consider (1) the extent to which the project may increase or reduce GHG emissions compared with existing conditions, (2) whether the project's GHG emissions would exceed a threshold of significance that the lead agency has determined to be applicable to the project, and (3) the extent to which the project would comply with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.

Because the *L.A. CEQA Thresholds Guide* was adopted prior to the requirement for GHG impacts to be addressed as part of CEQA, there are no local thresholds of significance related to GHGs. Therefore, the thresholds of significance from Appendix G of the State CEQA Guidelines are used, which state that a proposed project would normally have a significant impact on GHG emissions if it were to:

GHG-1. Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment;

GHG-2. Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.

The State CEQA Guidelines also state that the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the above determinations.

Although SCAQMD has not adopted quantitative thresholds, its staff has developed interim GHG significance thresholds that are applicable to industrial (stationary-source) projects where SCAQMD is the lead agency. The threshold identified by SCAQMD indicates that a project would normally have significant impacts with respect to GHG emissions if it were to:

GHG-3. Result in more than 10,000 metric tons of CO_2e per year, including construction emissions amortized over 30 years added to operational GHG emissions (SCAQMD 2008).

The Proposed Project uses this threshold in its determination of significance.

The project's GHG emissions were evaluated for consistency with California's AB 32 (the Global Warming Solutions Act of 2006) emissions reduction goals, as well as other applicable local plans for reducing GHGs.

Note that GHGs are exclusively cumulative impacts. Therefore, in accordance with the scientific consensus regarding the cumulative nature of GHGs, the analysis herein analyzes the cumulative contribution of project-related GHG emissions.

3.6.3.4 Construction and Operational Impacts

GHG-1. Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.

Construction of the Proposed Project would result in GHG emissions from fuel combustion associated with heavy-duty construction equipment, construction workers' vehicle trips, material deliveries, and trips by haul trucks. In addition, earthwork would require fuel combustion, resulting in further GHG emissions. As shown in Table 3.6-2, these activities would emit approximately 691 metric tons of CO_2e. Consistent with SCAQMD-prescribed methodology, emissions were amortized over a 30-year period, resulting in 23 metric tons of CO_2e per year.

Table 3.6-2. Project-Related GHG Emissions

Phase	CO_2e (metric tons)
Construction	
Total Construction	691
Amortized Construction	23
Operation	
Annual Operation	382
Energy	336
Mobile	21
Waste	6
Water	19
TOTAL[a]	405
SCAQMD Threshold	10,000

[a] The total includes amortized construction emissions.
Source: CalEEMod modeling by ICF, 2016 (Appendix B of this EIR).

Operation of the Proposed Project would result in GHG emissions from direct energy consumption at the operational building, employee vehicle trips, and waste and potable water distribution. As shown in Table 3.6-2, with the amortized construction-period emissions, project implementation would result in annual emissions of approximately 405 metric tons CO_2e. Table 3.6-2 does not quantify emissions associated with pumping at the future facility, as wastewater flows would not be increased as a result of project implementation. The Proposed Project would create additional capacity for use during infrequent wet-weather events (extreme weather flows), but any increases in emissions due to pumping would be offset by the increased efficiency of the VAPP pumps and the decreasing carbon intensity of LADWP's electricity.

As GHG emissions resulting from project implementation would not exceed SCAQMD's 10,000-metric-ton threshold, impacts would be **less than significant**, and no mitigation measures are required.

GHG-2. Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.

Implementation of the Proposed Project would generate GHG emissions that would be greater than existing conditions, but would not exceed the interim SCAQMD threshold, as shown in Table 3.6-2. Therefore, the Proposed Project would not directly contribute to the GHG reductions envisioned under AB 32, SB 375, Green LA, ClimateLA, or the Sustainable City pLAn, but would not conflict with state and local GHG reduction goals. Although the project type is not explicitly discussed in any of the GHG reduction plans identified above, Action E12 within ClimateLA aims to "maximize the energy efficiency of wastewater treatment equipment" (City of Los Angeles 2008). Energy efficiency has been incorporated into the project design through the use of variable frequency drives for the pumps, which adjust motor speeds to vary discharge flows, thereby allowing for efficient pump operation. Also, the new pumps would be more energy-efficient than the existing VPP pumps. Thus, the Proposed Project would be consistent with Action E12.

The City has several plans in place addressing GHG emissions reductions (ClimateLA, Green LA, and the Sustainable City pLAn), but the reduction targets are not legally binding. Therefore, the most applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions is AB 32, which codified the state's GHG emissions-reduction targets for 2020. Beyond 2020, there are no adopted enforceable plans, policies, or regulations pursuant to EO S-03-05 and EO B-30-15 that are legally applicable to the project. Regardless, an overview of proposed plans and discussion documents designed to help meet EO S-03-05 and EO B-30-15 targets is provided.

AB 32 Scoping Plan

AB 32 identified 427 $MMTCO_2e$ as the acceptable level of GHG emissions for California in 2020, which is the same as the 1990 GHG emissions level and approximately 28.5% less than 2020 business-as-usual (BAU) conditions (596 $MMTCO_2e$).[5] To reach the target level, there will have to be widespread reductions in GHG emissions across California. Some reductions will need to come in the form of changes pertaining to vehicle emissions and mileage standards. Some will come from changes pertaining to sources of electricity and increased energy efficiency at existing facilities. The remainder will need to come from plans, policies, or regulations that will require new facilities to have lower carbon intensities than they have under BAU conditions.

The AB 32 Scoping Plan details specific GHG emissions-reduction measures that target specific GHG emissions sources. The scoping plan considers a range of actions, including direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms (e.g., a cap-and-trade system). Also included are mobile-source emissions reduction measures (Pavley, Low-Carbon Fuel Standard [LCFS], vehicle efficiency measures), energy production–related emissions-reduction measures (natural gas transmission and distribution efficiency measures, natural gas extraction efficiency measures), and the renewable portfolio standard (electricity). The Proposed Project would be consistent with the measures identified in Table 3.6-3 contained within the AB 32 Scoping Plan and other measures adopted by ARB but not yet included in the scoping plan. A demonstration of the consistency with key ARB measures is included in Table 3.6-3. As a result, Proposed Project-related GHG emissions would be reduced through several of the AB 32 Scoping Plan measures. Accordingly, the Proposed Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs, and as such, **impacts would be less than significant**, and no mitigation measures are required.

[5] ARB recently updated the AB 32 Scoping Plan and revised the 2020 BAU downward slightly to 509 $MMTCO_2e$, which reflects the reduced GHG emissions estimates resulting from the recent economic downturn and increased efficiencies.

Table 3.6-3. Project Consistency with AB 32 Scoping Plan and Other ARB Measures

No.	Measure Description	Project Consistency
Scoping Plan Measures		
T-1	Advanced Clean Cars	**No conflict**. State program that requires no action at the local or project level. Benefits to project-related employee vehicle travel will be realized.
T-2	Low Carbon Fuel Standard	**No conflict**. State program that requires no action at the local or project level. Benefits to project-related vehicle travel will be realized.
T-3	Regional Transportation-Related Greenhouse Gas Targets	**No conflict**. State program that requires no action at the project level. SCAG is responsible for implementing the SCS and is currently revising the SCS as part of the 2016 RTP/SCS. Benefits to project-related employee vehicle travel will be realized.
T-4	Vehicle Efficiency Measures 1. Tire Pressure 2. Fuel Efficiency Tire Program 3. Low Friction Oil 4. Solar Reflective Automotive Paint and Window Glazing	**No conflict**. State program that requires no action at the local or project level. Benefits to project-related car and truck travel will be realized.
T-7	Heavy-Duty Vehicle GHG Emission Reduction 1. Tractor-Trailer GHG Regulation 2. Heavy Duty Greenhouse Gas Standards for New Vehicle and Engines (Phase I)	**No conflict**. State and federal programs that require no action at the local or project level. Benefits to project-related truck travel will be realized.
E-1	1. Building Energy Efficiency – Electricity 2.Appliance Energy Efficiency Standards – Electricity	**No conflict**. State program that requires no action at the local or project level. Proposed Project includes building efficiency design that will reduce emissions from electricity consumption.
CR-1	1. Building Energy Efficiency – Natural Gas 2.Appliance Energy Efficiency Standards – Natural Gas	**No conflict**. State program that requires no action at the local or project level. Proposed Project includes building efficiency design that will reduce emissions from natural gas consumption.
E-3	33 Percent Renewable Portfolio Standard	**No conflict**. State program that requires no action at the local or project level. Benefits to project-related electricity and water consumption will be realized.
W-1	Water Use Efficiency	**No conflict**. The Proposed Project proposes water fixture and irrigation efficiency measures to reduce water use. Moreover, this is a state program that requires no action at the local or project level. Benefits will be realized at the project level.
H-5	1. Low Global Warming Potential Refrigerants for New Motor Vehicle Air-Conditioning Systems	**No conflict**. State program that requires no action at the local or project level. Benefits will be realized independently.

No.	Measure Description	Project Consistency
Other ARB Measures		
-	Renewable Portfolio Standard (50% by 2030) per SB 350	**No conflict**. See E-3. State program that requires no action at the local or project level. Benefits to project-related electricity and water consumption will be realized.
-	Pavley (AB 1493)	**No conflict**. See T-1 and T-2. State program that requires no action at the local or project level. Benefits to project-related employee car travel will be realized.
-	Heavy Duty (Tractor-Trailer) GHG Regulation	**No conflict**. See T-7. State and federal programs that require no action at the local or project level. Benefits to project-related truck travel will be realized.

Source: ARB 2008; ARB 2014a.
Notes:
T = Transportation Measures; E = Electricity Measures; W = Water Measures; H = High GWP Measures

Green LA, ClimateLA, and Sustainability pLAn

The City's Green LA Climate Action Plan (CAP) created a concrete set of objectives and actions designed to make Los Angeles a leader in confronting global climate change and reducing GHG emissions. The Green LA CAP identifies over 50 individual action items that will lead Los Angeles to lower GHG emission levels. The City's ClimateLA is the implementation program for the Green LA Plan, and describes each of these action items, providing a context, lead departments, a timeline for completion of each measure, and GHG reduction potential from each action item. These action items and measures aim to reduce emissions directly from municipal facilities and operations and create a framework to address citywide GHG emissions. The actions build on the City's leadership in developing and implementing sustainable environmental policy. The major focus areas include energy, water transportation, land use, waste, Port, airport, open space and greening, green economy, and adaptation. The Sustainable City pLAn builds on ClimateLA and Green LA, and accelerates the City's commitment to reducing GHG emissions. A summary of project consistency with major goals and action items included in Green LA, ClimateLA, and the Sustainable City pLAn is provided in Table 3.6-4. As shown below, the project would not conflict with major goals and action items within the City's Green LA CAP, ClimateLA implementation plan, or Sustainable City pLAn. Accordingly, the Proposed Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs, and as such, **impacts would be less than significant and no mitigation measures are required.**

Table 3.6-4. Project Consistency with Green LA and ClimateLA, and Sustainable City pLAn Goals, Actions, and Targets

No.	Goal or Action Description	Project Consistency
Goal	Green the Power From the Largest Municipal Utility in the United States	**No conflict.** Actions include increasing use of renewables to 20% by 2010 and to 35% by 2020. This is a regional action that requires no action at the project level and reductions will be realized over time (similar to statewide RPS).
Goal	Transform Los Angeles Into The Model of an Energy Efficient City	**No conflict.** Actions include reducing energy use by all City departments to the maximum extent feasible and completing energy efficiency retrofits of all City-owned buildings to meet a 20% or more reduction in energy consumption. The Proposed Project would add redundancy and capacity relative to existing conditions, but would involve the use of more energy-efficient pumps.
Action E7	Reduce energy use by all City departments to the maximum extent feasible.	**No conflict.** The Proposed Project would add redundancy and capacity, which would require additional energy use compared with existing conditions. However, the project would not preclude the Department of Public Works from achieving overall reductions in energy use through other projects.
Action E12	Maximize energy efficiency of wastewater treatment equipment.	**No conflict.** Energy efficiency has been incorporated into the project design through the use of variable frequency drives for the pumps, which adjust motor speeds to vary discharge flows, thereby allowing for efficient pump operation. In addition, the new pumps would be more energy-efficient than the existing pumps.
Goal	Decrease Per Capita Water Use	**No conflict**. Actions include meeting all additional demand for water resulting from growth through water conservation and recycling, reducing per capita water consumption by 20%, and implementing the City's innovative water and wastewater integrated resources plan that will increase conservation, and maximize use of recycled water, including capture and reuse of stormwater. The Proposed Project would require minimal amounts of potable water, primarily for cleaning and restroom facilities, and would be in compliance with all standards for water efficiency.
Target	Reduce number of annual sewer spill to fewer than 100 by 2025 and 67 by 2035.	**No conflict.** The Proposed Project would add redundancy and capacity to prevent sanitary sewer overflows.

EO S-03-05 and EO B-30-15

EO B-30-15 established an interim GHG reduction target of 40 percent below 1990 levels by 2030, and EO S-3-05 established a long-term goal of reducing statewide GHG emissions to 80 percent below 1990 levels by 2050. Achieving these long-term GHG reduction policies will require systemic changes in how energy is produced and used.

There a number of studies that discuss potential mechanisms for limiting statewide GHG emissions to meet the aggressive goals identified by EO B-30-15 and EO S-3-05. For example, ARB and other state agencies commissioned Energy + Environmental Economics (E3) in 2015 to develop feasible GHG reduction scenarios for 2030. Other studies include a report by the California Center for Science and Technology (2012), the California Department of Transportation's (2015) *California Transportation Plan 2040,* ARB's *First Update to the AB 32 Scoping Plan*, and a study published in *Science* that analyzes the changes that will be required to reduce GHG emissions to 80 percent below 1990 levels by 2050 (Williams et al. 2012). In general, these studies reach similar conclusions—deep reductions in GHG emissions can *only* be achieved with significant changes in electricity production, transportation fuels, and industrial processes (e.g., decarbonizing electricity production, electrifying transportation, utilizing alternative fuels for aviation).

The systemic changes that will be required to achieve EO B-30-15 and EO S-3-05, if they are legislatively adopted, will require significant policy, technical, and economic solutions. Some changes, such as the use of alternative fuels (e.g., biofuel) to replace petroleum for aviation, cannot be accomplished without action by the federal government. Similarly, achieving the reduction goals will require California to dramatically increase the amount of electricity that is generated by renewable generation sources and, correspondingly, advance the deployment of energy storage technology and smart-grid strategies, such as price-responsive demand and the smart charging of vehicles. Although the City has increased its efforts in all of the areas discussed above, most notably for renewable source electricity generation, a significant statewide redesign of California's electricity system is needed to accomplish GHG emissions reduction goals. Accordingly, in evaluating the project's emissions for consistency with EO S-3-05 and EO B-30-15, it is important to note that many of the broad-scale shifts needed to meet the reduction goals are outside of the control of the City and beyond the scope of the Proposed Project.

The long-term climate change policy and regulatory changes that will be enacted to meet 2030 and 2050 emissions reduction targets are unknown at this time. As a consequence, the extent to which the project's emissions and resulting impacts will be mitigated through implementation of statewide (and nationwide) changes is not known. However, some of the anticipated statewide actions (e.g., decarbonization, energy efficiency, alternative transportation) can be facilitated, at least to some extent, through implementation of specific GHG reduction measures in large-scale developments. The Proposed Project includes a variable frequency drive, which would optimize the energy efficiency of the pumps.

The Proposed Project would be constructed and fully operational prior to 2020, but would remain in operation over a long period of years. Project features are consistent with anticipated long-term statewide strategies to reduce GHG emissions and would help to facilitate substantial progress towards long term targets as adopted (SB 350) and proposed (Phase 2 trucks) state regulations are fully realized. Accordingly, the Proposed Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs, and as such, **impacts would be less than significant and no mitigation measures are required.**

2016-2040 RTP/SCS and Air Quality Management Plan

SCAG is the regional planning agency for Los Angeles, Orange, Ventura, Riverside, San Bernardino, and Imperial Counties. SCAG addresses regional issues related to transportation, the economy, community development, and the environment. SCAG's 2016-2040 RTP/SCS integrates land use and transportation strategies to meet and exceed required emission reductions per SB 375 of 8% by 2020, and 18% by 2035 and 21% by 2040 compared with the base year (i.e., 2005). The RTP/SCS includes setting forth a development pattern for the region integrates with the transportation network, measures, and policies to reduce GHG emissions from light-duty automobiles and trucks. The RTP/SCS must conform to the federal Clean Air Act.

Most emissions from typical development projects are generated by the transportation sector and the transportation sector is subject to the most robust regulatory program. For example, LCFS, Pavley I, and Pavley II are expected to reduce GHG emissions from passenger vehicles approximately 34 percent by 2020.[6] Emissions from heavy-duty trucks would decrease over time per adopted ("Phase 1") and pending ("Phase 2") GHG-reduction regulations from both the ARB and EPA.[7] Additionally, GHG intensity of buildings would decrease as the state and LADWP move towards the 50% renewable requirement per SB 350. The project proposes a land use that would not generate a substantial number of vehicle trips, and associated mobile source emissions would not conflict with or delay implementation of the SCS/RTP. This **impact is considered less than significant.**

Because sources of GHG emissions are frequently responsible for emitting criteria pollutants as well, an analysis of the project's potential for conflicts the SCAQMD Air Quality Management Plan is discussed below. SCAQMD is required to reduce emissions of criteria pollutants for which the Basin is in nonattainment status and develop reduction attainment plans. SCAQMD's most recent plan to achieve air quality standards is the 2012 AQMP, which outlines a comprehensive control strategy to meet PM2.5 and O_3 standards. Additionally, measures within AB 32 are aimed at GHG-emitting sources that are in most cases the same sources that emit criteria pollutants, including pollutants that contribute to the Basin's nonattainment status. The 2012 AQMP includes an analysis of the air quality co-benefits of AB 32. The SCAQMD relies on various emission reduction control strategies aimed primarily at stationary (permitted), area, and mobile sources. The mobile source strategy includes actions seeking further emission reductions from both on-road and off-road mobile sources, such as accelerated penetration of zero- and near-zero emission vehicles and early retirement of older vehicles. Some of the proposed actions rely on other agencies, including the state, to implement (SCAQMD 2013). As described in the Air Quality section of this EIR, the project would be consistent with the AQMP because it would result in emissions below regional and localized criteria pollutant thresholds to ensure that no violations of the National Ambient Air Quality Standards and California Ambient Air Quality Standards occur locally. Accordingly, the Proposed Project would not delay implementation of the AQMP. Therefore, the Proposed Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs, and as such, **impacts would be less than significant and no mitigation measures are required.**

[6] Pavley I and II require manufacturers to reduce per-mile GHG emissions starting in 2009. Pavley I required manufacturers to reduce emissions by about 30% by 2016; Pavley II sets a reduction target of 45% by 2020.

[7] Phase 1 and Phase 2 refer to the National Highway Traffic Safety Administration's HD Fuel Efficiency Improvement Program, which requires improvements in fuel efficiency for medium- and heavy-duty on-road vehicles.

3.6.4 Mitigation Measures

No mitigation measures are required.

3.6.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts would result from project implementation related to GHGs.

3.6.6 Cumulative Impacts

GHG emissions are exclusively cumulative impacts; there are no non-cumulative GHG emissions impacts from a climate change perspective. No single project, when considered in isolation, can cause climate change because a single project's emissions are not enough to change the radiative balance of the atmosphere. Because climate change is the result of GHG emissions and GHGs are emitted by innumerable sources worldwide, global climate change will have a significant cumulative impact on the natural environment as well as human development and activity. As such, GHGs and climate change are cumulatively considerable, even though the contribution may be individually limited (SCAQMD 2008). SCAQMD methodology and thresholds are thus cumulative in nature. As discussed above, the Proposed Project would not exceed the threshold of significance. Based on the project not exceeding the SCAQMD emissions threshold and the lack of conflict with GHG emissions reductions plans and policies, **the Proposed Project would not result in a cumulatively considerable impact related to GHGs.**

3.7 Hydrology and Water Quality

This section describes the regulatory setting and current conditions of the Project Site related to hydrology, water quality, tsunami, and sea level rise. The environmental setting information and analysis in this section are based on the *Hydrology Technical Memorandum* prepared by Watearth, dated August, 2016. This technical report is hereby incorporated by reference and included as Appendix H of this Draft Environmental Impact Report (EIR).

The *Hydrology Technical Memorandum* was prepared to provide recommendations for design and construction of the Venice Auxiliary Pumping Plant (VAPP or Proposed Project) at the Project Site. Thus, the recommendations presented in that report are incorporated into project design and construction and address on- and off-site hydrology and water quality impacts. As noted in the analysis below, with the implementation of best management practices, most direct and indirect impacts associated with hydrology and water quality during construction or operation of the Proposed Project would be less than significant. However, impacts related to inundation associated with tsunami and sea level rise are significant and unavoidable.

3.7.1 Regulatory Setting

This section provides an overview of the pertinent federal, state, and local policies governing hydrology, water quality, and sea level rise for the Proposed Project.

3.7.1.1 Federal

Clean Water Act

The federal Clean Water Act (CWA) of 1977 (33 U.S. Code Section 1251 et seq.), which amended the federal Water Pollution Control Act of 1972, established the basic structure for regulating discharges of pollutants into the waters of the United States (not including groundwater). The CWA delegates authority to the U.S. Environmental Protection Agency (EPA) to implement pollution control programs. Under the CWA, it is unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a National Pollutant Discharge Elimination System (NPDES) permit is obtained and implemented in compliance. In addition, the CWA requires that states adopt water quality standards (WQS) for water bodies and that those standards be approved by EPA. Water quality standards consist of two components: designated beneficial uses for a particular receiving water body (e.g., wildlife habitat, agricultural supply, fishing), and water quality criteria necessary to support those uses.

Section 303: Impaired Water Bodies (303(d) list) and Total Maximum Daily Loads

Section 303(d) requires each state to identify and list impaired surface waters that do not meet or that the state expects will not meet state water quality standards. In California, the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) are responsible for assessing water quality monitoring data for surface waters every two years to determine if they contain pollutants exceeding the levels established in water quality standards. For these waters, the RWQCBs are required to develop total maximum daily loads (TMDL) of pollutants for impaired water bodies and a program of implementation to meet the TMDLs. The TMDL must account for the pollution sources causing the water to be listed by the state. The TMDL is a

calculation of the maximum amount of a pollutant that a water body can receive while still meeting water quality standards. TMDLs also define an allocation of that load among the various sources of that pollutant (i.e., municipalities, other permitted entities, etc.). Additionally, the TMDL can act as a plan to reduce pollutant loading, which improves water quality. After implementation of a TMDL, it is anticipated that the problems that led to placement of a given pollutant on the Section 303(d) list would be remediated.

The SWRCB has combined its 303(d) list and the 305(b) report into the 2012 California Integrated Report. After approval of the 303(d) list portion of the California Integrated Report by the SWRCB, the complete California Integrated Report was submitted to the USEPA. The USEPA approved the 303(d) list portion of the California Integrated Report on July 30, 2015.

The SWRCB 303(d)-listed impaired waters that could potentially be affected by the Proposed Project are discussed and evaluated in Table 3.7-1.

Section 401: Water Quality Certification

Section 401 of the CWA requires an applicant for any federal permit that proposes an activity that may result in a discharge to waters of the United States to obtain certification from the state that the discharge will comply with other provisions of the CWA. In California, the authority to either grant water quality certification or waive the requirement is delegated by the SWRCB to the nine RWQCBs. After receiving the certification, applicants are required to meet effluent limitations and monitoring requirements necessary to ensure compliance with the federal license or permit. The 401 certification provides for the protection of the physical, chemical, and biological integrity of waters.

Section 402: National Pollutant Discharge Elimination System Permits

Section 402 of the CWA establishes the NPDES permit program to regulate the discharge of pollutants from point sources (storm drains, ditches, etc.) into waters of the U.S. In general, the NPDES permit program controls, minimizes, or reduces surface water impacts. In California, the SWRCB administers the NPDES program, and the RWQCBs have implementation and enforcement responsibilities. The NPDES program is applicable to all discharges to waters of the U.S., including stormwater associated with construction activities, industrial operations, municipal drainage systems, and point sources to protect surface water quality. CWA Section 402(p) requires that states develop and implement stormwater management programs to meet the requirements for stormwater discharges from construction activities, industrial operations, and municipal separate storm sewer systems (MS4 permit [see below]).

Stormwater discharges in California are commonly regulated through general and individual NPDES permits, which are adopted by the SWRCB or RWQCBs and are administered by the RWQCBs. Two types of the NPDES program stormwater permits would be relevant to the Project Site and are discussed in Section 3.7.1.2, NPDES, the Construction General Permit (discussed below) and MS4 Permit.

Section 404: Permits For Dredged or Fill Material

Under Section 404, the U.S. Army Corps of Engineers (USACE) and the EPA regulate the discharge of dredged and fill materials into the waters of the United States. These waters are primarily defined as navigable waterways or water features (including wetlands) that have a significant nexus to navigable waters. Project sponsors must obtain authorization from USACE for all discharges of dredged or fill materials into waters of the United States before proceeding with a proposed activity.

Individual Section 404 permits may only be issued for a least environmentally damaging practicable alternative. Compliance with CWA Section 404 requires compliance with several other environmental laws and regulations. The USACE cannot issue an individual permit or verify the use of a general permit until the requirements of the National Environmental Policy Act of 1969 (NEPA), Endangered Species Act (ESA), the Coastal Zone Management Act (CZMA), and the National Historic Preservation Act (NHPA) have been met. Additionally, no permit can be issued or verified until a water quality certification, or waiver of certification, has been issued pursuant to CWA Section 401.

Section 10 of Rivers and Harbors Act of 1899

The Rivers and Harbors Act is a primary federal law regulating activities that may affect navigation on the nation's waterways. Section 10 of the Rivers and Harbors Act grants USACE control over obstructions to navigable waters of the U.S. and gives the USACE exclusive authority to approve construction of smaller structures, such as wharves, booms, and bulkheads, as well as to approve dredging and filling operations.

The Proposed Project may require a Section 10 Permit from the USACE for the submerged diversion structure within the Grand Canal.

Federal Executive Order 11988—Floodplain Management

Executive Order 11988 requires federal agencies to recognize the value of floodplains and to consider the public benefits of restoring and preserving floodplains. Under this order, the USACE has the responsibility of reviewing flood protection projects that may affect navigable waters. USACE is required to take action and provide leadership to avoid development in the base floodplain; reduce the risk and hazard associated with floods; minimize the impact of floods on human health, welfare, and safety; and restore and preserve the beneficial and natural values of the base floodplain.

National Flood Insurance Act and Flood Disaster Protection Act

The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 were enacted to reduce the need for flood protection structures and to limit disaster relief costs by restricting development in floodplains. One of FEMA's duties is to administer the National Floodplain Insurance Program (NFIP) and to develop standards for fluvial and coastal floodplain delineation. The NFIP is a federal program enabling property owners in participating communities to purchase insurance as protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages.

Federal Strategies to Address Sea Level Rise

Global climate change is occurring as evidenced by increasing mean atmospheric temperatures, melting ice caps and glaciers, extreme precipitation and drought cycles, and global sea level rise with a consequent increase in catastrophic events throughout the world. The scientific community has been quantifying the effects of climatic changes at global and local scales, while policymakers have been developing policies and strategies to reduce risks and to include climate change science in the existing regulatory frameworks.

Federal efforts to address sea level rise consists of a number of initiatives directing federal agencies to design plans to adapt to the future effects of climate change (Executive Orders 13514 and 13653) and a number of initiatives that specifically target sea level rise, like the US Army Corps of Engineers

(USACE) directive to include sea level rise when designing, planning, engineering, operating and maintaining projects.

The most recent effort is President Obama's January 2015 Executive Order 13960, which modifies Executive Order 11988, Floodplain Management, and recommends using a new flood standard that accounts for climate change in establishing flood elevation and hazard areas when federal funds are used to build, significantly retrofit, or repair structures.

3.7.1.2 State

Responsibility for the protection of water quality in California resides with the SWRCB and nine RWQCBs. The SWRCB establishes statewide policies and regulations for the implementation of water quality control programs mandated by federal and state water quality statutes and regulations. The RWQCBs develop and implement Basin Plans that consider regional beneficial uses, water quality characteristics, and water quality problems. The VAPP Project Site is within the jurisdiction of the Los Angeles RWQCB. The Los Angeles RWQCB and SWRCB implement a number of federal and state laws regarding water quality, the most important of which are the State of California's Porter-Cologne Water Quality Control Act and the federal CWA.

The Porter-Cologne Water Quality Control Act

The State of California's Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) provides the basis for water quality regulation within California. It includes the California Toxics Rule (CTR); the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Plan, or SIP); Inland Surface Water Quality Standards; the California Urban Water Management Act; and NPDES permits. The SWRCB administers water rights, water pollution control, and water quality functions throughout the state, while the RWQCBs conduct planning, permitting, and enforcement activities. The Porter-Cologne Water Quality Control Act authorizes the SWRCB to adopt, review, and revise policies for all waters of the state (including both surface and groundwater) and directs the RWQCBs to develop regional Basin Plans. Section 13170 of the California Water Code also authorizes the SWRCB to adopt Basin Plans on its own initiative.

The RWQCBs are required, by law, to develop, adopt, and implement a Basin Plan for the entire region. The principal elements of the Basin Plan are a statement of beneficial water uses that the RWQCBs will protect; water quality objectives needed to protect the designated beneficial water uses; and strategies and time schedules for achieving the water quality objectives. The water quality objectives are achieved primarily through the establishment and enforcement of waste discharge requirements (WDRs).

Water quality standards are set forth in the regional Basin Plan. Designated beneficial uses, along with water quality objectives to meet beneficial uses, compose the relevant water quality standards. Water quality objectives are achieved primarily through the establishment and enforcement of WDRs. All dischargers of waste to waters of the state are subject to regulation under the Porter-Cologne Water Quality Control Act. This includes both point- and nonpoint-source dischargers. All current and proposed discharges to land must be regulated under WDRs, waivers of WDRs, a basin plan prohibition, or some combination of these administrative tools. Discharges of waste directly to state waters would be subject to an individual or general NPDES permit, which also serves as a WDR.

The RWQCBs specifically designate beneficial uses for surface and groundwaters; set narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's antidegradation policy; and describe implementation programs to protect all waters in the region. In cases where the Basin Plan does not contain a criterion for a particular pollutant, other criteria are used to establish a water quality objective. These may be applied from SWRCB documents (e.g., the Inland Surface Waters Plan, the Pollutant Policy Document) or from water quality criteria developed under Section 304(a) of the CWA, which requires development of criteria for water quality that accurately reflect the latest scientific knowledge (e.g., CTR).

Discharges from artificial conveyances, such as flood control channels and minor lakes that are part of the City's storm drain system, may not have designated beneficial uses or water quality objectives. For those waters that don't have specific beneficial uses or water quality objectives, the tributary rule[1] applies.

National Pollutant Discharge Elimination System

The SWRCB and RWQCBs implement, monitor, and enforce the NPDES permitting requirements within their jurisdictions. In general, the regulations require all communities with populations over 50,000 to develop programs for reducing pollutants carried by stormwater runoff into waters of the United States. The SWRCB and RWQCBs also develop and implement state or regional general permits regulating certain types of discharges, as applicable. These permits serve as the mechanism for enforcement of the program. As with WDRs, the SWRCB and RWQCBs can issue individual NPDES permits to cover individual dischargers, or general permits to cover a category of dischargers. General permits can be issued on a statewide basis by the SWRCB or on a regional basis by the RWQCBs.

Construction General Permit

Pursuant to CWA Section 402(p) and as related to the goals of the Porter-Cologne Water Quality Control Act, the SWRCB has issued a statewide NPDES General Permit for Stormwater Discharges Associated with Construction Activity (Order No. 2009-0009-DWQ, NPDES No. CAS000002, as amended by Order 2010-0014-DWQ and 2012-006-DWQ) (Construction General Permit), adopted September 2, 2009. Every construction project that disturbs one or more acres of land surface or that is part of a common plan of development or sale that disturbs more than one acre of land surface would require coverage under this Construction General Permit. To obtain coverage under this Construction General Permit, the landowner or other applicable entity must file Permit Registration Documents prior to the commencement of construction activity, which include a Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP), and mail the appropriate permit fee to the SWRCB.

Because the Project Site is less than one acre, the NPDES Construction General Permit (Order No. 2009-0009-DWQ, NPDES No. CAS000002) does not apply. Therefore, erosion and sediment control BMPs would be implemented in accordance with the MS4 Permit and City of Los Angeles Development Construction Model Program, as described further below.

[1] The "tributary rule" refers to any streams not specifically listed in the Basin Plan that are deemed to have the same beneficial uses and water quality objectives of the listed stream, river, or lake to which they are a tributary.

Municipal General Permit

CWA Section 402 mandates permits for municipal stormwater discharges, which are regulated under the NPDES General Permit for Municipal Separate Storm Sewer Systems (MS4 Permit). Phase I MS4 Permit regulations cover medium (serving between 100,000 and 250,000 people) and large (serving more than 250,000 people) municipalities. Phase II (Small MS4 Permit) regulations require that stormwater management plans/programs be developed by municipalities with populations smaller than 100,000, including non-traditional Small MS4s, which are facilities such as military bases, public campuses, and prison and hospital complexes.

MS4 Permits require that cities and counties develop and implement programs and measures, including BMPs, control techniques, system design and engineering methods, and other measures as appropriate, to reduce the discharge of pollutants in stormwater to the maximum extent possible. As part of permit compliance, these permit holders have created stormwater management plans for their respective locations. These plans outline the requirements for municipal operations, industrial and commercial businesses, construction sites, and planning and land development. These requirements may include multiple measures to control pollutants in stormwater discharge. During implementation of specific projects under the program, project applicants are required to follow the guidance contained in the stormwater management plans as defined by the permit holder in that location.

The SWRCB is advancing Low-Impact Development (LID) in California as a means of complying with municipal stormwater permits. LID incorporates site design, including among other things the use of vegetated swales and retention basins and minimization of impermeable surfaces, to manage stormwater to maintain a site's predevelopment runoff rates and volumes.

The City of Los Angeles is a permittee under the current MS4 Permit for Los Angeles County (Order No. R4-2012-0175), as described further under Section 3.7.1.3, Los Angeles County Municipal Stormwater NPDES Permit (MS4 Permit).

State Strategies to Address Sea Level Rise

A range of State policies recommend and mandate that projects and programs located in coastal areas take sea level rise into account. California is at the forefront of the effort to find tools and instruments to reduce the impact of sea level rise on people, infrastructure and properties including executive orders and guidance documents. In 2008, Governor Schwarzenegger issued Executive Order S-13-08 directing state agencies to prepare guidance on sea level rise and to address sea level rise in any state projects located in vulnerable areas. Since the Proposed Project is within the California Coastal Zone, the California Coastal Commission is the primary agency that provides sea level rise policy guidance for the Proposed Project as it pertains to consistency with the CA Coastal Act.

The California Climate Adaption Strategy

In 2009 the California Climate Adaptation Strategy (2009) recommended that state agencies design policies to adapt to sea level rise and that all levels of government act to minimize sea level rise risk for infrastructure, properties and people. The document recommended five strategies: (1) a state policy to avoid future hazards and protect critical habitat; (2) a mandate to state agencies to devise statewide guidance for protecting existing critical ecosystems, existing coastal development, and future investments; (3) a mandate to state agencies to prepare sea level rise and climate adaptation

plans; (4) support for regional and local planning that address sea level rise impacts, and (5) a mandate to complete a statewide sea level rise vulnerability assessment every five years.

In relation to specific projects, the California Adaptation Strategy recommends that state agencies should generally not plan, develop, or build any new significant structure in a place on sites where future significant protection from sea level rise, storm surges, or coastal erosion would be required. However, the document also points out that there is an obligation to protect vulnerable shoreline areas where developments of regionally significant economic, cultural, or social value are currently located (NRA, 2009; p. 75).

National Research Council

Following a 2012 report by the National Research Council (NRC, 2012) that analyzed recent trends and forecasts of local sea level rise, in 2013 the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT) provided a coherent estimate of sea level rise projections for California (CO-CAT, 2013), and recommended that when incorporating sea level rise (SLR) projections into planning and decision making for projects, state agencies use year 2000 as a baseline and adopt the following projections:

Time Period	North of Cape Mendocino sea level rise projections	South of Cape Mendocino sea level rise projections
By 2030	From -0.13 to 0.75 feet (from -4 to + 23 cm)	From + 0.13 to 0.98 feet (from +4 to + 30 cm)
By 2050	From -0.10 to 1.57 feet (from -4 to + 23 cm)	From +0.39 to 2.00 feet (from +12 to + 61 cm)
By 2100	From +0.3 to 4.69 feet (from +10 to + 143 cm)	From +1.38 to 5.48 feet (from +42 to + 167 cm)

The CA State Safeguarding California Plan

The 2014 Safeguarding California Plan (2014, p. 155) framed adaptation strategies to sea level rise as actions to safeguard ocean and coastal ecosystems and resources as an integrated system. The plan recommends that state agencies improve their management practices with the goal of increasing the capacity of coastal systems to withstand and recover from climate impacts. It recommends supporting efforts to better understand evolving trends that could impact coastal and ocean ecosystems, and better information sharing among agencies.

In relation to coastal projects, the Plan suggests that "The state should not build or plan to build, lease, fund, or permit any significant new structures or infrastructure that will require new protection from sea-level rise, storm surges or coastal erosion during the expected life of the structure, beyond routine maintenance of existing levees or other protective measures, unless there is a compelling need (e.g. coastal-dependent marine terminals or as that must necessarily be sited in areas at risk)."(Natural Resources Agency, 2014; p. 179)

It also adds that "If the state is building or planning to build, lease, or permit structures that will require additional new expenditures for sea level rise protection during the expected life of the new structures, the state should ensure that the project proponent:

a. Minimizes risks through siting, design and engineering;

b. Ensures viable funding sources for building, monitoring and maintaining the new sea level rise protections;

c. Ensures that any new protections must consider how risk changes over time, ensure s that actions to reduce risk in the short-term do not increase risk in the long-term; and ensures that any new protections are capable of being augmented over time;

d. Designs protection in a manner that maximizes conservation of natural resources and public access." (NRA, 2014; p. 179)

CA Executive Order B-30-15

More recently, Governor Brown's April 2015 Executive Order B-30-15 addressed climate change and sea level rise adaptation, stating that state agencies shall take climate change into account in their planning and investment decisions. The order requires agencies to ensure that priority is given to actions that build climate preparedness and reduce greenhouse gas emissions, provide flexible and adaptive approaches, protect the state's most vulnerable populations, and promote natural infrastructure solutions.

California Coastal Act

As sea level rise increases the risk of flooding, coastal erosion, and saltwater intrusion and constitutes a threat for the California Coastal Zone, its potential impacts fall directly within the California Coastal Commission (CCC)'s planning and regulatory responsibilities of implementing the California Coastal Act. Many possible responses to sea level rise, such as construction of barriers or armoring, could have adverse impacts on coastal resources and also fall under the Coastal Commission's purview.

To address how coastal projects should take sea level rise into account, in 2015 the CCC issued its Sea Level Rise Policy Guidance (CCC, 2015) and established three important principles.

1. The CCC is committed to recognize and address sea level rise in planning and permitting decisions, to use locally relevant sea level rise estimates based on the best available science, to recognize and address scientific uncertainty and to act according to the precautionary principle.
2. The goal of the CCC is to avoid significant coastal hazard risks to new development where feasible, and if not feasible to minimize such hazards to both redevelopments and new developments. The Commission is also committed to take into account social and economic needs of the people of the state and to ensure that property owners understand and assume the risks of new development in hazardous areas, and mitigate their impacts on coastal resources.
3. The CCC's decisions maximize the protection of public access, recreation, and sensitive coastal resources; and maximize natural shoreline values, avoid expansion and minimize the perpetuation of shoreline armoring. The CCC also protects public trust lands and requires mitigation of unavoidable significant impacts to coastal resources.

According to the guidelines, to comply with Section 30253 of the Coastal Act, projects must be planned, located, designed, and engineered for the changing water levels and for any impact associated with sea level rise that might occur over the life of the development.

The guidelines include important mandates for project design and suggest a five step process to integrate sea level rise considerations into project design:

1. Establish the projected sea level rise range for the proposed project that includes:
    a. defining the expected project life (the CCC suggests more than 100 years for critical infrastructure);
    b. Determine sea level rise ranges;
2. Determine how physical impacts from sea level rise may constrain the project site;
3. Determine how the project may impact coastal resources, considering the influence of sea level rise (the analysis should consider: public access, coastal habitats, natural landforms, agricultural resources, water quality and groundwater, scenic resources);
4. Identify project alternatives that avoid resource impacts and minimize risks to the project (in practice identify adaptation options);
5. Finalize project design (CCC, 2015).

3.7.1.3 Local and Regional

Los Angeles Basin Water Quality Control Plan (Basin Plan)

The preparation and adoption of water quality control plans (Basin Plans) is required by the California Water Code (Section 13240) as prescribed by the CWA. Section 303 of the CWA requires states to adopt water quality standards that "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." According to Section 13050 of the California Water Code, Basin Plans consist of a designation or establishment of beneficial uses to be protected, water quality objectives to protect those uses, and a program of implementation needed for achieving the objectives for the waters within a specified area. Because beneficial uses, together with their corresponding water quality objectives, can be defined per federal regulations as water quality standards, the Basin Plans are regulatory references for meeting the state and federal requirements for water quality control. Beneficial uses of waters within the project study area and downstream receiving waters are shown in Table 3.7-3 in Section 3.7.2.2, Water Quality and Beneficial Uses. The Basin Plan specifies the water quality objectives for the all inland surface waters and enclosed bays and estuaries (including wetlands) in the Region (Los Angeles RWQCB 1995). Table 3.7-4 in Section 3.7.2.2, Water Quality and Beneficial Uses, lists the water quality constituents described in the Basin Plan and their objectives.

Waste Discharge Requirements for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles

Discharges of treated or untreated groundwater generated from permanent, temporary dewatering operations or other applicable wastewater discharges not specifically covered in other general or individual NPDES permits are currently regulated under a regional general permit, General Waste Discharge Requirements for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties) (Order No. R4-2013-0095, NPDES No. CAG994004).

Construction dewatering wastes (except stormwater) are regulated as low-threat discharges to surface waters. An NOI and Report of Waste Discharge must be submitted to the Los Angeles RWQCB to comply with this General Permit. Based on the depth to groundwater, it is anticipated

that the Proposed Project would require groundwater dewatering during construction, and would be subject to the requirements of this General Permit.

Los Angeles County Municipal Stormwater NPDES Permit (MS4 Permit)

The current Municipal Separate Storm Sewer System (MS4) Permit for Los Angeles County (Order No. R4-2012-0175) was adopted on November 8, 2012, became effective December 28, 2012, and will expire on December 28, 2017. Order No. R4-2012-0175 is the fourth iteration of the stormwater permit for the MS4s in the Los Angeles region, which includes the Los Angeles County Flood Control District, county of Los Angeles, and 84 incorporated cities (including the city of Los Angeles) within the county watersheds, excluding the city of Long Beach. The permit contains requirements that are necessary to improve efforts to reduce the discharge of pollutants in stormwater runoff to the maximum extent practicable (MEP) and achieve water quality standards. This permit requires that runoff is addressed during the major phases of urban development (planning, construction, and operation) in order to reduce the discharge of pollutants from stormwater to the MEP, effectively prohibit non-stormwater discharges, and protect receiving waters.

The MS4 Permit also includes construction requirements for implementation of the following minimum construction site BMPs for erosion, sediment, non-stormwater management, and waste management on all construction sites under one acre.

Erosion Controls	Scheduling Preservation of Existing Vegetation
Sediment Controls	Silt Fence Sand Bag Barrier Stabilized Construction Site Entrance/Exit
Non-Stormwater Management	Water Conservation Practices Dewatering Operations
Waste Management	Material Delivery and Storage Stockpile Management Spill Prevention and Control Solid Waste Management Concrete Waste Management Sanitary/Septic Waste Management

The permit also requires the design and implementation of specific post-construction controls to mitigate stormwater pollution, prior to project completion, for all “new development” and “redevelopment” projects that meet certain criteria as specified in the permit. During operation of new development or redevelopment, the permit prohibits non-stormwater discharges from the development (with some conditional exceptions), and requires BMPs to eliminate discharges to the MEP. Stormwater effluent must meet water quality–based effluent limitations (WQBELs), or water quality standards for discharge, and must not cause or contribute to the exceedance of water quality standards for receiving waters, as identified in the Los Angeles Basin Water Quality Control Plan (Basin Plan); also refer to Tables 3.7-3 (beneficial uses) and Table 3.7-4 (water quality objectives) in Section 3.7.2.2, Water Quality and Beneficial Uses. The permit requires each permittee to implement a Planning and Land Development Program for all new development, which requires permittees to:

1. Lessen the water quality impacts of development by using smart growth practices such as compact development, directing development towards existing communities via infill or redevelopment, and safeguarding of environmentally sensitive areas.
2. Minimize the adverse impacts from stormwater runoff on the biological integrity of Natural Drainage Systems and the beneficial uses of water bodies in accordance with requirements under CEQA (California Public Resources Code Section 21000 et seq.).
3. Minimize the percentage of impervious surfaces on land developments by minimizing soil compaction during construction, designing projects to minimize the impervious area footprint, and employing LID design principles to mimic predevelopment hydrology through infiltration, evapotranspiration and rainfall harvest and use.
4. Maintain existing riparian buffers and enhance riparian buffers when possible.
5. Minimize pollutant loadings from impervious surfaces such as rooftops, parking lots, and roadways through the use of properly designed, technically appropriate BMPs (including source-control BMPs such as good housekeeping practices), LID strategies, and treatment control BMPs.
6. Properly select, design, and maintain LID and hydromodification control BMPs to address pollutants that are likely to be generated, reduce changes to pre-development hydrology, assure long-term function, and avoid the breeding of vectors.
7. Prioritize the selection of BMPs to remove stormwater pollutants, reduce stormwater runoff volume, and beneficially use stormwater to support an integrated approach to protecting water quality and managing water resources in the following order of preference:
    a. On-site infiltration, bioretention and/or rainfall harvest and use.
    b. On-site biofiltration, off-site ground water replenishment, and/or off-site retrofit.

City of Los Angeles Development Construction Model Program

The City of Los Angeles (City) Development Construction Model Program addresses NPDES Phase II requirements on construction sites within incorporated city lands. BMPs for construction (as well as source control and treatment) are detailed in the City's Reference Guide for Stormwater Best Practices (LADPW, 2000). The BMPs are consistent with those developed by the state and county, and include erosion and sedimentation control measures, site management practices, materials and waste management, and general preventive maintenance and inspection.

City of Los Angeles Low-Impact Development Ordinance and Manual

In November 2011, the City of Los Angeles adopted the Stormwater Low Impact Development Ordinance #181899 with the stated purpose of:

- Requiring the use of LID standards and practices in future developments and redevelopments to encourage the beneficial use of rainwater and urban runoff
- Reducing stormwater/urban runoff while improving water quality
- Promoting rainwater harvesting
- Reducing off-site runoff and providing increased groundwater recharge
- Reducing erosion and hydrologic impacts downstream
- Enhancing the recreational and aesthetic values in our communities

The City of Los Angeles institutionalized the use of LID techniques for development and redevelopment projects. Subsequent to the adoption of the Stormwater LID Ordinance, the City prepared the Development Best Management Practices Handbook, Low Impact Development Manual, dated June 2011, to describe the required BMPs (City of Los Angeles, 2011).

Local Strategies to Address Sea Level Rise

University of Southern California Sea Grant Program

The University of Southern California Sea Grant Program conducted a sea level rise vulnerability study for the City of Los Angeles (Grifman et al., 2013) with the goal of analyzing the physical, social, and economic impacts of sea level rise on the City of Los Angeles, with a specific focus on City-owned assets like the port, power generation facilities, wastewater treatment facilities, and wastewater and stormwater conveyance infrastructure. According to the vulnerability assessment, the City's roads and water systems (wastewater, stormwater, and potable water), as well as the City's cultural assets, are vulnerable to impacts from the combined effect of sea level rise and storm surges. Parks and open space, while in vulnerable locations, are less vulnerable to flooding impacts since they can be restored relatively quickly. Port and City energy facilities also have relatively low vulnerability to sea level rise. However, City wastewater infrastructure is at risk. Specifically, wastewater pumping plants are at risk of being damaged during extreme wet weather events that inundate electrical components. Furthermore, such damage could result in wastewater spills with negative environmental and economic consequences.

Los Angeles Department of Public Works, Bureau of Sanitation

A climate change asset vulnerability study conducted by the Los Angeles City Bureau of Sanitation (LASAN) (USEPA, 2016) on its wastewater and stormwater facilities in 2015, resulted in findings that future storm surges, sea level rise, and tsunamis pose a quantifiable risk to LASAN assets and operations. The final report summarizing the findings of the study projects a 0.5 m (1.64 feet) rise in sea level in the Venice Beach Pumping Plant area by 2050 (based on NOAA estimates of 0.88mm/year sea level rise trends in the Los Angeles area). The study quantified the risk or asset vulnerability presented by this and other climate change effects, and identified and provided cost estimates for recommended adaptive measures that could reduce climate and sea level rise risks to LASAN. Recommended sea level rise adaptation measures include: installing temporary flood barriers, designing a wet weather plan specific to each installation, constructing perimeter walls, improving and protecting the back-up power of its plants, or using watertight enclosures to further protect electrical equipment, instrumentation and controls (USEPA, 2016).

Los Angeles Department of City Planning

The Los Angeles City Council recently adopted a motion that funds the Department of City Planning to conduct climate change and sea level rise studies as part of the update of the Venice Local Coastal Program, which will directly address future design measures that will help mitigate potential sea level rise impacts within Venice Coastal Zone.

3.7.2 Environmental Setting

This section describes the hydrology and water quality settings of the Proposed Project area. It is intended to assist the impact analysis and in designing necessary mitigation measures.

3.7.2.1 Watershed

The Project Site is located within the Marina del Rey subwatershed, which covers approximately 2.9 square miles in the coastal plain of the Los Angeles Basin (refer to Figure 3.7-1, Watersheds and Surface Waters). The Marina del Rey watershed is a small sub-watershed located in the larger, Santa Monica Bay watershed (Weston, 2014). Its tributary area is served by an MS4 that drains to Marina del Rey Harbor and is approximately 1,409 acres and consists of portions of the cities of Culver City and Los Angeles, as well as portions of the unincorporated County of Los Angeles (County). The Marina del Rey watershed is bordered by the Santa Monica Bay Watershed to the west and the Ballona Creek Watershed to the north and east. The Marina del Rey harbor is open to the Santa Monica Bay through the main channel and shares a common breakwater with Ballona Creek. The Marina del Rey watershed also includes the Venice Canals and the tributary area to the Ballona Lagoons, which discharge to the Marina del Rey Harbor, near the exit to the Santa Monica Bay. (Weston, 2014).

3.7.2.2 Surface Waters and Local Hydrology

Surface waters adjacent to the Project Site include the Grand Canal and Ballona Lagoon (refer to Figure 3.7-1, Watersheds and Surface Waters). The Grand Canal extends 2,000 feet north from Ballona Lagoon to the Washington Boulevard tide gates, and averages about 50 feet wide (Watearth, 2016). The Grand Canal is exposed to oceanic currents via the tidal gates at the mouth of Ballona Lagoon that connect to Marina Del Rey and Santa Monica Bay (Watearth, 2016). The Grand Canal and Ballona Lagoon are connected at the South Esplanade, approximately 150 feet southeast of the Project Site. Ballona Lagoon is a tidal channel situated on the Silver Strand Peninsula, adjacent to Marina del Rey Harbor (CWIS, 2016). Both the Ballona Lagoon and Grand Canal are direct tributaries to the Marina del Rey Harbor entrance and the Pacific Ocean. In addition, the lagoon channel is the source of water for the Venice Canals (located to the north of the Project Site) via the Grand Canal; tidal waters enter the lagoon at the southern end through tidal gates connected to the Marina del Rey harbor channel entrance (CWIS, 2016). The Grand Canal shares a tide gate with Ballona Lagoon as it empties into the Pacific Ocean at the Marina del Rey harbor channel entrance. Surface flows within the areas surrounding the Project Site drain via sheetflow or area storm drains to the Grand Canal.

Water Quality and Beneficial Uses

The Project Site discharges to the Grand Canal, which connects to Ballona Lagoon and then to Marina del Rey Harbor, located immediately to the south. Ballona Lagoon and Marina del Rey

Harbor are included on the 303(d) List for the water quality impairments shown below in Table 3.7-1. Multiple TMDLs are in effect for the Ballona Creek Watershed.

Table 3.7-1. Overview of Water Quality Impairments in Project Area

Water Body	Listed Impairments	Potential Sources	Estimated EPA TMDL Completion
Ballona Lagoon	Exotic Vegetation	Nonpoint Source	2019
	Habitat Alterations	Nonpoint Source	2019
	Hydromodification	Nonpoint Source	2019
	Reduced Tidal Flush	Nonpoint Source	2019
	Trash	Nonpoint Source	2019
Marina del Rey Harbor	Chlordane (tissue and sediment)	Nonpoint Source	EPA TMDL approval 2005
	Copper (sediment)	Nonpoint Source	EPA TMDL approval 2006
	DDT (tissue)	Nonpoint Source	EPA approved TMDL has made a finding of non-impairment for this pollutant
	Dieldrin (tissue)	Nonpoint Source	EPA approved TMDL has made a finding of non-impairment for this pollutant
	Fish Consumption advisory	Nonpoint Source	EPA TMDL approval 2005
	Indicator Bacteria	Nonpoint Source	EPA TMDL approval 2004
	Lead (sediment)	Nonpoint Source	EPA TMDL approval 2006
	PCBs (polychlorinated biphenyls) (tissue and sediment)	Nonpoint Source	EPA TMDL approval 2006
	Sediment Toxicity	Nonpoint Source	EPA TMDL approval 2005
	Zinc (sediment)	Nonpoint Source	EPA TMDL approval 2006

Source: SWRCB 2011.

The City of Los Angeles requested water quality sampling on June 5, 2015 before the project began. To establish baseline water quality conditions within the Grand Canal, water quality samples were obtained from three locations near the project area: Site 1 was at a culvert on Hurricane Street, Site 2 was at the existing Venice Pumping Plant (VPP) at the upstream incoming tide, and Site 3 was at the VPP station at the downstream outgoing tide. The following water quality parameters were determined for the baseline: acidity (pH), temperature, dissolved oxygen (DO), turbidity, and total suspended solids (TSS). A visual assessment for any floating hydrocarbons was also performed. The complete results of this study are included in the *Hydrology Technical Memorandum* prepared by Watearth, (Appendix K of Appendix H), including pH, Temperature, Dissolved Oxygen (DO), and Turbidity. In addition to the project sampling, water quality samples were collected as part of the Grand Canal West Bank Erosion Control Project between May 29th and July 17th, 2015. Complete water quality results from the Grand Canal West Bank Erosion Control Project are in Table 3.7-2.

Table 3.7-2. Project Area Water Quality Sampling Results

Location	Date	pH	Temperature (^{0}F)	DO	TSS (mg/L)	Turbidity (NTU)	Floatables (ug/L)
Anchorage (A)	5/1/2015	7.8	67	5.6	19.1	1.7	None Visible
	6/12/2015	7.9	71	5.6	10.4	0.91	None Visible
Driftwood (D)	5/8/2015	8	67	5	31.2	2.8	None Visible
	6/19/2015	8.2	75	8.4	67.5	2.3	None Visible
Eastwind (E)	5/15/2015	8	64	6.5	13.1	1.1	None Visible
	6/26/2015	7.9	76	5.4	20.1	1.7	None Visible
Fleet (F)	5/21/2015	8.2	70	4.5	22.6	2.8	None Visible
	7/2/2015	8	76	5.1	18.2	3	None Visible
Galleon (G)	5/29/2015	8.2	74	9	4	39.2	None Visible
	7/10/2015	8.2	80	8.7	17.8	3.8	None Visible
Ballona/ Grand (BG)	6/5/2015	8	70	6.3	42.5	2.4	None Visible
	7/17/2015	8.1	78	5	14.3	3.6	None Visible

Source: Department of Public Works, Water Quality Data for the Venice Grand Canal West Bank Erosion Control, 2015.

Beneficial uses of waters within the project study area and downstream receiving waters are shown in Table 3.7-3.

Table 3.7-3. Designated Beneficial Uses for Surface Water Bodies within the Project Vicinity

Beneficial Uses	Ballona Lagoon/ Venice Canals	Marina del Rey Entrance Channel
Navigation (NAV)	E	
Water Contact Recreation (REC-1)		E
Non-Contact Water Recreation (REC-2)		E
Commercial and Sportfishing (COMM)	E	
Spawning, Reproduction and Development (SPWN)	E	
Wildlife Habitat (WILD)	E	
Rare, Threatened or Endangered Species (RARE)	E	
Marine Habitat (MAR)	E	
Shellfish Harvesting (SHEL)	E	
Estuarine Habitat (EST)	E	
Migration of Aquatic Organisms (MIGR)	E	
Wetland Habitat (WET)	E	

E: Existing
Source: Los Angeles Regional Water Quality Control Board Basin Plan, 1995.

The Basin Plan specifies the water quality objectives for the all inland surface waters and enclosed bays and estuaries (including wetlands) in the Region (Los Angeles RWQCB 1995). Table 3.7-4 lists the water quality constituents described in the Basin Plan and their objectives.

Table 3.7-4. Water Quality Objectives Provided in the Water Quality Control Plan for the Los Angeles RWQCB Basin Plan

Water Quality Constituent	Water Quality Objective
Ammonia	For inland surface waters not characteristic of freshwater, the four-day average concentration of un-ionized ammonia shall not exceed 0.035 mg/L and the one-hour average concentration shall not exceed 0.233 mg/L.
Bacteria	In marine waters designated REC-1 the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than 10 percent of the total number of samples taken during any 30-day period exceed 400/100 ml.
Bioaccumulation	Toxic pollutants shall not be present at levels that will bioaccumulate in aquatic life to levels that are harmful to aquatic life or human health.
Biochemical Oxygen Demand	Waters shall be free of substances that result in increases in the BOD, which adversely affect beneficial uses.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses.
Chemical Constituents	Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use.
Chlorine, Total Residual	Chlorine residual shall not be present in surface water discharges at concentrations that exceed 0.1 mg/L and shall not persist in receiving waters at any concentration that causes impairment of beneficial uses.
Color	Waters shall be free of discoloration that causes nuisance or negatively affects beneficial uses.
Exotic Vegetation	Exotic vegetation shall not be introduced around stream courses to the extent that such growth causes nuisance or adversely affects beneficial uses.
Floating Material	Waters shall not contain floating material in amounts that cause nuisance or negatively affect beneficial uses.
Methylene Blue Activated Substances (MBAS)	Waters shall not have MBAS concentrations greater than 0.5 mg/L in waters designated MUN.
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise negatively affect beneficial uses.
Oxygen, Dissolved (DO)	At a minimum, the mean annual dissolved oxygen concentration of all waters shall be greater than 7 mg/L, and no single determination shall be less than 5.0 mg/L, except when natural conditions cause lesser concentrations.
Pesticides	No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.
pH	The pH of inland surface waters shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed more than 0.5 units from natural conditions as a result of waste discharge.
Polychlorinated Biphenyls (PCBs)	The purposeful discharge of PCBs (the sum of chlorinated biphenyls whose analytical characteristics resemble those of Aroclor-1016, Aroclor-1221, Aroclor-1232, Aroclor-1242, Aroclor-1248, Aroclor-1254, and Aroclor-1260) to waters of the Region, or at locations where the waste can subsequently reach waters of the Region, is prohibited.
	Pass-through or uncontrollable discharges to waters of the Region, or at

Water Quality Constituent	Water Quality Objective
	locations where the waste can subsequently reach water of the Region, are limited to 70 pg/L (30 day average) for protection of human health and 14 ng/L and 30 ng/L (daily average) to protect aquatic life in inland fresh waters and estuarine waters respectively.
Radioactive Substances	Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.
Solid, Suspended, or Settleable Materials	Waters shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses.
Taste and Odors	Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise negatively affect beneficial uses.
Temperature	The natural receiving water temperature of all regional waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or negatively affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits: where natural turbidity is between 0 and 50 NTU, increases shall not exceed 20%. Where natural turbidity is greater than 50 NTU, increases shall not exceed 10%.

Source: Los Angeles RWQCB, Basin Plan, May 2, 2013.

3.7.2.3 Hydrology

Building Site Hydrology

The Project Site and three associated Laydown Areas (see Figure 2-2, Chapter 2 [Project Description] of this EIR) are currently vacant lots and the vegetation is mostly native vegetation within the intertidal zone and non-native above the intertidal zone. Their impervious cover is zero-percent. Elevations within the Project Site range from a low of approximately four feet in the southwestern portion of the site to a high of approximately nine feet near the center of the site. Elevations are similar for Laydown Areas 1 and 2. The area surrounding the Project Site is relatively low, only reaching heights of five feet. The approximate elevation of the bank area of the Grand Canal is five feet with a gradual slope eventually reaching one-foot above mean sea level. The elevation for Laydown Area 3 located off-site in the City of Culver City is approximately 95 feet. Rainfall and subsequent on-site stormwater runoff at the Project Site is comprised of overland sheet flow, which generally flows southwest to northeast towards the Grand Canal and/or to an off-site storm drain at Hurricane Street and Esplanade. Flows from Laydown Area 1 drain to the Ballona Lagoon, while flows from Laydown Area 2 flow to the Grand Canal. Flows from Laydown Area 3 flow to stormwater drains located along Jefferson Boulevard. None of these vacant parcels include water quality or stormwater controls, such as stormwater BMPs, LID features, or hydromodification management facilities. Stormwater detention and other flood control features are also not present on-site.

As shown in Table 3.7-5, existing conditions peak discharges from the Project Site are estimated at 72.87 cubic feet per second (cfs), 165.64 cfs, and 263.83 cfs for the two-year, 24-hour, ten-year, 24-hour, and 100-year, 24-hour design storm events, respectively. As shown in Table 3.7-5, the existing two-year peak flow is 0.06 cfs, the existing ten-year peak flow is 0.14 cfs, and the existing 100-year peak flow is 0.24 cfs. Similar flows are expected for the Laydown Areas 1 and 2. There are no known existing capacity issues associated with the stormwater receiving facility located in Hurricane Street, which receives flows from the Project Site. As described above, there are no storm drains serving Laydown Areas 1 or 2, while flows from Laydown Area 3 drain to Jefferson Boulevard.

Table 3.7-5. Existing Peak Discharges and Flows (cfs) for Project Site

Existing Conditions	2-year, 24-hour	10-year, 24-hour	100-year, 24-hour
Peak Discharges	72.87 cfs	165.64 cfs	263.83 cfs
Peak Flow	0.06 cfs	0.14 cfs	0.24 cfs
Source: Watearth, 2016			

Off-site flows into or through the Project Site and laydown areas are minimal. The drainage inlets in roadways adjacent to the Project Site and laydown areas include screens or grates to prevent or limit trash from entering the storm drain system and discharging to Grand Canal or Ballona Lagoon or Ballona Creek (within the Culver City area).

3.7.2.4 Grand Canal

The Grand Canal is part of the Venice Canals system, which is hydrologically connected to Santa Monica Bay and the Pacific Ocean via Ballona Lagoon and the Marina Entrance Channel. Local surface flow is directed into the canals from local streets and storm drains. As a coastal waterway, the Grand Canal is subject to diurnal tidal fluctuation. High tides, combined with significant rainfall events, also lead to local flooding problems. Tide gates are positioned at the Marina Entrance Channel (to the South), and at the Washington Street Bridge (to the North). The Grand Canal Esplanade right-of way is 21.3 meters (70 feet [ft]) in width, while the channel bottom is approximately 14.6 m (48 ft) in width and from zero to 1.7 meters (5.5 ft) in depth (Los Angeles Bureau of Engineers [LABOE], 2013).

The Grand Canal Esplanade right-of-way is comprised of submerged lands, as well as unpaved banks, and paved sidewalks. Ten-foot wide easements occur along both banks, which includes the banks and (five-foot wide) sidewalks. The banks are unlined, while the channel bottom ranges from gravelly to soft bottom mud with varying amounts of sand and gravel. Areas of exposed mud flat are extensive at low tide, but are restricted to a narrow, canal bottom/bank transition (LABOE, 2013).

3.7.2.5 Soils

No mapping is available from the Natural Resources Conservation Service for the study area. Based on soils observed in the wetland sample points, the soils on-site consisted of sandy clay and loams and fill (see Appendices D, *Jurisdictional Delineation* and G, *Geotechnical Engineering Report – Venice Auxiliary Pumping Plant* of this EIR). As noted in Appendix G of this EIR, artificial fill soils exist within the site as the result of previous construction and/or previous construction activities. In general, the depth of fill is expected to be approximately three to four feet. The fill materials generally consist of silty sand and sand with some construction debris. Alluvial sediments encountered in the borings contain primarily coarse-grained soils consisting of gravels, sands, and

silty sands with interlayered fine-grained soils consisting of silts and clays. Soil samples were not taken for the laydown areas since no construction activities are proposed there. It is expected that the on-site soils at these locations (Laydown Areas 1 and 2) would be similar in nature to that of the Project Site, while soils at Laydown Area 3 are unknown.

3.7.2.6 Floodplain

The Project Site (including Laydown Areas 1 and 2) is located in Zone X (areas outside the 1-percent annual chance floodplain) within the regulatory 500-year floodplain of the Grand Canal. The diversion structure is proposed to be located within the Grand Canal (below grade). The Flood Insurance Rate Map (FIRM) Panel shown in the exhibit is 6037C1752F. These panels were updated September 26, 2008. Areas shown within the shaded Zone X are the areas between the limits of the base flood and the 0.2-percent annual chance, or 500-year floodplain. This means the area is classified as a moderate flood hazard area.

3.7.2.7 Tsunami, Seiche, Sea Level Rise and Mudflow

Elevations within the Project Site range from a low of approximately four feet in the southwestern portion of the site to a high of approximately nine feet near the center of the site. Similar elevations occur within Laydown Areas 1 and 2. As such, the Project Site and Laydown Areas 1 and 2 are not located within a landslide/mudflow hazard zone. Similarly, Laydown Area 3, located in Culver City is not located within a landslide or mudflow hazard zone.

A tsunami is a series of traveling ocean waves of great length and long period, which are generated by disturbances associated with earthquakes in oceanic and coastal regions. The Project Site (including Laydown Areas 1 and 2) is approximately 0.2 mile east from the Pacific Ocean and is located within a designated tsunami hazard zone. Laydown Area 3 is not located within a tsunami hazard zone.

A seiche is an oscillation of a body of water. Seiches occur most frequently in enclosed or semi-enclosed basins such as lakes, bays, or harbors and may be triggered by strong winds, changes in atmospheric pressure, earthquakes, tsunami, or tides. The Project Site and Laydown Areas 1 and 2 are adjacent to Grand Canal and Ballona Lagoon, which are semi-enclosed water bodies. The Project Site is also approximately 0.2 mile west of the Marina del Rey Harbor, but is separated from the harbor by Grand Canal and Ballona Lagoon, residential structures, and streets. Laydown Area 3 is located in Culver City about 750 feet west of Ballona Creek, a channelized stormwater conveyance facility. The Venice, California area is expected to be exposed to the risk of sea level rise, combined with the increased effects of a 100-year storm event based on information in the United States Geological Survey (USGS) and University of Southern California (USC) studies (Watearth, 2016). The Project Site is also located near Ballona Lagoon, which is classified as a major channel. Major water bodies are exposed to more flux in tides and may therefore have an increased risk of flooding during a 100-year flooding event. Sea level rise is expected to occur by the Intergovernmental Panel on Climate Change (IPCC). Projections range from 18 centimeters (cm) (0.59 ft) at the lowest projection to 59 cm (1.94 ft) for the highest projection by the year 2100. The USGS has mapped out the inundation risk of the project area, which could experience the effects of sea level rise if flood levels inundate at 200 centimeters (16.6 ft). However, because of the proximity to Grand Canal, a risk of inundation at 150 centimeters (12.5 ft) must be taken into account (Watearth, 2016). Sea level rise is not expected to affect Laydown Area 3 located in Culver City.

3.7.3 Environmental Impact Analysis

3.7.3.1 Methodology

Impacts were analyzed qualitatively based on professional judgment in light of the hydrologic and hydraulic analyses prepared for project design. The analysis focused on issues related to surface water hydrology, flood hazards, and water quality. The key construction-related impacts were identified and evaluated qualitatively based on the physical characteristics of the Project Site and the magnitude, intensity, location, and duration of activities.

The surface water hydrology impact analysis considers changes in drainage patterns, changes in stormwater volumes and capacity, creation of new impervious surfaces, and changes in nearby water bodies. Information from the *Hydrology Technical Memorandum* (Appendix H of this EIR) provided the data.

Information from the *Hydrology Technical Memorandum* also provided data used in the flood risk impact analysis. The impact analysis considers changes in the drainage system and layout to characterize potential effects on flood risk.

Impacts of the Proposed Project on surface water quality were analyzed using available information on potential existing sources of pollution and current water quality conditions in the project area. These conditions were then compared to potential project-related sources of pollution during construction, such as sediments and other construction materials, and operation, such as operation and maintenance activities, trash, and storage of hazardous materials. The Proposed Project was analyzed for potential impacts on beneficial uses and water quality objectives (i.e., pollutants of concern) of receiving waters. Receiving waters with CWA Section 303(d) impaired water quality were identified, along with the impairment (pollutant/stressor) and an indication of whether the impairment has the potential to be further affected by the Proposed Project.

3.7.3.2 Screening Analysis

As noted in Section Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study] of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in CEQA Appendix G and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.7.3.3 Thresholds of Significance

Thresholds of significance used to analyze impacts are based on CEQA Appendix G and the *L.A. CEQA Thresholds Guide* (2006).

According to Appendix G of the CEQA Guidelines, a project would normally have a significant impact on hydrology and water quality if it would:

HYDRO-1. Violate any water quality standards or waste discharge requirements;

HYDRO-2. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on-site or off-site;

HYDRO-3. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site;

HYDRO-4. Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

HYDRO-5. Otherwise substantially degrade water quality;

HYDRO-6. Place within a 100-year flood hazard area structures that would impede or redirect floodflows;

HYDRO-7. Contribute to inundation by seiche, tsunami, sea level rise or mudflow.

This threshold has been modified to also address sea level rise, and potential tsunami impacts in combination with future conditions created by sea level rise.

According to the *L.A. CEQA Thresholds Guide* (2006), a project would normally have a significant impact on hydrology and water quality if it would:

Sedimentation

HYDRO-8. Constitute a geologic hazard to other properties by causing or accelerating instability from erosion; or

HYDRO-9. Accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition that would not be contained or controlled on-site.

Surface Water Quality

HYDRO-10. Result in discharges that would create pollution, contamination or nuisance as defined in Section 13050 of the California Water Code (CWC) (see definitions on page G.2-4 of the City's Thresholds) or that cause regulatory standards to be violated, as defined in the applicable NPDES stormwater permit or Water Quality Control Plan for the receiving water body.

Surface Water Hydrology

HYDRO-11. Cause flooding during the projected 50-year developed storm event, which would have the potential to harm people or damage property or sensitive biological resources;

HYDRO-12. Substantially reduce or increase the amount of surface water in a water body; or

HYDRO-13. Result in a permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow.

3.7.3.4 Impacts and Mitigation

The assessment of impacts is based on the assumption that the Proposed Project would include the following:

- The City will reduce construction stormwater discharges to the maximum extent practicable in accordance with the Los Angeles County MS4 Permit for the landside portions of the Proposed Project. The following BMPs for erosion control, sediment control, non-stormwater

management, and waste management during construction will be implemented as part of the Proposed Project:

Erosion Controls	Scheduling Preservation of Existing Vegetation
Sediment Controls	Silt Fence Sand Bag Barrier Stabilized Construction Site Entrance/Exit
Non-Stormwater Management	Water Conservation Practices Dewatering Operations
Waste Management	Material Delivery and Storage Stockpile Management Spill Prevention and Control Solid Waste Management Concrete Waste Management Sanitary/Septic Waste Management

- Other standard operating procedures and BMPs for City construction projects will be implemented, including: BMPs for in water work, such as turbidity curtains and trash booms.
- The City will perform construction activities within the Grand Canal (a navigable water of the United States) in accordance with provisions of Section 404 (of the CWA), and Section 10 (of the RHA) permit from the USACE.
- The City will secure a Section 401 (of the CWA) Water Quality Certification from the LARWQCB for construction activities within the Grand Canal and will comply with conditions of that certification, including standard WDRs.
- The City will also comply with General Waste Discharge Requirements for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties (NPDES)
- Consistent with Standard Urban Stormwater Mitigation Plan (SUSMP) standards, the Proposed Project design will include the following Low Impact Development (LID) features:
    - Lined Bioretention or Planter Box, with a vegetated filter strip as a pre-treatment BMP
    - All impervious cover on the Project Site would be disconnected from impervious surfaces and drain through the vegetated filter strip by overland flow

3.7.3.5 Construction Impacts

The analysis below describes the temporary and permanent impacts on hydrology and water quality anticipated as a result of construction of the Proposed Project. Construction activities with the potential to affect hydrology and water quality would generally include:

- Soil-disturbing activity (e.g., excavation, grading, fills), which can lead to erosion and sedimentation;

- Excavation within and along the slope of the Grand Canal, which could result in impacts that affect water quality in an impaired water body from sedimentation.
- Excavation in areas of high groundwater, which could result in impacts that affect groundwater quality or quantity from dewatering activities and direct exposure of groundwater to sediment and other contaminants;
- Use of construction-related hazardous materials, which could result in spills that would affect surface waters and infiltrate to groundwater aquifers;
- Generation of pollutants of concern during construction, such as sediment, trash, sanitary waste, dry and wet concrete waste, and chemicals, which could degrade water quality.

HYDRO-1. Would the project violate any water quality standards or waste discharge requirements?

Construction at the Project Site would begin with site clearing, shoring, and excavation. As described in Chapter 2, Project Description, excavation would occur in stages, with shoring installed at each stage to prevent soil collapse or groundwater seepage into the excavation area. Dewatering methods would be required at all times during construction, to promptly remove and dispose of all water from any source entering the excavation sites. A cofferdam would be constructed to ensure dry bedding conditions to construct underground diversion structure foundations. The cofferdam would have two cells, one on land and the other in the Grand Canal in order to minimize risk of inundation. The land cell would be constructed first followed by the Grand Canal cell. The wet well, valve vault, and inlet pipe would be constructed within the land cell. Once all equipment is constructed, backfilling and compacting would begin. Once construction on the land cell is complete, the Grand Canal cell would be excavated and the diversion structure would be constructed. Once the diversion structure is in place, a modular channel insert would be constructed in order to reduce the risk of spills. The final step would be to seal the junction structure, backfill, and compact. The land cell shoring steel would be removed as needed to a minimum of five feet below grade minimizing the possibility of settlement and the Grand Canal cell shoring can be removed. The channel trapezoidal bottom would be restored to existing conditions. Surface improvements would occur next. Construction above grade would include the electrical building that would be concrete or masonry construction.

Land Side Construction Activities

Construction activities associated with the Proposed Project such as grading and excavation, construction of below ground facilities, filling and compaction, utility installation and construction of above ground facilities and building could result in increased polluted stormwater runoff. In case of heavy rain or wind conditions, when the Project Site is excavated or otherwise disturbed by construction activities, the potential for erosion and sediment transport from the Project Site and laydown areas could increase, if the excavated area is not below grade (below ground surface). Stormwater runoff (or wind) could carry the exposed or eroded sediments to the storm drain system and ultimately to the Grand Canal, Ballona Lagoon, and Marina del Rey Harbor or Ballona Creek (the location of Laydown Area 3). Erosion and sedimentation affects water quality through interference with photosynthesis, oxygen exchange, and the respiration, growth, and reproduction of aquatic species. Additionally, other pollutants, such as nutrients, trace metals, and hydrocarbons, can attach to sediment and be transported downstream, which could contribute to degradation of water quality. As such, construction activities could violate water quality standards or waste discharge requirements and impacts would be potentially significant.

In addition to potential pollutant contributions from disturbed areas, the delivery, handling, and storage of construction materials and wastes, as well as the use of construction equipment, could introduce a risk for stormwater contamination that could affect water quality. Spills or leaks from heavy equipment and machinery can result in oil and grease contamination. Some hydrocarbon compound pollution associated with oil and grease can be toxic to aquatic organisms at low concentrations. Staging areas or building sites can also be the source of pollution because of the use of paints, solvents, cleaning agents, and metals during construction. Materials from soil excavation could contain hazardous materials that may be exposed to stormwater. Larger pollutants, such as trash, debris, and organic matter, are also associated with construction activities. Furthermore, concrete used for structures, footings, and other paving materials could be potential sources of water quality pollution if any of these materials were spilled or deposited on unprotected surfaces. Other potential effects include health hazards and aquatic ecosystem damage associated with introduction of bacteria, viruses, and vectors if waste management is not adequately implemented. As such, construction activities could violate water quality standards or waste discharge requirements and impacts would be potentially significant.

Erosion and sediment control BMPs would be required to be implemented to protect water quality. Erosion control, sediment control, non-stormwater management, and waste management construction BMPs shall be implemented to prevent pollutants from being discharged to waterways from stockpiles, material, equipment storage and use, trash, and other pollutant sources. Erosion and sediment control BMPs would be implemented in accordance with the MS4 Permit and City of Los Angeles Development Construction Model Program. The BMPs are consistent with those developed by the state and county, and include erosion and sedimentation control measures, site management practices, materials and waste management, and general preventive maintenance and inspection. These measures would prevent excavated and eroded soils, construction materials, or debris from being transported to receiving waters, which include the Grand Canal, Ballona Lagoon and Ballona Creek (associated with Laydown Area 3 in Culver City). As such, implementation of BMPs required by the MS4 Permit would reduce potential impacts to water quality to less than significant; no mitigation measures are required.

Construction activities are anticipated to require dewatering. As such, construction activities could violate water quality standards or waste discharge requirements and impacts would be potentially significant. However, compliance with the General Waste Discharge Requirements for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties (Order No. R4-2013-0095, NPDES No. CAG994004) would ensure that the Proposed Project would not violate any water quality standards and would also reduce the potential for the Proposed Project to affect the quality of receiving waters during construction activities. Therefore, impacts would be less than significant; no mitigation measures are required.

As noted above, compliance with existing regulatory requirements, such as implementation of erosion and sediment control BMPs as required by the MS4 Permit and Dewatering Permit, would reduce impacts of the Proposed Project in regards to violation of a water quality standard or waste discharge requirement to **less than significant; no mitigation measures are required.**

In-Water Construction Activities

The construction of a temporary cofferdam in the Grand Canal would require installation of sheeting that would disturb existing sediments in the Grand Canal, which could impair water quality. In addition, once the cofferdam is in place, scour along the cofferdam could result, depending on tidal,

canal, or wave-induced current conditions. Construction of the cofferdam, placement of the diversion structure, and backfill and soil compaction within the Grand Canal would last approximately three months. Following its construction, the Grand Canal channel bottom would be restored to its original elevation and the diversion would not protrude into the water column.

Construction of the coffer dam could affect water quality if protection measures are not implemented. Scour and erosion control would be required as part of the cofferdam construction. Proposed sheeting in Grand Canal would result in short-term disturbance of localized sediments, which could adversely affect water quality by temporarily re-suspending sediments, thereby increasing turbidity. In addition, chemicals that are present in the sediments could be released to the water column during resuspension, which could temporarily degrade water quality. Suspended sediments in the water column can lower levels of dissolved oxygen, increase salinity, increase concentrations of suspended solids, and possibly release chemicals present in sediments into the water. The degree of turbidity resulting from the suspended sediments would vary depending on the disturbance to the sediments and would also depend on the methods used, the quality of equipment, and the care of the operator. In most cases, increased turbidity levels would be relatively short-lived and generally confined to within a few hundred yards of the activity. After initial high-turbidity levels, sediments would disperse and background levels would be restored. As such, construction activities could violate water quality standards or waste discharge requirements and impacts would be potentially significant.

The Proposed Project would be required to obtain a Section 10 permit from the USACE for dredging and placement of subsurface structures in navigable waters and a Section 404 permit (likely Nationwide Permit 33 [for cofferdams]) from the USACE for the discharge of dredged materials. In addition, the Proposed Project would be required to obtain a RWQCB water quality certification (Section 401 [see below]) for the federal permits from the USACE. A RWQCB water quality certification would specify methods for ensuring the protection of water quality during construction activities in Grand Canal, including water quality monitoring requirements. In addition, specific conditions would include the use of BMPs to minimize the discharge of construction materials from construction activities, control of floating debris, discharge of displaced water produced during construction to minimize discharge of pollutants to the Grand Canal, and provision of spill containment and cleanup equipment to control potential accidental spills.

Although temporary water quality impacts related to suspended solids in the water column would be expected, impacts related to resuspension of sediments would be reduced to a less than significant level with implementation of the appropriate regulatory permits, including the Section 401 Water Quality Certification. The Section 401 Water Quality Certification would require implementation of BMPs that would reduce water quality impacts associated with construction of the coffer dam. Common BMPs utilized may include use of silt curtains in addition to those previously identified.

With the adherence to USACE and RWQCB permit requirements associated with Sections 10, 401, and 404, **impacts associated with the Proposed Project related to violation of a water quality standard or waste discharge requirement would be less than significant and no mitigation measures are required.**

HYDRO-2. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on-site or off-site?

Land Side Construction Activities

The Project Site is relatively flat and would remain flat following construction activities. However, the Proposed Project requires shoring and excavation for construction of the below ground facilities. Shoring would be installed around the Project Site, after which excavation to a depth of approximately 25 feet and dewatering of the site would occur. Preliminary earthwork plans indicate that the Proposed Project would require approximately 10,000 cubic yards of soil to be excavated of which approximately 2,300 cubic yards would be stockpiled at Laydown Area 1. Approximately 7,700 cubic yards of soil would be stockpiled at Laydown Area 3.

Soil erosion is the process by which soil particles are removed from the land surface by wind, water or gravity. The rate of erosion increases when land is cleared or altered and left unprotected. Construction sites, if unprotected, can erode at rates in excess of one hundred times the natural background rate of erosion. Sediment resulting from excessive erosion is a pollutant. Stormwater runoff (or wind) could carry the exposed or eroded sediments to the storm drain system and ultimately to the Grand Canal, Ballona Lagoon, Marina del Rey Harbor, and Ballona Creek (for Laydown Area 3, located in Culver City). Erosion and sedimentation affects water quality through interference with photosynthesis, oxygen exchange, and the respiration, growth, and reproduction of aquatic species. Additionally, other pollutants, such as nutrients, trace metals, and hydrocarbons, can attach to sediment and be transported downstream, which could contribute to degradation of water quality. Although the Proposed Project does not entail altering the course of a stream or river, it could result in potentially significant impacts related to substantial erosion or siltation to on-site or off-site locations.

Compliance with existing regulations would reduce the potential for erosion, sediment transport, and pollutants in stormwater runoff to receiving waters from activities associated with the Project Site or Laydown areas. Construction erosion and sedimentation control measures, site management practices, materials and waste management BMPs would be implemented at the Project Site, as required by the NPDES MS4 Permit. Compliance with existing regulatory requirements, such as implementation of erosion and sediment control BMPs as required by the MS4 Permit would reduce impacts related to the Proposed Project's potential to substantially alter the existing drainage pattern of the site or area. **Therefore, impacts would be less than significant and no mitigation is required.**

In-Water Construction Activities

Water flowing in the Grand Canal would be diverted around the temporary cofferdam structure by the presence of the sheeting. Construction of the cofferdam could substantially alter the existing drainage pattern of the canal that would potentially result in erosion or siltation. The impacts of erosion or siltation from the cofferdam installation were previously described above and were determined to be potentially significant. Although temporary erosion and siltation impacts related to suspended solids in the water column would be expected, impacts related to resuspension of sediments would be reduced to a less than significant level with implementation of Section 401 Water Quality Certification requirements. The Section 401 Water Quality Certification would require implementation of BMPs (e.g., silt curtains) that would reduce water quality impacts associated with

construction of the cofferdam and water quality monitoring. Therefore, compliance with Section 401 Water Quality Certification requirements would ensure that **impacts related to the Proposed Project's potential alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on-site or off-site, would be less than significant; no mitigation is required.**

HYDRO-3. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site?

Land Side Construction Activities

Dewatering methods would be required at all times during construction, to promptly remove and dispose of all water from any source entering the Project Site. Since the amount and volume of dewatering is not known at this time, the Proposed Project could result in potentially significant impacts related to altering the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site. However, compliance with the General Waste Discharge Requirements for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties (Order No. R4-2013-0095, NPDES No. CAG994004) would ensure that the Proposed Project would not result in flooding on-site or off-site during construction activities. In addition, the Proposed Project includes minimum construction BMPs included in the MS4 permit that ensure that surface runoff rates and amounts would not result in flooding to either on or off site areas. Therefore, compliance with General Waste Discharge Requirements for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties (Order No. R4-2013-0095, NPDES No. CAG994004), **would result in less than significant impacts. No mitigation measures are required**.

In-Water Construction Activities

Construction of the cofferdam could substantially alter the existing drainage pattern of the canal and as such, the Proposed Project could result in potentially significant impacts related to altering the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site. Alteration of the Grand Canal west bank and water flowing in the Grand Canal (tidal flow) would be diverted around the temporary cofferdam structure by the presence of the sheeting. A hydraulic analysis of the Grand Canal was performed to simulate the effects of the cofferdam and diversion structure obstructions during the construction phase of the Proposed Project. The cofferdam and diversion structure were modeled as blocked obstructions within the affected cross-sections of Grand Canal. The dimensions of the cofferdam are 95 feet in length by 23 feet wide, whereas the width of the Grand Canal in the vicinity ranges from approximately 65 to 70 feet. The existing and proposed conditions models were run with different flood conditions (dry, wet, extreme flood) to estimate the potential for water to overtop the banks of the Grand Canal and result in flooding. The model results indicate that although there are increases in starting water surface elevation for all three flood conditions, the flow would be contained within the channel banks for all flood conditions. As such, there would be no adverse impact to the Grand

Canal for rainfall events up to and including the 100-year, 24-hour storm event during the temporary construction of the cofferdam.

Based on the analysis above, construction of the temporary cofferdam would not substantially alter the existing drainage patterns or hydrology of the Grand Canal or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site and therefore**, impacts would be less than significant; no mitigation is required.**

HYRDO-4. Would the project create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

For both land side and in-water construction activities, no runoff impacts that would exceed the capacity of existing or planned stormwater drainage systems would occur during construction since the Proposed Project would include construction BMPs identified in the MS4 Permit. In addition, during construction, the off-site storm drain system at Hurricane Street and the laydown areas would be protected in place and construction BMPs would prevent any construction pollutants from entering the Grand Canal, Ballona Lagoon or Ballona Creek. Therefore, construction activities associated with the Proposed Project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems nor would they provide substantial additional sources of polluted runoff. As such, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-5. Would the project otherwise substantially degrade water quality?

As previously shown in Table 3.7-1, sediment toxicity, exotic vegetation, habitat alterations, hydromodification, reduced tidal flush, trash and other metals and hydrocarbons are listed as 303(d) impairments in Ballona Lagoon and Marina del Rey Harbor. Both land side and in-water construction activities could result in a discharge of contaminated sediments, removed vegetation, trash, and other metals and hydrocarbons. In addition, although no known contaminated sediments are located at the Project Site, excavated soils may become accidentally contaminated in the event of a construction-related spill and could enter the Grand Canal, Ballona Lagoon, and Ballona Creek (associated with Laydown Area 3 in Culver City). Combined, these activities and events could result in a potentially significant impact related to degraded water quality. However, the minimum construction BMPs identified in the MS4 Permit include a Spill Prevention and Control BMP in order to promptly contain and clean up spills, along with a Stockpile Management BMP to protect soil piles in place. As a result, there is a low risk of soil contamination from spills. To the extent feasible, native vegetative would be protected in place (only a portion of the west bank of the Grand Canal would be temporarily affected [see Figure 2-2 in Chapter 2, Project Description of this EIR]), which is a minimum construction BMP identified in the MS4 Permit. Vegetation that is removed would be managed according to the Solid Waste Management BMP to prevent the discharge of vegetation and trash from the Project Site into the adjacent waters. While t a cofferdam will be used to allow construction work to occur within the canal, the cofferdam would not result in reduced tidal flush, as flows would continue to pass around the cofferdam while in place (see discussion above). Therefore, construction of the Proposed Project would not otherwise substantially degrade water quality and as such, **impacts would be less than significant; no mitigation measures are required.**

HYDRO-6. Would the project place within a 100-year flood hazard area structures that would impede or redirect floodflows?

The Proposed Project is not located in a 0.1% flood hazard zone. Moreover, the hydraulic analysis performed to assess the flood risk of the temporary cofferdam in the Grand Canal determined that its construction would not impede or redirect flows or result in on- or off-site flooding. Therefore, the Proposed Project would not place within a 100-year flood hazard area structures that would impede or redirect floodflows and as such, **impacts would be less than significant; no mitigation measures are required.**

HYDRO-7. Would the project contribute to inundation by seiche, tsunami, sea level rise or mudflow?

The Proposed Project is not located in an area subject to mudflow and therefore, **no impacts would result and no mitigation measures are required**.

The Project Site is located in a designated tsunami hazard zone and therefore, construction workers, employees and visitors would currently be subject to this hazard. Low-lying coastal areas, harbor inlets, and the mouths of moderate-sized drainages are locations particularly at risk to the hazard of tsunami wave runup. Tsunami safety depends on numerous factors including the degree of the tsunami-hazardous zone urbanization, probability and extent of secondary disasters, readiness of the tsunami-hazardous zone for the emergency, etc. While Los Angeles has not experienced a major tsunami, a tsunami warning was issued for the coastline beaches in 2009 following the Samoan earthquake, in 2010 following the Chilean earthquake, and in 2011 following the earthquake in Japan (City of Los Angeles, 2016). The City of Los Angeles adopted the Tsunami Response Plan to address a tsunami evacuation response. If a tsunami evacuation is ordered, all City Emergency Operations Organizations (EOO) departments would be involved in support role activities and the City's Emergency Operations Center (EOC) would be activated at Level III, the highest level possible. In addition, when the City's EOC is activated, the County EOC and the Regional EOC is activated.

Since construction activities related to the Proposed Project would not contribute to inundation by tsunami given that this phenomena is generated by seismic activities or underwater landslides**, impacts would be less than significant; no mitigation measures are required.**

Risks associated with seiche within the Grand Canal or Ballona Lagoon would be dependent on a seismic event capable of displacing surface waters and resulting in subsequent flooding. Construction activities related to the Proposed Project would not contribute to this condition since seismic activity is the principle cause of this phenomena and therefore, **impacts would be less than significant; and no mitigation measures are required**.

State guidance projections for sea level rise to range from .13 feet at the lowest projection to 5.48 ft for the highest projection by the year 2100. Construction activities related to the Proposed Project are not anticipated to contribute to inundation caused by sea level rise (or storm-related flooding combined with sea level rise conditions) since these conditions are expected to occur after the anticipated two year construction period. Since the Proposed Project would not contribute to sea level rise given that this phenomenon is generated by climate change and global warming and will occur after the Proposed Project construction duration, **impacts would be less than significant and no mitigation measures are required.**

In December 2015, the California Supreme Court held in California Building Industry Association v. Bay Area Air Quality Management District, Case No. S213478, that CEQA generally does not require an analysis of how existing environmental conditions will affect a project's future users or residents and noted that CEQA may not require an analysis of the impacts of global warming, including sea level rise, on the project. However, as CEQA case law is in this area is continuing to evolve and State, regional and local efforts increase to understand the potential impacts climate change and sea level rise may have on public infrastructure , the City has decided to begin to address these issues.

HYDRO-8. Constitute a geologic hazard to other properties by causing or accelerating instability from erosion?

Impacts from erosion or siltation were previously described above and were determined to be less than significant. As noted above, compliance with existing regulatory requirements, including the MS4 Permit would mitigate these impacts. Therefore, the Proposed Project would not constitute a geologic hazard to other properties by causing or accelerating instability from erosion and as such, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-9. Accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition that would not be contained or controlled on-site?

Impacts from erosion or siltation were previously described above and were determined to be less than significant. As noted above, compliance with existing regulatory requirements, including the MS4 Permit would mitigate these impacts. Therefore, the Proposed Project would not accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition that would not be contained or controlled on-site and as such, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-10. Discharges associated with the project would create pollution, contamination or nuisance as defined in Section 13050 of the California Water Code (CWC) or that cause regulatory standards to be violated, as defined in the applicable NPDES stormwater permit or Water Quality Control Plan for the receiving water body.

Excessive erosion and sedimentation during construction are the most visible water quality impacts due to construction activities, as discussed in detail above. Other less visible water quality impacts are associated with discharge of pollutants such as metals, nutrients, soil additives, pesticides, construction chemicals, and other construction waste. No other pollutant discharges are anticipated from construction activities. Impacts to water quality were previously described above and determined to be less than significant with adherence to standard BMPs. Therefore, compliance with existing regulatory requirements, such as implementation of erosion and sediment control BMPs as required by the MS4 Permit would reduce discharges associated with project construction that would create pollution, contamination, or nuisance. As such, discharges associated with the project would not create pollution, contamination or nuisance as defined in Section 13050 of the California Water Code (CWC) or that cause regulatory standards to be violated, as defined in the applicable NPDES stormwater permit or Water Quality Control Plan for the receiving water body and therefore, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-11. Cause flooding during the projected 50-year developed storm event, which would have the potential to harm people or damage property or sensitive biological resources?

Impacts from flooding during the projected 50-year developed storm event area during construction were previously described above and were determined to be less than significant. In addition, a

hydraulic analysis of the Grand Canal was performed to simulate the effects of the cofferdam and diversion structure obstructions during the construction phase of the project and under various storm-event conditions (e.g., 100-year, 24-hour event). The results of the analysis determined that impacts would be less than significant and no mitigation was required. In addition, the analysis contained in Section 3.3, Biological Resources of this EIR determined that impacts related to biological resources would be less than significant with adherence to permit requirements and associated mitigation measures. Therefore, the Proposed Project would not cause flooding during the projected 50-year developed storm event, which would have the potential to harm people or damage property or sensitive biological resources and as such, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-12. Substantially reduce or increase the amount of surface water in a water body?

As described above, construction of the cofferdam would temporarily increase the amount of surface water in Grand Canal. However, the hydraulic analysis of the Grand Canal concluded there was sufficient freeboard in the canal to support the 100-year, 24-hour storm event during the temporary construction of the cofferdam and that impacts would be less than significant. Therefore, the Proposed Project would not substantially reduce or increase the amount of surface water in a water body and as such, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-13. Result in a permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow?

As previously discussed above, construction activities would require temporary installation of a cofferdam in the Grand Canal to construct the diversion structure. However, the hydraulic analysis determined that the cofferdam would not result in a change to the movement of surface water nor would it produce a change in the current or direction of water flow and impacts would be less than significant. Therefore, the Proposed Project would not result in a permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow and as such, impacts would be **less than significant; no mitigation measures are required.**

3.7.3.6 Operational Impacts

The analysis below describes the temporary and permanent impacts on hydrology and water quality anticipated as a result of the Proposed Project during operation. Operational activities with the potential to affect hydrology and water quality would generally include:

- Changes to, or interruptions in, the local drainage infrastructure as a result of the design potentially leading to localized or regional flooding or loss of groundwater recharge;
- Increases in directly connected impervious surface area as a result of the project leading to increases in the timing, rate, and/or volume of stormwater runoff, and, accordingly, flooding or erosion;
- Creation of substantial new sources of pollutants leading to new sources of contaminated runoff;
- Location of facilities within a designated floodplain or levee or dam failure inundation zone, exposing people and/or property to risks related to flooding, as well as effects resulting in changes in the location and direction of flood flows; or

- Location of facilities below the naturally occurring water table, with potential effects related to flooding of facilities, changes in groundwater quality and/or quantity, and new discharge of groundwater to surface water.

HYDRO-1. Would the project violate any water quality standards or waste discharge requirements?

Once the VAPP is constructed, the Project Site would be covered with up to 75% impervious cover with Public Facility uses and construction Laydown Area 1 would be covered with up to 81.2% impervious surfaces associated with parking for the VAPP Project Site and proposed Open Space. Public facilities generate pollutants that could impair water quality if not treated prior to discharge. Typical pollutants associated with public uses include but are not limited to suspended solids, total phosphorus, total nitrogen, total kjedahl nitrogen, copper, lead and zinc. The increase in impervious cover associated with the Project Site would increase the volume of runoff during a storm, which would more effectively transport pollutants generated during operation into receiving waters. Therefore, the Proposed Project could result in potentially significant impacts related to a violation of water quality standards or waste discharge requirements.

The Proposed Project includes LID features, Source Control and Treatment Control BMPs to reduce the discharge of pollutants. Treatment Control BMPs would also be incorporated into the design of on-site storm drain systems to treat runoff in accordance with the SUSMP standards, as required by the City. The Proposed Project would also include non-structural BMPs such as: storm drain stenciling and signage, properly designed outdoor materials storage areas, properly designed trash storage areas, proof of on-going BMP maintenance, and other items relevant to operations of the site. Implementation of site-specific source control and treatment control BMPs along with non-structural BMPs, in accordance with the SUSMP standards, would filter potential pollutants from runoff prior to discharge into receiving waters.

The most significant water quality benefit of LID is removal of stormwater runoff from the storm drain system or receiving waters. The first flush of stormwater runoff during a rainfall event typically contains higher concentrations of pollutants than later rainfall. By directing this runoff through LID features and providing retention, infiltration into the various layers of the LID feature and/or the native soils below the LID, and evapotranspiration, the pollutants do not reach the receiving body of water. Other pollutant removal processes achieved through LID include physical, chemical, and biological processes. Physical processes include filtering of sediment and pollutants, such as metals absorbed to the sediment. Degradation of fecal coliform bacteria also occurs by drying out and exposure to ultraviolet (UV) light from sun exposure. Biological processes include bioremediation and biodegradation. Phytoremediation, or pollutant removal by plants, includes pollutant uptake into and bioaccumulation within the plants, release of some pollutants from plants into the atmosphere, and breakdown of pollutants at the soil-plant root interface.

A water quality analysis of the Proposed Project was conducted to estimate the potential contribution of pollutants generated on the VAPP Project Site after implementation of source control and treatment control BMPs. Both the two-year design storm event and the 36-year continuous simulation modeling runs were used. Table 3.7-6 lists the Pre-Project and Post-Project Event Mean Concentration (EMC) for each pollutant modeled in the water quality analysis. As shown in Table 3.7-6, as a result of the Proposed Project, the various industrial pollutants increase. LID features under consideration include lined bioretention, planter box, and vegetated swale. The lined

bioretention, planter box, and vegetated swale are not effective alone in reducing fecal coliform and chemical oxygen demand (COD) contributions. As shown in Table 3.7-7 below, the vegetated swale does not perform to the maximum extent practicable and as such is not considered a viable option for this site. The lined bioretention or the planter box both have high pollutant removal efficiencies for most of the pollutants except COD, which shows a 40% reduction. In addition, while the lined bioretention or the planter box may have high pollutant removal efficiencies for fecal coliform, the discharge concentration would still be much higher in the developed condition compared to existing conditions. In order to reduce the discharge of pollutants to the maximum extent practicable, as required by the MS4 Permit, a treatment train or multiple BMPs are necessary.

Table 3.7-6. Pre-Project and Post-Project Event Mean Concentration Values for Project Site

	Pre-Project (Vacant)	Post-Project (Industrial)
Pollutant	EMC	EMC
TSS (mg/L)	164.7	229.4
COD (mg/L)	40.0	65.0
Total Copper (µg/l)	9.1	31.0
Total Lead (µg/l)	30.0	114.0
Total Zinc (µg/l)	38.8	565.6
Fecal Coliform (MPN/100 L)	2,174.8	653,070.4
Source: Hydrology Technical Memorandum, Watearth, August 2016.		

Table 3.7-7. Pollutant Removal by Various Biofiltration Practices

	% Removal		
Pollutant	Lined Bioretention	Planter Box	Vegetated Swale
Total Suspended Solids (TSS)	85	85	52
Chemical Oxygen Demand (COD)	40	40	40
Total Copper	66	66	26
Total Lead	63	63	13
Total Zinc	68	68	38
Fecal Coliform	81	81	30
Source: Hydrology Technical Memorandum, Watearth, August 2016.			

In order to further reduce the COD and fecal coliform concentrations from the site, a pre-treatment BMP is recommended. The water quality analysis modeled adding a vegetated filter strip as a pre-treatment BMP; results indicated the filter strip would further reduce the COD and fecal coliform concentrations from the site and any remaining pollutants. In addition, consistent with LID requirements, all impervious cover on the Project Site would be routed to drain through the vegetated filter strip by overland flow. Use of this pre-treatment BMP would also concentrate removal of sediment and other maintenance activities pollutants outside of the primary BMP. Applicable BMPs would be implemented in accordance with Los Angeles County NPDES MS4 Permit and associated SUSMP requirements, as required per Order R4-2012-0175. Therefore, with the implementation of these requirements the Proposed Project would not violate any water quality

standards or waste discharge requirements and as such, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-2. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on-site or off-site?

Once the VAPP is constructed, the Project Site would be covered with up to 75% impervious cover and construction of Laydown Area 1 would be covered with up to 81.2% impervious surfaces. Implementation of the Project would alter the existing drainage pattern of the site, and increase peak flows and runoff volumes, resulting in increased erosion or siltation on-site or off-site and therefore, impacts are considered potentially significant. However, the increases in peak flows for the two-year, 10-year, and 100-year storm events would be managed through the use of LID features and MS4 drains. LID features under consideration include lined bioretention, planter box, and vegetated swale. LID features are required to retain 100-percent of the stormwater quality design volume (SWQDv) on-site through a combination of infiltration, evapotranspiration, and stormwater harvest and re-use unless it is demonstrated that it is technically infeasible to do so. The Proposed Project would implement a high removal efficiency biofiltration BMP within the Project Site sized to capture 1.5 times the runoff volume and to meet the minimum sizing requirements in the LID Manual. Therefore, the Proposed Project does not include changes to the existing storm drain system that would result in substantial erosion or siltation on site or off site. Thus, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-3. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site?

Land Side Construction Activities

Once the VAPP is constructed, the Project Site would be covered with up to 75% impervious cover and construction Laydown Area 1 would be covered with up to 81.2% impervious surfaces. Implementation of the Proposed Project would alter the existing drainage pattern of the site, and increase peak flows and runoff volumes, resulting in increased flooding on-site or off-site and therefore, could result in potentially significant impacts. However, the increases in peak flows for the two-year, 10-year, and 100-year storm events would be managed through the use of LID features and MS4 drains. As shown in Table 3.7-8, proposed conditions peak discharges from the Project Site with implementation of the lined bioretention with underdrain are estimated at 72.8 cubic feet per second (cfs), 165.6 cfs, and 263.8 cfs for the two-year, 24-hour; ten-year, 24-hour; and 100-year, 24-hour design storm events, respectively. As shown in Table 3.7-8, the proposed two-year peak flow is 0.02 cfs, the existing ten-year peak flow is 0.05 cfs and the existing 100-year peak flow is 0.17 cfs. The proposed conditions peak flows in the Grand Canal with the implementation of the lined bioretention with underdrain are essentially no change from existing flows for the two-year, 24-hour; ten-year, 24-hour; and 100-year 24-hour events. The planter box and lined bioretention BMP option would also result in reduced peak flows from the site; 67-percent less than existing flows for the two-year, 24-hour event; seven-percent less for the ten-year, 24-hour event; and no change from the existing for the proposed 100-year, 24-hour event. (Watearth, 2016). As a result, the Proposed Project would not increase the rate or amount of surface runoff in a manner

that would result in flooding on-site or off-site and impacts would be **less than significant; no mitigation measures are required.**

Table 3.7-8. Proposed Peak Discharges and Flow

Proposed Conditions	2-year, 24-hour	10-year, 24-hour	100-year, 24-hour
Peak Discharges	72.8 cfs	165.6 cfs	263.8 cfs
Change from Existing	0	0	0
Peak Flow	0.02 cfs	0.05 cfs	0.17 cfs
Change from Existing	(0.04)	(0.09)	(0.07)

Source: Hydrology Technical Memorandum, Watearth, August 2016.

In-Water Construction Activities

Post construction, the diversion structure located in the Grand Canal would be below ground and would not protrude within the water column and as such, would not impede or redirect flows as demonstrated in the hydraulics analysis. Therefore, during operation, the Proposed Project would not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site and as such, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-4. Would the project create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Impacts to water quality and runoff during operation were previously described above and determined to be less than significant. The Proposed Project would use a high removal efficiency biofiltration BMP within the Proposed Project Site (located along the eastern side of the VAPP, adjacent to Esplanade) sized to capture 1.5 times the runoff volume and meeting the minimum sizing requirements in the LID Manual. The existing peak flows from the area contributing to the existing outfall at Hurricane Street would not increase due to the Proposed Project and pollutants would be reduced to the maximum extent practicable through the use of BMPs. Operational activities associated with the Proposed Project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff during the operation phase. Consequently, operational activities are expected to result in **less than significant impacts on stormwater drainage capacity and polluted runoff**, **and no mitigation measures are required.**

HYDRO-5. Would the project otherwise substantially degrade water quality?

As previously shown in Table 3.7-1, sediment toxicity, exotic vegetation, habitat alterations, hydromodification, reduced tidal flush, trash, and other metals and hydrocarbons are listed as 303(d) impairments in Ballona Lagoon and Marina del Rey Harbor. During operation, the project would have the potential to discharge sediments, trash, and other metals and hydrocarbons. Typical pollutants associated with industrial uses include but are not limited to suspended solids, total phosphorus, total nitrogen, total kjedahl nitrogen, copper, lead, and zinc. The increase in impervious cover associated with the Project Site would increase the volume of runoff during a

storm, which would more effectively transport pollutants generated during operation into receiving waters and would be a potentially significant impact. However, the Project Site includes the required pervious surfaces (in the form of gravel and open space), which would accommodate the increased runoff (see analysis above) and would filter pollutants from water through a biofiltration BMP prior to discharge offsite. The BMPs under consideration include a lined bioretention with under drain or planter box, both with pre-treatment filter strips, which would remove the potential pollutants identified previously. Further, the gravel would serve to limit sediment erosion from the site. Operational activities associated with the Proposed Project would not otherwise substantially degrade water quality and therefore, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-6. Would the project place within a 100-year flood hazard area structures that would impede or redirect floodflows?

Impacts from placing structures within a 100-year flood hazard area during operation were previously described above and determined to be less than significant. As noted in the hydraulics analysis, the diversion structure would be installed in the Grand Canal, but would be entirely underground and would not protrude into the water column and therefore, would not impede or redirect floodflows. Therefore, the Proposed Project would not place within a 100-year flood hazard area structures that would impede or redirect floodflows and impacts would be **less than significant; no mitigation measures are required.**

HYDRO-7. Would the project contribute to inundation by seiche, tsunami, sea level rise or mudflow?

As previously discussed, the Proposed Project is currently located in a designated tsunami hazard zone and therefore employees and visitors would be subject to the risk of this hazard. Low-lying coastal areas, harbor inlets, and the mouths of moderate-sized drainages are locations particularly at risk to the hazard of tsunami wave run-up. Tsunami safety depends on numerous factors including the degree of the tsunami-hazardous zone urbanization, probability and extent of secondary disasters, readiness of the tsunami-hazardous zone for the emergency, etc. While Los Angeles has not experienced a major tsunami, a tsunami warning was issued for the coastline beaches in 2009 following the Samoan earthquake, in 2010 following the Chilean earthquake, and in 2011 following the earthquake in Japan (City of Los Angeles, 2016). The City of Los Angeles adopted a Tsunami Response Plan to address a tsunami evacuation response. If a tsunami evacuation is ordered, all City Emergency Operations Organizations (EOO) departments would be involved in support role activities and the City's Emergency Operations Center (EOC) would be activated at Level III, the highest level possible. In addition, when the City's EOC is activated, the County EOC and the Regional EOC is activated.

As discussed in Chapter 2, Project Description of this EIR, the existing VPP is the City's largest pumping plant, it and serves as a critical facility in the wastewater conveyance system receiving and conveying sewage from the communities of Topanga, Pacific Palisades, Brentwood, Santa Monica, Venice, Mar Vista, and parts of Los Angeles County. The control facility for the VPP is onsite, along with the wireless telemetry that controls the Marina and Washington Blvd. tide gates. The VPP receives wastewater from this tributary system via a Coastal Interceptor System (CIS) 48-inch force main, and continuously pumps the sewage flows to the Hyperion Treatment Plant. The Venice Dual Force Main, which will be construction by 2020, will augment and provide back-up conveyance capacity to Hyperion. The CIS runs parallel to the Grand Canal in the vicinity of the VPP. There is an

emergency sewer discharge pipe inside the Grand Canal through which in an emergency, sewage flows can be diverted to the Ballona Lagoon, a tidal channel on the Silver Strand Peninsula, that is connected through the Marina tide gate to the Pacific Ocean via the Marina del Rey Harbor.

In storm conditions, the VPP sewer system is affected by infiltration from storm drains and groundwater. Plant failure (possibly due to power outages from flooding) would lead to exceeded sewer capacity which would require emergency discharges and inundation into the Ballona Lagoon, the Grand Canal and the surrounding local streets. There have been several occasions when wet-weather flows have nearly exceeded the VPP pumping capacity resulting in near misses of wastewater spills into the Grand Canal and Ballona Lagoon. Locally, wastewater spills would affect human health and the environment, surrounding streets, as well as ESHA areas including the Ballona Lagoon and the Grand Canal.

The Sea Level Rise Vulnerability Study for the City of Los Angeles (Grifman et al. 2013), and the USEPA Los Angeles Sanitation Climate Resilience Evaluation and Awareness Tool (CREAT) Exercise Report for Wastewater Assets (USEPA, 2016) highlight two important issues related to City of Los Angeles sewers and wastewater pumping plants regarding climate change and sea level rise. First, wastewater pumping plants in the Venice Beach area are vulnerable to sea level rise because sea level rise conditions combined with 100-year storm surges could flood the wastewater pumping plants as shown in Figures 3.7-1 and 3.7-2, and cause electrical equipment to fail. Second, plant failures caused by flooding could contribute to inundation and result in wastewater spills with negative environmental consequences.

As discussed, the VPP and Proposed VAPP are also directly connected to the Pacific Ocean via Maria del Rey Harbor. A power outage as a result of inundation from storm surges and sea level rise conditions at the existing VPP and Proposed VAPP facility once constructed could result in wastewater releases into the Pacific Ocean. ,



Figure 3.7-1
Flood Risk to VAPP Due to Sea Level Rise and 100-Year Storm Surge
Venice Auxiliary Pumping Plant Project



Figure 3.7-1
Comparison of Flood Risk to VAPP Due to Sea Level Rise (SLR) and 100-Year Storm Surge at 0 cm, 50 cm, 100 cm, and 150 cm SLR Levels
Venice Auxiliary Pumping Plant Project

As shown in Figures 3.7-1 and 3.7-2, at a sea level rise of 50 cm (2050 to 2100), the Grand Canal and Ballona Lagoon which are adjacent to the VPP and proposed VAPP will inundate adjacent land areas during a 100-year flood event. Figure 3.7-1 shows that at a sea level rise level combined with a storm surge of 200 cm (16.6 ft), the existing VPP and the proposed VAPP and surrounding areas would likely be inundated during a 100-year storm event. The USEPA has projected a 50 cm (4.16 ft) rise in sea level in the Venice area by 2050 (based on NOAA estimates of 0.88mm/year sea level rise trends in the Los Angeles area) (USEPA, 2016). The California Coastal Commission estimates that sea level rise would range between 1.38 feet (42 cm) and 5.48 feet (167cm) by 2100.. Based on current observations, Los Angeles will likely be on the lower end of this range. While the Proposed Project may not be completely flooded during a 100-year storm event based on these projections, some part of the facilities and tide gates may be inundated. Should the Proposed Project fail or be nonfunctional due to local power outages, created by a storm event is causing flooding of the facilities, wastewater spills into the surrounding water bodies may occur as a result and contribute to the inundation . The Proposed Project and existing VPP could become completely inundated by sewage-contaminated water depending on the duration of the power outage. This could cause damage to the plant's electrical equipment and create local environmental and economic impacts.

The USEPA (2016) study of certain LA Sanitation wastewater assets identified potential measures that could reduce risks from climate change and sea level rise to LASAN facilities. Potential measures identified in the study include: installing temporary flood barriers, designing a wet weather plan specific to each installation, constructing perimeter walls, improving and protecting back-up power for pumping plant facilities, and using watertight enclosures to further protect electrical equipment, instrumentation and controls (USEPA, 2016).

In summary, due to its coastal location, the existing VPP and the Proposed VAPP are currently located in a tsunami hazard zone and are already vulnerable to inundation by tsunami impacts. Also, due to their location adjacent to tidal water bodies (i.e. the Pacific Ocean, Grand Canal and Ballona Lagoon), that could rise due to sea level rise and storm surges, the VPP and the Proposed VAPP are vulnerable to flooding from 100-year storm events. In the event of extended power outages during such a storm, this flooding could be exacerbated by any wastewater spills that might occur during operations due to any extended power outages. Therefore, the Proposed Project would contribute to inundation caused by tsunami and sea level rise during project operations, **and impacts are significant and unavoidable**.

In December 2015, the California Supreme Court held in California Building Industry Association v. Bay Area Air Quality Management District, Case No. S213478, that CEQA generally does not require an analysis of how existing environmental conditions will affect a project's future users or residents and noted that CEQA may not require an analysis of the impacts of global warming, including sea level rise, on the project. However, as CEQA case law is in this area is continuing to evolve and State, regional and local efforts increase to understand the potential impacts climate change and sea level rise may have on public infrastructure, the City has decided to begin to address these issues.

HYDRO-8. Constitute a geologic hazard to other properties by causing or accelerating instability from erosion?

Impacts from erosion or siltation were previously described above and were determined to be less than significant. Compliance with existing regulations would reduce the potential for causing or accelerating instability from erosion. Adherence to existing regulatory requirements, such as implementation of LID features, Source Control and Treatment Control BMPs would reduce the

impacts of the Proposed project related to causing or accelerating instability from erosion to **less than significant levels; no mitigation measures are required.**

HYDRO-9. Accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition that would not be contained or controlled on-site?

Impacts from erosion or siltation and runoff were previously described above and determined to be less than significant. Compliance with existing regulations would reduce the potential for sediment runoff or deposition that would not be contained or controlled on-site. Adherence with existing regulatory requirements, such as implementation of LID features, Source Control and Treatment Control BMPs would reduce impacts of the Proposed project related to accelerating natural processes of wind and water erosion and sedimentation to **less than significant levels; no mitigation measures are required.**

HYDRO-10. Discharges associated with the project would create pollution, contamination or nuisance as defined in Section 13050 of the California Water Code (CWC) (see definitions on page G.2-4 of the City's Thresholds) or that cause regulatory standards to be violated, as defined in the applicable NPDES stormwater permit or Water Quality Control Plan for the receiving water body.

Impacts to water quality were previously described above and determined to be less than significant. Compliance with existing regulatory requirements, such as implementation of LID features, Source Control and Treatment Control BMPs as required by the MS4 Permit would reduce discharges associated with project operation that would create pollution, contamination or nuisance as defined in Section 13050 of the CWC or that cause regulatory standards to be violated, as defined in the applicable NPDES stormwater permit or Water Quality Control Plan for the receiving water body to **less than significant levels; no mitigation measures are required.**

HYDRO-11. Cause flooding during the projected 50-year developed storm event, which would have the potential to harm people or damage property or sensitive biological resources?

Impacts from flooding during the projected 50-year developed storm event were previously described above and determined to be less than significant. The Proposed Project would not cause flooding during the projected 50-year developed storm event, which would have the potential to harm people or damage property or sensitive biological resources. A diversion structure would be installed in the Grand Canal for use during construction and would remain in place and be utilized post-construction. As noted in the hydraulics analysis, the diversion structure would be located under the Grand Canal and would not protrude into the water column and therefore, would not result in flooding. Therefore, impacts would be **less than significant; no mitigation measures are required.**

HYDRO-12. Substantially reduce or increase the amount of surface water in a water body?

Impacts to Grand Canal during operation were previously described above and were determined to be less than significant. Therefore, the Proposed Project would not substantially reduce or increase the amount of surface water in a water body; impacts would be **less than significant; no mitigation measures are required.**

HYDRO-13. Result in a permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow?

Impacts to Grand Canal during operation were previously described above and determined to be less than significant. As noted in the hydraulics analysis, the diversion structure would be located under the Grand Canal and would not protrude into the water column and therefore, would not result in in permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow. Impacts would be **less than significant; no mitigation measures are required.**

3.7.4 Mitigation Measures

The following mitigation measure will help address impacts to hydrology and water quality related to tsunami and sea level rise:

MM-HYDRO- 1: The City of Los Angeles Department of Sanitation shall prepare a Tsunami Response and Action Plan designed for the VPP/VAPP facility by 2020. At a minimum, the plan shall identify and implement specific measures related the VPP/VAPP which are designed to 1) reduce impacts to the facility in the event of a tsunami and/or with future sea level rise conditions and 2) identify what actions are needed at the VPP/VAPP facility and within the wastewater infrastructure system to accelerate the recovery period of the VPP/VAPP facility in the event that a tsunami or major storm event disabled the facilities. These measures shall be implemented at the VAPP by 2022. The action plan could include the following measures:

- Evaluate the potential for installing temporary flood barriers as needed when sufficient notice is given;
- Evaluate the use of watertight enclosures to further protect electrical equipment, instrumentation and controls before completing final design of the VAPP facility and other LA Sanitation wastewater facilities located within local coastal areas, as appropriate.

3.7.5 Significant Unavoidable Impacts

Project construction activities would not generate unavoidable adverse impacts to hydrology or water quality. Operation of the Proposed Project would contribute to inundation by tsunami or sea level rise, if a power failure resulted, and impacts to water quality would be significant and unavoidable.

3.7.6 Cumulative Impacts

The geographic scope for cumulative impacts on hydrology and water quality includes the Marina del Rey subwatershed. Implementation of the Proposed Project would include compliance with of all required laws, permits, ordinances and plans, such as the MS4 Permit, LID, SUSMP, and Construction General Permit requirements, that would reduce incremental effects to hydrology and water quality. The Proposed Project would not result in a substantial increase of impervious surfaces within the watershed and is required to include pervious surfaces to retain storm water drainage onsite. This increase in impervious surfaces with implementation of BMPs as required by the MS4 Permit would not lead to an increase in surface runoff or significant pollutant loadings. The areas surrounding the Proposed Project area are of similar urban pervious nature, and any future development would also

include compliance with of all required laws, permits, ordinances and plans, such as the MS4 Permit, LID, SUSMP, and Construction General Permit requirements in order to meet runoff requirements.

There are eight related projects surrounding the Project area that are also within the Marina del Rey subwatershed. These related projects generally consist of roadway improvements/repairs, stormwater and sewer infrastructure improvements, VPP generator improvements, and recreational development. The majority of these projects would occur within already developed areas and would not significantly contribute to increased runoff as result of increases in impervious surfaces. Other future developments within the urban and developed subwatershed would have similar effects as the Proposed Project. However, the past, current, and reasonably foreseeable future projects in the subwatershed would be required to implement similar measures when obtaining relevant permits, including compliance with the LID Manual and SUSMP requirements and implementation of minimum BMPs during construction. This would help reduce impacts to water quality and retain runoff, and to ensure that the incremental effects of individual projects do not cause a substantial cumulative impact related to water quality. For example, during operation, projects would be required to maintain water quality through development and implementation of LID BMPs.

Overall, potential impacts to hydrology and water quality associated with future development in the watershed and the region would not be cumulatively considerable with compliance with all applicable laws, permits, ordinances, and plans. As a result, potential impacts to hydrology and water quality from the Proposed Project in combination with the related projects would be less than cumulatively considerable.

3.8 Land Use and Planning

This section describes the affected environment and regulatory setting for land uses and planning related to the Project Site and surrounding area. It also describes the potential land use and planning impacts that would result from implementation of the Venice Auxiliary Pumping Plant (VAPP or Proposed Project). As noted in the analysis below, direct impacts associated with land use and planning during construction or operation of the Proposed Project would be less than significant and no mitigation measures are required. However, the Proposed Project would result in significant and unavoidable secondary impacts on surrounding land uses, related to construction noise and vibration, even with mitigation incorporated.

3.8.1 Regulatory Setting

3.8.1.1 California Coastal Act of 1976

The Coastal Act was enacted in 1976 by the California legislature, which established it as the primary law that governs the decisions of the California Coastal Commission (Commission). It was created in 1972 through the California Coastal Conservation Initiative and Proposition 20. The Coastal Act outlines standards for development within the Coastal Zone that seek to balance the right to develop with strong environmental policies aimed to protect coastal resources. The Coastal Zone is a distinct and valuable natural resource of vital and enduring interest to all the people and exists as a delicately balanced ecosystem. It encompasses 1.5 million acres of land and is bounded by the ocean on the west and an inland easterly boundary that traverses along the entire California coast.

The State of California's basic goals for the Coastal Zone are to (a) protect, maintain, and, where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources; (b) assure orderly, balanced utilization and conservation of coastal zone resources taking into account the social and economic needs of the people of the state; (c) maximize public access to and along the coast and maximize public recreational opportunities in the coastal zone consistent with sound resources conservation principles and constitutionally protected rights of private property owners; (d) assure priority for coastal-dependent and coastal-related development over other development on the coast; (e) encourage state and local initiatives and cooperation in preparing procedures to implement coordinated planning and development for mutually beneficial uses, including educational uses, in the coastal zone.

The Coastal Act is designed to empower local governments to create Local Coastal Programs (LCPs) as land use policy to govern decisions that determine the conservation and the best use of coastal resources. LCP's are usually incorporated into a city's general plan for areas within that jurisdiction's Coastal Zone. Until the Coastal Commission certifies an LCP, the Commission makes the final decisions on all development within a city within the Coastal Zone and has appellate authority. Chapter 3 of the Coastal Act includes the standards used by the Commission in the review of coastal development permits and LCPs. It governs all development along the Coast and mandates protection of public access, recreational opportunities, and marine and land resources.

Venice Coastal Zone

The Venice Coastal Zone is within the California Coastal Zone and is generally bounded by Marine Street on the north; the city/county boundary, Washington Boulevard and Via Marina on the south; Lincoln Boulevard and Via Dolce on the east; and the Pacific Ocean on the west.

3.8.1.2 City of Los Angeles General Plan

A general plan is required by the State of California to address the specified provisions of seven mandated elements land use, circulation, housing, conservation, open space, noise, and safety—to the extent that the provisions are locally relevant. The City of Los Angeles General Plan contains eleven elements, including a Framework, Air Quality, Health, and Service Systems/Public Recreation. Instead of a Circulation Element, the City of Los Angeles has a Mobility Element.

The City of Los Angeles General Plan is a comprehensive, long-term declaration of purposes, policies, and programs for the development of the city. It provides land use policies that meet the existing and future needs and desires of the community.

General Plan Framework Element

The General Plan Framework Element (GPFE) is a strategy for long-term growth that sets a citywide context to guide subsequent amendments to the City's community plans, zoning ordinances, and other pertinent programs. The GPFE responds to state and federal mandates to plan for the city's future. An Environmental Impact Report (EIR) that analyzes the GPFE and it's consistency with the California Environmental Quality Act (CEQA) was also prepared.

The Residential Citywide Design Guidelines (RCDG) are part of the City's GPFE and serve to implement the City's 10 Urban Design Principles (see Table 3.8-1). The RCDG do not supersede regulations in the Los Angeles Municipal Code (see discussion below). They contain options, solutions, and techniques to achieve the goal of excellence in new design. Through the Department of City Planning's Urban Design Studio and the Development Services Center, the RCDG and the 10 Urban Design Principles function as a design program for the City that helps communicate design expectations to applicants during the design phase of their projects. They facilitate the application of design objectives and encourages high-quality development that is appropriate to the context of the city's climate and urban environment. The 10 Urban Design Principles are a statement of the City's vision for the future of Los Angeles, providing guidance for new development and encouraging projects to complement existing urban form in order to enhance Los Angeles' built environment. The 10 Urban Design Principles are intended to apply to a variety of urban forms that exist within Los Angeles, from the most dense and concentrated city centers to suburban areas.

Land Use Element

The Land Use Element includes Community Plans that establish policy and standards for each of the 35 geographic areas in the city. Each community plan is focused on specific geographic areas of the city and, therefore, include more specific policies and programs than those developed for the city as a whole.

Community Plans are intended to promote an arrangement of land uses, streets, and services that will encourage and contribute to the economic, social and physical health, safety, welfare, and convenience of the people who live and work in the community. The Community Plans also guide

Table 3.8-1. The 10 Principles of Urban Design

1.	Develop inviting and accessible transit areas.
2.	Reinforce walkability, bikeability and well-being.
3.	Nurture neighborhood character.
4.	Bridge the past and the future.
5.	Produce great green streets.
6.	Generate public open space.
7.	Stimulate sustainability and innovation in our city.
8.	Improve equity and opportunity.
9.	Emphasize early integration, simple processes and maintainable solutions.
10.	Ensure connections.

Source: City of Los Angeles, 2009.

development by establishing the City's goals, policies, and development standards with the objective of creating a healthy and pleasant environment. Goals, objectives, policies, and programs are created to meet the existing and future needs of the community through 2010. The Community Plans are intended to coordinate development among the various parts of the city of Los Angeles and adjacent municipalities in a fashion both beneficial and desirable to the residents of their communities and compatible with infrastructure and public services. The City is currently in the process of updating a number of community plans.

Safety Element

Planning and preparedness are critical in mitigating the extent of the impacts of a disaster, through pre-disaster abatement, pre-disaster response preparation and post-disaster recovery plans. The state identifies local safety elements as key tools for assisting local jurisdictions in organizing their hazard mitigation, disaster response, and recovery efforts. The Safety Element of the City of Los Angeles General Plan provides a contextual framework and overview of the city's natural hazards (fire, flood, earthquake, landslides, and other hazards), hazard mitigation, and emergency response operations. The Safety Element also contains goals, objectives, policies, and City Emergency Operations Organization (EOO) programs.

To further address issues concerning seismic safety and resilience, the Mayoral Seismic Safety Task Force recently undertook an evaluation of buildings and water systems and telecommunication infrastructure. Their findings and recommendations are presented in the City of Los Angeles' Resilience by Design report. The intent of the report is to identify ways to protect residents' lives and the economy, improve response to earthquakes, and prepare for quick recovery from earthquakes.

Conservation Element

State law intends that conservation elements address "conservation, development, and utilization of natural resources including water and hydraulic force, forests, soils, rivers and other waters, harbors, fisheries, wildlife, minerals, and other natural resources." State general plan legislation was amended (1995) to require that preparation of the water portion of the general plan address water and land reclamation, water (including ocean) pollution, regulation and use of land in stream beds, erosion, watershed protection, flood control and rock, sand and gravel resources.

The Conservation Element of the City of Los Angeles General Plan surveys laws, requirements, and procedures that have been established for the protection of natural resources. It primarily is an informational document, which is designed to help readers understand the context, history, and opportunities for protection and improvement of the city's natural resources.

Open Space Element

The Open Space Element of the City of Los Angeles General Plan provides information to guide city citizens and decision makers with the identification, preservation, conservation, and acquisition of open space in the city of Los Angeles. The Open Space Plan includes the regulation of publically owned land as well as privately owned land for the public's benefit and protection from land misuse.

Plan for a Healthy Los Angeles

The Plan for a Healthy Los Angeles (Plan) is a new Health and Wellness Element of the City's General Plan. It focuses on public health and safety to address basic quality-of-life issues, including safe neighborhoods and healthy foods, which will help the City of Los Angeles achieve better health and social equity. In the Plan, existing health-oriented policies are promoted while new policies are created to make Los Angeles a healthier place to live, work and play.

Mobility Element

The Mobility Element of the General Plan (Mobility Plan 2035) was updated in 2015. The Mobility Plan 2035 provides the policy foundation for achieving a transportation system that balances the needs of all road users. As an update to the City's General Plan Transportation Element (last adopted in 1999), Mobility Plan 2035 incorporates "complete streets" principles and lays the policy foundation for how future generations interact with the streets in Los Angeles. The California legislature adopted AB 1358 in 2008, *The Complete Streets Act*, which requires local jurisdictions to "plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways, defined to include motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban or urban context."

Complete streets are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists, and transit riders. Some public benefits include improved transportation, a cleaner environment, and healthier neighborhoods. Complete streets offer safety, comfort, and convenience for all users. It enhances mobility and active transportation through multi modal connectivity and providing people the ability to utilize the public space to exercise, work, engage in community activities, interact with their neighbors, and beautify their surroundings. The City's transportation system will continue to evolve to fit the context of the time and situation.

Mobility Plan 2035 includes goals that define the City's high-level mobility priorities. Each of the goals contains objectives that are targets used to help measure the progress of the Plan and policies, broad strategies that guide the City's achievement of the Plan's five goals: (1) Safety First, (2) World Class Infrastructure (3) Access for All Angelenos (4) Collaboration, Communication and Informed Choices, and (5) Clean Environments & Healthy Communities.

The purpose of Mobility Plan 2035 is to present a guide to the further development of a citywide transportation system that provides for the efficient movement of people and goods. Mobility Plan 2035 recognizes that primary emphasis must be placed on maximizing the efficiency of existing and

proposed transportation infrastructure through advanced transportation technology, through reduction of vehicle trips, and through focusing growth in proximity to public transit. In addition, the Plan sets forth street designations and related standards. A listing of street types with descriptions and generalized cross sections for each designation is included in the *Complete Street Design Guide*. Mobility Plan 2035 recognizes the contribution of a proper mix of land uses to reduce vehicle trips. Uses that better serve the needs of the population closer to where they work and live reduces the number and distance of vehicle trips and decreases the amount of pollution from mobile sources.

Air Quality Element

The City's Air Quality Element accounts for economic and social growth and goals while achieving National and State Ambient Air Quality Standards. The Air Quality Element intends to keep population and economic growth in check to reduce environmental degradation and maintain a balance of urban systems with citywide elements, community plans, and neighborhood plans.

Noise Element

The Noise Element references the City's noise standards to address noise sources, mitigation strategies, and management programs. The Element also addresses the different federal, state, and City jurisdiction as it relates to automotive, aircraft, and nuisance noise. While regulation of vehicular noise is outside of a City's control, regulating land use, implementing federal and state regulations, and enforcing nuisance noise are within a city's authority and therefore, discussed in the Noise Element.

Service Systems/Public Recreation Element

The Public Recreation Plan emphasizes neighborhood and community recreational sites and parks. It includes policies and programs to meet the needs for community buildings, swimming pools, and tennis courts. The objectives for the Public Recreation Plan are based on recognized planning principles and the extent and nature of deficiencies in the City's recreational facilities and are as follows: (1) To provide a guide for the orderly development of the City's public recreational facilities, (2) To provide long-range standards for use in connection with new subdivisions, intensification of exiting residential development or redevelopment of blighted residential areas as described under general local recreation standards, (3) To develop and locate public facilities to provide the greatest benefit to the greatest number of people at the least cost and with the least environmental impact, (4) To provide a guide of priorities for the acquisition and development of public recreational facilities; and (5) To further refine and carry out the goals and objectives set forth in the Concept and Citywide Plan for recreation.[1]

3.8.1.3 City of Los Angeles Administrative Code

The City of Los Angeles Administrative Code is used to assist City offices, departments, and other governmental agencies with their functions, and serves as the official source for information about ordinances enacted by the City of Los Angeles that regulate administrative processes.

[1] Source: http://planning.lacity.org/Code_Studies/GeneralElement/PublicRecreationPlan.pdf. Accessed August 25, 2016.

Section 19.85 Public Works Improvements Arts Program

The mission of the City of Los Angeles Public Works Improvements Arts Program ("Program") is to:

> Provide publicly accessible works of art, arts and cultural facilities, and services for the cultural benefit of the city, its citizens and its visitors.

The Program was established to connect all City capital improvement projects with the opportunity to create art installed at facilities, enhance amenities, assist with the restoration of historic features, and provide community art services throughout the city. The Program is managed by the Department of Cultural Affairs (DCA) and it's General Manager.

The goals of the Program are:

- To provide appropriate forms of artistic and cultural expression in all City capital improvement projects;
- To integrate the work of artists into the design and planning of capital improvement projects;
- To ensure that the selected art programs serve the needs of the people using the capital improvement projects;
- To ensure that qualified artists of all genders and ethnic groups are represented;
- To provide a variety of arts and cultural activities; and
- To ensure the highest of level of artistic excellence.

All City capital improvement projects, whether funded by Council controlled or proprietary departments, must comply with this Program. The funds can be used for projects in many different ways. There is a formal consultation process that the sponsoring agency must go through that is determined by the Department of Cultural Affairs. Inter-agency consultations initiate the process.

All public art projects are reviewed by the Public Art Committee and recommended for approval by the Cultural Affairs Commission.

According to the Department of Cultural Affairs, the approval process consists of 1) completing the Application for Approval of Public Artwork, and gathering requested supporting materials; 2) submitting an application to the Public Art Division; 3) scheduling dates to present the art project to the Public Art Committee and Cultural Affairs Commission; 4) appearing before the Public Art Committee to receive feedback and be recommended for approval to the Cultural Affairs Commission; and 5) appearing before the Cultural Affairs Commission to receive a conceptual and/or final approval.[2]

There is an option for an Exemption to this Section of the LAMC that allows for Public Works Projects to pay the 1% of the total project budget to the Department of Cultural Affairs, in lieu of using the funds for public art on the Project Site.

[2] Source: http://culturela.org/percent-public-art/public-works-improvements-arts-program-pwiap/. Accessed August 25, 2016.

3.8.1.4 City of Los Angeles Municipal Code

The City of Los Angeles Municipal Code (LAMC) includes standards for different land uses and identifies land uses that are allowed in various zoning districts. Specifically, it consolidates and coordinates all existing zoning regulations and provisions in order to designate, regulate, and restrict locations and land uses.

Section 12.09.5 "RW2" Residential Waterways Zone

Section 12.09.5 of the LAMC is the "RW2" Residential Waterways Zone established by Ordinance No. 138,095. It established regulations that make possible the utilization of certain lots fronting on navigable public canals or waterways, or separated therefrom only by a public street, which make up, or are a portion of, a sizable system of recreational waterways when such lots are predominantly those which were recorded prior to June 1, 1946.

Because of exceptional past history, present conditions, the proximity of such lots to recreational water areas, and their usual location in areas which enjoy optimum climatic conditions, the best development of the property may require variation from some of the standard housing requirements necessary or desirable to the rest of the city.

Section 99.00 Los Angeles Green Building Code

Section 99 of the LAMC is the Los Angeles Green Building Code (LAGBC) and adopts by reference the California Green Building Standards Code (CAL Green Code). This code applies to the construction of all new buildings, all building alterations with a building permit valuation of over $200,000, and all building additions. This includes construction, alteration, replacement, repair, use and occupancy, and demolition of all structures connected to applicable buildings.

Venice Local Coastal Program

Section 30500 of the California Coastal Act establishes that Local Coastal Programs (LCP) govern decisions that determine the short- and long-term conservation and protection of coastal resources. A LCP specifies appropriate location, type, and scale of new or changed uses of land and water within the California Coastal Zone and also addresses planning and land use conformity with Coastal Act goals and policies. A Venice LCP was created to serve as a basic planning tool used by the City of Los Angeles to guide development in the Venice Coastal Zone, in partnership with the Coastal Commission. The Venice LCP was intended to contain the policies for future development and protection of coastal resources in the community of Venice.

The Venice LCP was adopted by the Los Angeles City Council and then was submitted to the Coastal Commission for their review for consistency with Coastal Act requirements. The Venice LCP included a Venice LCP Land Use Plan and the Venice Specific Plan to implement the plan. Both documents are used locally by the City of Los Angeles Department of City Planning to regulate development within the Venice Coastal Zone. Per the CA Coastal Act, a Venice Local Coastal Program (LCP) was presented to the California Coastal Commission in 2001. The Venice Land Use Plan was certified but the Venice Implementing Ordinance (Venice Specific Plan) was ultimately not certified. As a result, determinations for Coastal Development Permits (CDPs) are split, with applicants within the Dual Jurisdiction Zone processing their case through both the City of Los Angeles and the CA Coastal Commission while applicants within the Single Jurisdiction Zone were allowed to choose whether to process their case through the City of Los Angeles or the CA Coastal Commission. Currently, the City of Los Angeles does not have a certified Local Coastal Program for the Venice Coastal Zone.

Venice Coastal Zone Specific Plan (Venice Specific Plan)

Ordinance No. 172,897 established the Venice Specific Plan and created eight sub-areas within the Venice community. The Venice Specific Plan is intended to comply with the California Coastal Act of 1976 for development within the Venice Coastal Zone. The purpose of the Venice Specific Plan is to implement the policies and goals of the California Coastal Act and to address the unique conditions within the Venice Coastal Zone that must be consistent with the Los Angeles General Plan. It regulates all development, including use, height, density, setback, buffer zone, and other factors in order that it be compatible in character with the existing community and to provide for the consideration of aesthetics and scenic preservation and enhancement, and to protect environmentally sensitive areas.

Venice Local Coastal Program Land Use Plan

The Venice Local Coastal Program Land Use Plan (Venice LCP-LUP) is intended to serve as the Local Land Use Plan of the Venice LCP. It was prepared to comply with the California Coastal Act of 1976 for development within the Venice Coastal Zone and was certified by the California Coastal Commission in June 2001. The purpose of the Venice LCP-LUP is to define goals and land use policies for compliance with the California Coastal Act. It is intended to restore the overall quality of the Venice Coastal Zone environment and its natural and man-made resources and assures that public coastal access and public recreation areas are provided as required per the Coastal Act.

3.8.1.5 Land Use Entitlements for Project

The VAPP includes the construction of a new pumping plant with a two-story electrical building and control facility, three submersible pumps, and an associated valve and metering vault. It also includes the improvement of an adjacent vacant lot (128 Hurricane Street) that will contain eight parking spaces, open space, and the potential for public art (see Figure 2-2 in Chapter 2, Project Description, of this EIR). The design of the building and accessory uses include encroachment of a structure over six feet into the rear yard and eight parking spaces. This project is considered a Public Facilities use, which is not allowed by right in a RW2-1 zone or in a Medium Residential land use designation. The VAPP will need several land use entitlement approvals in order to be constructed. The City is evaluating various options: (1) Venice Specific Plan Project Compliance; (2) Public Benefits Project Compliance with Alternative Compliance; (3) RW2-1 Adjustment for Open Space; (4) and a Conditional Use for Parking. A local Coastal Development Permit and a state Coastal Development Permit are also required.

Venice Specific Plan Project Permit

The Venice Specific Plan Project Permit Compliance Review determination is issued for projects within the a Venice Coastal Zone. Venice Specific Plan projects are those projects located within the Venice Coastal Zone. The Director of Planning is the Approval Authority for a Venice Specific Plan Project Permit Compliance Review and must make findings of consistency with the Venice Specific Plan Findings. The Venice Specific Plan Project Permit Compliance Review is processed in compliance with Section 11.5.7 of the LAMC.

Public Benefits Project Permit Compliance

The Proposed Project has the option to pursue a Public Benefits Project Permit. The Proposed Project has uses that are applicable and can be permitted via a Section 14.6 Public Facility Public Benefits Project permit, with Alternative Compliance. Proposed uses, such as the Proposed Project, are permitted in any R zone (residential), provided these uses meet the performance standards or alternative compliance measures approved for the uses. Section 14.6 Public Facility Public Benefits Project indicates the following:

> Public utilities and public services uses and structures in the R zone include Performance Standards that provide for height, yards, setbacks, scale, landscaping, and open space, especially with the main buildings similar to other properties in the neighborhood. Signage, noise levels adjacent to residential uses should not be used at times or in a manner that would be disturbing to neighbors. Public telephones should not be located to encourage unwanted loitering. Sufficient off-street parking should be provided. The proposed use should be designed to minimize loitering on or near the site. The project should provide safe vehicular ingress and egress with no increase in traffic level of service to accommodate expected usage by the public and/or occupants of the facility, especially police and fire safety. Lighting should not reflect into nearby residential areas. Walls, fences, or other visible security devices should be similar to what is in the surrounding neighborhood. Graffiti should be monitored and removed immediately from site.

Adjustment for Yards

Section 12.28 of the LAMC authorizes a Zoning Administrator to grant adjustments to yard requirements. Although the Proposed Project has the option to pursue a Public Benefits Project Permit, it will be required to comply with the LAMC Section 12.09.5 RW2-1 Residential Waterways Zone yard requirements. Since the Proposed Project has an encroachment of over six feet within the rear yard, a YardAdjustment can remedy this issue, thereby bringing the Proposed Project into compliance with this requirement. A Yard Adjustment is appealable to the Area Planning Commission.

Conditional Use Permit for Parking

Parking on the Project Site will be located on the vacant lot located at 128 Hurricane Street. Per the Venice Specific Plan, the Proposed Project will require at least five on-site project automobile parking spaces. Since the parking would be located on an adjacent lot within 750 feet of the VAPP Project Site, a Conditional Use Permit for Parking will be required. The total number of parking spaces that will be provided on the 128 Hurricane Street lot is eight.

The initial decision on a Conditional Use application requires City Planning Commission consideration and is appealable to the City Council and/or Mayor. The Planning Commission has a range of findings it can make, including approval in whole or in part with or without conditions, or denial of the application. In addition, a public hearing must be held and three Findings of Approval must be granted and include the following: (1) That the project will enhance the built environment in the surrounding neighborhood or will perform a function or provide a service that is essential or beneficial to the community, city, or region; (2) That the project's location, size, height, operations, and other significant features will be compatible with and will not adversely affect or further degrade adjacent properties, the surrounding neighborhood, or the public health, welfare, and safety; and (3) That the project substantially conforms with the purpose, intent, and provisions of the General Plan, the applicable community plan, and any applicable specific plan.

3.8.1.6 Proposed Project Coastal Development Permits

The Proposed Project must obtain a local Coastal Development Permit and a state Coastal Development Permit from the California Coastal Commission. Coastal Development Permits are regulatory permits that projects located in the California Coastal Zone utilize to ensure compliance with the California Coastal Act. Coastal Development Permit authority for the Proposed Project is delegated to the California Coastal Commission, since the Venice Coastal Zone does not have a California Coastal Commission certified Local Coastal Program. For public infrastructure projects and those projects constructed in the public right of way, the City Engineer at the Los Angeles Department of Public Works, Bureau of Engineering, makes findings of consistency with the policies of the Coastal Act at a local level and has the authority to issue local Coastal Development Permits. For private projects, to support the planning entitlements process, the Department of City Planning, through the Venice Specific Plan and the Venice Coastal Land Use Plan, also evaluate consistency with the Coastal Act and have the authority to issue local Coastal Development Permits. For the Proposed Project, the Departments of Public Works and City Planning will work together to ensure that the Proposed Project is consistent with the Coastal Act, Venice Specific Plan, and Venice Coastal Land Use Plan.

3.8.2 Environmental Setting

This section describes the environmental setting or conditions related general plan land use, zoning, and applicable plans. The information in this section is used in preparing the evaluation and conclusions of the impact analysis as well as determining the required mitigation measures.

As described in Chapter 2 (Project Description), the Project Site comprises three undeveloped vacant Residential lots, zoned RW2-1. All three lots are owned by the City of Los Angeles and located next to the existing Venice Pumping Plant (VPP). The site addresses are 3813 and 3817 South Esplanade and 128 Hurricane Street (Laydown Area 1). The three lots are not contiguous and are separated by Hurricane Street and Canal Court (see Chapter 2, Figure 2-2, Project Location Map, of this EIR).

There are three construction Laydown Areas that will be used for materials and equipment storage and for construction staging during the anticipated 2-year construction period. Laydown Area 1 is located at 128 Hurricane Street, which is already part of the Project Site. Laydown Area 2 is comprised of two lots that are located at 3819 and 3821 Via Dolce across the Venice Grand Canal, east of the Project Site and is accessed from Via Dolce. Laydown Area 3 is located at 9940 Jefferson Boulevard in Culver City, which is approximately 7 miles west of the Project Site. Laydown Area 3 is owned by the City of Los Angeles.

The Project Site is highly urbanized within the Ballona Lagoon West sub-area of Venice, north of Ironside Street. It contains a mix of residential, open space, and public facility land uses. The Proposed Project is considered infill development. North and west of 3813 and 3817 South Esplanade are single- and multi-family residential uses. To the east is the Venice Canal System, which is designated as open space. To the south is the VPP, which is a public facilities land use.

The 128 Hurricane Street lot is bounded by the Ballona Lagoon to the south, Hurricane Street to the north, multi-family residential to the west, and Canal Court and the VPP to the east.

Laydown Areas 1 and 2 are bounded by single- and multi-family residences to the north, south, and east and by multi-family residences and the Grand Canal to the west.

Laydown Area 3 in Culver City is located within a light industrial/commercial area and adjacent to educational uses (i.e., West Los Angeles College).

3.8.2.1 General Plan Zoning and Land Use Designations

Zoning

Los Angeles Municipal Code

The Project Site and Laydown Areas 1 and 2 are located in the RW2 Zone. This designation includes lots that front on navigable public canals or waterways that may have historical significance, unique present conditions, close proximity to recreational water areas, and are located in areas that enjoy optimum climatic conditions. The RW2 Zone has the following requirements:

- **Use** - Residential and Accessory Uses
- **Area** – No building or structure shall be erected or maintained nor shall any building or structure be enlarged unless the following yards and lot areas are provided and maintained in connection with such building, structure or enlargement:
- **Front Yard** – 15 feet
- **Side Yards** – not less than ten percent of the width of the lot, but in no event of less than three feet in width.
- **Rear Yard** – There shall be a rear yard of not less than 15 feet in depth. Notwithstanding any provisions of this article to the contrary, the rear lot line is that line opposite and most distant from the lot line separating the narrowest canal frontage of the lot from the navigable public canal or waterway.
- **Lot Area** – Every lot shall have a minimum width of 28 feet and a minimum area of 2,300 square feet. The minimum lot area per dwelling unit shall be 1,150 square feet.
- **Open Space** – Same as required in "RW1" Zone – Section 12.08.5 C.5.

Culver City Municipal Code

Laydown Area 3 in Culver City is zoned Industrial General (IG). Per the Culver City Municipal Code, this designation is applied to areas appropriate for a wider variety of industrial uses than the Light Industrial (IL) District, including outdoor activities, but no heavy industry. The IG Zoning District is consistent with the Industrial land use designation of the General Plan.

Land Use Designation

Venice Community Plan

The Land Use designation for the Project Site and Laydown Areas 1 and 2 is Multiple Family Residential. This is defined as all multiple-family residential development of five or more units.

Culver City General Plan

Laydown Area 3 in Culver City has a land use designation of Industrial. The General Plan indicates that this designation is intended to strengthen and protect successful existing uses, while encouraging desirable and creative new development, including manufacturing and industrial, but excluding heavy industrial.

Development Standards and/or Principles

The following identifies land use and development regulations applicable to the Project Site, based upon its current general plan land use designations and zoning within the applicable plans. This information is included here in order to determine later in the analysis if the Proposed Project would be consistent with these requirements and if not, what land use and zoning actions would be needed. It should be noted that the information below does not address development standards or principles associated with Laydown Areas 2 or 3 since these sites would only be used temporarily for construction activities and once the Proposed Project is constructed, returned to their original use and condition (currently vacant lots).

Los Angeles Green Building Code

The Los Angeles Green Building Code (LAGBC) applies to the non-residential construction of all new buildings, all building alterations with a building permit valuation of over $200,000, and all building additions. This includes construction, alteration, replacement, repair, use and occupancy, and demolition of all structures connected to applicable buildings. The Los Angeles Green Building Code requires mandatory design elements in Planning and Design, Energy Efficiency, Water Efficiency & Conservation, Material Conservation and Resource Efficiency, and Environmental Quality.

Venice Community Plan

The following design guidelines are identified for land use designations and zoning for Multiple Family Residential.

Site Planning - All multiple-family residential development of five or more units should be designed to the extent feasible around a landscaped focal point or courtyard.

Design - The design of all buildings shall be of a quality and character that improves community appearances by avoiding excessive variety or monotonous repetition. This can be accomplished through:

- Requiring the use of articulations, recesses, surface perforations, and/or porticoes to break up long, flat building facades.
- Utilizing complementary building materials on building facades.
- Incorporating varying design to provide definition for each floor.
- Integrating building fixtures, awnings, or security gates, into the design of building(s).
- Screening of all roof top equipment and building appurtenances from view.
- Requiring decorative, masonry walls to enclose trash.

Venice Coastal Zone Specific Plan

The Project Site is located in the Ballona Lagoon West Bank Sub-area of Venice north of Ironside Street, generally bounded by Driftwood Street on the north; Via Marina on the south; Ballona Lagoon on the east; and Strongs Drive, Canal Court, and Pacific Avenue on the west. The following are applicable Development Standards from the Venice Specific Plan.

Height - Within 60 feet of the mean high tide of the Ballona Lagoon or inland side of the Esplanade (City right-of-way), whichever is furthest from the water as determined by a licensed surveyor, Venice Coastal Development Projects shall not exceed a maximum height of 30 feet. Beyond 60 horizontal feet, one additional foot in height is permitted for each two additional horizontal feet to a maximum height of 38 feet. No portion of any structure (including Roof Access Structures, roof deck railings, and Architectural Features) shall exceed the 30 foot height limit within 60 horizontal feet of the mean high tide line of Ballona Lagoon or the inland side of the Esplanade, whichever is furthest from the water.

Lagoon Buffer/Setback/Yards - Lots located north of Ironsides Street:

1. All Venice Coastal Development Projects shall be set back an average of 15 feet but not less than ten feet from the lot line nearest to the water.
2. An open, permeable yard with an area of at least 15 times the lot width and a minimum of 450 square feet shall be maintained between the property line that faces the water and the front of any structure. No building extensions, including stairs and balconies, shall be allowed in the required permeable yard area, except for ground level permeable decks that do not exceed 18 inches in height.
3. The combined height of any decks, railings, garden walls, and fences situated within the required permeable yard shall not exceed six feet above the elevation of the adjacent public walkway.
4. The sideyard shall be consistent with LAMC requirements, but shall not be less than 3 1/2 feet.

Fill - No Fill shall be permitted in the lagoon and buffer area, except for the minimum amount necessary for habitat restoration and public access.

Drainage - Prior to issuance of a building permit for a new Venice Coastal Development Project or an expansion of the existing building footprint by more than ten percent, the applicant shall submit drainage plans to the Department of Building and Safety for its approval. All drainage for new construction shall be directed away from Ballona Lagoon. The applicant and all successors in interest shall maintain the approved Venice Coastal Development Project consistent with the drainage plans approved by the Department of Building and Safety.

Lot Consolidation - Ballona Lagoon West residentially-zoned lots are allowed a maximum of two residentially-zoned lots to be consolidated provided the Venice Coastal Development Project conforms with the following applicable development standards:

- Buildings shall be designed with visual breaks or Architectural Features, including balconies or terraces, with a change of material or a break in the plane for every 20 feet in horizontal length and every 15 vertical feet. Residential buildings shall provide habitable space on the Ground Floor, a ground level entrance, and landscaping and windows fronting the street.
- For residential Venice Coastal Development Projects, front porches, bays and balconies shall be provided to maximize architectural variety.

Venice Specific Plan Findings of Consistency

Venice Specific Plan Findings of Consistency are required to grant a Project Permit Compliance Review in the Venice Coastal Zone. The Approving Authority, the Director of Planning must make each of the Findings:

- That the Venice Coastal Development Project is compatible in scale and character with the existing neighborhood, and that the Venice Coastal Development Project would not be materially detrimental to adjoining lots or the immediate neighborhood;
- That the Venice Coastal Development Project is in conformity with the certified Venice Local Coastal Program;
- That the applicant has guaranteed to keep the rent levels of any Replacement Affordable Unit at an affordable level for the life of the proposed Venice Coastal Development Project and to register the Replacement Affordable Units with the Los Angeles Department of Housing;
- That the Venice Coastal Development Project is consistent with the special requirements for low- and moderate-income housing units in the Venice Coastal Zone as mandated by California Government Code Section 65590 (Mello Act).

Venice Local Coastal Program Land Use Plan

The Venice LCP-LUP notes the following for the Ballona Lagoon West Sub-area North of Ironside Street in which the Project Site is located:

Height - The maximum allowable building height for the Project Site is 30 feet within 60 horizontal feet of the mean high tide line of Ballona Lagoon, Grand Canal or the inland side of the Esplanade (City right-of-way), whichever is furthest from the water. Beyond 60 horizontal feet, one foot in additional height is permitted for each two additional horizontal feet to a maximum height of 38 feet. It also notes the following:

- All building heights shall be measured from the elevation of the fronting right-of-way, except on lagoon lots where all building heights shall be measured from the average existing natural grade.
- No portion of any structure (including roof access structures, roof deck railings and architectural features) shall exceed the 30-foot height limit within 60 horizontal feet of the mean high tide line of Ballona Lagoon, Grand Canal, or the inland side of the Esplanade (City right-of-way).
- Notwithstanding other policies of this LUP, chimneys, exhaust ducts, ventilation shafts, and other similar devices essential for building function may exceed the specified height limit in a residential zone by five feet.

Lot Consolidation - Concerning lot consolidation, the LCP notes that no more than two lots may be consolidated in the Ballona Lagoon West sub-area north of Ironsides Street in which the Project Site is located and provided that:

- No building or structure shall be constructed on what were more than two contiguous lots prior to lot consolidation with the exception of subterranean development that is entirely below street elevation.
- Building facades shall be varied and articulated to provide a pedestrian scale which results in consistency with neighboring structures on small lots. Such buildings shall provide habitable space on the ground floor, a ground level entrance and landscaping and windows fronting the street. No increase in the number of units shall result from the lot consolidation.
- Front porches, bays and balconies shall be provided to maximize architectural variety.

Use - Two units per lot including duplexes.

Density - One unit per 1,500 square feet of lot area.

Esplanade - The Esplanade (City right-of-way) shall be maintained and improved in order to provide for continuous public pedestrian access along Ballona Lagoon and the Grand Canal waterway.

Grand Canal and Lagoon Buffer/Setback - In order to provide a setback for public access, visual quality, and to protect the biological productivity of the canals, an average setback of 15 feet, but not less than 10 feet, shall be maintained in the front yard adjacent to the property line nearest the water.

Yards - Minimum side yard of 3 ½ feet. An open, permeable yard of at least 450 square feet for a 30-foot wide lot, and at least 600 square feet for a 40-foot wide lot, shall be maintained between the lagoon/canal property line and the front of any structure. A minimum 10-foot front yard setback, with a required 15-foot setback average, shall provide the required permeable front yard area. No building extensions, including stairs and balconies, shall be placed in or over the required permeable front yard area with the exception of permeable decks. The total combined height of any deck, deck railings, garden walls and/or fences situated within the required permeable front yard area shall not exceed 6 feet above the elevation of the adjacent public walkway.

3.8.2.2 Applicable Goals, Objectives, and Policies

Table 3.8-2 contains applicable project-related goals, objective, and policies associated with plans and programs governing the Project Site.

Table 3.8-2. Proposed Project Consistency with Applicable Plans and Goals, Objectives, and Policies

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
Venice Local Coastal Program		
Policy I.A.1. Residential Development.	The maximum densities, building heights and bulks for residential development in the Venice Coastal Zone shall be defined by the Land Use Plan Maps and Height Exhibits (Exhibits 9 through 16), and the corresponding land use categories and the development standards as described in this LUP. Refer to Policies II.C.10 for development standards for walk streets and to Policies II.A.3 and 4 for parking requirements. b. Residential Lot Consolidations. In order to preserve the nature and character of existing residential neighborhoods, lot consolidations shall not be permitted in the Venice Canals and Silver Strand residential neighborhoods. No more than two lots may be consolidated in the Ballona Lagoon West, Ballona Lagoon (Venice Grand Canal) East, Southeast Venice, Milwood, North Venice and Oxford Triangle neighborhoods and on walk streets. Lot consolidations of not more than three lots shall be permitted in the Oakwood and Marina Peninsula residential neighborhoods. Lot consolidations may be permitted only subject to the following limitations: i. No building or structure shall be constructed on what were more than two contiguous lots prior to lot consolidation with the exception of subterranean development that is entirely below street elevation. ii. Building facades shall be varied and articulated to provide a pedestrian scale which results in consistency with neighboring structures on small lots. Such buildings shall provide habitable space on the ground floor, a ground level entrance and landscaping and windows fronting the street. No increase in the number of units shall result from the lot consolidation. iii. Front porches, bays and balconies shall be provided to maximize architectural variety.	No. The Proposed Project includes the consolidation of two lots, adjacent to the Venice Pumping Plant (VPP). The building's scale, massing, and design would complement the adjacent neighborhood's architecture and design. There would be no habitable space on the ground floor because the building would be used as an electrical and Control Room structure. A ground-level entrance and landscaping would be provided. Windows (including some faux windows) would be provided on both levels of the two-story building fronting the street and building's south side.
Policy I.A.5. Preserve and Protect Stable Multi-Family Neighborhoods	Preserve and protect stable multi-family residential neighborhoods and allow for growth in areas where there is sufficient public infrastructure and services and the residents' quality of life can be maintained and improved.	No. The Proposed Project would be designed in a manner that preserves and protects the multi-family residential neighborhood by following the Residential Citywide Design Guidelines and providing a high-quality building and landscaping design that complements the massing, scale, and architecture of the neighborhood. Although the building would function as an electrical and Control Room for the VPP and Venice Auxiliary Pumping Plant (VAPP), its appearance would be

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
		residential in nature. In addition, the provision of Open Space along the eastern portion of the VAPP and at 128 Hurricane Street, would introduce new green space within this area of the Venice community and would contribute to the resident's quality of life by providing passive recreation activities and unobstructed views of the Venice Grand Canal and Ballona Lagoon.
Policy I.A.7. Multi-Family Residential – Low Medium II Density	Accommodate the development of multi-family dwelling units in the areas designated as "Multiple Family Residential" and "Low Medium II Density" on the Venice Coastal Land Use Plan. The following is a summary of the Venice Specific Plan density and development standards for properties within the Ballona Lagoon West subarea North of Ironside Street: **Use:** Two units per lot including duplexes **Density:** One unit per 1,500 square feet of lot area **Esplanade:** the Esplanade (City right-of-way) shall be maintained and improved in order to provide for the continuous public pedestrian access along Ballona Lagoon and the Venice Grand Canal waterway. **Venice Grand Canal and Lagoon Buffer/Setback:** In order to provide a setback for public access, visual quality, and to protect the biological productivity of the canals, an average setback of 15 feet, but not less than 10 feet, shall be maintained in the front yard adjacent to the property line nearest the water. **Yards:** Minimum side yard of 3 ½ feet. An open, permeable yard of at least 450 square feet for a 30-foot wide lot, and at least 600 square feet for a 40-foot wide lot, shall be maintained between the lagoon/canal property line and the front of any structure. A minimum 10-foot front yard setback, with a required 15-foot setback average, shall provide the required permeable front yard area. No building extensions, including stairs and balconies, shall be placed in or over the required permeable front yard area with the exception of permeable decks. The total combined height of any deck, deck railings, garden walls and/or fences situated within the required permeable front yard area shall not exceed 6 feet above the elevation of the adjacent public walkway. **Height:** Not to exceed 30 feet within 60 horizontal feet of the mean high tide line of Ballona Lagoon, Venice Grand Canal or inland side of the Esplanade (City right-of-way), whichever is furthest from the water. Beyond 60 horizontal feet, one foot in additional height is permitted for each two additional horizontal feet to a maximum height of 38 feet. No portion of any structure (including roof access structures, roof deck	No. Although the Proposed Project is designated as RW2–1 (Residential Water Ways Zone) and the City of Los Angeles General Plan as Residential/Medium Residential, the proposed use (Public Facility) qualifies as a Public Benefits Project, per Article 4, Section 14.00 of the Los Angeles Municipal Code (LAMC). The LABOE will comply with the design criteria and development standards of Venice Specific Plan and the Residential Citywide Design Guidelines. The Open Space proposed along the east side of the VAPP would meet the front yard requirement along the Venice Grand Canal. The Proposed Project can meet the permeable Open Space requirement through a LAMC RW2-1 Zone Adjustment for Yards. This is needed to comply with rear yard setback requirements due to the facility's design which would include transformers that encroach into the rear yard more than the maximum 6 feet permitted. Similarly, there are Los Angeles Department of Water and Power (LADWP) facilities proposed to be located along Canal Court, which may not be able to meet local fencing requirements, due LADWP transformer design specifications. The building height (32 feet) would comply with building requirements. During construction of the Coastal Interceptor Sewer (CIS) diversion structure in the Venice Grand Canal, some fill derived from the canal would need to be stockpiled and then backfilled to cover the structure and to re-contour the western bank of the canal, which is proposed to be re-vegetated with native plants.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
	railings and architectural features) shall exceed the 30-foot height limit within 60 horizontal feet of the mean high tide line of Ballona Lagoon, Venice Grand Canal or inland side of the Esplanade (City right-of-way), whichever is furthest from the water. Notwithstanding other policies of this LUP, chimneys, exhaust ducts, ventilation shafts and other similar devices essential for building function may exceed the specified height limit in a residential zone by five feet. **Fill:** No fill shall be permitted in the lagoon. No fill may be placed in the lagoon buffer except for the minimum amount necessary for habitat restoration and public access.	
Policy I.D.1. Canals and Ballona Lagoon Waterways.	The Venice estuaries and wetlands including the Ballona Lagoon, Venice Canals, and Venice Grand Canal south of Washington Boulevard, are designated in the Land Use Plan as natural and coastal recreational resources, and are rezoned to the "Open Space" designation. Adjacent Use/Development: The only permitted development adjacent to the canals and lagoon shall be habitat restoration, single-family dwellings, public parks and walkways, subterranean or surface public parking lots, maintenance activities and emergency repairs. Surface public parking lots shall be permitted only where sufficient access and roadway capacity exists to accommodate such parking. New construction along the Canals, and Ballona Lagoon shall comply with standards for setbacks, noise barriers, landscape plan, pervious surfacing with drainage control measures to filter storm run-off and direct it away from environmentally sensitive habitat areas, buffer areas in permanent open space, land dedication for erosion control, and wetland restoration including off-site drainage improvements. For more details refer to the provisions contained in Policy Group I.A., Residential Land Use and Development Standards, and Policies IV.C.1 and IV.C.2, Stormwater Runoff and Circulation.	No. The Proposed Project entails development of a Public Facility on two lots designated in the General Plan as Medium Residential. As noted above, the Proposed Project qualifies as a Public Benefits Project, per the LAMC and therefore, would be considered a permitted use, if approved. The Proposed Project also includes restoration of a portion of the western bank of the Venice Grand Canal associated with installation of the CIS diversion structure. A Open Space along the eastern side of the Proposed Project adjacent to the Venice Grand Canal would provide both a buffer and serve as water quality treatment feature to capture and treat runoff from the site. As noted above, the site also includes drainage and water quality features designed to capture, contain, and treat stormwater runoff, consistent with applicable plans and policies.
Policy I.D.3. Views of Natural and Coastal Recreation Resources.	The scale of development shall comply with height limits, setbacks and standards for building massing specified in Policy Groups I.A and I.B, Residential and Commercial Land Use and Development Standards of this LUP, in order to protect public views of highly scenic coastal areas and vista points, including, but not limited to, the canals, lagoon, jetty, pier, Ocean Front Walk, walk streets and pedestrian oriented special communities.	No. As noted above, the Proposed Project qualifies as a Public Benefits Project and has been designed consistent with Venice the Residential Citywide Design Guidelines, and with design standards contained within the Venice Specific Plan. The building's massing, scale, design, and height would complement the adjacent residential neighborhood.
Policy V.A.1. General	Public services shall consider the competing needs of residents and visitors for use of roadways, existing parking, service systems, domestic water, public restrooms, etc., and shall allocate resources to expand the	No. The Proposed Project entails the construction of a critical facility necessary for the safe operation of the CIS and VPP and in order to reduce the potential for a catastrophic sewage spill into the Venice

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
	use of these existing facilities and create new facilities where necessary in a manner that they do not adversely affect residents. Public works projects shall be reviewed for consistency with the Coastal Act and the Venice Land Use Plan through the coastal development permit process as required by the Coastal Act.	Grand Canal, Ballona Lagoon, or adjacent street network. The Proposed Project would be constructed on three vacant lots owned by the City. Two of the lots would be consolidated and one is proposed for Open Space and parking for use by the adjacent residents. The analysis contained in the Draft Environmental Impact Report (EIR) determined that all impacts would be less than significant, except short-term noise and vibration and Greenhouse Gases. In addition, the Proposed Project would be required to obtain a Coastal Development Permit.
Policy V.A.3. Infrastructure	New sewer, storm drain, and water lines shall be installed using the least environmentally disturbing method feasible. The City of Los Angeles Department of Public Works shall develop a comprehensive citywide Storm Water Management Program, as discussed further in Implementation Strategy of Policy IV.C.1 of this LUP, to control stormwater run-off from new public and private developments and, where feasible, to remove pollutants from that run-off. Development of infrastructure shall precede or be constructed concurrently with the construction of developments or in lieu-fee should be paid.	No. The Proposed Project entails the construction of a critical facility necessary for the safe operation of the CIS and VPP and in order to reduce the potential for a catastrophic sewage spill into the Venice Grand Canal, Ballona Lagoon, or adjacent street network. The Proposed Project is part of a comprehensive Los Angeles Bureau of Sanitation (LABOS) and LABOE effort to upgrade and enhance critical sewage conveyance and pumping facilities throughout the city of Los Angeles in order to provide required redundancy and enhance safety.
Policy I.E.2. Scale.	New development within the Venice Coastal Zone shall respect the scale and character of community development. Buildings which are of a scale compatible with the community (with respect to bulk height, buffer and setback) shall be encouraged. All new development and renovations should respect the scale, massing, and landscape of existing residential neighborhoods. Lot consolidations shall be restricted to protect the scale of existing neighborhoods. Roof access structures shall be limited to the minimum size necessary to reduce visual impacts while providing access for fire safety. In visually sensitive areas, roof access structures shall be set back from public recreation areas, public walkways, and all water areas so that the roof access structure does not result in a visible increase in bulk or height of the roof line as seen from a public recreation area, public walkway, or water area. No roof access structure shall exceed the height limit by more than ten (10') feet. Roof deck enclosures (e.g. railings and parapet walls) shall not exceed the height limit by more than 42 inches and shall be constructed of railings or transparent materials. Notwithstanding other policies of this LUP, chimneys, exhaust ducts, ventilation shafts and other similar devices essential for building function may exceed the specified height limit in a residential zone by five feet.	No. As noted above, the Proposed Project qualifies as a Public Benefits Project, and has been designed consistent with the Residential Citywide Design Guidelines and the Venice Specific Plan. A high-quality design is proposed for the electrical building and would complement the scale, massing, design, and architecture of the adjacent residential neighborhood. A lot consolidation is proposed for the two contiguous lots adjacent to the existing VPP. The height of the electrical building would be 32 feet, which although above the 30-foot maximum includes roof access structures, etc. Exhaust ducts and other ancillary facilities associated with the building, except the heating and cooling mechanism (proposed to be constructed outside and at grade), would be contained within the building.

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Policy I.E.3. Architecture	Varied styles of architecture are encouraged with building facades which incorporate varied planes and textures while maintaining the neighborhood scale and massing.	No. The proposed design of the electrical building would be developed to complement the scale, massing, design, and architecture of the adjacent residential neighborhood.
Policy I.F.3. Venice Canals	The historic integrity of the Venice Canals shall be preserved. The canals are deemed to be significant as an early example of community recreational planning in a coastal marshlands area. Included in the historic district are the six canals, their associated sidewalks and a number of pedestrian and vehicular bridges. The Venice Canals are listed on the National Register of Historic Places as an historic district (August 30, 1982). Additionally, the City of Los Angeles Cultural Heritage Commission declared the Venice Canal System a Los Angeles City Historic-Cultural Monument (HCM No. 270, August 2, 1983).	No. The Proposed Project would preserve the historical integrity of the Venice Canals, including the Venice Grand Canal and Ballona Lagoon. During project construction, temporary work within the Venice Grand Canal would be required to construct the CIS diversion structure. Subsequent to construction, this portion of the western bank of the canal would be restored with native plant communities. No impacts are anticipated to the Grand Canal or Ballona Lagoon. The Office of Historic Preservation would be consulted to ensure that the Proposed Project is compatible with the Venice Canals. Additionally, the Proposed Project would undergo design review by the City's Case Management Division and the Department of City Planning's Urban Design Studio in order to ensure that it is compatible with and does not adversely affect the Grand Canal and Ballona Lagoon.
Policy I.F.6. Archaeological Resources	Significant archaeological resources shall be protected from permanent loss. A preliminary cultural resources record search to determine the existence of significant archeological sites shall be required for developments which require more than minimal grading. Mitigation plans for the protection of such resources shall be required. If, during construction, any archaeological resources are discovered, work shall be stopped to prevent further disturbance of the resources, and the proper authorities shall be immediately notified.	No. The analysis contained in the Draft EIR indicates that impacts to Cultural Resources would be less than significant and no mitigation measures are required. Standard regulatory requirements would require the cessation of construction activities in the event Cultural Resources are discovered.
Policy II.A.3. Parking Requirements.	Public Utility Facility not having a Business Office on the premises: 2 spaces; plus 1 space for each 500 square feet of floor area. Parking shall be provided pursuant to a detailed parking study that demonstrates that the project will provide adequate parking to meet the needs of the development without causing negative impacts to coastal access or access to public recreational facilities.	No. The Proposed Project includes a total of eight parking spaces, five for on-site parking and three relocated off-site parking spaces. The Proposed Project requires a total of five on-site parking spaces. A total of four spaces are required to comply with the Venice Specific Plan and one parking space is required to comply with Beach Impact Zone Parking requirements. These spaces are allowed off-site, located within 750 feet of the property per LAMC 12.21 A.4 (g) and would be located on 128 Hurricane Street with a recorded covenant. Since the proposed parking area is R-zoned, a Conditional Use for Parking (LAMC 12.24) would be required to allow a parking lot on the R-zoned lot. Also since the parking would be removed and replaced with a red curb and/or a driveway along the southerly boundary of the Proposed Project along Hurricane Street, three spaces would be relocated on the 128 Hurricane Street lot. It should be noted that the Draft EIR

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		determined that impacts associated with parking during operation of the Proposed Project would be less than significant and therefore, no mitigation measures are required.
Policy II.A.4. Parking Requirements in the Beach Impact Zone	Any new and/or any addition to commercial, industrial, and multiple-family residential development projects within the Beach Impact Zone shall provide additional (in addition to parking required by Policy II.A.3) parking spaces for public use or pay in-lieu fees into the Venice Coastal Parking Impact Trust Fund. Beach Impact Zone (BIZ) Parking Impact Trust Fund criteria: a. Commercial and industrial projects in the BIZ shall provide one additional parking space for each 640 square feet of floor area of the ground floor. Up to 50% of the total number of these additional parking spaces required in this section may be paid for in lieu of providing the spaces. c. All in-lieu fees shall be paid into the Venice Coastal Parking Impact Trust Fund to be administered by the City of Los Angeles Department of Transportation for improvement and development of public parking facilities that support public access to the Venice Coastal Zone. d. In no event shall the number of BIZ parking spaces (over and above those spaces required by the parking requirements set forth in Policy II.A.3) required for projects of three or more dwelling units, or commercial or industrial projects, be less than one (1) parking space for residential projects and two (2) parking spaces for commercial and industrial projects.	No. See response immediately above.
Policy II.A.9. Protection of Public Parking	The following policies shall be implemented and enforced in order to protect and enhance public parking opportunities provided on public rights-of-way and in off-street parking areas. b. Street Ends. It is the policy of the City to not permit privatization of street ends. Public parking opportunities shall be protected and encouraged at improved and unimproved street-ends that abut Ocean Front Walk and/or the beach. c. Rights-of-Way. In order to maintain and increase the public parking supply, the City shall maximize and protect the availability of public parking opportunities on city streets that currently accommodate vehicular traffic.	No. See response immediately above.

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Policy II.C.1. General Non-Vehicular Coastal Access Policy	Pedestrian and bicycle access ways are identified on Exhibit 19. Pedestrian Access and Bicycle Trails shall be developed, protected and maintained, and new development adjacent to the coast and coastal waterways shall be required to provide public access in a manner that is consistent with the policies of the Coastal Act.	No. The Proposed Project would introduce a new public Coastal Access point at 128 Hurricane Street that includes walking trails that lead to the coastal waterway. Public access to the coast and coastal waterways would not be removed as a result of the Proposed Project. The Esplanade walking trail adjacent to the Project Site would be maintained and protected consistent with the CA Coastal Act.
Policy II.C.2. Venice Grand Canal Pedestrian Access.	The three existing public rights-of-way from the Venice Grand Canal to Strongs Drive and Pacific Avenue shall be improved and appropriately signed. South of Washington Boulevard, the public walkways that provide public pedestrian access along both sides of Venice Grand Canal shall be improved and appropriately signed.	No. With the exception of temporary closure of the Esplanade between the northern project boundary and eastern terminus of Hurricane Street during construction of the CIS diversion structure within the Grand Canal, access to this portion of the canal would not be inhibited. It should be noted that Open Space located along the eastern portion of the VAPP site is proposed and would provide pedestrians with additional access and viewing point of the Venice Grand Canal. Signage indicating the Open Space is accessible to the public would be included.
Policy II.C.3. Ballona Lagoon Enhancement Plan (Pedestrian Access).	Pedestrian access and interpretative overlooks to the Ballona Lagoon shall be enhanced without invading the privacy of adjoining residents. The existing public walkway on the east bank of Ballona Lagoon, and the overlook on the southern end of the lagoon near Via Marina, shall be maintained and protected for public access. (Refer also to Policy IV.B.1).	No. Both of the Open Space proposed along the eastern boundary of the VAPP, fronting the Grand Canal and the vacant lot located at 128 Hurricane Street, which faces the Ballona Lagoon, would be accessible to the public.
Policy II.C.11. Encroachment into Walk Street Right-of-Way	Encroachments into City right-of-way shall be limited to grade level uses including gardens, patios, landscaping, ground level decks and fences. The gardens/patios in the right-of-way, between the fences and the buildings, shall be permitted to provide a transitional zone between the public path ways and private dwellings. To create a defensible space, the planting along the walk streets shall not impede the view of walkways by the residents and the view of the gardens by the pedestrian. Creative use and arrangement of permeable paving materials shall be encouraged. Any fence, wall or hedge erected in the public right-of-way shall not exceed 42 inches in height as measured from the existing grade of the public right-of-way. The use of decorative fence patterns such as split rail, picket and rustic is encouraged. New fences shall be located in line with existing fences on the same side of the street.	No. The Proposed Project does not include encroachment into the City right-of-way. The Open Space provided along the eastern boundary of the VAPP would serve as a buffer between the facility and the Grand Canal. Landscaping within this area would be limited to native species, turf or other permitted groundcovers or landscaping materials. The provision of this space would also be consistent with the hydrology and water quality design intended to capture, retain, and treat stormwater runoff originating from the Project Site. Portions of the surface areas of the VAPP would utilize decomposed granite, which would serve as a permeable paving material. Fencing materials used would follow City requirements, except the location in which LADWP facilities are proposed (along Canal Court) since these require certain design standards intended to protect the public and these facilities from vehicle damage.

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Policy III.A.1. General	New recreational opportunities should be provided, and existing recreational areas, shown on Exhibits 19a through 21b, shall be protected, maintained and enhanced for a variety of recreational opportunities for both residents and visitors, including passive recreational and educational activities, as well as active recreational uses. a. Recreation and visitor-serving facilities shall be encouraged, provided they retain the existing character and housing opportunities of the area, and provided there is sufficient infrastructure capacity to service such facilities. b. Acquisition, expansion and improvement of parks and facilities throughout the Venice Coastal Zone shall be encouraged and accelerated, subject to the availability of funds. c. Where feasible and compatible with the surrounding neighborhood, recreational uses shall be located in conjunction with other new public facilities, such as public parking lots.	No. As noted above, Open Space is proposed and would include the eastern boundary of the VAPP adjacent to the Grand Canal and a vacant lot located at 128 Hurricane Street and fronting Ballona Lagoon. These two areas would provide passive recreation opportunities for area residents and visitors. The facilities would be maintained by the LABOS. Limited parking for non-motorized vehicles (e.g., bicycles) is proposed for 128 Hurricane Street, although the exact number of spaces has not been determined.
Policy III.D.1. General	Existing bodies of water, including the Venice Canals, Venice Grand Canal south of Washington Boulevard, Ballona Lagoon, and the Pacific Ocean and beaches, shall remain open to the public for recreational uses, as specified in this LUP.	No. The Proposed Project would not inhibit public use of the Grand Canal, the Ballona Lagoon, or the Pacific Ocean.
Policy III.D.5. Educational and Passive Recreational Use of Waterways	Educational use of coastal waterways by schools and other groups shall be encouraged. Passive educational and recreational opportunities shall be maintained and enhanced via a public walkway along the Venice Grand Canal and lagoon wetlands. The City shall establish observation areas with seating and shade, subject to the availability of sufficient space and funding, to provide opportunities for passive recreation in the lagoon and canals in such a manner as to provide public access, consider the privacy of adjacent residences, and to protect public views.	No. As noted above the two Open Space areas located along the eastern boundary of the VAPP and on the vacant lot located at 128 Hurricane Street would provide passive recreation and viewing areas of the Grand Canal and the Ballona Lagoon. The design of these spaces would also consider the privacy of adjacent residences and would provide expansive public views of the scenic resources.
Policy III.D.6. Venice Canals Parks	New parks, with parking to the rear, shall be considered on some of the City-owned lots on the canals, provided that such facilities are compatible with the existing residential use of the area.	No. See response immediately above. It should be noted that the Open Space proposed along the eastern boundary of the VAPP does not include sufficient space for parking. The vacant lot located at 128 Hurricane Street would provide an alternative location for parking spaces that would be removed along Hurricane Street.

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Policy IV.A.2. Permitted Uses	Uses permitted in or adjacent to the canals shall be implemented in a manner to protect the biological productivity of marine resources and maintain healthy populations of marine organisms. Such uses as open space, habitat management, controlled nature study and interpretation, and passive public recreation use of walkways for birdwatching, photography, and strolling shall be encouraged and promoted.	No. The analysis contained in the Draft EIR determined that both construction and operational-related impacts to biological resources, with the incorporation of mitigation, would be less than significant. Pending construction of the CIS diversion structure, a portion of the western bank of the Grand Canal would be restored with native plant communities, which would result in direct benefits to local wildlife. The provision of two Open Space areas located along the eastern boundary of the VAPP, fronting the Grand Canal, and the vacant lot located at 128 Hurricane Street, fronting Ballona Lagoon, would provide passive recreation, birdwatching, photography, and strolling opportunities.
Policy IV.A.3. Venice Canals Landscape Buffer.	To protect the marine habitat, a one and one-half to two-foot-wide safety landscape buffer strip shall continue to be provided and maintained between the canal banks and sidewalks. Landscaping in the buffer strip shall consist of native coastal strand marshland or wetland vegetation as specified in the Venice Canals Rehabilitation Plan approved by Coastal Commission Coastal Development Permit 5-91-584.	No. Pending construction of the CIS diversion structure, a portion of the western bank of the Venice Grand Canal would be restored with native plant communities, consistent with Coastal Commission Coastal Development Permit 5-91-584. The restored area would extend from the northern boundary of the VAPP to the eastern terminus of Hurricane Street.
Policy IV.A.4. Venice Canals Setback and Yard Area	In order to provide a setback for access, to protect visual quality and the biological productivity of the canals, and to limit water runoff, a setback with an average depth of 15 feet (and a minimum depth at any point of 10 feet) shall be provided and maintained in the front yard areas of private residences (adjacent to the canal property line). This setback shall provide a permeable yard with an area at least 15 feet times the width of the lot line at the canal side. (See also Policy I.A.4a for details).	No. The Proposed Project must comply with the Venice Specific Plan Setbacks and Yard requirements. The Proposed Project can meet the permeable Open Space requirement but would need a RW2-1 zone Adjustment for Yards to comply with rear yard setback requirements due to the facility's design, which would include transformers taller than the maximum 6 feet that encroach into the rear yard. The LABOE however, proposes to provide an Open Space buffer approximately 15 feet in width between the Esplanade and VPP. This area would be serve a dual use purpose including Open Space for passive recreation and viewing of the Grand Canal and to capture, retain, and treat stormwater runoff originating from the VAPP. As noted above, pending construction of the CIS diversion structure, a portion of the western bank of the Venice Grand Canal would be restored with native plant communities, consistent with Coastal Commission Coastal Development Permit 5-91-584. The restored area would extend from the northern boundary of the VAPP to the eastern terminus of Hurricane Street.

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Policy IV.B.1. Ballona Lagoon	b. Permitted Uses. Only uses compatible with preservation of this habitat shall be permitted in and adjacent to the lagoon. Uses permitted in or adjacent to the lagoon shall be carried out in a manner to protect the biological productivity of marine resources and maintain healthy populations of marine organisms. Such uses as open space, habitat management, controlled nature study and interpretation, and passive public recreation such as birdwatching, photography, and strolling shall be encouraged and promoted. No fill shall occur in Ballona Lagoon unless it is consistent with Coastal Act Section 30233 and is the least environmentally damaging alternative. No untreated runoff shall be directed into the lagoon.	No. The Open Space proposed at the vacant lot at 128 Hurricane Street would be used for passive recreation uses. It would also provide opportunities for birdwatching, photography, and strolling along the Esplanade. As noted in the analysis contained in the Draft EIR, implementation of the Proposed Project would result in less-than-significant impacts to biological resources during construction and operation, with the inclusion of mitigation measures. In addition, all runoff would be captured, retained, and treated on-site and would not be allowed to enter the Ballona Lagoon. Similarly, no fill is proposed within the lagoon.
Policy IV.B.3. Ballona Lagoon Development Standards.	The setbacks and height of buildings adjacent to the lagoon shall continue to be limited as provided in Policies I.A.4b, c, and d so that development is compatible with the continuance of the environmentally sensitive habitat.	No. The Proposed Project does not include the development of buildings adjacent to the Ballona Lagoon, only passive Open Space uses, which are compatible with the Environmentally Sensitive Habitat. Moreover as noted in the analysis contained in the Draft EIR, implementation of the Proposed Project would result in less-than-significant impacts to biological resources during construction and operation, with the inclusion of mitigation measures.
Policy IV.B.4. Lagoon and Venice Grand Canal Zoning.	The lots beneath the waterways of the Ballona Lagoon and Venice Grand Canal south of Washington Boulevard shall be rezoned as Open Space (OS). This zone protects recreational and scenic uses of the coastal area while providing for other uses which would benefit the public without significant impairment of the recreational and residential uses.	No. The Proposed Project does not propose any changes to the OS zone of the Grand Canal and therefore would not be incompatible with it, as indicated in the analysis contained in the Draft EIR. Moreover, the construction of the CIS diversion structure within the Grand Canal would be temporary and would not protrude above the bottom of the canal and into the water column and would not be visible to area residents or visitors, thereby protecting scenic views.
Policy IV.B.7. Venice Grand Canal Rehabilitation.	The Venice Grand Canal between Hurricane Street and Washington Boulevard shall be restored and maintained in order to improve water quality, aquatic habitat, and public pedestrian access along the waterway in a manner that is sensitive to the privacy of adjoining residents.	No. As noted above, pending construction of the CIS diversion structure, a portion of the western bank of the Venice Grand Canal, between the northern property boundary of the VAPP north to Washington Blvd., would be restored with native plant communities, consistent with Coastal Commission Coastal Development Permit 5-91-584.
Policy IV.C.1. Stormwater Runoff	All new public and private development, substantial rehabilitation, redevelopment or related activity, which discharges stormwater runoff into the Ocean, Ballona Lagoon, Venice Grand Canal south of Washington Boulevard or the Venice Canals shall be designed and conducted in compliance with the County-wide Municipal National Pollution Discharge Elimination System (NPDES) Stormwater Permit, issued by the California Regional Water Quality Control Board (RWQCB), the RWQCB approved Standard Urban Stormwater Mitigation Plan, and the NPDES General	No. The Proposed Project includes the provision of required Best Management Practices (BMPs) and low impact development (LID) features to address on-site hydrology and water quality conditions and potential impacts. The Project Site (including Open Space areas) would be designed to convey, capture, and treat stormwater runoff originating from these sites and to ensure that it does not enter off-site areas, including the Grand Canal or Ballona Lagoon. Stormwater would not drain into any adjacent waterways, it would be self-contained on

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	Permit for Stormwater Discharges Associated with Construction Activity, issued by the State Water Resources Control Board (SWRCB), where applicable. Methods to improve water quality, such as the mitigation of the first-flush stormwater runoff entering coastal waterways, shall be imposed as conditions of development by the City of Los Angeles in accordance with SWRCB and RWQCB recommendations and regulations, and the Santa Monica Bay Restoration Project Action Plan in order to protect, restore, and where feasible, enhance the water quality and habitat of these waterways.	the Project Site. It should also be noted that the analysis contained in the Draft EIR determined that impacts related to hydrology and water quality would be less than significant with the implementation of mitigation measures.
Policy IV.C.2. Water Quality	Prior to issuance of building permits for all developments adjacent to the canals area, Venice Grand Canal and Ballona Lagoon, a grading and drainage plan indicating that low flow surface runoff is prevented from traveling directly from the lot into the coastal waterways by one or more of the following methods are recommended: Installation of green strip filters or equivalent pollution-reducing devices in all new private and public parking areas adjacent to the canals and lagoon; upgrading of existing illicit storm drain connections with French drains; surface runoff directed to an existing storm drain; lot sloped to drain toward the alley; and, front yards adjacent to the canals and lagoon shall be required to have a permeable surface, or where the surface is not permeable, provide a drainage system to prevent runoff directly into the lagoon or canals. An engineering and soils report to determine suitability of soils for french drains may be required.	No. See response directly above. In addition, runoff capture features are proposed on-site and a bioswale (Open Space area) is proposed along the eastern boundary of the VAPP adjacent to the Venice Grand Canal, which would prevent runoff from entering this waterbody. In addition, the green space proposed at 128 Hurricane Street would be developed to include similar stormwater runoff capture and treatment features to ensure that these flows do not enter Ballona Lagoon.
Policy IV.D.1. Venice Canals Habitat	The Venice Canals have been identified by the Least Tern Recovery Team as a foraging habitat for the Least Tern. Development within or adjacent to the canals that might affect this foraging habitat shall not be permitted.	No. As noted in the analysis contained in the Draft EIR, implementation of the Proposed Project would result in less-than-significant impacts to biological resources (including Least Tern) during construction and operation, with the inclusion of mitigation measures.
Policy IV.D.2. Ballona Lagoon Habitat	The Ballona Lagoon has been identified by the Least Tern Recovery Team as a critical habitat for the Least Tern for feeding. Development within or adjacent to the lagoon that might adversely impact the quality of this foraging habitat shall not be permitted.	No. See response directly above.
Policy IV.E.1. Maintenance	The banks, waterways and public walkways of the Venice Canals, Ballona Lagoon and Venice Grand Canal south of Washington Boulevard shall be periodically maintained by the City or other appropriate entity, to keep these areas free of accumulated trash and wastes, thereby maintaining the biological, water quality, recreational and aesthetic resources of these areas.	No. Both construction and operational-related waste would be disposed of properly within the VAPP. In addition, pending completion of the CIS diversion structure within the Venice Grand Canal, the western bank of the canal would be restored with native plant communities, consistent with Coastal Commission Coastal Development Permit 5-91-584. This is anticipated to have a beneficial impact on local wildlife by providing additional foraging habitat.

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Policy IV.F.1	Diking, dredging and fill shall be permitted only in conjunction with an approved restoration plan and maintenance activity consistent with Coastal Act Section 30233. No construction shall be permitted on sandy beaches, except for construction in conjunction with approved recreational, ecological, and erosion control facilities. No fill shall be permitted in coastal waterways or below the seven foot contour for structures adjacent to the lagoon unless it is consistent with Coastal Act Section 30233 and is the least environmentally damaging alternative.	No. Construction of the CIS diversion structure would be required within the Grand Canal and would be accomplished via a temporary coffer dam. Once completed, the diversion structure would be located underground and beneath the canal and would not protrude into the water column. Dredged material would be collected and stored within one of the Laydown areas or at a landfill. A portion of the fill material would be returned to the site and used to cover the diversion structure located in the canal and to re-contour the western bank of the canal in the area used to access it, from the northern boundary of the VAPP to the eastern terminus of Hurricane Street. Once the diversion structure is completed, the western bank of the canal would be restored with native plant communities, consistent with Coastal Commission Coastal Development Permit 5-91-584.
Policy IV.G.1. Flood Setback	Potential flood hazard to residents along the west bank of the Ballona Lagoon and the east bank of the Venice Grand Canal shall be alleviated by increasing the development setback in the Silver Strand area and along the banks of the Venice Grand Canal and Ballona Lagoon (see Policies I.A.4 and 7), and by controlling erosion along the banks by the use of native flora.	No. As noted above, a portion of the western bank of the Venice Grand Canal would be restored with native plant communities, consistent with Coastal Commission Coastal Development Permit 5-91-584, which would assist in reducing erosion. In addition, the analysis contained in the Draft EIR determined that impacts associated with erosion would be less than significant with adherence to standard regulatory compliance measures and the implementation of mitigation measures.
Policy IV.G.2. Hazard Mitigation for New Construction.	Special development standards shall be developed for those areas within the Venice Coastal Zone which present potential flood and liquefaction hazards.	No. The analysis contained in the Draft EIR determined that no flooding would result during either construction or operation of the Proposed Project and that impacts associated with liquefaction hazards would be less than significant with the implementation of mitigation measures.
Policy V.A.4. Conservation Programs.	Conservation programs for public works services within the Venice coastal zone shall be encouraged and developed.	No. The restoration of a portion of the western bank of the Venice Grand Canal would assist the City in accomplishing this policy objective by replanting this area with native coastal plant communities, consistent with Coastal Commission Coastal Development Permit 5-91-584, which would assist in reducing erosion and enhancement of native habitat.

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General Plan Framework		
Infrastructure and Public Services – Wastewater Collection		
Goal 9A	Adequate wastewater collection and treatment capacity for the city and in basins tributary to City-owned wastewater treatment facilities.	No. The Proposed Project is intended to provide additional reliability and redundancy to the VPP. It would allow regular service and maintenance to occur without jeopardizing human and environmental health as a result of sewage spills from the VPP into the adjacent Grand Canal, Ballona Lagoon, or adjacent street network. The facility would also be planned and designed to consider future risks associated with global climate change, including sea-level rise, which could affect operation of the existing VPP.
Objective 9.2	Maintain the wastewater collection and treatment system, upgrade it to mitigate current deficiencies, and improve it to keep pace with growth as measured by the City's monitoring and forecasting efforts.	No. See response immediately above. It should be noted that the analysis contained in the Draft EIR determined that the Proposed Project would not induce growth and does not include land uses that are growth-inducing by nature, such as residential, commercial, and industrial.
Policy 9.2.4	Continue to implement programs to upgrade the wastewater collection system to mitigate existing deficiencies and accommodate the needs of growth and development.	No. See response immediately above.
Safety Element		
Goal 1	A city where potential injury, loss of life, property damage and disruption of the social and economic life of the city due to fire, water related hazard, seismic event, geologic conditions or release of hazardous materials disasters is minimized.	No. The Proposed Project is intended to provide additional reliability and redundancy to the VPP. It would allow regular service and maintenance to occur without jeopardizing human and environmental health as a result of sewage spills from the VPP into the adjacent Grand Canal, Ballona Lagoon, or adjacent street network. The facility would also be planned and designed to consider future risks associated with global climate change, including sea-level rise, which could affect operation of the existing VPP.
Policy 1.1.2	Disruption reduction. Reduce, to the greatest extent feasible and within the resources available, potential critical facility, governmental functions, infrastructure and information resource disruption due to natural disaster. [All EOO programs involving mitigation of disruption of essential infrastructure, services and governmental operations systems and prepare personnel for quickly reestablishing damaged systems implement this policy.]	No. As noted above, the VPP is a critical City facility and currently has no mechanism to by-pass sewage flows from the CIS and therefore, must remain operational continuously. In the event of a natural disaster, the provision of additional pumps and associated redundancy would likely allow the facility to operate, thereby reducing the potential for catastrophic system failure and emergency discharges of sewage to the Grand Canal, Ballona Lagoon, or adjacent street network.

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Policy 1.1.3	Facility/systems maintenance. Provide redundancy (back-up) systems and strategies for continuation of adequate critical infrastructure systems and services so as to assure adequate circulation, communications, power, transportation, water and other services for emergency response in the event of disaster related systems disruptions. [All EOO programs that involve provision of back up systems and procedures for reestablishment of essential infrastructure, services and governmental operations which are disrupted implement this policy.]	No. The Proposed Project is intended to provide additional reliability and redundancy to the VPP. It would allow regular service and maintenance to occur without jeopardizing human and environmental health as a result of sewage spills from the VPP into the adjacent Grand Canal, Ballona Lagoon, or adjacent street network. The facility would also be planned and designed to consider future risks associated with global climate change, including sea-level rise, which could affect operation of the existing VPP.
Policy 1.1.4	Health/environmental protection. Protect the public and workers from the release of hazardous materials and protect city water supplies and resources from contamination resulting from accidental release or intrusion resulting from a disaster event, including protection of the environment and public from potential health and safety hazards associated with program implementation. [All EOO hazardous materials hazard and water pollution mitigation programs implement this policy.]	No. See response immediately above.
Conservation Element		
Objective:	Protect important cultural and historical sites and resources for historical, cultural, research, and community educational purposes.	No. The Venice Canal System is identified as City of Los Angeles Historic Cultural Monument No. 270 and is part of the Venice Historic Canal District (ZI–2370). The Grand Canal and Ballona Lagoon are located immediately adjacent to the Proposed Project. The analysis contained in the Draft EIR determined that no impacts to cultural resources, related to the Grand Canal or Ballona Lagoon would result with implementation of the Proposed Project. It should be noted however, that the City's Case Management Division and Urban Design Studio would assist with the design review of the Proposed Project. Additionally, the Office of Historic Preservation would be consulted to ensure that it is compatible with and does not adversely affect these Historic Resources.
Policy:	Continue to protect historic and cultural sites and/or resources potentially affected by proposed land development, demolition or property modification activities.	No. See response immediately above.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
Open Space Element		
Goal:	To conserve unique natural features, scenic areas, cultural and appropriate historical monuments for the benefit and enjoyment of the public.	No. See response immediately above. As noted above, the Proposed Project would include the provision of two Open Space areas, located along the eastern boundary of the VAPP and at a vacant lot at 128 Hurricane Street. These Open Space areas are required by the Venice Specific Plan and would provide passive recreation areas to adjacent residents and visitors and would directly benefit the public.
	To conserve and/or preserve those open space areas containing the city's environmental resources, including air and water.	No. See response immediately above.
Objective:	To emphasize the importance of, and to preserve open space and natural features in private and public development.	No. See response immediately above.
Policies:	Ecologically important areas are generally considered open space and shall be so designated. The following shall apply: (a) to the extent feasible, ecologically important areas should be kept in a natural state; (b) in the event a project is proposed within an ecologically important area, an environmental impact report shall be prepared	No. The Proposed Project is not located within an Environmentally Sensitive Habitat Area, but is located immediately adjacent to one (i.e., Grand Canal and Ballona Lagoon). Per the requirements of the California Environmental Quality Act (CEQA), an EIR has been prepared for the Proposed Project. As noted above, the analysis contained in the Draft EIR determined that impacts to biological resources, including Environmentally Sensitive Habitat Areas, would be less than significant during both construction and operation, with the implementation of mitigation measures.
	Small parks, public and private, should be located throughout the city. Not only should recreation activities be provided, but an emphasis shall be placed on greenery and openness.	No. As noted above, the Proposed Project would include the provision of two green Open Space areas, located along the eastern boundary of the VAPP and at a vacant lot at 128 Hurricane Street. These Open Space areas are required by the Venice Specific Plan would provide passive recreation areas to adjacent residents and visitors and would directly benefit the public.
	Where development is allowed in ecologically important areas, the intensity of development should be kept at a minimum consistent with reasonable use of the land. All measures should be taken to protect these areas including buffering ecologically important areas from conflicting or detrimental uses.	No. The Proposed Project is not located within an Environmentally Sensitive Habitat Area but is located immediately adjacent to the Venice Grand Canal and Ballona Lagoon. As noted above, the analysis contained in the Draft EIR determined that impacts to biological resources, including Environmentally Sensitive Habitat Area, would be less than significant during both construction and operation, with the implementation of mitigation measures.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
Mobility Element		
Objective:	Reduce the pollutant load of stormwater runoff to meet Total Maximum Daily Load standards.	No. The Proposed Project includes the provision of required BMPs and LID features to address on-site hydrology and water quality conditions and potential impacts. The Project Site (including Open Space areas) would be designed to convey, capture, and treat stormwater runoff originating from these sites and to ensure that it does not enter off-site areas, including the Grand Canal or Ballona Lagoon. It should also be noted that the analysis contained in the Draft EIR determined that impacts related to hydrology and water quality would be less than significant with the implementation of mitigation measures.
Policy 2.3 Pedestrian Infrastructure:	Recognize walking as a component of every trip, and ensure high-quality pedestrian access in all site planning and public right-of-way modifications to provide a safe and comfortable walking environment.	No. During construction of the CIS diversion structure within the Grand Canal, a portion of Esplanade, extending from the northern boundary of the VAPP to the eastern terminus of Hurricane Street, would be closed temporarily to the public, although adequate existing alternative access is available along Canal Court between Esplanade and Galleon Street.
Policy 5.5 Green Streets:	Maximize opportunities to capture and infiltrate stormwater within the City's public right-of-ways.	No. The Proposed Project includes the provision of required BMPs and LID features to address on-site hydrology and water quality conditions and potential impacts. The Project Site, especially the Open Space areas, would be designed to convey, capture, and treat stormwater runoff originating from these sites and to ensure that it does not enter off-site areas, including the Grand Canal or Ballona Lagoon. It should also be noted that the analysis contained in the Draft EIR determined that impacts related to hydrology and water quality would be less than significant with the implementation of mitigation measures.
Health Element		
Policy 2.2 Healthy Building Design and construction:	Promote a healthy built environment by encouraging the design and rehabilitation of buildings and sites for healthy living and working conditions, including promoting enhanced pedestrian-oriented circulation, lighting, attractive and open stairs, healthy building materials and universal accessibility using existing tools, practices, and programs.	No. The Proposed Project would include the construction of a high-quality building design that is attractive and complements the scale, massing, character, and architecture of the adjacent residential neighborhood. The building would be required to adhere with applicable building design standards, including the Venice Specific Plan and the Residential Citywide Design Guidelines, and LID design features would be also be required.
Policy 2.10 Social Connectedness:	Acknowledge the mental and physical health benefits of social connectedness by promoting and valuing public spaces, social interaction, relationship building, and resilience in community and urban design.	No. As noted above, the Proposed Project would include the provision of two Open Space areas, located along the eastern boundary of the VAPP and at a vacant lot at 128 Hurricane Street. These Open Space areas would provide passive recreation areas for adjacent residents and visitors and would encourage social interaction and connectedness by providing a communal gathering space.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
Objective:	Increase the number of neighborhood and community parks so that every Community Plan Area strives for 3 acres of neighborhood and community park space per 1000 residents (excluding regional parks and open spaces)	No. The Proposed Project would add additional Open Space to the community. As noted above, the Proposed Project would include the provision of two Open Space areas, located along the eastern boundary of the VAPP and at a vacant lot at 128 Hurricane Street. These Open Space areas would provide passive recreation areas for adjacent residents and visitors. The provision of these spaces would assist the community in achieving its Community Plan Area goals.
Objective:	Increase access to parks so that 75% of all residents are within a ¼ mile walk of a park or open space facility	No. See response immediately above.
Venice Community Plan		
GOAL 1.	A SAFE, SECURE, AND HIGH QUALITY RESIDENTIAL ENVIRONMENT FOR ALL COMMUNITY RESIDENTS	No. The Proposed Project would include the construction of a high-quality building design and landscaping that are in keeping with the massing, scale, character, and architecture of the adjacent neighborhood. In addition, it would include the provision of safety features, including fencing, gated entry, security cameras, and nighttime lighting.
Objective 1-1	To provide for the preservation of the housing stock and its expansion to meet the diverse economic and physical needs of the existing residents and projected population of the Plan area to the year 2010.	No. The Project Site is currently vacant and does not include residential uses. Although its current General Plan Land Use designation permits the development of such uses, the construction of Public Benefits Project uses would not substantially affect the potential expansion of the housing stock within the community. Although the community is largely built out, there are additional parcels within the community that could be redeveloped with more intense residential development, provided that the applicable zoning permits these uses and intensities.
Policy 1-1.1:	Protect the quality of the residential environment and the appearance of communities with attention to site and building design.	No. The Proposed Project would include the construction of a high-quality building design and landscaping that complements the massing, scale, character, and architecture of the adjacent neighborhood. The Proposed Project would also be subject to design review by the City's Case Management Division and the Urban Design Studio. Additionally, the Office of Historic Preservation would be consulted to ensure that the proposed use is compatible with the Venice Canals, a City-designated historic resource.
Policy 1-1.3:	Protect existing single-family residential neighborhoods from new out-of-scale development and other incompatible uses.	No. See response immediately above.
Objective 1-3	To preserve and enhance the varied and distinct residential character and integrity of existing residential neighborhoods	No. See response immediately above.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
Policy 1-3.1	Seek a higher degree of architectural compatibility and landscaping for new infill development to protect the character and scale of existing residential neighborhoods.	No. See response immediately above.
b	Sufficient land for a variety of industrial uses with maximum employment opportunities which are environmentally sensitive, safe for the work force and which have minimal adverse impact on adjacent uses.	No. The Proposed Project entails construction of a Public Facility and does not include Industrial uses. In addition, the current zoning and General Plan Land Use designations do not permit such uses to be constructed on-site. A total of two employees (per shift) would be employed on-site and would work three separate eight-hour shifts. As such, at any given time, these two employees would be on-site to operate and monitor the VAPP and VPP. As noted in the analysis contained in the Draft EIR, the Proposed Project would result in less-than-significant impacts during operation and only short-term impacts related to noise and vibration and greenhouse gases during construction, which is anticipated to last 18 months.
Objective 3-2:	To assure mitigation of potential negative impacts generated by industrial uses when they are located in proximity to residential neighborhoods and to improve the aesthetic quality of industrial uses.	No. See response immediately above. As noted above, the Proposed Project would include the construction of a high-quality building design and landscaping that complements the massing, scale, character, and architecture of the adjacent neighborhood. The Proposed Project would also be subject to design review by the City's Case Management Division and Urban Design Studio. Additionally, the Office of Historic Preservation would be consulted to ensure that the proposed use is compatible with the Venice Canals, a City-designated historic resource.
Policy 3-2.1:	Encourage new industrial uses adjacent to residential neighborhoods to mitigate their impact on the residential neighborhoods to the extent feasible.	No. See response immediately above.
Goal 4	Adequate recreation and park facilities which meet the needs of the residents in the plan area	No. The Proposed Project would add additional green space to the community. As noted above, the Proposed Project would include the provision of two Open Space areas, located along the eastern boundary of the VAPP and at a vacant lot at 128 Hurricane Street. These Open Space areas would provide passive recreation areas for adjacent residents and visitors. The provision of these spaces would assist the community in achieving its Community Plan Area goals.
Objective 4-2	To provide facilities for specialized recreational needs by utilizing existing public lands such as flood control channels, utility easements, or Department of Water and Power property.	No. See response immediately above.
Policy 4-2.1:	Flood control channels and other appropriate public lands should be considered for open space and recreational purposes.	No. See response immediately above.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
Objective 4-3:	To ensure the accessibility, security and safety of parks by their users, particularly families with children and senior citizens.	No. As noted above, the Proposed Project would include the provision of two Open Space areas, located along the eastern boundary of the VAPP and at a vacant lot at 128 Hurricane Street. These Open Space areas would provide passive recreation areas for adjacent residents and visitors. The provision of these spaces would consider such issues as accessibility, security (including lighting), and safety of patrons, including families with children and senior citizens. The Open Space and any design elements would be subject to design review by the City's Case Management Division and the Urban Design Studio. Additionally, the Office of Historic Preservation would be consulted to ensure that the proposed use is compatible with the Venice Grand Canal and the Ballona Lagoon, a City-designated Historic Resource.
Policy 4-3.1:	Provide local residents and visitors alike adequate access to local recreational facilities.	No. See response immediately above.
Policy 4-3.2:	Ensure that parks are adequately illuminated for safe use at night.	No. See response immediately above.
Goal 5	A community with sufficient open space in balance with new development to serve the recreational, environmental, health and safety needs of the community and to protect environmental and aesthetic resources.	No. As noted above, the Proposed Project would include the provision of two Open Space areas, located along the eastern boundary of the VAPP and at a vacant lot at 128 Hurricane Street. These Open Space areas would provide passive recreation areas for adjacent residents and visitors. The provision of these spaces would assist the community in achieving its Community Plan Area goals. They would also allow unobstructed views of scenic resources, including the Grand Canal and Ballona Lagoon. In addition, the analysis contained in the Draft EIR determined that impacts to biological resources would be less than significant during both construction and operation, with the inclusion of mitigation measures.
Objective 5-1	To preserve existing open space resources and where possible develop new open space.	No. See response immediately above.
Policy 5-1.1	Encourage the retention of passive and visual open space which provides a balance to the urban development of the community.	No. See response immediately above.
Policy 5-1.2	The City should encourage continuous efforts by federal, state and county agencies to acquire vacant land for publicly-owned open space.	No. The Proposed Project would facilitate the acquisition of additional vacant land for publicly-owned Open Space at 128 Hurricane Street. This lot would be used for public parking and Open Space that would lead to the Esplanade Walking Trail.
Policy 5-1.3	Protect significant environmental resources from environmental hazards.	No. As noted above, the VPP is a critical City facility and currently has no mechanism to by-pass sewage flows from the CIS and therefore, must remain operational continuously. In the event of a natural disaster or unexpected emergency, the provision of additional pumps

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
		and associated redundancy would likely allow the facility to operate, thereby reducing the potential for catastrophic system failure and emergency discharges of sewage to the Grand Canal, Ballona Lagoon, or adjacent street network.
Policy 5-1.4	Protect and maintain unique open space areas, including the Venice Canals, Venice Grand Canal, Ballona Lagoon and beaches.	No. With the exception of temporary construction within the Grand Canal associated with the CIS diversion structure, the Grand Canal would not be permanently affected and would maintain its unique Open Space area. The proposed CIS diversion structure would be constructed underground beneath the Grand Canal and would not protrude into the water column, nor would it be visible from the water surface.
GOAL 12	A system of safe, efficient and attractive bicycle and pedestrian routes	No. The Proposed Project does include a bicycle or pedestrian route on 128 Hurricane that leads to the Ballona Lagoon Esplanade Trail. Also, the Proposed Project would include new Coastal Access and Open Space accessible to this new walkway. However, a portion of Esplanade from the northern boundary of the VAPP to the eastern terminus of Hurricane Street would be temporarily closed to the public during construction of the CIS diversion structure in the Venice Grand Canal. Alternate existing access would be available via Canal Court at Esplanade and Galleon Street.
Objective 12-1	To promote an adequate system of safe bikeways for commuter, school and recreational use.	No. See response immediately above.
Policy 12-1.2	Identify bicycle routes along major and secondary arterials in the community.	No. The Proposed Project does not include the provision of bicycle or pedestrian routes. However, it should be noted that the project would not preclude the development of designated bicycle routes along major and secondary arterials in the community.
Policy 12-1.3	Assure that local bicycle routes are linked with the routes of neighboring areas of the city.	No. See response immediately above.
Objective 12-2	To promote pedestrian-oriented access and routes that are safe, efficient and attractive for commuter, school and recreational use, and facilitate economic activity and access to transit facilities.	No. A portion of Esplanade from the northern boundary of the VAPP to the eastern terminus of Hurricane Street would be temporarily closed to the public during construction of the CIS diversion structure in the Venice Grand Canal. Alternate existing access would be available via Canal Court at Esplanade and Galleon Street.
Policy 12-2.1	Encourage the safe utilization of easements and/or rights-of-way along flood control channels, public utilities, railroad rights-of-way, and streets wherever feasible for the use of bicycles and/or pedestrians.	No. While construction of the Proposed Project will impact the use of the sidewalk along the Grand Canal by bicycles and pedestrians, an alternate route along Canal Court at Galleon Street will be provided during the construction phase. Pedestrian and bicycle access will be restored when construction is complete. Also, when the Proposed

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
		Project is complete, the development of the 128 Hurricane Street lot will provide additional new Open Space with pedestrian access adjacent to the Ballona Lagoon, leading to the Ballona Lagoon Esplanade Trail.
Policy 12-2.2	Require the installation of sidewalks in all new roadway construction and in significant reconstruction of existing roadways.	No. The Proposed Project does not include new roadway construction or significant reconstruction of existing roadways; however, the southerly boundary of the VAPP site would include improved sidewalks.
Objective 12-3	To protect, maintain and improve pedestrian access to coastal resources including the system of walk streets.	No. The Proposed Project includes improvement of Coastal Access at 128 Hurricane Street by introducing new Open Space with additional pedestrian access leading to the Ballona Lagoon Esplanade Trail. During construction, temporary closure of the Esplanade, from the northern boundary of the VAPP to the eastern terminus of Hurricane Street, would be required. However, existing alternate access along Canal Court at Esplanade and Galleon Street would be maintained, which would provide the public with adequate access options to the Grand Canal and Ballona Lagoon and associated Esplanade and interpretive trails.
Policy 12-3.1	Implement all the policies and programs pertaining to pedestrian access to coastal resources contained in the Venice Coastal Zone Land Use Plan.	No. See response immediately above. The Proposed Project would not hinder pedestrian access to Coastal Resources, as contained in the Venice Coastal Zone Land Use Plan.
Goal 13	A sufficient system of well designed and convenient onstreet parking and off-street parking facilities throughout the plan area	No. The Proposed Project will provide a total of eight parking spaces at the 128 Hurricane Street lot. A total of four parking spaces would be provided to serve employees, one space for the Beach Impact Zone parking requirement, and relocated parking spaces, which would be removed from the southerly boundary of the Proposed Project along Hurricane Street between Canal Court and Esplanade and relocated to 128 Hurricane Street. Two existing non-public off-street parking spaces at the VPP would be maintained inside the existing VPP. The analysis contained in the Draft EIR determined that impacts related to the relocation of existing public parking spaces at the eastern terminus of Hurricane Street would result in less-than-significant parking impacts and no mitigation measures would be necessary.
Objective 13-1	To provide an adequate supply of parking at appropriate locations in accordance with Citywide standards and community needs.	No. See response immediately above.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
Goal 17	Preservation and restoration of cultural resources, neighborhoods and landmarks which have historical and/or cultural significance	No. The Proposed Project would include the construction of a high-quality building design and landscaping that would complement the massing, scale, character, and architecture of the adjacent neighborhood. The Proposed Project would also be subject to design review by the City's Case Management Division and the Urban Design Studio. Additionally, the Office of Historic Preservation would be consulted to ensure that the proposed use is compatible with the architectural styles of the Venice Canals, a City-designated historic resource.
Objective 17-1	To ensure that the Community's historically significant resources are protected, preserved and enhanced.	No. See response immediately above.
Goal 18	Preservation of the scenic and visual qualities of coastal areas.	No. See response immediately above. In addition, the Proposed Project would include the provision of two Open Space areas. One space would be located along the eastern boundary of the VAPP adjacent to the Venice Grand Canal. The other would be located at a vacant lot at 128 Hurricane Street, adjacent to the Ballona Lagoon. Both Open Space areas would help to preserve the scenic and visual qualities of coastal areas by providing expansive view opportunities of the Grand Canal and Ballona Lagoon. In addition, the analysis contained in the Draft EIR determined that visual impacts associated with the Proposed Project would be less than significant with the inclusion of mitigation measures.
Policy 18-1.1	The location and amount of new development should maintain and enhance public access to the coast.	No. The Proposed Project would require temporary closure of Esplanade, from the northern boundary of the VAPP to the eastern terminus of Hurricane Street during construction of the CIS diversion structure within the Grand Canal. During construction, existing alternate access along Canal Court at Esplanade and Galleon Street would be maintained to provide the public with adequate access options to the Grand Canal and Ballona Lagoon and associated Esplanade and interpretive trails.
Policy 18-1.2	The protection of estuaries and wetlands and the restoration and protection of the Venice Canals	No. As noted above, pending completion of the CIS diversion structure within the Venice Grand Canal, the western bank of the canal would be restored with native plant communities, consistent with Coastal Commission Coastal Development Permit 5-91-584. In addition, runoff originating from the Proposed Project would be captured on-site, retained, and treated and no flows would be allowed to enter either the Grand Canal or Ballona Lagoon.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
Design Principles for New Development	Any development occurring in the Venice Coastal zone is regulated by the Venice LUP and the Venice Coastal Zone Specific Plan. 1. Development will be guided by the following design principles: a. New development will be located in areas best served by existing road and utility systems. b. The design of new development will mitigate the impact of the new traffic generated on coastal recreation access roads. c. New development will be concentrated to preserve identified coastal resource values (i.e., wetlands, view corridors). e. Views of distinctive visual resources (e.g., bluffs, wetlands) will not be significantly disturbed. h. Open space buffer areas between new development, identified wetlands and support areas will be established.	No. As noted above, the Proposed Project qualifies as a Public Benefits Project and must comply with the Venice Specific Plan Development Standards, which include findings of consistency with the Venice Coastal Land Use Plan. The Proposed Project would consist of a high-quality design and landscaping that is consistent with the scale, massing, character, and architecture of the adjacent neighborhood. The Proposed Project also includes the provision of two Open Space areas. One would be located along the eastern boundary of the VAPP adjacent to the Grand Canal, while the other would be located at 128 Hurricane Street on a vacant lot. They would serve as buffer areas between the VAPP and these wetland resources and would provide expansive views of the Grand Canal and Ballona Lagoon. Moreover, the analysis contained in the Draft EIR determined that biological resources, traffic and transportation, and view-related impacts would be less than significant with the implementation of mitigation measures.
Coastal visual Resources	1. Protect existing views of the wetlands from the surrounding public streets and open space areas. 4. Landscaping and plant materials should be used to screen and soften visually obtrusive elements.	No. The analysis contained in the Draft EIR determined that Proposed Project impacts related to views would be less than significant with the implementation of mitigation measures. As noted above, the Proposed Project would include two Open Space areas that would provide expansive views of the Grand Canal and Ballona Lagoon, thereby protecting views of the wetlands. In addition, the building design and landscaping would be high-quality and would consider such elements as screening and softening visually obstructive elements.
Hazards Areas	3. Future development must be based on thorough site specific geologic and soils studies including specific geotechnical studies related to mitigation of liquefaction and lateral spreading. 4. All future development shall utilize earthquake-resistant construction and engineering practices particularly those intended for high density of human occupancy. Preliminary engineering mitigation and structural setbacks shall be designed for a bedrock acceleration of 0.5 g and high potential for liquefaction, unless a reliable geologic survey indicates otherwise. 5. Consider the effect of seismic sea waves in land use planning and development sitting.	No. The analysis contained in the Draft EIR determined that Proposed Project impacts related to geology and soils and hazards, including seismic sea waves and liquefaction, would be less than significant with the implementation of mitigation measures.
Public Works	1. Public works improvements in the study area shall be designed to protect sensitive habitat resources, accommodate new development permitted in the area and provide for future public access needs. 4. Installation of new sewer and water lines will be accomplished via the least environmentally disturbing method.	No. The analysis contained in the Draft EIR determined that Proposed Project impacts related to biological resources would be less than significant with the implementation of mitigation measures. As noted above, during construction of the CIS diversion structure within the Grand Canal, access along the Esplanade, between the northern

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
	5. Water conservation technology should be employed in the installation and operation of additional water service.	boundary of the VAPP and the eastern terminus of Hurricane Street, would not be available. During construction, there would be adequate existing access to both the Grand Canal and Ballona Lagoon along Canal Court at Esplanade and Galleon Street. Installation of new sewer and water lines would be made via adjacent connections and would be installed in a manner that would not be environmentally disturbing and would adhere to City requirements. The Proposed Project would include xeriscape landscaping and crushed granite or rock in outside surface areas, except for the two Open Space areas (described above). Water conservation measures required by the City would be implemented, as applicable.
Recreation and Park Facilities and Open Space	2. Ensure that parks, beaches and canals are adequately illuminated for safe use at night where appropriate. 4. Coordinate with the Department of Recreation and Parks and the Police Department to ensure adequate police patrons and the utilization of "defensible space" in the design of recreation and park facilities. 9. Target the provision of parks and recreation facilities in areas with the greatest deficiencies.	No. The two Open Space areas proposed along the eastern boundary of the VAPP and vacant lot at 128 Hurricane Street would be planned and designed in a manner that considers safety, including lighting. As noted above, the proposed Open Spaces would assist the Community Plan Area in achieving its Open Space and park acreage goals.
Community Design and Landscaping Guidelines		
Street Lighting	3. Any new street lighting or pedestrian lighting system built in the public right-or way must be designed to currently adopted City standards. Equipment must be tested and approved by the Bureau of Street Lighting. 4. New lighting systems will be designed to minimize glare and "light trespass".	No. As noted in the analysis contained in the Draft EIR, project impacts related to lighting (including glare) were determined to be less than significant with mitigation measures.
Venice Coastal Zone Specific Plan		
Section 10. A. Ballona Lagoon West Bank	1. Height. Within 60 feet of the mean high tide of the Ballona Lagoon or inland side of the Esplanade (City right-of-way), whichever is furthest from the water as determined by a licensed surveyor, Venice Coastal Development Projects shall not exceed a maximum height of 30 feet. Beyond 60 horizontal feet, one additional foot in height is permitted for each two additional horizontal feet to a maximum height of 38 feet. No portion of any structure (including Roof Access Structures, roof deck railings and Architectural Features) shall exceed the 30 foot height limit within 60 horizontal feet of the mean high tide line of Ballona Lagoon or the inland side of the Esplanade, whichever is furthest from the water.	No. See response above provided for Policy I.A.7. Multi-Family Residential – Low Medium II Density.

Plan Goal, Policy Or Objective Number	Applicable Goal, Policy, or Objective	Conflict with Applicable Plan, Policy, or Regulation?
	b. Lots located north of Ironsides Street: (1) All Venice Coastal Development Projects shall be set back an average of 15 feet but not less than ten feet from the lot line nearest to the water. (2) An open, Permeable yard with an area of at least 15 times the lot width and a minimum of 450 square feet shall be maintained between the property line that faces the water and the front of any structure. No building extensions, including stairs and balconies, shall be allowed in the required Permeable yard area, except for ground level Permeable decks that do not exceed 18 inches in height. (3) The combined height of any decks, railings, garden walls and fences situated within the required Permeable yard shall not exceed six feet above the elevation of the adjacent public walkway. (4) The sideyard shall be consistent with LAMC requirements, but shall not be less than 3 1/2 feet.	No. See response above provided for Policy I.A.7. Multi-Family Residential – Low Medium II Density. In addition, as noted above, the Proposed Project would include an Open Space area located along the eastern boundary of the VAPP adjacent to the Grand Canal and which would extend from the northern boundary to the eastern terminus of Hurricane Street. Moreover, electrical building would be constructed adjacent to Canal Court, approximately 50 feet west of Esplanade. The intervening areas would be comprised of hatches uses to access the submersible pumps and would include landscaping and permeable surfaces. The building design does not include any decks, railing, or garden walls. A RW2-1 Zone Yard Adjustment will be needed because the transformers in the rear yard encroach over 6 feet. Fencing would not exceed four feet above the elevation of the adjacent public walkway (Canal Court).
	3. Fill. No Fill shall be permitted in the lagoon and buffer area, except for the minimum amount necessary for habitat restoration and public access. 4. Drainage. Prior to issuance of a building permit for a new Venice Coastal Development Project or an expansion of the existing building footprint by more than ten percent, the applicant shall submit drainage plans to the Department of Building and Safety for its approval. All drainage for new construction shall be directed away from Ballona Lagoon. The applicant and all successors in interest shall maintain the approved Venice Coastal Development Project consistent with the drainage plans approved by the Department of Building and Safety.	No. See response above provided for Policy I.A.7. Multi-Family Residential – Low Medium II Density. In addition, per City requirements drainage plans would be submitted to the Department of Building and Safety. As noted above, the analysis contained in the Draft EIR determined that project impacts related to hydrology and water quality were less than significant with the mitigation measures.

3.8.3 Environmental Impact Analysis

3.8.3.1 Methodology

Potential significant impacts associated with the Proposed Project were based upon a review and assessment of applicable land use and zoning documents (see Table 2-1 [Chapter 2, Project Description]) of this EIR for a list of required permits), including the City of Los Angeles Municipal Code, the Venice Specific Plan, the City of Los Angeles General Plan Safety Element and Land Use Element (Venice Community Plan), and the Venice Local Coastal Program Land Use Plan. Permits and/or planning entitlements that may be pursued for this project include Public Benefits Project Permit review, Venice Specific Plan Project Permit Compliance review, Conditional Use for Parking, RW2-1 zone Adjustment for Yards, and California Coastal Commission Coastal Development Permit. City of Culver City requirements concerning the temporary use of Laydown Area 3 for soil stockpiling are also considered and evaluated.

Based upon these documents, an analysis was prepared to determine if the Proposed Project is consistent with the land use designations and zoning, as well as the applicable goals, objectives, and policies. Table 3.8-2 contains the results of the analysis and indicates if the Proposed Project would be "inconsistent." If an "inconsistent" determination is indicated, impacts related to land use and planning are not necessarily considered potentially significant since the overall context and intent must also be considered. Therefore, the discussion below identifies potential project-related impacts and the measures that would be required to mitigate these, if they are found to be potentially significant.

3.8.3.2 Screening Analysis

As noted in Section Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study] of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in CEQA Appendix G and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.8.3.3 Thresholds of Significance

According to Appendix G of the CEQA Guidelines, a project would normally have a significant impact on land use and planning if it would:

PLNG-1. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

According to the *L.A. CEQA Thresholds Guide*, a determination of significance shall be made on a case-by-case basis, considering the following factors:

PLNG-2. Whether the proposal is inconsistent with the adopted land use/density designation in the Community Plan, redevelopment plan, or specific plan for the site;

PLNG-3. Whether the proposal is inconsistent with the General Plan or adopted environmental goals or policies contained in other applicable plans;

PLNG-4. The extent of the area that would be impacted, the nature and degree of impacts, and the type of land uses within that area; and

PLNG-5. The number, degree, and type of secondary impacts to surrounding land uses that could result from implementation of the Proposed Project.

3.8.3.4 Construction Impacts

As noted in Table 2-1 (see Chapter 2, Project Description, of this EIR), there are land use entitlements and discretionary actions that would need to be obtained prior to the construction of the Proposed Project and therefore, it is assumed that these would be secured in advance of any construction activities. Similarly, as noted in Table 3.8-2, there are applicable goals, objectives, and policies that must be considered in approving the Proposed Project. These plans have been established in order to protect the environment and adjacent sensitive land uses and to ensure that the Proposed Project is consistent with the neighborhood's character and scale. As such, this section discusses the potential impacts that could occur during construction related to land use and zoning. As noted below, with compliance with applicable planning and zoning requirements, all impacts can be reduced to less than significant levels and no mitigation measures are required.

PLNG-1. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

As shown in Figures 3.1-3B (see Section 3.1, Aesthetics of this EIR) and described in Chapter 2 (Project Description), the Proposed Project would include a two-story electrical and control building, three submersible pumps, and an associated valve and metering vault. The building would be constructed along the westerly boundary of Project Site, would be approximately 32 feet in height, 50 feet in length, and 2,500 square feet (both levels combined) in area. The Project Site is zoned RW2-1 (Residential Waterways Zone), which allows for residential uses.

Laydown Area 2 is comprised of two lots, one located on private property and one owned by the County of Los Angeles. Laydown Area 1 is located on public land owned by the City of Los Angeles. Laydown Areas 1 and 2 are zoned RW2-1 (Residential Waterways Zone), which are intended for residential uses. Laydown Area 3 is located off-site in Culver City, seven miles east of the Project Site, and is intended for industrial uses.

Proposed building finishes include architectural stamped concrete, reveals, and impressions; metal awnings over each of the exterior doors and sustainable roofing (Sika Décor or similar); and painted surfaces with colors that blend in with the surrounding neighborhood. Windows would be located on the second level of the occupied space where employees work. It also includes the improvement of an adjacent lot that would contain a total of eight parking spaces, an option for public art, and open space. The design of the building and accessories include encroachment over six feet into the rear yard. The Proposed Project is considered a Public Facilities use, which is not allowed by right in a RW2-1 zone or in a Medium Residential land use designation.

The Proposed Project qualifies as a Public Benefits Project under the public utilities and public services use per LAMC Article 14, Section 14.00(b). Additional discretionary actions such as an Specific Plan Adjustment for Yards, Conditional Use for Parking would have to be processed with the Public Benefits Project Permit. Therefore, the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project and impacts are **less than significant**. No mitigation is required.

As noted previously, although the Venice LCP-LUP has been adopted by the City of Los Angeles, the Venice LCP-LUP has not been certified by the California Coastal Commission. Therefore, the VCP land use designation of Medium Residential and Open Space apply to the Project Site and Venice Grand Canal, respectively. Section 12.04.05.B.1(a) of the LAMC states that parks and recreation facilities, including bicycle trails, walking trails, nature trails used for park and recreation purposes; natural resource preserves including waterways; marine and ecological preserves, sanctuaries and habitat protection sites are all compatible with the Open Space land use designation.

The Open Space land use designation would not be affected since construction activities in the Venice Grand Canal associated with the diversion structure would be temporary, constructed below the canal, and would not protrude into the water column. Similarly, Laydown Areas 1 and 2 would only be used during construction of the Proposed Project and no permanent uses associated with the VAPP (excepting parking at Laydown Area 1) would be constructed on these parcels. As such, their current zoning of RW2 and General Plan land use designations of Medium Residential would not need to be changed. Therefore, neither construction of the diversion structure in the Venice Grand Canal nor use of Laydown Areas 1 and 2 would conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project and impacts would be less than significant. No mitigation is required.

Construction of the Proposed Project would require the use of machinery, materials, and personnel. These activities would require an area large enough to perform these operations safely and efficiently. As such, two temporary street closures would be required for the duration of the construction period; Hurricane Street between Canal Court and Esplanade; and Canal Court, extending from the VAPP's northern property boundary to Esplanade (see Figure 2-2, Project Location Map, in Chapter 2 of this EIR). The Proposed Project would be required to obtain a Temporary Street Closure permit from the Bureau of Street Services prior to construction to reduce impacts. This would ensure that the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project and therefore, impacts would be **less than significant** and no mitigation is required**.**

Construction activities within the Venice Grand Canal are under supervision of the U.S. Army Corps of Engineers and would be required to obtain applicable permits. Therefore, the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project. Impacts would be **less than significant** and no mitigation is required.

Construction of the diversion structure within the Venice Grand Canal would also require a number of preparation activities, including shoring, excavation, and construction of the temporary coffer dam. These activities would require work within the Venice Grand Canal and a portion of its western bank (see Figure 2-2, Project Location Map, in Chapter 2 of this EIR). Similarly, construction of the VAPP would entail the construction and installation of both above and belowground facilities, including the two-story electrical building and control facility and three submersible pumps and associated valve and metering vault. These activities within the Venice Grand Canal and Project Site

would be required to obtain necessary permits (see Table 2-1 in Chapter 2 of this EIR), including a Permit to Construct, prior to construction. Issuance of these permits would ensure that the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect. Therefore, impacts would be **less than significant** and no mitigation is required.

Stockpiling of soils and materials would be needed at all the Laydown Area sites during the construction period. Since three of these sites are owned by the City of Los Angeles, access for the other lot (owned by the County of Los Angeles) would need to be obtained from the property owners. For the privately owned parcel, a permission to enter (PTE) and encroachment permit would need to be obtained. The PTE and encroachment permit would need to be secured in advance of any construction permits. Similarly, a temporary use permit would be required from the City of Culver City to utilize Laydown Area 3. Issuance of these permits would ensure that the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect and therefore, impacts would be **less than significant** and no mitigation is required.

Minor grading may be required prior to excavation activities in order to prepare the Project Site for construction and the parking and open space area associated with the Laydown Areas. No grading is proposed for Laydown Areas 2 or 3. Once the Project Site is excavated and backfilled, additional minor grading may be required to construct the electrical building pad and to ensure proper drainage of the site. Grading activities would require a Permit to Construct, which would ensure that the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a General Plan, Specific Plan, Local Coastal Program, or Zoning Ordinance) adopted for the purpose of avoiding or mitigating an environmental effect and therefore, impacts would be **less than significant** and no mitigation is required.

The Venice Coastal Specific Plan establishes the amount of required parking for the Proposed Project and the California Coastal Act protects coastal street parking. Five parking spaces are required for the Proposed Project that would be located on the 128 Hurricane lot, within 750 feet of the Project Site. A Conditional Use Permit for Parking on this lot would be pursued in order for the parking requirements to be consistent with the Venice Specific Plan. On-street parking spaces located on Hurricane Street west of Canal Court are proposed to be relocated on the 128 Hurricane Street lot. Therefore, a total of eight parking spaces will be provided at the 128 Hurricane Street lot. Issuance of a Conditional Use Permit and a Coastal Development Permit would ensure that the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project, adopted for the purpose of avoiding or mitigating an environmental effect and therefore, impacts would be **less than significant** and no mitigation is required.

Because the Proposed Project would represent a new Public Facilities use within a Residential zone, it will need to be designed and constructed in a manner that is in keeping with the character of the existing residential neighborhood and as identified in the City's Municipal Code. The project would be required to adhere to goals, objectives, and policies related to siting and design, as contained in

the VCP and VSP. Although the exterior conceptual design has not been finalized, design features that are in keeping with the architecture, massing, and materials that are currently present on the adjacent residential structures will be provided.

The VLCPLUP and VSP have established urban development and design guidelines to ensure that development projects within the community are consistent with the character and scale of the neighborhoods in which they are proposed. Since the Land Implementation Plan of the Venice LCP has not been approved by the California Coastal Commission, the VSP is the controlling document for urban design and development standards for projects proposed within the Venice Coastal Zone. A review of the VSP indicates that there are no specific Design Guidelines for Public Facilities, such as the Proposed Project. In such incidents, and as noted in the VSP, the regulations of the Los Angeles Municipal Code apply. The Residential Citywide Design Guidelines are part of the City's General Plan Framework element and serve to implement the City's 10 Urban Design Principles.

The Proposed Project went through the Department of City Planning's Urban Design Studio and the Development Services Center required Design Review. They facilitated the application of design objectives and compliance with all planning requirements, including the VCP, VSP, and the VLCPLUP. These Design Guidelines do not supersede regulations in the municipal code.

In addition, due to its location adjacent to the Venice Grand Canal, a recognized historic resource (see Section 3.4, Cultural Resources of this EIR), it underwent design review by the City of Los Angeles Office of Historic Preservation to ensure its compatibility and consistency with this resource and the neighborhood in which it is proposed.

Through adherence to applicable plans and undergoing required design review, the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect and therefore, impacts would be **less than significant** and no mitigation is required.

The Residential Citywide Design Guidelines and Land Use and Development Regulations in the VSP would not apply to Laydown Areas 1 and 2, or to the diversion structure in the Venice Grand Canal, as these areas would not include permanent structures once construction of the Proposed Project is completed.

Therefore, the temporary use of all the Laydown Areas and construction of the diversion structure within the Venice Grand Canal would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project, impacts would **be less than significant.**

PLNG-2. Whether the proposal is inconsistent with the adopted land use/density designation in the Community Plan, redevelopment plan or specific plan for the site.

As noted above**,** impacts would be **less than significant** related to inconsistency with the adopted land use/density designation in the Community Plan, redevelopment plan, or specific plan for the site and no mitigation is required.

PLNG-3. Whether the proposal is inconsistent with the General Plan or adopted environmental goals or policies contained in other applicable plans.

Based upon the analysis above, impacts would be **less than significant** and no mitigation is required.

PLNG-4. The extent of the area that would be impacted, the nature and degree of impacts, and the type of land uses within that area.

The Venice Pumping Plant (VPP) was built in 1957 and the two vacant parcels proposed for the VAPP were obtained for future public facility uses. The residential land uses surrounding the Project Site were constructed subsequent to this time period beginning in the mid-1960s (see Section 3.4, Cultural Resources of this EIR) and continuing through the 2000s. The VPP is identified as the earliest building in the area. As noted above, the neighborhood is primarily comprised of residential uses, including single- and multi-family and is almost entirely built out. The construction of the VAPP represents a continuation of the Public Facilities use and which was present in the 1950s and was the first urban use in the neighborhood. As noted above, the Public Benefits Project section of the LAMC permits a Public Facility to be constructed in both the General Plan Land Use designation and LAMC zoning. In addition, the Proposed Project is required to obtain permits or entitlements in advance of construction activities. This would bring the Proposed Project into compliance with applicable plans and policies and ensure that a design review of proposed structures and materials by the Development Services Unit and Office of Historic Preservation are undertaken to consider its proximity to the Venice Grand Canal, a Historic Resource, and the neighborhood scale and character. As such, impacts related to the extent of the area that would be affected, the nature and degree of impacts, and the type of land uses within that area would be **less than significant** and no mitigation is required.

PLNG-5. The number, degree, and type of secondary impacts to surrounding land uses that could result from implementation of the Proposed Project.

The analysis contained in this EIR has determined that all impacts, with the exception of short-term construction-related noise and vibration impacts can be mitigated to less than significant levels with standard regulatory requirements or the implementation of mitigation measures (see Sections 3.1 through 3.11 of this EIR). In the case of construction-related noise and vibration impacts, these would be significant and unavoidable, even with mitigation incorporated, during the construction period, which is expected to last two years. Cumulative noise and vibration impacts during construction would also be significant and unavoidable. Therefore, the number, degree, and type of secondary impacts to surrounding land uses that could result from implementation of the Proposed Project during construction would be **significant and unavoidable**, even with the application of mitigation measures **MM NOI-1** and **MM NOI-2** identified in this EIR (see Section 3.9, Noise and Vibration).

3.8.3.5 Operational Impacts

This section discusses the potential impacts that could occur during operations related to land use and zoning and mitigation measures that may be required. As noted below, impacts are less than significant and no mitigation is required.

PLNG-1. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

Hurricane Street, between Canal Court and Esplanade currently separates the existing VPP from the proposed VAPP. Control of the two facilities would be administered via the control facility, housed in the two-story electrical building, once the construction of the VAPP is complete. Maintenance

activities, deliveries, and on-site operations would require employees and visitors to frequently enter and exit these two separate, but adjacent facilities. The curb along Hurricane Street, adjacent to the new VAPP site, would be changed to red and/or a driveway. The current on-street parking would be relocated to the 128 Hurricane Street lot. Because the VPP and VAPP are considered critical facilities, access would need to be controlled at all times. As discussed in Chapter 2 (Project Description), this would be achieved via security cameras, lighting, and perimeter fencing. Project parking for the VAPP would be located at the 128 Hurricane Street, just west of the existing VPP site. Therefore, the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect and therefore, impacts would be **less than significant**.

Impacts to land use and zoning were discussed previously and determined to be less than significant. Therefore, the Proposed Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect and no mitigation measures are required.

PLNG-2. Whether the proposal is inconsistent with the adopted land use/density designation in the Community Plan, redevelopment plan or specific plan for the site.

Impacts related to consistency with an adopted land use plan were discussed previously and determined to be less than significant. Therefore, the Proposed Project would be consistent with the adopted land use/density designation in the Community Plan, redevelopment plan or specific plan for the site, and as such impacts would be **less than significant**, and no mitigation is required.

T-PLNG-3. Whether the proposal is inconsistent with the General Plan or adopted environmental goals or policies contained in other applicable plans.

Impacts related to consistency with an adopted land use plan, environmental goals or policies, or other applicable plans were discussed previously (see Table 3.8-2) and determined to be less than significant. Therefore, the Proposed Project would be consistent with the General Plan or adopted environmental goals or policies contained in other applicable plans, and as such impacts would be **less than significant**, and no mitigation is required.

T-PLNG-4. The extent of the area that would be impacted, the nature and degree of impacts, and the type of land uses within that area.

Impacts related to the extent of the area, the nature and degree, and types of land uses within the area were discussed previously and determined to be less than significant. Therefore, the project-related impacts to the extent of the area that would be affected, the nature and degree of impacts, and the type of land uses within that area would be **less than significant**, and no mitigation is required.

T-PLNG-5. The number, degree, and type of secondary impacts to surrounding land uses that could result from implementation of the Proposed Project.

The analysis contained in this EIR has determined that all operational impacts can be mitigated to less than significant levels with standard regulatory requirements or the implementation of mitigation measures (see Sections 3.1 through 3.11 of this EIR). Therefore, the number, degree, and type of secondary impacts to surrounding land uses that could result from implementation of the

Proposed Project would be **less than significant with application of standard regulatory requirements, project design low-impact development features, and mitigation measures MM AES-3, MM GEO-1, and MM NOI-3**, identified in this EIR**.**

3.8.4 Mitigation Measures

There are no mitigation measures required for the Proposed Project directly related to land use and planning. Secondary impacts to surrounding land uses that could result from construction of the Proposed Project are addressed with mitigation measures MM AES-1, MM AES-2, MM BIO-1 through MM BIO-9, MM CUL-1, MM NOI-1, MM NOI-2, and MM TRAF-1. Secondary impacts to land uses that could result from Proposed Project operations are addressed with mitigation measures MM AES-3, MM GEO-1, and MM NOI-3.

3.8.5 Significant Unavoidable Adverse Impacts

There are no direct significant unavoidable adverse impacts to land use and planning from implementation of the Proposed Project. However, secondary impacts to surrounding land uses related to construction noise and vibration are significant and unavoidable.

3.8.6 Cumulative Impacts

The Proposed Project area is comprised of built out urban land uses. The Proposed Project represents in-fill development within this existing environment and includes the construction of a public facility adjacent to the City's existing VPP. The related projects identified in Table 1-1, Related Projects List (see Chapter 1.0, Introduction of this EIR), primarily include infrastructure improvement projects, reflective of the built-out nature of the area. The cumulative projects identified would not result in cumulative impacts related to land use and planning since they do not entail new development that would conflict with the existing area uses. Similarly, the Proposed Project would represent a continuation of an existing use contained within a built-out area and which pre-dates the uses currently occupying the area. Given this, cumulative land use and planning impacts would be **less than significant**.

3.9 Noise and Vibration

3.9.1 Introduction

This section describes the potential noise and vibration impacts of the Proposed Project. It includes a discussion of existing regulatory requirements, the existing noise setting within the project area, and noise and vibration impacts that would result from implementation of the Proposed Project. Supporting technical information and analyses are hereby incorporated by reference and included as Appendix I [Noise Modeling Calculations] of this Environmental Impact Report (EIR).

As noted in the analysis below, impacts related to noise and vibration during construction activities would be significant and unavoidable, despite the application of mitigation measures.

During operation, impacts would also be significant. However, with incorporation of required mitigation measures, noise impacts during operation would result in less than significant impacts.

3.9.1.1 Noise Fundamentals

Noise is commonly defined as unwanted sound. Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is often defined as sound that is objectionable because it is disturbing or annoying.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receptor, and the propagation path between the two. The loudness of the noise source and the obstructions or atmospheric factors, which affect the propagation path to the receptor, determine the sound level and the characteristics of the noise perceived by the receptor.

Continuous sound can be described by *frequency* (pitch) and *amplitude* (loudness). A low-frequency sound is perceived as low in pitch; a high-frequency sound is perceived as high-pitched. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz. Very-low-frequency airborne sound of sufficient amplitude may be felt before it can be heard, and can be confused with ground-borne vibration.

The amplitude of pressure waves generated by a sound source determines the loudness of that source. As discussed in further detail below, the sound pressure level (also referred to simply as the sound level) is typically described in terms of decibels.

Decibels

The magnitude of a sound is typically described in terms of *sound pressure level* (SPL), which refers to the root-mean-square pressure of a sound wave and is measured in units called micropascals (µPa). One µPa is approximately one hundred-billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to over 100,000,000 µPa. Because of this large range of values, sound is rarely expressed in terms of µPa. Instead, a logarithmic scale is used to describe the sound pressure level in terms of

decibels, abbreviated dB. The decibel is a logarithmic unit that describes the ratio of the actual sound pressure to a reference pressure (20 µPa is the standard reference pressure level for acoustical measurements in air). Specifically, a sound pressure level, in decibels, is calculated as follows:

$$SPL = 20\log_{10}\left(\frac{X}{20\mu Pa}\right)$$

where *X* is the actual sound pressure and 20 µPa is the reference pressure. The threshold of hearing for young people is about 0 dB, which corresponds to 20 µPa.

Decibel Addition

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted through ordinary arithmetic. On the dB scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing the same sound level, their combined sound level would be 3 dB higher than one source under the same conditions. For example, if one bulldozer produces a sound pressure level of 80 A-weighted decibels (dBA), two bulldozers would not produce 160 dBA; rather, they would combine to produce 83 dBA. The cumulative sound level of any number of sources, such as excavators, can be determined using decibel addition.

A-Weighting

The dB scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the sound pressure level in that range. In general, people are most sensitive to the frequency range of 1,000 to 8,000 Hz and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted (i.e., adjusted), depending on human sensitivity to those frequencies. The resulting sound pressure level is expressed in A-weighted decibels or dBA.

The A-weighting scale approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments regarding the relative loudness or annoyance of a sound, their judgments correlate well with the A-weighted sound levels of those sounds. Table 3.9-1 describes typical A-weighted sound levels for various noise sources.

Table 3.9-1. Typical A-Weighted Sound Levels

Common Outdoor Noise Source	Sound Level (dBA)	Common Indoor Noise Source
	— 110 —	Rock band
Jet flying at 1,000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower at 100 feet	— 70 —	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher in next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: California Department of Transportation, 2013a.

Noise Descriptors

Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations is utilized. Most commonly, environmental sounds are described in terms of the average level, or *equivalent sound level* (abbreviated L_{eq}), that describes the average acoustical energy content of noise for an identified period of time. Thus, the L_{eq} of a time-varying noise and that of a steady noise are the same if they deliver the same acoustical energy over the duration of the exposure. A common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration. The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within approximately plus or minus 1 dBA.

Additional commonly used noise metrics are described in Table 3.9-2 below, along with a summary of definitions of technical acoustical terms used in this section. Two of the metrics, Day/Night Noise Level (L_{dn}) and Community Noise Equivalent Level (CNEL), describe 24-hour average noise levels. When measured in typical outdoor environments, CNEL and L_{dn} are normally within 1 dBA of each other.

Table 3.9-2. Definitions of Acoustical Terms

Term	Definition
Decibel (dB)	A unit describing the amplitude of sound equal to 20 times the logarithm to base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 µPa.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in µPa (or micronewtons per square meter), where 1 pascal is the pressure resulting from a force of 1 newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 µPa in air). Sound pressure level is the quantity that is measured directly by a sound level meter.
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sounds are below 20 Hz, and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in decibels as measured on a sound level meter using the A weighting filter network. The A-weighting filter de-emphasizes the very low- and very high-frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Sound Level (L_{eq})	The average A-weighted noise level during the measurement period. The hourly L_{eq} used for this report is denoted as dBA L_{eq}(h).
Community Noise Equivalent Level (CNEL)	The average A-weighted noise level during a 24-hour day, which is obtained by adding 5 dB to sound levels in the evening from 7 p.m. to 10 p.m., and 10 dB to sound levels between 10 p.m. and 7 a.m.
Day/Night Noise Level (L_{dn})	The average A-weighted noise level during a 24-hour day, which is obtained by adding 10 dB to sound levels measured at night between 10 p.m. and 7 a.m.
Percentile-Exceeded Sound Level (L_{XX})	The A-weighted noise level that is exceeded XX% of the time during the measurement period. E.g., L_{25} is the sound level exceeded 25% of the time, and L_{50} is the sound level exceeded 50% of the time.
Maximum Sound Level (L_{max})	The maximum sound level measured during the measurement period.
Minimum Sound Level (L_{min})	The minimum sound level measured during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

Source: ICF International, 2014.

Human Response to Noise

Studies have shown that under controlled conditions in an acoustics laboratory, a healthy human ear is able to discern changes in sound levels of 1 dBA. In the normal environment, the healthy human ear can detect changes of about 2 dBA; however, it is widely accepted that changes of 3 dBA in the normal environment are considered just noticeable to most people. A change of 5 dBA is readily perceptible, and a change of 10 dBA is perceived as being twice as loud. Accordingly, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) resulting in a 3-dB increase in sound would generally be barely detectable.

Sound Propagation

When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise is reduced with distance depends on the following important factors.

- **Geometric Spreading**. Sound from a single source (i.e., a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance. Highway noise is not a single stationary point source of sound. The movement of vehicles on a highway makes the source of the sound appear to emanate from a line (i.e., a "line" source) rather than from a point. This results in cylindrical spreading rather than the spherical spreading resulting from a point source. The change in sound level (i.e., attenuation or decrease) from a line source is 3 dBA per doubling of distance.
- **Ground Absorption**. Usually the noise path between the source and the observer is very close to the ground. The excess noise attenuation from ground absorption occurs due to acoustic energy losses on sound wave reflection. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only; for distances of less than 200 feet, prediction results based on this scheme are sufficiently accurate. For acoustically "hard" sites (i.e., sites with a reflective surface, such as a parking lot or a smooth body of water, between the source and the receptor), no excess ground attenuation is assumed because the sound wave is reflected without energy losses. For acoustically absorptive or "soft" sites (i.e., sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.
- **Atmospheric Effects**. Research by the California Department of Transportation (Caltrans) and others has shown that atmospheric conditions can have a major effect on noise levels. Wind has been shown to be the single most important meteorological factor within approximately 500 feet, whereas vertical air temperature gradients are more important over longer distances. Other factors, such as air temperature, humidity, and turbulence, also have major effects. Receptors downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas receptors upwind can have lower noise levels. Increased sound levels can also occur because of temperature inversion conditions (i.e., increasing temperature with elevation, with cooler air near the surface, where the sound source tends to be and the warmer air above acts as a cap, causing a reflection of ground level–generated sound).
- **Shielding by Natural or Human-Made Features**. A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by this shielding depends on the size of the object, proximity to the noise source and receptor, surface weight, solidity, and the frequency content of the noise source. Natural terrain features (such as hills and dense woods) and human-made features (such as buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receptor with the specific purpose of reducing noise. A barrier that breaks the line of sight between a source and a receptor will typically result in at least 5 dB of noise reduction. A higher barrier may provide as much as 20 dB of noise reduction.

3.9.1.2 Ground-borne Vibration Fundamentals

Ground-borne vibration is an oscillatory motion of the soil with respect to the equilibrium position and can be quantified in terms of *velocity* or *acceleration*. The velocity describes the instantaneous speed of the motion and acceleration is the instantaneous rate of change of the speed. Each of these measures can be further described in terms of *frequency* and *amplitude*. Typical outdoor sources of perceptible ground-borne vibration are heavy construction equipment (such as blasting and pile driving), railroad operations, and heavy trucks on rough roads. If a roadway is smooth, the ground-borne vibration from traffic is rarely perceptible. Ground-borne vibration can be a serious concern for neighbors of nearby sources, causing buildings to shake and rumbling sounds to be heard. Most perceptible indoor vibration is caused by sources within buildings, such as the operation of mechanical equipment, movement of people, or the slamming of doors.

Ground-borne vibration can be described in terms of peak particle velocity (PPV). PPV is defined as the maximum instantaneous positive or negative peak amplitude of the vibration velocity. The unit of measurement for PPV is inches per second (in/s). For transient vibration sources (single isolated vibration events such as blasting), the human response to vibration varies from barely perceptible at a PPV of 0.04 in/s, to distinctly perceptible at a PPV of 0.25 in/s, and severe at a PPV of 2.0 in/s. For continuous or frequent intermittent vibration sources (such as impact pile driving or vibratory compaction equipment), the human response to vibration varies from barely perceptible at a PPV of 0.01 in/s, to distinctly perceptible at a PPV of 0.04 in/s, and severe at a PPV of 0.4 in/s (California Department of Transportation 2013b). If a person is engaged in any type of physical activity, vibration tolerance increases considerably.

3.9.2 Regulatory Setting

3.9.2.1 State Regulations

California requires each local government entity to perform noise studies and implement a noise element as part of its general plan. The purpose of the noise element is to limit the exposure of the community to excessive noise levels; the noise element must be used to guide decisions concerning land use. The state provides guidelines for evaluating the compatibility of various land uses as a function of community noise exposure.

3.9.2.2 Local

City of Los Angeles CEQA Thresholds Guide

The *L.A. CEQA Thresholds Guide* (City of Los Angeles 2006) defines noise-sensitive land uses as residences, transient lodgings, schools, day-care facilities, libraries, churches, hospitals, nursing homes, auditoriums, concert halls, amphitheaters, playgrounds, and parks, and provides noise/land use compatibility guidelines, as summarized in Table 3.9-3.

Table 3.9-3. Land Use Noise Compatibility Guidelines

Land Use	Community Noise Exposure CNEL, dB			
	Normally Acceptable	Conditionally Acceptable	Normally Unacceptable	Clearly Unacceptable
Single-Family, Duplex, Mobile Homes	50–60	55–70	70–75	above 70
Multifamily Homes	50–65	60–70	70–75	above 70
Schools, Libraries, Churches, Hospitals, Nursing Homes	50–70	60–70	70–80	above 80
Transient Lodging – Motels, Hotels	50–65	60–70	70–80	above 80
Auditoriums, Concert Halls, Amphitheaters	—	50–70	—	above 65
Sports Arena, Outdoor Spectator Sports	—	50–75	—	above 70
Playgrounds, Neighborhoods Parks	50–70	—	67–75	above 72
Golf Courses, Riding Stables, Water, Recreation, Cemeteries	50–75	—	70–80	above 80

Normally Acceptable: Specified land use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction and without any special noise insulation requirements.

Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air-conditioning, will normally suffice.

Normally Unacceptable: New construction or development generally should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable: New construction or development generally should not be undertaken.

Source: City of Los Angeles, 2006.

City of Los Angeles Municipal Code

Construction Noise

Section 41.40(a) of the City of Los Angeles Municipal Code prohibits the use, operation, repair, or servicing of construction equipment, as well as job-site delivery of construction materials, between the hours of 9:00 p.m. and 7:00 a.m. where such activities would disturb "persons occupying sleeping quarters in any dwelling hotel or apartment or other place of residence." Construction noise emanating from property zoned for manufacturing or industrial uses is exempted from the Section 41.40(a) standards. In addition, Section 41.40(c) prohibits construction, grading, and related job-site deliveries on or within 500 feet of land developed with residential structures before 8:00 a.m. or after 6:00 p.m. on any Saturday or national holiday or at any time on Sunday.

Section 112.05 of the municipal code places limits on the maximum noise levels (75 dBA at a distance of 50 feet for typical construction equipment) that may be produced by powered equipment or tools in, or within 500 feet of, any residential zone between the hours of 7 a.m. and 10 p.m. The proscribed limits shall not apply where compliance is technically infeasible but the

burden of proving that compliance is technically infeasible is on the person or persons charged with a violation of the standard. Technical infeasibility shall mean that the noise limit cannot be complied with despite the use of mufflers, shields, sound barriers, and/or other noise reduction devices or techniques during the operation of the equipment.

Operational Noise

Chapter XI, Noise Regulation, of the City of Los Angeles Municipal Code regulates noise from non-transportation noise sources such as commercial or industrial operations, mechanical equipment, or residential activities. It is noted that while these regulations do not apply to vehicles operating on public rights-of-way, they do apply to noise generated by vehicles on private property—such as truck operations at commercial or industrial facilities. The exact noise standards vary depending on the type of noise source, but the allowable noise levels are generally determined relative to the existing ambient noise levels at the affected location. Section 111.01(a) defines the ambient noise as "the composite of noise from all sources near and far in a given environment, exclusive of occasional and transient intrusive noise sources and of the particular noise source or sources to be measured. Ambient noise shall be averaged over a period of at least 15 minutes…" Section 111.03 provides minimum ambient noise levels for various land uses, as described in Table 3.9-4, below. In the event that the actual measured ambient level at the subject location is lower than that provided in the table, the level in the table shall be assumed.

Table 3.9-4. City of Los Angeles Assumed Minimum Ambient Noise Levels

	Assumed Minimum Ambient Noise (L_{eq}), dBA	
Zone	Daytime (7 a.m.–10 p.m.)	Nighttime (10 p.m.–7 a.m.)
A1, A2, RA, RE, RS, RD, RW1, RW2, R1, R2, R3, R4, and R5	50	40
P, PB, CR, C1, C1.5, C2, C4, C5, and CM	60	55
M1, MR1, and MR2	60	55
M2 and M3	65	65

Source: City of Los Angeles, 2013.

At the boundary line between two zones, the allowable noise level of the quieter zone shall be used. The allowable noise levels are then adjusted if certain conditions apply to the alleged offensive noise, as follows.

- For steady tone noise with an audible fundamental frequency or overtones (except for noise emanating from any electrical transformer or gas metering and pressure control equipment existing and installed prior to September 8, 1986) – reduce allowable noise level by 5 dBA.
- For repeated impulsive noise – reduce allowable noise level by 5 dBA.
- For noise occurring less than 15 minutes in any period of 60 consecutive minutes between the hours of 7:00 a.m. and 10:00 p.m. – increase allowable noise level by 5 dBA.

The City's noise ordinance is not explicit in defining the length of time over which an average noise level should be assessed. However, based on the noted reference to "60 consecutive minutes," above, it is inferred that the 1-hour L_{eq} metric should be used.

Section 112.02 of Chapter XI addresses noise from air conditioning, refrigeration, heating, pumping, and filtering equipment. It states that such equipment may not generate noise that would exceed the ambient noise level at any adjacent property by more than 5 dBA.

Section 114.02 of Chapter XI addresses noise from motor driven vehicles (it is noted that the code only addresses vehicles on private property and does not address vehicles while operated on public highways). It states that such vehicles may not generate noise that would exceed the ambient noise level at any occupied residential property by more than 5 dBA.

City of Los Angeles Noise Element

The Noise Element of the City's General Plan defines the following land uses to be noise-sensitive: single- and multi-family dwellings, long-term care facilities (including convalescent and retirement facilities), dormitories, motels, hotels, transient lodgings and other residential uses; houses of worship; hospitals; libraries; schools; auditoriums; concert halls; outdoor theaters; nature and wildlife preserves; and parks.

The Noise Element contains the following polices that are relevant to the Proposed Project.

Policy 5 – Continue to enforce, as applicable, City, state and federal regulations intended to abate or eliminate disturbances of the peace and other intrusive noise.

Policy 6 – When processing building permits, continue to require appropriate project design and/or insulation measures, in accordance with the California Noise Insulation Standards (Building Code Title 24, Section 3501 et seq.), or any amendments thereto or subsequent related regulations, so as to assure that interior noise levels will not exceed the minimum ambient noise levels, as set forth in the City's noise ordinance ([Los Angeles Municipal Code] Section 111 et seq., and any other insulation related code standards or requirements) for a particular zone or noise-sensitive use, as defined by the California Noise Insulation Standards.

Policy 11 – For a proposed development project that is deemed to have a potentially significant noise impact on noise-sensitive uses, as defined by this chapter, require mitigation measures, as appropriate, in accordance with California Environmental Quality Act and City procedures.

Policy 12 – When issuing discretionary permits for a proposed noise-sensitive use (as defined by this chapter) or a subdivision of four or more detached single-family units and which use is determined to be potentially significantly impacted by existing or proposed noise sources, require mitigation measures, as appropriate, in accordance with procedures set forth in the California Environmental Quality Act.

3.9.3 Environmental Setting

3.9.3.1 Existing Noise Environment

The primary existing noise sources in the project area are traffic on local streets, occasional aircraft overflights, and general neighborhood activities such as landscaping and home improvements. Noise from the existing Venice Pumping Plant (VPP) is also audible at the closest homes to that facility, which are approximately 50 to 80 feet to the west and south, on Hurricane Street and Canal Court.

The closest noise-sensitive receptors to the Project Site are residences (multi- and single-family) within approximately 15 feet of the Site. To the northwest, the Project Site is bounded by a neighboring residence. To the northeast, the site is bounded by a pedestrian/bike path and the Grand Canal, beyond which are existing homes along the east bank of the canal. To the southeast, the site is bounded by Hurricane Street, beyond which is the existing VPP; farther to the southeast are the Ballona Lagoon and more residences. To the southwest, the Project Site is bounded by Canal Court, beyond which are residences. Figure 2-2 (Chapter 2, Project Description) shows the Project Site and surrounding area.

Noise Monitoring

In order to determine the existing noise environment, measurements were obtained at five locations in the vicinity of the Project Site, as shown in Figure 3.9-1. One long-term (approximately 4 days) noise measurement (LT-1) was obtained at the northwest fence line of the Project Site. Short-term (ST) noise measurements (approximately 15 to 20 minutes) were obtained at four locations in the surrounding community. ST-1 was located approximately 70 feet northeast of the Project Site, across the Grand Canal; ST-2 was located approximately 20 feet southwest of the Project Site, across Canal Street; ST-3 was located approximately 100 feet south of the Project Site, across the intersection of Canal Street and Hurricane Street; and ST-4 was located approximately 400 feet southeast of the Project Site, across the Ballona Lagoon. The summary of the measurement results are provided in Tables 3.9-5 and 3.9-6. The long-term measurement was obtained between approximately 1:00 p.m. on Thursday, August 20, and 12:00 a.m. on Tuesday August 25, 2015. Short-term measurements were gathered on Thursday, August 20, and Tuesday August 25, 2015.

In addition to the noise measurements obtained directly for this noise analysis, ambient noise data were also supplied by the Proposed Project's design engineer (Arcadis 2015); the memo discussing these noise measurements is included in Appendix I. These data were gathered on Thursday, April 23, 2015, at locations very close to four of the measurement locations shown in Figure 3.9-1 and have also been added to Tables 3.9-5 and 3.9-6. The 24-hour CNEL noise levels for the locations monitored ranged from approximately 53 to 57 CNEL; daytime hourly average (one hour L_{eq}) noise levels ranged from approximately 45 to 66 dBA L_{eq} according to the long-term measurements, evening average noise levels ranged from approximately 47 to 52 dBA L_{eq}; and nighttime hourly average noise levels ranged from approximately 40 to 52 dBA L_{eq}. The L_{eq} values recorded during the short-term measurements ranged from approximately 50 to 53 dBA L_{eq} for ST-1, 48 to 50 dBA L_{eq} for ST-2, and 49 to 50 dBA L_{eq} for ST-3. The average noise level for ST-4 was approximately 51 dBA L_{eq}.



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Figure 3.9-1
Noise Monitoring Locations
Venice Auxiliary Pumping Plant Project

Table 3.9-5. Summary of Long-Term Noise Measurements

Location #, Description	Date	CNEL	Time Period	Range of Hourly Average Levels, L_{eq} (1h), dBA (*average*)	Range of Hourly Minimum Levels, L_{min}, dBA	Range of Hourly Maximum Levels, L_{max}, dBA
LT-1, Adjacent to northwest fence line of Project Site, near north corner of site.	Thursday 8/20/15	56.5[a]	Daytime (1 p.m. to 7 p.m.)	50.4–58.7 (*54.3*)	43.8–46.3	65.3–75.3
			Evening (7 p.m. to 10 p.m.)	49.2–52.1 (*50.9*)	43.8–45.0	64.4–75.0
			Nighttime (7 p.m. to 12 a.m.)	49.5–50.8 (*50.2*)	43.8–44.7	62.1–64.3
	Friday 8/21/15	55.8	Daytime (7 a.m. to 7 p.m.)	49.1–65.6 (*56.3*)	41.6–44.8	62.6–81.6
			Evening (7 p.m. to 10 p.m.)	48.0–50.5 (*49.1*)	43.2–44.2	59.7–65.1
			Nighttime (12 a.m. to 7 a.m., and 7 p.m. to 12 a.m.)	40.5–48.4 (*45.6*)	39.0–44.4	50.0–63.9
	Saturday 8/22/15	54.3	Daytime (7 a.m. to 7 p.m.)	46.4–52.7 (*50.7*)	38.9–45.7	61.1–74.6
			Evening (7 p.m. to 10 p.m.)	47.6–49.2 (*48.6*)	44.0–45.0	63.0–63.9
			Nighttime (12 a.m. to 7 a.m., and 7 p.m. to 12 a.m.)	40.5–52.4 (*46.8*)	37.9–42.9	51.8–77.5
	Sunday 8/23/15	52.8	Daytime (7 a.m. to 7 p.m.)	45.4–53.8 (*50.2*)	39.7–45.0	56.1–76.6
			Evening (7 p.m. to 10 p.m.)	46.7–50.0 (*48.4*)	42.9–43.6	56.5–67.6
			Nighttime (12 a.m. to 7 a.m., and 7 p.m. to 12 a.m.)	40.5–46.7 (*44.8*)	38.9–42.4	48.3–65.6
	Monday 8/24/15	53.4	Daytime (7 a.m. to 7 p.m.)	47.8–54.4 (*51.4*)	42.4–45.1	60.0–80.1
			Evening (7 p.m. to 10 p.m.)	46.9–49.0 (*47.8*)	43.0–43.4	60.1–64.2
			Nighttime (12 a.m. to 7 a.m., and 7 p.m. to 12 a.m.)	40.2–47.0 (*45.2*)	38.6–42.1	51.0–61.3
	Thursday 4/23/15[b]	N/A	Daytime (3:57 p.m. to 4:39 p.m.)	48.6	42.7	61.5

Notes:

[a] CNEL estimated by comparing available measured data from 8/20/15 with corresponding data and CNEL for days on which full 24-hour measurements were obtained (i.e., 8/21 through 8/24, 2015)

[b] Supplemental data calculated from raw data included in the Arcadis memo (Arcadis 2015) (see Appendix I of this EIR).

Sources: ICF International, 2015; Arcadis, 2015.

Table 3.9-6. Summary of Short-Term Noise Measurements

Location #, Description (Date, Time)	Estimated CNEL[a]	Measured Noise Levels, dBA			
		Date, Time	L_{eq}	L_{min}	L_{max}
ST-1, northeast of Project Site, across Grand Canal, adjacent to 3815 Via Dolce	57	8/20/15, 2:12 p.m.–2:28 p.m.	51.3	45.7	59.4
		8/25/15, 1:00 p.m.–1:19 p.m.	49.9	43.4	59.0
		4/23/2015, 4:50 p.m.–5:20 p.m.[b]	52.7	45.0	61.7
		Average	51.4	--	--
ST-2, southwest of Project Site, across Canal Court, in front of 129 Hurricane Street	56	8/20/15, 1:24 p.m.–1:44 p.m.	49.8	46.4	60.4
		8/25/15, 2:24 p.m.–2:45 p.m.	50.4	46.8	58.3
		4/23/2015, 4:43 p.m.–5:13 p.m.[b]	47.8	41.8	60.3
		Average	49.5	--	--
ST-3, southwest of Project Site on Hurricane Street, in front of 120 Hurricane Street	56	8/20/15, 1:24 p.m.–1:42 p.m.	49.9	44.8	58.8
		8/25/15, 1:45 p.m.–2:19 p.m.	48.7	42.8	61.1
		4/23/2015, 4:11 p.m.–4:41 p.m.[b]	49.9	44.7	63.4
		Average	49.5	--	--
ST-4, southeast of Project Site, across Ballona Lagoon, on trail adjacent to 107 Roma Court	57	8/20/15, 2:08 p.m.–2:24 p.m.	50.7	46.2	57.8
		Average	50.7	--	--

Notes:

[a] CNEL estimated by comparing available measured data from 8/20/15 with corresponding data and CNEL for days on which full 24-hour measurements were obtained (i.e., 8/21 through 8/24, 2015)

[b] Supplemental data calculated from raw data included in the Arcadis memo (Arcadis 2015) (see Appendix I of this EIR).

Sources: ICF International, 2015; Arcadis, 2015.

3.9.4 Environmental Impact Analysis

This section describes the methodology, evaluation, and impacts for temporary construction and permanent operational noise and vibration. This discussion is intended to assist in the evaluation and conclusions of the impact analysis provided below and in the formation of required mitigation measures.

3.9.4.1 Methodology

Noise Measurements

The long-term noise measurement of existing ambient noise levels was obtained using a Rion NL-21 Type 2 sound level meter. The short-term noise measurements of existing ambient noise levels and VPP equipment noise levels were obtained using Larson Davis 831 and LxT Type 1 sound level meters. The sound level meters were field calibrated for accuracy using a Larson Davis CAL200 acoustical calibrator.

Two measurements were obtained of equipment (pumps and motors) noise levels inside the existing VPP building, which is located southeast of the Project Site. The first measurement was taken in the VPP motor room, close to two motors that were running simultaneously. The microphone was located approximately 8 feet from the center axis of the first motor and 10.5 feet from the center axis of the second motor. At this location, the measured noise level (L_{eq}) was 83.6 dBA; this noise level included both direct noise from each motor and reverberant noise caused by sound reflected within the concrete-walled room.

The second measurement was taken in the VPP pump room, close to two pumps that were running simultaneously. The microphone was located approximately 11 feet from the center axis of the first motor and 12 feet from the center axis of the second motor. At this location the measured noise level (L_{eq}) was 83.8 dBA; this noise level included both direct noise from each pump and reverberant noise caused by sound reflected within the concrete-walled room.

Construction Noise and Vibration

Potential noise and vibration impacts associated with project construction activities were evaluated based on the Proposed Project's construction equipment schedule and phasing information.

Noise

Construction-related traffic noise was analyzed using calculations based on the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) Version 2.5 Look-Up Tables (FHWA 2004). The inputs used in the traffic noise modeling included the estimated maximum daily truck trips specified in the Truck Traffic Analysis Data memo prepared for the project (Arcadis 2016a) and an assumed speed of 25 miles per hour on the local streets closest to the Project Site.

Construction-related noise was analyzed using data and modeling methodologies from FHWA's Roadway Construction Noise Model (RCNM) (FHWA 2006, 2008), which predicts average noise levels at nearby receptors by analyzing the type of equipment, the distance from source to receptor, usage factor, and the presence or absence of intervening shielding between source and receptor. This methodology calculates the composite average noise levels for multiple equipment items

scheduled during each construction phase. The source-to-receptor distances used in the analyses were the acoustical average distances between the relevant construction area and each receptor. The acoustical average distance is used to represent noise sources that are mobile or distributed over an area (such as the Project Site); it is calculated by multiplying the shortest distance between the receiver and the noise source area by the farthest distance and then taking the square root of the product. Noise levels for each phase of construction were analyzed at five receptors in the vicinity of the Project Site. These receptors are illustrated in Figure 3.9-2, and represent the closest noise-sensitive receptors (i.e., homes) in each direction from the Project Site. Table 3.9-7 provides the noise levels of construction equipment expected to be used by the Proposed Project; the noise levels are provided for a reference distance of 50 feet. Consistent with the RCNM methodology, it was assumed that construction noise levels would be reduced at a rate of 6 dB per doubling of distance from the source.

Table 3.9-7. Construction Equipment Noise Levels

Equipment Item	Maximum Noise Level (L_{max}) at 50 feet, dBA [a]	Usage Factor [a, b]	Average Noise Level (L_{eq}) at 50 feet, dBA
Excavator	80.7	0.4	77
Backhoe	77.6	0.4	74
Grader	85	0.4	81
Jack Hammer	88.9	0.2	82
Crane	80.6	0.16	73
Compactor	83.2	0.2	76
Pile Driver	101.3	0.2	94
Air Compressor	77.7	0.4	74
Concrete Trucks	81.4	0.2	74

Notes:

[a] Obtained or estimated from FHWA 2006, 2008 (RCNM).

[b] Usage Factor is the fraction of time the equipment is operating in its noisiest mode while in use. L_{eq} is estimated from L_{max} using the following equation: $L_{eq} = L_{max} + 10 \times \log_{10}$ (Usage Factor)

Source: ICF, 2015

Vibration

Construction-related vibration was analyzed using data and modeling methodologies provided by Caltrans' *Transportation and Construction Vibration Guidance Manual* (California Department of Transportation 2013b). This guidance manual provides typical vibration source levels for various types of construction equipment, as well as methods for estimating the propagation of ground-borne vibration over distance. Because potential vibration impacts are assessed based on peak levels, rather than long-term average levels, the source-to-receptor distances used in the analyses were the estimated range of distances (closest to farthest) between the relevant construction activity and each receptor. Table 3.9-8 provides the PPV levels of worst-case construction equipment expected to be used by the Proposed Project; the levels are provided for a reference distance of 25 feet.



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Figure 3.9-2
Noise Analysis Locations
Venice Auxiliary Pumping Plant Project

Table 3.9-8. Construction Equipment Vibration Levels

Equipment Item	Reference PPV at 25 feet, in/s [a]
Pile driver	0.65
Large bulldozer[b]	0.089

Notes:
[a] Obtained from California Department of Transportation 2013b.
[b] Considered representative of other heavy earthmoving equipment such as excavators, graders, backhoes, etc.
Source: ICF, 2015

The following equations from the guidance manual were used to estimate the change in PPV levels over distance. For pile driving, the equation is:

$$PPV_{rec} = PPV_{ref} \times (25/D)^{n} \times (E_{equip}/E_{ref})^{0.5}$$

where PPV_{rec} is the PPV at a receiver; PPV_{ref} is the reference PPV at 25 feet from the pile driver (0.65 in/s); D is the distance from the pile driver to the receiver, in feet; n is a value related to the vibration attenuation rate through ground (the default recommended value for n is 1.1); E_{ref} is 36,000 foot-pounds (rated energy of reference pile driver); and E_{equip} is the rated energy of the actual impact pile driver in foot-pounds. (For the purposes of the analysis, it is assumed that the pile driver would be very similar to the reference pile driver and there would, therefore, be no adjustment for E_{equip}.)

For heavy earthmoving equipment such as excavators, graders, and backhoes, the equation is:

$$PPV_{rec} = PPV_{ref} \times (25/D)^{n}$$

where PPV_{rec} is the PPV at a receptor; PPV_{ref} is the reference PPV at 25 feet from the equipment (0.089 in/s); D is the distance from the equipment to the receiver, in feet; and n is a value related to the vibration attenuation rate through ground (the default recommended value for n is 1.1).

Operation

Potential noise and vibration impacts associated with project operations were evaluated based primarily on information provided in the project's *Preliminary Design Report* (PDR) (Arcadis 2016b). This information included the general project description, preliminary plans, and preliminary specifications for equipment at VAPP that would generate noise. For some equipment, noise data were provided within the PDR; for other equipment representative or additional noise data were obtained from publicly available manufacturers' specifications or predicted using published algorithms (Barron 2003). It was assumed that noise levels would be reduced at a rate of 6 dB per doubling of distance from the source and the noise levels at sensitive receptors were estimated using standard decibel calculations, including the following.

1. To calculate the change in sound level due to a change in the number of identical equipment items operating:

   $$\Delta = 10 \times \log_{10} (A/B)$$

   where Δ is the change in total noise level in dB; A is the new number of equipment items; and B is the new number of equipment items.

2. To calculate a sound pressure level from a stated sound power level:

   $SPL = SWL + DI - 20 \times \log_{10} (D) - 10.9$ (Barron 2003)

   where SPL is the resulting sound pressure level in dB; SWL is the stated sound power level in dB; DI is the directivity index (with a value of 3 for hemispherical spreading across the ground); and D is the distance from the noise source in feet.

3. To calculate the change in sound pressure level with distance:

   $SPL_{rec} = SPL_{ref} + 20 \times \log_{10} (D_{ref}/D_{rec})$

   where SPL_{rec} is the sound pressure level, in dB, at a receiver; SPL_{ref} is the sound pressure level, in dB, at a reference distance; D_{ref} is the reference distance, in feet, from the noise source; and D_{rec} is the receiver distance, in feet, from the noise source.

Screening Analysis

As noted in Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study] of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in Appendix G of the CEQA Guidelines and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.9.4.2 Thresholds of Significance

Appendix G of the *State CEQA Guidelines* provides six criteria, in the form of checklist questions a through e, that can be used to assess the significance of potential noise and vibration impacts. For some (but not all) of these criteria, the *L.A. CEQA Thresholds Guide* provides additional guidance on how potential impacts should be quantified or assessed. Where specific guidance is provided by the *L.A. CEQA Thresholds Guide*, those thresholds have been used as the basis for assessment of project impacts. For the any remaining criteria, the checklist questions provide the basis of the analysis, with specific thresholds developed, as necessary, from alternate sources as described below.

State CEQA Guidelines, Appendix G

The six checklist questions related to potential noise impacts are listed below, followed by a discussion of how each is addressed in this EIR.

Would the project result in:

NOI-1. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

NOI-2. Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?

NOI-3. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

NOI-4. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

NOI-5. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

NOI-6. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

To address checklist questions NOI-1, NOI-3, and NOI-4, the *L.A. CEQA Thresholds Guide* provides separate criteria for construction noise and operational noise; these criteria are described below and are used in place of checklist questions NOI-1, NOI-3, and NOI-4 to address potential construction and operational noise impacts. Checklist question NOI-2 does not quantify what would constitute excessive ground-borne vibration or ground-borne noise levels, and the *L.A. CEQA Thresholds Guide* does not provide any vibration criteria; therefore, thresholds for this potential impact have been developed based on guidance from Caltrans, as described below. As discussed above, Project implementation would result in no noise impacts related to airports or airstrips, so these issue areas are not included in this analysis and no further discussion of checklist questions NOI-5 or NOI-6 is provided.

City of Los Angeles CEQA Thresholds Guide

Construction Noise

The following threshold of significance for construction noise is based on the *L.A. CEQA Thresholds Guide* (2006).

The project would have a significant construction noise impact if:

NOI-7. Construction activities lasting more than 1 day would exceed existing ambient exterior noise levels by 10 dBA or more at a noise-sensitive use;

NOI-8. Construction activities lasting more than 10 days in a 3-month period would exceed existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use; or

NOI-9. Construction activities would exceed the ambient noise level by 5 dBA at a noise-sensitive use between the hours of 9:00 p.m. and 7:00 a.m. Monday through Friday, before 8:00 a.m. or after 6:00 p.m. on Saturday, or at any time on Sunday.

Proposed CEQA Threshold for Vibration

The *L.A. CEQA Thresholds Guide* (2006) does not include thresholds for vibration impacts. Because project construction would generate ground-borne vibration, the City uses guidance from Caltrans' *Transportation and Construction Vibration Guidance Manual* (California Department of Transportation 2013b) to determine the threshold of impact for vibration. Guidelines are provided for two types of potential impact: (1) damage to structures, and (2) annoyance of people. Guideline criteria for each are provided in Tables 3.9-9 and 3.9-10.

Table 3.9-9. Caltrans Guideline Vibration Damage Criteria

	Maximum PPV (in/s)	
Structure and Condition	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Notes:
Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: California Department of Transportation, 2013b.

Table 3.9-10. Caltrans Guideline Vibration Annoyance Criteria

	Maximum PPV (in/s)	
Human Response	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Notes:
Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
Source: California Department of Transportation, 2013b.

The construction equipment used at the Project Site would fall into the *continuous/frequent intermittent sources* category. Based on these guidelines, the following thresholds will be used to assess potential vibration impacts:

NOI-11. The project would have a significant vibration impact, relative to potential building damage, if NOI-13. PPV vibration levels from construction equipment are 0.3 in/s or greater at any existing residential structure, or 0.5 in/s at the adjacent VPP structure.

NOI-12. The project would have a significant vibration impact, relative to potential annoyance, if NOI-15. PPV vibration levels from construction equipment are 0.04 in/s or greater (distinctly perceptible) at any existing residence.

Operational Noise

The following threshold of impact for operational noise is based on the *L.A. CEQA Thresholds Guide* (2006).

NOI-13. The project would have a significant operational noise impact if it causes:

- The ambient noise level measured at the property line of affected uses to increase by 3 dBA in CNEL to or within the "normally unacceptable" or "clearly unacceptable" categories, or any 5 dBA or greater noise increase (refer to Table 3.9-3, above).

For residences this means a significant impact would occur if the project caused the ambient noise level to increase by 3 dB or more to 70 dB CNEL or greater, or to increase by 5 dB or more to less than 70 dB CNEL.

3.9.4.3 Construction Impacts

The analysis below describes the temporary impacts related to noise and vibration as a result of the Proposed Project during construction.

NOI-1: Would project construction noise exceed any of the construction noise criteria provided by the L.A. CEQA Thresholds Guide (i.e., exceed existing ambient exterior noise levels by 10 dBA or more at a noise-sensitive use for activities lasting more than 1 day; or exceed existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use for construction activities lasting more than 10 days in a 3-month period, or activities occurring between the hours of 9 p.m. and 7 a.m. Monday through Friday, before 8 a.m. or after 6 p.m. on Saturday, or at any time on Sunday?

Two types of short-term noise impacts could occur during construction of the Proposed Project. The first would be related to construction traffic—construction workers who commute to the site and trucks that transport equipment and materials. The second would be on-site construction activities at the Project Site and loading/unloading activities at the three proposed construction laydown areas (see Figure 2-2 in Chapter 2, Project Description).

Construction traffic would incrementally increase noise levels on access roads, including Pacific Avenue, Via Dolce, and Canal Court. Construction workers would be required to park off site and then travel to and from the site by shuttle, which would serve to minimize the number of vehicle trips on local streets to and from the Project Site. No construction worker parking would be allowed along Hurricane Street or on adjacent streets. Although there would be a relatively high single-event noise level, which could cause an intermittent noise nuisance (e.g., passing trucks at 50 feet would generate up to 76 dBA), the contribution of construction traffic to ambient noise levels (such as the daily CNEL) would be low due to the infrequent traffic volume. Based on data provided by the Project Engineer (Fehr & Peers 2016)[1], there could be up to 24 trucks per day to haul soil to or from the site. To provide a conservative analysis, it was assumed that each truck could travel on the same roadway twice during a round trip (for a total of 48 individual trips). The analysis indicates these truck trips would generate a noise level of up to 52 dB CNEL at the homes adjacent to access roads

[1] Fehr & Peers. 2016. *Trip Generation Analysis – Venice Auxiliary Pumping Plant Project.* LA15-2780.00. Los Angeles, CA..

(refer to Appendix I of this EIR for additional details). This is below the range of existing noise levels measured in the surrounding community (53 to 57 dB CNEL). Therefore, construction traffic would not increase ambient noise levels by 3 dB CNEL or more. As a result, short-term impacts associated with construction-related traffic driving to and from the Project Site would be less than significant and no mitigation is required.

Construction of the Proposed Project is anticipated to begin in March 2018 and last approximately 2 years. Day-to-day construction activities would vary throughout the construction process and would cease once construction of the Proposed Project is completed. In accordance with the City of Los Angeles Municipal Code, construction would not take place outside the hours of 7 a.m. to 9 p.m. Monday through Friday, or 8 a.m. to 6 p.m. on Saturdays or national holidays. Typical work hours would be 8 a.m. to 6 p.m., Monday through Saturday. Project construction would be broken down into phases. The phases of construction (see also Chapter 2, Project Description) and anticipated construction equipment for each are summarized in Table 3.9-11.

Table 3.9-11. Construction Phasing and Equipment Items

Construction Phase	Equipment Item(s)
Demolition	Excavator
	Backhoe
	Grader
	Jack Hammer
Site Preparation	Excavator
	Grader
	Crane
Grading	Backhoe
	Grader
Building Construction	Crane
	Compactor
	Pile Driver
	Air Compressor
Paving	Grader
	Excavator
	Concrete Trucks (2)

Source: Arcadis, 2015.

Based on this information, average hourly noise levels (i.e., 1-hour L_{eq}) were estimated for each phase of construction at each of the five receptors considered in the analysis (refer to Figure 3.9-2). For the building construction phase, noise levels were estimated both with and without pile driving. This is because pile driving would generally dominate the construction noise levels when it occurs, but would not occur throughout the entire phase. As such, noise levels and the associated potential impacts would be noticeably different with and without pile driving, and it is informative to examine both cases. Detailed calculations are provided in Appendix I of this EIR. The results of the analyses are summarized in Table 3.9-12, below, and show that noise levels could be up to 98 dBA L_{eq} at the nearest sensitive receptor during construction activities that involve pile driving, and up to 89 dBA L_{eq} at the nearest sensitive receptor during construction activities that do not involve pile driving. The table also indicates the average weekday daytime ambient noise levels at each receptor based

on the noise measurements summarized in Tables 3.9-5 and 3.9-6. Note that ambient noise levels range from 50 to 54 dBA L_{eq}. Because construction would last for more than 10 days in a 3-month period, a significant impact would occur if construction noise levels were to exceed the existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use.

Table 3.9-12. Estimated Construction Noise Levels

	1-Hour L_{eq} at Closest Sensitive Receptors, dBA				
Phase	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5
Construction Noise Levels					
Demolition	78	89	85	77	61
Site Preparation	75	86	82	75	58
Grading	74	85	81	73	57
Building Construction (with pile driving)	93	98	96	86	75
Building Construction (no pile driving)	71	82	78	71	55
Paving	76	87	83	75	59
Ambient Noise Levels					
Average ambient noise level (weekday, daytime)	51	54	50	50	51
Construction Noise Increase Over Ambient					
Demolition	27	35	35	27	10
Site Preparation	24	32	32	25	7
Grading	23	31	31	23	6
Building Construction (with pile driving)	42	44	46	36	24
Building Construction (no pile driving)	20	28	28	21	4
Paving	25	33	33	25	8
Significant Impact (Exceeds Ambient by 5 dBA or more)?					
Demolition	Yes	Yes	Yes	Yes	Yes
Site Preparation	Yes	Yes	Yes	Yes	Yes
Grading	Yes	Yes	Yes	Yes	Yes
Building Construction (with pile driving)	Yes	Yes	Yes	Yes	Yes
Building Construction (no pile driving)	Yes	Yes	Yes	Yes	No
Paving	Yes	Yes	Yes	Yes	Yes

Source: ICF, 2015.

Referring to Table 3.9-12, this condition would occur under all the analyzed scenarios for all receptors except for building construction (no pile driving) noise levels at Receptor 5. As shown in this table, construction noise increases over ambient noise levels range from 4 to 46 dB. While implementation of **Mitigation Measure (MM) NOI-1**, requires a construction noise control plan and includes a list of measures that would reduce construction noise, (see Section 3.9.5) impacts would not be completely eliminated. Even with implementation of the measures listed in **MM NOI-1**,

construction activities are anticipated to result in noise levels that increase the ambient noise levels by more than 5 dB and; therefore, **construction noise impacts would remain significant and unavoidable**.

Intermittent construction-related noise would also be generated by activities at nearby storage/laydown areas outside the Project Site at vacant lots adjacent to the Grand Canal (off Via Dolce, Laydown Area 2), Ballona Lagoon (128 Hurricane Street, Laydown Area 1), and in Culver City (9940 Jefferson Boulevard, Laydown Area 3). While these activities would likely be audible at neighboring noise-sensitive receptors and may cause annoyance, they would only occur sporadically and for a limited duration. **MM NOI-1**, which requires a construction noise control plan and includes a list of measures that would help reduce construction-generated noise, (see Section 3.9.5) would help to minimize noise levels from the storage/laydown areas at noise-sensitive receptors. As no noise sensitive land uses are located in close proximity to Laydown Area 3, noise impacts from the activities would be less than significant. Noise impacts at Laydown Areas 1 and 2 would be **reduced with implementation of MM NOI-1; however, overall construction activities would still result in a significant and unavoidable impact**.

NOI-2 and NOI-3: Would project construction result in groundborne vibration levels that are distinctly perceptible at a receiving residential use, or could potentially result in building damage?

Referring to the equipment schedule provided above in Table 3.9-11, various pieces of heavy equipment such as graders and excavators would be used at the Project Site, as well as pile driving equipment. Vibration levels (PPV, in/s) were estimated for each phase of construction at each of the five receptors considered in the analysis (refer to Figure 3.9-2), as well as the existing VPP structure, using the methodology described in Section 3.9.4.1. For the building construction phase, vibration levels were estimated both with and without pile driving because pile driving would generally dominate the vibration levels when it occurs, but would not occur throughout the entire phase (it is estimated that a total of up to 30 days of project construction would include pile driving). As such, vibration levels and the associated potential impacts would be noticeably different with and without pile driving, and it is informative to examine both cases. In accordance with the City of Los Angeles Municipal Code, construction activities, including pile driving, would not take place outside the hours of 7 a.m. to 9 p.m. Monday through Friday, or 8 a.m. to 6 p.m. on Saturdays or national holidays. Typical work hours would be 8 a.m. to 6 p.m., Monday through Friday. **MM NOI-1** restricts pile driving, excavation, and jackhammer activities to 9 am to 3:30 pm, Monday through Saturday.

Detailed vibration calculations are provided in Appendix I of this EIR. The results of the analyses are summarized in Table 3.9-13, below as a range of vibration levels based on the estimated range of distances from each receiver that would occur as construction activity shifts around the Project Site and impacts are assessed relative to the highest PPV. Modeling results generally show that vibration levels from building construction with pile driving would exceed the annoyance threshold (distinctly perceptible vibration of 0.04 in/s for the continuous/frequent intermittent sources) for vibration at receptors 1, 2, 3, and 4. Vibration levels from demolition, site preparation, grading, building construction without pile driving, and paving would exceed the annoyance thresholds at receptors 2 and 3. Vibration levels from building construction with pile driving would exceed the potential damage thresholds (0.3 in/s at homes and 0.5 in/s at VPP) at receptors 1, 2, and 3, and at the existing VPP structure; however, no other construction activities would result in exceedance of the potential damage threshold.

Table 3.9-13. Estimated Construction Vibration Levels

	Range of PPV at Closest Sensitive Receptors, in/s					
Phase	Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	VPP Structure
Demolition	0.010–0.022	0.022–0.244	0.016–0.089	0.009–0.023	0.003–0.004	0.017–0.073
Site Preparation	0.010–0.022	0.022–0.244	0.016–0.089	0.009–0.023	0.003–0.004	0.017–0.073
Grading	0.010–0.022	0.022–0.244	0.016–0.089	0.009–0.023	0.003–0.004	0.017–0.073
Building Construction (with pile driving)	0.076–0.303	0.159–1.781	0.091–0.532	0.082–0.141	0.024–0.029	0.127–0.532
Building Construction (no pile driving)	0.010–0.022	0.022–0.244	0.016–0.089	0.008–0.020	0.003–0.004	0.017–0.073
Paving	0.010–0.022	0.022–0.244	0.016–0.089	0.009–0.023	0.003–0.004	0.017–0.073
Significant Impact Relative to Potential Annoyance Threshold (0.04 in/s at homes)?						
Demolition	No	Yes	Yes	No	No	N/A
Site Preparation	No	Yes	Yes	No	No	N/A
Grading	No	Yes	Yes	No	No	N/A
Building Construction (with pile driving)	Yes	Yes	Yes	Yes	No	N/A
Building Construction (no pile driving)	No	Yes	Yes	No	No	N/A
Paving	No	Yes	Yes	No	No	N/A
Significant Impact Relative to Potential Damage Threshold (0.3 in/s at homes, 0.5 in/s at VPP)?						
Demolition	No	No	No	No	No	No
Site Preparation	No	No	No	No	No	No
Grading	No	No	No	No	No	No
Building Construction (with pile driving)	Yes	Yes	Yes	No	No	Yes
Building Construction (no pile driving)	No	No	No	No	No	No
Paving	No	No	No	No	No	No
Demolition	No	No	No	No	No	No

Source: ICF, 2015

Referring to the table, groundborne vibration from construction, including both pile driving and other construction activities, would exceed the thresholds developed for potential annoyance at nearby homes; ground-borne vibration from pile driving activities would exceed the thresholds developed for potential vibration damage at nearby structures. **MM NOI-2**, which requires the implementation of strategies to reduce construction-related vibration effects (the use of alternative pile driving methods, pre-construction surveys of adjacent structures, and possible monitoring during construction), would reduce construction vibration effects related to both of the thresholds. Impacts related to the threshold associated with potential building damage would be reduced to **less than significant with implementation of MM NOI-2**. Impacts related to the threshold associated with annoyance from distinctly perceptible vibration cannot be completely eliminated and vibration levels would remain distinctly perceptible at

residential buildings within approximately 52 feet of heavy construction equipment even after implementation of **MM NOI-1** and **MM NOI-2**; therefore, **this impact would remain significant and unavoidable.**

3.9.4.4 Operational Impacts

The analysis below describes the anticipated permanent impacts related to noise and vibration as a result of the Proposed Project during operation.

NOI-3 and NOI-4: Would project operational noise exceed the operational noise criteria provided by the L.A. CEQA Thresholds Guide (i.e., cause the ambient noise level measured at the property line of affected uses to increase by 3 dB CNEL to or within the "normally unacceptable" or "clearly unacceptable" categories, or any 5 dBA or greater noise increase)?

Once completed, VAPP would contain a number of equipment items and systems that would generate noise during operation. The primary noise sources would include the following:

- **Three submersible pumps, with associated electrical motors and variable frequency drives**. Each pump would have a design capacity of 18 million gallons per day and each pump, motor, and variable frequency drive would have a nominal power rating of 500 horsepower (HP). These pumps would be below ground and installed in a subterranean vault with sealed access hatches.
- **Heating, ventilation, and air conditioning (HVAC) equipment**. A 20-ton year-round cooling and ventilation unit is proposed for the first floor of the electrical building. A 5-ton heat pump is proposed for the second floor of the electrical building. The office and the mechanical room would each have a 40-cubic-feet-per-minute ventilation fan, and the bathroom would be provided with a 140-cubic-feet-per-minute exhaust fan. The cooling and ventilation unit and the heat pump would be outside the building; the exhaust fans would be inside the building or on the rooftop.
- **An emergency generator**. A 24-kilowatt (kW) diesel generator inside the electrical building would provide backup power to VAPP critical loads in the event of loss of power from the Los Angeles Department of Water and Power. The generator would provide 24 kW of power at 120/240 volts (V) for lighting and other support systems such as security and access control, and air conditioning. (This generator would not be of sufficient size to power the pumps within VAPP; standby power for pumps at VAPP would be provided by the existing 750-kW to 1,500-kW diesel generators at VPP.)
- **Two new 34.5 kV – 480 V pad-mounted type transformers** installed on existing exterior ground floor pads and connected to Los Angeles Department of Water and Power electrical power lines.

Potential noise levels generated by each of these sources are discussed below.

Pumps

In order to estimate noise levels from the proposed pumps, noise measurements were obtained at the existing VPP. The pumps and motors operating during these measurements were slightly smaller than the proposed VAPP equipment (400 HP versus 500 HP) but had the same nominal design capacity of 18 million gallons per day. Therefore, the noise levels are expected to be similar.

As noted previously (see Section 3.9.4.1, *Methodology*), noise measurements at the existing VPP indicate interior noise levels of 83.6 dBA for two motors running simultaneously and 83.8 dBA for two pumps running simultaneously. The average distance to the noise sources during the measurements was approximately 10 feet. At VAPP, up to three pumps and motors are expected to run simultaneously under worst-case conditions (only during extreme wet-weather conditions or in the event that service or maintenance of pumps at the VPP is required). In this condition, an overall noise level increase of 1.8 dB relative to two pumps and motors running would result. Furthermore, the pumps and motors at VAPP would be located in the same subterranean vault, resulting in a total estimated noise level of approximately 89 dBA L_{eq} within the vault. If the equipment were to run for 24 hours, this would equate to approximately 95 dB CNEL. In order to avoid increasing ambient noise levels by more than 5 dB CNEL, the noise levels would have to be reduced to less than 56 dB CNEL (based on the measured ambient CNEL of 53 dB). Adjusting for the distance from the pumps and motors to the closest noise-sensitive receptor (the residence approximately 32 feet to the northwest) the noise level would be reduced by approximately 10 dB[2] to 85 dB CNEL. The pumps and motors would also be enclosed within a concrete vault, which can reasonably be assumed to reduce noise levels by at least 20 dB (Caltrans 2013) resulting in a noise level of 65 dB CNEL. This would increase ambient noise levels by more than 5 dB CNEL, which would be a significant impact. **MM NOI-3**, which requires final design of the Project to limit noise increases and ensure that all mechanical and electrical equipment noise levels comply with the City of Los Angeles Municipal Code, would reduce noise impacts to **less-than-significant with incorporation of mitigation measures**.

HVAC Equipment

Noise levels for the proposed 20-ton cooling and ventilation unit were obtained from manufacturer's data for the unit specified in the PDR (Arcadis 2016b; Mitsubishi Electric Corporation 2014). The data indicate an overall noise level of 63 dBA at a distance of 1 meter (3.3 feet) from the side of the unit; based on the published dimensions of the unit, this equates to an acoustical average distance of approximately 5.2 feet. Published data for a 5-ton heat pump (Ingersoll-Rand 2015) indicate a sound power level of up to 75 dBA. Normalizing these source data to a reference distance of 50 feet gives reference noise levels of 43.3 dBA[3] and 43.4 dBA,[4] respectively, for the two units. Based on preliminary design plans, the HVAC units would be located on an exterior ground-floor pad adjacent to the northwest facade of the electrical building. The anticipated noise levels from the mechanical room and bathroom ventilation fans would be minimal in the surrounding community due to the relatively small size of the fans and because they would typically vent through the roof of the electrical building, where they would be shielded from neighboring properties. Based on the described assumptions and data, Table 3.9-14 summarizes the estimated noise levels at each of the five sensitive receptors considered in the analysis (refer to Figure 3.9-2). The table also indicates the combined HVAC noise level, the estimated CNEL that would occur if the equipment was to run continuously for 24 hours, a comparison to existing ambient noise levels, and the assessment of impact. The analysis indicates that HVAC noise levels would range from approximately 34 to 66 dB CNEL at the closest sensitive receptors, and would increase the overall CNEL by between 0 and 13 dB.

[2] $20 \times \log_{10} (10/32) = 10.1$

[3] $63 \text{ dBA} + 20 \times \log_{10} (5.2/50) = 43.3 \text{ dBA}$

[4] $75 \text{ dBA} + 3 - 20 \times \log_{10} (50*0.3048) - 0.6 = 43.4 \text{ dBA}$

Table 3.9-14. Estimated HVAC Noise Levels

Equipment Item/ Noise Source	Reference L_{eq} @ 50'	Noise Level at Closest Sensitive Receptors, dBA (distance, feet)				
		Receptor 1 (140 feet)	Receptor 2 (12 feet)	Receptor 3 (50 feet)	Receptor 4 (150 feet)	Receptor 5 (480 feet)
20-ton cooling and ventilation unit	43.3 dBA	34.4 dBA L_{eq}	55.7 dBA L_{eq}	43.3 dBA L_{eq}	33.8 dBA L_{eq}	23.7 dBA L_{eq}
5-ton heat pump	43.4 dBA	34.5 dBA L_{eq}	55.8 dBA L_{eq}	43.4 dBA L_{eq}	33.9 dBA L_{eq}	23.8 dBA L_{eq}
Combined HVAC noise level, dBA L_{eq}	46.4 dBA	37.5 dBA L_{eq}	58.8 dBA L_{eq}	46.6 dBA L_{eq}	36.9 dBA L_{eq}	26.8 dBA L_{eq}
Combined HVAC CNEL, dB[a]	N/A	44.2 dB CNEL	65.5 dB CNEL	53.1 dB CNEL	43.6 dB CNEL	33.5 dB CNEL
Existing Ambient CNEL	N/A	57 dB CNEL	52.8–56.5 dB CNEL	56 dB CNEL	56 dB CNEL	57 dB CNEL
Total CNEL (HVAC + Ambient)	N/A	57.2 dB CNEL	65.7–66.0 dB CNEL	57.8 dB CNEL	56.2 dB CNEL	57.0 dB CNEL
Increase over ambient CNEL	N/A	0.2 dB	9.5–12.9 dB	1.8 dB	0.2 dB	0 dB
Significant impact	N/A	No	Yes	No	No	No

Notes:
[a] Assumes equipment runs 24 hours per day
Source: ICF International, 2016.

Referring to the results of the analysis, HVAC noise is anticipated to increase ambient noise levels at Receptor 2 by more than 5 dB CNEL, which would be a potentially significant impact. However, with implementation of MM NOI-3, which requires final design of the Project to limit noise increases and ensure that all mechanical and electrical equipment noise levels comply with the City of Los Angeles Municipal Code, this significant impact would be reduced to a **less-than-significant level with incorporated mitigation measures**.

Emergency Generator

The new 24-kW standby generator, used to provide critical backup power in the event of loss of power from LADWP, would be housed inside of the proposed electrical building. Based on preliminary design plans in the PDR (Arcadis 2016b), the generator room would be on the first floor, at the southeast corner of the building. Noise levels for the generator were obtained from manufacturer's data for the unit specified in the PDR (Kohler Power Systems 2014). The manufacturer's data indicate an overall noise level of 66 dBA at a distance of 23 feet from the unit when installed with the manufacturer's sound-attenuating housing; this reference noise level was utilized to calculate estimated noise levels at the nearest noise-sensitive receptors. Table 3.9-15 summarizes the estimated noise levels at each of the five sensitive receptors considered in the analysis; these values do not account for the sound-attenuating benefits of enclosing the generator inside the building, which is a conservative approach. The table also indicates the estimated CNEL that would occur if the generator was to run continuously for 24 hours, a comparison to existing ambient noise levels, and the assessment of impact. The analysis indicates that generator noise

levels would range from approximately 47 to 65 dB CNEL at the closest sensitive receptors, and would increase the overall CNEL by between 0 and 11 dB.

Table 3.9-15. Estimated Standby Generator Noise Levels

Equipment Item/ Noise Source	Reference L_{eq} @ 23'	Noise Level at Closest Sensitive Receptors, dBA (distance, feet)				
		Receptor 1 (145 feet)	Receptor 2 (65 feet)	Receptor 3 (55 feet)	Receptor 4 (125 feet)	Receptor 5 (440 feet)
24-kW standby generator	66 dBA	50.0 dBA L_{eq}	57.0 dBA L_{eq}	58.4 dBA L_{eq}	51.3 dBA L_{eq}	40.4 dBA L_{eq}
Generator CNEL, dB[a]	N/A	56.7 dB CNEL	63.7 dB CNEL	65.1 dB CNEL	58.0 dB CNEL	47.1 dB CNEL
Existing Ambient CNEL	N/A	57 dB CNEL	52.8–56.5 dB CNEL	56 dB CNEL	56 dB CNEL	57 dB CNEL
Total CNEL (HVAC + Ambient)	N/A	59.9 dB CNEL	64.0–64.4 dB CNEL	65.6 dB CNEL	60.1 dB CNEL	57.4 dB CNEL
Increase over ambient CNEL	N/A	2.9 dB	7.9–11.2 dB	9.6 dB	4.1 dB	0.4 dB
Significant impact	N/A	No	Yes	Yes	No	No

Notes:
[a] Assumes equipment runs 24 hours per day
Source: ICF International, 2016.

Based on the results of the analysis, there is the potential for significant noise impacts (increases in ambient noise levels of 5 dB CNEL or more) associated with operation of the emergency generator. This significant impact could extend up to approximately 105 feet from the emergency generator. The electrical building would be required to provide approximately 8 dB of noise attenuation to eliminate impacts on nearby sensitive receptors (i.e., to reduce the resulting noise increases to less than 5 dB CNEL). **MM NOI-3**, which requires final design of the Project to limit noise increases and ensure that all mechanical and electrical equipment noise levels comply with the City of Los Angeles Municipal Code, would reduce noise impacts to **less-than-significant with incorporation of mitigation measures**.

Electrical Transformers

Noise levels for the proposed new electrical transformers were estimated assuming they would have a similar power rating to the existing VPP transformers, which are rated at 1,500 thousand volt-amps (kVA). Using published prediction algorithms (Barron 2003), the sound power level of each transformer was estimated to be 76 dBA. Normalizing this source level to a reference distance of 50 feet gives a reference noise level of 41.4 dBA[5] for each transformer. Based on preliminary design plans, the transformers would be located on exterior ground-floor pads between the southwest facade of the electrical building and the southwest project property line. Based on the described assumptions and data, Table 3.9-16 summarizes the estimated noise levels at each of the five sensitive receptors considered in the analysis (refer to Figure 3.9-2) due to the operation of the two transformers. The table also indicates the estimated CNEL that would occur if the transformers were to run continuously for 24 hours, a comparison to existing ambient noise levels, and the assessment

[5] 76 dBA - 20 × $\log_{10}$ (50) – 0.6 = 41.4 dBA

of impact. The analysis indicates that transformer noise levels would range from approximately 25 to 49 dB CNEL at the closest sensitive receptors, and would increase the overall CNEL by between 0 and 4 dB. Referring to the results of the analysis, transformer noise is not anticipated to increase

Table 3.9-16. Estimated Transformer Noise Levels

Equipment Item/Noise Source	Reference L_{eq} @ 50'	Noise Level at Closest Sensitive Receptors, dBA (distance, feet from each transformer)				
		Receptor 1 (165', 165')	Receptor 2 (27', 56')	Receptor 3 (28', 28')	Receptor 4 (110', 130')	Receptor 5 (440', 475')
1,500 kVA transformer	41.4 dBA	31.0 dBA L_{eq}	46.8 dBA L_{eq}	46.4 dBA L_{eq}	34.6 dBA L_{eq}	22.5 dBA L_{eq}
1,500 kVA transformer	41.4 dBA	31.0 dBA L_{eq}	40.4 dBA L_{eq}	46.4 dBA L_{eq}	33.1 dBA L_{eq}	21.8 dBA L_{eq}
Combined Transformer noise level, dBA L_{eq}	N/A	34.0 dBA L_{eq}	47.7 dBA L_{eq}	49.4 dBA L_{eq}	36.9 dBA L_{eq}	25.2 dBA L_{eq}
Combined HVAC CNEL, dB[a]	N/A	40.7 dB CNEL	54.4 dB CNEL	56.1 dB CNEL	43.6 dB CNEL	31.9 dB CNEL
Existing Ambient CNEL	N/A	57 dB CNEL	52.8–56.5 dB CNEL	56 dB CNEL	56 dB CNEL	57 dB CNEL
Total CNEL (HVAC + Ambient)	N/A	57.1 dB CNEL	56.7–58.6 dB CNEL	59.1 dB CNEL	56.2 dB CNEL	57.0 dB CNEL
Increase over ambient CNEL	N/A	0.1 dB	2.1–3.9 dB	3.1 dB	0.2 dB	0 dB
Significant impact	N/A	No	No	No	No	No

Notes:
[a] Assumes equipment runs 24 hours per day
Source: ICF International, 2016.

ambient noise levels at any sensitive receptor by 5 dB CNEL or more. However, transformer noise would contribute to the overall operational noise levels for the facility, which are identified elsewhere in this section as being potentially significant. **MM NOI-3**, which requires final design of the project to limit noise increases and ensure that all mechanical and electrical equipment noise levels comply with the City of Los Angeles Municipal Code, would reduce operational noise impacts to **less-than-significant with incorporation of mitigation measures**.

In addition to the various noise sources discussed above, some noise would be generated by the parking for the Proposed Project that would be provided on the 128 Hurricane Street lot. While sporadic noise would be audible at neighboring properties, the overall level and nature of the noise would be similar to that of the street parking activity that currently occurs in the neighborhood, Therefore, future operation of 128 Hurricane Street as a parking lot would not lead to a noticeable increase in ambient noise levels in the project vicinity and the impact would be **less than significant.**

Operational Vibration

The Proposed Project is not anticipated to produce significant levels of groundborne vibration once operational. While the project would include rotating machinery (i.e., pumps and motors), it is anticipated that this equipment would be well-maintained and balanced as part of the general long-term maintenance of the facility, which would prevent excessive vibration. In addition, it is assumed that the equipment would be installed according to the manufacturers' requirements, including any recommended resilient mounts. Furthermore, the largest of the equipment items would be installed below ground and the mass of the structure (a concrete vault/building) would be large relative to the mass of the rotating machinery, which would limit the ability of such machinery to induce significant levels of vibration in the structure of the VAPP. Therefore, **no impact** is anticipated.

3.9.5 Mitigation Measures

The following mitigation measures were developed to avoid or minimize the Proposed Project's potential impacts related to noise and vibration.

MM-NOI-1: Prepare and Implement a Construction Noise Control Plan to Reduce Construction Noise at Noise-Sensitive Land Uses. To reduce the significant construction noise impacts, the Los Angeles Bureau of Engineering (LABOE) and Contractor shall develop a noise control plan that includes the implementation of the following noise reduction measures during construction:

a) Construction activities shall occur only between 8:00 a.m. to 6:00 p.m. Monday through Saturdays. No construction activity shall occur on national holidays or at any time on Sundays. The use of the pile driver, grader and jackhammer construction equipment shall be limited to the hours of 9 a.m. to 3:30 p.m. Haul trucks can only access the site through local neighborhood streets from 9 a.m. to 4 p.m. Construction personnel shall not be permitted on the Project Site (including laydown and storage areas), and material or equipment deliveries and collections shall not occur outside of these hours. In addition, no construction worker parking would be allowed along Hurricane Street or on adjacent streets. Construction workers shall park offsite and arrive by shuttle to the construction site, as arranged by the construction contractor.

b) All piles, including sheeting, shall be installed and extracted using vibration- and percussive-free methods.

c) Noise coordinator - LABOE and/or its Contractor shall maintain good communication with the surrounding community regarding the schedule, duration, and progress of the construction. Residents at properties within 500 feet of construction activities shall be notified 72 hours in advance of the planned activities prior to the start of work. The notification shall advise that there will be loud noise associated with the construction, and shall state the date, time, and expected duration of the planned activities. The notification shall provide a telephone contact number for affected parties to ask questions or share any concerns. A noise coordinator for the project will be required to maintain a call log, so that the City can track resolution and nature of any noise complaints. This call log containing the name and address (if available) of the complainant, including time and reason for call shall be provided to the Public Works Department (Public Affairs Office, LA Sanitation, LABOE) upon request. Further, residents shall be informed of the noise coordinator and on-site

construction supervisor contact information by posting of the phone number on the construction site.

d) To the extent practicable, temporary noise barriers with a minimum height of 20 feet shall be employed around the Project Site. Openings in the barriers shall be kept to the minimum necessary for access of vehicles, equipment, and construction material. These barriers shall be constructed as follows.

   - From commercially available acoustical panels lined with sound-absorbing material (the sound-absorptive faces of the panels shall face the construction equipment); or,
   - From acoustical blankets hung over or from a supporting frame. The blankets shall provide a minimum sound transmission class rating of 28 and a minimum noise-reduction coefficient of 0.80 and shall be firmly secured to the framework with the sound-absorptive side of the blankets oriented toward the construction equipment. The blankets shall be overlapped by at least 6 inches at seams and taped so that no gaps exist. The largest blankets available shall be used in order to minimize the number of seams. The blankets shall be draped to the ground to eliminate any gaps at the base of the barrier.

e) For noise-generating equipment that cannot be shielded by site perimeter barriers, localized noise barriers or enclosures shall be employed wherever feasible. The height and location of these barriers/enclosures shall be designed to block the line of sight between the equipment and the surrounding homes.

f) LABOE/Contractor shall retain the services of an acoustical/noise consultant to prepare a Noise Monitoring Plan.

   - This shall be a site-specific plan for monitoring and reporting construction noise levels in the community to evaluate the Contractor's performance.
   - Based on the details of the Contractor's specific construction schedule, the plan shall develop construction noise goals, in terms of the 1-hour Leq, that should be achieved for each phase of construction with the inclusion of feasible and practicable noise abatement measures.
   - If noise monitoring indicates the applicable noise goals have been exceeded, steps shall be taken to promptly implement any additional effective abatement measures that are feasible and/or practicable.

g) To the fullest extent practicable, the quietest available type of construction equipment shall be used. Newer equipment is generally quieter than older equipment. The use of electric-powered equipment is typically quieter than diesel- or gasoline-powered equipment, and hydraulic-powered equipment is typically quieter than pneumatic-powered equipment.

h) All construction equipment used on the Proposed Project that is regulated for noise output by a local, state, or federal agency shall comply with such regulation while in the course of project activity and use on site.

i) All construction equipment shall be properly maintained. (Poor maintenance of equipment may cause excessive noise levels.)

j) All construction equipment shall be equipped with properly operating and maintained mufflers, air-inlet silencers where appropriate, and any other shrouds, shields, or other noise-reducing features that meet or exceed original factory specifications.

k) All construction equipment shall be operated only when necessary, and shall be switched off when not in use. Idling inactive construction equipment for prolonged periods (i.e., more than 2 minutes) shall not be permitted.

l) The use of noise-producing signals, including horns, whistles, alarms, and bells, shall be for safety warning purposes only.

m) No project-related public address or music system shall be audible at any adjacent residential receptor.

n) Construction employees shall be trained in the proper operation and use of the equipment. (Careless or improper operation or inappropriate use of equipment can increase noise levels. Poor loading, unloading, excavation, and hauling techniques are examples of how a lack of adequate guidance and training may lead to increased noise levels.)

o) Stationary noise sources such as generators and compressors shall be positioned as far as possible from noise sensitive areas.

p) Construction equipment shall be stored on the Project Site or designated laydown areas while in use, to the extent feasible. This will eliminate noise associated with repeated transportation of the equipment to and from the site.

q) To the extent possible, haul roads shall not be designated through noise-sensitive areas.

MM-NOI-2: Implement ground-borne vibration control measures to reduce construction-generated vibration. To reduce the significant construction vibration impacts, LABOE/Contractor shall implement the following vibration reduction measures during project construction:

a) All piles, including sheeting, shall be installed and extracted using vibration- and percussive-free methods.

b) LABOE and/or Contractor shall retain a qualified structural or geotechnical engineer to conduct pre-construction surveys of adjacent neighboring structures (including photographing and/or videotaping) to document existing building conditions for future comparison if any vibration-related damage is suspected or results from construction-related activities.

c) If considered appropriate by the structural/geotechnical engineer, monitoring shall be conducted during construction to check for vibration-related damage from equipment during its use. Such monitoring may include vibration measurements obtained inside or outside of the buildings, or other tests and observations deemed necessary.

MM-NOI-3: Design project facilities to reduce noise from all mechanical and electrical equipment to levels that comply with applicable regulations. To reduce the significant operational noise impacts to less than significant, noise control features shall be included during the final architectural and engineering design phase of the project, to reduce overall operational noise levels from all project-related sources to within 5 dB CNEL of existing ambient noise levels in the surrounding community (53 to 57 dB CNEL, as described in Table 3.9-6), and to comply with Chapter XI of the City of Los Angeles Municipal Code (i.e., restrict noise level increases, relative to

the existing 1-hour L_{eq}, to 5 dBA or less). The City shall retain an acoustical/noise consultant to evaluate the design and provide recommendations for specific noise-control features, as necessary, feasible, and practicable, based on the final equipment selections and specifications for the project. Such noise control features may include, but are not limited to, the following.

a) Selecting equipment with lower sound power levels.

b) Adjusting the location of equipment items within the Project Site to increase the distance from the closest sensitive receptors and/or increase acoustical shielding provided by intervening structures, where practicable and feasible.

c) Shielding noise-generating equipment with screens, acoustical panels, enclosures, or block walls.

d) Using sound-rated doors, windows, and access hatches at the electrical building and subterranean vault.

e) Adding sound-absorptive materials to interior spaces to reduce buildup of reverberant noise levels.

f) Designing ventilation systems with acoustical louvers, intake and exhaust silencers, and other features to control exterior noise propagation from interior sources.

3.9.6 Significant Unavoidable Adverse Impacts

While MM NOI-1 would reduce construction noise levels to the extent feasible, it would not eliminate the predicted noise impacts entirely; therefore, construction noise impacts are considered significant and unavoidable.

While MM NOI-2 would substantially reduce construction vibration levels and mitigate the potential impacts related to building damage, it would not eliminate all the predicted impacts related to annoyance at nearby residences; therefore, construction vibration impacts are considered significant and unavoidable.

It is noted that all significant and unavoidable impacts related to project construction would be temporary and would cease once project construction is complete.

All operational noise impacts would be less than significant after implementation of MM NOI-3.

3.9.7 Cumulative Impacts

As identified in Chapter 1, Introduction, a number of related projects are proposed in relatively close proximity to the Project Site (within 0 to 0.5 miles). The following sections discuss the cumulative impacts that could occur if construction or operation of these related projects occurs simultaneously with the Proposed Project.

3.9.7.1 Construction

Noise

Some of the related projects would bring additional construction activity into the immediate vicinity of the Project Site. Specifically, the Venice Dual Force Main Project and projects at the existing VPP would require the use of heavy construction equipment that would affect the same nearby receptors

affected by the Proposed Project. Assuming similar construction equipment could be used for two projects simultaneously, the total amount of construction equipment could be doubled, leading to a 3 dB increase in construction noise levels at adjacent receptors. While the Venice Dual Force Main Project construction activity is expected to be completed in the vicinity of the VPP before the start of construction of the proposed VAPP project, it is possible that some portions of the projects in Marina del Rey could still be occurring and overlap with the VAPP construction period. Because project construction noise impacts are predicted to be significant, the cumulative impact would also be significant. While **MM NOI-1** would reduce the Proposed Project's contribution to cumulative noise levels to the extent feasible, it would not eliminate the predicted noise impacts entirely; **therefore, cumulative construction noise impacts are considered significant and unavoidable**.

Vibration

Vibration from construction activities is assessed based on distinct single events using the instantaneous vibration (PPV) from a single piece of equipment. Therefore, the vibration levels experienced at any specific time at a given receptor are typically dominated by a single piece of construction equipment, and the cumulative increase due to additional pieces of equipment is minimal. However, because project construction vibration impacts are predicted to be significant, the cumulative impact would also be significant. While MM NOI-2 would substantially reduce the Proposed Project's contribution to construction vibration levels and mitigate the project's potential impacts related to building damage, it would not eliminate all the predicted impacts related to annoyance at nearby residences; therefore, cumulative construction vibration impacts are considered **significant and unavoidable**.

3.9.7.2 Operation

Noise

Once operational, noise and vibration levels from related projects are expected to be less than significant either because of the nature of the projects themselves (for instance, subterranean pipelines would not be expected to generate significant noise in the surrounding community) and/or because each project would be required to comply with the City Municipal Code's noise limits. Because **MM NOI-3** would reduce the Proposed Project's operational noise levels to comply with both the municipal code and the thresholds of the City's CEQA Guidelines, the cumulative operational noise impacts would also be **less than significant**.

Vibration

As discussed above, the Proposed Project is not anticipated to produce significant levels of groundborne vibration once operational and would, therefore, not have a meaningful contribution to cumulative operational vibration levels (if any) in the area. Furthermore, one of the related projects is actually proposed for the purposes of reducing vibration levels at the adjacent VPP which would lead to an improvement over existing conditions related to that facility. Consequently, the cumulative operational vibration impacts are anticipated to be **less than significant**.

3.10 Transportation/Traffic

This section describes the regulatory setting, existing transportation/traffic conditions at the Project Site and associated study area (see below) and the potential impacts that would result from implementation of the Proposed Project. It also identifies, where necessary, mitigation measures to reduce identified significant impacts. As noted in the analysis below, with the implementation of mitigation measures, direct and indirect impacts associated with transportation/traffic conditions during construction and operation of the Proposed Project would be less than significant.

3.10.1 Regulatory Setting

A review of the various regulatory requirements was conducted to identify regulations that address traffic and transportation. This section summarizes the various regulatory requirements that are relevant to the Proposed Project.

3.10.1.1 Federal

There are no federal regulations or policies regarding transportation and traffic that are applicable to the Proposed Project.

3.10.1.2 State

There are no state regulations or policies regarding transportation and traffic that are applicable to the Proposed Project.

3.10.1.3 Local and Regional

Southern California Area Governments Regional Transportation Plan/Sustainable Communities Strategy

The Southern California Association of Governments (SCAG) is a Joint Powers Authority under California state law and was established as an association of local governments and agencies that voluntarily convene as a forum to address regional issues. The SCAG region encompasses six counties (Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura), 191 cities in an area covering more than 38,000 square miles and six County Transportation Commissions that hold the primary responsibility for programming and implementing transportation projects, programs and services in their respective counties.

SCAG is designated under federal law as a Metropolitan Planning Organization (MPO) and as a Regional Transportation Planning Agency and a Council of Governments under state law. SCAG Bylaws provide for representation of Air Districts in the region. SCAG develops long-range regional transportation plans including growth forecast components, regional transportation improvement programs and a portion of the South Coast Air Quality management plans.

According to SCAG, their Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) is a long-range visioning plan that balances future mobility and transportation needs with economic, environmental and public health goals. The RTP/SCS consists of a vision for the region's future and is developed with input from local governments, county transportation

commissions (CTCs), tribal governments, non-profit organizations, businesses and local stakeholders within their region.

There are over 4,000 transportation projects from local county plans —ranging from highway improvements, railroad grade separations, bicycle lanes, new transit hubs and replacement bridges that are included in the 2016 RTP/SCS. These future investments seek to reduce traffic bottlenecks, improve the efficiency of the region's network and expand mobility choices for everyone.

County of Los Angeles Congestion Management Program

The Los Angeles Congestion Management Program (CMP) is a state-mandated program enacted by the California State Legislature with the passage of Proposition 111 in 1990, administered by the Los Angeles County Metropolitan Transportation Authority (Metro). The purpose of the CMP is to develop a coordinated approach to managing and decreasing traffic congestion by linking the various transportation, land use, and air quality planning programs throughout the County. One required element of the CMP is a process to evaluate the transportation and traffic impacts of large projects on the regional transportation system. That process is undertaken by local agencies, project applicants, and traffic consultants through a transportation impact report usually conducted as part of the CEQA project review process.

The 2010 CMP for the County (adopted October 28, 2010) was developed in part to link local land use decisions with their impacts on regional transportation. The CMP identifies a system of highways and roadways, with minimum levels of service (LOS)[1] performance measurements designated at LOS E (unless exceeded in base year conditions) for highway segments and key roadway intersections on this system. A traffic impact analysis (TIA) is required for projects that generate at least 50 new trips at CMP intersections during the peak hour or 150 trips to mainline freeway locations. The analysis must: investigate measures that will mitigate the significant CMP system impacts; develop cost estimates, including the fair share costs to mitigate impacts of the Proposed Project; and, indicate the responsible agency. Selection of final mitigation measures is left at the discretion of the local jurisdiction. Once a mitigation program is selected, the jurisdiction self-monitors implementation through the existing mitigation monitoring requirements of CEQA.

City of Los Angeles Mobility Plan 2035

In August 2015, the City of Los Angeles (City) updated the Transportation Element of the City's General Plan, now referred to as Mobility Plan 2035, or MP 2035, to reflect policies and programs that will lay the policy foundation for safe, accessible, and enjoyable streets for pedestrians, bicyclists, transit users, and vehicles throughout the city of Los Angeles. The MP 2035 and Final EIR were adopted on August 11, 2015 and are compliant with the 2008 Complete Streets Act, which mandates that the circulation element of a city's General Plan be modified to plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways, defined to include motorists, pedestrians, bicyclists, children, person with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban, or urban context of the general plan.

[1] LOS is a qualitative measure that is used to describe the condition of traffic flow, ranging from excellent conditions (LOS A) to overloaded conditions (LOS F). The City of Los Angeles uses LOS D as a standard, meaning LOS D or better is considered satisfactory conditions, while LOS E or F is generally considered to be substandard.

City of Los Angeles 1999 General Plan Transportation Element

At the time of this Draft EIR, the Mobility Plan 2035 is subject to legal challenge. In the event the litigation results in the Mobility Plan 2035 being stayed or overturned, the 1999 Transportation Element will be the effective circulation element for the City's General Plan. Therefore, in an excess of caution, the City has included a brief discussion of the Transportation Element.

The Transportation Element includes a discussion of the existing roadway infrastructure in the city of Los Angeles. Goals, objectives, and policies are included in the transportation element to ensure efficient circulation within the city and region.

Coastal Transportation Corridor Specific Plan

The Coastal Transportation Corridor Specific Plan Area consists of all or parts of the Westchester-Playa Del Rey Community Plan Area, the Palms-Mar Vista-Del Rey Community Plan Area, the Venice Community Plan Area, and the Los Angeles International Airport Interim Plan Area, generally bounded by the city of Santa Monica on the north, Imperial Highway on the south, San Diego Freeway on the east, and the Pacific Ocean on the west and has the following purposes:

- Provide a mechanism to fund specific transportation improvements due to transportation impacts generated by the projected new commercial and industrial development within the corridor;
- Establish the Coastal Transportation Corridor Impact Assessment Fee process for new development in the C, M, and P Zones and for development on property owned by the Department of Airports;
- Regulate the phased development of land uses, insofar as the transportation infrastructure can accommodate such uses;
- Establish a Coastal Transportation Corridor infrastructure implementation process;
- Promote or increase work-related ridesharing and bicycling to reduce peak-hour trips and to keep critical intersections from severe overload;
- Avoid peak-hour LOS on streets and interchanges from reaching LOS F or, if presently at LOS F, preclude further deterioration in the LOS;
- Promote the development of coordinated and comprehensive transportation plans and programs with other jurisdictions and public agencies;
- Reduce commute trips by encouraging the development of affordable housing at or near job sites;
- Ensure that the public transportation facilities that will be constructed with funds generated by the Specific Plan will significantly benefit the contributor; and
- Encourage Caltrans to widen the San Diego Freeway for high-occupancy vehicle lanes.

Venice Local Coastal Program

The Venice Local Coastal program (LCP) was prepared to comply with the California Coastal Act of 1976. The Coastal Act directs each local government lying wholly or partly within the Coastal Zone to prepare an LCP for those areas located in the state's designated Coastal Zone. The Venice Coastal Zone is the area generally bounded by Marine Street on the north, the city-county boundary, Washington Boulevard and Via Marina on the south, Lincoln Boulevard and Via Dolce on the east, and the Pacific Ocean on the west.

Venice Specific Plan

The purpose of the Venice Specific Plan is to implement the policies and goals of the California Coastal Act and regulate all development, including parking in order that it be compatible in character with the existing community. Section 13 of the Venice Specific Plan specifically addresses parking standards and requirements as well as Beach Impact Zone parking requirements for new development within the Venice Coastal Zone.

Venice Local Coastal Program Land Use Plan

The purpose of the Venice LCP-LUP is to define goals and land use policies for compliance with the California Coastal Act. It is intended to restore the overall quality of the Venice Coastal Zone environment and its natural and man-made resources and assures that public coastal access and public recreation areas are provided as required per the Coastal Act.

The following CA Coastal Act policies are included as part of the Venice LCP LUP:

Article 2. Public Access

> 30212. "(a) Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where (1) it is inconsistent with public safety, military security needs, or the protection of fragile coastal resources, (2) adequate access exists nearby, or (3) agriculture would be adversely affected. Dedicated accessway shall not be required to be opened to public use until a public agency or private association agrees to accept responsibility for maintenance and liability of the accessway."

Article 6. Development

> 30252. "The location and amount of new development should maintain and enhance public access to the coast by…..providing non-automobile circulation within the development and provide adequate parking facilities or providing substitute means of serving the development with public transportation."

Venice LCP LUP Policy Group II, *Shoreline Access Policy II. A. 3. Parking Requirements*, outlines parking requirements that shall apply to all new development. Extensive remodeling of an existing use or change of use that does not conform to the parking requirements shall be required to provide missing numbers of parking spaces or provide an in-lieu fee payment into the Venice Coastal Parking Impact Trust Fund for the existing deficiency. Public Utility Facility not having a Business Office on the premises requires 2 spaces; plus 1 space for each 500 square feet of floor area. Parking shall be provided pursuant to a detailed parking study that demonstrates that the project will provide adequate parking to meet the needs of the development without causing negative impacts to coastal access or access to public recreational facilities. (City of Los Angeles 2001).

Policy Group II Shoreline Access as it pertains to parking is considered a Venice Coastal Issue consistent with the California Coastal Act and has been identified in the Venice LCP LUP as the following:

The following parking issues have been identified as part of the Venice LCP LUP:

- Conflict between residential and beach visitor parking.
- Inadequate signage of available parking for beach visitors on weekends resulting in added traffic congestion.
- Inadequate parking provided by non-conforming uses.

- Inadequate off-street parking near or on the beach frontage for visitors and residents.
- Intrusion of non-resident vehicles on residential streets to locate available parking spaces.
- Preventing polluted stormwater runoff from parking lots from entering the Venice Canals and Ballona Lagoon.

3.10.2 Environmental Setting

This section describes the environmental setting or conditions related to traffic and transportation in the project vicinity, which represents the baseline required to evaluate the Proposed Project's impacts and identify required mitigation measures.

3.10.2.1 Existing Street System

Primary regional access to the Project Site is provided by the Marina Freeway (SR 90), the San Diego Freeway (I-405), and the Santa Monica Freeway (I-10). SR 90 runs east of the Project Site along a diagonal east of Marina Del Rey. Access to the Project Site from SR 90 can be obtained from Lincoln Boulevard (SR 1). I-10 runs in an east/west direction north of the study area and I-105 runs east/west south of the study area. Both I-10 and I-105 connect with I-405 to the north and south, respectively. Washington Boulevard, located approximately 0.3 mile north of the Project Site, serves as the nearest and primary commercial corridor. The Project Site is located at the northeast corner of Hurricane Street and Canal Court, across from and immediately north of the existing VPP. Figure 2-2, Project Location Map (see Chapter 2, Project Description of this EIR) shows the project location along with local existing pedestrian and vehicular access.

The main streets carrying project-related construction traffic (both worker trips and truck trips) to the construction site would be: Lincoln Boulevard, Washington Boulevard, Venice Boulevard (SR 187), Pacific Avenue, Hurricane Street, Canal Court, and Galleon Street. These boulevards, avenues, and local streets in the project's study area offer sub-regional and local access and circulation opportunities. These facilities generally provide two to four travel lanes and allow parking on one side of the street. However, both Hurricane Street and Canal Court are narrow roadways that do not allow two vehicles to pass at the same time. This condition creates the need for drivers to wait to pass one another.

Below is a brief description of the major streets serving the Proposed Project Site. Sidewalks are generally available in the vicinity of the project area, except along Canal Court.

- Canal Court – Canal Court is a short undivided alleyway that runs between Driftwood Street to the north and the Ballona Lagoon to the south. Parking is not permitted along Canal Court.
- Galleon Street – Galleon Street is a short undivided local street that runs east/west between Pacific Avenue and Esplanade, just west of the Venice Canal/Ballona Lagoon. Parking is permitted on both sides of the street, though some restrictions are present along several properties.
- Hurricane Street – Hurricane Street is a short undivided local street that runs east/west between Ocean Front Walk and Esplanade, just west of the Venice Canal/Ballona Lagoon. The street terminates adjacent to the Project Site and parking is permitted on both sides of the street.

- Lincoln Boulevard (SR 1) – SR 1 is an arterial street that runs north/south in the study area and it generally provides four travel lanes. Metered parking is available on both sides of the street and the speed limit is 35 miles per hour (MPH).
- Marquesas Way – Marquesas Way is a short four-lane secondary street that runs east/west and connects Via Dolce and Via Marina. Parking is permitted on the east side of the street and the speed limit is 25 MPH.
- Pacific Avenue – Pacific Avenue is a two-lane secondary arterial that runs north/south between Barnard Way to the north and Via Marina to the south. Between Washington Boulevard and Hurricane Street, parking is restricted along the east side of the street but it is unrestricted on the north side. The posted speed limit within this segment is 30 MPH.
- Via Marina – Via Marina is a four-lane street that runs north/south between Washington Boulevard and Pacific Avenue. No parking is allowed on either side of the street and the speed limit is 40 MPH.
- Via Dolce – Via Dolce is a secondary arterial that runs north/south between Washington Boulevard and Marquesas Way. It includes two northbound lanes and one southbound lane, plus bicycle lanes. Parking is allowed on both sides of the street and the speed limit is 35 MPH.
- Washington Boulevard – Washington Boulevard is a Major Highway Class II arterial street that runs east/west between Venice Beach and the City of Whittier. It generally provides four travel lanes plus bicycle lanes. Metered parking is generally available on both sides of the street. The speed limit is 35 MPH.

3.10.2.2 Existing Traffic Congestion and Levels of Service

As part of the Venice Dual Force Main (VDFM) Draft EIR prepared in 2006, the City conducted a detailed assessment of the existing operating conditions at 23 roadway segments and nine intersections in the vicinity of the Project Site's directly adjacent Venice Pumping Plant. In response to comments received on the Draft EIR and minor changes in the project description, the traffic study was updated in June 2009. The data collected and projected as part of that study is adequate to reflect existing conditions today since the area has not experienced significant change or new development that would have significantly added or reduced traffic patterns in the vicinity of the project area.

Of the roadway segments studied that are now within the project vicinity, the roadway segments were projected to operate at LOS D or better during morning and afternoon peak hours in the future (2011). Of the intersections studied that are now within the current project study area, three intersections would also serve the Project Site. The VDFM Traffic Study projected the intersection volume to capacity (V/C) ratio and corresponding LOS, as shown in Table 3.10-1 below.

As shown in Table 3.10-1, four of the six study intersections were projected to operate at LOS D or better during all analyzed peak hours. The intersection of Via Marina & Washington Boulevard was projected to operate at LOS E in the PM peak hour and LOS F in the Sunday midday peak hour. The intersection of Lincoln Boulevard & Washington Boulevard was projected to operate at LOS F during all three peak hours.

Table 3.10-1. Year 2011 Intersection Level of Service

Intersection	Peak Hour	VC or Delay	LOS
Pacific Avenue & Washington Boulevard	AM	0.657	B
	PM	0.797	C
	Weekend	0.512	A
Via Marina & Washington Boulevard	AM	0.863	D
	PM	0.934	E
	Weekend	1.029	F
Lincoln Boulevard & Washington Boulevard	AM	1.088	F
	PM	1.120	F
	Weekend	1.190	F
Via Marina & Marquesas Way	AM	0.325	A
	PM	0.253	A
	Weekend	0.331	A
Via Marina & Tahiti Way	AM	0.321	A
	PM	0.208	A
	Weekend	0.287	A
Via Marina & Bora Bora Way	AM	2.8	A
	PM	2.5	A
	Weekend	2.0	A
worst approach only	AM	11.7	B
worst approach only	PM	11.1	B
worst approach only	Weekend	12.0	B
If signalized	AM	0.438	A
If signalized	PM	0.372	A
If signalized	Weekend	0.450	A

Notes:
AM Peak Hours = 7:00 am – 9:00 am
PM Peak Hours = 4:00 pm – 6:00 pm
2011 Intersection LOS is based on the Year 2011 cumulative base (without project) conditions contained in the VDFM Traffic Study prepared by Fehr & Peers, 2009.
Source: Fehr & Peers, 2009.

3.10.2.3 Existing CMP Facilities

The CMP arterial monitoring intersection nearest to the Project Site is located at Lincoln Boulevard (SR 1) and SR 90 (Marina Expressway), which is approximately 1.2 miles to the northeast. Additionally, two additional arterial monitoring locations are located at the intersection of Lincoln Boulevard and Venice Boulevard (SR 187) approximately 1.3 miles to the northwest of the Project Site. West of this intersection, SR 187 is considered Other Principal Arterial. No other immediate streets surrounding the Project Site and vicinity are considered CMP facilities. The 2010 CMP showed these intersections to be operating at LOS D or better during both AM and PM peak hour.

3.10.2.4 Existing Parking

Parking within the community is predominantly unrestricted, publicly available, and on street. A City-owned off-street parking lot is located on the northwestern edge of the study area, at the terminus of Washington Boulevard, which includes a total of 364 parking spaces (329 regular, 26 extended spaces for recreational vehicles, and 9 spaces designated for disabled parking). Hurricane Street, where the Project Site is located, also contains restricted (street sweeping) on-street parking. The local street sweeping schedule varies by street but parking is generally restricted on Mondays or Tuesdays from 10:00 AM to 12:00 PM. Parking is prohibited on Canal Court.

3.10.2.5 Existing Transit System

Transit service within the study area is provided as follows:

- Metro Lines 108 and 358 operate on Pacific Avenue between Via Marina and Washington Boulevard and along Washington Boulevard between Pacific Avenue and Palawan Way. The lines run between Marina del Rey and Pico Rivera, with Line 358 providing limited stop service during the peak periods.
- Culver City Blue Bus Line 1 provides service on Washington Boulevard between Venice and the West Los Angeles Transit Center.
- Commuter Express Line 437 is operated by LAODT and runs on Via Dolce and Pacific Avenue in the project area. This line runs between Marina del Rey and downtown Los Angeles.

3.10.2.6 Non-Motorized Transportation

Biking and walking are non-motorized transportation modes that typically serve shorter trips than do motorized travel modes. In the project area, bikeways facilitate and encourage this mode of non-motorized transportation. According to LADOT, Class I bikeways are separate off-street paths, Class II bikeways are striped lanes within streets, and Class III bikeways are signed bicycle routes. The nearest dedicated bicycle lane is located along Washington Boulevard north of the Project Site and Via Dolce east of the Project Site. Pedestrian access at and near public transit, in local commercial and residential areas is facilitated by sidewalks, which are present on most streets, except Canal Court. Esplanade provides walking paths along the Grand Canal and Ballona Lagoon areas.

3.10.3 Environmental Impact Analysis

3.10.3.1 Methodology and Assumptions

This section describes the procedures used to assess impacts on the traffic and transportation system. Assumptions regarding the types of transport and the types of roads used to haul materials and workers were used to estimate the number of trips to be generated by the Proposed Project and assess the overall significance of project impacts. For purposes of assessing the project's traffic impact upon adjacent roadways, the project's net additional construction and operation traffic trip generation was qualitatively compared against existing traffic conditions. In determining the level of significance, the assessment assumed that the implementation of the Proposed Project would comply with relevant regulations, ordinances, and guidance.

The traffic projections for the Proposed Project were developed using three steps: estimating the trip generation of the project, determining trip distribution, and assigning the project traffic to the

roadway system. The information used in this analysis was provided by the Los Angeles Bureau of Engineering (LABOE) and the project team. Construction of the project is planned to begin in March 2018 and is expected to take approximately 24 months to complete, ending in 2020. The construction involves several key phases, which may overlap, as described below.

1. Stages 1-2: Mobilization, Site Preparation, and Excavation – three to four months (155 days), including approximately two to three months of soil hauling;
2. Stage 3: Pump Station Foundation/Electrical – nine to 10 months;
3. Stage 4: Diversion Structure – four to six months; and
4. Stages 5-6: Pump Station Integration/Finishing – two to four months.

The Los Angeles Municipal Code (LAMC) provides that construction activities are limited to the hours from 7:00 a.m. to 9:00 p.m. on weekdays and from 8:00 a.m. to 6:00 p.m. on Saturdays and holidays. No construction is permitted on Sundays. VAPP construction hours are proposed to be Monday through Saturday from 8:00 a.m. to 6:00 p.m. (See MM NOI-1). While other construction-related traffic could occur anytime within the allowable hours, soil hauling truck hours would occur between 9:00 a.m. and 4:00 p.m. Monday through Saturday. It is planned that construction workers would park at an off-site location and be shuttled to and from the Project Site each workday by passenger shuttles or vans (that have the capacity to seat 10 to15 passengers). While no specific off-site location has been identified at this time, it would likely lie within five miles of the Project Site. The selected contractor would be required to identify and secure a suitable location. In general, work is planned to occur between 8:00 a.m. and 6:00 p.m., and worker shuttles are expected to depart the site by 6:00 p.m. On days when soil export is occurring, workers would all be onsite before soil trucks begin to arrive and would remain on-site until after the last soil export truck departs. Appendix J (Trip Generation Analysis, October 3, 2016) of this EIR presents the estimated vehicle trip generation at the Project Site during the analyzed peak hours and on a typical weekday.

In addition to soil haul trucks, the project would generate equipment and delivery truck trips during each phase of construction. Such trips are estimated to be two per day (four passenger car equivalents [PCE] trips per day) and could include cranes, bulldozers, excavators, and other large items of machinery. These materials would be delivered to the site and stored on-site at one of two laydown areas (see Chapter 2, Project Description).

The number of construction workers would vary throughout the construction period. During Stages 1 and 2 and Stage 4, approximately eight workers would be on-site each day. Stage 3 would require up to 20 workers on-site daily. Stages 5 and 6 would require approximately six workers per day. Table 3.10-2 summarizes the daily trip generation by construction stage.

Table 3.10-2. Daily Trip Generation by Construction Phase

Stage	Stage Name	Duration (days)	Daily Workers by Phase	Worker Trips at Site per day*	Soil Haul Truck Trips per Day**	Other Truck Trips per Day	Total Daily 1-way Vehicle Trips	Total Daily 1-way PCE Trips
1-2	Mobilization/	30	3	4		2	6	8
	Site Preparation/ Excavation/ Shoring	95	8	4	48	2	54	104
3	Pump Station Foundation	50	20	8	48	2	10	12
	Pump Station	245	20	8		2	58	108
4	Diversion Structure	64	8	4	0	2	6	8
5-6	Pump Station Integration	85	6	4	0	2	6	8

Notes:
PCE – passenger car equivalency
*Assumes that employees will be shuttled to/from the Project Site after parking off-site. Capacity of shuttle is assumed to be 15 passengers or less.
** 10,000 cubic yards of soil will be excavated and exported during Stages 1 and 2, of which approximately 2,300 cubic yards would be stockpiled at Laydown Area 1 and approximately 7,700 cubic yards of soil would be stockpiled at Laydown Area 3. If needed, up to 3,850 cubic yards will be imported (returned) back to the VAPP site use as backfill during Stage 3 and 4. The balance of the exported soil is expected to be used as cover at an area landfill, such as Sunshine Canyon.
Source: City of Los Angeles, Fehr & Peers, 2016.

3.10.3.2 Screening Analysis

The *L.A. CEQA Thresholds Guide* (2006) includes two sets of criteria to evaluate project impacts: screening and significance criteria. The screening criteria assist in deciding when further study is needed to determine whether a project impact could be significant. For many issue areas, further study is recommended when one or more questions are answered with a "yes." A "no" response to all questions indicates that further study is not required, and there would normally be no significant impact from the Proposed Project on the subject issue.

The *L.A. CEQA Thresholds Guide* (2006) includes the screening criteria outlined below for Transportation and Traffic (L.1 through L.8) to determine if additional study is necessary. Table 3.10-3 below summarizes whether the project impacts would require further study based on the screening criteria.

Table 3.10-3. Summary of Screening Analysis

Screening Criteria	Requires Further Study? Yes/No
L.1. Intersection Capacity, L.2. Street Segment Capacity	
Would the Proposed Project generate and/or cause a diversion or shift of 500 or more daily trips or 43 or more PM peak-hour vehicle trips on the street system?	No
L.3. Freeway Capacity	
Would the Proposed Project add 150 or more one-way vehicle trips to a Congestion Management Program (CMP) mainline freeway monitoring segment during either the AM or PM peak hours?	No
Would the Proposed Project add 50 or more AM or PM peak-hour trips to a freeway on- or off-ramp?	No
L.4. Neighborhood Intrusion Impacts	
Would the Proposed Project generate more than 120 daily vehicle trips to a local residential street?	No
L.5. Project Access	
Would the Proposed Project generate and/or cause a diversion or shift of 500 or more daily trips or 43 or more PM peak-hour vehicle trips on the street system?	No
Is a project driveway proposed on a major or secondary highway within 150 feet of an intersection with another major or secondary highway?	No
Would a project driveway intersect an on-street bicycle lane or cross a sidewalk in an area of high pedestrian activity?	No
Can it be readily perceived that there are access risks or deficiencies associated with the adjoining street system due to curves, slopes, walls, or other barriers to adequate lines of sight?	No
L.6. Transit System Capacity	
Will an Environmental Impact Report (EIR) be prepared for the Proposed Project to evaluate potential transportation impacts??	
L.7. Parking	
Would the project's proposed parking supply be less than that required by City code, including Los Angeles Municipal Code (LAMC), Transportation Specific Plan (TSP) or Interim Control Ordinance (ICO) requirements, prior to applying for a variance, exemption, or amendment, if any apply to the project?	No
If the project is located within the coastal zone (generally, 1,000 yards inland of the mean high tide line), would the project's proposed parking supply be less than that required by California Coastal Commission requirements?	No
L.8. In-Street Construction Impacts	
Would a project not exempted in Article VII of the City CEQA Guidelines require construction activities to take place within a major or secondary highway ROW that would necessitate temporary lane, alley, or street closures for more than one day (including day and evening hours, and including overnight closures if on a residential street)?	No
Would a non-exempt project require construction activities to take place within a collector or local street ROW that would necessitate temporary lane, alley, or street closures for more than seven days (including day and evening hours, and including overnight closures if on a residential street)?	Yes

Screening Criteria	Requires Further Study? Yes/No
Would in-street construction activities result in the loss of regular vehicular or pedestrian access to an existing land use for more than one day, including day and evening hours and overnight closures if access is lost to residential units?	No
Would in-street construction activities result in the temporary loss for more than one day of an existing bus stop or rerouting of a bus route that serves the Project Site?	No
Source: *L.A. CEQA Thresholds Guide*, 2006; Fehr & Peers, 2016.	

L.1. Intersection Capacity, L.2. Street Segment Capacity

- **Would the Proposed Project generate and/or cause a diversion or shift of 500 or more daily trips or 43 or more PM peak-hour[2] vehicle trips on the street system?**

  According to the *L.A. CEQA Thresholds Guide* (2006), a "no" response to the preceding question indicates that there would normally be no significant Intersection Capacity and Street Segment Capacity impacts from the Proposed Project. Trip generation estimates that were prepared for the project were based upon projected staffing and truck activity levels. Trip generation estimates represent a worst-case scenario in that they consider the upper bounds of impacts likely to be experienced on the street system in the immediate vicinity of the Project Site where construction activities could result in temporary lane closures and loss of on-street parking.

  The number of vehicle trips generated by the project are expected to be up to a total of 58 daily one-way vehicle trips as the worst-case scenario (up to 48 soil haul, 8 construction worker, and 2 other trips). Considering the passenger car equivalency (PCE) factor of 2.0 for the truck trips, this stage of construction would result in up to 108 daily PCE trips.

  However, the number of construction workers and construction equipment would actually vary throughout the construction day in order to maintain a reasonable schedule of completion. Construction workers are anticipated to be onsite before 8:00 a.m. and would typically leave the Project Site before 6:00 p.m. While they would be commuting during morning and afternoon peak hours, the number of these trips would be negligible. As soil haul trucks will be restricted to the hours of 9:00 a.m. to 4:00 p.m. (see MM NOI-1), they will avoid morning peak (7:00 a.m. – 9:00 a.m.) and afternoon peak (4:00 p.m. – 6:00 p.m.) commute hours.

  Construction truck traffic would arrive and depart during allowed construction hours (8:00 a.m. – 6:00 p.m.) (See MM NOI-1), deliveries would be staggered throughout the day as work occurs, and to the extent feasible, coordinated to arrive and depart at off-peak commute times.

  Once VAPP becomes operational, two VAPP operations employees are expected to be at the site at any given time, and there would be three shifts per day. As such, the site is estimated to generate twelve 1-way trips per day.

  As a result, the Proposed Project would not generate and/or cause a diversion or shift of 500 or more daily trips or 43 or more PM peak-hour vehicle trips on the street system. As such, no significant impacts to Intersection Capacity and Street Segment Capacity would occur and no further analysis is required.

[2] PM Peak hour is typically between 4:00 pm and 6:00 pm.

L.3. Freeway Capacity

- **Would the Proposed Project add 150 or more one-way vehicle trips to a Congestion Management Program (CMP) mainline freeway monitoring segment during either the AM or PM peak hours?**
- **Would the Proposed Project add 50 or more AM or PM peak-hour trips to a freeway on- or off-ramp?**

  According to the *L.A. CEQA Thresholds Guide* (2006), a "no" response to all of the preceding questions indicates that there would normally be no significant impact on Freeway Capacity from the Proposed Project. As previously stated, the number of trips generated by the project would be up to a total of 58 daily one-way vehicle trips as the worst-case scenario (up to 48 soil haul, 8 construction worker, and 2 other trips), but the trips would be distributed throughout the day and not all 58 vehicle trips would occur during the AM or PM peak hours. Once VAPP becomes operational, the site is estimated to generate twelve 1-way trips per day. Two staff members are expected to be at the site at any given time, and there would be three shifts per day. As a result, the Proposed Project would not add 150 or more one-way vehicle trips to a Congestion Management Program (CMP) mainline freeway monitoring segment during either the AM or PM peak hour and would not add 50 or more AM or PM peak-hour trips to a freeway on- or off-ramp. As such, no significant impacts to Freeway Capacity would occur and no further analysis is required.

L.4. Neighborhood Intrusion Impacts

- **Would the Proposed Project generate more than 120 daily vehicle trips to a local residential street?**

  According to the *L.A. CEQA Thresholds Guide* (2006), a "no" response to the preceding question indicates that there would normally be no significant impact on Neighborhood Intrusion from the Proposed Project. As previously stated, the number of trips generated by the project would be up to a total of 58 daily trips as the worst-case scenario. Once VAPP becomes operational, the site is estimated to generate twelve 1-way trips per day. Two VAPP operations employees are expected to be at the site at any given time, and there would be three shifts per day. As a result, the Proposed Project would not generate more than 120 daily vehicle trips to a local residential street. As such, no significant neighborhood intrusion impacts would occur and no further analysis is required.

L.5. Project Access

- **Would the Proposed Project generate and/or cause a diversion or shift of 500 or more daily trips or 43 or more PM peak-hour vehicle trips on the street system?**
- **Is a project driveway proposed on a major or secondary highway within 150 feet of an intersection with another major or secondary highway?**
- **Would a project driveway intersect an on-street bicycle lane or cross a sidewalk in an area of high pedestrian activity?**
- **Can it be readily perceived that there are access risks or deficiencies associated with the adjoining street system due to curves, slopes, walls or other barriers to adequate lines of sight?**

According to the *L.A. CEQA Thresholds Guide* (2006), a "no" response to the response to the first question and all of the following questions indicates that there would normally be no significant project access impacts from the Proposed Project. As previously stated, the number of trips generated by the project would be up to a total of 58 daily one-way vehicle trips as the worst-case scenario (up to 48 soil haul, 8 worker, and 2 other trips), but the trips would be distributed throughout the day and not all 58 vehicle trips would occur during the AM or PM peak hours. Therefore, it is assumed that the construction worker traffic would be before the morning and afternoon peak commute hours. Once VAPP becomes operational, the site is estimated to generate twelve 12-one-way trips per day. Two VAPP operations employees are expected to be at the site at any given time, and there would be three shifts per day. As a result, the Proposed Project would not generate and/or cause a diversion or shift of 500 or more daily trips or 43 or more PM peak-hour vehicle trips on the street system. In addition, the project driveway is not proposed on a major or secondary highway within 150 feet of an intersection with another major or secondary highway. Further, the project driveway does not intersect an on-street bicycle lane or cross a sidewalk in an area of high pedestrian activity. Lastly, there are no access risks or deficiencies associated with the adjoining street system due to curves, slopes, walls, or other barriers to adequate lines of sight. As such, no significant project access impacts would occur and no further analysis is required.

L.6. Transit System Capacity

- **Will an Environmental Impact Report (EIR) be prepared for the Proposed Project to evaluate potential transportation impacts?**

  This issue involves the potential impacts of the Proposed Project on the existing transit system ridership and capacity from the increased demand by project residents, employees, patrons, etc. According to the *L.A. CEQA Thresholds Guide* (2006), the determination of significance shall be made on a case-by-case basis, considering the projected number of additional transit passengers expected with implementation of the Proposed Project and available transit capacity. Because the Proposed Project does not generate more than 20 construction workers at any one time, and would include only six permanent employees once operational, no adverse impacts to transit capacity is expected. As such, no significant project impacts to transit capacity would occur and no further analyses is required.

L.7. Parking

- **Would the project's proposed parking supply be less than that required by City code, including Los Angeles Municipal Code (LAMC), Transportation Specific Plan (TSP) or Interim Control Ordinance (ICO) requirements, prior to applying for a variance, exemption, or amendment, if any apply to the project?**
- **If the project is located within the coastal zone (generally, 1,000 yards inland of the mean high tide line), would the project's proposed parking supply be less than that required by California Coastal Commission requirements?**

  According to the *L.A. CEQA Thresholds Guide* (2006), a "no" response to all of the preceding questions indicates that there would normally be no significant parking impacts from the Proposed Project. A project would normally have a significant impact on parking if the project provides less parking than needed as determined through an analysis of demand from the project.

Section 13 of the Venice Specific Plan specifically addresses parking standards and requirements as well as Beach Impact Zone parking requirements for new development within the Venice Coastal Zone. Within the Venice LCP, Policy II. A. 3. Parking Requirements, outlines parking requirements that shall apply to all new development. For a Public Utility Facility not having a Business Office on the premises, the parking requirement is to provide 2 spaces, plus 1 space for each 500 square feet of floor area. Additionally, the policy states that parking shall be provided pursuant to a detailed parking study that demonstrates that the project will provide adequate parking to meet the needs of the development without causing negative impacts to coastal access or access to public recreational facilities.

The Parking Assessment Memorandum dated October 3, 2016 prepared by Fehr & Peers addresses impacts to parking and is found in Appendix J of this Draft EIR. As noted below, that analysis determined that impact to parking from the Proposed Project would be less than significant.

Parking utilization surveys were conducted bi-hourly from 8:00 a.m. to 10:00 p.m. near the Project Site on a typical weekend day and a typical weekday (Saturday, September 12 and Thursday September 17, 2015). These days were selected to represent typical weekend and weekday conditions. Counts were collected of on-street public parking and one off-street public lot in a study radius of approximately 0.3 mile around the Project Site. The number of available parking spaces for each roadway segment or lot was inventoried at the beginning of data collection efforts. Parking utilization was separated between unrestricted parking and any restricted parking for a given location. The only time-restricted parking within the vicinity of the Project Site is the metered spaces located along Strongs Drive between Anchorage Street and Washington Boulevard, while the remaining spaces are only restricted per their respective scheduled street-sweeping and trash collection days.

Once construction begins, Hurricane Street will be permanently closed to traffic between Esplanade and Canal Court. This will result in the loss of five on-street parking spaces. Additionally, the segment of Canal Court adjacent to the project site will be temporarily closed during the construction period; however, parking is prohibited there.

The Venice Pumping Plant currently requires two employees per 8-hour shift (three shifts over a 24-hour period) and two parking spaces are located within the VPP site. Once VAPP becomes operational, this staffing level will remain unchanged. Thus VAPP/VPP would require up to four parking spaces at the peak time, when shift changes occur. Per the Venice Specific Plan and the Venice Local Coastal Program Land Use Plan, the project must also provide one space for Beach Impact Zone parking. The proposed project will construct eight off-street parking spaces at 128 Hurricane Street, which will fully satisfy the need for replacement parking (five spaces), employee parking (four spaces including the existing two off-street employee spaces within the VPP), and the one new space required as Beach Impact Zone parking.During the 2-year construction period of the VAPP, the loss of the five existing parking spaces from Hurricane Street between Canal Court and the Grand Canal would temporarily reduce the parking supply in the project vicinity. This will affect the convenience of drivers seeking to park, by reducing the total supply of on-street parking in the neighborhood around the VAPP site, although the total on-street parking in the vicinity could still accommodate these vehicles. The Parking Assessment Draft Memorandum concluded the existing available parking supply near the Project Site is sufficient under normal circumstances to accommodate the parking spaces that would be temporarily displaced during construction of the Proposed Project. In addition, within approximately 1,000 feet of the Project Site, at least 70 spaces were available during the

weekday peak period and at least 11 spaces were available during the busier weekend peak period. It is recognized, however, that during peak times on peak summer weekend days and weekdays and holidays, parking utilization is higher than what was observed on the survey dates. On those days, the temporary loss of these on-street spaces would be expected to result in an increase in vehicles circling through the neighborhood as they seek available parking. However, under normal operating conditions, this impact is less than significant.

With implementation of the proposed parking spaces, the project's parking supply would comply with City codes, plans, and ordinances. While the project is located within the coastal zone, the project's proposed parking supply would meet California Coastal Commission requirements. Upon project completion, the on-street parking on Hurricane Street east of Canal Court would be fully replaced off-street at 128 Hurricane Street. In addition, the proposed VAPP project, together with the existing VPP facility, would provide four employee parking spaces, sufficient to accommodate its needs, as well as one additional space as required for Beach Impact Zone parking. Thus, upon completion the project would result in one additional parking space in the project vicinity. As such, no significant project impacts to parking would occur and no further analysisis required.

L.8. In-Street Construction Impacts

- **Would a project not exempted in Article VII of the City CEQA Guidelines require construction activities to take place within a major or secondary highway ROW which would necessitate temporary lane, alley, or street closures for more than one day (including day and evening hours, and including overnight closures if on a residential street)?**
- **Would a non-exempt project require construction activities to take place within a collector or local street ROW which would necessitate temporary lane, alley, or street closures for more than seven days (including day and evening hours, and including overnight closures if on a residential street)?**
- **Would in-street construction activities result in the loss of regular vehicular or pedestrian access to an existing land use for more than one day, including day and evening hours and overnight closures if access is lost to residential units?**
- **Would in-street construction activities result in the temporary loss for more than one day of an existing bus stop or rerouting of a bus route that serves the Project Site?**

The Proposed Project does not require construction activities to take place within a major or secondary highway right-of-way that would necessitate temporary lane, alley, or street closures for more than one day.

The majority of construction traffic disruptions would occur on Hurricane Street and Canal Court, since a portion of both local streets would be temporarily closed. As such, construction would result in repeated overnight closures on a residential street. The Proposed Project would result in closure of a local street right-of-way, which would necessitate temporary lane, alley, or street closures for more than seven days.

In addition, pedestrian access to the Grand Canal from Hurricane Street would be temporarily restricted during construction and pedestrians would be diverted to Galleon Street to the north. Therefore, in-street construction activities would result in the loss of regular pedestrian access for more than one day.

In-street construction activities would not result in the temporary loss or relocation of an existing bus stop that serves the Project Site. The nearest bus stop, which is located to the west along Pacific Avenue, would not be affected.

According to the *L.A. CEQA Thresholds Guide* (2006), a "yes" response to any of the preceding questions indicates that further study may be required. As such, the Proposed Project could result in impacts from in-street construction, and this impact is discussed further below.

3.10.3.3 Thresholds of Significance

Thresholds of significance used in this EIR to analyze impacts are based on CEQA Appendix G and on the *L.A. CEQA Thresholds Guide* (2006).

According to Appendix G of the CEQA Guidelines, a project would normally have a significant impact on transportation and traffic if it would:

TRANS-1. Exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass

TRANS-2. Conflict with an applicable congestion management program, including, but not limited to, level-of-service standards and travel demand measures or other standards established by the county congestion management agency for designated roads or highways

TRANS-3. Result in inadequate emergency access

Based on the Initial Study and the Screening Criteria addressed above, the applicable thresholds of significance from the *L.A. CEQA Thresholds Guide* (2006) for Transportation and Traffic are as follows:

TRANS-4. L.8. In-Street Construction Impacts: The determination of significance shall be made on a case-by-case basis, considering the following factors:

- Temporary Traffic Impacts:
  - The length of time of temporary street closures or closures of two or more traffic lanes;
  - The classification of the street (major arterial, state highway) affected;
  - The existing traffic levels and level of service (LOS) on the affected street segments and intersections;
  - Whether the affected street directly leads to a freeway on- or off-ramp or other state highway;
  - Potential safety issues involved with street or lane closures; and
  - The presence of emergency services (fire, hospital, etc.) located nearby that regularly use the affected street.
- Temporary Loss of Access:
  - The length of time of any loss of vehicular or pedestrian access to a parcel fronting the construction area;
  - The availability of alternative vehicular or pedestrian access within ¼ mile of the lost access; and

- The type of land uses affected, and related safety, convenience, and/or economic issues.

- Temporary Loss of Bus Stops or Rerouting of Bus Lines:
  - The length of time that an existing bus stop would be unavailable or that existing service would be interrupted;
  - The availability of a nearby location (within ¼ mile) to which the bus stop or route can be temporarily relocated;
  - The existence of other bus stops or routes with similar routes/destinations within a ¼ mile radius of the affected stops or routes; and
  - Whether the interruption would occur on a weekday, weekend or holiday, and whether the existing bus route typically provides service that/those day(s).
- Temporary Loss of On-Street Parking:
  - The current utilization of existing on-street parking;
  - The availability of alternative parking locations or public transit options (e.g. bus, train) within ¼ mile of the Project Site; and
  - The length of time that existing parking spaces would be unavailable.

3.10.3.4 Construction Impacts

The analysis below describes the temporary impacts related to traffic and transportation anticipated as a result of the Proposed Project during construction.

The City of Los Angeles requires implementation of Worksite Traffic Control Plans (WTCPs) to ensure that any construction-related impacts are minimized to the greatest extent possible. These WTCPs typically require delineation of base conditions; construction impact areas; site-specific detour operations, such as traffic striping, pavement and curb markings; traffic control signs; signals; delineators; barricades; and traffic management requirements.

Some local streets, however, have weight limitations or restrictions that limit truck traffic. Typically, trucks would not travel on these streets except to obtain access to a specific site. The City of Los Angeles' policy is to allow trucks to travel in a "reasonable fashion" to and from a work site. The City of Los Angeles reviews each haul-route permit for specific application of its general guidelines. Trucks traveling to and from the site for the export of soil would use a specific haul route to Laydown Area 3, located at a City-owned property at 9940 Jefferson Boulevard in Culver City. It is expected that the haul route for soil export and import would follow Hurricane Street, Canal Court, Galleon Street, Pacific Avenue, Washington Boulevard, and Lincoln Boulevard.

TRANS-1. Exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.

During construction of the Proposed Project, personnel, materials, and machinery would utilize the freeway system and local street system to access the site. Pacific Avenue, Canal Court, and Hurricane Street provide access to the Project Site and are residential collector streets that experience moderate to low traffic volumes during both day and evening peak-periods. During weekends and

summer months, these levels are elevated. There are no known exceedance capacities for pedestrian, bicycle paths, or the mass transit system associated with these streets or areas.

The entire Project Site would be fenced and Hurricane Street, between Canal Court and the Esplanade, would be permanently closed to the public. During Stage 1 of construction, a portion of Hurricane Street and Canal Court would be temporarily closed. Both Hurricane Street and Canal Court are narrow roadways that do not allow two vehicles to pass at the same time. This condition creates the need for drivers to wait to pass one another. Although during construction of the Proposed Project, procedures would be taken to ensure that all construction equipment, machinery, and construction personnel vehicles are kept off of these roadways, there is the potential for access to be blocked temporarily during loading and unloading activities or transport. At this stage of construction, pedestrian access along the Esplanade, Ballona Lagoon, and the Grand Canal would be maintained at Canal Court. However, pedestrian access to the Grand Canal from Hurricane Street would be eliminated; pedestrians would be diverted to Galleon Street to the north. The Esplanade would be re-opened to pedestrian access on the west side of the Grand Canal following completion of Stage 6 of construction. During the construction period at locations where construction activity would occur within public street right-of-way or in areas accessible to the public, increased safety risks to vehicles, bicyclists, and pedestrians could result from construction activities within or adjacent to affected sites due to narrowed lanes, altered travel patterns, and temporarily obstructed sidewalks.

Trip generation estimates that were prepared for the project were based upon projected staffing and vehicle activity levels. Trip generation estimates represent a worst-case scenario in that it considers the upper bounds of impacts likely to be experienced on the street system in the immediate vicinity of the site where construction activities could result in temporary lane closures and loss of on-street parking. It was found that the soil hauling during Stages 1 to 4 would generate the highest number of daily trips to and from the site. Preliminary analysis indicates that approximately 10,000 cubic yards of soil would need to be excavated from the site during Stages 1 and 2, including 2,300 cubic yards that would be exported to Laydown Area 1 and 7,700 cubic yards to be exported to Laydown Area 3. If needed, up to 3,850 cubic yards will be imported (returned) to the site for backfill during States 3 and 4. The balance of the exported soil is expected to be used as cover at an area landfill.

The anticipated peak estimate for the number of required truckloads for excavation is 48 one-way trips per day. The anticipated peak estimate for construction worker trips at the construction site is 6 trips per day. Including the 2 other trips for materials and equipment delivery, as mentioned above, a total of 58 daily trips is anticipated to be the worst-case scenario. The number of construction workers and construction equipment would actually vary throughout the construction process in order to maintain a reasonable schedule of completion. In addition, construction workers would be onsite at 7:00 a.m. and would typically leave the Project Site by 6:00 p.m. As a result, it is assumed that the construction worker traffic would occur during the morning and afternoon peak commute hours, but it would be considered negligible. Further, deliveries would be staggered throughout the day and coordinated to be delivered at off-peak commute times. Because construction worker traffic is negligible and material truck trips would be staggered through the day, traffic from construction trips is not expected to create a significant impact on the street system. While impacts are expected to be less than significant, incorporation of MM TRANS-1 Construction Worker Shuttles will ensure construction worker daily trips to the site are consolidated.

During the various construction phases of the project, travel by construction workers and truck hauling of supplies and disposal would generate trips on the regional and local transportation system surrounding construction site. These trips would represent temporary increases during

defined phases of construction and, upon completion of construction, would cease. The primary off-site impacts resulting from the movement of construction trucks would include a short-term and intermittent lessening of roadway capacities due to the slower movements and larger turning radii of the trucks compared to passenger vehicles. Drivers could experience delays if they were traveling behind a heavy truck. It is assumed that the soil hauling truck traffic would occur before the morning and afternoon peak commute hours. As such, the construction traffic impacts on the regional transportation network associated with the project would be short-term in nature and limited to the period of time when construction activity is taking place.

The added traffic would be most apparent on the local roadways serving the site, but as described above, this would be short-term in nature and the vehicle the trips would be distributed throughout the day (not all 58 vehicle trips would occur during the AM or PM peak hours). In addition, temporary street closures along Canal Court and Hurricane Street (see Chapter 2, Project Description) would not result in adverse traffic impacts on surrounding neighbors since alternate access would be available. Therefore, the Proposed Project would not exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit, and impacts would be **less than significant**; no mitigation measures are required.

TRANS-2. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

The CMP arterial monitoring intersection nearest to the Project Site is located at Lincoln Boulevard (SR 1) and SR 90 (Marina Expressway), which is approximately 1.2 miles to the northeast. Additionally, two additional arterial monitoring locations are located at the intersection of Lincoln Boulevard and Venice Boulevard (SR 187), approximately 1.3 miles to the northwest of the Project Site. As described above, the CMP requires analysis of traffic conditions at all CMP arterial monitoring intersections where the Proposed Project would add 50 or more trips during either the AM or PM weekday peak hours of adjacent street traffic. The CMP also requires that traffic studies analyze mainline freeway monitoring locations where the project would add 150 or more trips in either direction during either AM or PM weekday peak hours. As noted previously, the Proposed Project would add up to an estimated 58 daily trips, spread over an approximately 9-hour period, related to excavation, material deliveries, and worker commutes during the construction phase of the Proposed Project (construction hours are proposed to be Monday through Saturday from 8:00 a.m. to 6:00 p.m.; soil trucks are proposed to be at the Project Site only between 9:00 a.m. and 4:00 p.m. [see MM NOI-1]). As such, the project would not trigger a CMP analysis and implementation of the Proposed Project would not result in a potentially significant impact related to an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways. Therefore, impacts would be **less than significant**, and no mitigation measures are required.

TRANS-3. Result in inadequate emergency access

The entire Project Site would be fenced and Hurricane Street, between Canal Court and the Esplanade, would be permanently closed to the public. During Stage 1 of construction, a portion of Hurricane Street and Canal Court would be temporarily closed. Both Hurricane Street and Canal

Court are currently narrow roadways that do not allow two vehicles to pass at the same time. This condition creates the need for drivers to wait to pass one another. Construction activities would maintain this similar condition. During construction of the Proposed Project, procedures would be taken to ensure that all construction equipment, machinery, and construction personnel vehicles are kept off of these roadways. However, there is the potential for access to be temporarily blocked during loading and unloading activities or transport. As such, construction-related activities have the potential to result in temporary and periodic inadequate emergency access. Wherever possible, delivery trucks would be brought onto the Project Site and be loaded and unloaded within the perimeter fence of the construction site. To reduce the potential construction traffic impacts associated with the Proposed Project, Mitigation Measure MM-TRANS-2 would be implemented; this measure would require all construction activities to be conducted in accordance with an approved construction traffic control plan and requires advance notice to emergency service providers. This would serve to reduce the construction-related traffic impacts to the maximum extent feasible. MM TRANS-1 Construction Worker Shuttles would also help reduce construction-related traffic impacts on Hurricane Street. Therefore, construction of the Proposed Project would not result in inadequate emergency access and impacts would be **less than significant with mitigation**.

TRANS-4. L.8. Result in In-Street Construction Impacts

According to the *L.A. CEQA Thresholds Guide*, the determination of significance related to in-street construction shall be made on a case-by-case basis, considering several factors. These are each discussed below.

Temporary Traffic Impacts

The City of Los Angeles has established threshold criteria to determine significant traffic impacts of a Proposed Project in its jurisdiction. Although the methodologies and the criteria to calculate volume-to-capacity (V/C) ratios for intersections are intended by LADOT to identify potential traffic impacts during operation, they can also be applied to construction periods.

Under the City of Los Angeles guidelines, a project would be considered to significantly affect a local residential street if the projected increase in daily traffic volumes is as follows:

Projected Average Daily Traffic (ADT) with Project (Final ADT)	Project-Related Increase in ADT
0 to 999	120 or more
1,000 to 1,999	12% or more of final ADT
2,000 to 2,999	10% or more of final ADT
3,000 or more	8% or more of final ADT
Source: Fehr & Peers 2016.	

Based on these guidelines, VAPP construction activity would not result in any significant traffic impacts on study area streets because the maximum number of daily project trips is estimated to be 58 one-way trips (or 108 PCEs), which is below the minimum threshold volume considered significant. Therefore, the Proposed Project's in-street construction impacts related to temporary traffic impacts would be **less than significant**, and no mitigation measures are required.

Temporary Loss of Access

The entire Project Site would be fenced and Hurricane Street, between Canal Court and the Esplanade, would be closed to the public. During Stage 1 of construction, a portion of Hurricane Street and Canal Court would be temporarily closed and pedestrian access to the Grand Canal from Hurricane Street would be eliminated; pedestrians would be diverted to Galleon Street one block to the north or would be able to utilize Canal Court extending south to the Esplanade. Hurricane Street and Esplanade would be re-opened to pedestrian access on the west side of the Grand Canal following completion of Stage 6 of construction. Therefore, the Proposed Project would result in temporary loss of access impacts that would be **less than significant**; no mitigation measures are required**.**

Temporary Loss of Bus Stops or Rerouting of Bus Lines

The nearest bus stop to the Project Site is located at the corner of Pacific Avenue and Hurricane Street, approximately 0.7 mile to the west. Construction activities would not result in disruption to the existing bus stop or bus service, as no improvements would occur within the vicinity of the bus stop. Additionally, access to this bus stop would remain unchanged throughout project construction. Therefore, the Proposed Project **would not result in in-street construction impacts** related to temporary loss of bus stops or rerouting of bus lines; no mitigation measures are required**.**

Temporary Loss of On-Street Parking

As noted in the Parking Assessment Memorandum (Fehr & Peers 2016), within a study radius of 0.3 mile, there are an estimated 763 publicly available parking spaces, including 399 publicly available on-street spaces and 364 spaces at the public parking lot. This also includes 8 time-restricted parking spaces and 391 unrestricted parking spaces. During construction, a portion of Hurricane Street and Canal Court would be temporarily closed and parking spaces on Hurricane Street between Canal Court and the Esplanade would be unavailable. The loss of these spaces represents 0.65% of the total parking supply in the area.

Hurricane Street, where the Project Site is located, contains restricted on-street parking and parking is prohibited on Canal Court. There are approximately 19 parking spaces along Hurricane Street between Canal Court and Pacific Avenue. On weekend peak hours, parking on Hurricane Street is highly utilized and is greater than 85 percent. On weekday peak hours, parking on Hurricane Street is also highly utilized and is greater than 85 percent on the south side of the street but has a lower utilization less than 50 percent on the north side of the street. During construction, the loss of these on-street parking spaces would be expected to result in an increase in vehicles circling through the neighborhood as they seek available parking close to their residence. This impact could be adverse during peak hours, but is not considered to be significant because of the temporary nature of the construction activities. In addition, it is not considered significant because, within approximately 1,000 feet of the Project Site, at least 70 spaces are available during the weekday peak period and at least 11 spaces are available during the busier weekend peak period. It is noted however, that during peak times on peak summer weekend days and weekdays and holidays, it is recognized that parking utilization is higher than what was observed on the survey dates. On those days, the loss of these on-street spaces would be expected to result in a further increase in vehicles circling through the neighborhood as they seek available parking close to their destinations.

Because there is adequate supply during normal peak periods (the loss of these spaces represents less than 1% of the total parking within a 0.3-mile radius) and the loss of parking would be a temporary impact that would occur only during construction, as parking spaces would be provided at the 128 Hurricane Street lot upon completion of the Proposed Project, the Proposed Project **would not result in significant in-street construction impacts** related to loss of on-street parking, and no mitigation measures are required.

3.10.3.5 Operational Impacts

The analysis below describes the permanent impacts related to traffic and transportation anticipated as a result of the Proposed Project during operation.

TRANS-1. Exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit

The Proposed Project would require a total of six full-time employees, with two employees per shift working three consecutive eight-hour shifts. It is assumed that these employees would generally arrive two at a time to the job site via their personal automobiles and park at the 128 Hurricane Street lot. The addition of these twelve new one-way operation-related trips to the circulation and/or intersection or highway/freeway network would not generate levels that would exceed the capacity of these systems. Similarly, these trips would not exceed the capacity of the existing mass transit, pedestrian, or bicycle path system since adequate capacity currently exists and they would not generate sufficient trips to overwhelm these systems.

Pedestrian access to the Esplanade and the associated Grand Canal and Ballona Lagoon from Hurricane Street would be maintained during operations. Access during operations would also continue to be available from existing locations along Galleon Street and Canal Court. As such, implementation of the Proposed Project would not exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit. **Therefore, no adverse impacts would occur, and no mitigation is required.**

TRANS-2. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways

As described above, the CMP requires analysis of traffic conditions at all CMP arterial monitoring intersections where the Proposed Project would add 50 or more trips during either the AM or PM weekday peak hours of adjacent street traffic. The CMP also requires that traffic studies analyze mainline freeway monitoring locations where the project will add 150 or more trips in either direction during either AM or PM weekday peak hours. The Proposed Project would require two full-time employees (per shift) during operation, which would generate up to six new daily one-way trips. Implementation of the Proposed Project would not add 50 or more trips during either the AM or PM weekday peak hours of adjacent street traffic. As such, the Proposed Project would not result in a potentially significant impact related to an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other

standards established by the county congestion management agency for designated roads or highways. **Therefore, no adverse impacts would occur, and no mitigation is required.**

TRANS-3. Result in inadequate emergency access

The roadways surrounding the Project Site would remain accessible during operation of the Proposed Project. In addition, the City requires that development plans be submitted to the City for review and approval to ensure that new development has adequate access, including driveway access and turning radius in compliance with existing City regulations. As such, operation-related activities do not have the potential to result in inadequate emergency access; **no impacts would occur, and no mitigation is required.**

TRANS-4. L.8. In-Street Construction Impacts

This threshold relates to construction impacts and does not apply to operational impacts. No further analysis is required.

3.10.4 Mitigation Measures

Proposed mitigation consists of the following measure to reduce the temporary adverse impacts associated with construction-period activity in the vicinity of the construction site. The implementation of the following mitigation measure would ensure that traffic/transportation impacts would be less than significant.

MM- TRANS-1: Construction Worker Shuttles

Construction workers would park at an off-site location and be shuttled to and from the Project Site each workday on 10 to 15-passenger shuttles or vans. While no specific off-site location has been identified at this time, it would likely lie within five miles of the Project Site. The selected contractor would be required to identify and secure a suitable location. In general, work is planned to occur between 8:00 a.m. and 6:00 p.m., and worker shuttles are expected to depart the site by 6:00 p.m.

MM-TRANS-2. Coordination with Emergency Service Providers

To minimize impacts on emergency access to the site during construction, the contractor, on behalf of the LABOE, shall coordinate with emergency service providers (police, fire, ambulance and paramedic services), prior to initiating construction, to provide advance notice of any lane closures, construction hours, and changes to local access and to identify alternative routes where appropriate.

3.10.5 Significant Unavoidable Adverse Impacts

There would be no significant unavoidable adverse impacts to traffic/transportation conditions due to implementation of the Proposed Project.

3.10.6 Cumulative Impacts

The study area for the cumulative traffic analyses encompasses the streets and roadways in the vicinity of the Project Site. Since the Proposed Project would result in no adverse operational traffic

or parking impacts, it would not contribute to any adverse cumulative operational impacts that could occur due to related growth and development, and no further discussion is required. With regards to cumulative traffic impacts during construction, eight related projects (see Chapter 1) have been identified in the study area. Only two of those projects, Via Dolce Park and Venice Dual Force Main, have identified construction schedules that would overlap with VAPP. As shown in Table 3.10-1, two of six study intersections were projected (2011) to operate at unacceptable levels of service of E or F during one or both peak hours. Construction traffic generated by the two related projects could result in additional congestion at these and other intersections in the project area. As discussed in the VAPP construction impact analyses above, the Proposed Project could generate up to 48 daily vehicle trips during the construction period. Those vehicle trips, combined with the construction vehicle trips due to the related projects, could cumulatively exacerbate already congested conditions at study area intersections. However, the impacts due to construction traffic would be temporary, and as noted above, the City of Los Angeles considers construction-related traffic impacts adverse but not significant because such impacts, while sometimes inconvenient, are only temporary. Therefore, the Proposed Project's contribution to significant cumulative traffic impacts during construction would not be cumulatively considerable.

3.11 Energy

This section describes the potential energy impacts of the Venice Auxiliary Pumping Plant (VAPP; Proposed Project). It includes a discussion of existing regulatory requirements, energy setting within the project area, and construction and operational energy requirements and associated impacts that would result from implementation of the Proposed Project. As noted in the analysis in this section, impacts during construction and operation would be less than significant and no mitigation measures are required.

3.11.1 Regulatory Setting

A review of the various federal, state, regional, and local government regulatory requirements was conducted to identify those related to energy. This section summarizes the various regulatory requirements that are relevant and applicable to the Proposed Project.

3.11.1.1 Federal Regulations

There are federal no laws or regulations related to energy applicable to the Proposed Project.

3.11.1.2 State Regulations

California Energy Commission

Created by the legislature in 1974, the California Energy Commission (CEC) is the state's primary energy policy and planning agency and is responsible for, among other things, forecasting future energy needs for the state. Senate Bill 1389 (Chapter 568, Statutes of 2002) requires the CEC to prepare a biennial Integrated Energy Policy Report. This report contains an integrated assessment of major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors, and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety. The Commission adopted the 2015 Integrated Energy Policy Report on February 10, 2016.

3.11.1.3 Local Regulations

City of Los Angeles

Los Angeles Department of Water and Power: Power Integrated Resource Plan

Released to the public in December 2014, the Power Integrated Resource Plan identifies a portfolio of power generation resources and power system assets that would meet the City of Los Angeles' future energy needs, with the lowest cost and risk possible, consistent with the Los Angeles Department of Water and Power's (LADWP's) environmental priorities and reliability standards. Updates in the 2014 Power Integrated Resource Plan include new energy efficiency programs to achieve 15 percent energy efficiency savings by 2020, a Demand Response Implementation Plan with a goal to achieve 506 megawatts (MW) of demand response by 2026, and an energy storage procurement target of 178 MW by 2021 to support increased levels of renewable energy.

Building Construction Standards

Title 24 of the California Code of Regulations establishes energy conservation standards for new construction within the state of California. These standards are related to insulation requirements, glazing, lighting, shading, and water and space heating systems. The Los Angeles Municipal Code incorporates these state requirements (Section 91.1300).

The Los Angeles Green Building Code is based on the 2013 California Green Building Standards Code, commonly known as "CALGreen," which was developed and mandated by the state to attain consistency among the various jurisdictions within the state and reduce energy and water use, waste, and the overall carbon footprint in buildings. As of January 2011, all new buildings, additions, and building alterations for buildings valued at more than $200,000 are subject to the Green Building Code.

3.11.2 Environmental Setting

This section describes the environmental setting related to energy. It is intended to assist in the evaluation of impacts provided below and in the formation of required mitigation measures, if necessary.

LADWP provides electricity in the project area, as well as to approximately 1.4 million residential and business consumers in its service area. LADWP's service area includes a 465-square-mile swath in Los Angeles and the Owens Valley in the eastern Sierra Nevada region. Current electricity use is approximately 23,600 gigawatt-hours (GWh) annually. LADWP forecasts providing 24,000 GWh to customers in 2020 (LADWP 2014: p. 115).

The Project Site is currently vacant and as such, no public utilities serve the site. The adjacent Venice Pumping Plant (VPP) has 5 pumps (two duty and three backup), each of which has an 18-million-gallons-per-day (mgd) design capacity, which consumes approximately 6.5 million kWh per year based on an annualized 36-mgd flow (Arcadis 2016). The LADWP provides electrical service to the VPP, while natural gas service is provided by The Gas Company. In addition, VPP is served by a 1500-kW diesel generator and two parallel 750-kW diesel generators, which provide standby power in the event of loss of LADWP power or for maintenance purposes. The pumps and generators are the primary components of the VPP responsible for energy consumption, and the other equipment is responsible for minor amounts of energy use.

3.11.3 Environmental Impact Analysis

3.11.3.1 Methodology

Construction

The estimate of construction-related energy use was calculated by applying the U.S. Environmental Protection Agency– (EPA-) derived carbon dioxide equivalent (CO_2e) emissions per gallon of fuel to the total CO_2e emissions projected by the California Emissions Estimator Model (CalEEMod) in the air quality and GHG emissions analysis prepared for the Proposed Project. These calculations are included in Appendix B [Air Quality Emissions and Greenhouse Gas Calculations] of this EIR. Section 3.2, Air Quality, includes details on construction equipment and activity assumptions that were used to estimate CO_2e emissions. Emissions were then converted to million British thermal units (MMBTU) using energy unit conversion factors. Consistent with the GHG analysis methodology (see Section 3.6,

Greenhouse Gases of this EIR), the construction-period energy use was amortized over the expected 30-year life of the Proposed Project.

Operation

Based on information provided by the project design team (Arcadis), the proposed pumps at VAPP would be more efficient than the existing pumps at VPP. Because the Proposed Project would create redundancy to help ensure system reliability, the additional pumping capacity would not be needed except during wet-weather events. Assuming an annualized 36-mgd flow for the combined VPP and VAPP facility, there would be little change in overall energy consumption related to pumping. However, there would be an increase in energy consumption related to the operational control room, which would consume 570,000 kWh per year. Additional electricity consumption was assumed based on CalEEMod defaults, bringing the total electricity consumption to approximately 630,000 kWh annually (see Appendix B of this EIR) (Arcadis 2016). This figure was converted to MMBTU using energy unit conversion factors to allow for comparison with the energy use during the construction period. In addition to the electricity use from the Proposed Project, energy use from mobile, waste, and water sources would occur, which was calculated using the GHG output from CalEEMod (see Appendix B of this EIR). As was done for the construction period, CO_2e emissions were converted to gallons of fuel and MMBTU.

The discussion below identifies potential impacts from the Proposed Project and the measures that would be required to mitigate impacts that are found to be potentially significant.

3.11.3.2 Screening Analysis

As noted in Section Chapter 1.0, Introduction, the analysis and conclusions contained in the Initial Study (see Appendix A [Notice of Preparation/Initial Study] of this EIR) prepared for the Proposed Project considered and then eliminated a number of impacts from further analysis, including those contained in CEQA Appendix G and the *L.A. CEQA Thresholds Guide* (2006). Therefore, only those impacts and corresponding thresholds of significance noted below were determined to require further analysis and are addressed in this EIR.

3.11.3.3 Thresholds of Significance

According to the *L.A. CEQA Thresholds Guide*, the determination of significance with respect to energy impacts shall be made on a case-by-case basis, considering the following factors:

ENERGY-1. The extent to which the project would require new (off-site) energy supply facilities and distribution infrastructure, or capacity enhancing alterations to existing facilities;

ENERGY-2. Whether and when the needed infrastructure was anticipated by adopted plans; and

ENERGY-3. The degree to which the project design and/or operations incorporate energy conservation measures, particularly those that go beyond City requirements.

3.11.3.4 Construction Impacts

The analysis below describes the temporary and permanent impacts related to energy anticipated as a result of the Proposed Project during construction.

ENERGY-1. The extent to which the project would require new (off-site) energy supply facilities and distribution infrastructure, or capacity enhancing alterations to existing facilities

During the construction period, equipment and vehicles would be primarily powered by diesel fuel and would likely require minimal electricity. Table 3.11-1 shows the construction-period fuel use and equivalents in MMBTU, which would be 9,500 MMBTU over the entire period, or approximately 300 MMBTU when amortized over the anticipated 30-year life of the project.[1] Construction-period energy use includes energy that would be used in worker commute trips as well as haul trips and equipment use, which would result in the consumption of an estimated 66,000 gallons of fuel.

Although fuel would be consumed by construction vehicles and equipment, the fuel consumption would be temporary in nature and would represent a negligible increase in regional demand, and an insignificant amount relative to the more than 18 billion gallons of on-road fuels used in the state in 2013, an increase of approximately 0.000004 percent (California Energy Commission 2014). Given the extensive network of fueling stations throughout the project vicinity and the fact that the 2-year construction period would be short-term, no new or expanded sources of energy or infrastructure would be required to meet the energy demand associated with project construction. As such, construction impacts related to the extent to which the project would require new (off-site) energy supply facilities and distribution infrastructure, or capacity enhancing alterations to existing facilities would be **less than significant**, and no mitigation measures are required.

Table 3.11-1. Construction-Period Energy Use Estimate

	Diesel Fuel Use (gallons)	MMBTU
Overall Construction Energy Use	68,600	9,500
Amortized Construction Energy Use [a]	2,300	300

All figures have been rounded to the nearest 100.
[a] Construction energy use was amortized over the assumed 30-year life of the Proposed Project, consistent with the GHG analysis methodology
Source: CalEEMod modeling and conversion calculations by ICF 2016 (see Appendix B of this EIR).

ENERGY-2. Whether and when the needed infrastructure was anticipated by adopted plans

As discussed above, diesel fuel would be the primary energy source used during the construction period. Although there are no adopted local or regional plans regulating the supply and demand related fuels, given the extensive network of fueling stations throughout the project vicinity, the existing fuel infrastructure is expected to accommodate the increased construction-period demand for fuel introduced by the Proposed Project. Therefore, **no impact** would occur related to whether and when the needed infrastructure was anticipated by adopted plans, and no mitigation measures are required.

[1] Consistent with the methodology for GHG emissions, construction-period energy consumption is divided over the anticipated 30-year life of the proposed Project. Although construction would occur over a 2-year period, this method is intended to apportion the upfront energy consumption over the life of the proposed Project.

ENERGY-3. The degree to which the project design and/or operations incorporate energy conservation measures, particularly those that go beyond City requirements

There are no specific energy conservation measures proposed as part of construction activities. All equipment would be used in compliance with the manufacturer's specifications. As such, construction of the Proposed Project is not expected to result in the wasteful or inefficient use of energy. Therefore, impacts related to the degree to which the project design and/or operations incorporate energy conservation measures, particularly those that go beyond City requirements would be **less than significant**, and no mitigation measures are required.

3.11.3.5 Operational Impacts

ENERGY-1. The extent to which the project would require new (off-site) energy supply facilities and distribution infrastructure, or capacity enhancing alterations to existing facilities

Project operation would involve the use of electricity to power pumps and equipment (such as computers, servers, and mechanical systems), as well as to provide lighting. Energy would also be used in the transport of potable water and solid waste associated with the electrical building and as fuel in 3 employee vehicles commuting to and from the Project Site on a daily basis. Table 3.11-2 shows the energy requirements of the Proposed Project and the equivalents in MMBTU, which would be 3,100 MMBTU annually. Diesel use by the backup generator and by maintenance vehicles at the site was not quantified, as it would be an infrequent occurrence of limited duration. However, this energy consumption would be a nominal addition to the regular energy use identified in Table 3.11-2.

Table 3.11-2. Operational Energy Use Estimate

	Annual Energy	Annual MMBTU
Existing Energy Use		
Electricity (VPP only)	6.5 Million kWh	22,100
Proposed Project Energy Use		
Electricity (VAPP only)	632,400 kWh[a]	2,200
Natural Gas		200
Mobile	1,200 gallons fuel	300
Waste	12.4 tons[b]	100
Water	2.3 million gallons[b]	300
	Total Proposed Increase	*3,100*

All MMBTU figures have been rounded to the nearest 100.
[a] Based on the sum of the 570,000 kWh estimate provided by Arcadis and CalEEMod defaults for miscellaneous electricity requirements (lighting, heating and cooling, etc.)
[b] CalEEMod output provided based on default square footage building type.
Source: CalEEMod modeling and conversion calculations by ICF 2016 (see Appendix B of this EIR).

As discussed in Chapter 2, Project Description, new tie-ins to LADWP electricity sources would be required for project operation. The electricity required annually for operation of the pumps and electrical building would constitute a new energy demand and would increase the consumption of electricity in the LADWP service area relative to existing conditions. However, this project-related increase of approximately 630,000 kWh (2,200 MMBTU) represents a very small portion (approximately 0.00003 percent) of the 24,000 GWh (82 million MMBTU) of electricity that LADWP

forecasts providing to customers in 2020 (LADWP 2014: p. 115). It is anticipated that LADWP would be capable of meeting the electricity demands of the Proposed Project and that the Project would not require new electricity infrastructure beyond that which is existing or has been previously planned. Similarly, the Proposed Project's demand for natural gas (approximately 200 MMBTU, according to estimate calculated in Appendix B of this EIR) would be able to be met by existing supplies provided by The Gas Company. The Proposed Project is consistent with City and countywide efforts to maintain and improve the wastewater collection system. Therefore, impacts related to the extent to which the project would require new (off-site) energy supply facilities and distribution infrastructure, or capacity enhancing alterations to existing facilities would be **less than significant**, and no mitigation measures are required**.**

ENERGY-2. Whether and when the needed infrastructure was anticipated by adopted plans

As discussed in Section 3.2, Air Quality, the Proposed Project is consistent with the wastewater provisions contained within the Framework Element of the City of Los Angeles General Plan. In addition, The Bureau of Engineering has programmed the Proposed Project as part of its Wastewater – Collection System Program (City of Los Angeles 2016). LADWP has adopted the Power Integrated Resource Plan to manage the electricity needs of the City's inhabitants, which includes energy used for wastewater pumping.

Thus, the improvements proposed by the Project have been identified as needed infrastructure in adopted plans. Therefore, impacts related to whether and when the needed infrastructure was anticipated by adopted plans would be **less than significant** and no mitigation measures are required.

ENERGY-3. The degree to which the project design and/or operations incorporate energy conservation measures, particularly those that go beyond City requirements

The objective of the Proposed Project is to provide redundancy for increased system reliability and pumping capacity to the reduce risk of sewage overflows during extreme wet weather events. Energy conservation has been incorporated into the Proposed Project design through use of variable frequency drives (VFD) for the pumps. VFD will adjust motor speed to vary discharge flows, allowing for the most efficient pump operation. The electrical building would also be constructed in compliance with all applicable provisions of the City of Los Angeles Building Code, which includes the provisions of the Green Building Code. Despite the purpose of the Proposed Project to achieve redundancy and capacity increases, the Proposed Project would be as efficient as possible; Therefore, impacts related to the degree to which the project design and/or operations incorporate energy conservation measures, particularly those that go beyond City requirements would be **less than significant**, and no mitigation measures are required.

3.11.4 Mitigation Measures

No mitigation measures are required.

3.11.5 Significant Unavoidable Adverse Impacts

There would be no significant unavoidable impacts related to energy either during construction or operation of the Proposed Project.

3.11.6 Cumulative Impacts

As discussed above, the energy use that would result from implementation of the Proposed Project would be negligible relative to the regional market. However, the increased electricity consumption associated with the Proposed Project in combination with future projects within LADWP's service area may require new electricity transmission infrastructure or the rehabilitation of existing electricity infrastructure to meet that increased demand and maintain adequate levels of service, notwithstanding future savings resulting from increased energy efficiency. Although LADWP has planned for long-term increases in demand, new supply and delivery infrastructure facilities could be required to meet increased regional demands. Where LADWP has identified specific individual projects that are required to meet future projected regional cumulative demands and determined that construction or operation of those projects would result in significant impacts to the environment, then the cumulative impact of the Proposed Project and other projects in the LADWP service area would be considered significant. Therefore, for the purposes of this EIR, it is concluded that the Proposed Project could result in a cumulatively considerable contribution to a potentially significant cumulative energy impact.

Chapter 4
Comparison of Alternatives

4.1 Introduction

State CEQA Guidelines Section 15126.6 requires that an EIR describe a range of reasonable alternatives to a project that could feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any significant environmental impacts. According to the State CEQA Guidelines, the EIR should compare merits of the alternatives and determine an environmentally superior alternative. The range of alternatives discussed in an EIR is governed by the "rule of reason," which requires the identification of only those alternatives necessary to permit a reasoned choice between the alternatives and the proposed project. An EIR need not consider an alternative that would be infeasible. State CEQA Guidelines Section 15126.6(f)(1) explains that the evaluation of project alternative feasibility can consider "site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, and whether the proponent can reasonably acquire, control, or otherwise have access to the alternative site." The EIR is also not required to evaluate an alternative that: (1) has an effect that cannot be reasonably identified or that has remote or speculative implementation and (2) would not achieve the basic project objectives.

4.2 CEQA Alternatives

Pursuant to the CEQA requirements identified in Section 4.1 above, alternatives to the Proposed Project were developed for this EIR that would obtain many or most of the objectives of the Project and would avoid or substantially lessen one or more of the Proposed Project's significant environmental impacts.

The basic objectives of the Proposed Project are:

- Prevent potential impacts on human and environmental health caused by sewage spills from the existing Venice Pumping Plant during extreme wet-weather events;
- Increase reliability to the system by providing redundancy to pumping capacity to improve system reliability and to allow regular service and maintenance activities to take place without compromising the ability of the City of Los Angeles (City) to maintain pumping capacity and minimize the risk of sewage overflows; and
- Address future risks related to climate change, including increased storm intensities and sea level rise, which have the potential to result in flows that would be beyond the capacity of the existing VPP.

The Proposed Project would result in the following significant and unavoidable impacts:

- Noise and Vibration – during construction activities, impacts related to noise and vibration would be significant and unavoidable, despite the application of mitigation measures.

- Land Use – during construction activities, secondary impacts to surrounding land uses would occur related to noise and vibration. These impacts would be significant and unavoidable, despite the application of mitigation measures.

Based on the above, the following alternatives to the Proposed Project have been identified:

- No Project/No Build Alternative
- Alternative 1 – Construct Venice Auxiliary Pumping Plant and Permanently Vacate Hurricane Street between Canal Court and Esplanade

These alternatives are described below.

4.2.1 No Project/No Build Alternative

As required by CEQA Guidelines Section 15126.6 (e), under the No Project/No Build Alternative, the Proposed Project would not be implemented. The existing Venice Pumping Plant (VPP) would operate in its current condition with normal and planned upgrades and maintenance. Rental of temporary pumps and associated piping and back-up generators would be undertaken, as needed to address extreme wet-weather or dry weather events and/or when existing pumps are either down or undergoing maintenance (up to three pumps and two diesel generators). As in the past, temporary pumps and piping would be located at-grade within Hurricane Street between Canal Court and Esplanade. There is a minimum three-week set up time to bring the equipment on-line. Hurricane Street (between Canal Court and Esplanade) would be closed to the public during this time period. The equipment would operate 24 hours per day.

4.2.2 Alternative 1 – Construct Venice Auxiliary Pumping Plant and Permanently Vacate Hurricane Street between Canal Court and Esplanade

This alternative would be identical to the Proposed Project, except that Hurricane Street would be permanently vacated between Canal Court and Esplanade. Both coastal access and existing parking would be eliminated and no public access to the Venice Auxiliary Pumping Plant (VAPP; Proposed Project) or existing VPP would be allowed. The site would be fenced and controlled via secured and gated access.

4.2.3 Alternatives Considered but Rejected As Infeasible

Section 15126.6(c) of the State CEQA Guidelines requires EIRs to identify any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process, and briefly explain the reasons underlying the lead agency's determination.

4.2.3.1 Use of Temporary At-grade Pumps with External Piping at Venice Pumping Plant and/or Along Hurricane Street

This alternative would include the periodic and temporary use (e.g., Fall through Spring or potentially year round) of rented pumps (three) and associated external piping and back-up diesel generators (three) installed at-grade and on-site within the existing VPP and/or within Hurricane Street (between Canal Court and Esplanade, in lieu of the Proposed Project Site). A new Control

Room would be installed at the VPP. In addition, there is a minimum three-week set up time to bring the equipment on-line. Hurricane Street (between Canal Court and Esplanade) would be closed to the public during this time period. The equipment would operate 24 hours per day. It would also require the demolition of the existing Concrete Masonry Unit (CMU) on top of the newly constructed Venice Manifold (located along Hurricane Street between Canal Court and Esplanade).

Preliminary evaluations indicate that there is little or no available space to house the required pumps and associated piping and back-up generators on-site at the VPP and as such, all equipment would likely need to be installed along Hurricane Street between Canal Court and Esplanade. Since the Venice Manifold Project is currently installed within Hurricane Street any maintenance or repairs to that facility would require removal of the temporary pump equipment and its re-installation. This could result in system operation issues and compromise required redundancies, potentially resulting in catastrophic failure, requiring emergency discharges directly to the Grand Canal and Ballona Lagoon or overflows into the surrounding street network. A preliminary analysis indicates that there is no space available in the existing VPP Control Room to allow for construction of new control facilities. System operation and safety could also potentially be compromised during testing and migration of the control system. This alternative would reduce future risks related to climate change, including increased storm intensities and sea level rise, which have the potential to result in flows that would be beyond the capacity of the existing VPP. It would also provide the required redundancy needed to operate the facility safely and reduce the potential for catastrophic failure. However, as noted below, it would not be able to obtain the required design capacity of 87 million gallons per day (mgd).

Because there is little available space, it is unclear if operational or safety issues would be adequately addressed, including redundancy or sewage bypass capabilities. Similar to the No Build Alternative, this alternative depends on temporary, in lieu of permanent pumping facilities and associated piping and back-up generators in a provisional location and does not solve the long-term needs of the VPP. The use of these pumps and associated equipment in an outdoor environment are also expected to result in more frequent maintenance, breakdowns, and repairs. The anticipated combined pumping capacity of the five existing pumps at the VPP and the three temporary pumps would be between 60 and 65 mgd, which would be below the required design capacity of 87 MGD.

In addition to lack of space to construct the required improvements, the pumps would be required to operate 24-hours per day, seven-days per week, continuously and outdoors along Hurricane Street within a residential neighborhood. Their operation would also likely produce unacceptable noise levels, nuisance odors, and adverse air quality (diesel emissions from the back-up generators), which could affect adjacent sensitive receptors.

The number of near-misses and associated potential for catastrophic failure at the VPP have increased since the 1990s and is expected to worsen, due to climate change and associated sea-level rise and increased storm intensity and frequency. The current VPP does not have standard redundancies in place to address pump failure or required maintenance and therefore, cannot divert flows from the coastal interceptor sewer (CIS) collection area (see Chapter 2, Project Description of this EIR). In the event of catastrophic failure, untreated sewage flows would need to be diverted to the Grand Canal and Ballona Lagoon, both of which are designated as Sensitive Ecological Areas. In addition, the VPP does not contain a modern Control Room, which is needed for flow and pump monitoring.

This alternative could result in potential health and safety risks to area residents and wildlife.

4.2.3.2 Build new Plant on Proposed Site and Decommission and Demolish existing Venice Pumping Plant

This alternative would entail the construction of a new pumping plant on the Proposed Project Site and then decommissioning and demolishing of the existing plant. The new facility would be designed to handle the operational design capacity of the VPP and Proposed VAPP (87 mgd), as described for the Proposed Project (see Chapter 2, Project Description of this EIR) and would meet some, but not all of the project objectives. The lot of the demolished VPP would be converted to an open space area to enhance coastal access.

This alternative would not minimize the potential for sewage spills from the existing VPP because the two available parcels would not be able to physically accommodate the Proposed Project's electrical building and eight pumps (even if submersible pumps were assumed, which have a reduced footprint) required to meet the design capacity of 87 mgd. During extreme wet-weather events, it would not prevent potential impacts on human and environmental health due to the risk of sewage spills from the existing VPP. Moreover, this alternative would not satisfy the objective of providing redundancy to pumping capacity to improve system reliability and allow regular service and maintenance activities to take place without compromising the City's ability to address issues related to the risk of sewage overflows. It would also not address future risks related to climate change, including increased storm intensities and sea- level rise, which have the potential to result in flows that would be beyond the capacity of the existing VPP.

As noted above, there is insufficient space to construct a new plant and associated eight pumps on the two available parcels proposed for the VAPP and therefore, this alternative would not avoid severe operational and safety problems.

A new pumping plant cannot be physically constructed within the two available parcels, despite the installation of submersible pumps. As such, this alternative does not avoid unacceptable adverse social, economic or environmental impacts since it would not solve the VPP's long-term pumping capacity needs. It would also not allow for routine maintenance of pumps, which requires that they be taken off-line for service or in the event of pump failure (including multiple pumps), the ability of the system to have adequate back up or redundancy. Therefore, this alternative would not allow for avoidance of a catastrophic sewage spill into the Grand Canal and Ballona Lagoon, resulting in potential environmental damage and health and safety issues.

This alternative could result in potential health and safety risks to area residents and wildlife.

4.2.3.3 Expand Existing Venice Pumping Plant and Install Pumps and Piping Below-grade

This alternative would entail installation of three permanent pumps and associated piping underground and would require expansion of the existing VPP. Since the Venice Manifold Project is located within Hurricane Street and the Grand Canal and Ballona Lagoon are located to the east and south, respectively, expansion would be limited to the west within Canal Court and the adjacent vacant City-owned parcel at 128 Hurricane Street. Although the exact configuration of the design is not known, it is likely that installation of the three new pumps and associated piping would occur underground within Canal Court (between Hurricane Street and Esplanade). The back-up diesel generators would likely be installed within the adjacent vacant parcel at 128 Hurricane Street. It is not clear where the diversion structure between the VPP and the CIS would be located and

therefore, additional investigation is required. A new Control Room would be installed at the VPP (pending elimination of the existing one), within the adjacent vacant parcel at 128 Hurricane Street, or off-site at the Hyperion Treatment Plant in Playa del Rey.

This alternative would not minimize the potential for sewage spills from the existing VPP, provide redundancy to pumping capacity, and allow regular maintenance activities to occur, and would not address future risk related to climate change, including increased storm intensities and sea-level rise, which have the potential to result in flows that would be beyond the capacity of the existing VPP. This alternative has several inherent challenges and problems (see discussion below).

This alternative has several design and operational challenges that would need to be addressed to ensure that the VPP can be safely operated during construction. In particular, substantial modifications to the existing VPP would be required, necessitating taking it off-line for an extended period and the installation of temporary pumps. Because there is currently no by-pass mechanism for sewage flows from the CIS, this cannot be done since the VPP is required to pump sewage continually to avoid a catastrophic spill event or back-up into the Grand Canal, Ballona Lagoon, or adjacent street network. In addition, the CIS is located on the east side of the VPP and therefore, the existing wet well would have to be expanded to the west to make the connection. This would require extensive modifications to the existing VPP. Moreover, extensive modifications would be required in order to connect to the Venice Manifold (located within Hurricane Street between Canal Court and Esplanade) and to access the existing wet well. It is unclear if this would be structurally feasible. Maintenance of the pumps would also be problematic due to access. It should also be noted that the Venice Manifold has been designed and constructed to accommodate the VAPP from the two available vacant parcels (proposed Project Site) and the future connection to the CIS.

Because no sewage by-pass exists and therefore, the VPP cannot be taken off-line, the implementation of this alternative could result in a catastrophic system failure resulting in sewage spills to the Grand Canal and Ballona Lagoon and adjacent street network. Such an event could endanger the health and safety of area residents and wildlife.

4.2.3.4 Construct VAPP Underground at Proposed Project Site Location with Control Room Located Off-site

This alternative would be identical to the Proposed Project and would entail the construction of permanent pumps and associated piping underground within the Proposed Project Site. The back-up diesel generators would likely be constructed in an enclosed housing and at-grade. However, the new Control Room would be located off-site and possibly at the Hyperion Treatment Plant in Playa del Rey.

This alternative would minimize the potential for sewage spills from the existing VPP, provide redundancy to pumping capacity and allow regular maintenance activities to occur, and would address future risk related to climate change, including increased storm intensities and sea-level rise, which have the potential to result in flows that would be beyond the capacity of the existing VPP.

This alternative would result in increased safety issues since the proposed facility would be un-manned and controlled remotely via a Control Room located at an off-site location, potentially within the Hyperion Treatment Plant. Ideally, the control room should be located on-site since this is a critical City facility. Moreover, this is the only collection and pumping station that is staffed 24

hours per day 365 days per year. There are also hard-wired systems that need to be monitored by staff continuously.

The absence of on-site staff and remote control of the plant increases the potential risk for catastrophic system failure and potential for a sewage spill that could affect the health and safety of adjacent residents and wildlife. The presence of staff on-site increases plant safety through physical monitoring and assessment of the system's capacity and performance.

4.2.3.5 Construct Auxiliary Pumping Plant at Alternate Location along Coastal Interceptor Sewer

This alternative would entail construction of permanent pumps and associated piping and back-up generators at an alternate location along the Coastal Interceptor Sewer. A new Control Room would be installed on-site at this location. In addition, a new force main would be required.

This alternative would not minimize the potential for sewage spills from the existing VPP, provide redundancy to pumping capacity, and allow regular maintenance activities to occur, and would not address future risk related to climate change, including increased storm intensities and sea-level rise, which have the potential to result in flows that would be beyond the capacity of the existing VPP.

The VPP is located at a "low-point" in the CIS conveyance system and must pump sewage underneath and across the Marina del Rey channel and then to the Hyperion Treatment Plant (located Playa del Rey), which entails an elevational difference of some 60 feet. Relocating the auxiliary pumps and diversion structure outside of this area would not provide the necessary hydraulic capacity and redundancy needed during wet-weather or extreme weather events and therefore, could result in a catastrophic spill events or back-up into the Grand Canal, Ballona Lagoon, or street network. This alternative could result in potential health and safety risks to area residents and wildlife.

4.2.3.6 Summary

On December 1, 2015 and on June 11, 2016, the City of Los Angeles, Bureau of Engineering and its design team conducted Project Development Team (PDT) meetings to develop, evaluate, and screen project alternatives. This was undertaken in order comply with CEQA and develop a reasonable range of alternatives for consideration in the Draft Environmental Impact Report (Draft EIR). The process was completed in two stages: (1) consultant development of potential alternatives for analysis and discussion; and (2) evaluation of feasible and infeasible alternatives. This information was then used by the PDT to refine the alternatives into what is now the Proposed Project that is described in Chapter 2 and evaluated in Chapter 3 of this EIR.

4.3 Evaluation of CEQA Alternatives

The impacts of each of the alternatives are briefly described below and are compared to the impacts of the Proposed Project. The analysis includes a discussion of a No Project/No Build Alternative as required under Section 15126(e)(1) of the State CEQA Guidelines so that decision-makers can compare the impacts of approving the Proposed Project with the impacts of not approving the Proposed Project. Other than the No Project/No Build Alternative, each of these alternatives would

meet most of the Proposed Project objectives described in Chapter 2, but only the Proposed Project meets them all. In addition, any alternatives that would result in less-than-significant impacts with mitigation that are similar to the Proposed Project, would be required to comply with the same mitigation measures as would be implemented for the Proposed Project.

4.3.1 No Project/No Build Alternative

Since the Proposed Project would not be implemented, short-term unavoidable significant impacts related to construction noise and vibration and land use and planning (related to construction noise and vibration) or potentially significant cumulative impacts associated with energy would not result. In addition, there are currently no diversions for bypassing the VPP and the pumping plant must continuously pump sewage flows from the CIS in order to avoid sewage backups. As such, this alternative would not provide the required redundancy needed to operate the VPP safely and reduce the potential for catastrophic failure. It would also not reduce future risks related to climate change, including increased storm intensities and sea level rise, which have the potential to result in flows that would be beyond the capacity of the existing facility and could result in potentially significant impacts related to health and safety and wildlife (due to a catastrophic sewage spill in the adjacent street system and Grand Canal and Ballona Lagoon). Because this alternatives would require the periodic rental and placement of pumps along Hurricane Street (between Canal Court and Esplanade), required to operate 24-hours per day, seven-days per week, these activities would produce unacceptable noise levels and nuisance odors and air quality (diesel emissions from the back-up generators) on adjacent sensitive receptors. None of the Proposed Project's objectives would be met by this alternative.

4.3.2 Alternative 1 – Construct Venice Auxiliary Pumping Plant and Permanently Vacate Hurricane Street between Canal Court and Esplanade

4.3.2.1 Aesthetics

Impacts would be similar to the Proposed Project.

4.3.2.2 Air Quality

Impacts would be similar to the Proposed Project.

4.3.2.3 Biological Resources

Impacts would be similar to the Proposed Project.

4.3.2.4 Cultural Resources

Impacts would be similar to the Proposed Project.

4.3.2.5 Geology and Soils

Impacts would be similar to the Proposed Project.

4.3.2.6 Greenhouse Gas Emissions

Impacts would be similar to the Proposed Project.

4.3.2.7 Hydrology and Water Quality

Impacts would be similar to the Proposed Project.

4.3.2.8 Land Use

Impacts would be similar to the Proposed Project, although a street vacation permit would be required and Hurricane Street between Canal Court and Esplanade would be permanently closed to the public and parking eliminated. The street vacation would not be consistent with California Coastal Commission policies regarding coastal access and parking. To address the elimination of existing street parking along Hurricane Street in this area, a total of eight parking spaces would be provided at 128 Hurricane Street, immediately west of the VPP. Although pedestrian access along Hurricane Street between Canal Court and Esplanade would be eliminated, additional alternate access would be available via Canal Court and Galleon Street. Therefore, impacts would be less than significant and no mitigation measures are required.

4.3.2.9 Noise & Vibration

Impacts would be similar to the Proposed Project.

4.3.2.10 Transportation/Traffic

Impacts would be similar to the Proposed Project. Hurricane Street extending from Canal Court to Esplanade would be permanently closed to the public and parking eliminated. To address the elimination of existing street parking along Hurricane Street in this area, a total of eight parking spaces would be provided at 128 Hurricane Street, immediately west of the VPP. Although pedestrian access along Hurricane Street between Canal Court and Esplanade would be eliminated, additional alternate access would be available via Canal Court and Galleon Street. Therefore, impacts would be less than significant and no mitigation measures are required related to access. In addition, as with the Proposed Project, with the implementation of mitigation measures, direct and indirect impacts associated with transportation/traffic conditions during construction and operation of the Proposed Project would be less than significant.

4.3.2.11 Energy

Impacts would be similar to the Proposed Project.

4.3.2.12 Project Objectives Met

Under this alternative, all project objectives would be met, similar to the Proposed Project. Impacts during both construction and operation would be similar to the Proposed Project with the exception of pedestrian and vehicular access. Under this alternative, Hurricane Street between Canal Court and Esplanade would be vacated (closed) and public access permanently eliminated. This project component would reduce available area parking to residents and beach-goers along Hurricane Street between Canal Court and Esplanade. However, alternate parking (totaling 8 spaces) would be made available at 128 Hurricane Street (vacant parcel immediately west of the VPP). In addition, as

noted in Section 3.10, Transportation and Traffic of this EIR (see also Appendix J [Parking Memorandum] of this EIR), the elimination of these parking spaces would result in less than significant impacts and no mitigation is required. Moreover, alternate pedestrian access to Esplanade (see Figure 2-2, Chapter 2 [Project Description] of this EIR) would be available via Canal Court and Galleon Street, although this would be slightly more circuitous for some residents/visitors. Because alternate access would be available to the Grand Canal and Ballona Lagoon, impacts would be less than significant related to coastal access.

4.4 Comparison of CEQA Alternatives

Table 4-1 provides a comparison of the Proposed Project, No Project/No Build Alternative and Alternative 1. As noted below, the Proposed Project and Alternative 1 have similar impacts with the majority being less than significant or less than significant impacts with mitigation. In both cases for noise and vibration, impacts would be Significant and Unavoidable (construction only) as would land use and planning (construction only and related to noise and vibration), while cumulative energy impacts are potentially significant. In the case of the No Project/No Build Alternative, while impacts would be less than significant for the majority of environmental topics, they would be potentially significant and adverse for both Biological Resources and Hydrology and Water Quality since the existing VPP has been subject to near catastrophic failure due to insufficient pumping capacity during extreme wet-weather events in which multiple pumps have failed, were being repaired, or undergoing maintenance.

Table 4-1. Comparison of Proposed Project and Alternatives

	Alternatives		
Environmental Resource	Proposed Project	No Project/No Build Alternative	Alternative 1- Construct Venice Auxiliary Pumping Plant and Permanently Vacate Hurricane Street between Canal Court and Esplanade
Aesthetics			
	Less than Significant Impact with Mitigation	Environmentally Superior	Less than Significant Impact with Mitigation
Air Quality			
	Less than Significant Impact with Mitigation	Environmentally Superior	Less than Significant Impact with Mitigation
Biological Resources			
	Less than Significant Impact with Mitigation	Potentially Significant and Adverse	Less than Significant Impact with Mitigation
Cultural Resources			
	Less than Significant Impact with Mitigation	Environmentally Superior	Less than Significant Impact with Mitigation
Geology and Soils			

	Alternatives		
Environmental Resource	Proposed Project	No Project/No Build Alternative	Alternative 1- Construct Venice Auxiliary Pumping Plant and Permanently Vacate Hurricane Street between Canal Court and Esplanade
	Less than Significant Impact with Mitigation	Environmentally Superior	Less than Significant Impact with Mitigation
Greenhouse Gas Emissions			
	Less than Significant	Environmentally Superior	Less than Significant
Hydrology and Water Quality			
	Significant and Unavoidable (operation only and related to tsunami and sea level rise)	Potentially Significant and Adverse	Significant and Unavoidable (operation only and related to tsunami and sea level rise)
Land Use and Planning			
	Significant and Unavoidable (construction only and related to noise and vibration)	Environmentally Superior	Significant and Unavoidable (construction only and related to noise and vibration)
Noise and Vibration			
	Significant and Unavoidable (construction only)	Environmentally Superior	Significant and Unavoidable (construction only)
Transportation and Traffic			
	Less than Significant Impact with Mitigation	Environmentally Superior	Less than Significant Impact with Mitigation
Energy			
	Less than Significant (significant and unavoidable cumulative impact)	Environmentally Superior	Less than Significant (significant and unavoidable cumulative impact)

Source: ICF, 2016.

4.5 Environmentally Superior Alternative

In addition to the discussion and comparison of impacts of a proposed project and its alternatives, Section 15126.6 of the State CEQA Guidelines requires that an "environmentally superior" alternative be identified and the reasons for such a selection be disclosed. In general, the environmentally superior alternative is the alternative that would be expected to generate the least

amount of adverse impacts. In this case, as detailed above and shown in Table 4-1, the No Project/No Build Alternative would result in the fewest impacts on the existing environment. It should be noted however, that the No Project/No Build Alternative could result in catastrophic failure since the VPP has experienced near-miss conditions that would have resulted in discharges of sewage to the Grand Canal, Ballona Lagoon, or adjacent street system (see Chapter 2, Project Description of this EIR for more detail).

Pursuant to CEQA regulations (see CEQA Guidelines Section 15126.6(e)(2)), when the No Project Alternative is identified as the environmentally superior alternative, the EIR shall also identify an environmentally superior alternative from among the other alternatives. To determine which of the other alternatives would be environmentally superior, the analysis focused on those Proposed Project impacts identified as significant and unavoidable. As noted in Table 4-1, impacts associated with the Proposed Project and Alternative 1 would be similar. The differences between these two are minor since both alternatives would eliminate parking along Hurricane Street between Canal Court and Esplanade and provide alternate parking at 128 Hurricane Street. In the case of the Proposed Project, although Hurricane Street would not be vacated, red striping of the curb would occur, thereby eliminating these spaces permanently from public use. Similarly, under Alternative 1, the vacation of Hurricane Street would also permanently remove these spaces. In the case of pedestrian access, the Proposed Project would maintain access along Hurricane Street between Canal Court and Esplanade, while Alternative 1 would permanently eliminate it. Although alternate access to the Esplanade would be available via Canal Court and Galleon Street, access would be more circuitous to residents/visitors. As such, the Proposed Project is considered the Environmentally Superior Alternative.

Chapter 5
Other Environmental Considerations

This chapter evaluates other environmental considerations, including effects not found to be significant, based on analysis contained in the Initial Study (see Appendix A of this environmental impact report [EIR]), and therefore were subsequently omitted from analysis in the Draft EIR. It also addresses significant irreversible environmental changes that would be caused by the Proposed Project should it be implemented, including the use and consumption of nonrenewable resources or long-term commitments of these resources. The Proposed Project's potential for growth inducement is also addressed in this section.

5.1 Effects Found Not to Be Significant

Section 15128 of the California Environmental Quality Act (CEQA) Guidelines states:

> An EIR shall contain a statement briefly indicating the reasons that various possible significant effects of the project were determined not to be significant and were therefore not discussed in detail in the EIR. Such a statement may be contained in an attached copy of an Initial Study.

In accordance with the requirements of CEQA, the City of Los Angeles (City) prepared an Initial Study, dated November 12, 2015, that identified the topics to be analyzed in the EIR. The Initial Study is contained in Appendix A of this Draft EIR.

Because the analysis contained in the Initial Study determined that the Proposed Project would result in less than significant or no impacts related to the following environmental resource areas, they were eliminated from further analysis:

- Agriculture and Forestry Resources
- Hazards and Hazardous Materials
- Mineral Resources
- Population and Housing
- Public Services
- Recreation

In addition, the analysis contained in the Initial Study also determined that some thresholds of significance for environmental resources addressed in this Draft EIR could be eliminated. These include the following:

- Aesthetics
- Cultural Resources
- Geology and Soils
- Hydrology and Water Quality
- Land Use and Planning

- Noise
- Transportation/Traffic
- Utilities and Service Systems

As noted in the Initial Study, the thresholds of significance eliminated for further analysis for each of these environmental resources are noted by the statement "This issue is not proposed for further analysis in the EIR." The supporting analysis, findings, and conclusions in support of this determination are provided for each of these.

After analysis of the remaining thresholds in the Draft EIR, impacts related to the following issues were determined to be less than significant or less than significant with the implementation of mitigation measures:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils
- Greenhouse Gas Emissions
- Hydrology and Water Quality (except operation related to tsunami and sea level rise)
- Land Use and Planning (except for secondary impacts on surrounding land uses related to construction noise and vibration)
- Noise and Vibration (operation only)
- Transportation/Traffic
- Energy (except cumulative)

5.2 Significant Irreversible Environmental Changes that Would Be Caused by the Proposed Project Should It Be Implemented

Section 15126.2(c) of the State CEQA Guidelines indicates that uses of nonrenewable resources during the initial and continued phases of the project may be irreversible because a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as a highway improvement that provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to ensure that such current consumption is justified.

Implementation of the Proposed Project would commit nonrenewable (e.g., petroleum) or slowly renewable (e.g., timber) resources during project construction and operation. In order to construct the Proposed Project, machinery, equipment, materials (e.g., lumber, sand, gravel) and workers would be required, representing an irreversibly commitment of some of these resources. Similarly,

during operation, some of these resources (e.g., energy, electricity) would again be needed, representing a long-term commitment and permanent investment. The consumption and use of some of these resources would limit their availability for future generations. In addition, construction of the Proposed Project would also irreversibly change existing views to and from the Grand Canal and Ballona Lagoon for both visitors and residents. However, assuming that these commitments would occur in accordance with the adopted goals, policies, and implementation measures of the City of Los Angeles General Plan, Venice Local Coastal Program, Venice Community Plan, and Venice Local Coastal Specific Plan, as a matter of public policy, such commitments would be acceptable. The Proposed Project would also provide important redundancy and safety and ensure that the existing and future wastewater management needs of the Venice Pumping Plant (VPP) and surrounding service area are met. Therefore, the significant irreversible changes have been deemed acceptable in light of the Proposed Project's overall benefits.

5.3 Growth-Inducing Impacts

Section 15126.2(d) of the State CEQA Guidelines indicates the following relative to growth-inducement:

> Discuss the way in which a proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also discuss the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

A proposed project can result in both direct and indirect growth-inducing impacts. Typically, the development of new housing would result in direct growth-inducement, while the development of new employment opportunities (both short- and long-term) would result in indirect growth-inducement. The removal of an obstacle to growth, such as construction of a necessary public service of infrastructure can also result in indirect growth-inducement. If not considered in local land use or growth management plans, such projects can result in potentially significant and adverse impacts.

As stated in Chapter 2, *Project Description*, the overall objective of the Proposed Project is to reduce the risk of sewage spills by providing redundancy and reliability for the existing VPP wastewater collection system. The Proposed Project would also allow the system to handle future risks related to climate change, including increased storm intensities, which have the potential to result in flows that would be beyond the capacity of the existing VPP. In addition, the Proposed Project is not intended to facilitate growth but instead address existing deficiencies in the system that have been identified and planned for through the City of Los Angeles' normal infrastructure assessment practices.

5.3.1 Direct Population-Generating Uses

The Proposed Project does not include the development of new housing or other population-generating uses that would directly induce population growth or attract a substantial number or workers, nor would it tax existing community service facilities, thereby requiring the construction of

new facilities, which could cause significant environmental effects. Population-generating uses are not proposed. Furthermore, the Proposed Project is considered infill and is located in a highly urbanized area that experienced significant development over the past century, and the service area is primarily built out. Therefore, the Proposed Project would not directly induce new residential development or result in population growth in the service area. Impacts would be **less than significant**, and no mitigation is required.

5.3.2 Growth Accommodation

The population of the area served by the VPP and the Proposed Project has been growing and is projected to keep growing regardless of whether the Proposed Project is implemented. Furthermore, the Proposed Project would meet the current and future need for redundancy, pumping capacity, and reliability to prevent sewage spills and address future risks related to climate change. It would not, however, increase wastewater treatment plant capacity but instead increase wastewater transmission and distribution capacity during storm events and other peak-flow situations. Therefore, the Proposed Project is not growth inducing but, rather, growth accommodating. Impacts would be **less than significant**, and no mitigation is required.

5.3.3 Expansion of Public Services or Utilities

Because the Proposed Project involves creating redundancy and reliability for the collection system, as well as additional capacity to accommodate future risks related to climate change, it inherently involves the expansion of a public facility. However, the improvements would be growth accommodating rather than growth inducing, as described above. The Proposed Project would be designed to ensure that extreme wet-weather events (e.g., El Niño) are accommodated by the VPP and keep pace with flow increases, as predicted by anticipated population increases in the service area. Therefore, it would not create excess wastewater capacity that could stimulate population growth. Although the Proposed Project would involve expansion of a public facility, it would not induce population growth but, rather, accommodate growth that would occur independent of implementation and meet the existing need for redundancy, reliability, and additional capacity. Impacts would be **less than significant**, and no mitigation is required.

Chapter 6
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Chapter 8
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Appendix A

Notice of Preparation/Initial Study

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NOTICE OF PREPARATION

To: Responsible Agencies, Trustee Agencies, Stakeholders, and Interested Parties

From: City of Los Angeles
Department of Public Works, Bureau of Engineering
Environmental Management Group
1149 S. Broadway, 6th Floor
Los Angeles, CA 90015-2213

Subject: Notice of Preparation of a Draft Environmental Impact Report for the Proposed Venice Auxiliary Pumping Plant Project

Summary: The City of Los Angeles Bureau of Engineering (LABOE) is beginning the environmental review process for the proposed Venice Auxiliary Pumping Plant (VAPP) Project, which would be located adjacent to the existing Venice Pumping Plant at 140 Hurricane Street. LABOE welcomes comments and/or concerns on the content of the environmental information presented and invites you to attend a public meeting in your neighborhood to learn more about the proposed Project and participate in the environmental review process.

The City of Los Angeles (City), Department of Public Works, Bureau of Engineering (BOE), as the CEQA Lead Agency, has prepared a Notice of Preparation (NOP) of a Draft Environmental Impact Report (EIR) for the proposed Venice Auxiliary Pumping Plant (VAPP) Project. BOE has prepared, as part of the NOP, an Initial Study/Environmental Checklist in accordance with current City of Los Angeles Guidelines for Implementation of the California Environmental Quality Act (CEQA) of 1970, Article I and Section 15082 of CEQA Guidelines. The City is requesting input from responsible agencies, trustee agencies, stakeholders, and other interested parties on the scope and content of the environmental information relevant to the statutory responsibilities of agencies and to the concerns of other interested stakeholders. Using the information obtained through the scoping period and the Initial Study, the City will prepare an EIR to analyze the environmental impacts of the proposed Project and alternatives.

Project Location

The proposed Venice Auxiliary Pumping Plant Project (proposed Project) would be located on two existing vacant lots at the northeast corner of Hurricane Street and Canal Court across and immediately north of the existing Venice Pumping Plant in the community of Venice, in the City of Los Angeles, Los Angeles County. Combined, these parcels are approximately 90-feet in length and 70-feet in width (approximately 6,300 square feet). See attached Figure 1, Project Vicinity Map and Figure 2, Project Location Map.

Proposed Project

The proposed Project would include the construction of an auxiliary pumping facility that would provide additional reliability and supplement capacity to the existing Venice Pumping Plant (VPP), located at 140 Hurricane Street in the City of Los Angeles (City) community of Venice. The proposed facility would be sized to supplement the pumping capacity of the VPP, Pump Station No. 646, for a combined ultimate peak flow capacity of 87 million gallons per day (mgd), reflecting wet weather flows of a 10-year storm event. Major project components of the proposed project would include:

- One electrical building approximately 30-feet in height
- Three pumps constructed below ground level
- Utility connections, transformers and generators
- A 17-feet x 17-feet submerged diversion structure, the top of which will be below the lowest elevation of the Grand Canal
- A 66-inch sewer line to connect VAPP to the new diversion structure
- Vacation of a segment of Hurricane Street east of Canal Court to the Esplanade (pedestrian walkway) along the Grand Canal
- Landscaping and benches, green open space and public viewing areas
- Fencing with blinds and vegetation for screening

Potential Environmental Effects

Potential environmental effects associated with the proposed project include the following, which are included in the scope of the Initial Study and will be discussed in detail in the Draft EIR:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Geology/ Soils
- Greenhouse Gas Emissions
- Hydrology/ Water Quality
- Land Use/Planning
- Noise
- Transportation/Traffic
- Utilities/Service Systems

Initial Study

An Initial Study is a preliminary analysis conducted by the CEQA Lead Agency (BOE) to determine whether there is substantial evidence that a project may have a significant effect on the environment. A copy of the Initial Study is available online at:
http://eng.lacity.org/techdocs/emg/venice_aux_pumping_plant.htm .

In addition, hard copies are available for review at the following locations:

- Venice-Abbot Kinney Memorial Library, 501 South Venice Boulevard, Venice, CA 90291
- W Lloyd Taber-Marina del Rey Library, 4533 Admiralty Way, Marina del Rey, CA 90292
- Playa Vista Branch Library, 6400 Playa Vista Drive, Los Angeles, CA 90094

Scoping Meetings

Public scoping meetings will be held to obtain input on the scope and contents of the EIR:

- December 3, 2015, 6:00PM Venice Foursquare Church, 1400 Riviera Avenue, Venice, CA 90291
- December 8, 2015, 6:00PM Abbot Kinney Memorial Library, 501 South Venice Boulevard, Venice, CA 90291

Comments

Please submit your comments, concerns and any other information that will be helpful in preparing an informative EIR by Friday, **December 18, 2015**. **Comments may be submitted by email to: jan.green.rebstock@lacity.org** (please include VAPP Project in the subject line). Please include the name, telephone number, mailing address, and e-mail address of a person to contact if we have any questions regarding your comment.

Comments may also be submitted by mail to:

Dr. Jan Green Rebstock
City of Los Angeles
Public Works, -Bureau of Engineering
Environmental Management Group
1149 S. Broadway, 6th Floor, Mail Stop 939
Los Angeles, CA 90015-2213

If you have any questions about the environmental review process for the proposed VAPP Project, please contact Dr. Jan Green Rebstock at (213) 485-5671.

Attachments



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Figure 1
Project Vicinity Map
Venice Auxiliary Pumping Plant Project



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Figure 2
Project Location Map (with Existing, Temporary and Permanent Pedestrian/Vehicular Access)
Venice Auxiliary Pumping Plant Project

Appendix B

Air Quality Emissions and Greenhouse Gas Calculations

National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) Attainment Status for South Coast Air Basin

CRITERIA POLLUTANT	STANDARD	AVERAGING TIME	DESIGNATION [a]	ATTAINMENT DATE [b]
1-Hour Ozone	NAAQS	1979 1-Hour (0.12 ppm)	Nonattainment (Extreme)	2/6/2023 Originally 11/15/2010 (not attained)[c]
	CAAQS	1-Hour (0.09 ppm)	Nonattainment	N/A
8-Hour Ozone[d]	NAAQS	1997 8-Hour (0.08 ppm)	Nonattainment (Extreme)	6/15/2024
	NAAQS	2008 8-Hour (0.075 ppm)	Nonattainment (Extreme)	7/20/2032
	NAAQS	2015 8-Hour (0.070 ppm)	Designations Pending	~2037
	CAAQS	8-Hour (0.070 ppm)	Nonattainment	Beyond 2032
CO	NAAQS	1-Hour (35 ppm) 8-Hour (9 ppm)	Attainment (Maintenance)	6/11/2007 (attained)
	CAAQS	1-Hour (20 ppm) 8-Hour (9 ppm)	Attainment	6/11/2007 (attained)
NO_2[e]	NAAQS	1-Hour (0.10 ppm)	Unclassifiable/Attainment	N/A (attained)
	NAAQS	Annual (0.053 ppm)	Attainment (Maintenance)	9/22/1998 (attained)
	CAAQS	1-Hour (0.18 ppm) Annual (0.030 ppm)	Attainment	---
SO_2[f]	NAAQS	1-Hour (75 ppb)	Designations Pending (expect Uncl./Attainment)	N/A (attained)
	NAAQS	24-Hour (0.14 ppm) Annual (0.03 ppm)	Unclassifiable/Attainment	3/19/1979 (attained)
PM10	NAAQS	1987 24-hour (150 µg/m^3)	Attainment (Maintenance)[g]	7/26/2013 (attained)
	CAAQS	24-hour (50 µg/m^3) Annual (20 µg/m^3)	Nonattainment	N/A
PM2.5 [h]	NAAQS	2006 24-Hour (35 µg/m^3)	Nonattainment (Serious)	12/31/2019
	NAAQS	1997 Annual (15.0 µg/m^3)	Nonattainment	4/5/2015
	NAAQS	2012 Annual (12.0 µg/m^3)	Nonattainment (Serious)	12/31/2025
	CAAQS	Annual (12.0 µg/m^3)	Nonattainment	N/A

National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) Attainment Status for South Coast Air Basin

CRITERIA POLLUTANT	STANDARD	AVERAGING TIME	DESIGNATION [a)]	ATTAINMENT DATE [b)]
Lead	NAAQS	3-Months Rolling (0.15 µg/m^3)	Nonattainment (Partial)[i)]	12/31/2015
Hydrogen Sulfide (H_2S)	CAAQS	1-Hour (0.03 ppm/42 µg/m^3)	Attainment	---
Sulfates	CAAQS	24-Hour (25 µg/m^3)	Attainment	---
Vinyl Chloride	CAAQS	24-Hour (0.01 ppm/26 µg/m3)	Attainment	---

a) U.S. EPA often only declares Nonattainment areas; everywhere else is listed as Unclassifiable/Attainment or Unclassifiable

b) A design value below the NAAQS for data through the full year or smog season prior to the attainment date is typically required for attainment demonstration

c) 1-hour O_3 standard (0.12 ppm) was revoked, effective June 15, 2005 ; however, the Basin has not attained this standard based on 2008-2010 data and is still subject to anti-backsliding requirements

d) 1997 8-hour O_3 standard (0.08 ppm) was reduced (0.075 ppm), effective May 27, 2008; the revoked 1997 O_3 standard is still subject to anti-backsliding requirements

e) New NO_2 1-hour standard, effective August 2, 2010; attainment designations January 20, 2012; annual NO_2 standard retained

f) The 1971 annual and 24-hour SO_2 standards were revoked, effective August 23, 2010; however, these 1971 standards will remain in effect until one year after U.S. EPA promulgates area designations for the 2010 SO_2 1-hour standard. Area designations are still pending, with Basin expected to be designated Unclassifiable /Attainment.

g) Annual PM10 standard was revoked, effective December 18, 2006; 24-hour PM10 NAAQS deadline was 12/31/2006; SCAQMD request for attainment redesignation and PM10 maintenance plan was approved by U.S. EPA on June 26, 2013, effective July 26, 2013.

h) Attainment deadline for the 2006 24-Hour PM2.5 NAAQS (designation effective December 14, 2009) is December 31, 2019 (end of the 10th calendar year after effective date of designations for Serious nonattainment areas). Annual PM2.5 standard was revised on January 15, 2013, effective March 18, 2013, from 15 to 12 µg/m3. Designations effective April 15, 2015, so Serious area attainment deadline is December 31, 2025.

i) Partial Nonattainment designation – Los Angeles County portion of Basin only for near-source monitors. Expect to remain in attainment based on current monitoring data.

California Environmental Protection Agency
Air Resources Board

Top 4 Summary: Highest 4 Daily Maximum Hourly Nitrogen Dioxide Measurements

at West Los Angeles-VA Hospital

iADAM

	2012		2013		2014	
	Date	Measurement	Date	Measurement	Date	Measurement
National:						
First High:	Nov 15	61.3	Nov 1	51.2	Dec 23	63.9
Second High:	Oct 17	59.1	Mar 1	50.9	Jan 3	61.0
Third High:	Mar 5	56.8	Feb 26	49.6	May 15	60.0
Fourth High:	Oct 18	56.7	Dec 17	49.2	Feb 13	59.1
California:						
First High:	Nov 15	61	Nov 1	51	Dec 23	63
Second High:	Oct 17	59	Mar 1	50	Jan 3	61
Third High:	Mar 5	56	Feb 26	49	May 15	60
Fourth High:	Mar 10	56	Oct 18	49	Feb 13	59
National:						
1-Hour Standard Design Value:		56		*		*
1-Hour Standard 98th Percentile:		53.6		48.8		53.9
# Days Above the Standard:		0		0		0
Annual Standard Design Value:		13		*		13
California:						
1-Hour Std Designation Value:		70		70		60
Expected Peak Day Concentration:		68		67		60
# Days Above the Standard:		0		0		0
Annual Std Designation Value:		15		15		13
Annual Average:		*		*		13
Year Coverage:		88		72		93

Notes:

Hourly nitrogen dioxide measurements and related statistics are available at West Los Angeles-VA Hospital between 1984 and 2014. Some years in this range may not be represented.

All concentrations expressed in parts per billion.

An exceedance of a standard is not necessarily related to a violation of the standard.

Year Coverage indicates the extent to which available monitoring data represent the time of the year when concentrations are expected to be highest. 0 means that data represent none of the high period; 100 means that data represent the entire high period. A high Year Coverage does not mean that there was sufficient data for annual statistics to be considered valid.

California Environmental Protection Agency
Air Resources Board

Top 4 Summary: Highest 4 Daily Maximum Hourly Ozone Measurements

at West Los Angeles-VA Hospital

iADAM

	2012		2013		2014	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Sep 30	0.093	May 3	0.088	Oct 5	0.116
Second High:	Oct 1	0.093	May 13	0.086	May 2	0.094
Third High:	Oct 29	0.086	Sep 6	0.083	May 16	0.094
Fourth High:	Sep 23	0.083	Mar 24	0.076	Oct 6	0.090
California:						
# Days Above the Standard:		0		0		1
California Designation Value:		0.09		0.08		0.09
Expected Peak Day Concentration:		0.089		0.084		0.090
National:						
# Days Above the Standard:		*0*		*0*		*0*
Nat'l Standard Design Value:		*0.095*		*0.093*		*0.093*
Year Coverage:		98		90		94

Notes:

Hourly ozone measurements and related statistics are available at West Los Angeles-VA Hospital between 1984 and 2014. Some years in this range may not be represented.
All concentrations expressed in parts per million.
The national 1-hour ozone standard was revoked in June 2005 and is no longer in effect. Statistics related to the revoked standard are shown in *italics* or *italics* .
An exceedance of a standard is not necessarily related to a violation of the standard.
Year Coverage indicates the extent to which available monitoring data represent the time of the year when concentrations are expected to be highest. 0 means that data represent none of the high period; 100 means that data represent the entire high period. A high Year Coverage does not mean that there was sufficient data for annual statistics to be considered valid.
* means there was insufficient data available to determine the value.

Available Pollutants:

8-Hour Ozone | Hourly Ozone | PM2.5 | PM10 | Carbon Monoxide | Nitrogen Dioxide | State Sulfur Dioxide | Hydrogen Sulfide

California Environmental Protection Agency
Air Resources Board

Top 4 Summary: Highest 4 Daily Maximum 8-Hour Ozone Averages

at West Los Angeles-VA Hospital

iADAM

	2012		2013		2014	
	Date	8-Hr Average	Date	8-Hr Average	Date	8-Hr Average
National:						
First High:	Sep 15	0.073	May 3	0.075	Oct 5	0.094
Second High:	Sep 30	0.067	Mar 24	0.065	May 2	0.085
Third High:	Sep 22	0.066	Aug 15	0.060	May 16	0.078
Fourth High:	Oct 17	0.065	Oct 6	0.059	May 3	0.077
California:						
First High:	Sep 15	0.074	May 3	0.076	Oct 5	0.095
Second High:	Sep 30	0.068	Mar 24	0.066	May 2	0.086
Third High:	Sep 22	0.067	Aug 15	0.061	May 16	0.079
Fourth High:	Oct 17	0.066	Oct 6	0.059	May 3	0.077
National:						
# Days Above the Standard:		0		0		4
Nat'l Standard Design Value:		0.065		0.062		0.067
National Year Coverage:		97		88		92
California:						
# Days Above the Standard:		1		1		6
California Designation Value:		0.072		0.069		0.074
Expected Peak Day Concentration:		0.072		0.069		0.075
California Year Coverage:		97		88		90

Notes:

Eight-hour ozone averages and related statistics are available at West Los Angeles-VA Hospital between 1984 and 2014. Some years in this range may not be represented.
All averages expressed in parts per million.
An exceedance of a standard is not necessarily related to a violation of the standard.
Year Coverage indicates the extent to which available monitoring data represent the time of the year when concentrations are expected to be highest. 0 means that data represent none of the high period; 100 means that data represent the entire high period. A high Year Coverage does not mean that there was sufficient data for annual statistics to be considered valid.
* means there was insufficient data available to determine the value.

Available Pollutants:

8-Hour Ozone | Hourly Ozone | PM2.5 | PM10 | Carbon Monoxide | Nitrogen Dioxide | State Sulfur Dioxide | Hydrogen Sulfide

California Environmental Protection Agency
Air Resources Board

Top 4 Summary: Highest 4 Daily Maximum 8-Hour Carbon Monoxide Averages

at West Los Angeles-VA Hospital

iADAM

	2012		2013		2014	
	Date	8-Hr Average	Date	8-Hr Average	Date	8-Hr Average
National:						
First High:	Jan 6	1.15		*		*
Second High:	Jan 1	1.15		*		*
Third High:	Jan 7	1.14		*		*
Fourth High:	Jan 11	1.12		*		*
California:						
First High:	Jan 5	1.15		*		*
Second High:	Jan 7	1.14		*		*
Third High:	Jan 11	1.12		*		*
Fourth High:	Jan 3	1.11		*		*
National:						
# Days Above the Standard:		0		0		0
California:						
# Days Above the Standard:		0		0		0
Expected Peak Day Concentration:		1.50				
Year Coverage:		39		*		*

Notes:

Eight-hour carbon monoxide averages and related statistics are available at West Los Angeles-VA Hospital between 1984 and 2012. Some years in this range may not be represented.

All averages expressed in parts per million.

An exceedance of a standard is not necessarily related to a violation of the standard.

Year Coverage indicates the extent to which available monitoring data represent the time of the year when concentrations are expected to be highest. 0 means that data represent none of the high period; 100 means that data represent the entire high period. A high Year Coverage does not mean that there was sufficient data for annual statistics to be considered valid.

* means there was insufficient data available to determine the value.

Available Pollutants:

8-Hour Ozone | Hourly Ozone | PM2.5 | PM10 | Carbon Monoxide | Nitrogen Dioxide | State Sulfur Dioxide | Hydrogen Sulfide

California Environmental Protection Agency
Air Resources Board

Top 4 Summary: Highest 4 Daily 24-Hour PM10 Averages

at Los Angeles-Westchester Parkway

iADAM

	2012		2013		2014	
	Date	24-Hr Average	Date	24-Hr Average	Date	24-Hr Average
National:						
First High:	Mar 10	31.0	Apr 16	38.0	Jan 23	46.0
Second High:	Apr 3	30.0	Jul 9	35.0	Apr 29	40.0
Third High:	May 9	30.0	May 22	34.0	May 11	36.0
Fourth High:	Jun 8	30.0	May 4	29.0	Jan 5	35.0
California:						
First High:	Mar 10	30.0	Apr 16	37.0	Jan 23	45.0
Second High:	Apr 3	29.0	May 22	34.0	Apr 29	40.0
Third High:	May 9	29.0	Jul 9	34.0	May 11	36.0
Fourth High:	Jun 8	29.0	May 4	29.0	Jan 5	35.0
National:						
Estimated # Days > 24-Hour Std:		0.0		0.0		0.0
Measured # Days > 24-Hour Std:		0		0		0
3-Yr Avg Est # Days > 24-Hr Std:		0.0		0.0		0.0
Annual Average:		*19.8*		*20.8*		*22.1*
3-Year Average:		*21*		*21*		*21*
California:						
Estimated # Days > 24-Hour Std:		0.0		*		0.0
Measured # Days > 24-Hour Std:		0		0		0
Annual Average:		19.6		*		21.9
3-Year Maximum Annual Average:		21		21		22
Year Coverage:		96		85		100

Notes:

Daily PM10 averages and related statistics are available at Los Angeles-Westchester Parkway between 2004 and 2014. Some years in this range may not be represented.
All averages expressed in micrograms per cubic meter.
The national annual average PM10 standard was revoked in December 2006 and is no longer in effect. Statistics related to the revoked standard are shown in *italics* or *italics* .
An exceedance of a standard is not necessarily related to a violation of the standard.
All values listed above represent midnight-to-midnight 24-hour averages and may be related to an exceptional event.
State and national statistics may differ for the following reasons:
State statistics are based on California approved samplers, whereas national statistics are based on samplers using federal reference or equivalent methods. State and

national statistics may therefore be based on different samplers.

State statistics for 1998 and later are based on local conditions (except for sites in the South Coast Air Basin, where State statistics for 2002 and later are based on local conditions). National statistics are based on standard conditions.

State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.

Measurements are usually collected every six days. Measured days counts the days that a measurement was greater than the level of the standard; Estimated days mathematically estimates how many days concentrations would have been greater than the level of the standard had each day been monitored.

3-Year statistics represent the listed year and the 2 years before the listed year.

Year Coverage indicates the extent to which available monitoring data represent the time of the year when concentrations are expected to be highest. 0 means that data represent none of the high period; 100 means that data represent the entire high period. A high Year Coverage does not mean that there was sufficient data for annual statistics to be considered valid.

* means there was insufficient data available to determine the value.

Available Pollutants:

8-Hour Ozone | Hourly Ozone | PM2.5 | PM10 | Carbon Monoxide | Nitrogen Dioxide | State Sulfur Dioxide | Hydrogen Sulfide

California Environmental Protection Agency
Air Resources Board

Top 4 Summary: Highest 4 Daily 24-Hour PM2.5 Averages

at Compton-700 North Bullis Road

iADAM

	2012		2013		2014	
	Date	24-Hr Average	Date	24-Hr Average	Date	24-Hr Average
National:						
First High:	Dec 8	51.2	Jan 1	52.1	Jan 11	35.8
Second High:	Nov 23	30.5	Dec 24	28.5	Jan 20	33.5
Third High:	Jan 7	30.3	Oct 25	24.3	Nov 28	30.9
Fourth High:	Jan 19	26.4	Jan 16	24.1	Jan 29	30.8
California:						
First High:	Dec 8	51.2	Jan 1	52.1	Jan 11	35.8
Second High:	Nov 23	30.5	Dec 24	28.5	Jan 20	33.5
Third High:	Jan 7	30.3	Oct 25	24.3	Nov 28	30.9
Fourth High:	Jan 19	26.4	Jan 16	24.1	Jan 29	30.8
National:						
Estimated # Days > 24-Hour Std:		3.3		3.1		3.0
Measured # Days > 24-Hour Std:		1		1		1
24-Hour Standard Design Value:		31		29		29
24-Hour Standard 98th Percentile:		30.3		24.3		30.9
Annual Standard Design Value:		12.4		12.2		12.1
Annual Average:		11.6		11.9		12.6
California:						
Annual Std Designation Value:		13		13		12
Annual Average:		11.7		*		*
Year Coverage:		92		95		88

Notes:

Daily PM2.5 averages and related statistics are available at Compton-700 North Bullis Road between 2008 and 2014. Some years in this range may not be represented.
All averages expressed in micrograms per cubic meter.
An exceedance of a standard is not necessarily related to a violation of the standard.
State statistics are based on California approved samplers, whereas national statistics are based on samplers using federal reference or equivalent methods. State and national statistics may therefore be based on different samplers.
Year Coverage indicates the extent to which available monitoring data represent the time of the year when concentrations are expected to be highest. 0 means that data represent none of the high period; 100 means that data represent the entire high period. A high Year Coverage does not mean that there was sufficient data for annual statistics to be considered valid.
* means there was insufficient data available to determine the value.

SANTA MONICA PIER, CALIFORNIA (047953)

Period of Record Monthly Climate Summary

Period of Record : 01/01/1937 to 01/19/2015

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	64.1	63.7	63.4	64.5	65.4	68.1	71.0	72.1	72.1	70.4	68.0	64.8	67.3
Average Min. Temperature (F)	49.2	49.9	50.9	52.9	55.6	58.4	61.2	62.2	61.4	58.2	53.6	49.7	55.3
Average Total Precipitation (in.)	2.69	3.01	2.03	0.73	0.17	0.03	0.02	0.08	0.15	0.33	1.36	2.04	12.62
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 93.1% Min. Temp.: 93.1% Precipitation: 94.3% Snowfall: 94.6% Snow Depth: 94.3%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

LEMOORE NAS, CA (KNLC). WIN	SE	NNW	NNW	NNW	NNW	NNW	NNW	NW	NNW	N	NNW	NNW	NNW
LIVERMORE AP, CA (KLVK). WI	ENE	W	W	W	W	W	W	W	W	W	ENE	ENE	W
LOMPOC AP, CA (KLPC). WIND	E	E	W	W	W	W	W	W	W	W	E	E	W
LONG BEACH AP, CA (KLGB). W	WNW	W	S	W	S	S	S	WNW	WNW	WNW	WNW	WNW	WNW
LOS ANGELES INT'L AP, CA (KL	E	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	E	WSW
LOS ANGELES-DOWNTOWN, CA (KC	W	WSW	WSW	WSW	WSW	WSW	WSW	WSW	W	W	W	W	WSW
MADERA MUNI AP, CA (KMAE).	ESE	E	NW	NW	WNW	WNW	WNW	WNW	WNW	WNW	E	E	WNW
MARYSVILLE AIRPORT, CA (KMYV	SSE	SSE	SSE	SE	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE
MCCLELLAN AFB, CA (KMCC). W	SSE	SSE	SSE	SSE	SSE	S	SSE	SSE	SSE	SE	SSE	SSE	SSE
MERCED MUNI AP, CA (KMCE).	SE	SE	NNW	NNW	NW	NW	NW	NW	NW	NW	NW	ESE	NW
MIRAMAR NAS, CA (KNKX). WIN	E	E	E	WNW	W	WNW	WNW	NW	NW	E	E	E	E
MODESTO AIRPORT, CA (KMOD).	SE	SE	NW	NW	NW	NW	NNW	NNW	NW	NW	NW	SE	NW
MOFFETT FIELD NAS, CA (KNUQ)	SE	SE	NNW	NNW	NNW	NNW	NNW	NNW	NNW	NNW	NNW	SE	NNW
MONTEREY AIRPORT, CA (KMRY).	ESE	ESE	W	WNW	W	W	W	W	W	W	ESE	ESE	W
MOUNT SHASTA CITY, CA (KMHS)	SE	SE	SE	NW	N	N	N	NE	NE	N	NE	SE	N
NAPA COUNTY AP, CA (KAPC).	E	E	W	W	W	SSW	SSW	SSW	SSW	SSW	E	E	SSW
OAKLAND INT'L AP, CA (KOAK).	SE	W	W	W	W	W	W	W	W	W	W	SE	W
OCEANSIDE MUNI AP, CA (KOKB)	W	NE	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	NNE	WSW
ONTARIO INT'L AP, CA (KONT).	W	WSW	WSW	WSW	WSW	WSW	WSW	WSW	W	W	W	W	W
OROVILLE MUNI AP, CA (KOVE).	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE	E	E	SSE	SSE	SSE
OXNARD AIRPORT, CA (KOXR).	W	W	W	W	W	W	W	W	W	W	W	NE	W
PALM SPRINGS AP, CA (KPSP).	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW
PALMDALE AP, CA (KPMD). WIN	W	W	SW	W	SW	SW	SW	SW	SW	SW	W	W	SW
PALO ALTO AP, CA (KPAO). WI	N	N	N	NNW	N	N	N	N	N	NNW	N	N	N
PASO ROBLES AP, CA (KPRB).	E	E	NW	NW	NW	NW	SSW	WNW	NW	NW	E	E	NW
POINT MUGU NAS, CA (KNTD).	NE	W	W	W	W	W	W	W	W	W	NE	NE	W
POINT PIEDRAS BLANCAS, CA (K	N	N	NNW	NNW	N	N	N	NW	NNW	N	N	N	N
PORTERVILLE MUNI AP, CA (KPT	E	E	ESE	NW	NW	NW	NW	S	S	ESE	E	E	NW
RAMONA AIRPORT, CA (KRNM).	W	W	W	W	W	W	W	W	W	W	WNW	E	W
RED BLUFF AP, CA (KRBL). WI	NNW	SSE	N	NNW	SSE	N	S	S	NNW	NNW	NNW	NNW	NNW
REDDING AIRPORT, CA (KRDD).	N	N	N	N	N	N	S	S	N	N	N	N	N
RIVERSIDE MUNI AP, CA (KRAL)	WNW	WNW	WNW	W	WNW	WNW	WNW	WNW	WNW	WNW	WNW	N	WNW
RIVERSIDE-MARCH AFB, CA (KRI	NW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	NW	WNW
SACRAMENTO EXECUTIVE AP, CA	SE	SSE	S	SSW	S	S	S	S	S	S	SSE	SSE	S
SACRAMENTO INT'L AP, CA (KSM	SSE	SSE	S	S	S	S	S	S	S	S	NW	SSE	S
SACRAMENTO-MATHER AP, CA (KM	SE	SE	SE	S	S	S	S	S	S	SE	SE	SE	S
SALINAS MUNI AP, CA (KSNS).	SE	SE	W	W	W	W	WNW	WNW	WNW	WNW	SE	SE	W
SAN CARLOS AP, CA (KSQL). W	N	W	W	W	W	W	W	W	N	N	N	N	W
SAN DIEGO-BROWN FIELD, CA (K	W	W	W	W	W	W	W	W	W	W	W	SE	W
SAN DIEGO-GILLESPIE FIELD, C	W	W	W	W	W	W	W	W	W	W	W	W	W
SAN DIEGO-LINDBERGH FIELD, C	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW
SAN DIEGO-MONTGOMERY FIELD,	W	W	W	W	WSW	WSW	WSW	WSW	WNW	W	W	W	W
SAN DIEGO-NORTH ISLAND NAS,	NW	W	W	W	W	W	W	NW	NW	NW	NW	NW	W
SAN FRANCISCO INT'L AP, CA (	W	W	W	W	W	W	W	W	W	W	W	W	W
SAN JOSE INT'L AP, CA (KSJC)	SSE	SSE	NNW	NNW	NNW	NNW	NW	NNW	NW	NW	NW	SE	NNW
SAN JOSE-REID HILLVIEW AP, C	SE	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW
SAN LUIS OBISPO AP, CA (KSBP	NW	NW	NW	NW	WNW	WNW	WNW	WNW	WNW	WNW	NW	NW	WNW
SAN NICHOLAS ISLAND NOLF, CA	WNW	WNW	WNW	WNW	WNW	NW	WNW	NW	WNW	WNW	NW	NW	WNW
SANDBURG, CA (KSDB). WIND R	NE	S	NW	NW	NW	NW	NW	NW	NW	NW	NE	NE	NW
SANTA ANA-JOHN WAYNE AP, CA	S	S	S	S	S	SSW	SSW	SSW	SW	SW	SW	S	SSW
SANTA BARBARA AP, CA (KSBA).	WSW	W	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW
SANTA MARIA AP, CA (KSMX).	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW	WNW
SANTA MONICA AIRPORT, CA (KS	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	N	SW
SANTA ROSA AIRPORT, CA (KSTS	S	SE	S	S	S	S	S	S	S	S	S	SE	S
SISKIYOU COUNTY AP-MONTAGUE,	S	S	N	N	N	N	N	N	N	N	S	S	N
SOUTH LAKE TAHOE AP, CA (KTV	S	S	S	S	S	SSW	S	S	S	S	S	S	S
STOCKTON AIRPORT, CA (KSCK).	SE	SE	W	W	W	W	W	W	W	W	W	SE	W
THERMAL AIRPORT, CA (KTRM).	N	N	NNW	NNW	NW	NW	NW	NW	NNW	NNW	NW	NW	NW
TORRANCE AIRPORT, CA (KTOA).	W	W	W	W	W	W	WNW	WNW	W	W	W	W	W
TRAVIS AFB-FAIRFIELD, CA (KS	N	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	N	N	WSW
TRUCKEE AIRPORT, CA (KTRK).	S	S	S	SSW	SW	SSW	SW	SSW	SSW	N	S	S	S
TUSTIN MCAS, CA (KNTK). WIN	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	WSW	W	WSW
TWENTYNINE PALMS EAF, CA (KN	W	W	WNW	WNW	WNW	NW	W	W	W	W	WNW	NW	WNW
UKIAH AIRPORT, CA (KUKI). W	S	SSE	WNW	WNW	N	N	N	N	N	W	SSE	SSE	N
VACAVILLE AIRPORT, CA (KVCB)	NNW	S	SSW	SSW	SSW	SSW	S	SSW	SSW	SSW	SSW	NNW	SSW

NORTH ISLAND NAS	KNZY	1996-2006	5.5	6.9	7.0	7.9	7.1	7.5	7.1	7.0	6.9	6.0	5.3	5.3	6.6
OAKLAND INTL AP ASOS	KOAK	1996-2006	6.8	8.3	9.0	10.4	10.4	10.4	10.2	9.6	8.5	7.5	7.0	7.6	8.8
OCEANSIDE AIRPORT ASOS	KOKB	1999-2006	3.9	4.4	4.4	4.7	4.8	4.8	4.5	4.2	4.0	3.6	3.5	3.5	4.2
ONTARIO INTL AP ASOS	KONT	1996-2006	5.2	5.7	6.3	6.9	7.2	7.3	7.0	6.5	5.8	5.6	5.2	5.7	6.2
OROVILLE AIRPORT ASOS	KOVE	1998-2006	5.9	7.0	7.2	7.7	7.1	7.0	6.4	5.9	5.6	5.5	5.5	6.6	6.4
OXNARD AIRPORT ASOS	KOXR	1996-2006	7.1	8.2	7.7	8.3	7.0	7.1	7.2	6.9	6.6	6.4	6.8	7.7	7.2
PALM SPRINGS AP ASOS	KPSP	1996-2006	5.7	5.9	7.3	9.0	9.6	9.2	8.2	7.5	7.5	6.8	6.0	5.7	7.3
PALMDALE AIRPORT ASOS	KPMD	1996-2006	8.1	9.2	10.4	12.5	12.6	12.8	11.5	10.3	9.3	8.9	7.9	8.1	10.1
PALO ALTO AIRPORT	KPAO	1996-2006	7.0	8.9	9.8	10.3	11.2	11.6	11.4	10.7	9.3	8.2	7.0	6.8	9.4
PASO ROBLES AP ASOS	KPRB	1996-2006	5.0	5.9	6.3	7.7	9.1	9.9	8.6	7.9	6.5	5.5	4.7	5.0	6.8
POINT MUGU NAS	KNTD	1996-2006	7.3	8.5	7.8	8.3	7.4	7.2	6.8	6.6	6.2	6.6	6.9	8.4	7.3
POINT PIEDRAS BLANCAS	K87Q	1996-2005	9.2	10.2	10.8	12.9	14.1	13.0	11.2	11.4	10.0	9.6	8.7	9.2	10.9
PORTERVILLE AP AWOS	KPTV	1996-2006	3.7	4.3	4.5	5.2	5.7	6.0	5.9	5.6	5.1	4.3	3.7	3.7	4.8
RAMONA AIRPORT ASOS	KRNM	1998-2006	4.5	5.3	5.0	5.2	5.0	5.2	5.2	4.9	4.6	4.6	4.4	4.6	4.9
RED BLUFF AIRPORT ASOS	KRBL	1996-2006	7.4	8.9	8.7	8.9	8.5	8.8	7.2	7.0	7.5	7.7	7.5	8.7	8.0
REDDING AIRPORT ASOS	KRDD	1996-2006	5.2	6.8	6.4	6.9	6.6	6.9	5.7	5.4	5.7	5.7	4.9	6.2	6.0
RIVERSIDE AIRPORT ASOS	KRAL	1998-2006	5.0	5.2	4.9	5.1	5.6	5.8	5.5	5.1	4.4	4.1	4.3	5.4	5.0
RIVERSIDE-MARCH AFB	KRIV	1996-2006	5.2	5.9	5.4	6.0	6.2	6.2	6.2	6.0	5.5	5.3	5.0	5.6	5.7
SACRAMENTO EXEC AP ASOS	KSAC	1996-2006	5.5	6.4	6.8	7.6	7.5	8.2	7.8	7.2	6.3	5.8	5.0	6.0	6.6
SACRAMENTO INTL AP ASOS	KSMF	1996-2006	6.9	8.0	7.9	8.7	8.6	9.4	9.0	8.4	7.6	7.3	6.4	7.7	8.0
SACRAMENTO-MATHER AP	KMHR	2000-2006	4.8	5.8	6.5	6.8	6.7	7.2	6.9	6.0	5.7	5.2	4.6	6.2	6.0
SACRAMENTO-MCCLELLAN AF	KMCC	1992-2000	7.7	8.1	7.5	8.0	7.9	8.7	8.8	8.5	7.4	6.8	6.3	7.9	7.8
SALINAS AIRPORT ASOS	KSNS	1996-2006	7.3	8.1	7.7	8.4	9.2	9.8	9.1	8.4	7.5	6.9	6.9	7.8	8.1
SAN CARLOS AIRPORT	KSQL	1996-2006	8.2	9.5	10.6	11.5	12.1	12.7	11.8	11.3	10.3	9.4	8.5	8.6	10.5
SAN DIEGO-BROWN FIELD	KSDM	1996-2006	5.6	6.7	6.0	6.4	5.9	5.6	5.3	5.0	5.0	5.1	5.5	6.0	5.7
SAN DIEGO-GILLESPIE FLD	KSEE	1996-2006	3.8	5.4	6.1	7.4	7.1	7.0	6.9	6.8	6.4	5.5	4.1	3.7	5.9
SAN DIEGO-LINDBERGH FLD	KSAN	1996-2006	4.8	6.1	6.6	7.4	7.0	7.2	6.9	6.8	6.5	5.6	4.8	4.5	6.1
SAN DIEGO-MONTGOMERY AP	KMYF	1996-2006	4.6	5.6	5.9	6.7	6.3	6.5	6.0	6.0	5.9	5.2	4.6	4.5	5.6
SAN FRANCISCO INTL AP	KSFO	1996-2006	6.7	8.2	10.2	12.1	13.6	14.1	12.9	12.3	10.6	9.0	7.2	7.2	10.3
SAN JOSE INTL AP ASOS	KSJC	1996-2006	5.4	6.6	7.0	8.0	8.2	8.4	7.7	7.4	6.5	5.8	5.3	6.0	6.8
SAN JOSE-REID HILLVIEW	KRHV	1996-2006	5.3	7.2	8.1	9.3	9.7	9.8	8.8	8.5	7.5	6.5	5.5	5.9	7.7
SAN LUIS OBISPO AP ASOS	KSBP	1996-2006	5.4	6.5	7.4	8.2	9.3	8.5	7.6	7.7	7.1	6.5	5.8	5.3	7.1
SAN NICOLAS ISLAND NAS	KNSI	1996-2006	11.1	13.1	13.0	14.8	13.2	12.5	11.6	12.0	11.9	10.8	11.8	11.8	12.3
SANDBURG ASOS	KSDB	1996-2006	14.3	15.4	14.6	14.7	15.5	14.5	12.1	11.9	12.1	13.1	14.1	15.5	14.0
SANTA ANA AIRPORT ASOS	KSNA	1996-2006	4.3	5.2	5.7	6.4	6.7	7.0	6.7	6.3	5.6	4.9	4.4	4.4	5.6
SANTA BARBARA AP ASOS	KSBA	1996-2006	4.2	5.7	5.8	6.6	6.0	6.0	5.9	5.5	5.2	4.5	4.1	4.1	5.3
SANTA MARIA AP ASOS	KSMX	1996-2006	5.7	6.7	7.2	7.8	8.3	7.7	6.5	6.1	5.6	5.7	5.8	5.8	6.5
SANTA MONICA AP ASOS	KSMO	1996-2006	5.1	6.1	6.2	7.0	6.7	6.8	6.5	6.2	5.7	5.1	5.0	5.3	6.0
SANTA ROSA AIRPORT ASOS	KSTS	1996-2006	3.5	4.8	5.4	5.8	6.0	6.3	5.8	5.3	4.7	4.2	3.6	4.1	4.9
SOUTH LAKE TAHOE AP ASOS	KTVL	1996-2006	5.5	5.7	6.7	7.5	6.9	6.6	5.9	5.8	5.6	5.4	6.0	6.1	6.1
STOCKTON AIRPORT ASOS	KSCK	1996-2006	6.2	7.3	7.4	8.8	9.6	10.0	8.7	8.3	7.4	6.4	5.7	7.0	7.7
THERMAL AIRPORT ASOS	KTRM	1996-2006	5.1	5.7	7.6	9.2	9.3	9.0	7.4	6.6	6.8	6.2	5.2	4.9	6.8
TORRANCE AIRPORT	KTOA	1996-2006	5.6	7.2	7.9	8.7	8.7	9.4	9.5	9.2	8.5	7.1	6.0	5.7	7.8
TRUCKEE AIRPORT AWOS	KTRK	1996-2006	3.5	4.0	4.8	5.5	5.5	5.0	4.8	4.6	4.2	3.7	4.0	3.8	4.4
TWENTYNINE PALMS EAF	KNXP	1996-2006	7.0	7.8	8.5	10.4	9.5	9.7	8.3	7.8	6.9	6.7	6.6	6.9	8.0
UKIAH AIRPORT ASOS	KUKI	1996-2006	2.6	3.5	4.1	4.6	4.9	5.5	4.5	4.0	3.2	2.7	2.5	2.9	3.7
VACAVILLE AIRPORT ASOS	KVCB	1998-2006	4.4	5.5	6.3	7.1	7.0	7.5	7.3	6.7	5.9	5.5	4.4	4.9	6.0
VAN NUYS AIRPORT ASOS	KVNY	1996-2006	5.9	6.3	5.5	6.0	5.7	5.7	5.6	5.0	4.6	4.5	5.1	6.5	5.5
VISALIA AIRPORT AWOS	KVIS	1996-2006	3.3	4.0	4.3	5.1	5.9	5.9	4.9	4.4	3.8	3.2	3.0	3.1	4.2
WATSONVILLE AP ASOS	KWVI	1998-2006	3.2	3.8	3.7	5.1	5.1	5.2	4.9	4.6	4.1	3.6	3.1	3.4	4.1

COLORADO

AVERAGE WIND SPEED - MPH

STATION	ID	Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
AKRON AIRPORT ASOS	KAKO	1996-2006	11.5	12.5	13.1	14.2	12.7	12.6	11.5	11.2	11.5	12.1	12.0	12.0	12.2
ALAMOSA AIRPORT ASOS	KALS	1996-2006	5.7	6.8	8.8	10.8	10.0	9.5	7.1	6.6	7.1	6.9	6.2	5.4	7.5
ASPEN-PITKIN COUNTY AP	KASE	1996-2006	5.1	5.6	6.4	7.5	7.6	7.7	7.1	6.9	6.9	6.2	5.2	5.1	6.4
AURORA-BUCKLEY AFB	KBKF	1996-2006	8.3	8.6	9.3	10.1	8.6	8.4	7.9	7.6	7.6	7.9	8.0	8.6	8.4
BOULDER-JEFFCO AP ASOS	KBJC	1996-2006	11.0	10.3	10.8	11.1	10.4	10.1	9.5	9.3	9.2	9.2	9.6	11.0	10.1
BURLINGTON AIRPORT ASOS	KITR	1997-2006	11.2	12.5	13.2	14.0	13.1	12.9	11.8	10.9	11.9	11.9	11.8	11.5	12.2
COLORADO SPRGS AP ASOS	KCOS	1996-2006	8.8	9.5	10.6	12.3	10.9	10.6	9.2	8.9	9.1	9.7	9.0	9.2	9.8
CORTEZ AIRPORT ASOS	KCEZ	1996-2006	5.8	6.5	7.6	8.8	8.5	8.4	6.8	6.3	6.6	6.8	6.1	6.0	7.0
CRAIG AIRPORT AWOS	KCAG	1996-2006	4.0	4.5	5.7	7.6	6.8	6.9	5.8	5.7	5.4	5.1	4.3	3.9	5.4
DENVER INTL AP ASOS	KDEN	1996-2006	9.7	10.0	10.8	11.9	11.0	10.7	10.3	10.1	9.9	9.9	9.6	10.1	10.3
DENVER-CENTENNIAL AP	KAPA	1996-2006	8.3	8.7	9.3	10.5	9.5	9.6	8.8	8.4	8.4	8.1	8.1	8.5	8.8

Venice Auxiliary Pumping Plant
Air Quality/GHG Assumptions

Construction

Export	**10,000**	**cy**	**Vehicle round trips**	**Trip Distance**	
Stored at Laydown Area 1 (128 Hurricane)	*2,300*	*cy*	444	*0.1 miles*	*Laydown Area 1 is adjacent to the site; a conveyor belt may be used, but construction vehicle assumed. 7-cy capcity, assumes a 35% allowance for soil expansion and less-than-full loads*
Stored at Laydown Area 3 (Culver City)	*7,700*	*cy*	1,485	*7 miles*	*Laydown Area 3 is 7 miles east of the project site. 7-cy capcity, assumes a 35% allowance for soil expansion and less-than-full loads*
Returned to Project Site	*3,850*	*cy*	743	*7 miles*	*Laydown Area 3 is 7 miles east of the project site. 7-cy capcity, assumes a 35% allowance for soil expansion and less-than-full loads*
Disposed Off-Site	*3,850*	*cy*	743	*20 miles*	*CalEEMod default distance of 20 miles, 7-cy capacity, assumes a 35% allowance for soil expansion and less-than-full loads*
			3,415	**round trips**	
			6,830	one-way trips	
	Weighted Trip Length		8.93	*miles per trip*	
	Truck VMT		61,001		

Operation

Daily Commute Trips	12	trips		
	1.2	per 1,000 sf		
Operational Center Energy	1,560	kWh per day		*(Arcadis)*
	569,400	kWh/year		
	56.94	kWh/year/sf		

Venice Auxiliary Pumping Plant
CalEEMod Outputs - Criteria Pollutant Emissions

Construction (Daily)
Unmitigated (Rule 403)
Summer

		ROG	Nox	CO	SO2	Total PM10	Total PM2.5	
Site Preparation	On-Site	2	19	12	0	1	1	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**2**	**19**	**12**	**0**	**1**	**1**	
Grading	On-Site	3	29	22	0	4	3	
	Off-Site	1	8	11	0	1	0	
	Phase Total	**4**	**38**	**33**	**0**	**5**	**3**	
Building Construction (2018)	On-Site	2	18	12	0	1	1	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**2**	**19**	**13**	**0**	**1**	**1**	
Building Construction (2019)	On-Site	2	16	12	0	1	1	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**2**	**17**	**13**	**0**	**1**	**1**	
Building Construction (2020)	On-Site	2	15	12	0	1	1	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**2**	**15**	**12**	**0**	**1**	**1**	
Paving	On-Site	1	7	7	0	0	0	
	Off-Site	0	0	1	0	0	0	
	Phase Total	**1**	**7**	**8**	**0**	**1**	**0**	
Architectural Coating	On-Site	8	2	2	0	0	0	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**8**	**2**	**2**	**0**	**0**	**0**	
Maximum Total		**10**	**38**	**33**	**0**	**5**	**3**	Phases would be independent, but Building
Regional Significance Thresholds		75	100	550	150	150	55	Construction/Paving/Architectural Coating assumed overlap)
Maximum On-Site		**10**	**29**	**22**	**0**	**4.4**	**3.0**	On-Site Only: Site Preparation/Grading phases assumed to overlap, Building
Localized Significance Thresholds			103	562		4	3	Construction/Paving/Architectural Coating assumed overlap)

*SRA 2, 1-acre site, receptor distance of 25 meters

Mitigated (Rule 403 and Tier 3 Construction Equipment)
Summer

		ROG	Nox	CO	SO2	Total PM10	Total PM2.5	
Site Preparation	On-Site	0	9	13	0	0	0	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**0**	**9**	**14**	**0**	**1**	**0**	
Grading	On-Site	1	13	18	0	3	2	
	Off-Site	1	8	11	0	1	0	
	Phase Total	**1**	**22**	**29**	**0**	**4**	**3**	
Building Construction (2018)	On-Site	1	12	15	0	1	1	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**1**	**12**	**15**	**0**	**1**	**1**	
Building Construction (2019)	On-Site	1	12	15	0	1	1	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**1**	**12**	**15**	**0**	**1**	**1**	
Building Construction (2020)	On-Site	1	12	15	0	1	1	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**1**	**12**	**15**	**0**	**1**	**1**	
Paving	On-Site	0	5	7	0	0	0	
	Off-Site	0	0	1	0	0	0	
	Phase Total	**0**	**5**	**8**	**0**	**0**	**0**	
Architectural Coating	On-Site	8	1	2	0	0	0	
	Off-Site	0	0	0	0	0	0	
	Phase Total	**8**	**1**	**2**	**0**	**0**	**0**	
Maximum Total		**8**	**22**	**29**	**0**	**4**	**3**	Phases would be independent, but Building
Regional Significance Thresholds		75	100	550	150	150	55	Construction/Paving/Architectural Coating assumed overlap)
Maximum On-Site		**8**	**18**	**23**	**0**	**3.5**	**2.2**	On-Site Only: Site Preparation/Grading phases assumed to overlap, Building
Localized Significance Thresholds			103	562		4	3	Construction/Paving/Architectural Coating assumed overlap)

*SRA 2, 1-acre site, receptor distance of 25 meters

Operational (Daily)

	ROG	Nox	CO	SO2	Total PM10	Total PM2.5
Area	0.2665	0.0000	0.0010	0.0000	0.0000	0.0000
Energy	0.0056	0.0505	0.0424	0.0003	0.0038	0.0038
Mobile	0.0380	0.1167	0.4914	0.0017	0.1151	0.0323
Total	0.3101	0.1673	0.5348	0.0020	0.1190	0.0361
Localized Significance Thresholds		103.0000	562.0000		1.0000	1.0000

*SRA 2, 1-acre site, receptor distance of 25 meters

Venice Auxiliary Pumping Plant

GHG Emissions and Energy Consumption

Greenhouse Gases

Proposed			*Existing*		
Construction	691	MT CO2e	6,480,575	kWh	Source: Arcadis 2016
Amortized Construction	23	MT CO2e	1,135	lbs/MWh	LADWP carbon intensity (https://data.lacity.org/A-Livable-and-Sustainable-City/LADWP-CO2-Generation/e5ni-eqan)
Annual Operation	382	MT CO2e	7,355,453	lbs CO2	
Area	0	MT CO2e	3,336.38	MT CO2	
Energy	336	MT CO2e			
Mobile	21	MT CO2e			
Waste	6	MT CO2e			
Water	19	MT CO2e			

Source: CalEEMod, annual outputs

Energy

Construction

			pounds per metric ton	pounds CO2e	pounds of CO2e per gallon diesel	gallons of diesel	Btu/gal (gross)	BTU	MMBTU
	691	MT CO2e	2204.62262	1,523,098.37	22.2	68,608.03	138,700	9,515,934,411	9,515.93
Amortized Construction	23	MT CO2e	2204.62262	50,769.95	22.2	2,286.93	138,700	317,197,814	317.20
					Source: EPA		Source: Oak Ridge National Laboratory		

Annual Operation

Existing

			BTU/kWh	BTU/year	MMBTU
Electricity Use	17,755	kWh/day	3,412	60,580,060	61
	6,480,575	kWh/year	3,412	22,111,721,900	22,112

Electricity

			BTU/kWh	BTU/year	MMBTU
VAPP Electricity Use	632,400	kWh/year	3,412	2,157,748,800	2,158

Natural Gas

			BTU/kWh	BTU/year	MMBTU
VAPP Natural Gas Use			-	188,100,000	188.10

Other Energy

			pounds per metric ton	pounds CO2e	pounds of CO2e per gallon diesel	gallons of diesel	Btu/gal (gross)	BTU	MMBTU
Mobile	21	MT CO2e	2204.62262	46,495.27	22.2	2,094.38	138,700	290,490,722	290
Waste	6	MT CO2e	2204.62262	12,436.28	22.2	560.19	138,700	77,698,717	78
Water	19	MT CO2e	2204.62262	41,024.06	22.2	1,847.93	138,700	256,307,970	256

Venice Auxiliary Pumping Plant

Los Angeles-South Coast County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	10.00	1000sqft	0.23	10,000.00	0
City Park	0.03	Acre	0.03	1,306.80	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	33
Climate Zone	11			**Operational Year**	2021
Utility Company	Los Angeles Department of Water & Power				
CO2 Intensity (lb/MWhr)	1135	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - LADWP CO2 intensity factor based on 2013 data from https://data.lacity.org/A-Livable-and-Sustainable-City/LADWP-CO2-Generation/e5ni-eqan. Construction shown to start the year after construction is complete (2021).

Land Use - Site is approximately 10,000 square feet and the pocket park would be approximately 1,000 square feet.

Construction Phase - Schedule based on information provided by the project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - CalEEMod defaults

Off-road Equipment - CalEEMod defaults

Grading - 10,000 cy would be excavated, 2,300 of which would be stockpiled at Laydown Area 1 (adjacent to the site) and 7,700 cy would be stockpiled at Laydown Area 3 (Culver City). All 2,300 cy at Laydown Area 1 would be reused at the project site and half of the Laydown Area 3 materials would be returned to the site. The remaining 3,850 would taken to a landfill.

Trips and VMT - Due to the small roadways near the project site, trucks with a 7-cy capacity were assumed. Laydown Area 1 is adjacent to the site (0.1 trip distance assumed), Laydown Area 3 is 7 miles from the project site, landfill site assumed to be 20 miles from Laydown Area 3. The weighted average trip distance is 8.93 miles. Worker trips based on two trips per day for the number of workers provided by the project engineer

On-road Fugitive Dust - CalEEMod defaults

Architectural Coating - Based on dimensions from Preliminary Design Report.

Vehicle Trips - Pocket park is assumed to generate no trips, as users would be neighborhood residents. The pumping plant would be operated by two employees per 8-hour shift, 24 hours per day, 7 days per week.

Energy Use - The new pumps would be used to achieve the same levels of of wastewater flow as at present; new energy consumption would occur as result of the VAPP operational center, which would consume 569,400 kWh. Energy consumption woudl be 56.94 per square feet of the facility. CalEEMod defaults used for all other energy intensities.

Water And Wastewater - Potable water would be used for washdown and lavatory purposes. Defaults used.

Solid Waste - CalEEMod defaults

Construction Off-road Equipment Mitigation - Rule 403 compliance

Area Coating - Based on dimensions from Preliminary Design Report.

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	5,653.00	5,250.00
tblArchitecturalCoating	ConstArea_Nonresidential_Interior	16,960.00	7,750.00
tblAreaCoating	Area_Nonresidential_Interior	16960	7750
tblAreaMitigation	UseLowVOCPaintNonresidentialExteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintResidentialExteriorValue	100	0
tblAreaMitigation	UseLowVOCPaintResidentialInteriorValue	50	0
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	61	55
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	61	55
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	NumDays	100.00	360.00
tblConstructionPhase	NumDays	2.00	95.00
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	NumDays	1.00	60.00

tblEnergyUse	NT24E	5.75	56.94
tblGrading	AcresOfGrading	47.50	0.25
tblGrading	AcresOfGrading	30.00	0.25
tblGrading	MaterialExported	0.00	10,000.00
tblGrading	MaterialImported	0.00	6,150.00
tblOffRoadEquipment	UsageHours	4.00	6.00
tblOffRoadEquipment	UsageHours	1.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	1227.89	1135
tblProjectCharacteristics	OperationalYear	2014	2021
tblTripsAndVMT	HaulingTripLength	20.00	8.93
tblTripsAndVMT	HaulingTripNumber	2,019.00	6,830.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	10.00
tblVehicleTrips	ST_TR	1.59	0.00
tblVehicleTrips	ST_TR	1.32	1.20
tblVehicleTrips	SU_TR	1.59	0.00
tblVehicleTrips	SU_TR	0.68	1.20
tblVehicleTrips	WD_TR	1.59	0.00
tblVehicleTrips	WD_TR	6.97	1.20

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					

2018	3.7226	37.6494	32.8017	0.0537	6.7159	1.7710	8.4870	3.4965	1.6507	5.1472	0.0000	5,261.9308	5,261.9308	0.7401	0.0000	5,277.4728
2019	1.6955	16.6482	12.6207	0.0249	0.0684	0.9219	0.9902	0.0184	0.8626	0.8810	0.0000	2,412.5436	2,412.5436	0.6414	0.0000	2,426.0129
2020	7.7772	15.1975	12.3968	0.0249	0.2012	0.8051	0.8735	0.0534	0.7533	0.7717	0.0000	2,369.6785	2,369.6785	0.6392	0.0000	2,383.1008
Total	**13.1952**	**69.4952**	**57.8193**	**0.1035**	**6.9855**	**3.4980**	**10.3506**	**3.5682**	**3.2666**	**6.7999**	**0.0000**	**10,044.1530**	**10,044.1530**	**2.0207**	**0.0000**	**10,086.5866**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	3.7226	37.6494	32.8017	0.0537	3.3917	1.7710	5.1627	1.6741	1.6507	3.3248	0.0000	5,261.9308	5,261.9308	0.7401	0.0000	5,277.4728
2019	1.6955	16.6482	12.6207	0.0249	0.0684	0.9219	0.9902	0.0184	0.8626	0.8810	0.0000	2,412.5436	2,412.5436	0.6414	0.0000	2,426.0129
2020	7.7772	15.1975	12.3968	0.0249	0.2012	0.8051	0.8735	0.0534	0.7533	0.7717	0.0000	2,369.6785	2,369.6785	0.6392	0.0000	2,383.1008
Total	**13.1952**	**69.4952**	**57.8193**	**0.1035**	**3.6613**	**3.4980**	**7.0264**	**1.7459**	**3.2666**	**4.9775**	**0.0000**	**10,044.1530**	**10,044.1530**	**2.0207**	**0.0000**	**10,086.5866**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**47.59**	**0.00**	**32.12**	**51.07**	**0.00**	**26.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Area	0.2665	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Energy	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
Mobile	0.0380	0.1167	0.4914	1.7200e-003	0.1129	2.2300e-003	0.1151	0.0302	2.0600e-003	0.0323		131.8409	131.8409	4.5300e-003		131.9361
Total	**0.3101**	**0.1673**	**0.5348**	**2.0200e-003**	**0.1129**	**6.0700e-003**	**0.1190**	**0.0302**	**5.9000e-003**	**0.0361**		**192.4716**	**192.4716**	**5.7000e-003**	**1.1100e-003**	**192.9359**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.2665	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Energy	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
Mobile	0.0380	0.1167	0.4914	1.7200e-003	0.1129	2.2300e-003	0.1151	0.0302	2.0600e-003	0.0323		131.8409	131.8409	4.5300e-003		131.9361
Total	**0.3101**	**0.1673**	**0.5348**	**2.0200e-003**	**0.1129**	**6.0700e-003**	**0.1190**	**0.0302**	**5.9000e-003**	**0.0361**		**192.4716**	**192.4716**	**5.7000e-003**	**1.1100e-003**	**192.9359**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	2/1/2018	4/25/2018	5	60	
2	Grading	Grading	4/26/2018	9/5/2018	5	95	

3	Building Construction	Building Construction	9/6/2018	1/22/2020	5	360	
4	Paving	Paving	1/23/2020	2/19/2020	5	20	
5	Architectural Coating	Architectural Coating	2/20/2020	3/18/2020	5	20	

Acres of Grading (Site Preparation Phase): 0.25

Acres of Grading (Grading Phase): 0.25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 7,750; Non-Residential Outdoor: 5,250 (Architectural Coating –

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Cranes	1	6.00	226	0.29
Site Preparation	Excavators	1	8.00	162	0.38
Site Preparation	Graders	1	8.00	174	0.41
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Graders	1	8.00	174	0.41
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Air Compressors	1	8.00	78	0.48
Building Construction	Bore/Drill Rigs	1	6.00	205	0.50
Building Construction	Cranes	1	6.00	226	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Building Construction	Plate Compactors	1	8.00	8	0.43
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Paving	Pavers	1	7.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	4	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	5	10.00	0.00	6,830.00	14.70	6.90	8.93	LD_Mix	HDT_Mix	HHDT
Building Construction	8	5.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Clean Paved Roads

3.2 Site Preparation - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					4.4200e-003	0.0000	4.4200e-003	4.8000e-004	0.0000	4.8000e-004			0.0000			0.0000
Off-Road	1.8135	19.1190	12.2132	0.0188		1.0240	1.0240		0.9421	0.9421		1,897.3486	1,897.3486	0.5907		1,909.7527
Total	**1.8135**	**19.1190**	**12.2132**	**0.0188**	**4.4200e-003**	**1.0240**	**1.0285**	**4.8000e-004**	**0.9421**	**0.9426**		**1,897.3486**	**1,897.3486**	**0.5907**		**1,909.7527**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0180	0.0230	0.2856	7.3000e-004	0.0559	4.9000e-004	0.0564	0.0148	4.5000e-004	0.0153		56.9868	56.9868	2.8700e-003		57.0471
Total	**0.0180**	**0.0230**	**0.2856**	**7.3000e-004**	**0.0559**	**4.9000e-004**	**0.0564**	**0.0148**	**4.5000e-004**	**0.0153**		**56.9868**	**56.9868**	**2.8700e-003**		**57.0471**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.9900e-003	0.0000	1.9900e-003	2.1000e-004	0.0000	2.1000e-004			0.0000			0.0000
Off-Road	1.8135	19.1190	12.2132	0.0188		1.0240	1.0240		0.9421	0.9421	0.0000	1,897.3486	1,897.3486	0.5907		1,909.7527
Total	**1.8135**	**19.1190**	**12.2132**	**0.0188**	**1.9900e-003**	**1.0240**	**1.0260**	**2.1000e-004**	**0.9421**	**0.9423**	**0.0000**	**1,897.3486**	**1,897.3486**	**0.5907**		**1,909.7527**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0180	0.0230	0.2856	7.3000e-004	0.0559	4.9000e-004	0.0564	0.0148	4.5000e-004	0.0153		56.9868	56.9868	2.8700e-003		57.0471
Total	**0.0180**	**0.0230**	**0.2856**	**7.3000e-004**	**0.0559**	**4.9000e-004**	**0.0564**	**0.0148**	**4.5000e-004**	**0.0153**		**56.9868**	**56.9868**	**2.8700e-003**		**57.0471**

3.3 Grading - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0441	0.0000	6.0441	3.3134	0.0000	3.3134			0.0000			0.0000
Off-Road	2.9596	29.1812	22.0276	0.0276		1.6468	1.6468		1.5364	1.5364		2,740.2500	2,740.2500	0.7145		2,755.2537
Total	**2.9596**	**29.1812**	**22.0276**	**0.0276**	**6.0441**	**1.6468**	**7.6909**	**3.3134**	**1.5364**	**4.8499**		**2,740.2500**	**2,740.2500**	**0.7145**		**2,755.2537**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.7269	8.4223	10.2031	0.0247	0.5601	0.1232	0.6833	0.1534	0.1134	0.2668		2,407.7072	2,407.7072	0.0199		2,408.1250
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0360	0.0460	0.5711	1.4500e-003	0.1118	9.8000e-004	0.1128	0.0296	9.1000e-004	0.0306		113.9736	113.9736	5.7400e-003		114.0942
Total	**0.7630**	**8.4683**	**10.7742**	**0.0262**	**0.6718**	**0.1242**	**0.7961**	**0.1831**	**0.1143**	**0.2974**		**2,521.6808**	**2,521.6808**	**0.0256**		**2,522.2192**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.7199	0.0000	2.7199	1.4911	0.0000	1.4911			0.0000			0.0000
Off-Road	2.9596	29.1812	22.0276	0.0276		1.6468	1.6468		1.5364	1.5364	0.0000	2,740.2500	2,740.2500	0.7145		2,755.2537
Total	**2.9596**	**29.1812**	**22.0276**	**0.0276**	**2.7199**	**1.6468**	**4.3667**	**1.4911**	**1.5364**	**3.0275**	**0.0000**	**2,740.2500**	**2,740.2500**	**0.7145**		**2,755.2537**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.7269	8.4223	10.2031	0.0247	0.5601	0.1232	0.6833	0.1534	0.1134	0.2668		2,407.7072	2,407.7072	0.0199		2,408.1250
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0360	0.0460	0.5711	1.4500e-003	0.1118	9.8000e-004	0.1128	0.0296	9.1000e-004	0.0306		113.9736	113.9736	5.7400e-003		114.0942
Total	**0.7630**	**8.4683**	**10.7742**	**0.0262**	**0.6718**	**0.1242**	**0.7961**	**0.1831**	**0.1143**	**0.2974**		**2,521.6808**	**2,521.6808**	**0.0256**		**2,522.2192**

3.4 Building Construction - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8660	18.4709	12.4787	0.0237		1.0707	1.0707		1.0019	1.0019		2,348.9886	2,348.9886	0.6430		2,362.4905
Total	**1.8660**	**18.4709**	**12.4787**	**0.0237**		**1.0707**	**1.0707**		**1.0019**	**1.0019**		**2,348.9886**	**2,348.9886**	**0.6430**		**2,362.4905**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0145	0.1467	0.1824	4.4000e-004	0.0125	2.3000e-003	0.0148	3.5500e-003	2.1100e-003	5.6600e-003		42.6249	42.6249	3.1000e-004		42.6315
Worker	0.0180	0.0230	0.2856	7.3000e-004	0.0559	4.9000e-004	0.0564	0.0148	4.5000e-004	0.0153		56.9868	56.9868	2.8700e-003		57.0471
Total	**0.0325**	**0.1697**	**0.4679**	**1.1700e-003**	**0.0684**	**2.7900e-003**	**0.0712**	**0.0184**	**2.5600e-003**	**0.0209**		**99.6117**	**99.6117**	**3.1800e-003**		**99.6786**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8660	18.4709	12.4787	0.0237		1.0707	1.0707		1.0019	1.0019	0.0000	2,348.9886	2,348.9886	0.6430		2,362.4905

Total	**1.8660**	**18.4709**	**12.4787**	**0.0237**		**1.0707**	**1.0707**		**1.0019**	**1.0019**	**0.0000**	**2,348.9886**	**2,348.9886**	**0.6430**		**2,362.4905**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0145	0.1467	0.1824	4.4000e-004	0.0125	2.3000e-003	0.0148	3.5500e-003	2.1100e-003	5.6600e-003		42.6249	42.6249	3.1000e-004		42.6315
Worker	0.0180	0.0230	0.2856	7.3000e-004	0.0559	4.9000e-004	0.0564	0.0148	4.5000e-004	0.0153		56.9868	56.9868	2.8700e-003		57.0471
Total	**0.0325**	**0.1697**	**0.4679**	**1.1700e-003**	**0.0684**	**2.7900e-003**	**0.0712**	**0.0184**	**2.5600e-003**	**0.0209**		**99.6117**	**99.6117**	**3.1800e-003**		**99.6786**

3.4 Building Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6651	16.4918	12.1828	0.0237		0.9192	0.9192		0.8602	0.8602		2,316.0388	2,316.0388	0.6384		2,329.4454
Total	**1.6651**	**16.4918**	**12.1828**	**0.0237**		**0.9192**	**0.9192**		**0.8602**	**0.8602**		**2,316.0388**	**2,316.0388**	**0.6384**		**2,329.4454**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0138	0.1353	0.1758	4.4000e-004	0.0125	2.1800e-003	0.0147	3.5500e-003	2.0100e-003	5.5600e-003		41.7508	41.7508	3.0000e-004		41.7572
Worker	0.0166	0.0211	0.2622	7.2000e-004	0.0559	4.8000e-004	0.0564	0.0148	4.4000e-004	0.0153		54.7540	54.7540	2.6800e-003		54.8104
Total	**0.0303**	**0.1564**	**0.4380**	**1.1600e-003**	**0.0684**	**2.6600e-003**	**0.0710**	**0.0184**	**2.4500e-003**	**0.0208**		**96.5048**	**96.5048**	**2.9800e-003**		**96.5676**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6651	16.4918	12.1828	0.0237		0.9192	0.9192		0.8602	0.8602	0.0000	2,316.0388	2,316.0388	0.6384		2,329.4454
Total	**1.6651**	**16.4918**	**12.1828**	**0.0237**		**0.9192**	**0.9192**		**0.8602**	**0.8602**	**0.0000**	**2,316.0388**	**2,316.0388**	**0.6384**		**2,329.4454**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0138	0.1353	0.1758	4.4000e-004	0.0125	2.1800e-003	0.0147	3.5500e-003	2.0100e-003	5.5600e-003		41.7508	41.7508	3.0000e-004		41.7572
Worker	0.0166	0.0211	0.2622	7.2000e-004	0.0559	4.8000e-004	0.0564	0.0148	4.4000e-004	0.0153		54.7540	54.7540	2.6800e-003		54.8104
Total	**0.0303**	**0.1564**	**0.4380**	**1.1600e-003**	**0.0684**	**2.6600e-003**	**0.0710**	**0.0184**	**2.4500e-003**	**0.0208**		**96.5048**	**96.5048**	**2.9800e-003**		**96.5676**

3.4 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Off-Road	1.5238	15.0595	11.9819	0.0237		0.8026	0.8026		0.7510	0.7510		2,276.3016	2,276.3016	0.6363		2,289.6642
Total	**1.5238**	**15.0595**	**11.9819**	**0.0237**		**0.8026**	**0.8026**		**0.7510**	**0.7510**		**2,276.3016**	**2,276.3016**	**0.6363**		**2,289.6642**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0132	0.1184	0.1705	4.4000e-004	0.0125	1.9900e-003	0.0145	3.5500e-003	1.8300e-003	5.3900e-003		40.8210	40.8210	3.0000e-004		40.8272

Worker	0.0155	0.0196	0.2444	7.2000e-004	0.0559	4.7000e-004	0.0564	0.0148	4.4000e-004	0.0153		52.5560	52.5560	2.5400e-003		52.6094
Total	**0.0287**	**0.1380**	**0.4149**	**1.1600e-003**	**0.0684**	**2.4600e-003**	**0.0708**	**0.0184**	**2.2700e-003**	**0.0207**		**93.3770**	**93.3770**	**2.8400e-003**		**93.4366**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5238	15.0595	11.9819	0.0237		0.8026	0.8026		0.7510	0.7510	0.0000	2,276.3016	2,276.3016	0.6363		2,289.6642
Total	**1.5238**	**15.0595**	**11.9819**	**0.0237**		**0.8026**	**0.8026**		**0.7510**	**0.7510**	**0.0000**	**2,276.3016**	**2,276.3016**	**0.6363**		**2,289.6642**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0132	0.1184	0.1705	4.4000e-004	0.0125	1.9900e-003	0.0145	3.5500e-003	1.8300e-003	5.3900e-003		40.8210	40.8210	3.0000e-004		40.8272
Worker	0.0155	0.0196	0.2444	7.2000e-004	0.0559	4.7000e-004	0.0564	0.0148	4.4000e-004	0.0153		52.5560	52.5560	2.5400e-003		52.6094
Total	**0.0287**	**0.1380**	**0.4149**	**1.1600e-003**	**0.0684**	**2.4600e-003**	**0.0708**	**0.0184**	**2.2700e-003**	**0.0207**		**93.3770**	**93.3770**	**2.8400e-003**		**93.4366**

3.5 Paving - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7627	7.1320	7.0153	0.0111		0.3905	0.3905		0.3626	0.3626		1,020.0710	1,020.0710	0.2966		1,026.3002
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.7627**	**7.1320**	**7.0153**	**0.0111**		**0.3905**	**0.3905**		**0.3626**	**0.3626**		**1,020.0710**	**1,020.0710**	**0.2966**		**1,026.3002**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0559	0.0704	0.8798	2.6100e-003	0.2012	1.7000e-003	0.2029	0.0534	1.5800e-003	0.0549		189.2015	189.2015	9.1600e-003		189.3939
Total	**0.0559**	**0.0704**	**0.8798**	**2.6100e-003**	**0.2012**	**1.7000e-003**	**0.2029**	**0.0534**	**1.5800e-003**	**0.0549**		**189.2015**	**189.2015**	**9.1600e-003**		**189.3939**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Off-Road	0.7627	7.1320	7.0153	0.0111		0.3905	0.3905		0.3626	0.3626	0.0000	1,020.0710	1,020.0710	0.2966		1,026.3002
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.7627**	**7.1320**	**7.0153**	**0.0111**		**0.3905**	**0.3905**		**0.3626**	**0.3626**	**0.0000**	**1,020.0710**	**1,020.0710**	**0.2966**		**1,026.3002**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0559	0.0704	0.8798	2.6100e-003	0.2012	1.7000e-003	0.2029	0.0534	1.5800e-003	0.0549		189.2015	189.2015	9.1600e-003		189.3939
Total	**0.0559**	**0.0704**	**0.8798**	**2.6100e-003**	**0.2012**	**1.7000e-003**	**0.2029**	**0.0534**	**1.5800e-003**	**0.0549**		**189.2015**	**189.2015**	**9.1600e-003**		**189.3939**

3.6 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	7.5319					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2422	1.6838	1.8314	2.9700e-003		0.1109	0.1109		0.1109	0.1109		281.4481	281.4481	0.0218		281.9057

Total	**7.7741**	**1.6838**	**1.8314**	**2.9700e-003**		**0.1109**	**0.1109**		**0.1109**	**0.1109**		**281.4481**	**281.4481**	**0.0218**		**281.9057**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	3.1000e-003	3.9100e-003	0.0489	1.4000e-004	0.0112	9.0000e-005	0.0113	2.9600e-003	9.0000e-005	3.0500e-003		10.5112	10.5112	5.1000e-004		10.5219
Total	**3.1000e-003**	**3.9100e-003**	**0.0489**	**1.4000e-004**	**0.0112**	**9.0000e-005**	**0.0113**	**2.9600e-003**	**9.0000e-005**	**3.0500e-003**		**10.5112**	**10.5112**	**5.1000e-004**		**10.5219**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	7.5319					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2422	1.6838	1.8314	2.9700e-003		0.1109	0.1109		0.1109	0.1109	0.0000	281.4481	281.4481	0.0218		281.9057
Total	**7.7741**	**1.6838**	**1.8314**	**2.9700e-003**		**0.1109**	**0.1109**		**0.1109**	**0.1109**	**0.0000**	**281.4481**	**281.4481**	**0.0218**		**281.9057**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	3.1000e-003	3.9100e-003	0.0489	1.4000e-004	0.0112	9.0000e-005	0.0113	2.9600e-003	9.0000e-005	3.0500e-003		10.5112	10.5112	5.1000e-004		10.5219
Total	**3.1000e-003**	**3.9100e-003**	**0.0489**	**1.4000e-004**	**0.0112**	**9.0000e-005**	**0.0113**	**2.9600e-003**	**9.0000e-005**	**3.0500e-003**		**10.5112**	**10.5112**	**5.1000e-004**		**10.5219**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0380	0.1167	0.4914	1.7200e-003	0.1129	2.2300e-003	0.1151	0.0302	2.0600e-003	0.0323		131.8409	131.8409	4.5300e-003		131.9361
Unmitigated	0.0380	0.1167	0.4914	1.7200e-003	0.1129	2.2300e-003	0.1151	0.0302	2.0600e-003	0.0323		131.8409	131.8409	4.5300e-003		131.9361

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		
General Light Industry	12.00	12.00	12.00	53,139	53,139

Total	12.00	12.00	12.00	53,139	53,139

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-...	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	16.60	8.40	6.90	33.00	48.00	19.00	66	28	6
General Light Industry	16.60	8.40	6.90	59.00	28.00	13.00	92	5	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.527271	0.057774	0.179409	0.125521	0.039563	0.006393	0.017164	0.035220	0.002536	0.003167	0.003715	0.000530	0.001736

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
NaturalGas Unmitigated	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	515.342	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**5.5600e-003**	**0.0505**	**0.0424**	**3.0000e-004**		**3.8400e-003**	**3.8400e-003**		**3.8400e-003**	**3.8400e-003**		**60.6285**	**60.6285**	**1.1600e-003**	**1.1100e-003**	**60.9975**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
General Light Industry	0.515342	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
Total		**5.5600e-003**	**0.0505**	**0.0424**	**3.0000e-004**		**3.8400e-003**	**3.8400e-003**		**3.8400e-003**	**3.8400e-003**		**60.6285**	**60.6285**	**1.1600e-003**	**1.1100e-003**	**60.9975**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.2665	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003

Unmitigated	0.2665	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0426					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.2239					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-004	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Total	**0.2665**	**1.0000e-005**	**1.0300e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-003**	**2.2000e-003**	**1.0000e-005**		**2.3200e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0426					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.2239					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-004	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Total	**0.2665**	**1.0000e-005**	**1.0300e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-003**	**2.2000e-003**	**1.0000e-005**		**2.3200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Venice Auxiliary Pumping Plant - Mitigated with Tier 3 Equipment

Los Angeles-South Coast County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	10.00	1000sqft	0.23	10,000.00	0
City Park	0.03	Acre	0.03	1,306.80	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	33
Climate Zone	11			**Operational Year**	2021
Utility Company	Los Angeles Department of Water & Power				
CO2 Intensity (lb/MWhr)	1135	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - LADWP CO2 intensity factor based on 2013 data from https://data.lacity.org/A-Livable-and-Sustainable-City/LADWP-CO2-Generation/e5ni-eqan. Construction shown to start the year after construction is complete (2021).

Land Use - Site is approximately 10,000 square feet and the pocket park would be approximately 1,000 square feet.

Construction Phase - Schedule based on information provided by the project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - CalEEMod defaults

Off-road Equipment - CalEEMod defaults

Grading - 10,000 cy would be excavated, 2,300 of which would be stockpiled at Laydown Area 1 (adjacent to the site) and 7,700 cy would be stockpiled at Laydown Area 3 (Culver City). All 2,300 cy at Laydown Area 1 would be reused at the project site and half of the Laydown Area 3 materials would be returned to the site. The remaining 3,850 would taken to a landfill.

Trips and VMT - Due to the small roadways near the project site, trucks with a 7-cy capacity were assumed. Laydown Area 1 is adjacent to the site (0.1 trip distance assumed), Laydown Area 3 is 7 miles from the project site, landfill site assumed to be 20 miles from Laydown Area 3. The weighted average trip distance is 8.93 miles. Worker trips based on two trips per day for the number of workers provided by the project engineer

On-road Fugitive Dust - CalEEMod defaults

Architectural Coating - Based on dimensions from Preliminary Design Report.

Vehicle Trips - Pocket park is assumed to generate no trips, as users would be neighborhood residents. The pumping plant would be operated by two employees per 8-hour shift, 24 hours per day, 7 days per week.

Energy Use - The new pumps would be used to achieve the same levels of of wastewater flow as at present; new energy consumption would occur as result of the VAPP operational center, which would consume 569,400 kWh. Energy consumption woudl be 56.94 per square feet of the facility. CalEEMod defaults used for all other energy intensities.

Water And Wastewater - Potable water would be used for washdown and lavatory purposes. Defaults used.

Solid Waste - CalEEMod defaults

Construction Off-road Equipment Mitigation - Rule 403 compliance and Tier 3 equipment

Area Coating - Based on dimensions from Preliminary Design Report.

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	5,653.00	5,250.00
tblArchitecturalCoating	ConstArea_Nonresidential_Interior	16,960.00	7,750.00
tblAreaCoating	Area_Nonresidential_Interior	16960	7750
tblAreaMitigation	UseLowVOCPaintNonresidentialExteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintResidentialExteriorValue	100	0
tblAreaMitigation	UseLowVOCPaintResidentialInteriorValue	50	0
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	61	55
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	61	55
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	NumDays	100.00	360.00
tblConstructionPhase	NumDays	2.00	95.00
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	NumDays	1.00	60.00
tblEnergyUse	NT24E	5.75	56.94
tblGrading	AcresOfGrading	47.50	0.25
tblGrading	AcresOfGrading	30.00	0.25

tblGrading	MaterialExported	0.00	10,000.00
tblGrading	MaterialImported	0.00	6,150.00
tblOffRoadEquipment	UsageHours	4.00	6.00
tblOffRoadEquipment	UsageHours	1.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	1227.89	1135
tblProjectCharacteristics	OperationalYear	2014	2021
tblTripsAndVMT	HaulingTripLength	20.00	8.93
tblTripsAndVMT	HaulingTripNumber	2,019.00	6,830.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	10.00
tblVehicleTrips	ST_TR	1.59	0.00
tblVehicleTrips	ST_TR	1.32	1.20
tblVehicleTrips	SU_TR	1.59	0.00
tblVehicleTrips	SU_TR	0.68	1.20
tblVehicleTrips	WD_TR	1.59	0.00
tblVehicleTrips	WD_TR	6.97	1.20

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	3.7226	37.6494	32.8017	0.0537	6.7159	1.7710	8.4870	3.4965	1.6507	5.1472	0.0000	5,261.9308	5,261.9308	0.7401	0.0000	5,277.4728
2019	1.6955	16.6482	12.6207	0.0249	0.0684	0.9219	0.9902	0.0184	0.8626	0.8810	0.0000	2,412.5436	2,412.5436	0.6414	0.0000	2,426.0129

2020	7.7772	15.1975	12.3968	0.0249	0.2012	0.8051	0.8735	0.0534	0.7533	0.7717	0.0000	2,369.6785	2,369.6785	0.6392	0.0000	2,383.1008
Total	**13.1952**	**69.4952**	**57.8193**	**0.1035**	**6.9855**	**3.4980**	**10.3506**	**3.5682**	**3.2666**	**6.7999**	**0.0000**	**10,044.1530**	**10,044.1530**	**2.0207**	**0.0000**	**10,086.5866**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	1.4069	21.8873	28.6497	0.0537	3.3917	0.8668	4.2584	1.6741	0.8568	2.5309	0.0000	5,261.9308	5,261.9308	0.7401	0.0000	5,277.4728
2019	0.5847	11.8817	15.0869	0.0249	0.0684	0.6585	0.7269	0.0184	0.6583	0.6767	0.0000	2,412.5436	2,412.5436	0.6414	0.0000	2,426.0129
2020	7.5944	11.8633	15.0639	0.0249	0.2012	0.6583	0.7267	0.0534	0.6581	0.6765	0.0000	2,369.6785	2,369.6785	0.6392	0.0000	2,383.1008
Total	**9.5860**	**45.6322**	**58.8005**	**0.1035**	**3.6613**	**2.1836**	**5.7120**	**1.7459**	**2.1733**	**3.8842**	**0.0000**	**10,044.1530**	**10,044.1530**	**2.0207**	**0.0000**	**10,086.5866**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**27.35**	**34.34**	**-1.70**	**0.00**	**47.59**	**37.57**	**44.81**	**51.07**	**33.47**	**42.88**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.2665	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Energy	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975

Mobile	0.0380	0.1167	0.4914	1.7200e-003	0.1129	2.2300e-003	0.1151	0.0302	2.0600e-003	0.0323		131.8409	131.8409	4.5300e-003		131.9361
Total	**0.3101**	**0.1673**	**0.5348**	**2.0200e-003**	**0.1129**	**6.0700e-003**	**0.1190**	**0.0302**	**5.9000e-003**	**0.0361**		**192.4716**	**192.4716**	**5.7000e-003**	**1.1100e-003**	**192.9359**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.2665	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Energy	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
Mobile	0.0380	0.1167	0.4914	1.7200e-003	0.1129	2.2300e-003	0.1151	0.0302	2.0600e-003	0.0323		131.8409	131.8409	4.5300e-003		131.9361
Total	**0.3101**	**0.1673**	**0.5348**	**2.0200e-003**	**0.1129**	**6.0700e-003**	**0.1190**	**0.0302**	**5.9000e-003**	**0.0361**		**192.4716**	**192.4716**	**5.7000e-003**	**1.1100e-003**	**192.9359**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	2/1/2018	4/25/2018	5	60	
2	Grading	Grading	4/26/2018	9/5/2018	5	95	
3	Building Construction	Building Construction	9/6/2018	1/22/2020	5	360	
4	Paving	Paving	1/23/2020	2/19/2020	5	20	
5	Architectural Coating	Architectural Coating	2/20/2020	3/18/2020	5	20	

Acres of Grading (Site Preparation Phase): 0.25

Acres of Grading (Grading Phase): 0.25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 7,750; Non-Residential Outdoor: 5,250 (Architectural Coating –

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Cranes	1	6.00	226	0.29
Site Preparation	Excavators	1	8.00	162	0.38
Site Preparation	Graders	1	8.00	174	0.41
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Graders	1	8.00	174	0.41
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Air Compressors	1	8.00	78	0.48
Building Construction	Bore/Drill Rigs	1	6.00	205	0.50
Building Construction	Cranes	1	6.00	226	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Building Construction	Plate Compactors	1	8.00	8	0.43
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Paving	Pavers	1	7.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	4	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	5	10.00	0.00	6,830.00	14.70	6.90	8.93	LD_Mix	HDT_Mix	HHDT
Building Construction	8	5.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Water Exposed Area

Clean Paved Roads

3.2 Site Preparation - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					4.4200e-003	0.0000	4.4200e-003	4.8000e-004	0.0000	4.8000e-004			0.0000			0.0000
Off-Road	1.8135	19.1190	12.2132	0.0188		1.0240	1.0240		0.9421	0.9421		1,897.3486	1,897.3486	0.5907		1,909.7527
Total	**1.8135**	**19.1190**	**12.2132**	**0.0188**	**4.4200e-003**	**1.0240**	**1.0285**	**4.8000e-004**	**0.9421**	**0.9426**		**1,897.3486**	**1,897.3486**	**0.5907**		**1,909.7527**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0180	0.0230	0.2856	7.3000e-004	0.0559	4.9000e-004	0.0564	0.0148	4.5000e-004	0.0153		56.9868	56.9868	2.8700e-003		57.0471
Total	**0.0180**	**0.0230**	**0.2856**	**7.3000e-004**	**0.0559**	**4.9000e-004**	**0.0564**	**0.0148**	**4.5000e-004**	**0.0153**		**56.9868**	**56.9868**	**2.8700e-003**		**57.0471**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.9900e-003	0.0000	1.9900e-003	2.1000e-004	0.0000	2.1000e-004			0.0000			0.0000
Off-Road	0.4613	9.1837	13.2688	0.0188		0.4604	0.4604		0.4604	0.4604	0.0000	1,897.3486	1,897.3486	0.5907		1,909.7527
Total	**0.4613**	**9.1837**	**13.2688**	**0.0188**	**1.9900e-003**	**0.4604**	**0.4623**	**2.1000e-004**	**0.4604**	**0.4606**	**0.0000**	**1,897.3486**	**1,897.3486**	**0.5907**		**1,909.7527**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

Worker	0.0180	0.0230	0.2856	7.3000e-004	0.0559	4.9000e-004	0.0564	0.0148	4.5000e-004	0.0153		56.9868	56.9868	2.8700e-003		57.0471
Total	**0.0180**	**0.0230**	**0.2856**	**7.3000e-004**	**0.0559**	**4.9000e-004**	**0.0564**	**0.0148**	**4.5000e-004**	**0.0153**		**56.9868**	**56.9868**	**2.8700e-003**		**57.0471**

3.3 Grading - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0441	0.0000	6.0441	3.3134	0.0000	3.3134			0.0000			0.0000
Off-Road	2.9596	29.1812	22.0276	0.0276		1.6468	1.6468		1.5364	1.5364		2,740.2500	2,740.2500	0.7145		2,755.2537
Total	**2.9596**	**29.1812**	**22.0276**	**0.0276**	**6.0441**	**1.6468**	**7.6909**	**3.3134**	**1.5364**	**4.8499**		**2,740.2500**	**2,740.2500**	**0.7145**		**2,755.2537**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.7269	8.4223	10.2031	0.0247	0.5601	0.1232	0.6833	0.1534	0.1134	0.2668		2,407.7072	2,407.7072	0.0199		2,408.1250
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0360	0.0460	0.5711	1.4500e-003	0.1118	9.8000e-004	0.1128	0.0296	9.1000e-004	0.0306		113.9736	113.9736	5.7400e-003		114.0942
Total	**0.7630**	**8.4683**	**10.7742**	**0.0262**	**0.6718**	**0.1242**	**0.7961**	**0.1831**	**0.1143**	**0.2974**		**2,521.6808**	**2,521.6808**	**0.0256**		**2,522.2192**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.7199	0.0000	2.7199	1.4911	0.0000	1.4911			0.0000			0.0000
Off-Road	0.6439	13.4190	17.8755	0.0276		0.7425	0.7425		0.7425	0.7425	0.0000	2,740.2500	2,740.2500	0.7145		2,755.2537
Total	**0.6439**	**13.4190**	**17.8755**	**0.0276**	**2.7199**	**0.7425**	**3.4624**	**1.4911**	**0.7425**	**2.2336**	**0.0000**	**2,740.2500**	**2,740.2500**	**0.7145**		**2,755.2537**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.7269	8.4223	10.2031	0.0247	0.5601	0.1232	0.6833	0.1534	0.1134	0.2668		2,407.7072	2,407.7072	0.0199		2,408.1250
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0360	0.0460	0.5711	1.4500e-003	0.1118	9.8000e-004	0.1128	0.0296	9.1000e-004	0.0306		113.9736	113.9736	5.7400e-003		114.0942
Total	**0.7630**	**8.4683**	**10.7742**	**0.0262**	**0.6718**	**0.1242**	**0.7961**	**0.1831**	**0.1143**	**0.2974**		**2,521.6808**	**2,521.6808**	**0.0256**		**2,522.2192**

3.4 Building Construction - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Off-Road	1.8660	18.4709	12.4787	0.0237		1.0707	1.0707		1.0019	1.0019		2,348.9886	2,348.9886	0.6430		2,362.4905
Total	**1.8660**	**18.4709**	**12.4787**	**0.0237**		**1.0707**	**1.0707**		**1.0019**	**1.0019**		**2,348.9886**	**2,348.9886**	**0.6430**		**2,362.4905**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0145	0.1467	0.1824	4.4000e-004	0.0125	2.3000e-003	0.0148	3.5500e-003	2.1100e-003	5.6600e-003		42.6249	42.6249	3.1000e-004		42.6315
Worker	0.0180	0.0230	0.2856	7.3000e-004	0.0559	4.9000e-004	0.0564	0.0148	4.5000e-004	0.0153		56.9868	56.9868	2.8700e-003		57.0471
Total	**0.0325**	**0.1697**	**0.4679**	**1.1700e-003**	**0.0684**	**2.7900e-003**	**0.0712**	**0.0184**	**2.5600e-003**	**0.0209**		**99.6117**	**99.6117**	**3.1800e-003**		**99.6786**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.5544	11.7253	14.6490	0.0237		0.6559	0.6559		0.6559	0.6559	0.0000	2,348.9886	2,348.9886	0.6430		2,362.4905
Total	**0.5544**	**11.7253**	**14.6490**	**0.0237**		**0.6559**	**0.6559**		**0.6559**	**0.6559**	**0.0000**	**2,348.9886**	**2,348.9886**	**0.6430**		**2,362.4905**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0145	0.1467	0.1824	4.4000e-004	0.0125	2.3000e-003	0.0148	3.5500e-003	2.1100e-003	5.6600e-003		42.6249	42.6249	3.1000e-004		42.6315
Worker	0.0180	0.0230	0.2856	7.3000e-004	0.0559	4.9000e-004	0.0564	0.0148	4.5000e-004	0.0153		56.9868	56.9868	2.8700e-003		57.0471
Total	**0.0325**	**0.1697**	**0.4679**	**1.1700e-003**	**0.0684**	**2.7900e-003**	**0.0712**	**0.0184**	**2.5600e-003**	**0.0209**		**99.6117**	**99.6117**	**3.1800e-003**		**99.6786**

3.4 Building Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.6651	16.4918	12.1828	0.0237		0.9192	0.9192		0.8602	0.8602		2,316.0388	2,316.0388	0.6384		2,329.4454
Total	**1.6651**	**16.4918**	**12.1828**	**0.0237**		**0.9192**	**0.9192**		**0.8602**	**0.8602**		**2,316.0388**	**2,316.0388**	**0.6384**		**2,329.4454**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0138	0.1353	0.1758	4.4000e-004	0.0125	2.1800e-003	0.0147	3.5500e-003	2.0100e-003	5.5600e-003		41.7508	41.7508	3.0000e-004		41.7572
Worker	0.0166	0.0211	0.2622	7.2000e-004	0.0559	4.8000e-004	0.0564	0.0148	4.4000e-004	0.0153		54.7540	54.7540	2.6800e-003		54.8104
Total	**0.0303**	**0.1564**	**0.4380**	**1.1600e-003**	**0.0684**	**2.6600e-003**	**0.0710**	**0.0184**	**2.4500e-003**	**0.0208**		**96.5048**	**96.5048**	**2.9800e-003**		**96.5676**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.5544	11.7253	14.6490	0.0237		0.6559	0.6559		0.6559	0.6559	0.0000	2,316.0388	2,316.0388	0.6384		2,329.4454
Total	**0.5544**	**11.7253**	**14.6490**	**0.0237**		**0.6559**	**0.6559**		**0.6559**	**0.6559**	**0.0000**	**2,316.0388**	**2,316.0388**	**0.6384**		**2,329.4454**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0138	0.1353	0.1758	4.4000e-004	0.0125	2.1800e-003	0.0147	3.5500e-003	2.0100e-003	5.5600e-003		41.7508	41.7508	3.0000e-004		41.7572
Worker	0.0166	0.0211	0.2622	7.2000e-004	0.0559	4.8000e-004	0.0564	0.0148	4.4000e-004	0.0153		54.7540	54.7540	2.6800e-003		54.8104
Total	**0.0303**	**0.1564**	**0.4380**	**1.1600e-003**	**0.0684**	**2.6600e-003**	**0.0710**	**0.0184**	**2.4500e-003**	**0.0208**		**96.5048**	**96.5048**	**2.9800e-003**		**96.5676**

3.4 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5238	15.0595	11.9819	0.0237		0.8026	0.8026		0.7510	0.7510		2,276.3016	2,276.3016	0.6363		2,289.6642
Total	**1.5238**	**15.0595**	**11.9819**	**0.0237**		**0.8026**	**0.8026**		**0.7510**	**0.7510**		**2,276.3016**	**2,276.3016**	**0.6363**		**2,289.6642**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0132	0.1184	0.1705	4.4000e-004	0.0125	1.9900e-003	0.0145	3.5500e-003	1.8300e-003	5.3900e-003		40.8210	40.8210	3.0000e-004		40.8272
Worker	0.0155	0.0196	0.2444	7.2000e-004	0.0559	4.7000e-004	0.0564	0.0148	4.4000e-004	0.0153		52.5560	52.5560	2.5400e-003		52.6094

Total	**0.0287**	**0.1380**	**0.4149**	**1.1600e-003**	**0.0684**	**2.4600e-003**	**0.0708**	**0.0184**	**2.2700e-003**	**0.0207**		**93.3770**	**93.3770**	**2.8400e-003**		**93.4366**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.5544	11.7253	14.6490	0.0237		0.6559	0.6559		0.6559	0.6559	0.0000	2,276.3016	2,276.3016	0.6363		2,289.6642
Total	**0.5544**	**11.7253**	**14.6490**	**0.0237**		**0.6559**	**0.6559**		**0.6559**	**0.6559**	**0.0000**	**2,276.3016**	**2,276.3016**	**0.6363**		**2,289.6642**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0132	0.1184	0.1705	4.4000e-004	0.0125	1.9900e-003	0.0145	3.5500e-003	1.8300e-003	5.3900e-003		40.8210	40.8210	3.0000e-004		40.8272
Worker	0.0155	0.0196	0.2444	7.2000e-004	0.0559	4.7000e-004	0.0564	0.0148	4.4000e-004	0.0153		52.5560	52.5560	2.5400e-003		52.6094
Total	**0.0287**	**0.1380**	**0.4149**	**1.1600e-003**	**0.0684**	**2.4600e-003**	**0.0708**	**0.0184**	**2.2700e-003**	**0.0207**		**93.3770**	**93.3770**	**2.8400e-003**		**93.4366**

3.5 Paving - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7627	7.1320	7.0153	0.0111		0.3905	0.3905		0.3626	0.3626		1,020.0710	1,020.0710	0.2966		1,026.3002
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.7627**	**7.1320**	**7.0153**	**0.0111**		**0.3905**	**0.3905**		**0.3626**	**0.3626**		**1,020.0710**	**1,020.0710**	**0.2966**		**1,026.3002**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0559	0.0704	0.8798	2.6100e-003	0.2012	1.7000e-003	0.2029	0.0534	1.5800e-003	0.0549		189.2015	189.2015	9.1600e-003		189.3939
Total	**0.0559**	**0.0704**	**0.8798**	**2.6100e-003**	**0.2012**	**1.7000e-003**	**0.2029**	**0.0534**	**1.5800e-003**	**0.0549**		**189.2015**	**189.2015**	**9.1600e-003**		**189.3939**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	0.2200	4.6827	6.7829	0.0111		0.2872	0.2872		0.2872	0.2872	0.0000	1,020.0710	1,020.0710	0.2966		1,026.3002
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.2200**	**4.6827**	**6.7829**	**0.0111**		**0.2872**	**0.2872**		**0.2872**	**0.2872**	**0.0000**	**1,020.0710**	**1,020.0710**	**0.2966**		**1,026.3002**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0559	0.0704	0.8798	2.6100e-003	0.2012	1.7000e-003	0.2029	0.0534	1.5800e-003	0.0549		189.2015	189.2015	9.1600e-003		189.3939
Total	**0.0559**	**0.0704**	**0.8798**	**2.6100e-003**	**0.2012**	**1.7000e-003**	**0.2029**	**0.0534**	**1.5800e-003**	**0.0549**		**189.2015**	**189.2015**	**9.1600e-003**		**189.3939**

3.6 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	7.5319					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2422	1.6838	1.8314	2.9700e-003		0.1109	0.1109		0.1109	0.1109		281.4481	281.4481	0.0218		281.9057
Total	**7.7741**	**1.6838**	**1.8314**	**2.9700e-003**		**0.1109**	**0.1109**		**0.1109**	**0.1109**		**281.4481**	**281.4481**	**0.0218**		**281.9057**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	3.1000e-003	3.9100e-003	0.0489	1.4000e-004	0.0112	9.0000e-005	0.0113	2.9600e-003	9.0000e-005	3.0500e-003		10.5112	10.5112	5.1000e-004		10.5219
Total	**3.1000e-003**	**3.9100e-003**	**0.0489**	**1.4000e-004**	**0.0112**	**9.0000e-005**	**0.0113**	**2.9600e-003**	**9.0000e-005**	**3.0500e-003**		**10.5112**	**10.5112**	**5.1000e-004**		**10.5219**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	7.5319					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0594	1.3570	1.8324	2.9700e-003		0.0951	0.0951		0.0951	0.0951	0.0000	281.4481	281.4481	0.0218		281.9057
Total	**7.5913**	**1.3570**	**1.8324**	**2.9700e-003**		**0.0951**	**0.0951**		**0.0951**	**0.0951**	**0.0000**	**281.4481**	**281.4481**	**0.0218**		**281.9057**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	3.1000e-003	3.9100e-003	0.0489	1.4000e-004	0.0112	9.0000e-005	0.0113	2.9600e-003	9.0000e-005	3.0500e-003		10.5112	10.5112	5.1000e-004		10.5219
Total	**3.1000e-003**	**3.9100e-003**	**0.0489**	**1.4000e-004**	**0.0112**	**9.0000e-005**	**0.0113**	**2.9600e-003**	**9.0000e-005**	**3.0500e-003**		**10.5112**	**10.5112**	**5.1000e-004**		**10.5219**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0380	0.1167	0.4914	1.7200e-003	0.1129	2.2300e-003	0.1151	0.0302	2.0600e-003	0.0323		131.8409	131.8409	4.5300e-003		131.9361
Unmitigated	0.0380	0.1167	0.4914	1.7200e-003	0.1129	2.2300e-003	0.1151	0.0302	2.0600e-003	0.0323		131.8409	131.8409	4.5300e-003		131.9361

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		
General Light Industry	12.00	12.00	12.00	53,139	53,139
Total	12.00	12.00	12.00	53,139	53,139

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	16.60	8.40	6.90	33.00	48.00	19.00	66	28	6
General Light Industry	16.60	8.40	6.90	59.00	28.00	13.00	92	5	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.527271	0.057774	0.179409	0.125521	0.039563	0.006393	0.017164	0.035220	0.002536	0.003167	0.003715	0.000530	0.001736

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
NaturalGas Unmitigated	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	515.342	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**5.5600e-003**	**0.0505**	**0.0424**	**3.0000e-004**		**3.8400e-003**	**3.8400e-003**		**3.8400e-003**	**3.8400e-003**		**60.6285**	**60.6285**	**1.1600e-003**	**1.1100e-003**	**60.9975**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
General Light Industry	0.515342	5.5600e-003	0.0505	0.0424	3.0000e-004		3.8400e-003	3.8400e-003		3.8400e-003	3.8400e-003		60.6285	60.6285	1.1600e-003	1.1100e-003	60.9975
Total		**5.5600e-003**	**0.0505**	**0.0424**	**3.0000e-004**		**3.8400e-003**	**3.8400e-003**		**3.8400e-003**	**3.8400e-003**		**60.6285**	**60.6285**	**1.1600e-003**	**1.1100e-003**	**60.9975**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.2665	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Unmitigated	0.2665	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0426					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.2239					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-004	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Total	**0.2665**	**1.0000e-005**	**1.0300e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-003**	**2.2000e-003**	**1.0000e-005**		**2.3200e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0426					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.2239					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-004	1.0000e-005	1.0300e-003	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-003	2.2000e-003	1.0000e-005		2.3200e-003
Total	**0.2665**	**1.0000e-005**	**1.0300e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-003**	**2.2000e-003**	**1.0000e-005**		**2.3200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Venice Auxiliary Pumping Plant

Los Angeles-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	10.00	1000sqft	0.23	10,000.00	0
City Park	0.03	Acre	0.03	1,306.80	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	33
Climate Zone	11			**Operational Year**	2021
Utility Company	Los Angeles Department of Water & Power				
CO2 Intensity (lb/MWhr)	1135	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - LADWP CO2 intensity factor based on 2013 data from https://data.lacity.org/A-Livable-and-Sustainable-City/LADWP-CO2-Generation/e5ni-eqan. Construction shown to start the year after construction is complete (2021).

Land Use - Site is approximately 10,000 square feet and the pocket park would be approximately 1,000 square feet.

Construction Phase - Schedule based on information provided by the project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - CalEEMod defaults

Off-road Equipment - CalEEMod defaults

Grading - 10,000 cy would be excavated, 2,300 of which would be stockpiled at Laydown Area 1 (adjacent to the site) and 7,700 cy would be stockpiled at Laydown Area 3 (Culver City). All 2,300 cy at Laydown Area 1 would be reused at the project site and half of the Laydown Area 3 materials would be returned to the site. The remaining 3,850 would taken to a landfill.

Trips and VMT - Due to the small roadways near the project site, trucks with a 7-cy capacity were assumed. Laydown Area 1 is adjacent to the site (0.1 trip distance assumed), Laydown Area 3 is 7 miles from the project site, landfill site assumed to be 20 miles from Laydown Area 3. The weighted average trip distance is 8.93 miles. Worker trips based on two trips per day for the number of workers provided by the project engineer

On-road Fugitive Dust - CalEEMod defaults

Architectural Coating - Based on dimensions from Preliminary Design Report.

Vehicle Trips - Pocket park is assumed to generate no trips, as users would be neighborhood residents. The pumping plant would be operated by two employees per 8-hour shift, 24 hours per day, 7 days per week.

Energy Use - The new pumps would be used to achieve the same levels of of wastewater flow as at present; new energy consumption would occur as result of the VAPP operational center, which would consume 569,400 kWh. Energy consumption woudl be 56.94 per square feet of the facility. CalEEMod defaults used for all other energy intensities.

Water And Wastewater - Potable water would be used for washdown and lavatory purposes. Defaults used.

Solid Waste - CalEEMod defaults

Construction Off-road Equipment Mitigation - Rule 403 compliance

Area Coating - Based on dimensions from Preliminary Design Report.

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	5,653.00	5,250.00
tblArchitecturalCoating	ConstArea_Nonresidential_Interior	16,960.00	7,750.00
tblAreaCoating	Area_Nonresidential_Interior	16960	7750
tblAreaMitigation	UseLowVOCPaintNonresidentialExteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintResidentialExteriorValue	100	0
tblAreaMitigation	UseLowVOCPaintResidentialInteriorValue	50	0
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	61	55
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	61	55
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	NumDays	100.00	360.00
tblConstructionPhase	NumDays	2.00	95.00
tblConstructionPhase	NumDays	5.00	20.00

tblConstructionPhase	NumDays	1.00	60.00
tblEnergyUse	NT24E	5.75	56.94
tblGrading	AcresOfGrading	47.50	0.25
tblGrading	AcresOfGrading	30.00	0.25
tblGrading	MaterialExported	0.00	10,000.00
tblGrading	MaterialImported	0.00	6,150.00
tblOffRoadEquipment	UsageHours	4.00	6.00
tblOffRoadEquipment	UsageHours	1.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	1227.89	1135
tblProjectCharacteristics	OperationalYear	2014	2021
tblTripsAndVMT	HaulingTripLength	20.00	8.93
tblTripsAndVMT	HaulingTripNumber	2,019.00	6,830.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	10.00
tblVehicleTrips	ST_TR	1.59	0.00
tblVehicleTrips	ST_TR	1.32	1.20
tblVehicleTrips	SU_TR	1.59	0.00
tblVehicleTrips	SU_TR	0.68	1.20
tblVehicleTrips	WD_TR	1.59	0.00
tblVehicleTrips	WD_TR	6.97	1.20

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Year	tons/yr										MT/yr					
2018	0.3124	3.1566	2.5558	4.1700e-003	0.3230	0.1594	0.4824	0.1672	0.1484	0.3155	0.0000	371.5351	371.5351	0.0724	0.0000	373.0551
2019	0.2213	2.1738	1.6496	3.2400e-003	8.7500e-003	0.1203	0.1291	2.3600e-003	0.1126	0.1149	0.0000	285.3314	285.3314	0.0759	0.0000	286.9260
2020	0.0984	0.2107	0.1966	3.7000e-004	2.6200e-003	0.0115	0.0141	7.0000e-004	0.0108	0.0115	0.0000	30.7255	30.7255	7.6200e-003	0.0000	30.8854
Total	**0.6321**	**5.5410**	**4.4020**	**7.7800e-003**	**0.3344**	**0.2912**	**0.6256**	**0.1702**	**0.2717**	**0.4419**	**0.0000**	**687.5920**	**687.5920**	**0.1559**	**0.0000**	**690.8665**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2018	0.3124	3.1566	2.5558	4.1700e-003	0.1650	0.1594	0.3245	0.0806	0.1484	0.2290	0.0000	371.5348	371.5348	0.0724	0.0000	373.0548
2019	0.2213	2.1738	1.6496	3.2400e-003	8.7500e-003	0.1203	0.1291	2.3600e-003	0.1126	0.1149	0.0000	285.3310	285.3310	0.0759	0.0000	286.9256
2020	0.0984	0.2107	0.1966	3.7000e-004	2.6200e-003	0.0115	0.0141	7.0000e-004	0.0108	0.0115	0.0000	30.7255	30.7255	7.6200e-003	0.0000	30.8854
Total	**0.6321**	**5.5410**	**4.4020**	**7.7800e-003**	**0.1764**	**0.2912**	**0.4676**	**0.0836**	**0.2717**	**0.3554**	**0.0000**	**687.5913**	**687.5913**	**0.1559**	**0.0000**	**690.8658**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**47.25**	**0.00**	**25.25**	**50.86**	**0.00**	**19.59**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Area	0.0486	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Energy	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	335.6145	335.6145	8.5100e-003	1.9100e-003	336.3839
Mobile	6.8600e-003	0.0229	0.0887	3.0000e-004	0.0202	4.1000e-004	0.0206	5.4000e-003	3.7000e-004	5.7700e-003	0.0000	21.0742	21.0742	7.5000e-004	0.0000	21.0899
Waste						0.0000	0.0000		0.0000	0.0000	2.5171	0.0000	2.5171	0.1488	0.0000	5.6410
Water						0.0000	0.0000		0.0000	0.0000	0.7337	15.7065	16.4401	0.0758	1.8600e-003	18.6082
Total	**0.0565**	**0.0321**	**0.0966**	**3.6000e-004**	**0.0202**	**1.1100e-003**	**0.0213**	**5.4000e-003**	**1.0700e-003**	**6.4700e-003**	**3.2507**	**372.3955**	**375.6462**	**0.2338**	**3.7700e-003**	**381.7233**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0486	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Energy	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	335.6145	335.6145	8.5100e-003	1.9100e-003	336.3839
Mobile	6.8600e-003	0.0229	0.0887	3.0000e-004	0.0202	4.1000e-004	0.0206	5.4000e-003	3.7000e-004	5.7700e-003	0.0000	21.0742	21.0742	7.5000e-004	0.0000	21.0899
Waste						0.0000	0.0000		0.0000	0.0000	2.5171	0.0000	2.5171	0.1488	0.0000	5.6410
Water						0.0000	0.0000		0.0000	0.0000	0.7337	15.7065	16.4401	0.0757	1.8600e-003	18.6071
Total	**0.0565**	**0.0321**	**0.0966**	**3.6000e-004**	**0.0202**	**1.1100e-003**	**0.0213**	**5.4000e-003**	**1.0700e-003**	**6.4700e-003**	**3.2507**	**372.3955**	**375.6462**	**0.2338**	**3.7700e-003**	**381.7221**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	2/1/2018	4/25/2018	5	60	
2	Grading	Grading	4/26/2018	9/5/2018	5	95	
3	Building Construction	Building Construction	9/6/2018	1/22/2020	5	360	
4	Paving	Paving	1/23/2020	2/19/2020	5	20	
5	Architectural Coating	Architectural Coating	2/20/2020	3/18/2020	5	20	

Acres of Grading (Site Preparation Phase): 0.25

Acres of Grading (Grading Phase): 0.25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 7,750; Non-Residential Outdoor: 5,250 (Architectural Coating –

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Cranes	1	6.00	226	0.29
Site Preparation	Excavators	1	8.00	162	0.38
Site Preparation	Graders	1	8.00	174	0.41
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Graders	1	8.00	174	0.41
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Air Compressors	1	8.00	78	0.48
Building Construction	Bore/Drill Rigs	1	6.00	205	0.50
Building Construction	Cranes	1	6.00	226	0.29

Building Construction	Forklifts	2	6.00	89	0.20
Building Construction	Plate Compactors	1	8.00	8	0.43
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Paving	Pavers	1	7.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	4	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	5	10.00	0.00	6,830.00	14.70	6.90	8.93	LD_Mix	HDT_Mix	HHDT
Building Construction	8	5.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Clean Paved Roads

3.2 Site Preparation - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Fugitive Dust					1.3000e-004	0.0000	1.3000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0544	0.5736	0.3664	5.7000e-004		0.0307	0.0307		0.0283	0.0283	0.0000	51.6374	51.6374	0.0161	0.0000	51.9750
Total	**0.0544**	**0.5736**	**0.3664**	**5.7000e-004**	**1.3000e-004**	**0.0307**	**0.0309**	**1.0000e-005**	**0.0283**	**0.0283**	**0.0000**	**51.6374**	**51.6374**	**0.0161**	**0.0000**	**51.9750**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.3000e-004	7.9000e-004	8.1600e-003	2.0000e-005	1.6400e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.4872	1.4872	8.0000e-005	0.0000	1.4889
Total	**5.3000e-004**	**7.9000e-004**	**8.1600e-003**	**2.0000e-005**	**1.6400e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.4872**	**1.4872**	**8.0000e-005**	**0.0000**	**1.4889**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0544	0.5736	0.3664	5.7000e-004		0.0307	0.0307		0.0283	0.0283	0.0000	51.6373	51.6373	0.0161	0.0000	51.9749
Total	**0.0544**	**0.5736**	**0.3664**	**5.7000e-004**	**6.0000e-005**	**0.0307**	**0.0308**	**1.0000e-005**	**0.0283**	**0.0283**	**0.0000**	**51.6373**	**51.6373**	**0.0161**	**0.0000**	**51.9749**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.3000e-004	7.9000e-004	8.1600e-003	2.0000e-005	1.6400e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.4872	1.4872	8.0000e-005	0.0000	1.4889
Total	**5.3000e-004**	**7.9000e-004**	**8.1600e-003**	**2.0000e-005**	**1.6400e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.4872**	**1.4872**	**8.0000e-005**	**0.0000**	**1.4889**

3.3 Grading - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2871	0.0000	0.2871	0.1574	0.0000	0.1574	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1406	1.3861	1.0463	1.3100e-003		0.0782	0.0782		0.0730	0.0730	0.0000	118.0809	118.0809	0.0308	0.0000	118.7274
Total	**0.1406**	**1.3861**	**1.0463**	**1.3100e-003**	**0.2871**	**0.0782**	**0.3653**	**0.1574**	**0.0730**	**0.2304**	**0.0000**	**118.0809**	**118.0809**	**0.0308**	**0.0000**	**118.7274**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0364	0.4197	0.5710	1.1700e-003	0.0262	5.8700e-003	0.0320	7.1800e-003	5.4000e-003	0.0126	0.0000	103.5285	103.5285	8.7000e-004	0.0000	103.5467
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6700e-003	2.4900e-003	0.0258	7.0000e-005	5.2100e-003	5.0000e-005	5.2500e-003	1.3800e-003	4.0000e-005	1.4300e-003	0.0000	4.7096	4.7096	2.5000e-004	0.0000	4.7148
Total	**0.0381**	**0.4222**	**0.5968**	**1.2400e-003**	**0.0314**	**5.9200e-003**	**0.0373**	**8.5600e-003**	**5.4400e-003**	**0.0140**	**0.0000**	**108.2381**	**108.2381**	**1.1200e-003**	**0.0000**	**108.2615**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1292	0.0000	0.1292	0.0708	0.0000	0.0708	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1406	1.3861	1.0463	1.3100e-003		0.0782	0.0782		0.0730	0.0730	0.0000	118.0807	118.0807	0.0308	0.0000	118.7273
Total	**0.1406**	**1.3861**	**1.0463**	**1.3100e-003**	**0.1292**	**0.0782**	**0.2074**	**0.0708**	**0.0730**	**0.1438**	**0.0000**	**118.0807**	**118.0807**	**0.0308**	**0.0000**	**118.7273**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0364	0.4197	0.5710	1.1700e-003	0.0262	5.8700e-003	0.0320	7.1800e-003	5.4000e-003	0.0126	0.0000	103.5285	103.5285	8.7000e-004	0.0000	103.5467

Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6700e-003	2.4900e-003	0.0258	7.0000e-005	5.2100e-003	5.0000e-005	5.2500e-003	1.3800e-003	4.0000e-005	1.4300e-003	0.0000	4.7096	4.7096	2.5000e-004	0.0000	4.7148
Total	**0.0381**	**0.4222**	**0.5968**	**1.2400e-003**	**0.0314**	**5.9200e-003**	**0.0373**	**8.5600e-003**	**5.4400e-003**	**0.0140**	**0.0000**	**108.2381**	**108.2381**	**1.1200e-003**	**0.0000**	**108.2615**

3.4 Building Construction - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0774	0.7665	0.5179	9.8000e-004		0.0444	0.0444		0.0416	0.0416	0.0000	88.4351	88.4351	0.0242	0.0000	88.9434
Total	**0.0774**	**0.7665**	**0.5179**	**9.8000e-004**		**0.0444**	**0.0444**		**0.0416**	**0.0416**	**0.0000**	**88.4351**	**88.4351**	**0.0242**	**0.0000**	**88.9434**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.4000e-004	6.3600e-003	8.9600e-003	2.0000e-005	5.1000e-004	1.0000e-004	6.1000e-004	1.5000e-004	9.0000e-005	2.3000e-004	0.0000	1.5991	1.5991	1.0000e-005	0.0000	1.5994
Worker	7.3000e-004	1.0900e-003	0.0113	3.0000e-005	2.2700e-003	2.0000e-005	2.2900e-003	6.0000e-004	2.0000e-005	6.2000e-004	0.0000	2.0573	2.0573	1.1000e-004	0.0000	2.0596
Total	**1.3700e-003**	**7.4500e-003**	**0.0203**	**5.0000e-005**	**2.7800e-003**	**1.2000e-004**	**2.9000e-003**	**7.5000e-004**	**1.1000e-004**	**8.5000e-004**	**0.0000**	**3.6565**	**3.6565**	**1.2000e-004**	**0.0000**	**3.6590**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0774	0.7665	0.5179	9.8000e-004		0.0444	0.0444		0.0416	0.0416	0.0000	88.4350	88.4350	0.0242	0.0000	88.9433
Total	**0.0774**	**0.7665**	**0.5179**	**9.8000e-004**		**0.0444**	**0.0444**		**0.0416**	**0.0416**	**0.0000**	**88.4350**	**88.4350**	**0.0242**	**0.0000**	**88.9433**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.4000e-004	6.3600e-003	8.9600e-003	2.0000e-005	5.1000e-004	1.0000e-004	6.1000e-004	1.5000e-004	9.0000e-005	2.3000e-004	0.0000	1.5991	1.5991	1.0000e-005	0.0000	1.5994
Worker	7.3000e-004	1.0900e-003	0.0113	3.0000e-005	2.2700e-003	2.0000e-005	2.2900e-003	6.0000e-004	2.0000e-005	6.2000e-004	0.0000	2.0573	2.0573	1.1000e-004	0.0000	2.0596
Total	**1.3700e-003**	**7.4500e-003**	**0.0203**	**5.0000e-005**	**2.7800e-003**	**1.2000e-004**	**2.9000e-003**	**7.5000e-004**	**1.1000e-004**	**8.5000e-004**	**0.0000**	**3.6565**	**3.6565**	**1.2000e-004**	**0.0000**	**3.6590**

3.4 Building Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2173	2.1522	1.5899	3.0900e-003		0.1200	0.1200		0.1123	0.1123	0.0000	274.1903	274.1903	0.0756	0.0000	275.7775
Total	**0.2173**	**2.1522**	**1.5899**	**3.0900e-003**		**0.1200**	**0.1200**		**0.1123**	**0.1123**	**0.0000**	**274.1903**	**274.1903**	**0.0756**	**0.0000**	**275.7775**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.9000e-003	0.0184	0.0272	6.0000e-005	1.6000e-003	2.9000e-004	1.8900e-003	4.6000e-004	2.6000e-004	7.2000e-004	0.0000	4.9254	4.9254	4.0000e-005	0.0000	4.9261
Worker	2.1000e-003	3.1300e-003	0.0325	9.0000e-005	7.1500e-003	6.0000e-005	7.2100e-003	1.9000e-003	6.0000e-005	1.9600e-003	0.0000	6.2157	6.2157	3.2000e-004	0.0000	6.2224
Total	**4.0000e-003**	**0.0216**	**0.0598**	**1.5000e-004**	**8.7500e-003**	**3.5000e-004**	**9.1000e-003**	**2.3600e-003**	**3.2000e-004**	**2.6800e-003**	**0.0000**	**11.1411**	**11.1411**	**3.6000e-004**	**0.0000**	**11.1485**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2173	2.1522	1.5899	3.0900e-003		0.1200	0.1200		0.1123	0.1123	0.0000	274.1900	274.1900	0.0756	0.0000	275.7771

Total	**0.2173**	**2.1522**	**1.5899**	**3.0900e-003**		**0.1200**	**0.1200**		**0.1123**	**0.1123**	**0.0000**	**274.1900**	**274.1900**	**0.0756**	**0.0000**	**275.7771**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.9000e-003	0.0184	0.0272	6.0000e-005	1.6000e-003	2.9000e-004	1.8900e-003	4.6000e-004	2.6000e-004	7.2000e-004	0.0000	4.9254	4.9254	4.0000e-005	0.0000	4.9261
Worker	2.1000e-003	3.1300e-003	0.0325	9.0000e-005	7.1500e-003	6.0000e-005	7.2100e-003	1.9000e-003	6.0000e-005	1.9600e-003	0.0000	6.2157	6.2157	3.2000e-004	0.0000	6.2224
Total	**4.0000e-003**	**0.0216**	**0.0598**	**1.5000e-004**	**8.7500e-003**	**3.5000e-004**	**9.1000e-003**	**2.3600e-003**	**3.2000e-004**	**2.6800e-003**	**0.0000**	**11.1411**	**11.1411**	**3.6000e-004**	**0.0000**	**11.1485**

3.4 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0122	0.1205	0.0959	1.9000e-004		6.4200e-003	6.4200e-003		6.0100e-003	6.0100e-003	0.0000	16.5202	16.5202	4.6200e-003	0.0000	16.6172
Total	**0.0122**	**0.1205**	**0.0959**	**1.9000e-004**		**6.4200e-003**	**6.4200e-003**		**6.0100e-003**	**6.0100e-003**	**0.0000**	**16.5202**	**16.5202**	**4.6200e-003**	**0.0000**	**16.6172**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1000e-004	9.9000e-004	1.6200e-003	0.0000	1.0000e-004	2.0000e-005	1.1000e-004	3.0000e-005	1.0000e-005	4.0000e-005	0.0000	0.2952	0.2952	0.0000	0.0000	0.2953
Worker	1.2000e-004	1.8000e-004	1.8600e-003	1.0000e-005	4.4000e-004	0.0000	4.4000e-004	1.2000e-004	0.0000	1.2000e-004	0.0000	0.3657	0.3657	2.0000e-005	0.0000	0.3661
Total	**2.3000e-004**	**1.1700e-003**	**3.4800e-003**	**1.0000e-005**	**5.4000e-004**	**2.0000e-005**	**5.5000e-004**	**1.5000e-004**	**1.0000e-005**	**1.6000e-004**	**0.0000**	**0.6609**	**0.6609**	**2.0000e-005**	**0.0000**	**0.6614**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0122	0.1205	0.0959	1.9000e-004		6.4200e-003	6.4200e-003		6.0100e-003	6.0100e-003	0.0000	16.5202	16.5202	4.6200e-003	0.0000	16.6172
Total	**0.0122**	**0.1205**	**0.0959**	**1.9000e-004**		**6.4200e-003**	**6.4200e-003**		**6.0100e-003**	**6.0100e-003**	**0.0000**	**16.5202**	**16.5202**	**4.6200e-003**	**0.0000**	**16.6172**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1000e-004	9.9000e-004	1.6200e-003	0.0000	1.0000e-004	2.0000e-005	1.1000e-004	3.0000e-005	1.0000e-005	4.0000e-005	0.0000	0.2952	0.2952	0.0000	0.0000	0.2953
Worker	1.2000e-004	1.8000e-004	1.8600e-003	1.0000e-005	4.4000e-004	0.0000	4.4000e-004	1.2000e-004	0.0000	1.2000e-004	0.0000	0.3657	0.3657	2.0000e-005	0.0000	0.3661
Total	**2.3000e-004**	**1.1700e-003**	**3.4800e-003**	**1.0000e-005**	**5.4000e-004**	**2.0000e-005**	**5.5000e-004**	**1.5000e-004**	**1.0000e-005**	**1.6000e-004**	**0.0000**	**0.6609**	**0.6609**	**2.0000e-005**	**0.0000**	**0.6614**

3.5 Paving - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.6300e-003	0.0713	0.0702	1.1000e-004		3.9000e-003	3.9000e-003		3.6300e-003	3.6300e-003	0.0000	9.2539	9.2539	2.6900e-003	0.0000	9.3104
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.6300e-003**	**0.0713**	**0.0702**	**1.1000e-004**		**3.9000e-003**	**3.9000e-003**		**3.6300e-003**	**3.6300e-003**	**0.0000**	**9.2539**	**9.2539**	**2.6900e-003**	**0.0000**	**9.3104**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Worker	5.4000e-004	8.0000e-004	8.3500e-003	2.0000e-005	1.9700e-003	2.0000e-005	1.9900e-003	5.2000e-004	2.0000e-005	5.4000e-004	0.0000	1.6458	1.6458	8.0000e-005	0.0000	1.6475
Total	**5.4000e-004**	**8.0000e-004**	**8.3500e-003**	**2.0000e-005**	**1.9700e-003**	**2.0000e-005**	**1.9900e-003**	**5.2000e-004**	**2.0000e-005**	**5.4000e-004**	**0.0000**	**1.6458**	**1.6458**	**8.0000e-005**	**0.0000**	**1.6475**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.6300e-003	0.0713	0.0702	1.1000e-004		3.9000e-003	3.9000e-003		3.6300e-003	3.6300e-003	0.0000	9.2539	9.2539	2.6900e-003	0.0000	9.3104
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.6300e-003**	**0.0713**	**0.0702**	**1.1000e-004**		**3.9000e-003**	**3.9000e-003**		**3.6300e-003**	**3.6300e-003**	**0.0000**	**9.2539**	**9.2539**	**2.6900e-003**	**0.0000**	**9.3104**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	8.0000e-004	8.3500e-003	2.0000e-005	1.9700e-003	2.0000e-005	1.9900e-003	5.2000e-004	2.0000e-005	5.4000e-004	0.0000	1.6458	1.6458	8.0000e-005	0.0000	1.6475
Total	**5.4000e-004**	**8.0000e-004**	**8.3500e-003**	**2.0000e-005**	**1.9700e-003**	**2.0000e-005**	**1.9900e-003**	**5.2000e-004**	**2.0000e-005**	**5.4000e-004**	**0.0000**	**1.6458**	**1.6458**	**8.0000e-005**	**0.0000**	**1.6475**

3.6 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0753					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.4200e-003	0.0168	0.0183	3.0000e-005		1.1100e-003	1.1100e-003		1.1100e-003	1.1100e-003	0.0000	2.5533	2.5533	2.0000e-004	0.0000	2.5574
Total	**0.0777**	**0.0168**	**0.0183**	**3.0000e-005**		**1.1100e-003**	**1.1100e-003**		**1.1100e-003**	**1.1100e-003**	**0.0000**	**2.5533**	**2.5533**	**2.0000e-004**	**0.0000**	**2.5574**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.6000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0914	0.0914	0.0000	0.0000	0.0915
Total	**3.0000e-005**	**4.0000e-005**	**4.6000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0914**	**0.0914**	**0.0000**	**0.0000**	**0.0915**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Archit. Coating	0.0753					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.4200e-003	0.0168	0.0183	3.0000e-005		1.1100e-003	1.1100e-003		1.1100e-003	1.1100e-003	0.0000	2.5533	2.5533	2.0000e-004	0.0000	2.5574
Total	**0.0777**	**0.0168**	**0.0183**	**3.0000e-005**		**1.1100e-003**	**1.1100e-003**		**1.1100e-003**	**1.1100e-003**	**0.0000**	**2.5533**	**2.5533**	**2.0000e-004**	**0.0000**	**2.5574**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.6000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0914	0.0914	0.0000	0.0000	0.0915
Total	**3.0000e-005**	**4.0000e-005**	**4.6000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0914**	**0.0914**	**0.0000**	**0.0000**	**0.0915**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Mitigated	6.8600e-003	0.0229	0.0887	3.0000e-004	0.0202	4.1000e-004	0.0206	5.4000e-003	3.7000e-004	5.7700e-003	0.0000	21.0742	21.0742	7.5000e-004	0.0000	21.0899
Unmitigated	6.8600e-003	0.0229	0.0887	3.0000e-004	0.0202	4.1000e-004	0.0206	5.4000e-003	3.7000e-004	5.7700e-003	0.0000	21.0742	21.0742	7.5000e-004	0.0000	21.0899

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		
General Light Industry	12.00	12.00	12.00	53,139	53,139
Total	12.00	12.00	12.00	53,139	53,139

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	16.60	8.40	6.90	33.00	48.00	19.00	66	28	6
General Light Industry	16.60	8.40	6.90	59.00	28.00	13.00	92	5	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.527271	0.057774	0.179409	0.125521	0.039563	0.006393	0.017164	0.035220	0.002536	0.003167	0.003715	0.000530	0.001736

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	325.5768	325.5768	8.3200e-003	1.7200e-003	326.2851
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	325.5768	325.5768	8.3200e-003	1.7200e-003	326.2851
NaturalGas Mitigated	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	10.0377	10.0377	1.9000e-004	1.8000e-004	10.0988
NaturalGas Unmitigated	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	10.0377	10.0377	1.9000e-004	1.8000e-004	10.0988

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	188100	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	10.0377	10.0377	1.9000e-004	1.8000e-004	10.0988
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**1.0100e-003**	**9.2200e-003**	**7.7500e-003**	**6.0000e-005**		**7.0000e-004**	**7.0000e-004**		**7.0000e-004**	**7.0000e-004**	**0.0000**	**10.0377**	**10.0377**	**1.9000e-004**	**1.8000e-004**	**10.0988**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
General Light Industry	188100	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	10.0377	10.0377	1.9000e-004	1.8000e-004	10.0988

Total		**1.0100e-003**	**9.2200e-003**	**7.7500e-003**	**6.0000e-005**		**7.0000e-004**	**7.0000e-004**		**7.0000e-004**	**7.0000e-004**	**0.0000**	**10.0377**	**10.0377**	**1.9000e-004**	**1.8000e-004**	**10.0988**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
General Light Industry	632400	325.5768	8.3200e-003	1.7200e-003	326.2851
Total		**325.5768**	**8.3200e-003**	**1.7200e-003**	**326.2851**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
General Light Industry	632400	325.5768	8.3200e-003	1.7200e-003	326.2851
Total		**325.5768**	**8.3200e-003**	**1.7200e-003**	**326.2851**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0486	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Unmitigated	0.0486	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	7.7700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0409					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Total	**0.0486**	**0.0000**	**1.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5000e-004**	**2.5000e-004**	**0.0000**	**0.0000**	**2.6000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					

Architectural Coating	7.7700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0409					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Total	**0.0486**	**0.0000**	**1.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5000e-004**	**2.5000e-004**	**0.0000**	**0.0000**	**2.6000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	16.4401	0.0757	1.8600e-003	18.6071
Unmitigated	16.4401	0.0758	1.8600e-003	18.6082

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 0.0357444	0.2045	1.0000e-005	0.0000	0.2049
General Light Industry	2.3125 / 0	16.2357	0.0758	1.8600e-003	18.4034
Total		**16.4401**	**0.0758**	**1.8600e-003**	**18.6082**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 0.0357444	0.2045	1.0000e-005	0.0000	0.2049
General Light Industry	2.3125 / 0	16.2357	0.0757	1.8600e-003	18.4022
Total		**16.4401**	**0.0758**	**1.8600e-003**	**18.6071**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	2.5171	0.1488	0.0000	5.6410
Unmitigated	2.5171	0.1488	0.0000	5.6410

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
General Light Industry	12.4	2.5171	0.1488	0.0000	5.6410
Total		**2.5171**	**0.1488**	**0.0000**	**5.6410**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
General Light Industry	12.4	2.5171	0.1488	0.0000	5.6410
Total		**2.5171**	**0.1488**	**0.0000**	**5.6410**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Venice Auxiliary Pumping Plant - Mitigated with Tier 3 Equipment

Los Angeles-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	10.00	1000sqft	0.23	10,000.00	0
City Park	0.03	Acre	0.03	1,306.80	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	33
Climate Zone	11			**Operational Year**	2021
Utility Company	Los Angeles Department of Water & Power				
CO2 Intensity (lb/MWhr)	1135	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - LADWP CO2 intensity factor based on 2013 data from https://data.lacity.org/A-Livable-and-Sustainable-City/LADWP-CO2-Generation/e5ni-eqan. Construction shown to start the year after construction is complete (2021).

Land Use - Site is approximately 10,000 square feet and the pocket park would be approximately 1,000 square feet.

Construction Phase - Schedule based on information provided by the project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - Equipment list provided by project engineer.

Off-road Equipment - CalEEMod defaults

Off-road Equipment - CalEEMod defaults

Grading - 10,000 cy would be excavated, 2,300 of which would be stockpiled at Laydown Area 1 (adjacent to the site) and 7,700 cy would be stockpiled at Laydown Area 3 (Culver City). All 2,300 cy at Laydown Area 1 would be reused at the project site and half of the Laydown Area 3 materials would be returned to the site. The remaining 3,850 would taken to a landfill.

Trips and VMT - Due to the small roadways near the project site, trucks with a 7-cy capacity were assumed. Laydown Area 1 is adjacent to the site (0.1 trip distance assumed), Laydown Area 3 is 7 miles from the project site, landfill site assumed to be 20 miles from Laydown Area 3. The weighted average trip distance is 8.93 miles. Worker trips based on two trips per day for the number of workers provided by the project engineer

On-road Fugitive Dust - CalEEMod defaults

Architectural Coating - Based on dimensions from Preliminary Design Report.

Vehicle Trips - Pocket park is assumed to generate no trips, as users would be neighborhood residents. The pumping plant would be operated by two employees per 8-hour shift, 24 hours per day, 7 days per week.

Energy Use - The new pumps would be used to achieve the same levels of of wastewater flow as at present; new energy consumption would occur as result of the VAPP operational center, which would consume 569,400 kWh. Energy consumption woudl be 56.94 per square feet of the facility. CalEEMod defaults used for all other energy intensities.

Water And Wastewater - Potable water would be used for washdown and lavatory purposes. Defaults used.

Solid Waste - CalEEMod defaults

Construction Off-road Equipment Mitigation - Rule 403 compliance and Tier 3 equipment

Area Coating - Based on dimensions from Preliminary Design Report.

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	5,653.00	5,250.00
tblArchitecturalCoating	ConstArea_Nonresidential_Interior	16,960.00	7,750.00
tblAreaCoating	Area_Nonresidential_Interior	16960	7750
tblAreaMitigation	UseLowVOCPaintNonresidentialExteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintNonresidentialInteriorValue	250	0
tblAreaMitigation	UseLowVOCPaintResidentialExteriorValue	100	0
tblAreaMitigation	UseLowVOCPaintResidentialInteriorValue	50	0
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	61	55
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	61	55
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	6.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	NumDays	100.00	360.00
tblConstructionPhase	NumDays	2.00	95.00
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	NumDays	1.00	60.00
tblEnergyUse	NT24E	5.75	56.94
tblGrading	AcresOfGrading	47.50	0.25
tblGrading	AcresOfGrading	30.00	0.25
tblGrading	MaterialExported	0.00	10,000.00

tblGrading	MaterialImported	0.00	6,150.00
tblOffRoadEquipment	UsageHours	4.00	6.00
tblOffRoadEquipment	UsageHours	1.00	8.00
tblOffRoadEquipment	UsageHours	6.00	8.00
tblProjectCharacteristics	CO2IntensityFactor	1227.89	1135
tblProjectCharacteristics	OperationalYear	2014	2021
tblTripsAndVMT	HaulingTripLength	20.00	8.93
tblTripsAndVMT	HaulingTripNumber	2,019.00	6,830.00
tblTripsAndVMT	WorkerTripNumber	10.00	5.00
tblTripsAndVMT	WorkerTripNumber	13.00	10.00
tblVehicleTrips	ST_TR	1.59	0.00
tblVehicleTrips	ST_TR	1.32	1.20
tblVehicleTrips	SU_TR	1.59	0.00
tblVehicleTrips	SU_TR	0.68	1.20
tblVehicleTrips	WD_TR	1.59	0.00
tblVehicleTrips	WD_TR	6.97	1.20

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2018	0.3124	3.1566	2.5558	4.1700e-003	0.3230	0.1594	0.4824	0.1672	0.1484	0.3155	0.0000	371.5351	371.5351	0.0724	0.0000	373.0551
2019	0.2213	2.1738	1.6496	3.2400e-003	8.7500e-003	0.1203	0.1291	2.3600e-003	0.1126	0.1149	0.0000	285.3314	285.3314	0.0759	0.0000	286.9260
2020	0.0984	0.2107	0.1966	3.7000e-004	2.6200e-003	0.0115	0.0141	7.0000e-004	0.0108	0.0115	0.0000	30.7255	30.7255	7.6200e-003	0.0000	30.8854

Total	**0.6321**	**5.5410**	**4.4020**	**7.7800e-003**	**0.3344**	**0.2912**	**0.6256**	**0.1702**	**0.2717**	**0.4419**	**0.0000**	**687.5920**	**687.5920**	**0.1559**	**0.0000**	**690.8665**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2018	0.1074	1.8299	2.4803	4.1700e-003	0.1650	0.0823	0.2474	0.0806	0.0819	0.1624	0.0000	371.5348	371.5348	0.0724	0.0000	373.0548
2019	0.0764	1.5517	1.9715	3.2400e-003	8.7500e-003	0.0859	0.0947	2.3600e-003	0.0859	0.0883	0.0000	285.3310	285.3310	0.0759	0.0000	286.9256
2020	0.0834	0.1562	0.2156	3.7000e-004	2.6200e-003	9.1100e-003	0.0117	7.0000e-004	9.1000e-003	9.8000e-003	0.0000	30.7255	30.7255	7.6200e-003	0.0000	30.8854
Total	**0.2671**	**3.5379**	**4.6674**	**7.7800e-003**	**0.1764**	**0.1774**	**0.3538**	**0.0836**	**0.1769**	**0.2605**	**0.0000**	**687.5913**	**687.5913**	**0.1559**	**0.0000**	**690.8658**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**57.74**	**36.15**	**-6.03**	**0.00**	**47.25**	**39.08**	**43.45**	**50.86**	**34.91**	**41.06**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0486	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Energy	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	335.6145	335.6145	8.5100e-003	1.9100e-003	336.3839
Mobile	6.8600e-003	0.0229	0.0887	3.0000e-004	0.0202	4.1000e-004	0.0206	5.4000e-003	3.7000e-004	5.7700e-003	0.0000	21.0742	21.0742	7.5000e-004	0.0000	21.0899

Waste						0.0000	0.0000		0.0000	0.0000	2.5171	0.0000	2.5171	0.1488	0.0000	5.6410
Water						0.0000	0.0000		0.0000	0.0000	0.7337	15.7065	16.4401	0.0758	1.8600e-003	18.6082
Total	**0.0565**	**0.0321**	**0.0966**	**3.6000e-004**	**0.0202**	**1.1100e-003**	**0.0213**	**5.4000e-003**	**1.0700e-003**	**6.4700e-003**	**3.2507**	**372.3955**	**375.6462**	**0.2338**	**3.7700e-003**	**381.7233**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0486	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Energy	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	335.6145	335.6145	8.5100e-003	1.9100e-003	336.3839
Mobile	6.8600e-003	0.0229	0.0887	3.0000e-004	0.0202	4.1000e-004	0.0206	5.4000e-003	3.7000e-004	5.7700e-003	0.0000	21.0742	21.0742	7.5000e-004	0.0000	21.0899
Waste						0.0000	0.0000		0.0000	0.0000	2.5171	0.0000	2.5171	0.1488	0.0000	5.6410
Water						0.0000	0.0000		0.0000	0.0000	0.7337	15.7065	16.4401	0.0757	1.8600e-003	18.6071
Total	**0.0565**	**0.0321**	**0.0966**	**3.6000e-004**	**0.0202**	**1.1100e-003**	**0.0213**	**5.4000e-003**	**1.0700e-003**	**6.4700e-003**	**3.2507**	**372.3955**	**375.6462**	**0.2338**	**3.7700e-003**	**381.7221**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	2/1/2018	4/25/2018	5	60	

2	Grading	Grading	4/26/2018	9/5/2018	5	95	
3	Building Construction	Building Construction	9/6/2018	1/22/2020	5	360	
4	Paving	Paving	1/23/2020	2/19/2020	5	20	
5	Architectural Coating	Architectural Coating	2/20/2020	3/18/2020	5	20	

Acres of Grading (Site Preparation Phase): 0.25

Acres of Grading (Grading Phase): 0.25

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 7,750; Non-Residential Outdoor: 5,250 (Architectural Coating –

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Cranes	1	6.00	226	0.29
Site Preparation	Excavators	1	8.00	162	0.38
Site Preparation	Graders	1	8.00	174	0.41
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Graders	1	8.00	174	0.41
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Air Compressors	1	8.00	78	0.48
Building Construction	Bore/Drill Rigs	1	6.00	205	0.50
Building Construction	Cranes	1	6.00	226	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Building Construction	Plate Compactors	1	8.00	8	0.43
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Paving	Pavers	1	7.00	125	0.42
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37

Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	4	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	5	10.00	0.00	6,830.00	14.70	6.90	8.93	LD_Mix	HDT_Mix	HHDT
Building Construction	8	5.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Water Exposed Area

Clean Paved Roads

3.2 Site Preparation - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.3000e-004	0.0000	1.3000e-004	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0544	0.5736	0.3664	5.7000e-004		0.0307	0.0307		0.0283	0.0283	0.0000	51.6374	51.6374	0.0161	0.0000	51.9750
Total	**0.0544**	**0.5736**	**0.3664**	**5.7000e-004**	**1.3000e-004**	**0.0307**	**0.0309**	**1.0000e-005**	**0.0283**	**0.0283**	**0.0000**	**51.6374**	**51.6374**	**0.0161**	**0.0000**	**51.9750**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.3000e-004	7.9000e-004	8.1600e-003	2.0000e-005	1.6400e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.4872	1.4872	8.0000e-005	0.0000	1.4889
Total	**5.3000e-004**	**7.9000e-004**	**8.1600e-003**	**2.0000e-005**	**1.6400e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.4872**	**1.4872**	**8.0000e-005**	**0.0000**	**1.4889**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0138	0.2755	0.3981	5.7000e-004		0.0138	0.0138		0.0138	0.0138	0.0000	51.6373	51.6373	0.0161	0.0000	51.9749
Total	**0.0138**	**0.2755**	**0.3981**	**5.7000e-004**	**6.0000e-005**	**0.0138**	**0.0139**	**1.0000e-005**	**0.0138**	**0.0138**	**0.0000**	**51.6373**	**51.6373**	**0.0161**	**0.0000**	**51.9749**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.3000e-004	7.9000e-004	8.1600e-003	2.0000e-005	1.6400e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.4872	1.4872	8.0000e-005	0.0000	1.4889
Total	**5.3000e-004**	**7.9000e-004**	**8.1600e-003**	**2.0000e-005**	**1.6400e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.4872**	**1.4872**	**8.0000e-005**	**0.0000**	**1.4889**

3.3 Grading - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2871	0.0000	0.2871	0.1574	0.0000	0.1574	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1406	1.3861	1.0463	1.3100e-003		0.0782	0.0782		0.0730	0.0730	0.0000	118.0809	118.0809	0.0308	0.0000	118.7274
Total	**0.1406**	**1.3861**	**1.0463**	**1.3100e-003**	**0.2871**	**0.0782**	**0.3653**	**0.1574**	**0.0730**	**0.2304**	**0.0000**	**118.0809**	**118.0809**	**0.0308**	**0.0000**	**118.7274**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0364	0.4197	0.5710	1.1700e-003	0.0262	5.8700e-003	0.0320	7.1800e-003	5.4000e-003	0.0126	0.0000	103.5285	103.5285	8.7000e-004	0.0000	103.5467
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6700e-003	2.4900e-003	0.0258	7.0000e-005	5.2100e-003	5.0000e-005	5.2500e-003	1.3800e-003	4.0000e-005	1.4300e-003	0.0000	4.7096	4.7096	2.5000e-004	0.0000	4.7148

Total	**0.0381**	**0.4222**	**0.5968**	**1.2400e-003**	**0.0314**	**5.9200e-003**	**0.0373**	**8.5600e-003**	**5.4400e-003**	**0.0140**	**0.0000**	**108.2381**	**108.2381**	**1.1200e-003**	**0.0000**	**108.2615**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1292	0.0000	0.1292	0.0708	0.0000	0.0708	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0306	0.6374	0.8491	1.3100e-003		0.0353	0.0353		0.0353	0.0353	0.0000	118.0807	118.0807	0.0308	0.0000	118.7273
Total	**0.0306**	**0.6374**	**0.8491**	**1.3100e-003**	**0.1292**	**0.0353**	**0.1645**	**0.0708**	**0.0353**	**0.1061**	**0.0000**	**118.0807**	**118.0807**	**0.0308**	**0.0000**	**118.7273**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0364	0.4197	0.5710	1.1700e-003	0.0262	5.8700e-003	0.0320	7.1800e-003	5.4000e-003	0.0126	0.0000	103.5285	103.5285	8.7000e-004	0.0000	103.5467
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6700e-003	2.4900e-003	0.0258	7.0000e-005	5.2100e-003	5.0000e-005	5.2500e-003	1.3800e-003	4.0000e-005	1.4300e-003	0.0000	4.7096	4.7096	2.5000e-004	0.0000	4.7148
Total	**0.0381**	**0.4222**	**0.5968**	**1.2400e-003**	**0.0314**	**5.9200e-003**	**0.0373**	**8.5600e-003**	**5.4400e-003**	**0.0140**	**0.0000**	**108.2381**	**108.2381**	**1.1200e-003**	**0.0000**	**108.2615**

3.4 Building Construction - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0774	0.7665	0.5179	9.8000e-004		0.0444	0.0444		0.0416	0.0416	0.0000	88.4351	88.4351	0.0242	0.0000	88.9434
Total	**0.0774**	**0.7665**	**0.5179**	**9.8000e-004**		**0.0444**	**0.0444**		**0.0416**	**0.0416**	**0.0000**	**88.4351**	**88.4351**	**0.0242**	**0.0000**	**88.9434**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.4000e-004	6.3600e-003	8.9600e-003	2.0000e-005	5.1000e-004	1.0000e-004	6.1000e-004	1.5000e-004	9.0000e-005	2.3000e-004	0.0000	1.5991	1.5991	1.0000e-005	0.0000	1.5994
Worker	7.3000e-004	1.0900e-003	0.0113	3.0000e-005	2.2700e-003	2.0000e-005	2.2900e-003	6.0000e-004	2.0000e-005	6.2000e-004	0.0000	2.0573	2.0573	1.1000e-004	0.0000	2.0596
Total	**1.3700e-003**	**7.4500e-003**	**0.0203**	**5.0000e-005**	**2.7800e-003**	**1.2000e-004**	**2.9000e-003**	**7.5000e-004**	**1.1000e-004**	**8.5000e-004**	**0.0000**	**3.6565**	**3.6565**	**1.2000e-004**	**0.0000**	**3.6590**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Off-Road	0.0230	0.4866	0.6079	9.8000e-004		0.0272	0.0272		0.0272	0.0272	0.0000	88.4350	88.4350	0.0242	0.0000	88.9433
Total	**0.0230**	**0.4866**	**0.6079**	**9.8000e-004**		**0.0272**	**0.0272**		**0.0272**	**0.0272**	**0.0000**	**88.4350**	**88.4350**	**0.0242**	**0.0000**	**88.9433**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	6.4000e-004	6.3600e-003	8.9600e-003	2.0000e-005	5.1000e-004	1.0000e-004	6.1000e-004	1.5000e-004	9.0000e-005	2.3000e-004	0.0000	1.5991	1.5991	1.0000e-005	0.0000	1.5994
Worker	7.3000e-004	1.0900e-003	0.0113	3.0000e-005	2.2700e-003	2.0000e-005	2.2900e-003	6.0000e-004	2.0000e-005	6.2000e-004	0.0000	2.0573	2.0573	1.1000e-004	0.0000	2.0596
Total	**1.3700e-003**	**7.4500e-003**	**0.0203**	**5.0000e-005**	**2.7800e-003**	**1.2000e-004**	**2.9000e-003**	**7.5000e-004**	**1.1000e-004**	**8.5000e-004**	**0.0000**	**3.6565**	**3.6565**	**1.2000e-004**	**0.0000**	**3.6590**

3.4 Building Construction - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2173	2.1522	1.5899	3.0900e-003		0.1200	0.1200		0.1123	0.1123	0.0000	274.1903	274.1903	0.0756	0.0000	275.7775
Total	**0.2173**	**2.1522**	**1.5899**	**3.0900e-003**		**0.1200**	**0.1200**		**0.1123**	**0.1123**	**0.0000**	**274.1903**	**274.1903**	**0.0756**	**0.0000**	**275.7775**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.9000e-003	0.0184	0.0272	6.0000e-005	1.6000e-003	2.9000e-004	1.8900e-003	4.6000e-004	2.6000e-004	7.2000e-004	0.0000	4.9254	4.9254	4.0000e-005	0.0000	4.9261
Worker	2.1000e-003	3.1300e-003	0.0325	9.0000e-005	7.1500e-003	6.0000e-005	7.2100e-003	1.9000e-003	6.0000e-005	1.9600e-003	0.0000	6.2157	6.2157	3.2000e-004	0.0000	6.2224
Total	**4.0000e-003**	**0.0216**	**0.0598**	**1.5000e-004**	**8.7500e-003**	**3.5000e-004**	**9.1000e-003**	**2.3600e-003**	**3.2000e-004**	**2.6800e-003**	**0.0000**	**11.1411**	**11.1411**	**3.6000e-004**	**0.0000**	**11.1485**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0724	1.5301	1.9117	3.0900e-003		0.0856	0.0856		0.0856	0.0856	0.0000	274.1900	274.1900	0.0756	0.0000	275.7771
Total	**0.0724**	**1.5301**	**1.9117**	**3.0900e-003**		**0.0856**	**0.0856**		**0.0856**	**0.0856**	**0.0000**	**274.1900**	**274.1900**	**0.0756**	**0.0000**	**275.7771**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.9000e-003	0.0184	0.0272	6.0000e-005	1.6000e-003	2.9000e-004	1.8900e-003	4.6000e-004	2.6000e-004	7.2000e-004	0.0000	4.9254	4.9254	4.0000e-005	0.0000	4.9261
Worker	2.1000e-003	3.1300e-003	0.0325	9.0000e-005	7.1500e-003	6.0000e-005	7.2100e-003	1.9000e-003	6.0000e-005	1.9600e-003	0.0000	6.2157	6.2157	3.2000e-004	0.0000	6.2224
Total	**4.0000e-003**	**0.0216**	**0.0598**	**1.5000e-004**	**8.7500e-003**	**3.5000e-004**	**9.1000e-003**	**2.3600e-003**	**3.2000e-004**	**2.6800e-003**	**0.0000**	**11.1411**	**11.1411**	**3.6000e-004**	**0.0000**	**11.1485**

3.4 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0122	0.1205	0.0959	1.9000e-004		6.4200e-003	6.4200e-003		6.0100e-003	6.0100e-003	0.0000	16.5202	16.5202	4.6200e-003	0.0000	16.6172
Total	**0.0122**	**0.1205**	**0.0959**	**1.9000e-004**		**6.4200e-003**	**6.4200e-003**		**6.0100e-003**	**6.0100e-003**	**0.0000**	**16.5202**	**16.5202**	**4.6200e-003**	**0.0000**	**16.6172**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Vendor	1.1000e-004	9.9000e-004	1.6200e-003	0.0000	1.0000e-004	2.0000e-005	1.1000e-004	3.0000e-005	1.0000e-005	4.0000e-005	0.0000	0.2952	0.2952	0.0000	0.0000	0.2953
Worker	1.2000e-004	1.8000e-004	1.8600e-003	1.0000e-005	4.4000e-004	0.0000	4.4000e-004	1.2000e-004	0.0000	1.2000e-004	0.0000	0.3657	0.3657	2.0000e-005	0.0000	0.3661
Total	**2.3000e-004**	**1.1700e-003**	**3.4800e-003**	**1.0000e-005**	**5.4000e-004**	**2.0000e-005**	**5.5000e-004**	**1.5000e-004**	**1.0000e-005**	**1.6000e-004**	**0.0000**	**0.6609**	**0.6609**	**2.0000e-005**	**0.0000**	**0.6614**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.4400e-003	0.0938	0.1172	1.9000e-004		5.2500e-003	5.2500e-003		5.2500e-003	5.2500e-003	0.0000	16.5202	16.5202	4.6200e-003	0.0000	16.6172
Total	**4.4400e-003**	**0.0938**	**0.1172**	**1.9000e-004**		**5.2500e-003**	**5.2500e-003**		**5.2500e-003**	**5.2500e-003**	**0.0000**	**16.5202**	**16.5202**	**4.6200e-003**	**0.0000**	**16.6172**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.1000e-004	9.9000e-004	1.6200e-003	0.0000	1.0000e-004	2.0000e-005	1.1000e-004	3.0000e-005	1.0000e-005	4.0000e-005	0.0000	0.2952	0.2952	0.0000	0.0000	0.2953
Worker	1.2000e-004	1.8000e-004	1.8600e-003	1.0000e-005	4.4000e-004	0.0000	4.4000e-004	1.2000e-004	0.0000	1.2000e-004	0.0000	0.3657	0.3657	2.0000e-005	0.0000	0.3661
Total	**2.3000e-004**	**1.1700e-003**	**3.4800e-003**	**1.0000e-005**	**5.4000e-004**	**2.0000e-005**	**5.5000e-004**	**1.5000e-004**	**1.0000e-005**	**1.6000e-004**	**0.0000**	**0.6609**	**0.6609**	**2.0000e-005**	**0.0000**	**0.6614**

3.5 Paving - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.6300e-003	0.0713	0.0702	1.1000e-004		3.9000e-003	3.9000e-003		3.6300e-003	3.6300e-003	0.0000	9.2539	9.2539	2.6900e-003	0.0000	9.3104
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.6300e-003**	**0.0713**	**0.0702**	**1.1000e-004**		**3.9000e-003**	**3.9000e-003**		**3.6300e-003**	**3.6300e-003**	**0.0000**	**9.2539**	**9.2539**	**2.6900e-003**	**0.0000**	**9.3104**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	8.0000e-004	8.3500e-003	2.0000e-005	1.9700e-003	2.0000e-005	1.9900e-003	5.2000e-004	2.0000e-005	5.4000e-004	0.0000	1.6458	1.6458	8.0000e-005	0.0000	1.6475
Total	**5.4000e-004**	**8.0000e-004**	**8.3500e-003**	**2.0000e-005**	**1.9700e-003**	**2.0000e-005**	**1.9900e-003**	**5.2000e-004**	**2.0000e-005**	**5.4000e-004**	**0.0000**	**1.6458**	**1.6458**	**8.0000e-005**	**0.0000**	**1.6475**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.2000e-003	0.0468	0.0678	1.1000e-004		2.8700e-003	2.8700e-003		2.8700e-003	2.8700e-003	0.0000	9.2539	9.2539	2.6900e-003	0.0000	9.3104
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**2.2000e-003**	**0.0468**	**0.0678**	**1.1000e-004**		**2.8700e-003**	**2.8700e-003**		**2.8700e-003**	**2.8700e-003**	**0.0000**	**9.2539**	**9.2539**	**2.6900e-003**	**0.0000**	**9.3104**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.4000e-004	8.0000e-004	8.3500e-003	2.0000e-005	1.9700e-003	2.0000e-005	1.9900e-003	5.2000e-004	2.0000e-005	5.4000e-004	0.0000	1.6458	1.6458	8.0000e-005	0.0000	1.6475
Total	**5.4000e-004**	**8.0000e-004**	**8.3500e-003**	**2.0000e-005**	**1.9700e-003**	**2.0000e-005**	**1.9900e-003**	**5.2000e-004**	**2.0000e-005**	**5.4000e-004**	**0.0000**	**1.6458**	**1.6458**	**8.0000e-005**	**0.0000**	**1.6475**

3.6 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0753					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	2.4200e-003	0.0168	0.0183	3.0000e-005		1.1100e-003	1.1100e-003		1.1100e-003	1.1100e-003	0.0000	2.5533	2.5533	2.0000e-004	0.0000	2.5574
Total	**0.0777**	**0.0168**	**0.0183**	**3.0000e-005**		**1.1100e-003**	**1.1100e-003**		**1.1100e-003**	**1.1100e-003**	**0.0000**	**2.5533**	**2.5533**	**2.0000e-004**	**0.0000**	**2.5574**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.6000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0914	0.0914	0.0000	0.0000	0.0915
Total	**3.0000e-005**	**4.0000e-005**	**4.6000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0914**	**0.0914**	**0.0000**	**0.0000**	**0.0915**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0753					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.9000e-004	0.0136	0.0183	3.0000e-005		9.5000e-004	9.5000e-004		9.5000e-004	9.5000e-004	0.0000	2.5533	2.5533	2.0000e-004	0.0000	2.5574
Total	**0.0759**	**0.0136**	**0.0183**	**3.0000e-005**		**9.5000e-004**	**9.5000e-004**		**9.5000e-004**	**9.5000e-004**	**0.0000**	**2.5533**	**2.5533**	**2.0000e-004**	**0.0000**	**2.5574**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.0000e-005	4.0000e-005	4.6000e-004	0.0000	1.1000e-004	0.0000	1.1000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.0914	0.0914	0.0000	0.0000	0.0915
Total	**3.0000e-005**	**4.0000e-005**	**4.6000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0914**	**0.0914**	**0.0000**	**0.0000**	**0.0915**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	6.8600e-003	0.0229	0.0887	3.0000e-004	0.0202	4.1000e-004	0.0206	5.4000e-003	3.7000e-004	5.7700e-003	0.0000	21.0742	21.0742	7.5000e-004	0.0000	21.0899
Unmitigated	6.8600e-003	0.0229	0.0887	3.0000e-004	0.0202	4.1000e-004	0.0206	5.4000e-003	3.7000e-004	5.7700e-003	0.0000	21.0742	21.0742	7.5000e-004	0.0000	21.0899

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		

General Light Industry	12.00	12.00	12.00	53,139	53,139
Total	12.00	12.00	12.00	53,139	53,139

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-...	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	16.60	8.40	6.90	33.00	48.00	19.00	66	28	6
General Light Industry	16.60	8.40	6.90	59.00	28.00	13.00	92	5	3

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.527271	0.057774	0.179409	0.125521	0.039563	0.006393	0.017164	0.035220	0.002536	0.003167	0.003715	0.000530	0.001736

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	325.5768	325.5768	8.3200e-003	1.7200e-003	326.2851
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	325.5768	325.5768	8.3200e-003	1.7200e-003	326.2851
NaturalGas Mitigated	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	10.0377	10.0377	1.9000e-004	1.8000e-004	10.0988
NaturalGas Unmitigated	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	10.0377	10.0377	1.9000e-004	1.8000e-004	10.0988

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Light Industry	188100	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	10.0377	10.0377	1.9000e-004	1.8000e-004	10.0988
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**1.0100e-003**	**9.2200e-003**	**7.7500e-003**	**6.0000e-005**		**7.0000e-004**	**7.0000e-004**		**7.0000e-004**	**7.0000e-004**	**0.0000**	**10.0377**	**10.0377**	**1.9000e-004**	**1.8000e-004**	**10.0988**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
General Light Industry	188100	1.0100e-003	9.2200e-003	7.7500e-003	6.0000e-005		7.0000e-004	7.0000e-004		7.0000e-004	7.0000e-004	0.0000	10.0377	10.0377	1.9000e-004	1.8000e-004	10.0988
Total		**1.0100e-003**	**9.2200e-003**	**7.7500e-003**	**6.0000e-005**		**7.0000e-004**	**7.0000e-004**		**7.0000e-004**	**7.0000e-004**	**0.0000**	**10.0377**	**10.0377**	**1.9000e-004**	**1.8000e-004**	**10.0988**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			

City Park	0	0.0000	0.0000	0.0000	0.0000
General Light Industry	632400	325.5768	8.3200e-003	1.7200e-003	326.2851
Total		**325.5768**	**8.3200e-003**	**1.7200e-003**	**326.2851**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
General Light Industry	632400	325.5768	8.3200e-003	1.7200e-003	326.2851
Total		**325.5768**	**8.3200e-003**	**1.7200e-003**	**326.2851**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0486	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Unmitigated	0.0486	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	7.7700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0409					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Total	**0.0486**	**0.0000**	**1.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5000e-004**	**2.5000e-004**	**0.0000**	**0.0000**	**2.6000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	7.7700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0409					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5000e-004	2.5000e-004	0.0000	0.0000	2.6000e-004
Total	**0.0486**	**0.0000**	**1.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5000e-004**	**2.5000e-004**	**0.0000**	**0.0000**	**2.6000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	16.4401	0.0757	1.8600e-003	18.6071
Unmitigated	16.4401	0.0758	1.8600e-003	18.6082

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 0.0357444	0.2045	1.0000e-005	0.0000	0.2049
General Light Industry	2.3125 / 0	16.2357	0.0758	1.8600e-003	18.4034
Total		**16.4401**	**0.0758**	**1.8600e-003**	**18.6082**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			

City Park	0 / 0.0357444	0.2045	1.0000e-005	0.0000	0.2049
General Light Industry	2.3125 / 0	16.2357	0.0757	1.8600e-003	18.4022
Total		**16.4401**	**0.0758**	**1.8600e-003**	**18.6071**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	2.5171	0.1488	0.0000	5.6410
Unmitigated	2.5171	0.1488	0.0000	5.6410

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
General Light Industry	12.4	2.5171	0.1488	0.0000	5.6410

Total		**2.5171**	**0.1488**	**0.0000**	**5.6410**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
General Light Industry	12.4	2.5171	0.1488	0.0000	5.6410
Total		**2.5171**	**0.1488**	**0.0000**	**5.6410**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Appendix C

Biological Resources and Habitat Assessment

BIOLOGICAL RESOURCES AND HABITAT ASSESSMENT

VENICE AUXILIARY PUMPING PLANT PROJECT

LOS ANGELES COUNTY, CALIFORNIA

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January 2016



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Acronyms and Abbreviations

APNs	assessor's parcel numbers
CCC	California Coastal Commission
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
EPA	U.S. Environmental Protection Agency
ESHAs	Environmentally Sensitive Habitat Areas
FESA	Federal Endangered Species Act
FR	Federal Register
ICF	ICF International
mgd	million gallons per day
MSL	mean sea level
project	Venice Auxiliary Pumping Plant Project
RWQCB	Regional Water Quality Control Board
SFP	State Fully Protected
VPP	Venice Pumping Plant
VAPP	Venice Auxiliary Pumping Plant
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey

Chapter 1
Introduction

This report contains the results of a biological resources and habitat assessment conducted for the Venice Auxiliary Pumping Plant Project (VAPP or proposed project) located in the City of Los Angeles, Los Angeles County, California.

1.1 Project Location

The proposed project is located at the northeast corner of Hurricane Street and Canal Court across and immediately north of the existing Venice Pumping Plant (Figure 1). The project would be located on two three existing vacant lots (Assessor Parcel Numbers [APN]: 4225-008-904 and 42250089044225-010-016), which are owned by the City of Los Angeles, two of which would serve as laydown areas. Laydown Area 1 would be used for soil stockpile and construction materials and equipment and then permanently converted to parking and open space once the proposed project is operational. Laydown Area 2, located on the east side of the Grand Canal would be used for temporary storage of construction material and equipment, and two laydown areas, as well as within the Grand Canal. The site is mapped in Township 2 South, Range 15 West, Section 21 U.S. Geological Survey (USGS) 7.5-minute "Venice" quadrangle map (USGS 1964) (Figure 2).

1.2 Project Description

The project would include the construction of an auxiliary pumping facility that would provide additional reliability and supplement capacity to the existing Venice Pumping Plant (VPP). The project would be sized to supplement the pumping capacity of the VPP (Pump Station No. 646), for a combined ultimate peak flow capacity of 87 million gallons per day (mgd), reflecting wet weather flows of a 10-year storm event. Major project components of the VAPP would include: one electrical building approximately 3532-feet in height, three pumps constructed below ground level, utility connections, transformers and generators, 17-feet by 17-feet submerged diversion structure, the top of which will be below the channel bed, or the lowest elevation of the Grand Canal, and a 66-inch sewer to connect VAPP to the new diversion structure. A portion of Hurricane Street between and Canal Court and Esplanade would be temporarily closed off during construction and then reopened, with Hurricane Street from Canal Court to Esplanade closed to the public once the facility is operational. Shoring would be installed around the project site, and then excavation would occur to a depth of approximately 25 feet. The proposed project would require the excavation of approximately 10,000 cubic yards of soil of which approximately 2,300 cubic yards would be stockpiled at Laydown Area 1. The remaining 7,700 cubic yards of soil would be exported off-site and stockpiled at Laydown Area 3 in Culver Cityexported off-site and disposed of in an approved area landfill. Laydown Area 2 (across Grand Canal), given the slope and access constraints, may be used only as needed for equipment and materials storage. Water pumped from the site would be disposed of in a manner consistent with Regional Water Quality Control Board (RWQCB) regulations. Construction of the underground facilities associated with the VAPP, including the three new pumps, the wet well, valve vault, meter vault and piping, would occur. These facilities would be



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Figure 1
Project Vicinity Map
Venice Auxiliary Pumping Plant Project

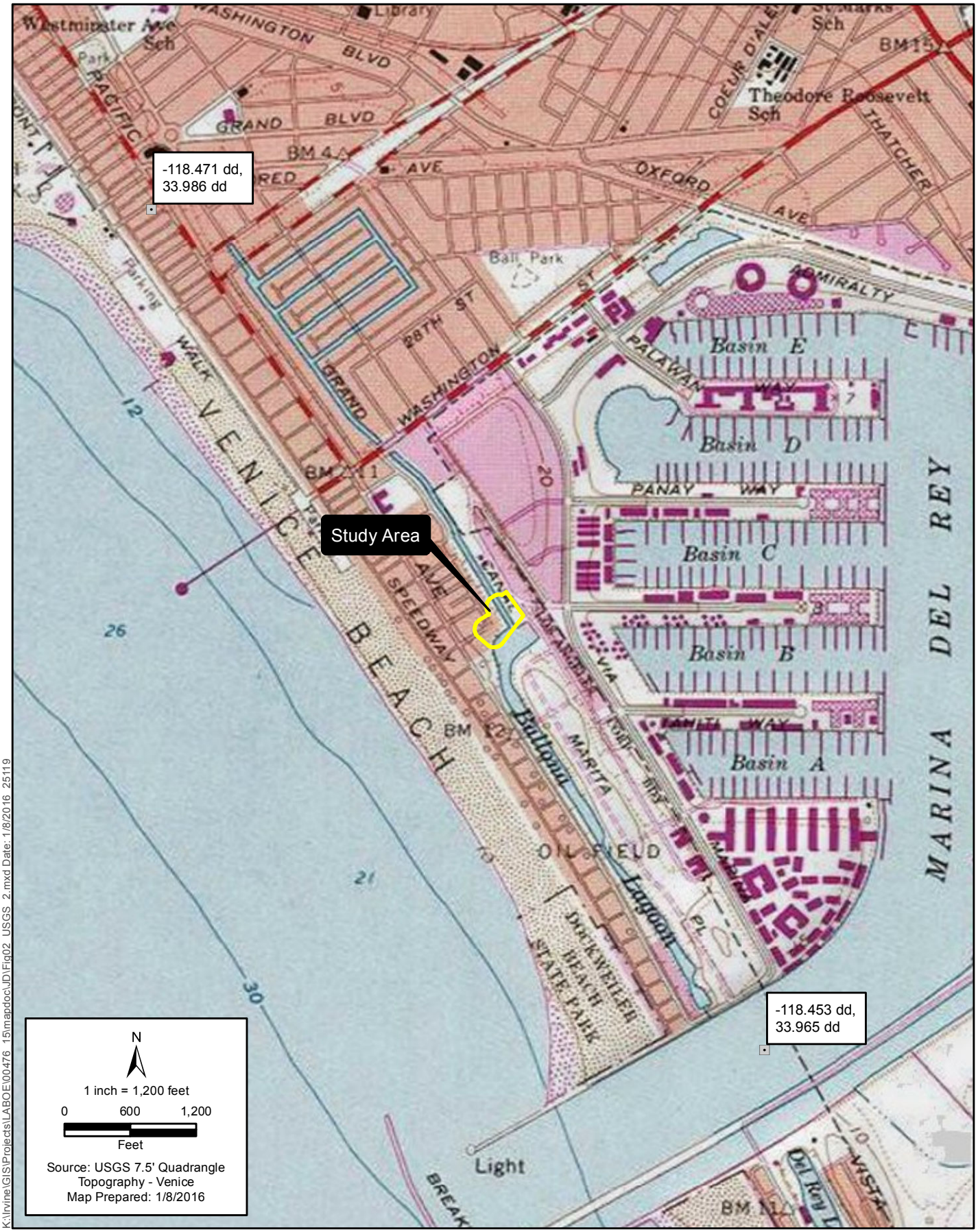

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Figure 2
USGS Topographic Map
Venice Auxiliary Pumping Plant Project

constructed at a maximum depth of approximately 25 feet below ground. Within the Grand Canal, a diversion structure approximately 23-feet by 95-feet would be excavated to a depth of approximately 18 feet below ground and then sealed. Excavated materials would be hauled from the site and stockpiled at either Laydown Area 1 or Laydown Area 3 or transported to an approved area landfill; upon completing of installation and sealing, The Grand Canal would be backfilled using the stockpiled excavated material and the coffer dam removed.Excavated materials would be hauled from the site and disposed of at an appropriate location. Water flowing in the Grand Canal would be diverted around a cofferdam structure by the presence of the dam itself. The diversion structure would then be constructed around the in-service Coastal Interceptor Sewer (CIS) pipe. Construction of the cofferdam, placement of the diversion structure, and backfill and soil compaction within the Grand Canal would last approximately three months. The CIS pipe would be cut so that the modular insert could be installed. The pipes would then be connected and a seal would be inserted into the shell. Backfill and soil compaction would be completed, and the Grand Canal channel bottom would be restored to its original elevation. Finally, the diversion structure will be sealed, removing all shoring steel, and allowing flows to resume to pre-construction conditions within the Grand Canal. The Esplanade would be re-opened to pedestrian access on the west side of the Grand Canal. Surface improvements at the site will occur, consisting of constructing an approximately 3532-foot high electrical building and installing two new 480-Volt City of Los Angeles Department of Water and Power transformers.

Chapter 2
Methods

2.1 Terminology

Within this report, the term "project" refers to the proposed construction footprint encompassing the proposed construction limits and lay down areas. The term "study area" refers to the project site plus an additional 500-foot buffer area surrounding the project site. Special-status species referred to in this report include those wildlife and plants listed as threatened or endangered under federal or state endangered species acts (CDFW 2015a); plant species designated by the California Native Plant Society (CNPS) with a California Rare Plant Rank (CRPR) or other plants of local concern (CNPS 2015); and wildlife that is designated as a California Species of Special Concern, as defined by the California Department of Fish and Wildlife (CDFW) (CDFW 2015a).

2.2 Database Search and Literature Review

A literature review was conducted to evaluate the environmental setting of the study area prior to the habitat assessment and identify special-status species or potentially suitable habitat for special-status species. The literature review included a review of the U.S. Fish and Wildlife Service (USFWS) mapping of designated critical habitat and generation of a species list (USFWS 2015, 2016). In addition, the National Marine Fisheries Service Essential Fish Habitat was reviewed to determine if the study area contains designated Essential Fish Habitat (NOAA 2015). The California Natural Diversity Database (CNDDB) (CDFW 2015b) and the CNPS Inventory of Rare and Endangered Plants (CNPS 2015) were reviewed for the Venice (USGS 1964) and surrounding USGS 7.5-minute quadrangles.

Previous reports reviewed include The Ballona Wetlands Ecological Reserve Baseline Assessment Program 2010-2011 Final Report (Johnson 2012) and previous Los Angeles Bureau of Engineering studies including biological resource surveys for the ESR-Hurricane Maintenance Hole Replacement, Grand Canal West Bank, Venice Tide Gates, and Venice Pumping Plant Sluice Gate Replacement (Jones 2016).

2.3 Biological Resources

ICF International (ICF) biologists Shannon Crossen and Marissa Maggio, conducted a habitat assessment for special-status biological resources within the study area on August 20th, 2015. The habitat assessment was conducted between 0930 and 1330, and temperatures ranged from 74˚ to 78˚ Fahrenheit. Winds were calm, and cloud cover was overcast and later becoming clear. Visibility was good.

During the habitat assessment, photos of the study area were taken (see Appendix A). All plant species observed or otherwise detected during the habitat assessment were recorded in a field notebook. Common plant species observed were identified by visual characteristics and morphology in the field. Any unusual and less-familiar plants were identified in the office using taxonomic keys

and guides. Taxonomic nomenclature for plants follows *The Jepson Manual: Vascular Plants of California* (Baldwin et al. 2012). A complete list of all plant species observed during the site visit is found in Appendix B of this document. Appendix B also includes a list of plants observed during previous surveys there were not detected during this habitat assessment (LADPW 2005).

All wildlife species observed or otherwise detected during the habitat assessment were recorded in a field notebook. Wildlife species were detected by sight, calls, tracks, scat, or other sign. Field guides were used to assist with identification of species during surveys and included the *National Geographic Field Guide to the Birds of North America* (National Geographic 2002) for birds, *Western Reptiles and Amphibians* (Stebbins 2003) for reptiles, and *A Field Guide to the Mammals of North America* (Reid 2006) for mammals. A complete list of all wildlife species observed during the site visit is found in Section 3.4 of this document.

2.3.1 Vegetation/Land Use/Land Condition Mapping

Vegetation/land use/land condition within the study area was mapped during the habitat assessment on a satellite aerial image of the site taken from Google Earth (scale: 1 inch = 200 feet) (Google Earth 2015). The Google Earth image was also evaluated to confirm conditions within the extended project footprint within the canal channel, and the associated 500-foot buffer. Community descriptions from the *Preliminary Descriptions of Terrestrial Natural Communities of California.* (Holland 1986) were used to classify the vegetation within the study area where possible.

2.4 Survey Limitations

Plant and animal observations were limited because of the timing of the surveys (mid-August). As such, it is important to note that additional species, beyond those observed in this evaluation, may occur in the study area, but may not have been detected. For example, some species may not have been found because they were not present at the time of day or time of year that the fieldwork was conducted. Some special survey methods may be required to determine the presence or absence of some species (e.g., rare plant surveys during a species blooming season). Therefore, the plants and wildlife species observed and reported herein are not intended to be complete lists of species present within the study area; they include only those species observed during the habitat assessment.

2.5 Regulatory Constraints

Applicable local, state, and federal laws and regulations, as well as court precedents enacted to protect and/or manage biological resources, were evaluated for their relevance and potential to constrain the proposed project. The analysis of constraints provided in this report is based on a combination of direct evaluation of the site, current regulatory information, and professional judgment.

2.5.1 Federal Laws

The federal laws listed below were considered during evaluation of the biological resources in the study area. Note that this is not an exhaustive list of all federal laws that may be applicable to the project.

- *Endangered Species Act of 1973* (including designated critical habitat for listed species)
- *Environmental Quality Improvement Act of 1970*
- *Federal Noxious Weed Act of 1974*
- *Federal Water Pollution Control Act* (Clean Water Act, CWA)
- *Rivers and Harbors Appropriations Act of 1899*
- *Fish and Wildlife Act of 1956*
- *Migratory Bird Treaty Act*
- *National Environmental Policy Act of 1969*

2.5.2 State Laws and Regulations

The state laws and regulations listed below were considered during evaluation of the biological resources in the study area. Note that this is not an exhaustive list of all state laws and regulations that may be considered.

- *California Environmental Quality Act* (CEQA) (Public Resources Code Sections 21000–21177, CEQA Guidelines Sections 15000–15387)
- *California Fish and Game Code* (including codes for the state Endangered Species Act, those similar to the federal Migratory Bird Treaty Act, those for lake or streambed alteration agreements, and those for navigation dredging permits)
- In California, the State Water Resources and nine Regional Water Quality Control Boards regulate activities within state and federal waters under Section 401 of the CWA and the Porter-Cologne Act. Waters of the State under the Porter-Cologne Act are defined as "any surface water or groundwater, including saline waters, within the boundaries of the state" (California Water Code 13050 [e])
- *Coastal Zone Management Act* (Title 16 United States Code 1451–1464)
- *The California Coastal Act* (California Public Resources Code Division 20, Section 30240a) restricts land uses within or adjacent to Environmentally Sensitive Habitat Areas (ESHAs). The *California Coastal Act*, Section 30107.5, defines an ESHA as:
    - …any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and could be easily disturbed or degraded by human activities and developments.

2.5.3 Local Regulations

The local regulations listed below were considered during evaluation of the biological resources in the study area. Note that this is not an exhaustive list of all local regulations that may be considered.

- L.A. CEQA Thresholds Guide
- City of Los Angeles General Plan
- Venice Community Plan
- Venice Local Coastal Program

Chapter 3
Existing Conditions

The following discussions address conditions and biological resources observed or potentially present in the study area. Chapter 4 and Appendix C contain specific details regarding habitat assessments conducted for special-status resources.

3.1 Environmental Setting

The project is located within an urban area within the City of Los Angeles community of Venice. The study area is surrounded on the north and west by residential land uses and to the east by the Grand Canal and Ballona Lagoon to the south. Residential land uses are also located immediately east of the Grand Canal. Two parcels associated with the project are currently undeveloped vacant lots surrounded by a chain-link fence. Two other undeveloped lots will function as laydown areas during construction. Elevations within the study area range from approximately 0 feet to approximately 10 feet above mean sea level (MSL).

3.2 Vegetation/Land Use Types

The study area is composed of ornamental vegetation associated with developed and/or disturbed lots surrounding the Grand Canal and Ballona Lagoon, both of which contain native plant communities with varying composition of non-native species. Vegetation types/land uses within the study area are discussed below. Table 1 provides data regarding the vegetation communities, including land use types and acreages for each community mapped within the study area. Figure 3 depicts the location of each vegetation community within the study area.

Table 1. Vegetation Communities/Land Use/Land Condition within the Study Area

Vegetation Community/Land Use/Land Condition	Acres
Developed	24.60
Disturbed/Ruderal	0.18
Open Water	3.13
Southern Coastal Salt Marsh	0.90
Coastal Brackish Marsh	0.16
Southern Foredunes	0.43
Southern Coastal Bluff Scrub	0.35
Total	**29.74**

3.2.1 Developed

Developed lands were mapped in association with the residential structures and surface roads within the study area and include ornamental vegetation typically associated with the developed

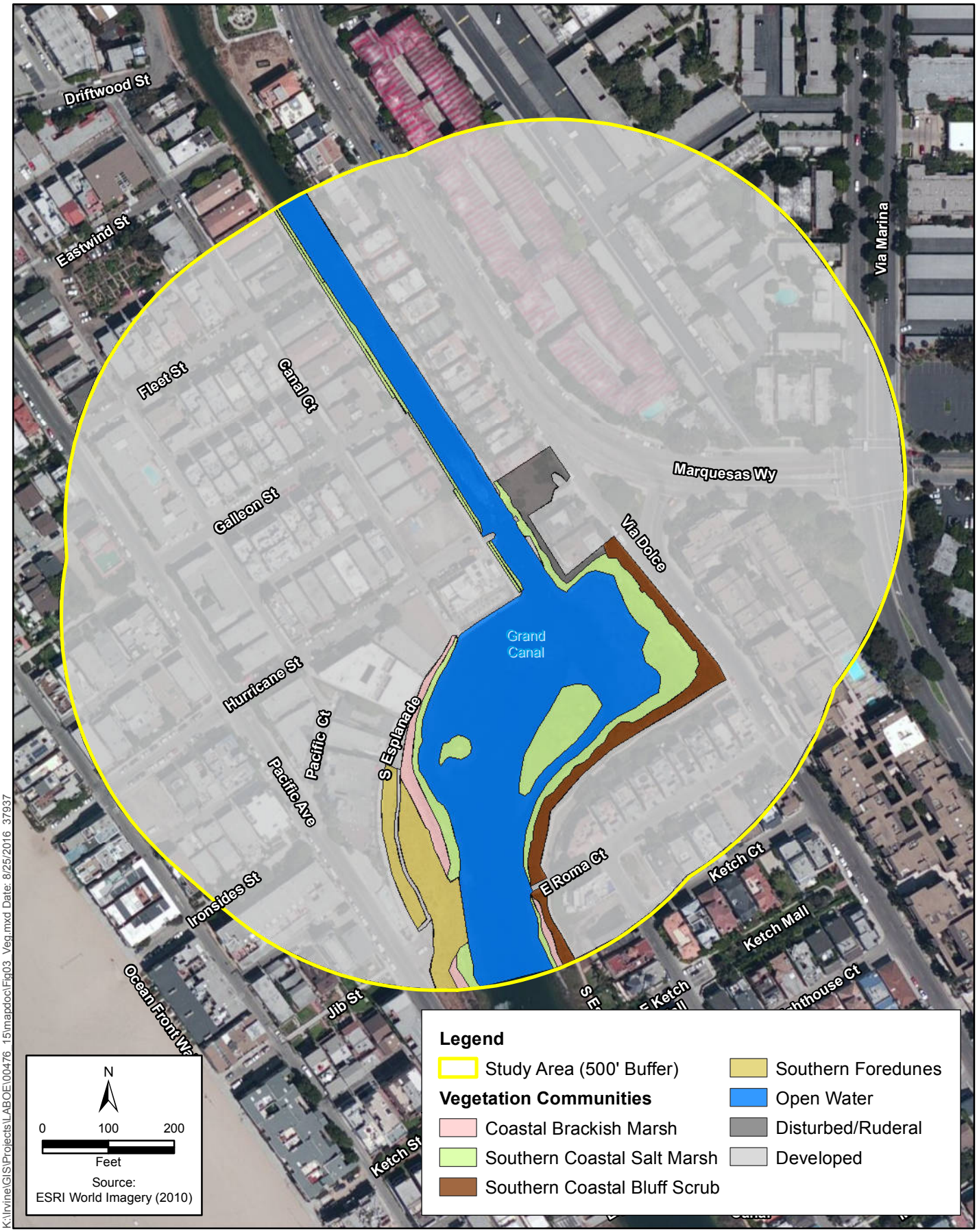

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Figure 3
Vegetation Communities
Venice Auxiliary Pumping Plant Project

areas such as Mexican fan palm (*Washingtonis robusta*), acacia (*Acacia* sp.), eucalyptus (*Eucalyptus* sp.), Peruvian pepper tree (*Schinus molle*), iceplant (*Carpobrotus* sp.), and myoporum (*Myoporum* sp.).

3.2.2 Disturbed/Ruderal

This area vegetation type was mapped on the eastern side of the study area associated with a vacant lot surrounded by developed lands to the north, east, and south. The area contains a small footpath leading from the sidewalk adjacent to the Grand Canal to the Via Dolce surface street. This area is dominated by non-native and native annual and perennial species such as iceplant, garland chrysanthemum (*Glebionis coronaria*), telegraphweed (*Heterotheca grandifolia*), cheeseweed (*Malva parviflora*), Bermuda grass (*Cynodon dactylon*), and Australian saltbush (*Atriplex semibaccata*).

3.2.3 Open Water

Open Water consists of the tidal influenced Grand Canal. Grand Canal opens to Marina del Rey approximately 4,000 feet to the south through a flood gate system under Via Marina road. Mudflats occur within the tidally-influenced portions of the BSA and exposed areas of mudflats fluctuate with tide. A small strip of exposed mudflat occurs within the project footprint during low tides within this habitat type.

3.2.4 Southern Coastal Salt Marsh (Holland 52120)

This vegetation type was mapped within the tidal zone of the Grand Canal and Ballona Lagoon. This area is dominated by native wetland species such as pickleweed (*Sarcocornia pacifica*), batis (*Batis maritima*), wooly seablight (*Suaeda taxifolia*[1]), spearscale (*Atriplex prostrata*), and fleshy jaumea (*Jaumea carnosa*). Wooly seablight is a CNPS CRPR List 4.2 species (plants of limited distribution). The upper portions of this area support species such as salt grass (*Distichilis spicata*), five-hooked bassia (*Bassia hyssopifolia*), beach bur (*Ambrosia chamissonis*), and alkali heath (*Frankenia salina*) indicating the start of the wetland-upland interface. Two "islands" were mapped within the Ballona Lagoon that are periodically covered by tidal waters each day.

3.2.5 Coastal Brackish Marsh (Holland 52200) -

This vegetation type was mapped immediately above the tidal zone of the Grand Canal and Ballona Lagoon. This area is dominated by species such as alkali heath, salt grass, five-hooked bassia, woolly seablight, beach bur, alkali heliotrope (*Heliotropium curassavicum*), and deerweed (*Acmispon glaber*). The lower portion of this area transitions to wetland species such as pickleweed, batis, and fleshy jaumea.

3.2.6 Southern Foredunes (Holland 21230)

This area was mapped on the western side of Ballona Lagoon within the southwestern portion of the study area. This area is dominated by upland coastal dune and maritime sage scrub species. Dominant species observed on the western side of the lagoon include beach bur, deerweed, bluff

[1] *Suaeda taxifolia* is designated as a CNPS CRPR 4.2 species.

buckwheat (*Eriogonum parviflora*), red sand verbena (*Abronia maritima*[2]), beach evening primrose (*Camissonia cheiranthifolia*), southwestern spiny rush (*Juncus acutus* ssp. *leopoldii*[3]), telegraphweed (*Heterotheca grandifolia*), and Watson's saltbush (*Atriplex watsonii*).

3.2.7 Southern Coastal Bluff Scrub (Holland 31200)

This area was mapped on the eastern side of Ballona Lagoon. Dominant species observed in this area include southwestern spiny rush, California encelia (*Encelia californica*), California sagebrush (*Artemisia californica*), prickly-pear cactus (*Opuntia littoralis*), and lemonade berry (*Rhus integrifolia*).

3.3 Plants

Most plant species that were observed within the study area are considered common within the study area vicinity. However, three special-status species were determined to be present within the study area: woolly seablite, southwestern spiny rush, and red sand verbena, each of which is CNPS CRPR List 4.2 species. In addition, suitable habitat for other special-status plant species is present within the study area and is discussed in Section 4.1.

Common native plant species observed during the habitat assessment included the following species: lemonade berry (*Rhus integrifolia*), California sagebrush(*Artemisia californica*), California encelia (*Encelia californica*), , telegraphweed (*Heterotheca grandifolia*), alkali heath (*Frankenia salina*), alkali heliotrope(*Heliotropium curassavicum*) , prickly-pear cactus (*Opuntia littoralis*), saltwort , deerweed (*Acmispon glaber*), salt grass (*Distichilis spicata*), gut weed (*Ulva intestinalis*), sea lettuce (*Ulva lactuca*), western ragweed (*Ambrosia psilostachya*), ragweed (*Ambrosia* sp.), coastal goldenbush (*Isocoma menziesii*), beachwort (*Batis maritima*), mouse-ear chickweed (*Cerastium* sp.), Parish's pickleweed (*Arthrocnemum subterminale*), big saltbush (*Atriplex lentiformis*), saltbush (*Atriplex* sp.), Pacific pickleweed (*Salicornia pacifica*), pickleweed (*Salicornia* sp.), salt dodder (*Cuscuta salina*), vetch (*Vicia* sp.), suncup (*Camissonia* sp.), seacliff buckwheat (*Eriogonum parvifolium*), nightshade (*Solanum* sp.), and brittlegrass (*Setaria* sp.).

Common nonnative species observed during the habitat assessment included: Mexican fan palm (*Washingtonis robusta*), acacia (*Acacia* sp.), eucalyptus (*Eucalyptus* sp.), Australian saltbush(*Atriplex semibaccata*), Bermuda grass (*Cynodon dactylon*), flax-leaved horseweed (*Erigeron bonariensis*), five-hooked bassia, cheeseweed, baby sun-rose (*Aptenia cordifolia*), fat-hen (*Atriplex prostrata*), hottentot fig (*Carpobrotus* sp.), Lamb's quarters (*Chenopodium album*), whitestem filaree (*Erodium moschatum*),spotted spurge (*Euphorbia maculate*), crown daisy (*Glebionis coronaria*), grass poly (*Lythrum hyssopifolia*), Ngaio tree (*Myoporum laetum*), Brazilian pepper tree (*Schinus terebinthifolius*), sowthistle (*Sonchus* sp.), and puncturevine (*Tribulus terrestris*).

Appendix B provides a list of all plant species observed on the project site during the habitat assessment, as well as those observed during previous studies (LADPW 2005)

[2] *Abronia maritima* is designated as a CNPS CRPR 4.2 species.

[3] *Juncus acutus* is designated as a CNPS CRPR 4.2 species.

3.4 Wildlife

Wildlife species that were observed within the study area are considered common to the general project vicinity. The majority of species detected were birds. Bird species observed and/or heard during the habitat assessment include mallard (*Anas platyrhynchos*), mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), white-throated swift (*Aeronautes saxatalis*), barn swallow (*Hirundo rustica*), cliff swallow (*Petrochelidon pyrrhonota*), northern rough-winged swallow (*Stelgidopteryx serripennis*), black phoebe (*Sayornis nigricans*), American crow (*Corvus brachyrhynchos*), common raven (*Corvus corax*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), osprey (*Pandion haliaetus*), American coot (*Fulica americana*), black-bellied plover (*Pluvialis squatarola*), willet (*Tringa semipalmata*), whimbrel (*Numenius phaeopus*), marbled godwit (*Limosa fedoa*), and belted kingfisher (*Ceryle alcyon*).

Marine invertebrates observed included buckshot barnacles (*Chthalamus* spp.), blue mussel (*Mytilus edulis*), California horn snail (*Cerithidea californica*), California mussel (*Mytilus californianus*), checkered limpet (*Lottia strigatella*), Gould's bubble snail (*Bulla gouldiana*), and Pacific oyster (*Ostrea lurida*). Additional marine invertebrates observed within the Grand Canal include commonly-occurring bivalves, mollusks, and crustaceans (LADPW 2005). Marine vertebrates observed included California corbina (*Menticirrhus undulates*) and topsmelt (*Atherinops affinis*). Appendix B provides a list of all wildlife species observed on the project site during the habitat assessment.

Suitable habitat for several special-status wildlife species is present within the study area and is discussed in Section 4.2.

3.5 Federal and State Jurisdictional Resources

The Grand Canal is a potential jurisdictional waters of the U.S., to Army Corps of Engineers (USACE) and the RWQCB, as well as the California Coastal Commission (CCC). A jurisdictional delineation was prepared for the project, the results of which are presented under separate cover. Please see the jurisdictional delineation report prepared for the proposed project titled *Jurisdictional Delineation Report, Venice Auxiliary Pumping Plant, Community of Venice, Los Angeles County, California,* dated January 2016 (ICF 2016), for a complete analysis of the federal and state jurisdictional resources present at the project site.

The jurisdictional delineation study area is defined as the project footprint plus a 100-foot buffer. Within the study area, two named features that could be subject to the jurisdiction of the USACE, RWQCB, and CCC were delineated: Ballona Lagoon and Grand Canal. These two features are treated as one for the purpose of this document. USACE and RWQCB potential jurisdictional areas within the study area total approximately 0.929-acre of Section 404 non-wetland waters of the U.S. /Section 401 non-wetland waters of the State and 0.075-acre of Section 404 wetland waters of the U.S. and Section 401 wetland waters of the State (Table 2). Additionally, 0.793-acre of potential USACE Section 10 waters of the U.S. was mapped in the study area. Potential CCC jurisdiction within the study area totaled approximately 0.929-acre of one-parameter wetlands.

Table 2. Jurisdictional Delineation Summary (acres)

Study Area Feature	USACE Section 404 Non-Wetland Waters of the U.S./RWQCB Section 401 Non-Wetland Waters of the State	USACE Section 404 Wetland Waters of the U.S./RWQCB Section 401 Wetland Waters of the State	USACE Section 10 Navigable Waters of the U.S.	CCC 1-Parameter Wetlands
Ballona Lagoon and Grand Canal	0.929	0.075	0.793	0.929
Total	**0.929**	**0.075**	**0.793**	**0.929**

Chapter 4
Results of Habitat Assessments

The following discussions address the results of habitat assessments conducted for special-status plant and wildlife species occurring or potentially occurring within the study area, as well as other sensitive biological resources. Appendix C contains specific details regarding the habitat assessments conducted for special-status resources and their potential for occurrence within the study area.

Special-status species are plants and animals that are legally protected under the *California Endangered Species Act* (CESA), the *Federal Endangered Species Act* (FESA), or other regulations, as well as species considered sufficiently rare by the scientific community to qualify for such listing. Special-status species are defined as:

- Species listed or proposed for listing as threatened or endangered under the FESA (Title 50, *Code of Federal Regulations* [CFR], Section 17.12 for listed plants, 50 CFR 17.11 for listed animals, and various notices in the Federal Register [FR] for proposed species);
- Species that are candidates for possible future listing as threatened or endangered under the FESA (CFR 71:53756-53835, September 12, 2006);
- Species that are listed or proposed for listing by the State of California as threatened or endangered under CESA (Title 14, *California Code of Regulations* [CCR], Section 670.5);
- Plants listed as rare under the *California Native Plant Protection Act of 1977* (*California Fish and Game Code*, Section 1900, et seq.);
- Plants considered by CNPS to be "rare, threatened, or endangered in California and elsewhere" (List 1B, 2, and 3. List 4 species were included and evaluated in the impact analysis to determine whether they should be considered special-status species for the purposes of CEQA) (CNPS 2015);
- Species that meet the definition of rare or endangered under CEQA Guidelines, Section 15380;
- Animals fully protected in California (*California Fish and Game Code*, Section 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]); or,
- Animal species of special concern to CDFW.

4.1 Special-Status Plants

Habitat assessments for all special-status plant species evaluated are presented in Appendix C. Of the 47 special-status species evaluated, three species were determined to be present within the study area: woolly seablite, southwestern spiny rush, and red sand verbena, each of which is CNPS CRPR List 4.2 species. These species are discussed in more detail below in Section 4.1.2.

4.1.1 Threatened and Endangered Plants

There are 13 federally and/or state threatened and endangered plant species reviewed to have a potential to occur within the geographical vicinity of the project area (CDFW 2015a; CNPS 2015) (Appendix C). Each of these listed species is presumed absent based on the absence of suitable habitat within the study area, the species being extirpated from the region, and/or recent negative floristic surveys at the adjacent Ballona Wetlands (Johnson 2012).

4.1.2 Non-Listed Special-Status Plants

A total of 34 federal and/or state non-listed special-status plants were reviewed to have a potential to occur within the geographical vicinity of the project area (CDFW 2015a; CNPS 2015) (Appendix C). Non-listed special-status plant species include those species that do not receive protection from state and/or federal endangered species legislation, but are covered in the CEQA process because of their rarity. The following three species were determined to be present within the study area.

Wooly Seablite (*Suaeda taxifolia*)

Wooly seablite is a CNPS CRPR 4.2 species found in coastal bluff scrub, coastal dunes, and margins of coastal salt marshes between the elevation ranges of 0–165 feet. Coastal salt marsh and coastal dunes suitable for this species occurs within the study area. This species was observed during the habitat assessment and is confirmed present within the study area.

Southwestern Spiny Rush (*Juncus acutis* ssp. *leopoldii*)

Southwestern spiny rush is a CNPS CRPR 4.2 species found in coastal dunes, meadows and seeps, and coastal salt marshes between the elevation ranges of 10–2,925 feet. Coastal salt marsh and coastal dunes suitable for this species occurs within the study area. This species was observed during the habitat assessment and is confirmed present within the study area.

Red Sand Verbena (*Abronia maritima*)

Red sand verbena is a CNPS CRPR 4.2 species found in coastal dunes between the elevation ranges of 0–325 feet. Coastal dunes suitable for this species occurs within the study area. This species was observed during the habitat assessment and is confirmed present within the study area.

4.1.3 Sensitive Vegetation Communities

Three sensitive vegetation communities as defined by CDFW occur within the project vicinity: Southern Coastal Bluff Scrub, Southern Coastal Salt Marsh, and Southern Dune Scrub (Holland 1986). Each of these communities occurs within the study area; however, only Southern Coastal Salt Marsh occurs within the disturbance footprint (Figure 4). Southern Coastal Salt Marsh is generally synonymous with *Sarcocornia pacifica* Herbaceous Alliance (Pickleweed Mats) and *Distichilis spicata* Herbaceous Alliance – Disturbed (Salt Grass Flats – Disturbed) as described by Sawyer et al (2009). Southern Coastal Salt Marsh is generally a collection of vegetation community series, which includes pickleweed series, cordgrass series, and saltgrass series. Both pickleweed and saltgrass series occur within the project disturbance footprint.



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Figure 4
Disturbance Footprint
Venice Auxiliary Pumping Plant Project

4.2 Special-Status Wildlife

Habitat assessments for all special-status wildlife species evaluated are presented in Appendix C. Of the 37 special-status species evaluated, four species were determined to have a potential to occur within the study area: El Segundo blue butterfly (*Euphilotes battoides allyni;* FE), Belding's savannah sparrow (*Passerculus sandwichensis beldingi*; SE), light-footed clapper rail (*Rallus longirostris levipes*; FE, SE, SFP), and California least tern (*Sternula antillarum browni*; FE, SE, CFP).

4.2.1 Threatened and Endangered Wildlife

There are 22 federally and/or state listed wildlife species reviewed to have potential to occur within the geographical vicinity of the project area (CDFW 2015a) (Appendix C). Four of these species are judged to have a potential for occurrence within the study area based on current habitat conditions and are discussed in more detail below. No USFWS-designated critical habitat for federally threatened and/or endangered wildlife species is present within the study area (USFWS 2015).

El Segundo Blue Butterfly (*Euphilotes battoides allyni*)

El Segundo blue butterfly is designated as a federally endangered species. This species is found in coastal dune habitat where the host plant, bluff buckwheat, is present. Bluff buckwheat occurs within a restored area along the western portion of Ballona Lagoon in the southwest portion of the study area. None is present within the disturbance footprint. Approximately 30 El Segundo blue butterfly individuals were observed in July 2011 at the neighboring Ballona Wetland in a recently restored area approximately 1.3 miles from the study area (Johnson 2012). Based on the limited amount of host plant and very small population at the adjacent Ballona Wetlands, there is a low potential for this species to occur within the study area.

Belding's Savannah Sparrow (*Passerculus sandwichensis beldingi*)

Belding's savannah sparrow is a state endangered, non-migratory resident of coastal saltmarsh. This species is an obligate breeder in middle elevation saltmarsh dominated by pickleweed, in or adjacent to, tidal or non-tidal flats. Belding's savannah sparrow forages in a wide variety of habitats including upper marsh, adjacent ruderal and ornamental vegetation, open beach and mudflat, and even dirt and gravel parking lots. This species is known to breed within the neighboring Ballona Wetlands (Johnson 2012), but is not known to breed within the study area and no records of occurrence are known within the study area (CNDDB 2015). Therefore, this species has a low potential to breed within the study area. It has a moderate potential to forage within the study area due to the isolated nature of the study area and a limited amount of quality foraging habitat.

Light-Footed Clapper Rail (*Rallus longirostris levipes*)

Light-footed clapper rail is a designated federally endangered, state endangered, and state fully protected species. This subspecies of clapper rail is restricted to the lower elevations of coastal marshes with active tidal flow and dense pickleweed or cordgrass thickets. This species is typically a non-migratory resident. It is known to breed within the neighboring Ballona Wetlands (Johnson 2012), but is not known to breed within the study area and no records of occurrence are known within the study area (CNDDB 2015). In addition, the study area is relatively isolated from the

nearby breeding area. Therefore, this species has low potential to breed or forage within the study area.

California Least Tern (*Sternula antillarum browni*)

California least tern is a designated federally and state endangered species and fully protected state species. It nests on sandy upper ocean beaches, open barren sites, and occasionally uses mudflats. A large breeding colony is present at a neighboring fenced breeding area at Venice Beach, located approximately 0.6 miles to the southwest of the project site. This species has a less than reasonable potential to breed within the study area due to lack of suitable habitat and nearby suitable breeding grounds; however, it has a high potential to occur as a forager within the study area.

4.2.2 Essential Fish Habitat

The National Marine Fisheries Service Essential Fish Habitat mapper was reviewed to determine the presence of mapped Essential Fish Habitat (NOAA 2015). Neither Grand Canal nor Ballona Lagoon is mapped as Essential Fish Habitat. The nearest mapped Essential Fish Habitat is Marina del Rey, located approximately 4,200 feet to the south at the intersection of Ballona Lagoon and Marina del Rey Channel.

4.2.3 Non-Listed Special-Status Animals

Non-listed special-status species referred to herein include those wildlife species that are designated as a California Species of Special Concern, as defined by CDFW. There are 15 non-listed special-status species reviewed to have some potential to occur within the geographical vicinity of the project area (CDFW 2015a) (Appendix C). None of these species are judged to have a potential for occurrence based on current habitat conditions within the study area.

4.3 Nesting Birds

All developed and undeveloped portions of the study area contain suitable nesting habitat for a variety of avian species including, but not limited to, those species observed during the habitat assessment. During the habitat assessment, no birds were observed nesting as it was outside of the breeding season.

4.4 Raptor Foraging

The study area was evaluated for its potential to support raptor foraging activities. Except for a single osprey, no raptors or raptor nests were observed within or in the vicinity of the project site during the site visit. Due to the lack of expansive open areas, the study area would generally not be considered high quality raptor foraging habitat, although it provides foraging opportunities for some raptors that occupy developed areas.

4.5 Wildlife Corridors

No wildlife corridors are identified within the study area as a result of the surrounding urban development and lack of habitat connectivity and upstream hydrological connectivity to any other aquatic resource. Grand Canal and Ballona Lagoon provide refuge for aquatic species; however, neither function as a wildlife corridor since they connect only to the Marina del Rey Channel.

4.6 Environmentally Sensitive Habitat Areas (ESHA)

Grand Canal and Ballona Lagoon are classified as an ESHA by the CCC and County of Los Angeles because of their plant and wildlife resources within the local ecosystem. Portions of the Ballona Lagoon have been restored and have increased the functions and values of biological resources within the portion of the ESHA where the project is proposed (Hamilton 2010).

Chapter 5
Impacts

5.1 Thresholds of Significance

The City of Los Angeles includes the following CEQA thresholds to determine if a project would have a significant impact on biological resources. A project would normally have a significant impact on biological resources if it could result in the following:

- The loss of individuals, or the reduction of existing habitat, of a state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat;
- The loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community;
- Interference with habitat such that normal species behaviors are disturbed (e.g., from the introduction of noise, light) to a degree that may diminish the chances for long-term survival of a sensitive species;
- The alteration of an existing wetland habitat; or
- Interference with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species.

5.2 Impacts

Direct impacts occur when sensitive biological resources are altered through project implementation, such as through vegetation removal, habitat modifications, and injury or death of wildlife species. Indirect impacts may occur from elevated levels of noise or lighting, changes in surface water hydrology, or increased erosion or sedimentation. These types of indirect impacts can affect vegetation communities or their potential use by sensitive wildlife species.

The proposed project includes temporary direct impacts to the Grand Canal, its banks, and adjacent undeveloped lots to be used as construction laydown areas (Figure 4). The installation of project components, including the coffer dam diversion structure and 66-inch sewer connection within the Grand Canal, will occur below the existing grade of the channel and the work area will be restored to original contours following construction. Grand Canal will also receive increased light exposure from temporary construction lighting that will be installed to prevent incursion into the construction area. Temporary indirect impacts may occur during construction and include increased sedimentation as a result of installation and removal, minor alteration of surface water hydrology within the Grand Canal from the coffer dam that partially obstructs the canal, construction noise and lighting, as well as dust and other particulates that may become airborne during construction. Permanent direct impacts within the study area are limited to areas that are currently developed. No natural habitats would receive direct permanent impacts with the exception of habitat within Grand Canal that could be subject to permanent lighting installed on the new facility. The lighting

may increase the amount of permanent ambient light within Grand Canal. An increase in light could expose wildlife to increased detection and predation and could also deter some wildlife from utilizing the immediate area around the proposed facility lighting. The following sections describe in more detail temporary and permanent short-term and long-term direct and indirect impacts to vegetation communities and other sensitive biological resources anticipated as a result of the proposed project.

5.2.1 Impacts on Vegetation Communities

Temporary and permanent direct impacts to vegetation communities are provided in Table 3. The project will result in a total of 0.14 acre of short-term temporary direct impacts to vegetation communities (excluding developed areas). These impacts would occur during the construction phase only and no operational temporary direct impacts will occur. No permanent direct impacts to vegetation communities will occur. Approximately 0.02 acre of temporary direct impacts will occur to the sensitive vegetation community Southern Coastal Salt Marsh, which is generally synonymous with *Sarcocornia pacifica* Herbaceous Alliance (Pickleweed Mats) and *Distichilis spicata* Herbaceous Alliance – Disturbed (Salt Grass Flats – Disturbed) as described by Sawyer et al (2009). These impacts are potentially significant without mitigation. Mitigation Measures BIO-2, BIO-3, and BIO-7 (see Section 6) will ensure that the project will not cause the loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community Therefore, impacts to this sensitive vegetation community are less than significant with mitigation incorporated.

Table 3. Temporary and Permanent Impacts to Vegetation Communities/Land Uses/Land Conditions /Land Uses within the Study Area

Vegetation Community/Land Use/Land Condition	Temporary Impacts (acres)	Permanent Impacts (acres)
Developed (Vegetation Community)	0.17	0.27
Disturbed/Ruderal	0.12	-
Open water	0.06	
Southern Coastal Salt Marsh)	0.02	-
Coastal Brackish Marsh	0.003*	-
Southern Foredunes	-	-
Southern Coastal Bluff Scrub	-	-
Total	**0.37**	**0.27**

*Temporary impacts are negligible and this community will be avoided during project construction. Mitigation Measures BIO-2, BIO-3, and BIO-7 will also be implemented.

5.2.2 Impacts on Special-Status Plants

Each of the state and/or federally listed threatened and/or endangered plant species with records of occurrence within the project vicinity are presumed absent within the study area based on the lack of suitable habitat, and as a result, no impacts to listed plant species is anticipated. Three non-listed plant species were observed within the study area: woolly seablite, southwestern spiny rush, and red sand verbena, each of which is classified as a CNPS CRPR List 4.2 species (plants of limited

distribution). Although these species were observed in the study area, they are currently absent within the disturbance footprint, and as a result, no impacts to individuals or populations are anticipated. If these species were to inhabit the disturbance footprint, then impacts could be significant. Mitigation Measure BIO-1 (see Chapter 6) will ensure the project will not have a substantial adverse effect, either directly or through habitat modifications, or result in the loss of individuals, or the reduction of existing habitat, of a local, state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat. Therefore, impacts to special-status plants are less than significant with mitigation incorporated.

5.2.3 Impacts on Special-Status Wildlife

This section addresses impacts to special-status species with potential to occur within the study area. Impacts to special-status species would be significant without mitigation measures implemented. With the implementation of mitigation measures, the project will not have a substantial adverse effect, either directly or indirectly or through habitat modifications, or result in the loss of individuals, or the reduction of existing habitat, of a local, state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat. Furthermore, with the implementation of mitigation measures, the project would not cause an interference with habitat such that normal species behaviors are disturbed (e.g., from the introduction of noise, light) to a degree that may diminish the chances for long-term survival of a sensitive species.

El Segundo Blue Butterfly (*Euphilotes battoides allyn*)

Based on the lack of suitable habitat and host plant within the project footprint, no temporary or permanent direct or indirect impacts to El Segundo blue butterfly are anticipated during construction or in operation. It is possible that stray individuals could temporarily occupy the adjacent restoration area along the western portion of Ballona Lagoon outside of the project footprint; however, no temporary direct or indirect impacts would occur given the disturbance footprint is approximately 390 feet northeast from the closest habitat containing the host plant. Impacts to this species could be potentially significant if the host plant inhabits the disturbance footprint. Although the host plant is not a sensitive species, BIO-1 would ensure that no host plants have established within the disturbance footprint prior to construction. Therefore, impacts to special-status wildlife are less than significant with mitigation incorporated.

Belding's Savannah Sparrow (*Passerculus sandwichensis beldingi*)

No permanent direct or indirect impacts to Belding's savannah sparrow would occur as a result of the project during construction or in operation due to restoration of the disturbance footprint following construction. BIO-3 would ensure that permanent direct impacts would be less than significant. Belding's savannah sparrow has a moderate potential to forage within the study area due to the nearby population at Ballona Wetlands, although the species has not been observed within Ballona Lagoon or Grand Canal and no records of occurrence are known within the study area (CNDDB 2015). Therefore, direct or indirect temporary impacts to this species are not anticipated. BIO-2 would ensure that no temporary impacts will occur to Belding's savannah sparrow. Therefore, impacts to special-status wildlife are less than significant with mitigation incorporated.

Light-Footed Clapper Rail (*Rallus longirostris levipes*)

No permanent direct or indirect impacts to light-footed clapper rail would occur as a result of the project during construction or in operation due to restoration of the disturbance footprint within Grand Canal following construction. BIO-3 would ensure that permanent direct impacts would be less than significant. Light-footed clapper rail has a low potential to forage within the study area due to the nearby population at Ballona Wetlands. However, the study area is relatively isolated and this species has not been observed within Ballona Lagoon or the Grand Canal and no records of occurrence within the study area are known (CNDDB 2015). Therefore, direct or indirect temporary impacts to this species are not anticipated. BIO-2 would ensure that no temporary impacts will occur to light-footed clapper rail. Therefore, impacts to special-status wildlife are less than significant with mitigation incorporated.

California Least Tern (*Sternula antillarum browni*)

No permanent direct or indirect impacts to California least tern would occur as a result of the project during construction or in operation due to restoration of the disturbance footprint following construction. BIO-3 would ensure that permanent direct impacts would be less than significant. California least tern has a less than reasonable potential to breed within the study area due to lack of suitable habitat and nearby suitable and protected breeding grounds approximately 0.6 miles from the study area; therefore, direct or indirect temporary impacts to breeding California least tern are not anticipated during construction or in operation. Installation of the coffer dam could cause an increase in turbidity that could have temporary indirect impacts on California least tern foraging either by reducing local prey availability and/or by reducing visibility of prey in the vicinity. Any construction activities conducted during the California least tern nesting season when terns are present could also cause temporary impacts in the form of noise and increased human disturbance that may attract tern predators such as the American crow and common raven. These predators could result in nest predation within the tern colony. Impacts to this species could be potentially significant. BIO-2, BIO-4, and BIO-5 would ensure that impacts to foraging California are least tern less than significant. Therefore, impacts to special-status wildlife are less than significant with mitigation incorporated.

5.2.4 Impacts on Nesting Birds

The study area and disturbance footprint support marginally suitable habitat for nesting birds, and as a result, direct and indirect temporary impacts to nesting species within the study area could potentially occur during construction. The areas to be affected potentially support nesting habitat only for ground-nesting birds, such as black-necked stilt (*Himantopus mexicanus*) and killdeer (*Charadrius vociferous*), as well as a habitat for a few species that commonly nest in structures and trees in developed areas. Impacts to nesting birds could be potentially significant. Impacts to nesting birds are protected under the *Migratory Bird Treaty Act* and *California Fish and Game Code* Sections and a nesting bird survey will be conducted during the nesting bird season and prior to any disturbance within the study area to document the presence or absence of nesting birds. Following construction, the project disturbance footprint within Grand Canal will be restored to original conditions. No operational impacts on nesting birds would occur. BIO-2, BIO-4, and BIO 6 will ensure that impacts on nesting birds will be less than significant with mitigation incorporated should the project occur during the nesting season.

5.2.5 Impacts on Raptor Foraging

Raptors such as osprey, Cooper's hawk, and red-tailed hawk are generally not expected to nest within the study area due to the disturbed and developed nature of the project; however, limited foraging habitat does occur for some raptor species. Because the project impacts within natural habitats are limited to a relatively small and defined portion of the Grand Canal and to a lesser extent Ballona Lagoon within the context of an urban environment and are temporary in nature, they are not considered significant. No operational impacts on nesting birds would occur. BIO-2 and BIO 6 will ensure that impacts on raptors will be less than significant.

5.2.6 Impacts on Wildlife Corridors

Construction of the project will include installation of a coffer dam that will partially block the Grand Canal; however, hydrological connectivity between upstream and downstream will remain in place throughout construction. Therefore, the project will not result in interference with wildlife movement/migration corridors that may diminish the chances for long-term survival of a sensitive species. Impacts on wildlife corridors will be less than significant.

5.2.7 Impacts on Jurisdictional Resources

The project occurs within the jurisdiction of several agencies including, but not limited to, USACE, RWQCB, and CCC and will result in temporary direct and indirect impacts to aquatic resources, including an existing wetland habitat. These impacts are significant without mitigation. No permanent direct or indirect impacts will occur. Table 4 below and Figure 5 identify temporary impacts to jurisdiction regulated by each of the agencies. Applicable permits from resource agencies will be obtained during the permitting phase prior to construction and all permit conditions and avoidance and minimization measures will be implemented. BIO-3 and BIO-5 will ensure that project impacts are less than significant with mitigation incorporated. Therefore, impacts associated with alteration of an existing wetland habitat are less than significant with mitigation incorporated.

Table 4. Temporary Impacts to Aquatic Resources (acres)

Study Area Feature	USACE Section 404 Non-Wetland Waters of the U.S./RWQCB Section 401 Non-Wetland Waters of the State	USACE Section 404 Wetland Waters of the U.S./RWQCB Section 401 Wetland Waters of the State	USACE Section 10 Navigable Waters of the U.S.	CCC 1-Parameter Wetlands
Ballona Lagoon and Grand Canal	0.092	0.012	0.056	0.092
Total	**0.092**	**0.012**	**0.056**	**0.092**

5.2.8 Impacts on Essential Fish Habitat

No designated Essential Fish Habitat is present within the study area; therefore; no impacts to Essential Fish Habitat will occur and no mitigation is required.



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Figure 5
USACE/RWQCB Jurisdictional Delineation Results Map
Venice Auxiliary Pumping Plant Project

5.2.9 Impacts on Environmentally Sensitive Habitat Areas

The Grand Canal and Ballona Lagoon are classified as an ESHA by the CCC and County of Los Angeles because of their plant and wildlife resources within the local ecosystem. Direct and indirect temporary impacts to ESHA will occur as a result of the project and are significant without mitigation. BIO-1 through BIO-9 will ensure that project construction and operation will not result in the loss of individuals or the reduction of existing habitat of a locally designated species or a reduction in a locally designated natural habitat or plant community. Therefore, impacts to ESHA will be less than significant with mitigation incorporated.

Chapter 6
Mitigation Measures

The following section provides specific mitigation measures to offset potential indirect or direct impacts on special-status species or resources. These mitigation measures will ensure that impacts on special-status biological resources would be mitigated to a level considered less than significant pursuant to CEQA.

MM-BIO-1: Special-Status Plant Surveys

To confirm the presence or absence of special-status plant species within the disturbance footprint, a special-status plant survey shall be completed prior to construction. The focused survey shall be conducted by a qualified biologist during the appropriate blooming period, or when the plant is readily identifiable, prior to the start of construction activities. If any sensitive non-listed plant species is found, then the individuals shall be clearly identified and avoidance measures shall be utilized to the extent practical.

MM-BIO-2: Monitoring During Vegetation Removal

A qualified biologist shall monitor all vegetation removal and ground-disturbing activities, such as staging and grading, for the duration of the project to ensure that practicable measures are being employed to avoid incidental disturbance of habitat outside the project footprint and to survey for sensitive wildlife species. When vegetation removal and ground-disturbing activities are not occurring, as-needed monitoring at the Project Site shall occur. Monitoring logs, as appropriate depending on project activities, shall be maintained for the duration of construction activities.

MM-BIO-3: Restoration of Vegetation within Grand Canal

Regarding the disturbance footprint within the Grand Canal, habitat along the bank shall be restored to its original condition by seeding, cuttings and/or container plant installation following construction. Habitat restoration shall be performed in coordination with regulating agencies (CCC, USACE, and RWQCB) and as required by agency permits. A habitat restoration plan shall be prepared and submitted to the Environmental Management Group for review and approval, prior to submittal to the agencies. The plan will include a native plant palette, and establishment period, as well as success criteria and monitoring requirements. In addition, a monetary contribution will be provided to the Grand Canal Restoration Project fund for wider restoration of the canal banks.

MM-BIO-4: Covered Disposal Containers

Work crews shall properly dispose of all garbage in covered containers to avoid attracting predators (such as crows and ravens) that could contribute indirectly to depredation of California least tern eggs and chicks in the nearby nesting colony.

MM-BIO-5: Water Quality Monitoring During Construction

Water quality shall be monitored by the qualified biologist or a water quality specialist to ensure that no substantial increases in turbidity occur during construction. The contractor shall ensure

compliance with RWQCB Section 401 Water Quality Certification, USACE Section 404 authorization, applicable water-quality related Best Management Practices, and the project Storm Water Pollution Prevention Plan.

MM-BIO-6: Nesting Bird Survey

If construction commences during the bird breeding season (February 15 through August 31), a preconstruction survey for nesting birds shall occur within three days prior to construction activities by an experienced avian biologist. The survey shall occur within all suitable nesting habitat within the project impact area and a 500-foot buffer. If nesting birds are found, an avoidance area shall be established in consultation with the resource agencies as appropriate by a qualified biologist around the nest until a qualified avian biologist has determined that young have fledged or nesting activities have ceased. The Project Site shall be re-surveyed if there is a lapse in construction activities for more than seven days during the bird breeding season.

MM-BIO-7: Silt Fencing at Construction Limits

Construction limits shall be identified using silt fencing, which shall be installed under the supervision of a qualified biologist prior to the commencement of work. Construction personnel shall strictly limit their activities, vehicles, equipment, and construction materials to the project footprint, including designated staging areas, and routes of travel. The construction areas shall consist of the minimal area necessary to complete the Proposed Project. The fencing shall remain in place until the completion of all construction activities.

MM-BIO-8: ESHA Protection

Existing functions and values in ESHA shall be protected, enhanced, and restored as necessary to previous undisturbed conditions in accordance with applicable USACE, RWQCB, CCC, or City of Los Angeles permits and requirements.

MM-BIO-9: Restoration of Mudflats within Grand Canal

The temporary work area within Grand Canal within mudflat/open water shall be returned to pre-construction grade and contours following construction.

Chapter 7
References

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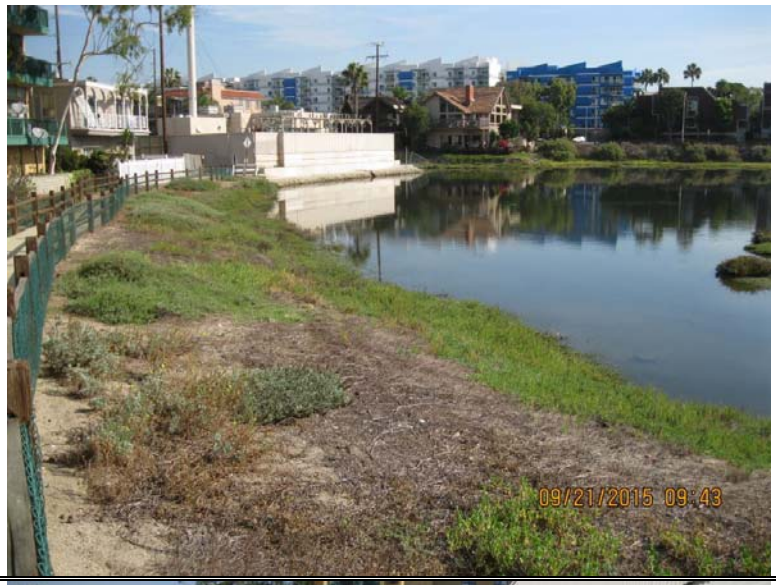
Appendix A

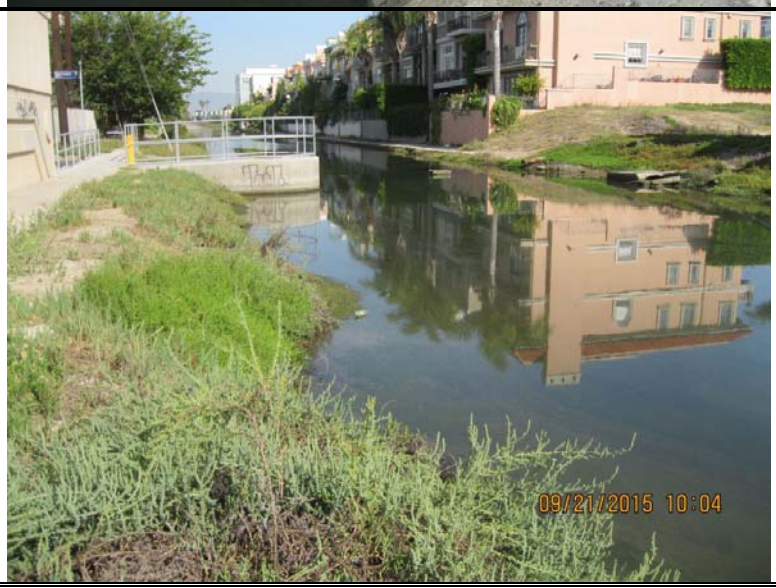
Site Photographs



Photograph #	1
Photo Date	9/21/2015
Location	West side of study area, adjacent to trail.
Direction	Northeast
Comment	Photo depicts conditions along the banks of Ballona Lagoon.



Photograph #	2
Photo Date	9/21/2015
Location	West side of study area, south of existing pumping plant.
Direction	Southwest
Comment	Photo depicts conditions along the concrete bank south of the existing pumping plant.



Photograph #	3
Photo Date	9/21/2015
Location	West side of study area, along sidewalk on east side of existing pumping plant.
Direction	Northwest
Comment	Photo depicts conditions present along the west side of Grand Canal.



Photograph #	4
Photo Date	9/21/2015
Location	West side of study area, at Intersection of Canal Ct. and Hurricane St.
Direction	Northeast
Comment	Photo depicts conditions present where the proposed auxiliary pumping plant will be located.



Photograph #	5
Photo Date	9/21/2015
Location	West side of study area, along sidewalk adjacent to residential housing and location of proposed auxiliary pumping plant.
Direction	Southeast.
Comment	Photo depicts conditions present along the west side of Grand Canal where work will occur.



Photograph #	6
Photo Date	9/21/2015
Location	East side of the study area, in empty lot.
Direction	Southeast
Comment	Photo depicts conditions present within the empty lot on east side of the study area.



Photograph #	7
Photo Date	9/21/2015
Location	Sidewalk on east side of Grand Canal.
Direction	Northwest
Comment	Photo depicts conditions present along the sidewalk on the east side of Grand Canal.



Photograph #	8
Photo Date	9/21/2015
Location	Sidewalk on east side of Grand Canal.
Direction	Southeast
Comment	Photo depicts conditions present along the sidewalk on the east side of Grand Canal.



Photograph #	9
Photo Date	9/21/2015
Location	East side of the study area, confluence of Grand Canal and Ballona Lagoon.
Direction	Northwest
Comment	Photo depicts conditions present along the sidewalk on the east side of Grand Canal.

Appendix B

Floral Compendium and Wildlife Observed

Plant Species Observed During 2015 Habitat Assessment Survey

Scientific Name	Common Name	Special Status
CHLOROPHYTA		
Ulvaceae		
Ulva intestinalis	Gut Weed	
Ulva lactuca	Sea Lettuce	
ANTHOPHYTA		
Aizoaceae - Fig-marigold family		
* *Aptenia cordifolia*	Baby sun-rose	
* *Carpobrotus edulis*	Hottentot fig	
Anacardiaceae - Sumac Or Cashew family		
Rhus integrifolia	Lemonade berry	
* *Schinus terebinthifolius*	Brazilian pepper tree	
Asteraceae - Sunflower family		
Ambrosia chamissonis	Beach bur-sage	
Ambrosia psilostachya	Western ragweed	
Ambrosia sp.	Ragweed	
Artemisia californica	California sagebrush	
Encelia californica	California encelia	
* *Erigeron bonariensis*	Flax-leaved horseweed	
* *Glebionis coronaria*	Crown daisy	
Heterotheca grandiflora	Telegraph weed	
Isocoma menziesii	Coastal goldenbush	
Jaumea carnosa	Marsh sunflower	
* *Sonchus asper ssp. asper*	Prickly sow thistle	
Bataceae - Saltwort family		
Batis maritima	Saltwort, beachwort	
Boraginaceae - Borage family		
Heliotropium curassavicum	Alkali heliotrope	
Cactaceae - Cactus family		
Opuntia littoralis	Coastal prickly pear	
Caryophyllaceae - Pink family		
Cerastium sp.	Mouse-ear chickweed	
Chenopodiaceae - Goosefoot family		
Arthrocnemum subterminale	Parish's pickleweed	
Atriplex lentiformis	Big saltbush	

Scientific Name	Common Name	Special Status
* *Atriplex prostrata*	Fat-hen	
* *Atriplex semibaccata*	Australian saltbush	
Atriplex watsonii	Watson's saltbush	
* *Bassia hyssopifolia*	Fivehorn smotherweed	
* *Chenopodium album*	Lamb's quarters	
Salicornia pacifica	Pacific pickleweed	
Suaeda taxifolia	Woolly seablite	CRPR 4.2
Convolvulaceae - Morning-glory family		
Cuscuta salina	Salt dodder	
Euphorbiaceae - Spurge family		
Euphorbia albomarginata	White margin spurge	
* *Euphorbia maculata*	Spotted spurge	
Fabaceae - Legume family		
Acmispon glaber	Deerweed	
Vicia sp.	Vetch	
Frankeniaceae - Frankenia family		
Frankenia salina	Alkali heath	
Geraniaceae - Geranium family		
* *Erodium moschatum*	Whitestem filaree	
Lythraceae - Loosestrife family		
* *Lythrum hyssopifolia*	Grass Poly	
Malvaceae - Mallow family		
* *Malva parviflora*	Cheeseweed	
Myrtaceae - Myrtle family		
* *Eucalyptus sp.*	Gum	
Nyctaginaceae - Four O'clock family		
Abronia maritima	Red sand-verbena	CRPR 4.2
Onagraceae - Evening Primrose family		
Camissoniopsis cheiranthifolia	Beach evening-primrose	
Polygonaceae - Buckwheat family		
Eriogonum parvifolium	Seacliff buckwheat	
Scrophulariaceae - Figwort family		
* *Myoporum laetum*	Ngaio tree	
Solanaceae - Nightshade family		
Solanum americanum	White nightshade	

Scientific Name	Common Name	Special Status
Zygophyllaceae - Caltrop family		
* *Tribulus terrestris*	Puncturevine	
Arecaceae - Palm family		
* *Washingtonia robusta*	Mexican fan palm	
Juncaceae - Rush family		
Juncus acutus ssp. leopoldii	Southwestern spiny rush	CRPR 4.2
Poaceae - Grass family		
* *Cynodon dactylon*	Bermuda grass	
Distichlis spicata	Salt grass	
Setaria sp.	Bristlegrass	

Legend

*= Non-native or invasive species

Special Status:

Federal:
FE = Endangered
FT = Threatened

State:
SE = Endangered
ST =Threatened

CRPR – California Rare Plant Rank
1A. Presumed extinct in California and elsewhere
1B. Rare or Endangered in California and elsewhere
2A. Presumed extinct in California, more common elsewhere
2B. Rare or Endangered in California, more common elsewhere
3. Plants for which we need more information - Review list
4. Plants of limited distribution - Watch list

Threat Ranks
.1 - Seriously endangered in California
.2 – Fairly endangered in California
.3 – Not very endangered in California

Plant Species Observed During LADPW 2005 Surveys Not Observed During 2015 Survey

Scientific Name	Common Name	Special Status
EUDICOTS		
Aizoaceae - Fig-marigold family		
Sesuvium verrucosum	Western sea-purslane	
Asteraceae - Sunflower family		
Erigeron canadensis	Horseweed	
* *Helminthotheca echioides*	Bristly ox-tongue	
* *Sonchus oleraceus*	Common sow thistle	
* *Taraxacum officinale*	Common dandelion	
Caryophyllaceae - Pink family		
* *Spergularia media var. media*	Greater sand-spurrey	
Chenopodiaceae - Goosefoot family		
* *Chenopodium macrospermum*	Largeseed goosefoot	
* *Chenopodium murale*	Nettleleaf goosefoot	
* *Dysphania botrys*	Clustered goosefoot	
Suaeda californica	California seablite	FE, CRPR 1B.1
Fabaceae - Legume family		
* *Melilotus sp.*	Sweetclover	
Geraniaceae - Geranium family		
* *Erodium cicutarium*	Redstem filaree	
Malvaceae - Mallow family		
* *Malva neglecta*	Common mallow	
Plantaginaceae - Plantain family		
* *Plantago major*	Common plantain	
Polygonaceae - Buckwheat family		
* *Polygonum aviculare ssp. depressum*	Dented oval leaf knotweed	
Rosaceae		
* *Rhaphiolepis indica*	Indian hawthorn	
MONOCOTS		
Poaceae - Grass family		
* *Digitaria ischaemum*	Smooth cottontop	
* *Stenotaphrum secundatum*	Saint augustine grass	

Scientific Name	Common Name	Special Status

Legend

*= Non-native or invasive species

Special Status:

Federal:
FE = Endangered
FT = Threatened

State:
SE = Endangered
ST =Threatened

CRPR – California Rare Plant Rank
1A. Presumed extinct in California and elsewhere
1B. Rare or Endangered in California and elsewhere
2A. Presumed extinct in California, more common elsewhere
2B. Rare or Endangered in California, more common elsewhere
3. Plants for which we need more information - Review list
4. Plants of limited distribution - Watch list

Threat Ranks
.1 - Seriously endangered in California
.2 – Fairly endangered in California
.3 – Not very endangered in California

Wildlife Species Observed

Scientific Name	Common Name	Special Status
INVERTEBRATES		
Arthropods		
Chthamalus spp.	Buckshot Barnacle	
Mollusks		
Cerithidea californica	California Horn Snail	
Lottia strigatella	Checkered Limpet	
Bulla gouldiana	Gould's Bubble Snail	
Ostrea lurida	Pacific Oyster	
Mytilus californianus	California Mussel	
Mytilus edulis	Blue Mussel	
VERTEBRATES		
Fish		
Atherinops affinis	Topsmelt	
Menticirrhus undulates	California Corbina	
Birds		
Anas platyrhynchos	Mallard	
Phalacrocorax auritus	Double-crested Cormorant	
Ardea herodias	Great Blue Heron	
Ardea alba	Great Egret	
Pandion haliaetus	Osprey	
Fulica americana	American Coot	
Pluvialis squatarola	Black-bellied Plover	
Tringa semipalmata	Willet	
Numenius phaeopus	Whimbrel	
Limosa fedoa	Marbled Godwit	
Zenaida macroura	Mourning Dove	
Calypte anna	Anna's Hummingbird	
Ceryle alcyon	Belted Kingfisher	
Sayornis nigricans	Black Phoebe	
Corvus brachyrhynchos	American Crow	
**Sturnus vulgaris*	European Starling	
Haemorhous mexicanus	House Finch	

Scientific Name	Common Name	Special Status

Legend

*= Non-native or invasive species

Special Status:

Federal:
FE = Endangered
FT = Threatened

State:
SE = Endangered
ST =Threatened
CSC = California Species of Special Concern
CFP = California Fully Protected Species

Appendix C

Special-Status Species Table

Appendix C
Special-Status Species Information

This appendix addresses all species with applicable special regulatory or management status whose general range includes the study area or whose habitat occurs within or near the study area and/or vicinity. Information provided includes: 1) definitions of terms to describe likelihood of occurrence, 2) a table of special-status codes and their meanings, and 3) a species information table listing the English and scientific names, current special-status, likelihood of occurrence within the project site, and specific notes relevant to likelihood of occurrence.

Conclusions provided in this report are limited to biology and do not address regulatory or management issues. For interpretation of this information under applicable laws, regulations, and court precedent, see the relevant portion(s) of the report. Judgments regarding likelihood of occurrence are based on evaluation of available biological information regarding regional and local conditions, species biology, available evaluations of the study area and vicinity, and professional experience conducting field investigations across California over many years. Though professional, such judgments are necessarily subjective at least in part.

Specific factors substantially affect likelihood of occurrence for individual species on any particular study area. These factors are relevant at multiple scales, including regionally, locally, and within the study area. These factors include the presence or absence of other particular species (e.g., predators and prey), climate, ongoing disturbances, historical land use, and other past disturbances such as fire history, surface and subsurface hydrology, soil texture and chemistry, study area and habitat size and topology (i.e., shape and fragmentation), past population fluctuations of the species in response to random and nonrandom events, and many other factors, including many not readily visible. Note that some species, including some amphibians and many birds and bats, can occur in multiple roles. Thus, likelihood of occurrence, habitat use, and abundance may vary accordingly.

Finally, note that likelihood of occurrence for a given species refers to a time scale of a few years up to perhaps 10 years under current or assumed resources and conditions.

Terms for Likelihood of Occurrence in the Study Area

Confirmed Absent

If the likelihood of occurrence is *confirmed absent*, the species is confirmed to be absent on the study area as a formal and/or practical matter. Most often, this is a determination based on negative results of a focused survey for the species conducted in appropriate habitat at appropriate time(s) of year, using biologically sound methods and qualified personnel. In the remaining cases, it may be based on a simple study area examination, where it is easily determined that the species is absent because of the study area context. For example, a tidal marsh insect would not occur in a dry mountainside study area, or a disturbance-intolerant chaparral shrub would not occur in a long-standing, degraded grassland study area located far from chaparral. When a species is confirmed absent, the relevant fieldwork in all cases was conducted within a timeframe sufficiently recent to conclude that the species remains absent, based on study area conditions and the species' known ecology. In most cases a specific, established survey protocol and/or guidelines have been followed.

Less than Reasonable/Presumed Absent

If the potential to occur is *less than reasonable or presumed absent*, the likelihood of occurrence, although remotely possible, is less than that required for any potentially applicable regulatory threshold. Further, the likelihood that the site is meaningfully valuable to any population(s) of this taxon is less than reasonable. The species may or may not include the study area within its current, general range. However, no appropriate, or adequately extensive, or effectively connected habitat is present. Neither the species nor any indication of its presence was detected. In some cases, based on the best available information, this likelihood may indicate that the study area has a very high probability of being outside of the species' current range. In all of the above cases, the species may not be definitively ruled out but is strongly believed to be absent based on professional evaluation of all available evidence. In some cases, the species may occur on rare occasions and in low numbers, but with no more than brief, incidental use of the study area; that is, the site is also judged to lack any important function for the species. Certainly, there are no substantial populations directly utilizing the study area at any time of year. Further evaluation should not normally be required.

Low

If the potential to occur is *low*, occurrence of the species is reasonable but unlikely because of some combination of facts. For example, 1) the study area was the subject of unsuccessful searches conducted under relevant and reasonable circumstances, 2) potential habitat present is marginal or minimal in extent, 3) the best available information suggests the species is absent from the study area, and/or 4) available information sheds no clear light on the species likelihood on the study area but it is known to be rare at best in the vicinity. Neither the species nor any indication of its presence was detected. Although individuals may have been missed, it is unlikely that substantial populations are present. Further evaluation should usually not be required for individual species except, in most cases, for biologically threatened or endangered species. Note, however, that where several non-listed species hold this status, a higher likelihood of occurrence for "one or more" will generally hold. This is due both to the increased number of species and the fact that an array of possibilities often correlates with greater site biodiversity and lower relevant (but not readily detected) disturbance levels.

Moderate

If the potential to occur is *moderate*, the study area is within the range of the species and contains potentially appropriate habitat. Neither individuals nor diagnostic sign were detected. It is nevertheless reasonable that some individuals may have been overlooked. The best available information on the species with regard to the study area is either very uncertain, or may be equally weighted for and against occurrence. Depending on local and special legal status, extent of habitat, and the nature and sensitivity of the project, focused surveys for the species may be warranted or presence may be assumed.

High

If the potential to occur is *high*, the study area is known to be within the range of the species and contains potential habitat with a high likelihood of occupancy. Although no individuals or diagnostic sign were detected during current fieldwork by a qualified observer, the species is likely to be present to some degree given the best available information. Depending on regulatory status, local

rarity, public interest, extent of habitat on the study area, and the nature of potential project impacts, a substantial basis may exist for either conducting focused surveys for the species or for assuming presence.

Confirmed Present

If the likelihood of occurrence is *confirmed present*, a qualified biologist or other reliable source has confirmed the presence of the species and there is no specific evidence that the species has subsequently become absent. Depending on the species and other information available, it may or may not be possible to determine, without further studies, what portions of the study area are currently in use.

Table C-1. Sensitive Plant Species

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Abronia maritima	Red sand verbena	CRPR 4.2	Coastal dunes. Elevation range: 0–325 feet. Blooms: February–November.	HP, P	**Confirmed Present**. This species was observed within the study area.
Arenaria paludicola	Marsh sandwort	FE, SE, CRPR 1B.1	Sandy openings within freshwater marshes and swamps. Elevation range: 9–510 feet. Blooms: May–August.	HA	**Presumed Absent**. Present in the project region, but not known from the study area. Closely associated with freshwater wetland habitat, which is not present in the study area. Last southern California record is from 1899. Known from only two natural occurrences in Black Lake Canyon and at Oso Flaco Lake.
Astragalus brauntonii	Braunton's milk-vetch	FE, CRPR 1B.1	Recent burned or disturbed areas within chaparral, coastal scrub, and valley and foothill grasslands. Usually associated with sandstone or carbonate substrates. Elevation range: 12–1,920 feet. Blooms: January–August.	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. This is a primarily chaparral species and the habitats in the study area do not provide suitable microsite conditions. Multiple surveys of the adjacent Ballona Wetlands conducted since 1979, including floristic rare plant surveys in July 2010 and April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Astragalus pycnostachyus var. *lanosissimus*	Ventura Marsh milk-vetch	FE, SE, CRPR 1B.1	Coastal salt marsh, coastal dune, coastal scrub. Typically located within reach of high tide protected by barrier beaches and near seeps on sandy bluffs. Elevation range: 1–115 feet. Blooms: June–October.	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. The study area does not contain the barrier beaches and sandy bluffs that provide suitable microsite conditions for the species. Multiple surveys of the adjacent Ballona Wetlands conducted since 1979, including floristic rare plant surveys in July 2010 and April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Astragalus tener var. *titi*	Coastal dunes milk-vetch	FE, SE, CRPR 1B.1	Vernally mesic areas within sandy coastal bluff scrub, coastal dunes, and mesic coastal prairie. Elevation range: below 165 feet. Blooms: March–May.	HA	**Presumed Absent**. Historically present in the project region but not known from the study area or adjacent Ballona Wetlands. Primarily a coastal prairie species, which does not occur in the study area. Multiple surveys of the study area conducted since 1979, including floristic rare plant surveys in April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Atriplex pacifica	South Coast saltscale	CRPR 1B.2	Coastal scrub, coastal bluff scrub, playas, chenopod scrub. Located on alkali soils. Elevation range: 0–460 feet. Blooms: March–October.	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. The study area does not contain the drier, steeper bluffs that provide suitable microsite conditions for the species. Multiple surveys of the adjacent Ballona Wetlands site conducted since 1979, including floristic rare plant surveys in April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Atriplex parishii	Parish's saltscale	CRPR 1B.1	Alkaline meadows, vernal pools, chenopod scrub, and playas. Usually on drying alkaline flats with fine soils. Elevation range: 80–6,160 feet. Blooms: June–October.	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. The study area is below the known elevation distribution.
Atriplex serenana var. *davidsonii*	Davidson's saltscale	CRPR 1B.2	Alkaline areas within coastal bluff scrub and coastal scrub. Elevation range: 30–650 feet. Blooms: April–October.	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. The study area does not contain the drier, steeper bluffs that provide suitable microsite conditions for the species. Multiple surveys of the adjacent Ballona Wetlands site conducted since 1979, including floristic rare plant surveys in April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Calochortus clavatus var. *gracilis*	Slender mariposa lily	CRPR 1B.2	Chaparral, coastal scrub, and valley and foothill grasslands. Elevation range: 1,180–3,280 feet. Blooms: March–June.	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. The study area is below the known elevation distribution.
Calochortus plummerae	Plummer's mariposa lily	CRPR 4.2	Sandy or rocky sites of granitic or alluvial material in valley and foothill grassland, coastal scrub, chaparral, cismontane woodland, and lower coniferous forests. Elevation range: 320–5,510 feet. Blooms: May–July.	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. The study area is below the known elevation distribution.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Calystegia felix	Lucky morning-glory	CRPR 3.1	Historically associated with wetland and marshy places but possibly in drier situations as well. Occurs in meadows and seeps (sometimes alkaline) and riparian scrub (alluvial). Elevation range: 90–650 feet. Blooms: March–September.	HA	**Presumed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution.
Camissoniopsis lewisii (=Camissonia lewisii)	Lewis's evening primrose	CRPR 3	Coastal bluff scrub, cismontane woodland, coastal dunes, coastal scrub, and valley and foothill grassland on sandy or clay soils. Elevation range: 0–975 feet. Blooms: March–May, sometimes June.	HP	**Moderate potential.** Suitable habitat is present within the study area. Although this species was not observed during surveys (August 2015), the field visit was outside of its blooming period. Several populations were mapped in the adjacent Ballona Wetlands during focused rare plant surveys in 2011 (Johnson 2012). Additionally, this species was observed during surveys by LABOE near 62nd Avenue and Pacific Street, south of the project area (personal communication W. Jones).
Centromadia parryi ssp. *australis*	Southern tarplant	CRPR 1B.1	Margins of marshes and swamps, vernally mesic valley and foothill grassland, and vernal pools. Often located on disturbed sites near the coast on alkali soils. Elevation range: 0–1,385 feet. Blooms: May–November.	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. Rare plant surveys in 2010 and 2011 at Ballona Wetlands did not detect this species (Johnson 2012).

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Chaenactis glabriuscula var. *orcuttiana*	Orcutt's pincushion	CRPR 1B.1	Coastal bluff scrub, coastal dunes. Located on sandy soils. Elevation range: 0–330 feet. Blooms: January–August.	HP	**Presumed Absent**. Although first documented from Ballona Wetlands in 1979 and found during focused rare plant surveys in 2011 (Johnson 2012), suitable habitat for this species only occurs outside of the project disturbance footprint within the 500-foot buffer. As such, it would not be impacted by the project. This species is known to occur within the adjacent Ballona Lagoon Restoration Area (Personal communication W. Jones 2016).
Chenopodium littoreum	Coastal goosefoot	CRPR 1B.2	Coastal dunes. Elevation range: 30–95 feet. Blooms: April–August.	HA	**Presumed Absent**. Historically present in the Ballona Wetlands. The study area contains small portions of restored coastal dune habitat that is potential habitat for this species; however, multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in 2010 and 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Chloropyron maritimum ssp. *maritimum (=Cordylanthus maritimus* ssp. *maritimus)*	Salt marsh bird's-beak	FE, SE, CRPR 1B.2	Coastal dune, marsh and swamp, coastal salt marsh, and wetland. Located on the higher zones of salt marshes. Elevation range: 0–100 feet. Blooms: May–October.	HP	**Presumed Absent**. Known historically from a 1901 collection from the region area; occurrence considered to be extirpated, based on surveys at Ballona Wetlands in 1980, 1982 and 1983; floristic rare plant surveys in July and October 2010 did not observe this species (Johnson 2012).
Chorizanthe parryi var. *fernandina*	San Fernando Valley spineflower	FC, SE, CRPR 1B.1	Coastal scrub and valley and foothill grasslands. Elevation range: 450–3,680 feet. Blooms: April–July.	HA	**Presumed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Deinandra minthornii	Santa Susana tarplant	CRPR 1B.2	This deciduous shrub can be found in rocky chaparral and coastal scrub communities of Ventura and Los Angeles counties. Elevation range: 919–2,493 feet. Blooms: July–November.	HA	**Presumed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution.
Dithyrea maritima	Beach spectaclepod	ST, CRPR 1B.1	Coastal dunes, coastal scrub. Located at seashores on sand dunes and sandy places near the shore. Elevation range: 10–165 feet. Blooms: March–May.	HP	**Presumed Absent**. Historically present in the region and last observed in 1934; the study area contains small portions of restored coastal dune habitat that is potential habitat for this species; however, multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Dudleya cymosa ssp. *ovatifolia*	Santa Monica dudleya	FT, CRPR 1B.2	Chaparral, coastal scrub. Located in canyons on sedimentary conglomerates on primarily north-facing slopes. Elevation range: 485–5,430 feet. Blooms: March–June.	HA	**Presumed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution.
Dudleya multicaulis	Many-stemmed dudleya	CRPR 1B.2	Often on clay soils around granitic outcrops in chaparral, coastal sage scrub, and grasslands. Elevation range: 45–5,430 feet. Blooms: April–July.	HA	**Presumed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Dudleya virens ssp. *insularis*	Island green dudleya	CRPR 1B.2	Coastal bluff scrub, coastal scrub. Located on rocky sites. Elevation range: 15–975 feet. Blooms: April–June	HA	**Presumed Absent**. Present in the project region but not known from the study area or adjacent Ballona Wetlands. The study area does not contain the drier, steeper bluffs that provide suitable microsite conditions for the species. Multiple surveys of the adjacent Ballona Wetlands site conducted since 1979, including floristic rare plant surveys in April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Eryngium aristulatum var. *parishii*	San Diego button-celery	FE, SE	Occurs in vernal pools and wetlands within coastal scrub, valley and foothill grassland, and wetland riparian communities. Elevation range: 60–1,860 feet. Blooms: April–June.	HA	**Presumed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution.
Erysimum insulare	Island wallflower	CRPR 1B.3	Coastal bluff scrub and coastal dune habitat. Elevation range: 0–985 feet. Blooms: March–July.	HP	**Moderate Potential.** Suitable habitat is present within the study area. Although this species was not observed during surveys (August 2015), the field visit was outside of its blooming period.
Helianthus nuttallii ssp. *parishii*	Los Angeles sunflower	CRPR 1A	Saltwater and freshwater marshes and swamps. Elevation range: 30–5,445 feet. Blooms: August–October.	HP	**Presumed Absent**. Historically present in the project region, but not known from the study area or adjacent Ballona Wetlands. Considered to be extirpated in California. Multiple surveys of the adjacent Ballona Wetlands site conducted since 1979, including floristic rare plant surveys in 2010, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Hordeum intercedens	Vernal barley	CRPR 3.2	Coastal dunes, coastal scrub, valley and foothill grassland, vernal pools. Located on saline flats and depressions. Elevation range: 15–3,240 feet. Blooms: March–June.	HA	**Presumed Absent**. Historically present in the region, but not observed since 1901. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Horkelia cuneata var. *puberula*	Mesa horkelia	CRPR 1B.1	Sandy or gravelly soils in chaparral or rarely in cismontane woodlands or coastal scrub. Elevation range: 225–2,625 feet. Blooms: February–September.	HA	**Presumed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution.
Juncus acutus ssp. *leopoldii*	Southwestern spiny rush	CRPR 4.2	Coastal dunes, meadows and seeps, coastal salt marshes. Located on mesic, alkaline seeps and coastal salt. Elevation range: 10–2,925 feet. Blooms: May–June.	HP, P	**Confirmed Present**. This species was observed within the study area.
Lasthenia glabrata ssp. *coulteri*	Coulter's goldfields	CRPR 1B.1	Marshes, playas, vernal pools, and grasslands. Usually associated with alkaline soils. Elevation range: 1–3,955 feet. Blooms: February–June.	HP	**Presumed Absent**. Wetlands in the study area may provide suitable habitat for the species. However, although it was historically present in the region it has not observed since 1934. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Leptosyne maritima	Sea dahlia	CRPR 2B.2	Found in coastal bluff scrub and coastal scrub habitat. Located on a variety of soil types, including sandstone. Elevation range: 16–492 feet. Blooms: March–May.	HA	**Presumed Absent.** This species does not occur in the project region and study area is outside of the species range. The study area contains coastal scrub habitat, but not the drier, steeper bluffs that provide suitable microsite conditions for the species. Multiple surveys of the adjacent Ballona Wetlands, including floristic rare plant surveys in 2010 and 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Monardella hypoleuca ssp. *hypoleuca*	White-veined monardella	CRPR 1B.3	Found in chaparral and cismontane woodland. Located on dry slopes. Elevation range: 164–5,003 feet. Blooms: April–December.	HA	**Presumed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution.
Nama stenocarpa	Mud nama	CRPR 2B.2	Marshes and swamps. Located on lake shores, streambanks, and intermittently wet areas. Elevation range: 15–1,620 feet. Blooms: January–July.	HA	**Presumed Absent**. Historically present in the region but not observed since 1924. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in 2010 and 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Nasturtium gambelii	Gambel's water cress	FE, ST, CRPR 1B.1	Freshwater and brackish marshes and swamps. Elevation range: 16–1,083 feet. Blooms: April–October.	HP	**Presumed Absent**. Marshes in the study area may provide suitable habitat for the species. However, although it was historically present in the region it has not observed since 1906 and is not known from the study area. Multiple surveys of the Ballona Wetlands conducted since 1979, including focused rare plant surveys in July 2010, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Navarretia fossalis	Spreading navarretia	FT, CRPR 1B.1	Chenopod scrub, marshes and swamps (shallow freshwater), playas, and vernal pools. Elevation range: 98–2,149 feet. Blooms: April–June.	HA	**Presumed Absent**. Known historically in the project region (last seen in 1904) but not known from the study area. Closely associated with freshwater wetland habitat, which is not present in the study area. Multiple surveys of the Ballona Wetlands conducted since 1979, including focused rare plant surveys in July 2010, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Navarretia prostrata	Prostrate navarretia	CRPR 1B.1	Vernal pools, coastal scrub, meadows and seeps, and alkaline valley and foothill grassland. Elevation range: 95–4,225 feet. Blooms: April–June.	HA	**Presumed Absent**. Historically present in the region, but not observed since 1906. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in April 2011, did not observe this species (Johnson 2012). The study area is below the known elevation distribution.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Orcuttia californica	California Orcutt's grass	FE, SE, CRPR 1B.1	Vernal pools that remain ponded for longer than three weeks. Elevation range: 45–2,145 feet. Blooms: April–August.	HA	**Presumed Absent**. Known historically in the project region (last seen in 1946) but not known from the study area. Closely associated with freshwater wetland habitat, which is not present in the study area. Multiple surveys of the Ballona Wetlands conducted since 1979, including focused rare plant surveys in July 2010, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Pentachaeta lyonii	Lyon's pentachaeta	FE, SE, CRPR 1B.1	Chaparral, valley and foothill grassland. Located on the edges of openings at the ecotone between chaparral and grassland. Elevation range: 95–2,050 feet. Blooms: March–August.	HA	**Presumed Absent**. Historically present in the region but not observed since 1884. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in July 2010 and April 2011, did not observe this species (Johnson 2012). The study area is below the known elevation distribution.
Phacelia stellaris	Brand's star phacelia	FC, CRPR 1B.1	Coastal scrub and coastal dunes. Elevation range: below 1,200 feet. Blooms: March–June.	HP	**Presumed Absent**. Historically present in the region, but not observed since 1932. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Potentilla multijuga	Ballona cinquefoil	CRPR 1A	Perennial herb found in brackish meadows and seeps. Elevation range: 0–10 feet. Blooms: June–August.	HP	**Presumed Absent**. This species is known from only a single location. It was originally collected on the flats of Ballona (now called Venice) in 1890. No further observations of the species were made, and it is presumed to be extinct. Multiple surveys of the Ballona Wetlands conducted since 1979, including focused rare plant surveys in July 2010, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Pseudognaphalium leucocephalum	White rabbit tobacco	CRPR 2.2	Sandy areas within chaparral, cismontane woodland, coastal scrub, riparian woodland. Elevation range: below 6,825 feet. Blooms: July–December.	HP	**Presumed Absent**. Coastal scrub habitat in the study area may be suitable habitat for this species. However, although known historically in the project region, this species was last recorded in 1907 and the study area occurs outside of the species range. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in July and October 2010, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Quercus dumosa	Nuttall's scrub oak	CRPR 1B.1	Evergreen shrub that inhabits sandy soils and clay loam in coastal scrub, chaparral, and closed-cone coniferous forests. It can be found along the coasts of Santa Barbara, Orange, and San Diego counties. Elevation range: 49–1,312 feet. Blooms: February–August.	HA	**Confirmed Absent**. No suitable habitat is present within the study area, and the study area is below the known elevation distribution. This species was not observed during field surveys.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Sidalcea neomexicana	Salt spring checkerbloom	CRPR 2B.2	Alkali playas, brackish marshes, chaparral, coastal scrub, lower montane coniferous forest, Mojavean Desert scrub. Located on alkali springs and marshes. Elevation range: 45–4,960 feet. Blooms: March–June.	HA	**Presumed Absent**. Brackish marsh in the study area may be suitable habitat for this species. However, the study area is below the known elevation distribution and outside of the species range. In addition, it known historically in the project region from only a single collection from 1890. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in July 2010 and April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Suaeda esteroa	Estuary seablite	CRPR 1B.2	Coastal salt marshes and swamps. Located on clay, silt, and sand substrates. Elevation range: 0–15 feet. Blooms: May–January.	HP	**Presumed Absent**. Marshes in the study area may be suitable habitat for this species. However, it is not known to occur in the project region. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in July and October 2010, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Suaeda taxifolia	Wooly seablite	CRPR 4.2	Coastal bluff scrub, coastal dunes, margins of coastal salt marshes. Elevation range: 0–165 feet. Blooms: January–December	HP, P	**Confirmed Present**. The species is known to occur in the study area. Coastal salt marsh and coastal dunes in the study area are habitat for this species.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Symphyotrichum defoliatum	San Bernardino aster	CRPR 1B.2	Cismontane woodland, coastal scrub, coniferous forest, meadows and seeps, marshes and swamps, and mesic grassland near water. Elevation range: 5–6,630 feet. Blooms: July–November.	HA	**Presumed Absent**. No chaparral or woodland habitat is present in the study area. Known historically in the project region (last seen in 1932) but not known from the study area. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in July and October 2010, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.
Symphyotrichum greatae	Greata's aster	CRPR 1B.3	Broadleaved upland forest, chaparral, cismontane woodland, lower cismontane coniferous forest, and riparian woodland. Elevation range: 975–6,535 feet. Blooms: June–October.	HA	**Presumed Absent**. Known historically in the project region (last seen in 1930) but not known from the study area. Coastal scrub habitats in the study area do not provide suitable habitat for this species and the study area is below the known elevation distribution.
Thelypteris puberula var. *sonorensis*	Sonoran maiden fern	CRPR 2B.2	Seeps and streams in meadows. From southern California south to Sonora, Mexico, and east to Arizona. Within California it is known from Santa Barbara, Los Angeles, Riverside, and San Bernardino counties. This fern is rare to uncommon in California but is more common outside of the state. Elevation range: 164–2,001 feet. Blooms: January–September.	HA	**Presumed Absent**. Not known to occur in the project region or study area and no suitable habitat occurs in the study area. Not observed during field surveys. Multiple surveys of the Ballona Wetlands conducted since 1979, including floristic rare plant surveys in July 2010 and April 2011, did not observe this species (Johnson 2012). Additionally, surveys done within the Grand Canal in November 2005 (LABOE 2005) and May 2009 (LABOE 2009) were also negative for the species.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale

U.S. Fish and Wildlife Service

FE Federal Endangered
FT Federal Threatened
PE Proposed Endangered
PT Proposed Threatened
FC Federal Candidate

California Department of Fish and Wildlife

SE State Endangered
ST State Threatened
SR State Rare

California Native Plant Society, California Rare Plant Ranks (CRPR)

1A Plants presumed extinct in California.
1B Plants rare, threatened, or endangered in California and elsewhere.
1 Seriously endangered in California.
2 Plants rare, threatened, or endangered in California, but more common elsewhere.
3 Plants about which we need more information.
4 Plants of limited distribution.

Habitat Present/Absent

CH Critical habitat
P Species is present
HA Habitat is absent
HP Habitat is, or may be, present

Table C-2. Sensitive Wildlife Species

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Insects					
Euphilotes battoides allyni	El Segundo blue butterfly	FE	Historically ranged over the entire Los Angeles/El Segundo Dunes and the northwestern Palos Verdes Peninsula in southwestern LA County. Currently distributed on three remnant habitats within its former range supporting coastal sand dunes with host plant sea cliff buckwheat (*Eriogonum parvifolium*). All life stages depend on the host plant, as well as possibly loose sand.	HP	**Low Potential.** The study area contains the host plant *Eriogonum parvifolium* within a restoration area along the western portion of Ballona Lagoon although no host plant is present within the project footprint. Because approximately 30 individuals were observed in July 2011 at the adjacent Ballona Wetland (Johnson 2012), there is a potential for the species to occur within the study area, albeit low.
Glaucopsyche lygdamus palosverdesensis	Palos Verdes blue butterfly	FE	Restricted to the cool, fog-shrouded, seaward side of Palos Verdes Hills, Los Angeles County. The larval host plant, Southern California milkvetch (*Astragalus trichopodus* ssp. *lochus*), is typically found on clay soils on rocky slopes. Butterflies feed on milkvetch and deerweed.	HA	**Less than Reasonable.** The study area lacks suitable habitat and the host plant. Historical sightings include Malaga Cove in 2001 (approximately 10 miles to the south). Other sightings in CNDDB are from the 1980's and are considered possibly extirpated (CNDDB 2015).
Crustaceans					
Streptocephalus woottoni	Riverside fairy shrimp	FE	Found in shallow depressions containing a clay hard pan soil layer. Discontinuously distributed along coastal southern California and northern Baja California.	HA	**Less than Reasonable.** The study area lacks vernal pools or suitable clay hardpan with freshwater habitat.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Reptiles and Amphibians					
Anniella pulchra pulchra	Silvery legless lizard	SSC	Sandy or loose soils under sparse vegetation on beaches, within chaparral, pine-oak woodlands, sycamore and cottonwood woodland or oaks near stream terraces.	HP	**Less than Reasonable.** The study area lacks quality habitat and the isolated nature of the study area precludes this species from occurring.
Emys marmorata	Western pond turtle	SSC	Inhabits permanent or nearly permanent freshwaters. Requires basking sites (i.e., partially submerged logs, rocks, or open banks).	HA	**Less than Reasonable.** The study area lacks suitable vegetated freshwater habitat. No pond turtles were detected during surveys at the adjacent Ballona Wetlands from 1981 to 2011 (Johnson 2012).
Phrynosoma blainvillii	Coast horned lizard	SSC	Sandy areas within valley and foothill hardwood and conifer woodlands, riparian areas, coastal scrub, chaparral, and annual grasslands.	HA	**Less than Reasonable.** The study area lacks suitable loose sand and soil habitat. Documented CNDDB observations are greater than 5 miles away predominantly near Santa Monica mountains.
Rana draytonii	California red-legged frog	FT, SSC	Occurs very locally on the western slopes of the Sierra Nevada and the coastal foothills the length of the state, up to about 4,920 feet. Inhabits pools of streams, marshes, and ponds. Adults feed on a wide variety of aquatic prey and will move up to a mile through riparian communities under wet conditions, such as rainfall. They prefer shorelines with extensive vegetation and are vulnerable to the introduction of exotic competitors.	HA	**Less than Reasonable.** The study area lacks suitable freshwater habitat. This species has not been detected during any of the numerous studies conducted in the adjacent Ballona Wetlands over the past several decades (Johnson 2012).

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Spea hammondii	Western spadefoot	SSC	Open habitats including low grasslands, open chaparral, and pine-oak woodlands, where soils are sandy or gravelly. Requires temporary rain pools that last at least 3 weeks. Pools must lack predators of eggs and tadpoles.	HA	**Less than Reasonable.** The study area lacks suitable freshwater habitat.
Taricha torosa	Coast range newt	SSC	Breeds in ponds, reservoirs, and slow-moving streams. Uses nearby upland areas including grasslands, chaparral, and woodlands.	HA	**Less than Reasonable.** The study area lacks suitable freshwater habitat.
Thamnophis hammondii	Two-striped garter snake	SSC	Permanent streams with rocky beds that support riparian canopy.	HA	**Less than Reasonable.** The study area lacks suitable habitat. This species has not been detected during surveys at the adjacent Ballona Wetlands from 1981 to 2011 (Johnson 2012).
Fish					
Eucyclogobius newberryi	Tidewater goby	FE, SSC	Found primarily in waters of coastal lagoons, estuaries, and marshes, and historically ranged from mouth of the Smith River, Del Norte County to northern San Diego County. The species is benthic in nature, living at the bottom of shallow brackish bodies of water, such as lagoons and in lower stream reaches where the water is fairly still but not stagnant. Prefers water with high dissolved oxygen levels and salinities less than 10 parts per thousand.	HP	**Less than Reasonable.** Possible suitable habitat may occur within the study area and this species may have occurred historically; however, the species has not been detected during numerous studies over the last several decades within the adjacent Ballona Wetlands (Johnson 2012).

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Oncorhynchus mykiss irideus	Southern steelhead	FE, SSC	Permanent streams in coastal basins. Migrates into fresh water streams when sandbars breach during winter and spring rains. Occurs in coastal streams with water temperatures < 15°C. Needs cool, clear water with in-stream cover. Spawns in tributaries to large rivers or streams directly connected to the ocean. Spawning habitat consists of gravel substrates free of excessive silt. Thrives when dissolved oxygen concentration is at least 7 parts per million. In streams, deep low-velocity pools are important wintering habitats.	HA	**Less than Reasonable** Although individuals have been periodically observed in Ballona Creek (Johnson 2012), the study area and its tributaries are urbanized and provide no spawning conditions.
Siphateles bicolor mohavensis	Mohave tui chub	FE, SE	Deep pools or shallow outflow streams of mineralized, alkaline waters. Formerly in mainstream Mohave River; now in lakes and mineral spring pools. Dominant plants in habitat include ditchgrass, bulrush, cattail, rush, and saltgrass. Capable of surviving low oxygen (1 mg oxygen/L) and high alkaline (pH 9-10) environments.	HA	**Less than Reasonable.** Suitable conditions for this species not present in the study area. There is no historic record of occurrence of this species near the study area.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Birds					
Agelaius tricolor	Tricolored blackbird	SSC	Range is restricted to the Central Valley and surrounding foothills, throughout coastal and some inland localities in southern California. Breeds in dense colonies near freshwater, often in tall emergent wetland habitats with dense cattail or tule. Will also nest in thickets of willow, blackberry, wild rose, and tall herbs. May travel several kilometers to secure food for nestlings. Forages in grassland and cropland habitat. They are itinerant breeders, nesting more than once at different locations during the breeding season.	HA	**Less than Reasonable** as a breeder as the study areas lacks high quality breeding habitat for this species. The nearest historical nesting site is several miles inland near Torrance. **Less than Reasonable** as a forager as this species, with the exception of a regular wintering flock of several dozen birds in the vicinity of Westchester Park, is a casual visitor to the Ballona Valley.
Athene cunicularia	Burrowing owl	SSC	Level, open, dry, heavily grazed or low grassland or desert vegetation with available rodent or other large burrows. In coastal Southern California, found in microhabitats highly altered by humans, including flood control and irrigation basins, dikes, banks, abandoned fields surrounded by agriculture, and road cuts and margins.	HA	**Less than Reasonable** as a breeder or a forager as there is no suitable nesting habitat in the study area and this species has not been observed during the breading season at the adjacent Ballona Wetlands for decades (Johnson 2012).
Buteo swainsoni	Swainson's hawk	ST	Occurs in open habitats, including cropland and hedgerow, desert, grassland, savanna, and mixed woodland. Nests in solitary or small groups of trees in open areas where they forage. Breeds in the western United States and migrates through Central America to winter in Argentina and Brazil.	HA	**Less than Reasonable** as a breeder or a forager as the study area lacks suitable habitat.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Charadrius alexandrinus nivosus	Western snowy plover	FT, SSC	Breeds primarily above the high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries. In winter, found on beaches used for nesting and other beaches, in manmade salt ponds, and on estuarine sand and mud flats.	HA	**Less than Reasonable** as a breeder. This species has been extirpated as a breeding perennial resident from the region. **Less than Reasonable** as a forager as the study area lacks high quality foraging habitat for this species.
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	FC, SE	Breeds and nests in extensive stands of cottonwood/willow riparian forest within large rivers with broad flood prone bottoms.	HA	**Less than Reasonable** as a breeder due to lack of habitat. **Less than Reasonable** as a forager as this species is a vagrant.
Empidonax traillii extimus	Southwestern willow flycatcher	FE, SE	Restricted to riparian woodlands along streams and rivers with mature, dense stands of willows, cottonwoods, or smaller spring-fed or boggy areas with willows or alders.	HA	**Less than Reasonable** as a breeder due to lack of habitat. **Less than Reasonable** as a forager as this species is a vagrant.
Grus canadensis tabida	Greater sandhill crane	ST	Sandhill cranes breed in the upper Midwest and Canada, winter in the southern U.S. and northern Mexico, and can be seen throughout the Great Plains and Pacific Northwest during migration. Winter foraging habitat includes irrigated croplands, pastures, grasslands, and wetlands with shallow lakes or rivers for night roosts. Three subpopulations of this species are non-migratory and found in Mississippi, Florida, and Cuba.	HA	**Less than Reasonable** as a breeder. The study area is outside of the species breeding range. **Less than Reasonable** as a forager as this species is considered extirpated from the region.
Gymnogyps californianus	California condor	FE, SE, SFP	Requires large areas of remote country for foraging and tall cliff faces for breeding. Forages in open grasslands and oak savanna foothills.	HA	**Less than Reasonable** as a breeder due to lack of habitat. **Less than Reasonable** as a forager as this species is considered extirpated from the region.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Laterallus jamaicensis coturniculus	California black rail	ST, SFP	Tidal salt marshes associated with heavy growth of tule and pickleweed; also occurs in brackish marshes or freshwater marshes at low elevations. Primarily restricted to the San Francisco Bay, with smaller numbers in wetlands from the Salton Sea area to Arizona.	HA	**Less than Reasonable** as a breeder or a forager as this species is deemed extirpated from the region.
Passerculus sandwichensis beldingi	Belding's savannah sparrow	SE	Locally common non-migratory resident of coastal saltmarsh. Obligate breeder in middle elevation saltmarsh, nearly always characterized by pickleweed, either in tidal situations or non-tidal alkaline flats nearby. The majority of its subsistence stems from the saltmarsh and closely adjacent mudflat. Also can be found foraging in a wide variety of habitats, including upper marsh, adjacent ruderal and ornamental vegetation, open beach and mudflat, and even dirt and gravel parking lots.	HP	**Low potential** as a breeder due to lack of high quality habitat within the study area. **Moderate potential** as a forager due to the isolated nature of the study area and limited amount of quality foraging habitat.
Polioptila californica californica	Coastal California gnatcatcher	FT, SSC	May be found in coastal sage scrub below 2,500 feet. Prefers low, coastal sage scrub in arid washes, mesas, and slopes.	HA	**Less than Reasonable** as a breeder or a forager due to lack of habitat.
Rallus longirostris levipes	Light-footed clapper rail	FE, SE, SFP	This subspecies of the large and widespread clapper rail is restricted to the lower elevations of coastal marshes with active tidal flow and dense pickleweed and/or cordgrass thickets from Hueneme, Ventura County (formerly to Santa Barbara County) south to Bahia de San Quintin, Baja California, Mexico. No substantial seasonal movements occur, although rare individuals wander away from known breeding locales.	HP	**Low potential** as a breeder. This species breeds within the adjacent Ballona Wetlands, but is not known to breed within the study area. **Low potential** as a forager as the study area is relatively isolated from the nearby breeding area.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Rallus longirostris obsoletus	California clapper rail	FE, SE	Occurs in marine and brackish water marshes with pickleweed and cordgrass.	HA	**Less than Reasonable** as a breeder or a forager due to lack of quality habitat and nearby breeding populations.
Riparia riparia	Bank swallow	ST	Nests on vertical banks along streams and rivers.	HA	**Less than reasonable** as a breeder due to lack of suitable nesting habitat. **Less than Reasonable** as a forager as this species is an occasional transient.
Sternula antillarum browni	California least tern	FE, SE, CFP	Nests on sandy upper ocean beaches, open barren sites, and occasionally uses mudflats. Forages on adjacent surf line, estuaries, or the open ocean. Colonies are located near the ocean shoreline (within 0.5 miles [about 800 meters]), typically on nearly flat, loose sandy substrates with lightly scattered short vegetation and debris, although some colonies have been located on hard-packed surfaces, even unused asphalt.	HP	**Less than Reasonable** as a breeder as suitable habitat is not present. A large breeding colony (up to 200–300 pairs) within fenced-off "tern preserve" is on Venice Beach just north of Ballona Creek mouth. **High potential** as a forager as this species is a common local summer resident, fishing offshore, along lower Ballona Creek., along tidal channels within Ballona Lagoon, and at the Ballona freshwater marsh.
Vireo bellii pusillus	Least Bell's vireo	FE, SE	Prefers dense riparian habitats but can also be found in more open riparian habitats such as mulefat scrub.	HA	**Less than Reasonable** as a breeder or a forager due to lack of habitat.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Mammals					
Antrozous pallidus	Pallid bat	SSC	Arid regions with suitable roosting habitat adjacent to large bodies of water to forage over. Suitable roosting habitat consists of rocky outcrops, caves, tunnels, mines, eaves, and tree hollows.	HA	**Less than Reasonable**. Roosting and foraging sites are lacking in the study area.
Eumops perotis californicus	Western mastiff bat	SSC	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, and chaparral. Roosts in crevices in cliff faces, high buildings, trees, and tunnels.	HA	**Less than Reasonable**. Roosting and foraging sites are lacking in the study area.
Microtus californicus stephensi	South coast marsh vole	SSC	Occurs in the area of tidal marshes in Los Angeles, Orange, and southern Ventura counties.	HA	**Less than Reasonable**. Although this species was captured during small mammal surveys in marsh habitats containing saltgrass (*Distichlis spicata*) in Ballona Wetlands (Johnson 2012), the lack of quality habitat and isolated nature of the study area preclude this species from occurring.
Nyctinomops femorosaccus	Pocketed free-tailed bat	SSC	Rocky desert areas with relatively high cliffs. Less frequently known to roost in buildings, caves, and under roof tiles.	HA	**Less than Reasonable**. Roosting and foraging sites are lacking in the study area.
Nyctinomops macrotis	Big free-tailed bat	SSC	Roosts are in deep tunnels or caves, occasionally in buildings or bridges. It was formerly found throughout southern California but is apparently now confined to lowland Sonoran Desert habitat below 1,800 feet. It forages in desert wash vegetation within 1 to 3 miles of roosting sites. Historical habitats used in coastal areas appear to be poorly known.	HA	**Less than Reasonable**. Roosting and foraging sites are lacking in the study area.

Scientific Name	Common Name	Status	General Habitat Description	Habitat Present/ Absent	Rationale
Perognathus longimembris pacificus	Pacific pocket mouse	FE, SSC	This species is an obligate resident of fine-grained sandy soils of Coastal Strand, Coastal Dunes, River and Marine Alluvium, and Coastal Sage Scrub close to the ocean, and it has never been collected more than 2 miles from the coast or above 600 feet in elevation. It appears that occurrences are closely associated with loose or friable soils that permit burrowing.	HP	**Less than Reasonable.** No detection in survey efforts in 1981–2011 within Ballona Wetlands (Johnson 2012). The study area contains some suitable habitat; however, the last noted detections in the region were in 1938.
Sorex ornatus salicornicus	Southern California saltmarsh shrew	SSC	Occurs in coastal marshes in Los Angeles, Orange, and Ventura counties. Based on other studies of shrews, may require dense ground cover and nesting sites above mean high tide and free from inundation.	HP	**Less than Reasonable**. Last captured in Ballona Wetlands in 1991 (Johnson 2012). Although some marginal suitable habitat is present within the study area, the isolated nature of the study area precludes this species from occurring.
Taxidea taxus	American badger	SSC	Open plains and fields, particularly in grasslands.	HA	**Less than Reasonable** due to lack of habitat. The closest occurrence is greater than 9 miles away. Urbanized and isolated setting precludes the species from occurring.

U.S. Fish and Wildlife Service		**California Department of Fish and Game**		**Habitat Present/Absent**	
FE	Federal Endangered	SE	State Endangered	P	Species is present
FT	Federal Threatened	ST	State Threatened	HA	Habitat absent
PE	Proposed Endangered	SR	State Rare	HP	Habitat is, or may be, present
PT	Proposed Threatened	SSC	California Species of Special Concern	CH	Critical Habitat
FC	Federal Candidate	SFP	State Fully Protected		
		WL	Watch List		

Appendix D
Jurisdictional Delineation Report

WETLANDS JURISDICTIONAL DELINEATION REPORT

VENICE AUXILIARY PUMPING PLANT
COMMUNITY OF VENICE,
LOS ANGELES COUNTY, CALIFORNIA

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January 2016

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Acronyms and Abbreviations

CCC	California Coastal Commission
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CIS	close interval survey
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
EPA	U.S. Environmental Protection Agency
ESHA	Environmentally Sensitive Habitat Area
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
GPS	global positioning system
HTL	High-Tide Level
HUC	Hydrologic Unit Code
ICF	ICF International
JD	Jurisdictional Determination
LCP	Local Coastal Program
LIP	Land Implementation Plan
LUP	Land Use Plan
MHW	Mean High-Water
MLLW	Mean Lower Low-Water
msl	mean sea level
NHD	National Hydrography Dataset
NI	no indicator
NO	no occurrence
NOAA	National Oceanic and Atmospheric Administration
OBL	status of obligate
OHWM	ordinary high-water mark
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
project	Venice Auxiliary Pumping Plant Project
RGL	Regulatory Guidance Letter
RPW	relatively permanent water
RWQCB	Regional Water Quality Control Board
SWANCC	Solid Waste Agency of Northern Cook County
SWRCB	State Water Resources Control Board
TNW	traditional navigable water
UPL	obligate upland

USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VAPP	Venice Auxiliary Pumping Plant
VERTCON	North American Vertical Datum Conversion
VPP	Venice Pumping Plant
WoS	waters of the State
WoUS	waters of the United States

Chapter 1
Introduction

On September 21, 2015, ICF International (ICF) conducted a routine-level delineation of jurisdictional waters and wetlands within a portion of the Ballona Lagoon and Grand Canal for the Los Angeles Bureau of Engineering as part of the federal and state regulatory permitting process for activities to be conducted for the Venice Auxiliary Pumping Plant Project (project).

The purpose of this delineation is to identify the extent of federal, state, and local jurisdictions within and adjacent to the project site to support the resource-agency permitting process. Given the location of the project, the analysis focuses on the jurisdiction over water and wetlands and takes into consideration the Clean Water Act (CWA) and its State iterations (in California the Porter-Cologne Act), the River and Harbors Act, Section 1602 of the California Fish and Game Code, and Section 30121 of the California Coastal Act.

Section 404 of the CWA covers waters of the United States (WoUS) as well as federal wetlands. Section 10 of the Rivers and Harbors Act covers navigable waters and rivers. Both Section 404 and Section 10 establish the jurisdiction by the U.S. Army Corps of Engineers (USACE). The Regional Water Quality Control Board (RWQCB), under guidance from the U.S. Environmental Protection Agency (EPA), regulates at the state level all activities that are regulated at the federal level by USACE through CWA Section 401. The RWQCB/State Water Resources Control Board (SWRCB) may also regulate activities that affect non-federal waters and wetlands (e.g., isolated features) under the Porter-Cologne Act. Section 1600 et. seq. of the California Fish and Game Code is regulated by the California Department of Fish and Wildlife (CDFW) and covers aquatic features, which may include lakes or streambeds or other aquatic features that support wildlife or potential habitat for wildlife. Section 30121 of the California Coastal Act establishes the jurisdiction by the California Coastal Commission (CCC), which regulates all development activities in the Coastal Zone, including wetlands, as defined by the CCC under Title 14 of the California Code of Regulations, and Environmentally Sensitive Habitat Areas (ESHAs), defined under Section 30107.5 of the California Coastal Act. If a proposed project may affect waters or wetlands, the project site must be evaluated to determine the presence of jurisdictional waters. Permits for the proposed activity must be sought from each applicable resource agency. Details regarding each of these resource agencies and their regulatory authority, jurisdiction, permits, and regulatory processes are provided in Chapter 2, *Regulatory Background*.

The information and results presented herein document the investigation, best professional judgment, and conclusions of the investigators. It is correct and complete to the best of our knowledge. However, all jurisdictional determinations should be considered preliminary until reviewed and approved by the regulatory agencies.

1.1 Project Location

The proposed project is located at the northeast corner of Hurricane Street and Canal Court across and immediately north of the existing Venice Pumping Plant (Figure 1). The project would be located on two three existing vacant lots (Assessor Parcel Numbers [APN]: 4225-008-904 and 42250089044225-010-016), which are owned by the City of Los Angeles, two of which would serve

as laydown areas. Laydown Area 1 would be used for soil stockpile and construction materials and equipment and then permanently converted to parking and open space once the proposed project is operational. Laydown Area 2, located on the east side of the Grand Canal would be used for temporary storage of construction material and equipment, and two laydown areas, as well as within the Grand Canal. The site is mapped in Township 2 South, Range 15 West, Section 21 U.S. Geological Survey (USGS) 7.5-minute "Venice" quadrangle map (USGS 1964) (Figure 2).

1.2 Project Description

The project would include the construction of an auxiliary pumping facility that would provide additional reliability and supplement capacity to the existing Venice Pumping Plant (VPP). The project would be sized to supplement the pumping capacity of the VPP (Pump Station No. 646), for a combined ultimate peak flow capacity of 87 million gallons per day (mgd), reflecting wet weather flows of a 10-year storm event. Major project components of the VAPP would include: one electrical building approximately 3532-feet in height, three pumps constructed below ground level, utility connections, transformers and generators, 17-feet by 17-feet submerged diversion structure, the top of which will be below the channel bed, or the lowest elevation of the Grand Canal, and a 66-inch sewer to connect VAPP to the new diversion structure. A portion of Hurricane Street between and Canal Court and Esplanade would be temporarily closed off during construction and then reopened , with Hurricane Street from Canal Court to Esplanade closed to the public once the facility is operational. Shoring would be installed around the project site, and then excavation would occur to a depth of approximately 25 feet. The proposed project would require the excavation of approximately 10,000 cubic yards of soil of which approximately 2,300 cubic yards would be stockpiled at Laydown Area 1. The remaining 7,700 cubic yards of soil would be exported off-site and stockpiled at Laydown Area 3 in Culver Cityexported off-site and disposed of in an approved area landfill. Laydown Area 2 (across Grand Canal), given the slope and access constraints, may be used only as needed for equipment and materials storage. Water pumped from the site would be disposed of in a manner consistent with Regional Water Quality Control Board (RWQCB) regulations. Construction of the underground facilities associated with the VAPP, including the three new pumps, the wet well, valve vault, meter vault and piping, would occur. These facilities would be constructed at a maximum depth of approximately 25 feet below ground. Within the Grand Canal, a diversion structure approximately 23-feet by 95-feet would be excavated to a depth of approximately 18 feet below ground and then sealed. Excavated materials would be hauled from the site and stockpiled at either Laydown Area 1 or Laydown Area 3 or transported to an approved area landfill; upon completing of installation and sealing, The Grand Canal would be backfilled using the stockpiled excavated material and the coffer dam removed.Excavated materials would be hauled from the site and disposed of at an appropriate location. Water flowing in the Grand Canal would be diverted around a cofferdam structure by the presence of the dam itself. The diversion structure would then be constructed around the in-service Coastal Interceptor Sewer (CIS) pipe. Construction of the cofferdam, placement of the diversion structure, and backfill and soil compaction within the Grand Canal would last approximately three months. The CIS pipe would be cut so that the modular insert could be installed. The pipes would then be connected and a seal would be inserted into the shell. Backfill and soil compaction would be completed, and the Grand Canal channel bottom would be restored to its original elevation. Finally, the diversion structure will be sealed, removing all shoring steel, and allowing flows to resume to pre-construction conditions within the Grand Canal. The Esplanade would be re-opened to pedestrian access on the west side of the Grand Canal. Surface

improvements at the site will occur, consisting of constructing an approximately 3532-foot high electrical building and installing two new 480-Volt City of Los Angeles Department of Water and Power transformers.

Chapter 2
Regulatory Background

The following sections summarize the regulations imposed on each type of jurisdictional feature potentially present within the study area.

2.1 Waters and Activities Regulated by U.S. Army Corps of Engineers

USACE regulates the discharge (temporary or permanent) of dredged or fill material into WoUS, including wetlands. A discharge of fill material includes, but is not limited to, grading, placing riprap for erosion control, pouring concrete, and stockpiling excavated material into WoUS.[1]

2.1.1 Waters of the United States

WoUS within the study area may include some or all of the following classifications of potentially jurisdictional aquatic resources. WoUS, as defined in Code of Federal Regulations (CFR) Title 33, Section 328.3, includes:

(1) All waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide;

(2) All interstate waters, including interstate wetlands;

(3) All other waters, such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce, including any such waters:

(i) That are or could be used by interstate or foreign travelers for recreational or other purposes; or

(ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or

(iii) That are used or could be used for industrial purpose by industries in interstate commerce;

(4) All impoundments of waters otherwise defined as waters of the United States under the definition;

(5) Tributaries of waters identified in paragraphs (1) through (4) of this section;

(6) The territorial seas;

(7) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6) of this section.

(8) Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for

[1] Activities that generally do not involve a regulated discharge (if performed specifically in a manner to avoid discharges) include driving pilings, performing certain drainage channel maintenance activities, constructing temporary mining and farm/forest roads, and excavating without stockpiling.

> the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.
>
> Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m), which also meet the criteria of this definition), are not waters of the United States.

Excluding wetlands and tidal waters, the limit of USACE jurisdiction is delineated using the ordinary high-water mark (OHWM), defined in CFR 328.3(e) as:

> …that line on the shore established by the fluctuations of water and indicated by physical characteristics such as [a] clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

The limit of Section 404 jurisdiction within navigable/tidal waters is delineated using the maximum predicted annual tide (or High-Tide Level [HTL]) for the previous year. The HTL elevations for each tidal gauge station are available online from the National Oceanic and Atmospheric Administration (NOAA) (NOAA 2015a).

2.1.2 Special Aquatic Sites and Wetlands

Section 404 of the CWA identifies six categories of Special Aquatic Sites: Sanctuaries and Refuges, Wetlands, Mudflats, Vegetated Shallows, Coral Reefs, and Riffle and Pool Complexes. Wetlands are explained in detail below.

Normally, three criteria must be satisfied to classify an area as a jurisdictional wetland: (1) a predominance of plant life that is adapted to life in wet conditions (hydrophytic vegetation); (2) soils that saturate, flood, or pond long enough during the growing season to develop anaerobic conditions in the upper part (hydric soils); and (3) permanent or periodic inundation or soils saturation, at least seasonally (wetland hydrology) (Environmental Laboratory 1987).

2011 Draft Clean Water Act Guidance

On April 27, 2011, USACE and EPA issued draft guidance for determining jurisdiction under the CWA (USACE 2011). The guidance supersedes the previous guidance from 2003 regarding *SWANCC* (68 *Federal Register* 1991–1995) and 2007 *Rapanos* guidance. This document reiterated the guidance issued under the *Rapanos* decision, asserting that the following waters are protected by the CWA.

- Traditional navigable waters
- Interstate waters
- Wetlands adjacent to either TNWs or interstate waters
- Non-navigable tributaries to TNWs that are relatively permanent (meaning they contain water at least seasonally)
- Wetlands that directly abut relatively permanent waters

The guidance further clarifies the criteria for defining TNWs, primarily consistent with previous guidance. In addition, a significant nexus evaluation is required for the "other waters" category of the regulations (see item 3 in Section 2.1.1, *Waters of the United States*, above). The guidance divides these waters into two categories—those that are physically proximate to other jurisdictional waters and those that are not—and discusses how each category should be evaluated.

Finally, the guidance reiterated that certain aquatic areas are generally not considered WoUS, as follows.

- Wet areas that are not tributaries or open waters and do not meet the agencies' regulatory definition of "wetlands"
- Waters that are excluded from coverage under the CWA by existing regulations
- Waters that lack a "significant nexus" where one is required for a water to be protected by the CWA
- Artificially irrigated areas that would revert to upland should irrigation cease
- Artificial lakes or ponds created by excavating and/or diking dry land and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing
- Artificial reflecting pools or swimming pools created by excavating and/or diking dry land
- Small ornamental waters created by excavating and/or diking dry land for primarily aesthetic reasons
- Water-filled depressions created incidental to construction activity
- Groundwater drained through subsurface drainage systems
- Erosional features (gullies and rills) and swales and ditches that are not tributaries or wetlands

2.1.3 Section 10 of the Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act gives USACE regulatory and permitting authority over work in, over, or under "navigable WoUS." Regulated Section 10 activities include the construction of structures in or over navigable WoUS, the excavation/dredging or deposition of material in navigable WoUS, or any obstruction or alteration to a navigable WoUS. Section 10 navigable WoUS and Section 404 WoUS do overlap in some areas that involve wetlands and non-wetland waters associated with navigable WoUS.

The limits of Section 10 navigable WoUS are defined by the Mean High Water (MHW) elevation, using Mean Lower Low Water (MLLW) as a baseline (MHW minus MLLW = Section 10 MHW).

2.2 Waters and Activities Regulated by the State of California

2.2.1 Section 401 of the Clean Water Act

Before USACE will issue a Section 404 permit, applicants must apply for and receive a Section 401 water quality certification or waiver. Under Section 401 of the CWA, all activities that are regulated at the federal level by USACE are also regulated at the state level. Therefore, state jurisdiction usually includes all waters or tributaries to waters that are determined to be WoUS and, similar to WoUS, typically delineated at the OHWM. However, if it is determined that the waters are not WoUS,

they may still be subject to state jurisdiction based on the Porter-Cologne Act. Pursuant to Section 401 of the CWA:

> …any applicant for a federal permit for activities that involve a discharge to waters of the United States shall provide the federal permitting agency a certification from the state in which the discharge is proposed that states that the discharge will comply with the applicable provisions under the federal Clean Water Act.

2.2.2 Porter-Cologne Water Quality Control Act

In addition to the USACE, the state also regulates activities that would involve "discharging waste, or proposing to discharge waste, within any region that could affect waters of the State" (California Water Code 13260(a)),. The definition of WoS in California is wider than the the definition of WoUS included in Section 404 of the CWA. Waters of the State (WoS) are defined as "any surface water or groundwater, including saline waters, within the boundaries of the state" (California Water Code 13050(e)).. These waters may include isolated vernal pools, isolated wetlands, or other aquatic habitats that are not normally subject to federal regulation under Section 404 of the CWA.

2.2.3 Jurisdiction of the State Water Resources Control Board/Regional Water Quality Control Boards

In California, SWRCB and nine RWQCBs regulate activities within state and federal waters under Section 401 of the CWA and the Porter-Cologne Act. SWRCB is responsible for setting statewide policy, coordinating and supporting RWQCB efforts, and reviewing petitions that contest RWQCB actions. Each semi-autonomous RWQCB sets water quality standards, issues Section 401 certifications and waste discharge requirements, and takes enforcement action for projects that occur within its boundary. However, when a project crosses multiple RWQCB jurisdictional boundaries, SWRCB becomes the regulating agency and issues project permits.

2.3 Activities Regulated by the California Department of Fish and Wildlife Regulated

Pursuant to Sections 1600–1616 of the California Fish and Game Code, CDFW regulates any activity that will substantially divert or obstruct the natural flow—or substantially change or use any material from the bed, channel, or bank—of any river, stream, or lake. CDFW also regulates any activity that will deposit or dispose of debris, wastewater, or other material containing crumbled, flaked, or ground pavement that may pass into any river, stream, or lake. The applicant must notify CDFW prior to such activities and obtain a Lake or Streambed Alteration Agreement.

2.3.1 California Department of Fish and Wildlife Jurisdiction

CDFW jurisdiction includes ephemeral, intermittent, and perennial watercourses (including dry washes) and lakes that are characterized by the presence of (1) definable bed and banks and (2) existing fish or wildlife resources. Furthermore, CDFW jurisdiction often extends to habitats adjacent to watercourses, such as oak woodlands in canyon bottoms or willow woodlands that

support hydrologic functions within the riparian system. CDFW jurisdiction typically does not include features without a discernible bed and bank, such as swales, vernal pools, or wet meadows.

2.4 California Coastal Act – California Coastal Commission

In 1972, the United States Congress passed the Coastal Zone Management Act (CZMA) (Title 16 United States Code 1451–1464). The CZMA declared a national policy "to preserve, protect, develop, and, where possible, restore or enhance the resources of the nation's Coastal Zone for this and succeeding generations" and sought to encourage and help states develop and implement management programs for the use of coastal land and water resources, "giving full consideration to ecological, cultural, historic, and esthetic values as well as the need for compatible economic development."

To achieve maximum responsiveness to local conditions, accountability, and public accessibility, the California Coastal Act relies heavily on local government and local land use planning procedures and enforcement. Therefore, implementation of California Coastal Act policies is accomplished primarily through the preparation of Local Coastal Programs (LCPs), which are reviewed and approved by the CCC. The project occurs within the Venice LCP, which was certified in 2001. Therefore, the project is subject to the Venice LCP policy with ultimate approval from the CCC.

An LCP typically consists of a Land Use Plan (LUP) and an Land Implementation Plan (LIP). The LUP indicates the kinds, locations, and intensities of land uses; the applicable resource protection and development policies; and, where necessary, a listing of implementing actions. The LIP consists of the zoning ordinances, zoning district maps, and other legal instruments that are necessary to implement the LUP. Any amendments to the certified LCP will require review and approval by the CCC prior to becoming effective. After certification of an LCP, coastal development permit authority is delegated to the appropriate local government. The CCC retains original permit jurisdiction over certain specified lands, such as submerged lands, tidelands, and public trust lands, and has appellate authority over development approved by local government in specified geographic areas and for major public works projects and major energy facilities.

In authorizing coastal development permits, the local government must find that the development conforms to the certified LCP. Furthermore, after certification of the LCP, city actions on applications for California Coastal Act authority to conduct certain types of development, as well as development within certain geographic areas, are appealable to the CCC.

2.4.1 Definition of Wetlands and Policy

Section 30121 of The California Coastal Act defines wetlands as such:

> Wetland "means lands within the Coastal Zone may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens."

The CCC applies a one-parameter approach to defining wetlands. As such, any area with a preponderance of hydrophytic vegetation, the presence of hydric soils, or wetland hydrology meets

the definition of a wetland in the Coastal Zone. This is important to the site because many areas meet the one-parameter wetland definition.

Section 13577(b) of Title 14, Division 5.5, Article 18, of The California Code of Regulations defines wetlands as such:

(1) Measured 100 feet landward from the upland limit of the wetland. Wetland shall be defined as land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent and drastic fluctuations of surface water levels, wave action, water flow, turbidity, or high concentrations of salts or other substances in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to, vegetated wetlands or deep-water habitats. For purposes of this section, the upland limit of a wetland shall be defined as:

   (A) The boundary between land with predominantly hydrophytic cover and land with predominantly mesophytic or xerophytic cover;

   (B) The boundary between soil that is predominantly hydric and soil that is predominantly non-hydric; or

   (C) In the case of wetlands without vegetation or soils, the boundary between land that is flooded or saturated at some time during years of normal precipitation and land that is not.

(2) For the purposes of this section, the term "wetland" shall not include wetland habitat created by the presence of and associated with agricultural ponds and reservoirs where:

   (A) The pond or reservoir was in fact constructed by a farmer or rancher for agricultural purposes; and

   (B) There is no evidence (e.g., aerial photographs, historical survey, etc.) showing that wetland habitat pre-dated the existence of the pond or reservoir. Areas with drained hydric soils that are no longer capable of supporting hydrophytes shall not be considered wetlands.

2.4.2 Environmentally Sensitive Habitat Areas

The California Coastal Act (California Public Resources Code Division 20, Section 30240a) restricts land uses within or adjacent to ESHAs. The California Coastal Act, Section 30107.5, defines an ESHA as:

> …any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and could be easily disturbed or degraded by human activities and developments.

Included within this definition are wetlands, estuaries, streams, riparian habitats, lakes, and portions of open coastal waters that meet the rare or valuable habitat criteria. Not all wetlands necessarily meet the "rare or valuable habitat criteria," and as set forth in Section 30233, "where there is no feasible less environmentally damaging alternative and where feasible mitigation measures have been provided to minimize adverse environmental effects," degraded or low-value wetlands that do not meet the rare or valuable habitat criteria may be subject to restoration in accordance with Section 30233.7.

Chapter 3
Methodology

3.1 Project Research

Project research was conducted to determine the areas over which different Federal and State agencies have jurisdiction and authorization power. Prior to the field visit, a 200-foot-scale (1 inch = 200 feet) aerial photograph of the study area was obtained and compared with USGS 7.5-minute topographic quadrangles to identify potential differing agency jurisdiction and jurisdictional features within the study area as indicated by vegetation types, topographic changes, or visible drainage patterns. The National Hydrography Dataset (NHD) data for the study area (USGS 2015) and the National Wetlands Inventory (USFWS 2015) were referenced to identify any mapped features such as streams and wetlands. The study area was carefully reviewed in Google Earth (Google Earth 2015) at various scales, and potential jurisdictional features were noted and identified on field maps. A review of the U.S. Department of Agriculture, Natural Resources Conservation Service, Soil Survey Geographic database (USDA/NRCS 2015) was attempted but no soil data is available for the study area.

3.2 Jurisdictional Delineation

ICF biologists Paul Schwartz and Lily Sam conducted the jurisdictional waters and wetland delineation for the study area on September 21, 2015. The jurisdictional delineation was conducted between 9:00 a.m. and 1 p.m. The tide during the September 21 field visit was rising from a low tide of +3.02 feet mean sea level (msl) at 9:10 a.m. to a high tide of 4.65 feet msl at 3:51 p.m. (NOAA 2015a). Weather conditions during the delineation consisted of clear skies (5–15% cloud cover), temperatures ranging from 81–88 degrees Fahrenheit, with winds ranging from 0–2 miles per hour. The study area was surveyed on foot and jurisdictional limits, wetland sample points, culverts, and other notable locations were recorded using a Trimble Yuma global positioning system (GPS) unit with a Geneq SX Blue II receiver, providing sub-meter accuracy, and recorded on field maps. Common plant species observed were identified by visual characteristics and morphology in the field. Taxonomic nomenclature for plants follows the National Wetlands Plant List (USACE 2014). If plants were unknown, the *Jepson Manual: Vascular Plants of California,* second edition (Baldwin et al. 2012), was used to identify plants to species level.

On September 29, 2015, Arcadis U.S. Inc. conducted a topographic mapping of a subset of the study area (Appendix A, Figures 6a and 6b). The topographic mapping was prepared at 0.5-foot intervals using National Geodetic Vertical Datum of 1929 (NGVD 29). The NGVD 29 elevations were then converted to North American Vertical Datum of 1988 (NAVD 88) elevations using an Orthometric Height Conversion calculator available via North American Vertical Datum Conversion (VERTCON) (NOAA 2015b). The NOAA MHW and HTL elevations (MLLW datum) were then adjusted to match the NAVD 88 topographic elevations depicted on Figure 6a and 6b by subtracting 0.19 foot from each elevation.

3.2.1 U.S. Army Corps of Engineers Jurisdiction

In order to accurately map the limits of USACE jurisdictional waters and wetlands within the study area, the jurisdictional delineation consisted of two components: a field visit and a desktop analysis. The methodology for both of these components is discussed below.

USACE Field Investigation

Potential Section 404 WoUS and wetlands were initially delineated using methods established in the *Wetland Delineation Manual* (Environmental Laboratory 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008a), *A Field Guide to the Identification of the Ordinary High-Water Mark (OHWM) in the Arid West Region of the Western United States* (USACE 2008b), and 2007 and 2008 *Rapanos* guidance (USACE and EPA 2008).[2]

During the September 21, 2015 field visit, the delineation of non-wetland waters was based on the presence of observable OHWM indicators, consisting of break in bank slope, debris wracking, staining, change in sediment texture, and change in vegetation cover. Paired wetland sample points were spaced throughout the study area to determine the limits of the USACE wetland boundary.

At each wetland sample point, several parameters were considered to determine whether the sample point was within a wetland. Three criteria normally must be fulfilled to classify an area as a jurisdictional USACE wetland: (1) a predominance of hydrophytic vegetation, (2) the presence of hydric soils, and (3) the presence of wetland hydrology. Details regarding the application of these techniques are described below.

- **Hydrophytic Vegetation:** The hydrophytic vegetation criterion is satisfied at a location if greater than 50 percent of all the dominant species present within the vegetation unit have a wetland indicator status of obligate (OBL), facultative wetland (FACW), or facultative (FAC) (Environmental Laboratory 1987). An OBL indicator status refers to plants that have a 99 percent probability of occurring in wetlands under natural conditions. An FACW indicator status refers to plants that usually occur in wetlands (67–99 percent probability) but are occasionally found elsewhere. An FAC indicator status refers to plants that are equally likely to occur in wetlands or elsewhere (estimated probability 34–66 percent for each). An NI (no indicator) status designates that insufficient information was available to determine an indicator status. An NO (no occurrence) status indicates that the species does not occur in the region. When a plant with an NO status is found within a region, it usually indicates that the plant is ornamental. The wetland indicator status used for this report follows the *Arid West 2014 Regional Wetland Plant List* (USACE 2014).
- **Hydric Soils:** The definition of a hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA/NRCS 1994). This determination is based on the various field indicators detailed in the *Arid West Supplement* and the *Field Indicators of Hydric Soils in the United States* (Version 7.0) (USDA/NRCS 2010).

[2] On June 5, 2007, USACE and EPA issued guidance related to the *Rapanos-Carabell* consolidated decisions to address the question of jurisdiction over attenuated tributaries to WoUS as well as wetlands adjacent to those tributaries. On December 2, 2008, USACE and EPA issued guidance that incorporated revisions to the June 5, 2007, memorandum. The *Rapanos-Carabell* decision is discussed in further detail in Section 2.1.4, above.

- **Wetland Hydrology:** Wetland hydrology is determined using indicators of inundation or saturation (flooding, ponding, or tidally influenced) detailed in the *Wetland Delineation Manual* and the *Arid West Supplement*.

USACE Desktop Analysis

On November 3, 2015, USACE Regulatory Section Chief Dan Swenson was contacted to confirm the appropriate delineation approach for the study area[3]. Due to the tidal influence in the study area, it was determined that Section 404 waters of the U.S. and wetlands as well as Section 10 navigable waters would need to be delineated. Section 404 tidal waters[4] and Section 10 navigable waters are mapped using elevations based on NOAA tidal stations. The tidal data from the Santa Monica Tidal Station (Station 9410840) were used to determine the elevational limits of Section 404 and Section 10 waters (NOAA 2015a).

Pursuant to USACE, guidance for delineating Section 404 tidal waters states that the upper elevational limit of Section 404 tidal waters is established based on the HTL. NOAA tidal stations do not provide HTL data, so the upper elevational limit of Section 404 waters is based on the maximum predicted annual tide for the given year (i.e., the highest tide predicted for the year) The maximum predicted annual tide for the Santa Monica Tidal Gauge Station for the study area is +6.9 feet msl (MLLW datum).

Pursuant to USACE, guidance for delineating Section 10 navigable waters states that the upper elevational limit of Section 10 waters is established based on the MHW elevation (+7.13 feet msl) and then adjusted to convert the tidal station datum to MLLW datum[5]. As such, the MLLW elevation (+2.44 feet msl) is subtracted from the MHW elevation in order to map Section 10 tidal waters (i.e., +7.13 feet msl minus +2.44 feet msl = +4.69 feet msl). Therefore, the upper elevational limit of Section 10 jurisdiction in the study area is +4.69 feet msl (MLLW datum).

Because the project topographic mapping provided was based on NAVD88 datum, the MHW and HTL elevations (MLLW datum) were then adjusted to match the NAVD 88 datum topographic elevations depicted on Figure 6a and 6b by subtracting 0.19 foot from each elevation. Therefore, the Section 404 elevation mapped in the study area is 6.71 feet (NAVD 88) and the Section 10 elevation mapped in the study area is 4.5 feet (NAVD 88).

3.2.2 Regional Water Quality Control Board Jurisdiction

The evaluation of state jurisdiction followed guidance from Section 401 of the CWA and typically follows the same jurisdictional areas that are used to define the limits of Section 404 WoUS and wetlands.

[3] Dan Swenson, USACE Regulatory Section Chief (Los Angeles District), personal communication, November 3, 2015

[4] Delineation procedures for Section 404 wetlands follows guidance outlined in *Wetland Delineation Manual* (Environmental Laboratory 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008a),

[5] NOAA Tidal datums are referenced to an station datum other than MLLW. In order to use NOAA station datums for surveying, the station datum must be reduced to MLLW, which is the standard reference datum for tide predictions, bench mark publications and nautical charting.

3.2.3 California Department of Fish and Wildlife Jurisdiction

CDFW jurisdiction typically includes features with a defined bed and bank. The evaluation of potential jurisdictional areas follows the guidance of relevant CDFW materials and standard practices by CDFW personnel. CDFW jurisdiction is generally delineated by measuring the outer width and length boundaries of potential jurisdictional areas, consisting of the greater of either the top-of-bank measurement or the extent of associated riparian or wetland vegetation.

For this project, in addition to delineating the physical limits of what could be considered limits of CDFW jurisdiction, the feature was also evaluated using satellite aerial photos (Google Earth 2015) to assess the inputs into the feature and its historical function as a marine non-aquatic resource. Based on the review of that data, it was determined that the feature is a canal/lagoon and primarily marine with minimal freshwater input, mostly from local runoff, and does not meet the CFGC definition of a lake or stream.

3.2.4 California Coastal Commission

CCC jurisdictional wetlands were mapped as the limits of one-parameter wetlands, consisting of the presence of a preponderance of hydrophytic vegetation, and/or the presence of hydric soils, and/or the presence of wetland hydrology. USACE standard definitions provided above were used to define each of the three potential wetland indicators used to delineate CCC wetlands. The upper limits of CCC one-parameter wetlands consisted of the greater of either the limits of the OHWM, Section 404 elevations, limits of hydric soils, or the upper limits of areas supporting a preponderance of hydrophytic vegetation.

Chapter 4
Environmental Setting

This chapter describes the topography, land use, hydrology, vegetation characteristics, and soils associated with the study area.

4.1 Topography and Land Use

The study area is within the coastal low lands of the community of Venice, City of Los Angeles, California, at the confluence of the Grand Canal and Ballona Lagoon. Ballona Lagoon is connected to the Marina Del Rey Harbor channel approximately 0.80 mile to the southeast, and the study area is subject to muted daily tidal fluctuations. The Grand Canal is the main channel of the Venice Canals. The elevations within the study area range from sea level to approximately 12 feet above mean sea level (msl) (USGS 1964). The study area consists primarily of either open water, the vegetated banks associated with Ballona Lagoon and the Grand Canal, or developed lands associated with the adjacent upland residential areas. A portion of the existing VPP is in the study area. Sidewalks run along both sides of the Grand Canal; however, the sidewalk on the eastern bank is in need of repair and has areas of pickleweed vegetation growing through cracks. The study area is surrounded by residential housing to the north, west and east, the existing VPP to the west, and open water associated with the Ballona Lagoon to the south.

The NHD depicts the Grand Canal and Ballona Lagoon within the study area as an NHD Streamline (Appendix A, Figure 3). The National Wetlands Inventory has mapped the following wetland types as occurring in the study area: Estuarine and Marine Deepwater and Estuarine and Marine Wetland occurring in Ballona Lagoon, and Riverine occurring in the Grand Canal (Appendix A, Figure 4).

4.1.1 Hydrologic Unit

The study area is within the Garapito Creek-Frontal Santa Monica Bay Hydrologic Unit Code (HUC) 10 watershed, which is included in the larger Santa Monica Bay HUC 8 watershed. The Garapito Creek-Frontal Santa Monica Bay HUC 10 and Santa Monica Bay HUC 8 watersheds terminate in the Pacific Ocean (Appendix A, Figure 5).

The Santa Monica Bay HUC 8 watershed drains an area of approximately 385 square miles and contains 27 sub-watersheds. The northern extent of the watershed extends along the Ventura-Los Angeles County line on the west to the Ballona Creek Watershed to the south. Much of the northern portion of the watershed is open space associated with the Santa Monica Mountains. The middle and southern portions of the watershed are more urban and contains portions of Los Angeles, Santa Monica, El Segundo, Manhattan Beach, Redondo Beach and Palos Verdes. (City of Los Angeles Stormwater Program 2015.)

Chapter 5
Jurisdictional Delineation Results

This chapter describes the delineated features and expected jurisdictional status within the study area. This report documents the potential jurisdictional waters, wetlands, and other aquatic features within the study area. An impacts analysis is not included as a part of this report.

The information and results included herein document the investigation, best professional judgment, and conclusions of the investigators. It is correct and complete to the best of our knowledge. However, all jurisdictional determinations should be considered preliminary until reviewed and approved by the regulatory agencies. The study area was delineated with the understanding that a request for a Preliminary JD would be submitted for the project.

Appendix A, Figures 6a and 6b, depict the results of the jurisdictional delineation. Photographs documenting the conditions present during the delineation are provided in Appendix B. Wetland Determination Data forms are provided in Appendix C, and a Preliminary JD form is included in Appendix D.

5.1 Delineated Feature Descriptions

Two named features depicted on the Venice USGS topographic quadrangle map containing the study area were documented as occurring within the study area: Ballona Lagoon and Grand Canal. For the purposes of this delineation, the two features are treated as one feature of open water and associated wetlands referred to as Ballona Lagoon and Grand Canal. The feature was determined to contain waters and wetlands subject to the jurisdiction of USACE under Section 404 and Section 10 of the CWA, waters and wetlands subject to the jurisdiction of the RWQCB under Section 401 of the CWA, and coastal wetlands subject to the jurisdiction of CCC under Title 14 of the California Code of Regulations and Section 30107.5 of the California Coastal Act. Each of the various jurisdictions is discussed below. Table 5-1 presents a summary of all jurisdictions within the study area.

5.1.1 USACE/RWQCB Jurisdiction Description

Within the study area, the Ballona Lagoon and the Grand Canal is a perennial water feature and is a direct tributary to the Marina Del Rey Harbor Channel and the Pacific Ocean. Based on physical evidence (i.e., break in bank slope, debris wracking, staining, change in sediment texture, and change in vegetation cover) within the study area, the OHWM was observed to be at the toe of the slope along the 2.5-foot elevational contour. Based on the tidal gauge data from the Santa Monica Tidal Gauge Station (adjusted to plot on NAVD 88 topographic elevations), the limits of potential Section 404 and Section 10 waters were determined to be +6.71 feet (NAVD 88) and +4.5 feet (NAVD 88), respectively (Appendix A, Figure 6a). Several sets of paired wetland sample points were assessed to determine the extent of three-parameter USACE wetlands. Based on the results of the wetland sample points, the lower areas of the channel banks were determined to meet the criteria for three-parameter USACE wetlands (Appendix A, Figure 6a).

Within the study area, approximately 0.929 acre of USACE Section 404 WoUS and 0.075 acre of Section 404 wetlands were delineated, and approximately 0.793 acre of Section 10 navigable waters was delineated.

Within the study area, approximately 0.929 acre of RWQCB Section 401 WoS and 0.075 acre of Section 401 wetlands were delineated. Appendix A, Figure 6a, depicts potential USACE and RWQCB jurisdiction delineated within the study area.

5.1.2 CDFW Jurisdiction Description

As discussed in Section 3.2.3 above, it was determined that this feature was not subject to CDFW jurisdiction, based on the lack of freshwater input and the historic context of this feature receiving any freshwater flows. It should be noted that the feature does provide habitat and so is expected to be subject to CDFW jurisdiction under the California Endangered Species Act (CESA) and the California Environmental Quality Act (CEQA). Those assessments and conclusions are discussed separately in the *Biological Resources and Habitat Assessment, Venice Auxiliary Pumping Plant, Los Angeles County, California*, dated January 2016 (ICF 2016).

5.1.3 CCC Jurisdiction Description

The limits of potential CCC jurisdictional one-parameter wetlands in the study area were determined by the presence of the hydrology parameter, which was based on the limits of Section 404 WoUS (6.71 feet, NAVD 88). The 6.71 foot msl elevation exceeded the limits of the hydric soil and hydrophytic vegetation parameters. Within the study area, approximately 0.929 acre of CCC jurisdiction was mapped. Appendix A, Figure 6b, depicts potential CCC jurisdiction mapped within the study area.

5.2 Delineation Results Summary

Within the entire study area, one feature that could be subject to the jurisdiction of USACE, RWQCB/EPA, CDFW, and CCC was delineated: Ballona Lagoon and Grand Canal. USACE and RWQCB/EPA potential jurisdictional areas within the study area total approximately 0.929 acre of Section 404 non-wetland WoUS/Section 401 non-wetland WoS and 0.075 acre of Section 404 wetland WoUS and Section 401 wetland WoS. Additionally, 0.793 acre of potential USACE Section 10 WoUS was mapped in the study area. Appendix A, Figure 6a, depicts the limits of potential USACE/RWQCB jurisdiction in the study area. Potential CCC jurisdiction within the study area totaled approximately 0.929 acre of one-parameter wetlands. Appendix A, Figure 6b, depicts the limits of potential CCC jurisdiction in the study area.

Table 5-1. Jurisdictional Delineation Summary (acres)

	Ballona Lagoon and Grand Canal	
Jurisdiction	**Acres**	**Total**
USACE Section 404 Non-Wetland WoUS/RWQCB Section 401 Non-Wetland WoS	0.929	0.929
USACE Section 404 Wetland WoUS/RWQCB Section 401 Wetland WoS	0.075	0.075
USACE Section 10 Navigable WoUS	0.793	0.793

CCC One-Parameter Wetlands	0.929	0.929

5.3 List of Delineators and Report Preparers/ Reviewer

Paul Schwartz, Senior Biologist—Lead Delineator/Report Preparer

Lily Sam, Biologist—Delineator

Megan Jameson, Senior Regulatory Specialist—Report Reviewer

Brittany Buscombe—GIS Specialist

Chapter 6
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Personal Communication

Dan Swenson. USACE Regulatory Section Chief, Los Angeles District. November 3, 2015 and December 28, 2015—personal conversation regarding Section 404 elevational limits and Section 10 limits in the tidal waters of Ballona Lagoon and Grand Canal. City of Los Angeles, Los Angeles County, California.

Appendix A
Jurisdictional Delineation Maps

1 Regional Vicinity Map

2 USGS Topographic Map

3 National Hydrography Dataset Map

4 National Wetlands Inventory Map

5 Watershed Map

6a USACE/RWQCB Jurisdictional Delineation Results

6b CDFW/CCC Jurisdictional Delineation Results



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Figure 1
Project Vicinity Map
Venice Auxiliary Pumping Plant Project

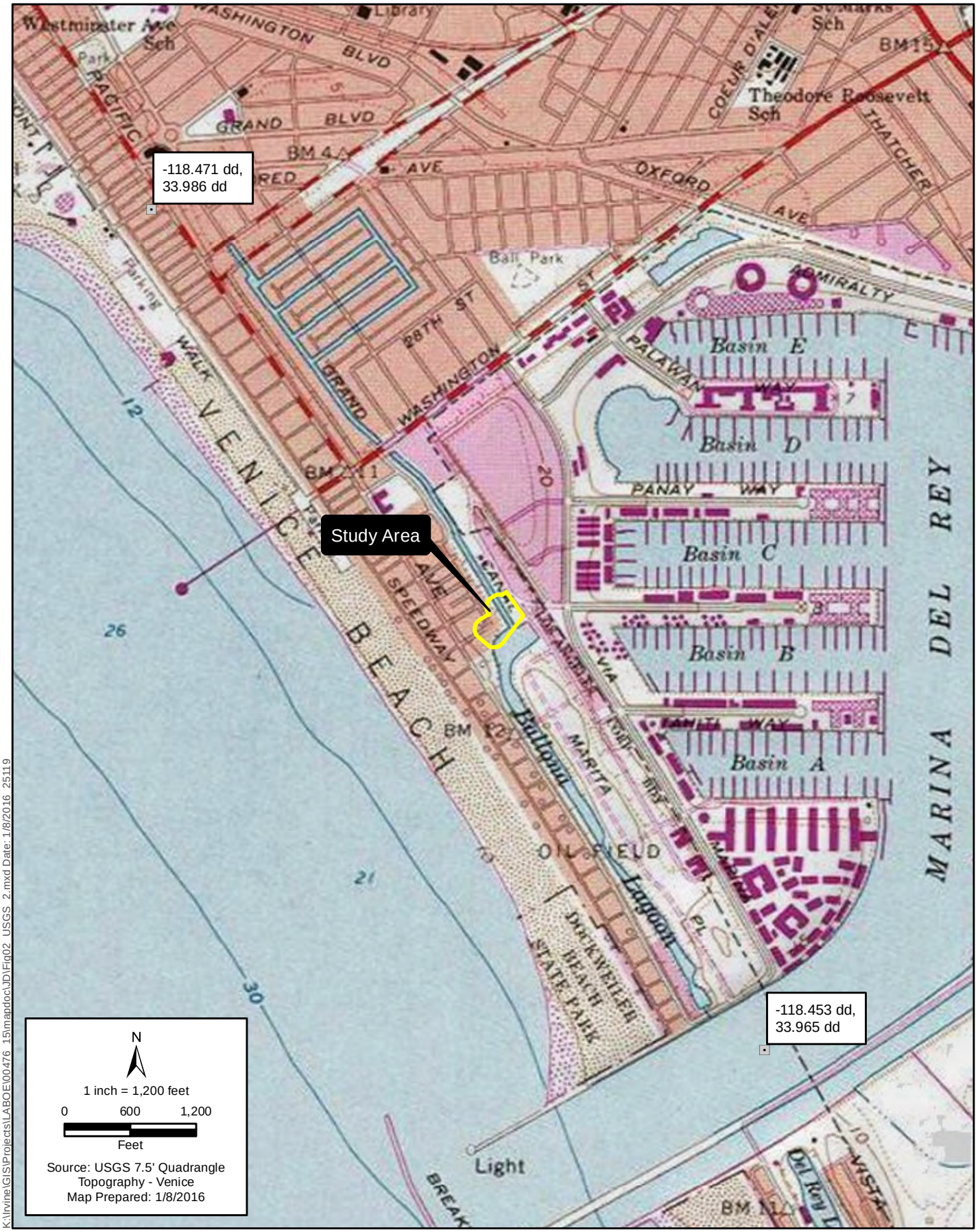

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Figure 2
USGS Topographic Map
Venice Auxiliary Pumping Plant Project

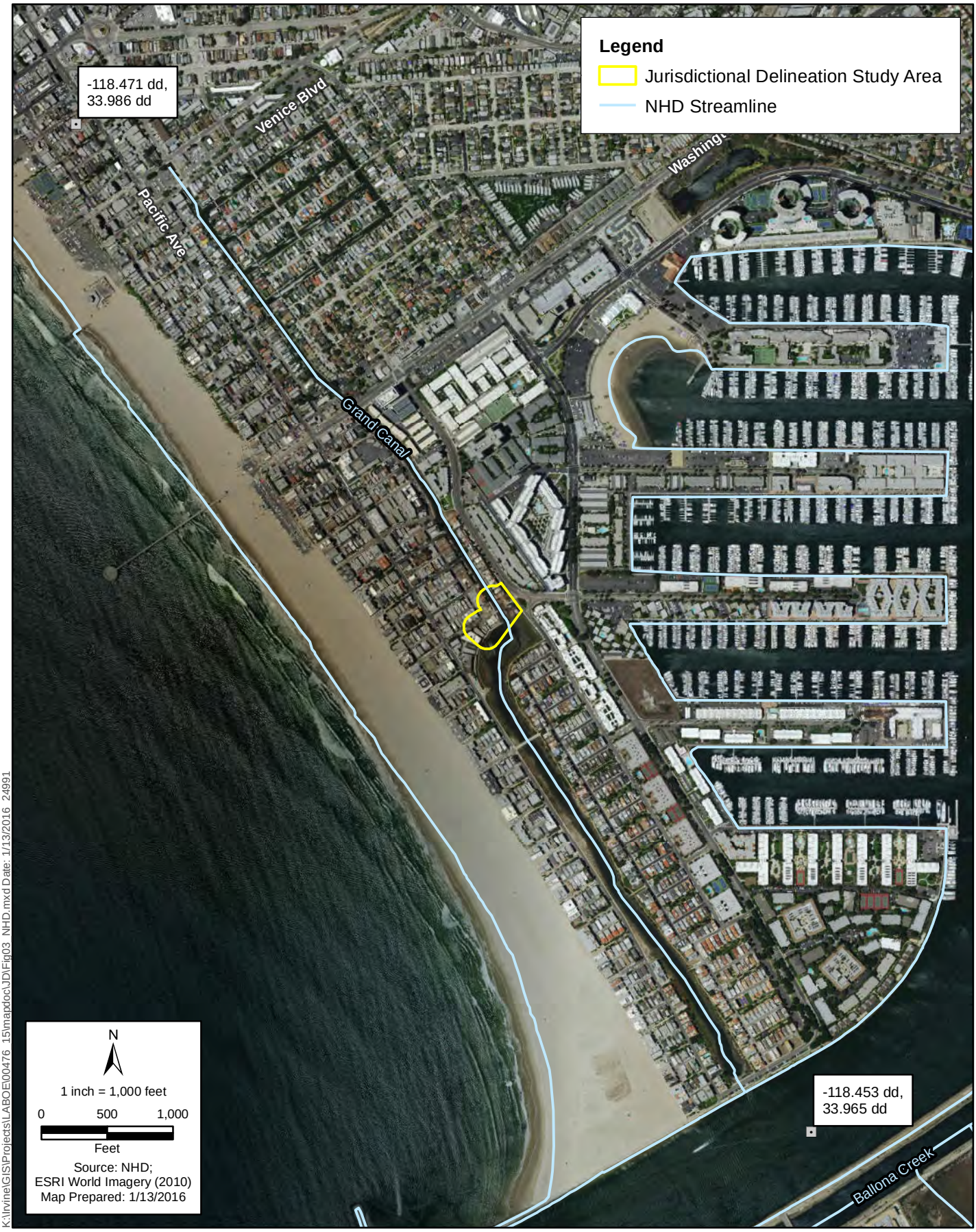

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Figure 3
National Hydrography Dataset Map
Venice Auxiliary Pumping Plant Project



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Figure 4
National Wetlands Inventory Map
Venice Auxiliary Pumping Plant Project



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Figure 5
Watershed Map
Venice Auxiliary Pumping Plant Project



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Figure 6a
USACE/RWQCB Jurisdictional Delineation Results Map
Venice Auxiliary Pumping Plant Project

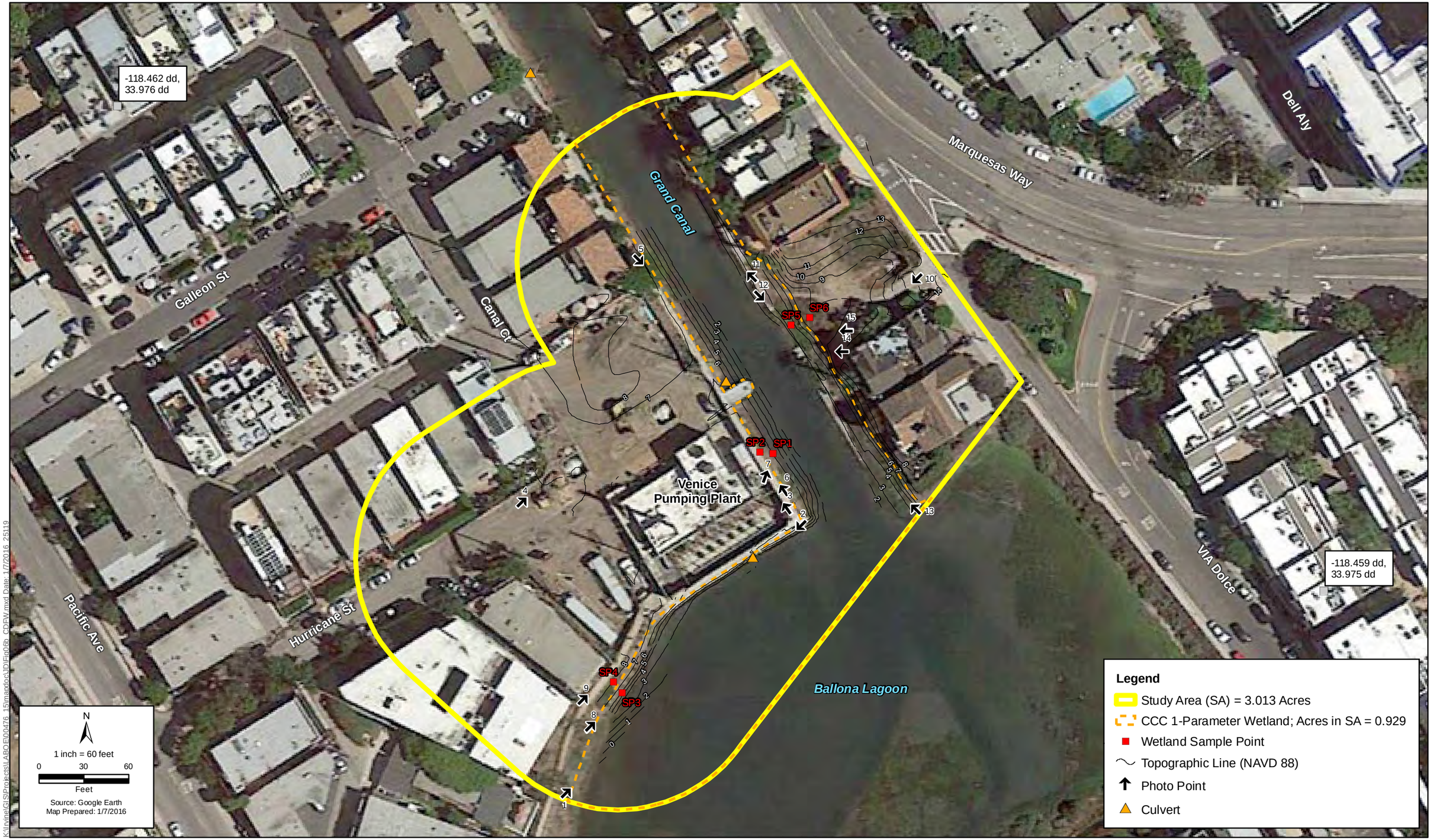

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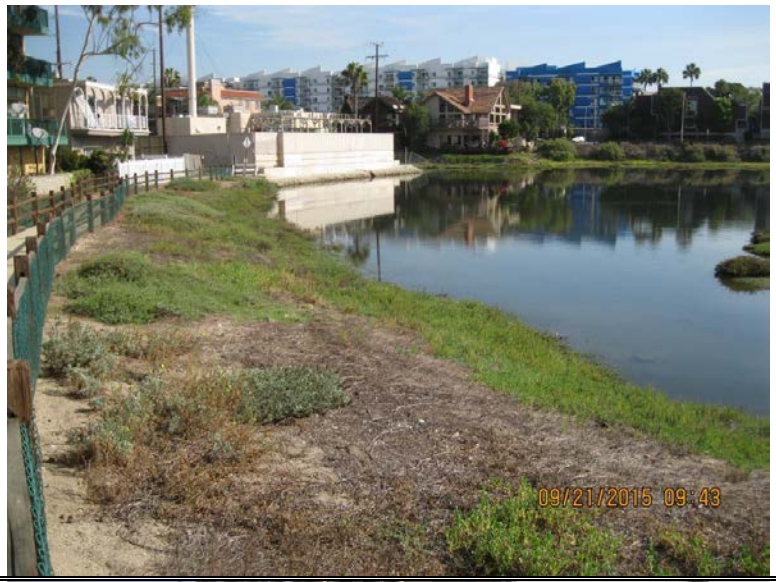
Figure 6b
CCC Jurisdictional Delineation Results Map
Venice Auxiliary Pumping Plant Project

Appendix B
Study Area Photographs



Photograph #	1
Photo Date	9/21/2015
Location	West side of study area, adjacent to trail.
Direction	Northeast
Comment	Photo depicts conditions along the banks of Ballona Lagoon.



Photograph #	2
Photo Date	9/21/2015
Location	West side of study area, south of existing pumping plant.
Direction	Southwest
Comment	Photo depicts conditions along the concrete bank south of the existing pumping plant.



Photograph #	3
Photo Date	9/21/2015
Location	West side of study area, along sidewalk on east side of existing pumping plant.
Direction	Northwest
Comment	Photo depicts conditions present along the west side of Grand Canal.



Photograph #	4
Photo Date	9/21/2015
Location	West side of study area, at Intersection of Canal Ct. and Hurricane St.
Direction	Northeast
Comment	Photo depicts conditions present where the proposed auxiliary pumping plant will be located.



Photograph #	5
Photo Date	9/21/2015
Location	West side of study area, along sidewalk adjacent to residential housing and location of proposed auxiliary pumping plant.
Direction	Southeast.
Comment	Photo depicts conditions present along the west side of Grand Canal.



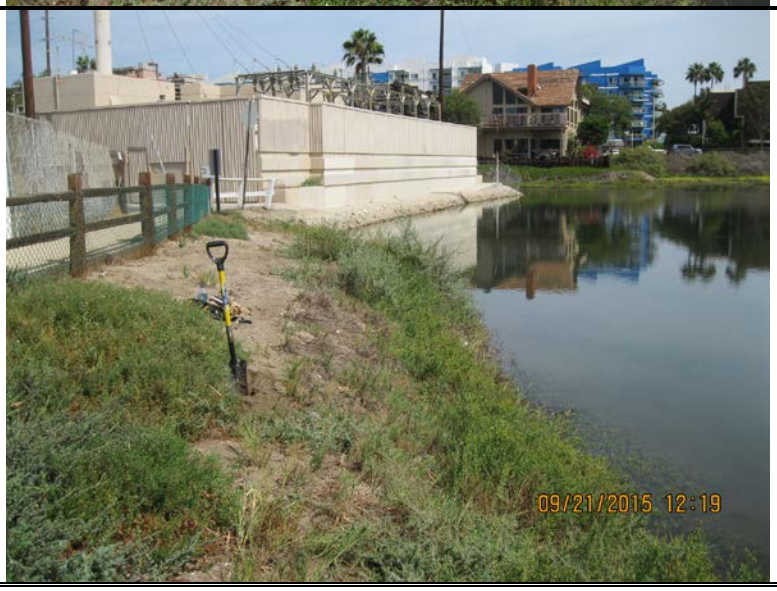
Photograph #	6
Photo Date	9/21/2015
Location	West side of study area, along sidewalk on east side of existing pumping plant.
Direction	Northwest
Comment	Photo depicts location of SP 1.



Photograph #	7
Photo Date	9/21/2015
Location	West side of study area, along sidewalk on east side of existing pumping plant.
Direction	Northwest
Comment	Photo depicts location of SP 2.



Photograph #	8
Photo Date	9/21/2015
Location	West side of study area, adjacent to side walk along Ballona Lagoon.
Direction	Northeast
Comment	Photo depicts location of SP 3.



Photograph #	9
Photo Date	9/21/2015
Location	West side of study area, adjacent to side walk along Ballona Lagoon.
Direction	Northeast
Comment	Photo depicts location of SP 4.



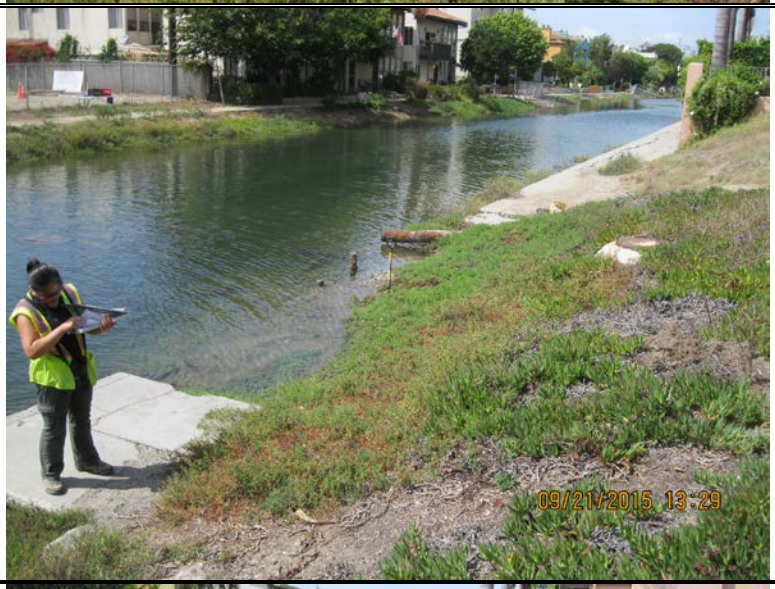
Photograph #	10
Photo Date	9/21/2015
Location	East side of the study area, in empty lot.
Direction	Southeast
Comment	Photo depicts conditions present within the empty lot on east side of the study area.



Photograph #	11
Photo Date	9/21/2015
Location	Sidewalk on east side of Grand Canal.
Direction	Northwest
Comment	Photo depicts conditions present along the sidewalk on the east side of Grand Canal.



Photograph #	12
Photo Date	9/21/2015
Location	Sidewalk on east side of Grand Canal.
Direction	Southeast
Comment	Photo depicts conditions present along the sidewalk on the east side of Grand Canal.

	**Photograph #** 13 **Photo Date** 9/21/2015 **Location** East side of the study area, confluence of Grand Canal and Ballona Lagoon. **Direction** Northwest **Comment** Photo depicts conditions present along the sidewalk on the east side of Grand Canal.
	**Photograph #** 14 **Photo Date** 9/21/2015 **Location** East side of study area, in empty lot. **Direction** Northwest **Comment** Photo depicts location of SP 5.
	**Photograph #** 15 **Photo Date** 9/21/2015 **Location** East side of study area, in empty lot. **Direction** Northwest **Comment** Photo depicts location of SP 6.

Appendix C
Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Venice - APP City/County: Venice Beach Los Angeles Sampling Date: 9-21-15

Applicant/Owner: LABOE State: CA Sampling Point: 1

Investigator(s): Paul Schwartz / Lily Sam Section, Township, Range: No Section, T1SW R2S venice CA

Landform (hillslope, terrace, etc.): slope Local relief (concave, convex, none): Concave Slope (%): ~5

Subregion (LRR): C - Med Lat: 33.975980° Long: -118.460989 Datum: WGS 84

Soil Map Unit Name: No available soil data NWI classification: Estuarine / Marine Wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? No Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5')			
1. Distichlis Spicata	20	Y	FAC
2. Sarcocornia pacifica	15	Y	OBL
3. Frankenia salina	10	Y	FACW
4.			
5.			
6.			
7.			
8.			
	45 = Total Cover		
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	N/A = Total Cover		

% Bare Ground in Herb Stratum 55 % Cover of Biotic Crust Ø

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14"	2.5Y 2.5/1	80	7.5YR 4/4	20	C	M	Sandy clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): 0

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 5"

Water Table Present? Yes ✓ No ___ Depth (inches): 5"

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Mud snails present along and below OHWM

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Venice - APP City/County: Venice Beach, Los Angeles Sampling Date: 9-21-15

Applicant/Owner: LABOE State: CA Sampling Point: 2

Investigator(s): Paul Schwartz Lily Sam Section, Township, Range: No Section T1SW R2S Venice CA

Landform (hillslope, terrace, etc.): top of slope Local relief (concave, convex, none): convex Slope (%): ~3

Subregion (LRR): C-Med Lat: 33.975972° Long: -118.460962 Datum: WGS 84

Soil Map Unit Name: No available soil data NWI classification: Estuarine/marine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____ No X	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5')			
1. Distichlis spicata	15%	Y	FAC
2. Conyza bonariensis	3%	N	FACU
3. Stellaria media	1%	N	FACU
4. Chamaesyce albomarginata	1%	N	UPL
5.			
6.			
7.			
8.			
	20 = Total Cover		
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	N/A = Total Cover		

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust Ø

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species 15	x 3 = 45
FACU species 4	x 4 = 16
UPL species 1	x 5 = 5
Column Totals: 20 (A)	66 (B)

Prevalence Index = B/A = 3.3

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1] No

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10yr 3/2	100	—	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): Ø

Hydric Soil Present? Yes ____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Pit dug ~5ft from edge of water no hydrology indicators met. Paired pits were dug

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Venice - APP City/County: Venice Beach Los Angeles Sampling Date: 9/21/15

Applicant/Owner: LABOE State: CA Sampling Point: 3

Investigator(s): Paul Schwartz Lily Sam Section, Township, Range: No Section T1SW R2S Venice CA

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Concave Slope (%): ~3

Subregion (LRR): C-Med Lat: 33.975534 Long: -118.461261 Datum: WGS 84

Soil Map Unit Name: NO available soil data NWI classification: Estuarine/Marine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? NO Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5')			
1. Sarcocornia pacifica	45	Y	OBL
2. Distichlis spicata	25	Y	FAC
3. Suaeda taxifolia	10	N	FACW
4. Jaumea carnosa	10	N	OBL
5.			
6.			
7.			
8.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes Y No _____

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	2.5Y 2.5/1	90	7.5yr 4/4	10	C	M	Sandy Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): 6

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 4

Water Table Present? Yes X No ___ Depth (inches): 4

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): —

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Venice - APP City/County: Venice Beach, Los Angeles Sampling Date: 9/21/15

Applicant/Owner: LABOE State: CA Sampling Point: 4

Investigator(s): Paul Schwartz Lily Sam Section, Township, Range: No Section T1SW R2S Venice CA

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): concave Slope (%): ~1

Subregion (LRR): C-med Lat: 33.975544 Long: -118.461271 Datum: WGS 84

Soil Map Unit Name: NO available soil data NWI classification: Estuarine/Marine Wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____ No X	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5')			
1. Distichlis spicata	40	Y	FAC
2. Suaeda taxifolia	10	N	FACW
3. Frankenia salina	35	Y	FACW
4. Heliotropium curassavicum	3	N	FAC
5. Jaumea carnosa	2	N	OBL
6.			
7.			
8.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	N/A = Total Cover		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	10yr 3/2	100					Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Rock/rubble fill material

Depth (inches): 12 in

Hydric Soil Present? Yes ____ No X

Remarks: seems like Fill material

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

pit dug on upper terrace, paired pit, non-wetland hydrology

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Venice - APP City/County: Venice Beach, Los Angeles Sampling Date: 9/21/15

Applicant/Owner: LABOE State: CA Sampling Point: 5

Investigator(s): Paul Schwartz Lily Sam Section, Township, Range: No Section T1SW R2S Venice, CA

Landform (hillslope, terrace, etc.): slope Local relief (concave, convex, none): _____ Slope (%): ~1-2

Subregion (LRR): C-med Lat: 33.976216° Long: -118.460906° Datum: WGS 84

Soil Map Unit Name: No available soil data NWI classification: Estuarine/Marine Wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil V, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks: Sample point taken near old broken sidewalk that runs parallel to the bank.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 0')			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5')			
1. Frankenia salina	48%	Y	FACW
2. Distichlis spicata	1%	N	FAC
3. Jaumea carnosa	1%	N	OBL
4.			
5.			
6.			
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	N/A = Total Cover		

% Bare Ground in Herb Stratum ~10 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: ~40 Open water

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	2.5y 3/1	75	7.5yr 4/4	25	C	M	Sandy Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): 0

Hydric Soil Present? Yes X No ___

Remarks: Several test pits conducted but restrictive concrete layer present (sidewalk)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 4

Water Table Present? Yes X No ___ Depth (inches): 4

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): —

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Venice - APP City/County: Venice Beach Los Angeles Sampling Date: 9/21/15

Applicant/Owner: LABOE State: CA Sampling Point: 6

Investigator(s): Paul Schwartz Lily Sams Section, Township, Range: No Section T1SW R2S Venice CA

Landform (hillslope, terrace, etc.): top of slope Local relief (concave, convex, none): concave Slope (%): ~1

Subregion (LRR): C-med Lat: 33.976216° Long: -118.460906° Datum: WGS84

Soil Map Unit Name: No available soil data NWI classification: Estuarine/Marine Wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? No Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? No (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5')			
1. Carpobrotus chilensis	65%	Y	FACU
2. Chrysanthemum coronarium	10%	N	UPL
3. Fraxinus salina	5%	N	FACW
4.			
5.			
6.			
7.			
8.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: N/A)			
1.			
2.			
	N/A = Total Cover		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	_____	x 1 =	_____
FACW species	5	x 2 =	10
FAC species	_____	x 3 =	_____
FACU species	85	x 4 =	340
UPL species	10	x 5 =	50
Column Totals:	100 (A)		400 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50% No

___ Prevalence Index is ≤3.0[1] No

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10yr 3/2	100	—	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): 0

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes _____ No X Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix D
Preliminary Jurisdictional Determination Form

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

District Office: Los Angeles District | File/ORM #: | PJD Date:

State: CA | City/County: Los Angeles/Los Angeles County

Nearest Waterbody: Grand Canal/Ballona Lagoon/Pacific Ocean

Location: TRS, LatLong or UTM: (WGS 84) Lat. 33.975544, Long. 118.461271

Name/ Address of Person Requesting PJD: City of Los Angeles, Department of Public Works

Identify (Estimate) Amount of Waters in the Review Area:

Non-Wetland Waters: linear ft | width 0.929 acres | Stream Flow: N/A

Wetlands: 0.075 acre(s) | Cowardin Class: Estuarine

Name of Any Water Bodies on the Site Identified as Section 10 Waters: Tidal: See attached Aquatic Resources Table | Non-Tidal:

☐ Office (Desk) Determination
☑ Field Determination: | Date of Field Trip:

SUPPORTING DATA: Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

- ☑ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: See JD report
- ☑ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☐ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report.
- ☐ Data sheets prepared by the Corps
- ☐ Corps navigable waters' study:
- ☑ U.S. Geological Survey Hydrologic Atlas:
  - ☑ USGS NHD data.
  - ☑ USGS 8 and 12 digit HUC maps.
- ☑ U.S. Geological Survey map(s). Cite quad name: Venice, California
- ☐ USDA Natural Resources Conservation Service Soil Survey. Citation: No NRCS/USDA soil data available
- ☑ National wetlands inventory map(s). Cite name: See Figure 5 from JD report.
- ☐ State/Local wetland inventory map(s):
- ☐ FEMA/FIRM maps:
- ☐ 100-year Floodplain Elevation is:
- ☑ Photographs: ☑ Aerial (Name & Date): Google Earth, Various dates.
  ☑ Other (Name & Date): Site Photographs from 9/21/2015
- ☐ Previous determination(s). File no. and date of response letter:
- ☐ Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and Date of Regulatory Project Manager (REQUIRED)

Signature and Date of Person Requesting Preliminary JD (REQUIRED, unless obtaining the signature is impracticable)

EXPLANATION OF PRELIMINARY AND APPROVED JURISDICTIONAL DETERMINATIONS:

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "preconstruction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

Appendix A - Sites

District Office: Los Angeles District | File/ORM #: | PJD Date:

State: CA | City/County: Los Angeles/Los Angeles County | Person Requestinq PJD:

Site Number	Latitude	Longitude	Cowardin Class	Est. Amount of Aquatic Resource in Review Area	Class of Aquatic Resource
1	33.975544	-118.461271	Estuarine	0.929	Non-Section 10 non-wetlanc
1	33.975544	-118.461271	Estuarine	0.075	Non-Section 10 wetland
1	33.975544	-118.461271	Estuarine	0.793	Section 10 tidal

Notes:

See attached jurisdictional delineation report for additional information.

Appendix E

Cultural Resources Screening Memorandum

MEMORANDUM

To: Gilberto Ruiz, ICF

From: Mark Robinson, ICF

Date: January 21, 2016

Re: Screening Memo-Venice Auxiliary Pumping Plant—Archaeology and Paleontology

---

For the Venice Auxiliary Pumping Plant Project (VAPP), archaeological and paleontological resources and human remains were evaluated with the following two considerations in mind: 1) known archaeological and paleontological resources that exist in the Project footprint; and 2) the potential to encompass as yet undiscovered archaeological and paleontological resources, as well as human remains within the project footprint and area of potential effect (APE).

Known Resources: To determine if archaeological resources—including prehistoric human remains--are known to be present in the Project area, ICF conducted a records search at the South Central Coastal Information Center (SCCIC) located at California State University Fullerton. SCCIC is a branch of the California Historical Resources Information Center, which maintains the State of California's official records of previously recorded cultural resource studies and recorded archaeological sites for Los Angeles County. The SCCIC records search included the project study areas of potential effect (APE) and a 0.5-mile buffer surrounding the APE.

The record search indicated that the VAPP site had been surveyed twice in the past, and that no prehistoric or historic archaeological resources or isolated artifacts were recorded in the current project's footprint or within the 0.5 mile surrounding record search area. (Two historic period cultural resources are within the 0.5-mile record search area--the Venice Canal Historic District Lan-19-167310 (HRI-021273), and the Warren Wilson Beach House, LAn-19-174098.)

An ICF International archaeologist also conducted a comprehensive archaeological pedestrian survey of the VAPP on August 20, 2015. This area was surveyed in order to inspect for and identify any previously undiscovered cultural resources. The pedestrian survey consisted of walking transects in an east/west orientation, spaced 3 meters apart. Ground surface visibility was fair with the surface somewhat obscured by vegetation resulting in approximately 80% surface visibility. No cultural resources were identified during the field survey. Based on the record search and survey, no archaeological resources are known to be present in the project footprint. No human remains are known to be present in the VAPP or surrounding area.

To determine if paleontological resources are known to be present in the Project footprint, ICF contacted the Natural History Museum of Los Angeles County (NHMLAC) and requested a search of

their vertebrate fossil resources records. NHMLAC responded on October 6, 2015, that they had no recorded fossil localities in the VAPP footprint or the surrounding area. Based on this locality records search, no paleontological resources are known to be present in the project footprint.

Potential for Undiscovered Resources: The Project area is on the western margin of the boundaries of Ballona Lagoon, a broad swampy marsh that existed in the area until 20th Century development. The geologic formation underlying the proposed project area is tentatively identified as clay and sand of existing marshlands. These sediments are Holocene in age, and are less than 10,000 years in age. Sediment in the Project area may also derived from beach dune sands deposited along the lee of the Pacific Ocean, which are also Holocene in age. Both of these sediments are too young to contain fossil resources.

This area was originally marshland and beach dunes adjacent to the outlet of Ballona Creek at the Pacific Ocean. This setting is unlikely to have preserved prehistoric archaeological resources, due to constant erosion and deposition, prior to modern development. These marshland and beach dune sediments have been substantially altered by 20th Century development. This development altered landforms in the VAPP and surroundings to enhance an existing drainage into the Venice Grand Canal, and to create level, above water level lots on both sides of the Canal, which includes the VAPP footprint. Canal dredge spoils appear to have been used as fill for this purpose, as well as imported fill materials.

Any grading and excavation for the project would occur within this mixture of sediment and fill, and would not encounter unique paleontological resources or geologic features. There is some potential to encounter significant archaeological resources in undisturbed sediments. These marshland and beach sediments are unlikely to be the setting for the discovery of prehistoric human remains.

Summary: Impacts to paleontological resources and human remains have been analyzed sufficiently in the Project Initial Study and will not be further evaluated in the Project EIR. CEQA mandated consultation with Native American groups will continue, as required by the new AB 52 legislation. This consultation will determine if any Tribal Cultural Resources (TCR) are present in the VAPP. This AB 52 consultation will be summarized in the EIR in the Cultural Resources chapter.

Appendix F

AB 52 Consultation

NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
(916) 373-3710
(916) 373-5471 FAX

November 3, 2015

Mark Robinson
ICF International
630 K Street, Suite 400
Sacramento, CA 95814

Sent by Email: mark.robinson@icfi.com
Number of Pages: 3

RE: Venice Auxilary Pumping Plant Project, Venice USGS Quadrangle, Los Angeles County

Dear Mr. Robinson:

Attached is a consultation list of tribes with traditional lands or cultural places located within the boundaries of the above referenced counties. Please note that the intent above reference codes is to mitigate impacts to tribal cultural resources, as defined, for California Environmental Quality Act (CEQA) projects.

As of July 1, 2015, Public Resources Code Sections 21080.1, 21080.3.1 and 21080.3.2 require public agencies to consult with California Native American tribes identified by the Native American Heritage Commission (NAHC) for the purpose mitigating impacts to tribal cultural resources:

> Within 14 days of determining that an application for a project is complete or a decision by a public agency to undertake a project, the lead agency shall provide formal notification to the designated contact of, or a tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, which shall be accomplished by means of at least one written notification that includes a brief description of the proposed project and its location, the lead agency contact information, and a notification that the California Native American tribe has 30 days to request consultation pursuant to this section. (Public Resources Code Section 21080.1(d))

The law does not preclude agencies from initiating consultation with the tribes that are culturally and traditionally affiliated with their jurisdictions. The NAHC believes that in fact that this is the best practice to ensure that tribes are consulted commensurate with the intent of the law.

In accordance with Public Resources Code Section 21080.1(d), formal notification must include a brief description of the proposed project and its location, the lead agency contact information, and a notification that the California Native American tribe has 30 days to request consultation. The NAHC believes that agencies should also include with their notification letters information regarding any cultural resources assessment that has been completed on the APE, such as:

1. The results of any record search that may have been conducted at an Information Center of the California Historical Resources Information System (CHRIS), including, but not limited to:

   - A listing of any and all known cultural resources have already been recorded on or adjacent to the APE;
   - Copies of any and all cultural resource records and study reports that may have been provided by the Information Center as part of the records search response;
   - If the probability is low, moderate, or high that cultural resources are located in the APE.
   - Whether the records search indicates a low, moderate or high probability that unrecorded cultural resources are located in the potential APE; and

- If a survey is recommended by the Information Center to determine whether previously unrecorded cultural resources are present.

2. The results of any archaeological inventory survey that was conducted, including:

   - Any report that may contain site forms, site significance, and suggested mitigation measurers.

     All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for pubic disclosure in accordance with Government Code Section 6254.10.

3. The results of any Sacred Lands File (SFL) check conducted through Native American Heritage Commission. There are a number of recorded archaeological sites in the area, including CA-LAN-63, 64, 65, 203, 204, and 206A. Please contact Mr. John Tommy Rosas of the Tongva Ancestral Territorial Tribal Nation for more information about this area. His email is tattnlaw@gmail.com and his telephone number is (310) 570-6567.

4. Any ethnographic studies conducted for any area including all or part of the potential APE; and

5. Any geotechnical reports regarding all or part of the potential APE.

Lead agencies should be aware that records maintained by the NAHC and CHRIS is not exhaustive, and a negative response to these searches does not preclude the existence of a cultural place. A tribe may be the only source of information regarding the existence of a tribal cultural resource.

This information will aid tribes in determining whether to request formal consultation. In the case that they do, having the information beforehand well help to facilitate the consultation process.

If you receive notification of change of addresses and phone numbers from tribes, please notify me. With your assistance we are able to assure that our consultation list contains current information.

If you have any questions, please contact me at my email address: rob.wood@nahc.ca.gov.

Sincerely,

Rob Wood
Associate Environmental Planner

Native American Heritage Commission
Tribal Consultation List
Los Angeles County
November 3, 2015

Soboba Band of Mission Indians
Rosemary Morillo, Chairperson; Attn: Carrie Garcia
P.O. Box 487
San Jacinto , CA 92581
carrieg@soboba-nsn.gov
(951) 654-2765
Luiseno
Cahuilla

Gabrieleno Band of Mission Indians - Kizh Nation
Andrew Salas, Chairperson
P.O. Box 393
Covina , CA 91723
gabrielenoindians@yahoo.com
(626) 926-4131
Gabrielino

Gabrieleno/Tongva San Gabriel Band of Mission Indians
Anthony Morales, Chairperson
P.O. Box 693
San Gabriel , CA 91778
GTTribalcouncil@aol.com
(626) 483-3564 Cell
Gabrielino Tongva

Gabrielino /Tongva Nation
Sandonne Goad, Chairperson
106 1/2 Judge John Aiso St., #231
Los Angeles , CA 90012
sgoad@gabrielino-tongva.com
(951) 807-0479
Gabrielino Tongva

Gabrielino Tongva Indians of California Tribal Council
Robert F. Dorame, Tribal Chair/Cultural Resources
P.O. Box 490
Bellflower , CA 90707
gtongva@verizon.net
(562) 761-6417 Voice/Fax
Gabrielino Tongva

Gabrielino-Tongva Tribe
Linda Candelaria, Co-Chairperson
1999 Avenue of the Stars, Suite 1100
Los Angeles , CA 90067
(626) 676-1184 Cell
Gabrielino

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.
This list applicable only for consultation with Native American tribes under Public Resources Code Sections 21080.3.1 for the proposed

Venice Auxilary Pumping Plan Project, Venice USGS Quadrangle, Los Angeles County.

Native American Heritage Commission Tribal Consultation List
for the City of Los Angeles as of August 11, 2015

Gabrielino Tongva Indians of California Tribal Council
Robert F. Dorame, Tribal Chair, Cultural Resources
P.O. Box 490
Bellflower, CA 90707

Tongva Ancestral Territorial Tribal Nation
John Tommy Rosas, Tribal Administrator
Tattnlaw@gmail.com
(Mr. Rosas does not have a mailing address and prefers PDFs of contact letters via e-mail.)

Fernandeño Tataviam Band of Mission Indians
Rudy Ortega Jr., President
1019 2nd Street
San Fernando, CA 91340

Gabrieleño Band of Mission Indians – Kizh Nation
Andrew Salas, Chairperson
P.O. Box 393
Covina, CA 91723

Gabrielino/Tongva Nation
Sam Dunlap, Cultural Resources Director
P.O. Box 86908
Los Angeles, CA 90086

Gabrielino/Tongva San Gabriel Band of Mission Indians
Anthony Morales, Chairperson
P.O. Box 693
San Gabriel, CA 91778

Gabrielino-Tongva Tribe
Linda Candelaria, Co-Chairperson
1999 Avenue of the Stars, Suite 1100
Los Angeles, CA 90067

San Fernando Band of Mission Indians
John Valenzuela, Chairperson
P.O. Box 221838
Newhall, CA 91322

Soboba Band of Luiseño Indians
Joseph Ontiveros, Cultural Resource Director

P.O. Box 487
San Jacinto, CA 92581

Ruiz, Gilberto

From: Jan Green Rebstock <jan.green.rebstock@lacity.org>
Sent: Tuesday, December 01, 2015 10:54 AM
To: Robinson, Mark; Mir, Tamseel; Ruiz, Gilberto
Subject: Fwd: AB 52 Tribal Consultation: Venice Auxiliary Pumping Plant and Contact Corrections
Attachments: Tataviam Tribal Territory Map 2015.pdf

Dr. Jan Green Rebstock
Environmental Management Group, Environmental Supervisor II
Bureau of Engineering, Department of Public Works
213.485.5761
jan.green.rebstock@lacity.org
1149 S. Broadway, Ste. 600
Los Angeles, CA 90015

---------- Forwarded message ----------
From: **Caitlin Gulley** <cgulley@tataviam-nsn.us>
Date: Tue, Dec 1, 2015 at 9:50 AM
Subject: AB 52 Tribal Consultation: Venice Auxiliary Pumping Plant and Contact Corrections
To: jan.green.rebstock@lacity.org

Ms. Rebstock,

Thank you for the opportunity to comment on the above referenced project. As the project is outside of both boundaries on the traditional Tataviam territory map provided to the City of Los Angeles (attached), we do not wish to consult on VAPP.

Also, please note that the contact information provided to the City of Los Angeles on July 1st, 2015 lists the following as the AB 52 contact for Tataviam:

Caitlin B. Gulley
Tribal Historic and Cultural Preservation Officer
Fernandeño Tataviam Band of Mission Indians
1019 Second Street
San Fernando CA, 91340
Phone (818) 837-0794
Fax (818) 837-0796
cgulley@tataviam-nsn.us
If you would please forward this email or the discussion points of our map and contact information to the appropriate department for database correction, it would be greatly appreciated.

Thank you,

--
***Caitlin Gulley**, Director*
Tribal Historic and Cultural Preservation Department
Cell: (661) 433-0599
Office: (818) 837-0794
cgulley@tataviam-nsn.us

Fernandeño Tataviam Band of Mission Indians
1019 Second Street
San Fernando, California 91340
Phone: (818) 837-0794 Ext. 208
Website: http://www.tataviam-nsn.us

This e-mail message is confidential, intended only for the named recipient(s) above and may contain information that is privileged, attorney work product or exempt from disclosure under applicable law. If you have received this message in error, or are not the named recipient(s), please immediately notify the sender by reply-email and delete this e-mail from your computer. Also, neither this message nor any attachments to it constitute an offer of any kind, and to the extent this communication, or any other communication in connection herewith, is in the context of negotiations regarding a possible agreement or transaction, in no event shall Fernandeno Tataviam Band of Mission Indians be bound to anything without a final, signed contract (it being understood that in all cases Fernandeno Tataviam Band of Mission Indians shall have the absolute right to terminate any discussions or negotiations at any time and for any reason without any liability whatsoever). Thank you.

Ruiz, Gilberto

From: Ruiz, Gilberto
Sent: Tuesday, November 24, 2015 8:29 PM
To: Mir, Tamseel; Robinson, Mark
Subject: FW: AB 52 TRIBAL CONSULTATION NOTICE - Venice Auxiliary Pumping Plant

From: Johntommy Rosas [mailto:tattnlaw@gmail.com]
Sent: Tuesday, November 24, 2015 8:04 PM
To: Ruiz, Gilberto <Gilberto.Ruiz@icfi.com>
Cc: Jan Green Rebstock <jan.green.rebstock@lacity.org>
Subject: Re: AB 52 TRIBAL CONSULTATION NOTICE - Venice Auxiliary Pumping Plant

Thanks I confirm receipt of your document -
I will respond alter after I review all the documents and applicable laws -
thanks jt

On Tue, Nov 24, 2015 at 7:58 PM, Ruiz, Gilberto <Gilberto.Ruiz@icfi.com> wrote:

> Dear Mr. Rosas:
>
> On behalf of the City of Los Angeles, Bureau of Engineering, please find attached the AB 52 Tribal Consultation Notice related to the proposed Venice Auxiliary Pumping Plant.
>
> Should you have any questions, please feel free to contact Dr. Jan Green Rebstock (copied here) with the Bureau of Engineering and whose contact information is also noted in the attached. Thank you.
>
> **GILBERTO RUIZ** | Senior Project Manager
>
> |213.312.1800 (p) |213.312.1767 (direct) | gilberto.ruiz@icfi.com | icfi.com
>
> **ICF INTERNATIONAL** | 601 West Fifth Street Suite 900, Los Angeles, CA 90071 | 213.312.1799 (f)

--

JOHN TOMMY ROSAS
TRIBAL ADMINISTRATOR
TRIBAL LITIGATOR
TONGVA ANCESTRAL TERRITORIAL TRIBAL NATION
A TRIBAL SOVEREIGN NATION UNDER UNDRIP
AND AS A CALIFORNIA NATIVE AMERICAN TRIBE / SB18-AJ52-AJR 42
25 U.S. Code § 1679 - Public Law 85-671
August 18, 1958 | [H. R. 2824] 72 Stat. 619
Tribal sovereignty in the United States is the inherent authority of indigenous tribes to govern themselves within and outside the borders and waters of the United States of America .
OFFICIAL TATTN CONFIDENTIAL E-MAIL
ALL RIGHTS RESERVED
TATTN / TRIBAL NOTICE OF CONFIDENTIALITY:

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tongvanation.org

SOBOBA BAND OF LUISEÑO INDIANS
EST. JUNE 19, 1883

December 21, 2015

Attn: Dr. Jan Green Rebstock, Environmental Supervisor II
Los Angeles Department of Public Works
Bureau of Engineering, Environmental Management Group
1149 South Broadway, Suite 600, Mail Stop 939
Los Angeles, CA 90015

RE: AB 52 Consultation; Proposed Venice Auxiliary Pumping Plant (VAPP) Project

The Soboba Band of Luiseño Indians has received your notification pursuant under Assembly Bill 52.

The Soboba Band of Luiseño Indians appreciates your observance of Tribal Cultural Resources and their preservation in your project. The information provided to us on said project(s) has been assessed through our Cultural Resource Department. At this time the Soboba Band does not have any specific concerns regarding known cultural resources in the specified areas that the project encompasses, but does request that the appropriate consultation continue to take place between concerned tribes, project proponents, and local agencies.

Also, working in and around traditional use areas intensifies the possibility of encountering cultural resources during any future construction/excavation phases that may take place. For this reason the Soboba Band of Luiseño Indians requests that approved Native American Monitor(s) be present during any future ground disturbing proceedings, including surveys and archaeological testing, associated with this project. The Soboba Band wishes to defer to Gabrieleño Tribal Consultants who are in closer proximity to the project. Please feel free to contact me with any additional questions or concerns.

Sincerely,

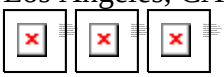
Joseph Ontiveros
Cultural Resource Director
Soboba Band of Luiseño Indians
P.O. Box 487
San Jacinto, CA 92581
Phone (951) 654-5544 ext. 4137
Cell (951) 663-5279
jontiveros@soboba-nsn.gov

Confidentiality: The entirety of the contents of this letter shall remain confidential between Soboba and the City of Los Angeles. No part of the contents of this letter may be shared, copied, or utilized in any way with any other individual, entity, municipality, or tribe, whatsoever, without the expressed written permission of the Soboba Band of Luiseño Indians.

Ruiz, Gilberto

From: Jan Green Rebstock <jan.green.rebstock@lacity.org>
Sent: Monday, November 30, 2015 10:38 AM
To: Robinson, Mark; Ruiz, Gilberto; Mir, Tamseel
Cc: Maria Martin
Subject: Fwd: Proposed Venice Auxiliary pumping plant (VAPP) project

Dr. Jan Green Rebstock
Environmental Management Group, Environmental Supervisor II
Bureau of Engineering, Department of Public Works
213.485.5761
jan.green.rebstock@lacity.org
1149 S. Broadway, Ste. 600
Los Angeles, CA 90015



---------- Forwarded message ----------
From: **Andy** <gabrielenoindians@yahoo.com>
Date: Mon, Nov 30, 2015 at 10:31 AM
Subject: Re: Proposed Venice Auxiliary pumping plant (VAPP) project
To: "jan.green.rebstock@lacity.org" <jan.green.rebstock@lacity.org>
Cc: "Christina Swindall Martinez. Kizh Gabrieleno" <christinaswindall@yahoo.com>, "Matt Teutimez.Kizh Gabrieleno" <Matt.Teutimez@gmail.com>, Richard Gradias <RGRADIAS@yahoo.com>, "Nadine Salas. Kizh Gabrieleno" <nadinesalas@hotmail.com>, "Martha Gonzalez. Kizh Gabrieleno" <marthagonzalez777@yahoo.com>, "Albert Perez.Kizh Gabrieleno" <cedarez@aol.com>, "Katy@NAHC Sanchez" <katy.sanchez@nahc.ca.gov>, Terri Robinson <terrie.robinson@nahc.ca.gov>, Gary Stickel <dregarystickel@att.net>

I forgot to include the Map of villages that are with in the project location. Thank you



Sent from my iPhone

On Nov 30, 2015, at 9:59 AM, Andy <gabrielenoindians@yahoo.com> wrote:

> Dr. Jan Green Rebstock
> Environmental Supervisor II
> Los Angeles Department of public works
> Bureau of Engineering, Environmental Management group
> 1149 S. Broadway Ste 600 Mailstop 939
> Los Angeles, CA 90015
>
> Dear Dr. Jan Green Rebstock
> As a direct Lineal Descendant of the Gabrieleño Kizh, I would like to acknowledge you & your agency that the above project location is within a highly sensitive area & in the village location of Suaangna . Previous developments in the area such as Playa Vista resulted in discoveries of human remains there fore During Ground Disturbance of this project location there is a high potential that there maybe human remains found . Therefore Our tribe would like to request one of our certified Native American Monitor to be on site during any and all ground disturbances to protect any cultural resources which may be effected during construction or development . We are there to work along side the developer and not against them .
>
> Avoid significant impacts…"
>
> In all cases, when the Native American Heritage Commission states there are "No Records of Sacred Sites" in the project area; the NAHC will always refer lead agencies to the respective Native American Tribe because the NAHC is only aware of general information and are not the "experts" on each California Tribe. Our Elder Committee & Tribal Historians are the experts for our Tribe and are able to provide a more complete history (both written and/or oral) regarding the location of historic villages, trade routes, cemeteries and sacred/religious sites in the project area. While the property may be located in an area that has been previously developed, numerous examples can be shared to show that there still is a possibility that unknown, yet significant, cultural resources will be encountered during ground disturbance activities. The recent implementation of AB52 dictates that lead agencies consult with Native American Tribes who can prove and document traditional and cultural affiliation with the area of said project in order to protect cultural resources. Our priorities are to avoid and protect without delay or conflicts –

to consult with you to avoid unnecessary destruction of cultural and biological resources, but also to protect what resources still exist at the project site for the benefit and education of future generations.

: Field Methods

At least One Native American Monitor will be present during ground disturbing activities (including but not limited to pavement removal , pot- holing or auguring ,boring , grading , excavation and trenching) within the project area. The Native American Monitor will complete monitoring Longs on a daily basis . The logs will provide descriptions of the daily activities, including construction activities, locations , Soil and any cultural materials identified . The monitor will photo-document the ground disturbing activities.

The following person is designated as our Tribe's lead contact person for the purposes of receiving notices of proposed projects from your agency: please keep us updated regarding this project.

With Respect

Direct Lineal Gabrieleño Descendant

Andrew Salas, Chairman

Gabrieleño Band of Mission Indians – Kizh Nation

PO Box 393

Covina, CA 91723

cell: (626)926-4131

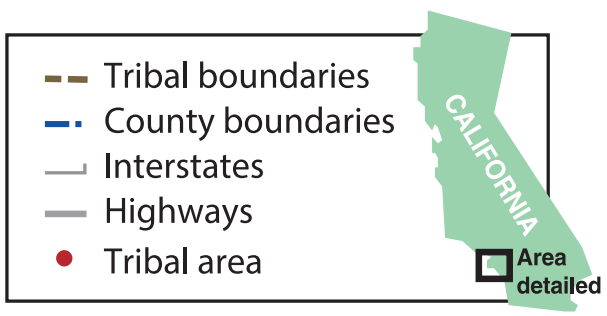
email: gabrielenoindians@yahoo.com

Sent from my iPhone



Fernandeño Tataviam Band of Mission Indians
Historical Tribal Territory





Tribal boundary depicted is based on registered tribal citizens' ancestral villages. Due to kinship networks and social exchange, this hard boundary does not include all of the abundant locations associated with Tataviam cultural resources and ancestry. Therefore, the overlap yellow boundary accommodates the natural mobility of ancestral and contemporary Tataviam people, which are also known to be well associated with the tribe and sensitive cultural resources.

All projects breaking soil within the tribal boundary are subject to Tataviam jurisdiction, whereas any projects occurring within the yellow boundary may be subject to further analysis by other surrounding Tribal Governments.

Appendix G

Geotechnical Engineering Report – Venice Auxiliary Pumping Plant, December 14, 2015

CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

GEOTECHNICAL ENGINEERING GROUP (GEO)

GEOTECHNICAL REPORT
VENICE AUXILIARY PUMPING PLANT
133 EAST HURRICANE STREET
VENICE AREA OF LOS ANGELES

W.O. SZC12923
GEO FILE NO.: 14-103
December 14, 2015

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APPENDIX A

Geotechnical Data Report, Venice Auxiliary Pump Plant, Los Angeles, CA prepared by Geotechnical Professionals Inc. dated September 29, 2015.

APPENDIX B

Logs of Borings and laboratory test results from exploratory borings G-1A and G-1B from Geotechnical Data Report, Venice Dual Force Main, Los Angeles, CA prepared by Amec dated March 26, 2009.

Log of Boring and laboratory test results from exploratory boring 8 from Report of Subsurface Investigation, Lab No 140-4360, prepared by Department of General Sevicecs Standards dated October 17, 1994 (GEO File No. 94-072).

Log of Test Boring 2 from Report of Subsurface Investigation, Lab No 140-3609, prepared by Department of General Sevicecs Standards dated April 4, 1990 (GEO File No. 89-305.)

APPENDIX C

Preliminary Subsruface Methane Gas Investigation at Venice Auxiliary Pump Station, 133 East Hurricane Street, Los Angeles, CA prepared by GeoKinetics dated August 20, 2015.

1.0 INTRODUCTION

This Geotechnical Report presents the results of a geotechnical investigation conducted for the Venice Auxiliary Pumping Plant to be located at 133 East Hurricane Street in the Venice area of Los Angeles. This report was prepared in response to a request received from the Wastewater Conveyance Engineering Division dated September 10, 2014. This investigation was performed to evaluate subsurface characteristics and to provide geotechnical recommendations for design and construction of the proposed project.

This report is based on visual observation, subsurface investigation and laboratory testing. At the request of the Geotechnical Engineering Group (GEO), Geotechnical Professionals Inc. (GPI) performed subsurface exploration at the site and laboratory testing of samples collected from the site. The results of their field work and laboratory tests are included in their Data Report, dated September 29, 2015, presented in Appendix A of this report.

In addition, Amec previously prepared a Geotechnical Data Report as part of a geotechnical investigation for the Venice Dual Force Main project. Their scope of work included two exploratory borings (G-1A and G-1B) in the southeast portion of the Venice Auxiliary Pumping Plant site. Logs of these exploratory borings and laboratory test results of samples retrieved from these borings are presented in Appendix B of this report.

Also, the Department of General Services Standards Division previously advanced two exploratory borings on the site in support of previous projects. Logs of these exploratory borings and laboratory test results of samples retrieved from these borings are presented in Appendix B of this report.

GEO has reviewed the above referenced reports and concurs with the findings and accepts responsibility for the use of the contents as described herein.

2.0 SITE DESCRIPTION

The Venice Auxiliary Pumping Plant site consists of an approximately 7,800 square foot piece of land bounded by private property to the northwest, the Grand Canal to the northeast, Hurricane Street to the southeast and Canal Street to the southwest. The site is across Hurricane Street from the existing Venice Pump Plant. At the time this report was prepared, the site was unoccupied. The site was recently used to facilitate construction of the Venice Manifold Replacement project. Site ground surface elevations are on the order of 5 to 6 feet above sea level. Figure 1, "Vicinity Map", illustrates the site location.

3.0 PROJECT SCOPE

In preparation of this report we have reviewed an October 2105 draft of the Preliminary Design Report for the project, prepared by Arcadis. Appendix B of the draft Preliminary Design Report includes several preliminary design drawings. Drawing C-03A illustrates a proposed layout of the planned construction. As shown on this drawing, the project is planned to consist of an auxiliary pumping plant (wetwell/valve vault), an electrical building, a diversion structure, a new 66-inch diameter sewer between the diversion structure and the new auxiliary pumping plant wetwell, and a new 42-inch discharge line to connect to the existing force main. Drawing C-03A has been reproduced herein as Figure 2, "Proposed Construction".

Preliminary Design Drawing C-03A indicates the auxiliary pumping plant (wetwell/valve vault) will be located in the east central portion of the site and that this structure is anticipated to have plan dimensions on the order of 55 feet by 32 feet. Preliminary Design Drawing S-2 indicates the wetwell will be founded on a mat foundation with a bearing elevation on the order of -26 feet (below sea level) and the valve vault at an elevation on the order of -9 feet (below sea level).

Preliminary Design Drawing C-03A indicates the new electrical building will be located in the west central portion of the site and will have plan dimensions on the order of 25 feet by 50 feet. Preliminary Design Drawing A-04 indicates this building will be an at-grade, two-story structure with an overall height on the order of 30 feet. The finish floor elevation of the ground level floor is expected to be on the order of 6 feet above sea level.

Preliminary Design Drawing C-03A indicates the diversion structure will encompass an existing 66-inch reinforced concrete sewer pipe that extends along the east side of the site. This structure is anticipated to have plan dimensions on the order of 21 feet by 21 feet and is expected to be founded on a mat foundation bearing at an elevation of approximately -20 feet (below sea level).

Approximately 23 feet of new 66-inch diameter reinforced concrete sewer pipe will be constructed between the new diversion structure and the auxiliary pumping plant wetwell. Preliminary Design Drawing S-3 indicates this sewer will have an invert elevation of -7.37 feet (below sea level).

A new 42-inch diameter pipe header is shown on Preliminary Design Drawing C-03A to extend from the new valve vault to the west end of the new manifold within Hurricane Street. Preliminary Design Drawing M-02 indicates this pipe header will have an invert elevation on the order of -4.75 feet (below sea level).

Construction will also include new equipment pads and possibly sidewalks, planters, landscaping, and other minor improvements. Final site grades are expected to be within one to two feet of the current site grades.

The analyses and recommendations of this report reflect the layout of major improvements provided in Figure 2, but are also intended to be flexible to allow minor changes in the scope. GEO shall review the final project scope and grading plans to confirm that the recommendations contain within this report are appropriate. If the final scope includes significant changes from those described herein, a supplemental report will be necessary.

4.0 EXPLORATION PROGRAM

4.1 Subsurface investigation 2015

Five Cone Penetrometer tests (CPT's) were performed for the project on July 31, 2015. The CPT's were advanced to approximate depths of 40 to 80 feet below ground surface (bgs). In addition, three rotary wash boring were drilled on August 6 and 7, 2015 to depths of 49 feet to 79-1/2 feet bgs. Approximate locations of the CPTs and exploratory borings are shown in Figure 3, "Exploration Locations Map" and in the data report presented in Appendix A.

Relatively undisturbed geotechnical samples were obtained from the rotary wash borings by driving a modified California-type split spoon sampler lined with 1-inch high brass rings. Standard Penetration Tests (SPT) were also performed in these borings. Starting began at a depth of 2.5 feet and was performed every 2.5 feet thereafter to the final depth of the borings. The samplers were driven with successive drops of a 140-pound automatic-trip hammer falling 30 inches.

Each collected sample was inspected and described in general conformance with the Unified Soil Classification System (USCS). All samples were sealed and packaged for transportation to GPI's laboratory. After completion of drilling and sampling, the borings were backfilled with cement slurry.

Although GEO has no record of contamination at the project site, the samples obtained from the borings were screened in the field for volatile organic compounds (VOCs) to determine if the site may have been contaminated in the past by petroleum distillates or other types of contamination. Soil samples were screened in the field with a photo-ionization detector. No organic vapors were detected. No odor, staining, or other evidence of contamination was observed in the borings.

The site is located within a Methane Study Zone and a Methane Study has been performed for the project. The requirements of the Methane Study report shall be incorporated into the design and construction of the project. A copy of the methane report is presented in Appendix C of this report.

4.2 Subsurface investigation 2008

In 2008, Amec drilled two exploratory borings (G-1A and G-1B) within the southeastern portion of the site as part of a subsurface investigation for the Venice Dual Force Main project. Ring, Standard Penetration Test (SPT) and shelby tube samples were collected from exploratory boring G-1A at depth intervals of 2-1/2 to 5 feet to the explored depth of approximately 71.5 feet below the ground surface. Ring and SPT samples were collected from exploratory boring G-1B at depth intervals of 2-1/2 to 5 feet to the explored depth of approximately 25.5 feet below the ground surface. Ring and SPT samplers were driven into the bottom of the borings with successive drops of a 140-pound Automatic trip hammer falling 30 inches. Approximate locations of these borings are shown on Figure 3.

Each collected sample was inspected and described in general conformance with the Unified Soil Classification System (USCS). All samples were sealed and packaged for transportation to Amec's laboratory. After completion of drilling and sampling, the borings were converted to monitoring wells.

Soil samples obtained from the borings during exploration were field-screened for the presence of organic vapors using a MiniRAE 2000, a portable photo-ionization detector (PID). Results of the PID screening are presented in the boring logs (Appendix B).

A portable combustible gas meter (CGM), RAE QRAE Plus 4, capable of measuring the Lower Explosive Limit (LEL) of potential gases, the percent of oxygen, carbon monoxide (CO), and hydrogen sulfide gases (H_2S), was used to measure the LEL at the ground surface. For these borings, only zero readings were recorded, and thus the values are not shown on the boring logs.

4.3 Subsurface investigation 1994

In 1994, the Department of General Services Standards Division drilled one exploratory boring (94-072 B-8) within the eastern portion of the site as part of a subsurface investigation for the Venice Area Relief sewer project. Standard Penetration Test (SPT) samples were collected from this exploratory boring at depths of 5 feet, 10 feet and every 5 feet thereafter to the explored depth of approximately 31 feet below the ground surface. The SPT samplers were driven into the bottom of the borings with successive drops of a 140-pound hammer falling 30 inches. The approximate location of this boring is shown on Figure 3.

Each collected sample was inspected and described in general conformance with the Unified Soil Classification System (USCS). All samples were sealed and packaged for transportation to the Standards laboratory. After completion of drilling, the exploratory boring was backfilled with soil cuttings. An exploratory boring log and laboratory test results of samples retrieved from this boring are presented in Appendix B.

4.4 Subsurface investigation 1990

In 1990, the Department of General Services Standards Division drilled one exploratory boring (89-305 B-2) within the western portion of the site as part of a subsurface investigation for a seismic evaluation of the existing Venice Pumping Plant. Standard Penetration Test (SPT) samples were collected from this exploratory boring at depths of 5 feet, 10 feet and every 5 feet thereafter to the explored depth of approximately 41 feet below the ground surface. The SPT samplers were driven into the bottom of the borings with successive drops of a 140-pound hammer falling 30 inches. The approximate location of this boring is shown on Figure 3.

Each collected sample was inspected and described in general conformance with the Unified Soil Classification System (USCS). All samples were sealed and packaged for transportation to the Standards laboratory. After completion of drilling, the exploratory boring was backfilled with soil cuttings. An exploratory boring log for this boring is presented in Appendix B.

5.0 GEOLOGIC CONDITIONS

5.1 Regional Geology

The Venice Auxiliary Pumping Plant site is located within the Los Angeles Basin part of the Peninsular Ranges geomorphic province, which extends from Southern California to the southern tip of Baja California. This province is characterized by elongate northwest-trending mountain ridges separated by straight-sided sediment-filled valleys. The northwest trend is further displayed in the dominant structural features of the province, which are northwest to west-northwest trending folds and faults, such as the nearby Newport-Inglewood fault zone.

The site is located in an alluviated lowland area in the west portion of the Los Angeles Basin, a northwest trending alluviated plain about 50 miles long and 20 miles wide. The Basin is bound on the north by the Santa Monica Mountains and the Elysian, Repetto, and Puente Hills, and on the east and southeast by the Santa Ana Mountains and San Joaquin Hills. The aerially extensive alluviated plain slopes southward and seaward however in the vicinity of the project the plain is interrupted by the Baldwin Hills and Beverly Hills. The Baldwin Hills are the northern extension of the Newport-Inglewood structural block which has uplifted the Baldwin Hills, Dominquez Hills, and Signal Hill located to the south.

The Los Angeles Basin is underlain by a deep structural depression. Parts of this depression have been filled with sediments discontinuously since the Late Cretaceous (starting about 85 million years ago). Starting in the middle Miocene (about 20 million years ago) the basin (which extended to the Ventura Basin) continuously subsided as sediments were deposited. The buried basement surface has relief of as much as 4.5 miles in a distance of 8 miles (Yerkes, et al, 1965).

5.2 Local Geologic Setting

The Marina Del Rey and Venice areas were once a large wetland marsh fed by the meandering Ballona Creek, which drained into the Santa Monica Bay near the current location. The 1924 United States Geological Survey Map of the Venice Quadrangle shows the project site is adjacent to a large lowland marsh area northeast of the Grand Canal. The elevation of the site was approximately 5 feet above sea level. Surficial geologic exposures are all Quaternary Age sedimentary units.

5.3 Stratigraphy

5.3.1 Fill (af)

Artificial fill soils exist within the site as the result of previous construction and/or previous construction activities on the site. In general, the depth of fill is expected to be on the order of three to four feet within the site. Fill depths may be deeper in some areas. The fill materials generally consist of silty sand and sand with some construction debris.

5.3.2 Alluvium (Qa)

Alluvial sediments encountered in the borings were primarily coarse grained soils consisting of gravels, sands, and silty sands with interlayered fine grained soils consisting of silts and clays.

Coarse-grained alluvial materials range widely in type and consistency from poorly graded sands and gravels to silty and clayey sands. Generally, the coarse alluvium soils are typically brown or light brown in color though they may be gray or olive with high fine contents in the case of silty or clayey sands. The coarse grained materials are moist to wet, loose to very dense with varying amounts of silt, clay, gravel, and cobbles.

The fine-grained materials are typically moist to wet. Fine-grained alluvium consists of lean and fat (low to high plasticity) silts and clays of very soft to hard consistency. Generally, the fine grained alluvial soils are brown, dark brown, dark gray or greenish gray in color.

Seashells and seashell fragments were observed in many of the samples collected from the borings. These materials were observed to be interspersed anywhere within the matrix of the soil and as concentrated lenses and layers of several inches in thickness.

More detailed descriptions of the alluvium can be found in the boring logs in Appendices A and B.

5.4 Groundwater

The Grand Canal and the Venice Canals convey surface water runoff from nearby areas to the Marina Del Rey entrance channel. The Marina Del Rey harbor and entrance channel are also unlined, and was constructed via dredging in the 1950's. In order to reduce the chance of flooding low lying areas along the Grand Canal, the County of Los Angeles maintains tide gates that control flow into and out of the Grand Canal from the Marina Del Rey entrance channel. County personnel report that when a high tide in excess of 5.7 feet above sea level is forecast, the tide gates are closed. In the past, when tide gates were not closed, water levels in the Grand Canal increased and local flooding resulted. Historically, groundwater levels have been measured near the ground surface in the project area.

Measured groundwater levels in the project area have generally varied between elevations of -2 to +4 feet of sea level. Groundwater levels beneath the site fluctuate as the result of seasonal variations and tidal fluctuations. Based on the available geotechnical data, a baseline groundwater elevation of one foot above sea level has been selected for the project.

6.0 FAULTING AND SEISMICITY

The site lies within Seismic Zone 4 of the 2010 California Building Code (CBC). Primary seismic hazards that could affect the site include ground motion or shaking, ground surface rupture along faults, liquefaction, and earthquake-induced landslides.

6.1 Ground Motion

Based on the current understanding of the geologic framework of the site area, the seismic hazard which is expected to have the highest probability of affecting the site is ground shaking or motion resulting from an earthquake occurring along any of several major active and potentially active faults in Southern California. Known regional faults that could produce significant ground shaking at the site include the Malibu Coast, Santa Monica, Palos Verdes, Newport-Inglewood, among others.

Ground motion parameters were determined for the site using the United States Geological Survey (USGS) 2008 Probabilistic Seismic Hazard Analysis Interactive Deaggregation web tool. The site longitude and latitude, a 10% probability of

exceedance in 50 years and an average shear wave velocity of 230 meters per second for the upper 100 feet of subsurface were input into the program. Using these parameters a peak ground acceleration of 0.4g was determined for the site. The program also calculated a mean earthquake magnitude of 6.7 at a distance of 20.5 kilometers from the site.

6.2 Ground Rupture and Deformation

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (Act) requires that "Earthquake Fault Zones" be established along the trace of active faults. The purpose of the Act is to regulate development near active faults so as to mitigate the hazard of surface fault rupture. Earthquake faults that are "sufficiently active" (have evidence of surface displacement within Holocene time or the last 11,000 years) and "well-defined" (a fault whose trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface) are subject to zoning. Under the Act, the State Geologist is required to delineate Earthquake Fault Zones along all sufficiently active and well-defined faults that constitute a hazard to structures from surface displacement. Maps depicting the Earthquake Fault Zones are issued by the California Geological Survey (CGS). According to the CGS, the site is not located within an Alquist-Priolo Earthquake Fault Zone and no faults are known to be in close proximity of the site.

6.3 Liquefaction

According to the State of California Seismic Hazard Zones Map (Figure 4), the site is located within an area that has potential for liquefaction. Liquefaction is a process that occurs when saturated sediments are subjected to repeated strain reversals during a seismic event. The strain reversals cause an increase in pore water pressure such that the internal pore pressure approaches the overburden pressure and the shear strength approaches a low residual value. Liquefied soils are subject to flow, consolidation, or excessive strain. Liquefaction typically occurs in loose to medium dense sand and silty sand soils below the groundwater table. Predominately fine-grained soils, such as silts and clays are less susceptible to liquefaction.

Liquefaction analyses were performed for a ground acceleration of 0.43g (2/3 of the Maximum Considered Earthquake-Geometric Mean ground acceleration of 0.642g). The analyses were performed for the deepest rotary wash boring, RW-2, located near the center of the site. The analyses were performed with consideration to the soil particle size and plasticity information obtained through laboratory testing, and the measured and anticipated high groundwater levels. Potential liquefaction induced settlements on the order of 1-3/4 inches were calculated for the project site.

6.4 Earthquake-Induced Landslides

As shown by the State of California Seismic Hazard Zones Map (Figure 4), the site is not within a zone of earthquake-induced landslide potential.

6.5 Seismic Design Parameters

Table 1613.5.2 of 2013 California Building Code - "Site Class Definitions" list six Site Classes (A through F). The Site Class is based on the average properties of the upper 100 feet of the soil and/or bedrock beneath the site. The appropriate Site Class is chosen by referencing the average shear wave velocity, average Standard Penetration Test blow counts, and/or average undrained shear strength. Based on data obtained from the deepest boring, Site Class D is recommended for this site.

The mapped acceleration parameters Ss and S_1, 0.2 and 1-second spectral response accelerations, were determined and used along with the Site Class to obtain the site coefficients Fa and Fv. The maximum considered earthquake spectral response acceleration for short periods, S_{MS}, and at the 1.0-second period, S_{M1}, adjusted for Site Class effects were then calculated followed by the calculation of the design spectral response acceleration for short periods, S_{DS}, and at the 1.0-second period, S_{D1}. The values of T_O and T_S, in seconds, were then determined using the equations presented in the code to represent the beginning and end of the design response spectra peak.

The seismic parameter values for the site are summarized in Table 1, Seismic Design Parameters.

Table 1 – Seismic Design Parameters

Parameter	Value	2008 LABC Reference
Site Class	D	Table 1613.5.2
S_s	1.661	Figure 1613.5(3)
S_1	0.660	Figure 1613.5(4)
S_{MS}	1.661	Equation 16-37
S_{M1}	0.990	Equation 16-38
S_{DS}	1.107	Equation 16-39
S_{D1}	0.660	Equation 16-40
T_O (seconds)	0.119	Chapter 16
T_S (seconds)	0.596	Chapter 16

7.0 LABORATORY TESTING

Selected soil samples were tested for the following properties:

- In-Place Dry Density and Field Moisture (D2937)
- Laboratory Maximum Dry Density and Optimum Moisture Content (ASTM D1557)
- Consolidation (ASTM D 2435)
- Direct Shear (ASTM D 3080)
- Unconfined Compression Strength (ASTM D 2166)
- Triaxial Compresion Strength (ASTM D2850)
- Sieve and Hydrometer Analysis (ASTM D422)
- Liquid Limit and Plasticity Index (ASTM D4318)
- Conductivity (EPA 120.1)
- Chlorides (EPA 300.0)
- pH (SM 4500-H+B)
- Sulfates (EPA 300.0)

Laboratory test results are presented in Appendices A and B.

8.0 SITE RECOMMENDATIONS

8.1 General

Our primary geotechnical consideration with respect to the proposed construction is the existing uncertified fill soils and compressible shallow soils within the site, the potential for liquefaction at the site, and the potential for methane gas. Remedial earthwork is recommended in the area of the electrical building to provide suitable foundation support. To mitigate the potential effects of soil liquefaction, we recommend the project structures be supported on concrete mat foundations. Mat foundations should be designed and constructed to accommodate the estimated potential total and differential seismic induced settlements presented herein. The requirements of the Methane Study report shall be incorporated into the design and construction of the project. A copy of the methane report is presented in Appendix C of this report.

Detailed geotechnical engineering recommendations addressing the surficial soils, site preparation, site earthwork, foundations and retaining walls are presented in the remaining portions of this report. The following opinions, conclusions, and recommendations are based on the properties of materials encountered in the geotechnical field investigations and laboratory test results.

A representative of GEO will need to provide observation and testing services during site earthwork and construction of foundations. This will allow us the opportunity to compare actual conditions with those encountered in the exploratory borings and, if necessary, to expedite supplemental recommendations if warranted by the exposed subsurface conditions. We shall also review the preliminary foundation and earthwork plans and specifications. Specifications for groundwater control and discharge, shoring and jet grouting shall also be reviewed by our office. These reviews will provide us an opportunity to detect misinterpretation or misunderstandings of our recommendations prior to advertising the project for construction.

8.2 Site Clearing

Prior to construction, all organic or inorganic materials shall be removed from the construction area and disposed of outside the site. Any existing structural or landscape elements within these areas, including any foundation elements, shall be demolished and removed from the site. Any utilities, whether active or inactive, shall be identified and removed from the site or relocated per project plans and specifications. Any cavities resulting from removal of any existing foundations or utility lines shall be properly backfilled and compacted in accordance with the following sections.

8.3 Groundwater Control During Construction

Dewatering from outside of excavations is not allowed. Continuous, solid impervious shoring extending below planned excavation depths, to act as a groundwater cut-off, is required for all excavations that extend more than 3 feet below the baseline groundwater level. Acceptable methods of impervious shoring include sheet piles, secant piles or diaphragm walls.

In addition, Jet grouting shall be performed to create a structural and watertight bottom seal beneath the wetwell/vault structure and diversion structure. Jet grouting can also be used to create a bottom seal for the sewer pipe that will be constructed between the new diversion structure and the auxiliary pumping plant wetwell and the 42-inch header pipe. The zones of jet grouting shall extend from the bottom of proposed excavation to an elevation of at least -35 feet (below sea level). Jetted grouted bottom seals shall be in-place prior to excavating below the baseline groundwater level.

Actual plan dimensions and depths of the jetted grouted bottom seals shall be designed by a specialty geotechnical contractor and endorsed by a Geotechnical Engineer or Engineering Geologist with at least five years of experience in groundwater control applications in excavations. Calculations supporting the design dimensions of the treatment areas shall be provided to demonstrate that the goals of the treatment will be fulfilled and that the treated areas will have adequate factors of safety against bottom heave and piping.

Carefully controlled dewatering, in combination with continuous impervious shoring functioning as a groundwater cut-off, may be used to control groundwater to facilitate construction of the 66-inch diameter reinforced concrete sewer pipe as an alternative to jet grouting. This method of dewatering can also be used to facilitate construction of the 42-inch header pipe. For this method, impervious shoring shall be installed to extend from the ground surface to an elevation of -25 feet (below sea level) or deeper. Dewatering wells shall be located within the shored excavations and shall be constructed with the well points above the bottom of the shoring. The dewatering system shall be designed, constructed and operated to lower the ground water level within the excavation to at least 3 feet below the bottom of the excavation without drawing down groundwater levels outside the excavations. Dewatering to below the planned depth of excavation shall be completed prior to excavating below the baseline ground water level. The drawn down groundwater level should be maintained at least three (3) feet below the bottom of excavations until construction has progressed above the surrounding static groundwater level and sufficient structural dead-load and backfill have been placed to counteract hydrostatic uplift pressures. Backfill may be assumed to have a unit weight of 105 (pcf) above groundwater. Submerged backfill may be assumed to have a buoyant unit weight of 42 pcf. Monitoring wells shall be installed outside of the excavations. The locations shall be approved by GEO. Groundwater recharge shall be performed as necessary to maintain groundwater levels outside of excavations at their natural levels.

Sump pumps shall be provided at the base of excavations which extend below the baseline groundwater level to facilitate removal of any water that seeps into the excavations through the shoring system.

Any groundwater pumped from excavations shall be discharged into nearby sanitary sewers and discharge rates into the sewers shall not exceed those allowed by the Bureau of Sanitation.

8.4 Temporary Sloped Excavations

Based on our observations during subsurface investigation and results of laboratory tests, the materials at the site should be readily excavated by conventional earthmoving equipment in good operating condition. All temporary excavations shall conform to the State of California Construction Safety Orders (CAL/OSHA).

In level areas, unsurcharged, temporary vertical excavations can be a maximum depth of four feet. Unsurcharged excavations greater than 4 feet, to a maximum of 8 feet, in level areas shall be sloped at a 1:1 (H:V) or flatter inclination from the ground surface to the bottom of the excavation or should be shored. Excavations greater than 8 feet should be shored.

Any excavation that enters the influence zone (imaginary plane extending downward at a 1:1 inclination) of an adjacent structure, private property or right-of-way subject to vehicle loading shall utilize shoring.

8.5 Excavation Support

8.5.1 Excavation Methods

Based on the available geotechnical data and construction experience in similar materials, it is anticipated that excavations can be achieved using heavy excavation equipment. The artificial fill and alluvium can be excavated with backhoes, clam shells, excavators, dozers, and other hydraulic equipment.

In sizing and laying out excavations, the Contractor must consider allowable construction limits shown on the Contract Drawings, requirements for construction of permanent structures (indicated on the Contract Drawings), as well as requirements for construction methods selected for the work. The following sections address excavation methods and support requirements.

8.5.2 Excavation Support Requirements

Excavations will require continuous support unless the soils are strengthened or stabilized by implementing an effective ground improvement technique. Acceptable excavation support systems for excavations that extend more than three feet below the baseline groundwater level include water-tight interlocking sheet piling, secant piles or diaphragm walls or other approved water tight shoring.

Dewatering or bottom seals placed "in the wet" are not permitted. The relatively water-tight excavation support systems shall extend a sufficient depth below the bottom of the planned excavations to prevent heave and/or piping of excavation bottoms. Design of the embedment depth of the water tight shoring below the base of excavations shall be based on the assumption that the extension is embedded in pervious granular soils with seashell lenses and layers. Ground treatment consisting of jet grouting below the excavation bottom is also required for the wetwell/valve vault structure and the diversion structure to further reduce groundwater in-flow and the potential for bottom instability. As an alternative to jet grouting, impervious shoring and dewatering in accordance with the recommendations of section 8.3 can be used to facilitate construction of the 66-inch diameter reinforced concrete sewer pipe and 42-inch header pipe. Calculations supporting the design of the shoring cut-off depth and depth of jet grouting below the excavation bottoms shall be included in the shoring submittal.

Shoring for excavations shall be installed in accordance with the General Requirements, the project specifications and Section 306-1.1.6 of the Standard Specifications for Public Works Construction (SSPWC), most current edition adopted by the Board of Public Works. Design of shoring shall be in accordance with Title 8, Division 1, Chapter

4, Subchapter 4 of the California Code of Regulations: CAL/OSHA Construction Safety Orders or the lateral earth pressure distributions recommended in the following section of this report. Based on the soil classification system presented in the Construction Safety Orders, the site soils shall be considered as Type C soils. All shoring systems shall be designed for maximum deflections of ½-inch.

Where bracing is used, each excavation sequence must be designed to allow removals of struts during construction of permanent facilities within excavations and as excavations are backfilled.

Sheet piles, if used shall be installed and extracted using vibration- and percussive-free methods. Coating should be applied to the sheet piles to prevent the soils from adhering to the sheet piles to facilitate removal of the sheet piles at the end of construction.

For secant pile shoring, casing or other methods approved by the geotechnical engineer of record shall be used to support the sides of pile excavations in the artificial fill and alluvial materials. The inside diameter of casing shall be at least as large as the diameter of the pile as indicated on the plans. Drilling shall be accomplished within the casing. Drilling fluids shall not be used to support the sides of the excavation without the review and approval of GEO.

All proposed shoring system designs including supporting documentation and calculations shall be submitted to GEO for review and approval in reference to existing soil conditions. All shoring systems must meet the following minimum requirements to be considered for review.

- Shoring shall directly support the sides of the excavation. Shoring shall be designed to minimize the development and presence of voids behind shoring support.
- Shoring installation procedures shall be designed so that no person is required to enter an unsupported excavation greater than 5 feet in depth at any time.

Trench box and shield systems are not allowed as shoring for the project. Trench box or shield systems do not adequately support the adjacent soil and utilities. Also, voids can occur between the outside of the box and the firm soil.

8.5.3 Design Earth Pressures

Temporary internally braced shoring shall be designed using a lateral soil equivalent fluid pressure of 48 pounds per cubic foot (pcf) above groundwater. Below groundwater, the design soil lateral earth pressure can be assumed to increase at a rate of 24 pcf for braced shoring. Cantilevered shoring shall be designed using an effective fluid pressure (EFP) of 36 pounds per cubic foot (pcf). Cantilevered shoring shall not be allowed in areas where existing utilities and structures are located within a 1:1 projection upward from the bottom of the planned excavation. Hydrostatic pressures shall be added to the

lateral earth pressures for the portions of shoring that extend below the baseline groundwater level. These design pressures assume level backslopes.

A surcharge load equivalent to an additional 2 feet of retained soil shall be applied to the upper 10 feet of shoring. The minimum surcharge load shall be 100 psf. Heavy construction equipment wheel or outrigger loads shall not be located within a distance equal to 0.7H feet the face of the shoring unless considered as surcharge loads in the Contractor's shoring calculations.

Allowable passive earth pressures equal to 150 pounds per square foot (psf) per foot of depth below groundwater and 300 psf per foot of depth above groundwater, measured below the base on the planned excavation, to a maximum value of 3,000 psf can be used for resistance in the alluvium materials.

8.6 Over-excavation

All existing fill materials shall be removed from the area of the proposed electrical building. This area shall be further excavated as necessary to a depth of seven feet below the existing ground surface or to three feet below the bottom of the proposed mat foundation, whichever is deeper. Over-excavation depths may have to be greater in some areas to remove unsuitable soils. Removal excavations should extend a horizontal distance beyond the edges of the foundations equal to the depth of over excavation below the foundations or a minimum of 5 feet, whichever is greater. All exposed subgrade soil surfaces shall be observed by a representative of the GEO and the City of Los Angeles Grading Inspector prior to placement of fill.

Shallow sump pumps may be necessary to control groundwater within the over-excavation area. The exposed soils in the over-excavation bottom may be susceptible to pumping. The contractor should take precautionary measures to avoid disturbance of the over-excavation bottom. Heavy construction equipment, such as trucks or rubber tired equipment should not be allowed to operate within the over-excavation area. Over-excavation should be accomplished with excavation equipment operating from outside the over-excavation area to the extent possible. With-in the over-excavation area, only low ground pressure equipment should be used to excavate, place and compact materials over the over-excavation bottom. Track-mounted equipment will lessen the softening of wet soils as a result of the "pumping" action of moving heavy wheel loads.

After over-excavating for the foundation of the electrical building, the following shall be performed;

- The exposed over-excavation bottom shall be observed by a representative of the GEO and the City of Los Angeles Grading Inspector. The bottom shall be smooth and uniform (free of ruts). If necessary, additional over-excavation shall be performed as directed by the GEO. If additional over-excavation isn't

necessary, the subgrade shall be prepared as directed by the GEO.

- Place a Geotextile fabric over the over-excavation bottom. The geotextile shall be placed in accordance with manufacturer's recommendations. The geotextile fabric shall be temporary extended up the excavation slopes. The geofabric shall comply with following minimum requirements: Density of 6 ounces per square yard or more, Grab Tensile Strength (ASTM D-4632) of 120 pounds, Grab Tensile Elongation (ASTM D-4632) of 50%, Trapezoidal Tear Strength (ASTM D-4533) of 50 pounds. No equipment should operate directly over the geotextile fabric.

- Place a 24-inch layer of 1-inch crushed rock over the entire over-excavated area. Densify the crushed rock using vibration and track walking. Cover the crushed rock with the geotextile fabric that was temporary extended up the slopes of the excavation. Use additional geotextile fabric to completely cover the crushed rock. Overlap all seams per the geotextile manufacturer's recommendations.

- Place an 8-inch layer of Crushed Miscellaneous Base (CMB) over the geofabric. The CMB shall be moisture conditioned and compacted to at least 95-percent relative compaction.

- If pumping is observed, additional base shall be placed in 6-inch lifts until pumping ceases.

- Once pumping ceases, place a geotextile fabric over the compacted base and place suitable fill materials in lifts of 8 inches or less in thickness (before compaction) to finish subgrade elevation (base on the methane mitigation system). Each lift shall be moisture conditioned and compacted as specified section 8.9 of this report.

Exterior slab-on-grade and any pavement areas, should be over-excavated to a depth of at least 12 inches below existing grade or the finish subgrade elevation, whichever is lower, and replaced with properly compacted fill. Removal excavations should extend a horizontal distance of at least 2 feet beyond the plan dimensions of slabs-on-grade or pavements.

8.7 Subgrade Preparation

All exposed subgrade soil surfaces shall be observed by a representative of the GEO and the City of Los Angeles Grading Inspector prior to placement of fill. If soft, yielding, or unsuitable soils are exposed at the subgrade surface, then the unsuitable soils should be removed and replaced with properly compacted fill soils. Due to the nature of the site soils and shallow groundwater levels, unsuitable soft wet soils will be encountered below the ground surface in some areas. If a suitable bottom is not

obtainable within a reasonable depth of the excavation subgrade elevation, supplemental recommendations will be provided during construction to stabilize areas of soft soils.

Subgrade surfaces suitable for fill placement should be scarified to a depth of 6 inches, moisture-conditioned and compacted. Subgrade soils shall be moisture conditioned to between optimum moisture content and 2 percent above the optimum moisture content, at the time of compaction, and compacted to a minimum of 95 percent of the ASTM Test Method D1557-91 laboratory maximum density to a depth of 6 inches. After the completion and acceptance of the subgrade preparation, fill material may be placed in accordance with Section 8.9 of this report. Subgrade soils shall be kept moist (between 0 and 2 percent above the optimum moisture content) but not flooded until covered with subsequent fill or construction.

8.8 Fill Materials

Fill soils shall consist of select on-site soils or approved import material. The on-site soils encountered during the geotechnical investigation are generally acceptable for use as fill material for this project. On-site clayey and silty soils (such as elastic silt encountered in boring RW-1 between 4 and 6 feet) may not be used as fill within the electrical building footprint, below slabs or behind retaining walls. Before being used as fill, on-site soils shall be cleaned of all organic or inorganic debris and all materials with any dimension larger than 3 inches. Drying of wet site soils or mixing of these soils with dryer soils may be required prior to being used as compacted fill. Import material for use as fill for this project shall be predominantly granular (minimum 80% passing number 4 sieve and 25% or less passing the number 200 sieve), non-expansive (EI less than 20), and shall be free of organic or inorganic debris, contamination and materials with any dimension larger than 3 inches. Import material shall be tested and approved by GEO prior to importing to the job site. GEO shall be notified a minimum of five working days prior to scheduled importing of soil to the project site.

8.9 Fill and Backfill Placement

Structural fill shall only be placed on approved surfaces/subgrades prepared in accordance with Section 8.7 of this report. Fill material shall be placed in loose lifts not exceeding 8 inches in thickness, moisture-conditioned between 0 to 2 percent over the optimum moisture content and mechanically compacted. Fill soils placed below building foundations or slabs-on-grade shall be compacted to a minimum of 95 percent relative compaction, as determined by ASTM Test Method D1557.

Fill soils placed in non-structural areas such as paved areas, sidewalks, and landscaped areas shall be compacted to a minimum of 90 percent relative compaction, as determined by ASTM Test Method D1557. Any aggregate base should be moisture-conditioned between optimum and two percent above optimum-moisture and compacted to a minimum of 95 percent relative compaction.

Fill compaction shall be tested and recorded by a certified compaction testing agency working under the direct supervision of GEO. Densification by flooding or jetting is not allowed. Compacted fill soils shall be kept moist, (at or slightly above the specified moisture content at the time of compaction) but not flooded, until covered with subsequent construction. If fill soils are softened or eroded by excessive moisture or construction disturbance, they shall be replaced or recompacted at the discretion of the Geotechnical Engineer before additional fill or construction is placed. Certification and inspection approvals for compromised soils are void and invalid.

8.10 Trench Backfill

Trench excavations for utility pipes may be backfilled with on-site soils under the observation of a representative of GEO. After utility pipes have been laid, properly bedded, and covered per the project specifications, they shall be backfilled to the ground surface or design subgrade with controlled backfill. Controlled backfill shall be moisture conditioned, placed and compacted in accordance with the recommendations presented in Section 8.9 of this report.

8.11 Liquefaction Considerations

Based on the data presented in Section 3 of this report and the results of the liquefaction calculations, potential liquefaction induced settlements on the order of 1-3/4 inches are estimated for the site. A potential liquefaction induced differential settlement of 1 inch is estimated between the proposed structures and the pipe header. These potential liquefaction induced settlements shall be considered and accounted for in the design and construction of the project.

8.12 Mat Foundations

Mat foundations are recommended for support of the project structures with the understanding that the foundations will be susceptible to liquefaction induced settlements. Mat foundations for the wetwell/valve structure and diversion structures shall be founded on natural soils that have been jet grouted to create an excavation bottom seal. The mat foundation for the electrical building shall be founded on compacted fill soil. Mat foundations shall be designed and constructed to bear at a depth of at least 24 inches below the lowest adjacent grade. Mat foundations can be designed for an allowable bearing capacity of 1,500 pounds per square foot. A coefficient of vertical subgrade reaction, for a 1-foot-square loaded area, of 100 kips per cubic foot (kcf) may be used for design of the mats.

Total static settlement of the proposed foundations, designed and constructed in accordance with the recommendations presented herein, should not exceed 1-inch. Differential static settlement should not exceed one-half of the total settlement. The majority of these settlements are expected to occur within a year of construction. In

addition, the foundation will also be potentially susceptible to seismically induced settlements. Potential total and differential seismically induced settlements of 1-3/4 inches or less and 1 inch have been estimated for the project structures. The structural design of the proposed structures should consider the possibility that the estimated magnitudes of seismically induced settlement could occur during the life of the structures. The actual magnitude of total and differential static settlements of the mat foundations will be a function of the structural design and stiffness of the mats.

Resistance to lateral loads can be provided by friction acting at the base of the foundation and by passive earth pressure. A coefficient of friction of 0.35 may be assumed with dead-load forces. An allowable passive lateral earth pressure of 250 psf per foot of depth up to a maximum of 2,500 psf may be used for sides of the foundation poured against undisturbed natural soil or properly compacted fill. The allowable passive pressure may be increased by 33 percent of lateral loading due to wind or seismic forces.

8.13 Retaining Walls

Cantilevered retaining walls that retain a level granular (sand equivalent of 30 or greater) non-expansive backfill for a horizontal distance equal to or greater than the height of the wall may be designed for an active equivalent fluid pressure of 30 pcf. Walls that are fixed against rotation (no movement allowed) supporting a level ground surface and retaining native soils or granular (sand equivalent of 30 or greater) non-expansive backfill for a horizontal distance equal to or greater than the height of the wall can be designed using at-rest uniform pressure of 27H psf. Hydrostatic pressures shall be added to the lateral earth pressures for the portions of retaining walls that extend below the baseline groundwater level. A lateral seismic load of 24 psf per foot of height starting from 0 at the base of the retaining walls and increasing to a maximum at the top of the retaining walls can be considered for seismic conditions.

In addition to the above lateral pressures from retained earth, lateral pressures from other superimposed loads, such as those from vehicle traffic and adjacent structures, should be added, if the loads fall within a 1:1 projection of wall foundations. The effects of any surcharge loads should be added to the above recommended lateral earth pressures.

Backfill behind retaining walls should consist of free-draining granular soil as described in Section 8.8. Backfill should be placed in 8-inch or thinner loose lifts and compacted to a minimum of 90 percent of the ASTM Test Method D1557 maximum density. Compaction should be performed by mechanical means only and monitored by testing during construction. Care should be taken not to damage walls during backfill operations. Concrete should attain the strength specified by the structural designer prior to placement of large quantities of backfill.

Earth pressures presented herein also assume that only hand operated compaction equipment will be used within five feet of walls to limit compaction lateral stresses. The operation of compaction equipment behind retaining walls can induce horizontal pressures in excess of the at-rest pressures on the wall. To help reduce the development of excessive horizontal pressures over-compaction should be avoided.

Earth pressures used in the design of the walls should be indicated on the retaining wall plans. All retaining wall designs and plans should be reviewed by the project geotechnical consultant to confirm that the appropriate soil parameters are used.

Final surface grades should be sloped at a gradient such that surface water drains away from structures and retaining walls.

8.14 Cement Type and Corrosion Measures

Based on the results of soluble sulfate content testing of near-surface soils and our understanding of the proposed improvements, GEO recommends that Type II or Type V cement be used. Based on other test results including pH, chloride content, acidity, and conductivity, the site soils are moderately to severely corrosive. A corrosion expert should make the final determination of what corrosion measures are necessary for the project.

9.0 SUPPLEMENTAL GEOTECHNICAL SERVICES

9.1 Review of Plans and Specifications

The grading and foundation plans and specifications should implement the recommendations presented in this report and should be reviewed by GEO to ensure proper interpretation and application of our recommendations.

9.2 Geotechnical Observation and Testing During Construction

All grading, excavation, and construction of foundations should be performed under the observation and testing of the Geotechnical Engineer at the following stages:

- Upon completion of site clearing;
- During shoring installation;
- During jet grouting;
- During site excavation;
- During subgrade preparation;
- During fill placement;

- After excavation of foundations and immediately prior to placement of foundation concrete;
- During excavation and backfilling of all utility trenches; and
- When any unusual or unexpected geotechnical conditions are encountered

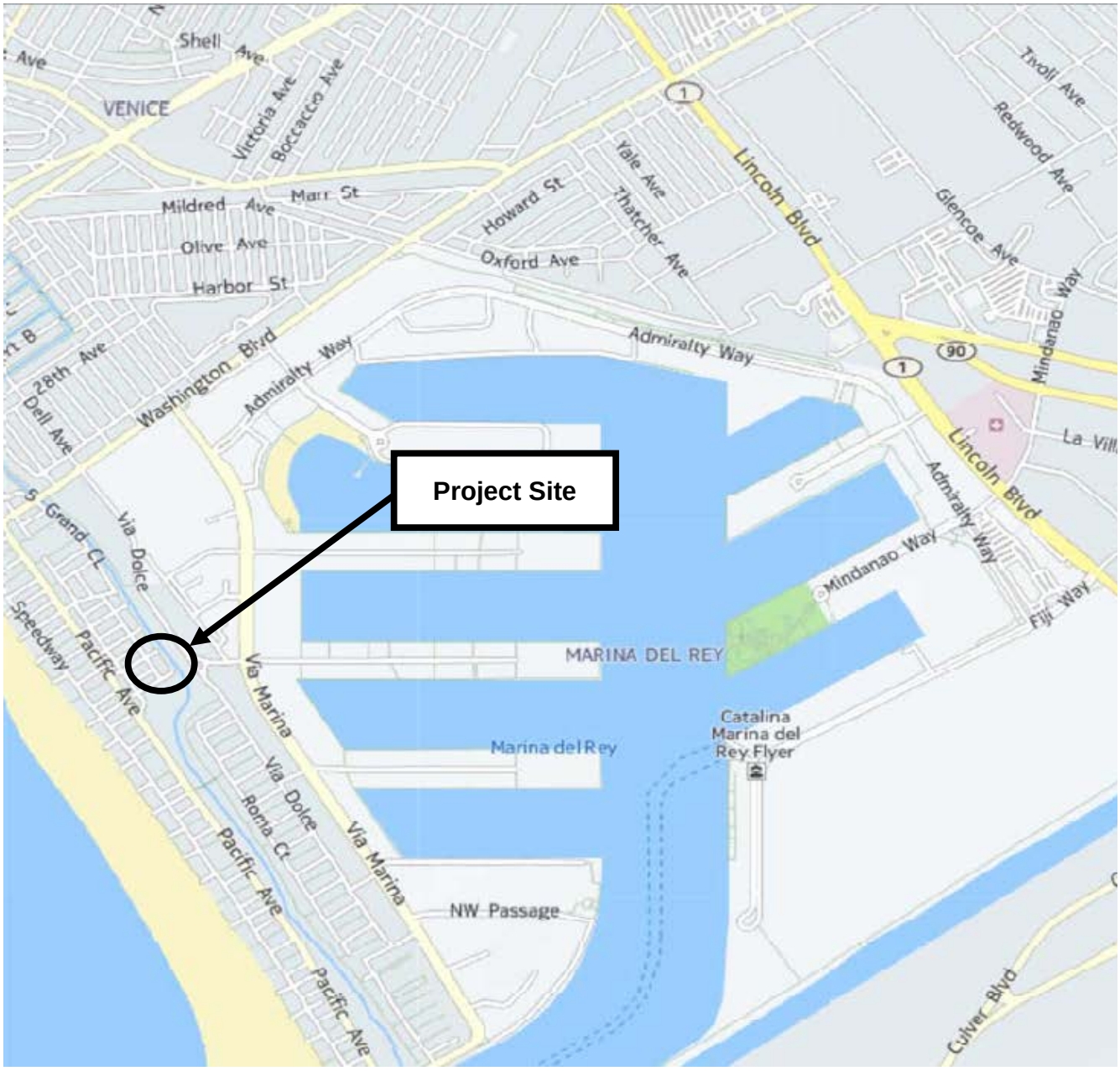
10.0 Closure

If there are any questions regarding this report, please contact Patrick Schmidt at (213) 847-0535 or Fred Burnett at (213) 847-0523.



Patrick J. Schmidt, GE 2260
Geotechnical Engineer II

Fred W. Burnett, CEG 2052
Engineering Geologist I



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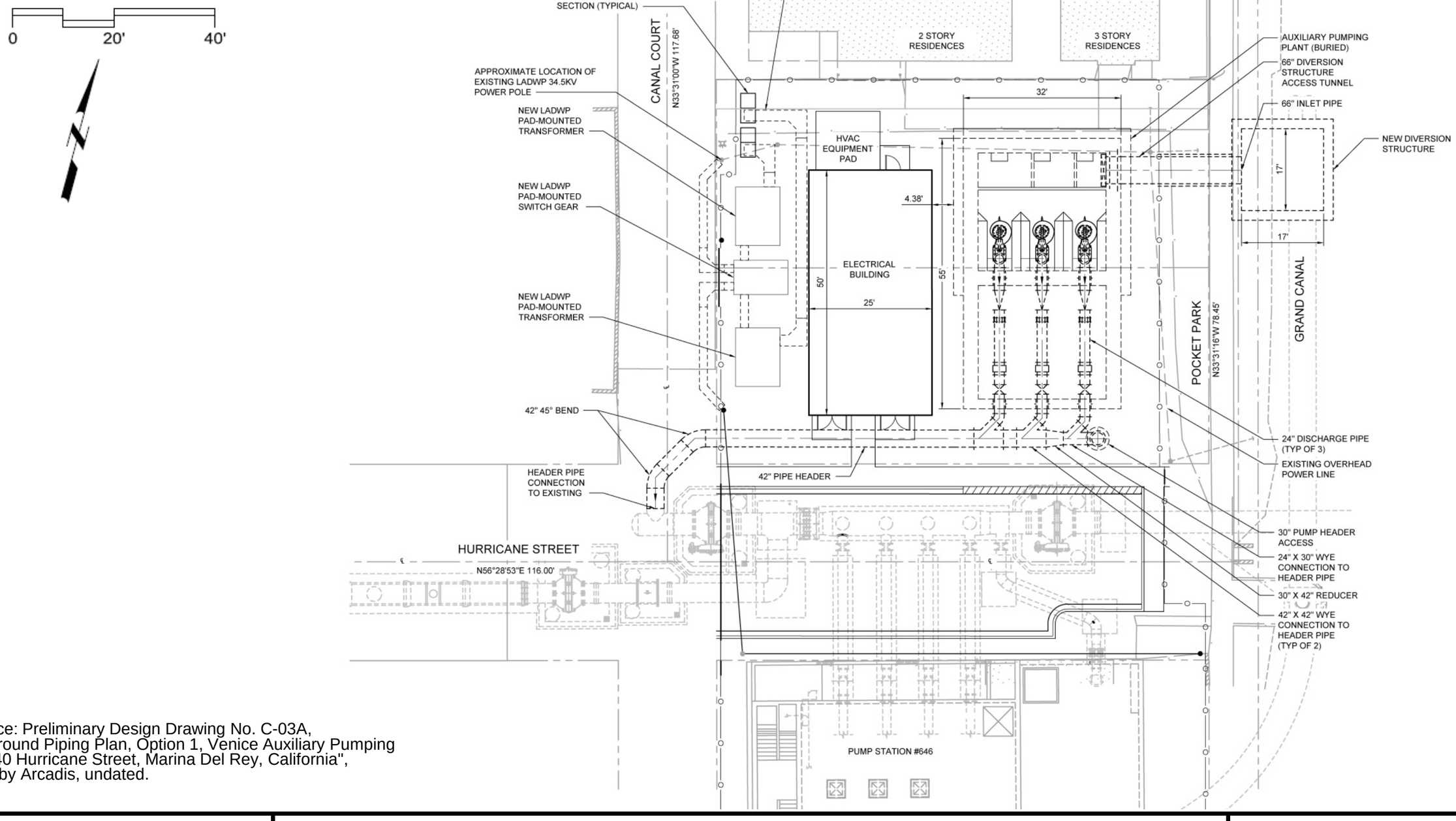
VICINITY MAP

VENICE AUXILIARY PUMPING PLANT **133 East Hurricane Street** **Venice Area of Los Angeles, CA**	BUREAU OF ENGINEERING GEOTECHNICAL ENGINEERING GROUP (GEO) FILE No.: 14-103 DATE: December 2015	**FIGURE 1**



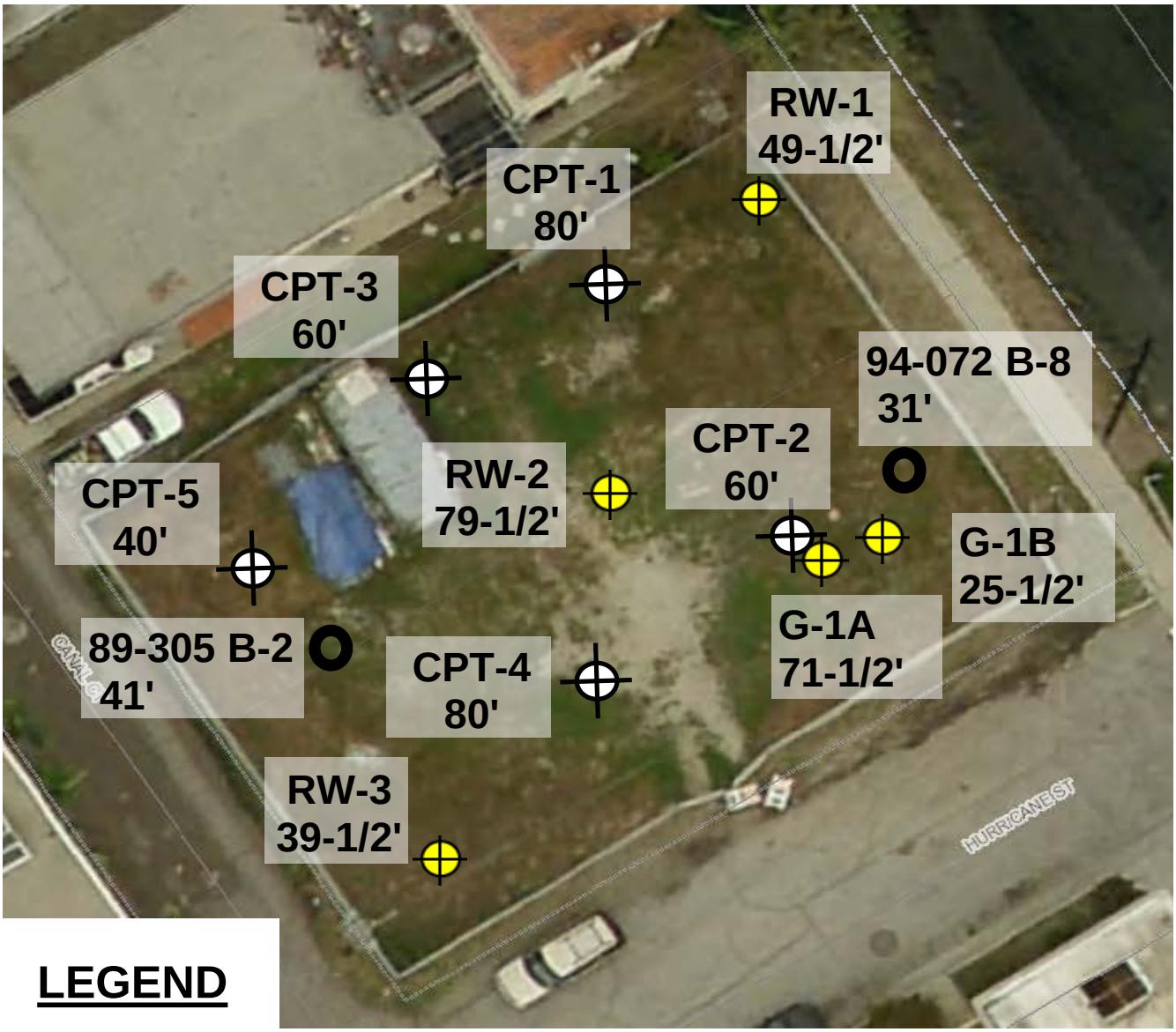
Reference: Preliminary Design Drawing No. C-03A, "Underground Piping Plan, Option 1, Venice Auxiliary Pumping Plant, 140 Hurricane Street, Marina Del Rey, California", prepard by Arcadis, undated.

VENICE AUXILIARY PUMPING PLANT

133 East Hurricane Street
Venice Area of Los Angeles, CA

PROPOSED CONSTRUCTION
BUREAU OF ENGINEERING
GEOTECHNICAL ENGINEERING GROUP
File No. 14-103 Date December 2015

FIGURE NO. 2



LEGEND

RW-2 — Rotary Wash Boring Number, Location, and Depth in feet

CPT-2 — Cone Penetration Test Number, Location, and Depth in feet

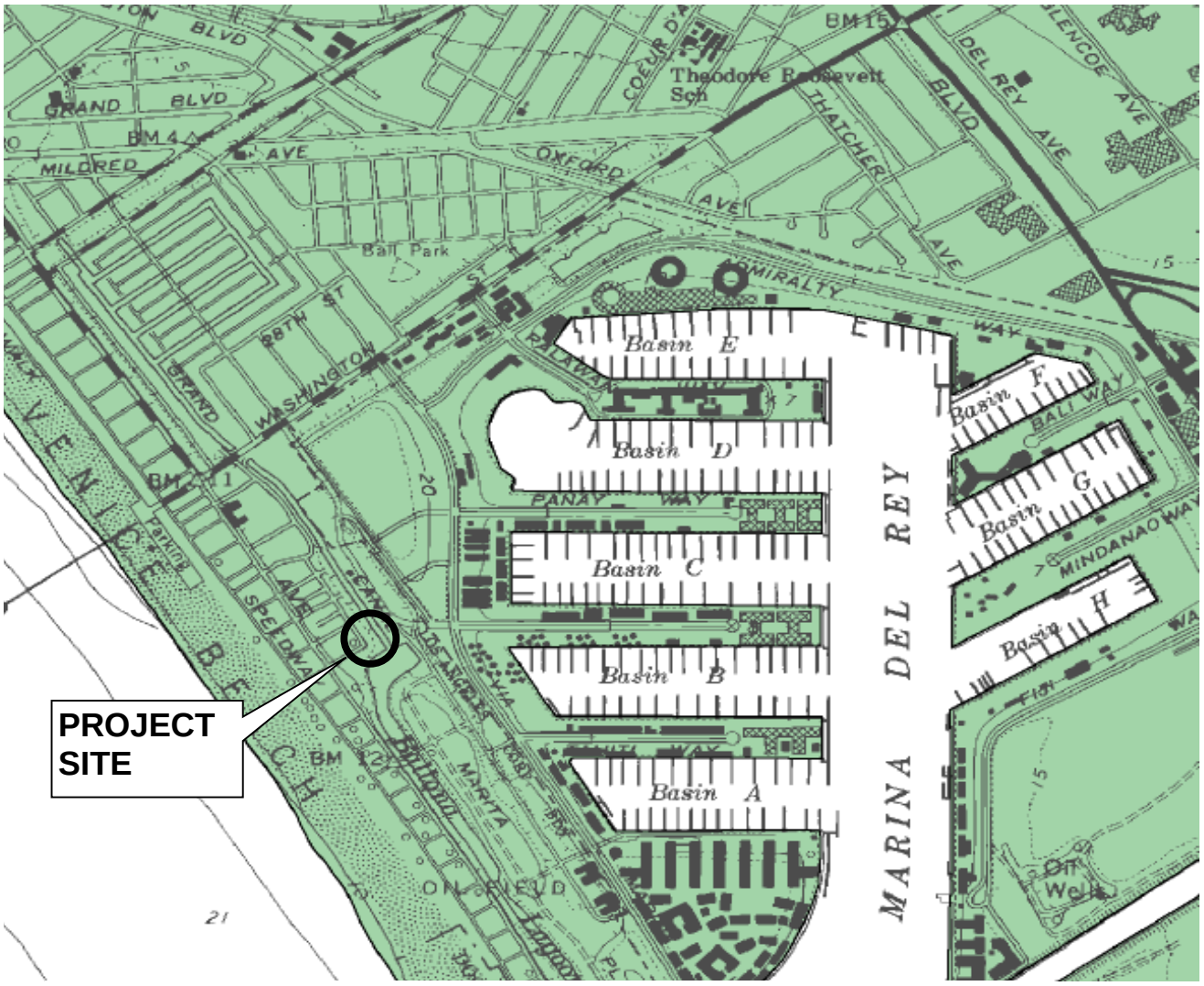
B-2 — Hollowstem Auger Boring Number, Location, and Depth in feet

N

APPROXIMATE SCALE
1 Inch = 20 Feet

EXPLORATION LOCATIONS MAP

VENICE AUXILIARY PUMPING PLANT **133 East Hurricane Street** **Venice Area of Los Angeles, CA**	BUREAU OF ENGINEERING GEOTECHNICAL ENGINEERING GROUP (GEO) FILE No.: 14-103 DATE: December 2015	**FIGURE 3**



Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

SCALE

N

Reference: "Official Map of Seismic Hazard Zones,"Venice", March 25, 1999, California, Department of Conservation, Division of Mines and Geology.

SEISMIC HAZARD ZONES

VENICE AUXILIARY PUMPING PLANT **133 East Hurricane Street** **Venice Area of Los Angeles, CA**	BUREAU OF ENGINEERING GEOTECHNICAL ENGINEERING GROUP (GEO) FILE No.: 14-103 DATE: December 2015	**FIGURE 4**

APPENDIX A

GPI GEOTECHNICAL PROFESSIONALS INC

September 29, 2015

City of Los Angeles
Department of Public Works Bureau of Engineering
Geotechnical Engineering Group
1149 South Broadway, Suite 120
Los Angeles, California 90015

Attention: Mr. Christopher F. Johnson
Manager, Geotechnical Engineering Group

Subject: Data Report
Geotechnical Investigation for
Venice Auxiliary Pump Plant (VAPP)
133 E. Hurricane Street
Venice Area of Los Angeles, California
Contract No. C-121601, Work Order No. SZC 12923
GPI Project No. 2500.06I

Dear Mr. Johnson:

This report presents geotechnical data from a subsurface field investigation and laboratory testing performed by Geotechnical Professionals Inc. (GPI) for the subject project. The site location is presented in Figure 1.

SCOPE OF WORK

The scope of the geotechnical investigation presented in this report was developed by the Geotechnical Engineering Group (GEO) of the City of Los Angeles Department of Public Works, as outlined in Task Order Solicitation No. 14-103 and further updated by GEO staff. We understand that GEO will review the data from this investigation and will be responsible for geotechnical recommendations for the subject project, as the Geotechnical Engineer of Record.

The full scope of work under the subject task order included a geotechnical investigation and a methane investigation. This report presents the results of the geotechnical investigation only. A separate methane investigation was performed by GeoKinetics under subcontract with GPI. Their report was submitted on August 20, 2015.

The geotechnical field investigation included five cone penetration tests to depths ranging from 40 to 80 feet and three rotary wash borings to depths ranging from 40 to 80 feet. The locations of the subsurface explorations were selected by GEO and marked in the field with GPI on July 28, 2015. The approximate locations are presented in Figure 2. A detailed description of CPT field procedures and results, including graphical CPT logs with site-specific soil descriptions, tabular data summaries and shearwave velocity measurements are presented in Appendix A. Field procedures and logs of the rotary wash borings are presented in Appendix B.

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Geotechnical laboratory testing, as requested by GEO, included the following types and number of tests:

- 19 Moisture and Density (ASTM D 2216)
- 8 Percent Passing No. 200 Sieve (ASTM D 1140)
- 16 Full Sieve Analyses (ASTM D 6913)
- 5 Atterberg Limits (ASTM D 4318)
- 1 Compaction (ASTM D 1557)
- 3 Consolidation Tests (ASTM D 2435)
- 8 sets Direct Shear Tests (ASTM D 3080)
- 2 Unconfined Compression (ASTM D 2166)
- 2 Unconsolidated Undrained Triaxial Test (ASTM D 2850)
- 1 Expansion Index (ASTM D 4829)
- 2 sets Corrosivity (California Test Methods 417, 422, 643)

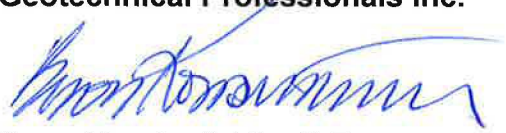
A detailed description of laboratory test procedures and results are presented in Appendix C.

CONCLUDING REMARKS

GPI warrants that the services covered by this report were performed as requested by GEO, in accordance with the standard procedures indicated, and with the standard of care of the geotechnical engineering profession in Southern California at this time. No other warranty or representation is included or intended in this report.

We appreciate the opportunity of offering our services on this project. Do not hesitate to call us if you have any questions on the contents of this report.

Respectfully submitted by,
Geotechnical Professionals Inc.



Byron Konstantinidis, G.E.
Principal



SEP 29 2015

BK:sph

Attachments:
Figure 1 - Site Location Map
Figure 2 - Site Plan
Appendix A - Cone Penetration Test Results
Appendix B - Exploratory Borings
Appendix C - Laboratory Test Results



BASE MAP REPRODUCED FROM MICROSOFT STREETS AND TRIPS (C. 2008)

GPI GEOTECHNICAL PROFESSIONALS, INC.

VENICE AUXILLARY PUMP PLANTS

GPI PROJECT NO. 2500.061 | SCALE: 1" = 2000'

SITE LOCATION MAP

FIGURE 1



EXPLANATION

RW-1 — APPROXIMATE LOCATION AND NUMBER OF EXPLORATORY BORING

C-2 — APPROXIMATE LOCATION AND NUMBER OF CONE PENETRATION TEST

0 30 60 FEET

N

BASE MAP REPRODUCED FROM NAVIGATE LA MAP: (UNDATED)

GPI GEOTECHNICAL PROFESSIONALS, INC.

VENICE AUXILLARY PUMP PLANTS

GPI PROJECT NO.: 2500.061 | SCALE: 1" = 30'

SITE PLAN

FIGURE 2

APPENDIX A

APPENDIX A

CONE PENETRATION TESTS

The subsurface conditions were investigated by performing five Cone Penetration Tests (CPT's) at the site. The soundings were advanced to depths ranging from 40.5 to 80.5 feet below existing grades. The locations of the CPT's are shown on the Site Plan, Figure 2. The latitude and longitude of each CPT location and distances from the northeastern and northwestern fences at the site are presented below:

CPT No.	Latitude	Longitude	Distance (feet)	
			from NE Fence	from NW Fence
C-1	33° 58' 34.44"	-118° 27' 40.62"	32	8
C-2	34.03"	40.33"	22	48
C-3	34.29"	40.89"	48	9
C-4	33.98"	40.67"	51	48
C-5	34.12"	41.13"	75	16

The Cone Penetration Test consists of pushing a cone-tipped probe into the soil deposit while simultaneously recording the cone tip resistance and side friction resistance of the soil to penetration (refer to Figure A-1). The CPT's described in this report were conducted in general accordance with ASTM specifications (ASTM D 5778) using an electric cone penetrometer.

The CPT equipment consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to push the cone and rods into the soil while a continuous record of cone and friction resistance versus depth is obtained in both analog and digital form at the ground surface. A specially designed truck is used to transport and house the test equipment and to provide a 30-ton reaction to the thrust of the hydraulic rams.

Standard data obtained during a CPT consists of continuous stratigraphic information with close vertical resolution. Stratigraphic interpretation is based on relationships between cone tip resistance and friction resistance. The calculated friction ratio (CPT friction sleeve resistance divided by cone tip resistance) is used as an indicator of soil type. Granular soils typically have low friction ratios and high cone resistance, while cohesive or organic soils have high friction ratios and low cone resistance. These stratigraphic material categories form the basis for all subsequent calculations which utilize the CPT data.

Computer plots of the reduced CPT data acquired for this investigation are presented in Figures A-2 to A-6 of this appendix. The field testing and computer processing was performed by Kehoe Testing and Engineering under subcontract to Geotechnical Professionals Inc. (GPI). The interpreted soil descriptions were prepared by GPI.

The CPT locations were laid out in the field by measuring from existing site features. Upon completion, the uncaved portions of the CPT holes were backfilled with bentonite chips.

Ground surface elevations at the CPT locations were estimated from Google Earth and should be considered very approximate.

The cone penetrometer used for the project was equipped with a pore pressure transducer to measure both transient and stabilized pore pressures. At selected depths in sandy soils, the penetration was stopped until stabilized pore pressures were obtained as an indication of the static piezometric groundwater levels. The piezometric measurements are summarized below.

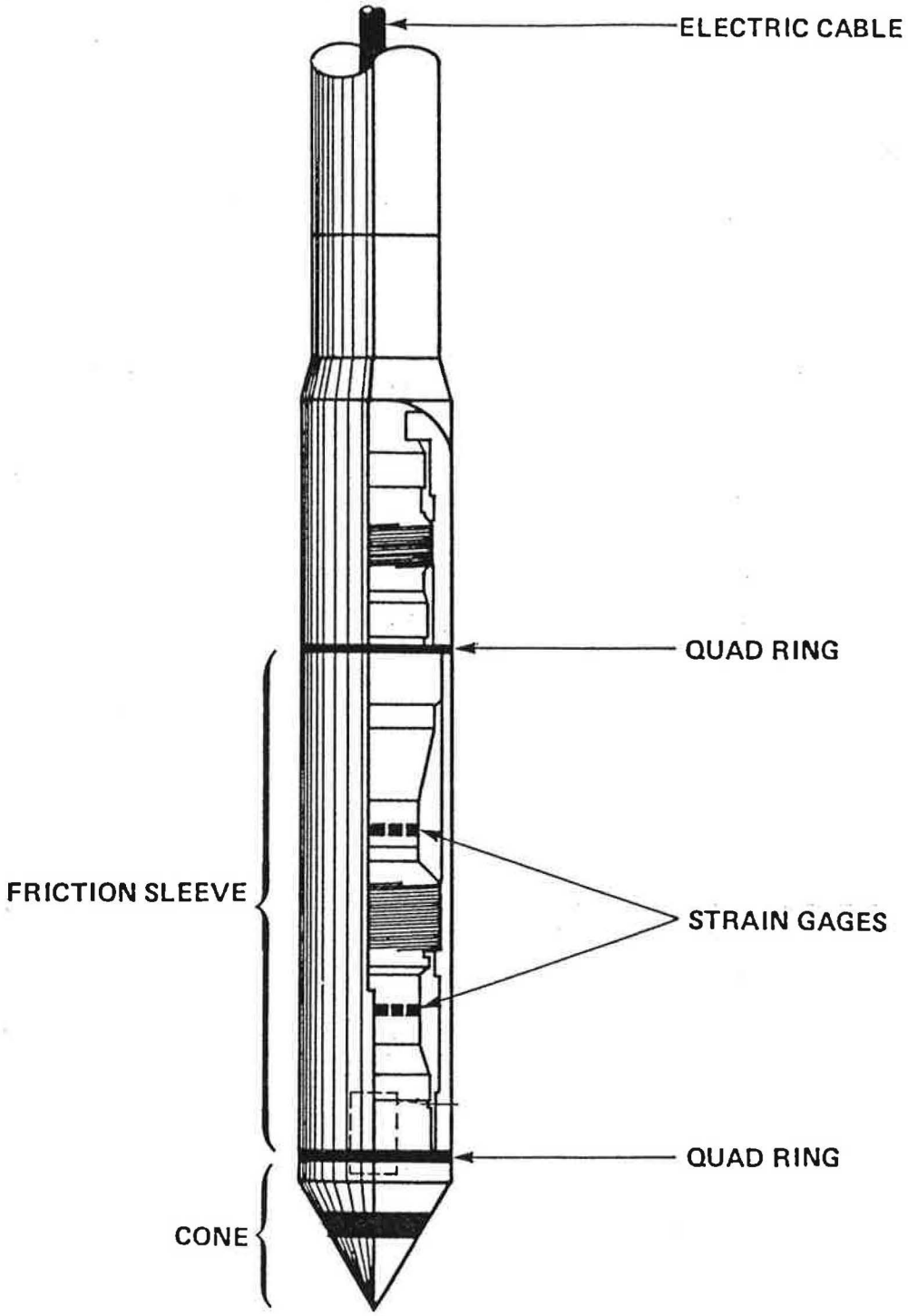
CPT NO.	Depth (ft)	Static Pore Pressure (psi)	Piezometric Groundwater Depth (ft)
C-2	18.8	6.2±	4.5
C-2	37.7	13.9	5.6
C-3	21.5	7.0±	5.3
C-3	37.8	13.7	6.1

The cone penetrometer was also equipped with a tri-axial geophone set and impact source for obtaining shear wave velocity measurements versus depth in accordance with ASTM D 7400-08. Such measurements were obtained at 5-foot depth intervals in CPT C-4. The results of the measurements are summarized below:

Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
5.16	4.16	6.50	9.76	666.42	
10.05	9.05	10.34	16.54	625.11	565.65
15.07	14.07	14.93	25.47	586.26	514.29
20.10	19.10	19.74	34.62	570.29	525.86
25.22	24.22	24.73	41.43	596.93	732.32
30.13	29.13	29.56	54.58	541.52	366.94
35.14	34014	34.50	62.96	548.03	590.48
40.12	39.12	39.44	67.44	584.79	1101.35
45.06	44.06	44.34	71.58	619.49	1184.68
50.08	49.08	49.33	76.05	648.71	1116.61
55.01	54.01	54.24	81.35	666.76	925.83
60.04	59.04	59.25	86.39	685.86	994.13
64.98	63.98	64.18	90.14	711.95	1313.00
70.14	69.14	69.32	95.61	725.03	940.67
75.04	74.04	74.21	99.75	743.95	1180.70
80.11	79.11	79.27	103.41	766.54	1382.30

Notes:

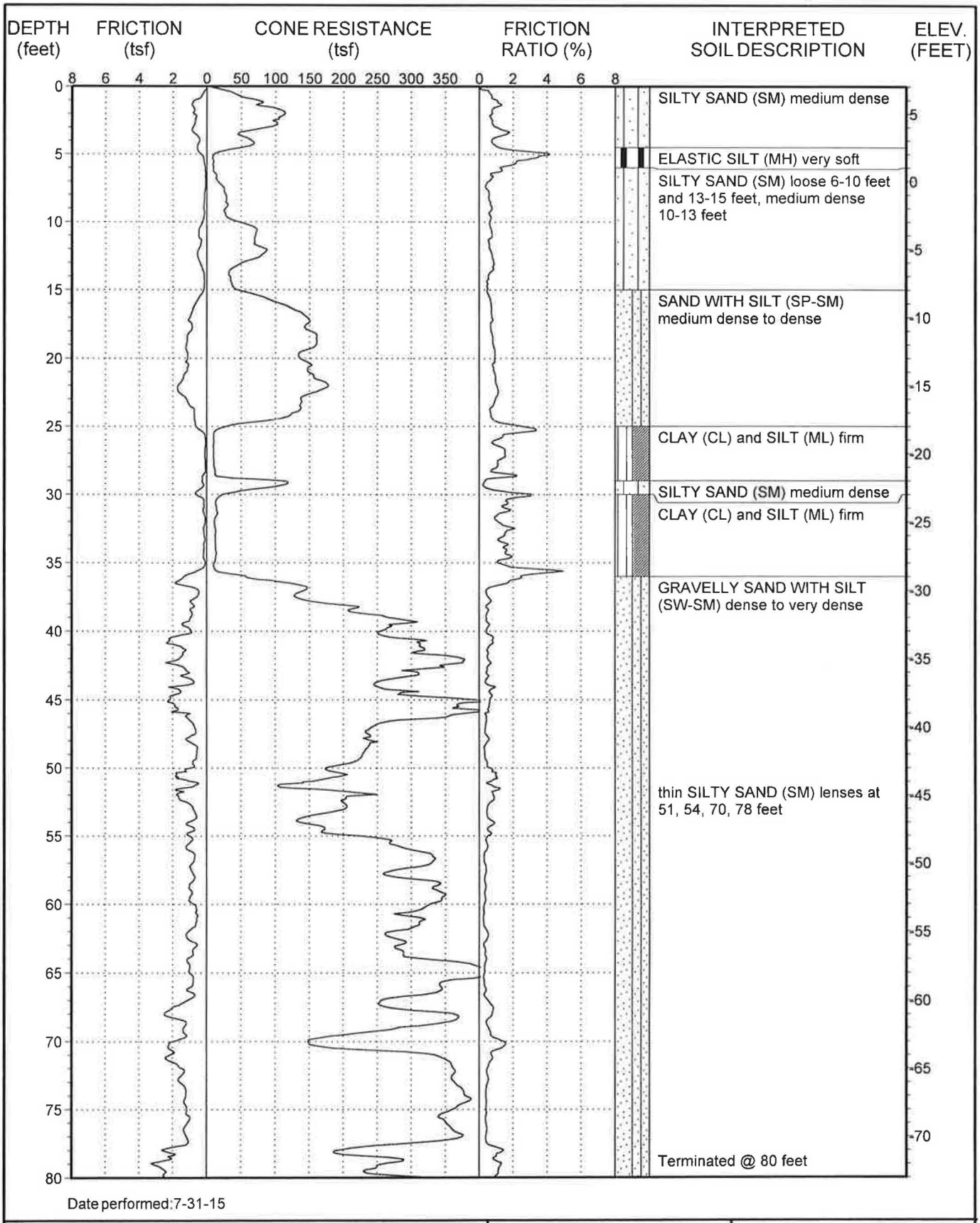
1. Shear Wave Source Offset = 5 ft
2. S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
3. Interval S-Wave Velocity = (Travel Dist2-Travel Dist1) / (Time2-Time1)



GPI GEOTECHNICAL PROFESSIONALS INC.

CONE PENETROMETER

FIGURE A-1



Date performed:7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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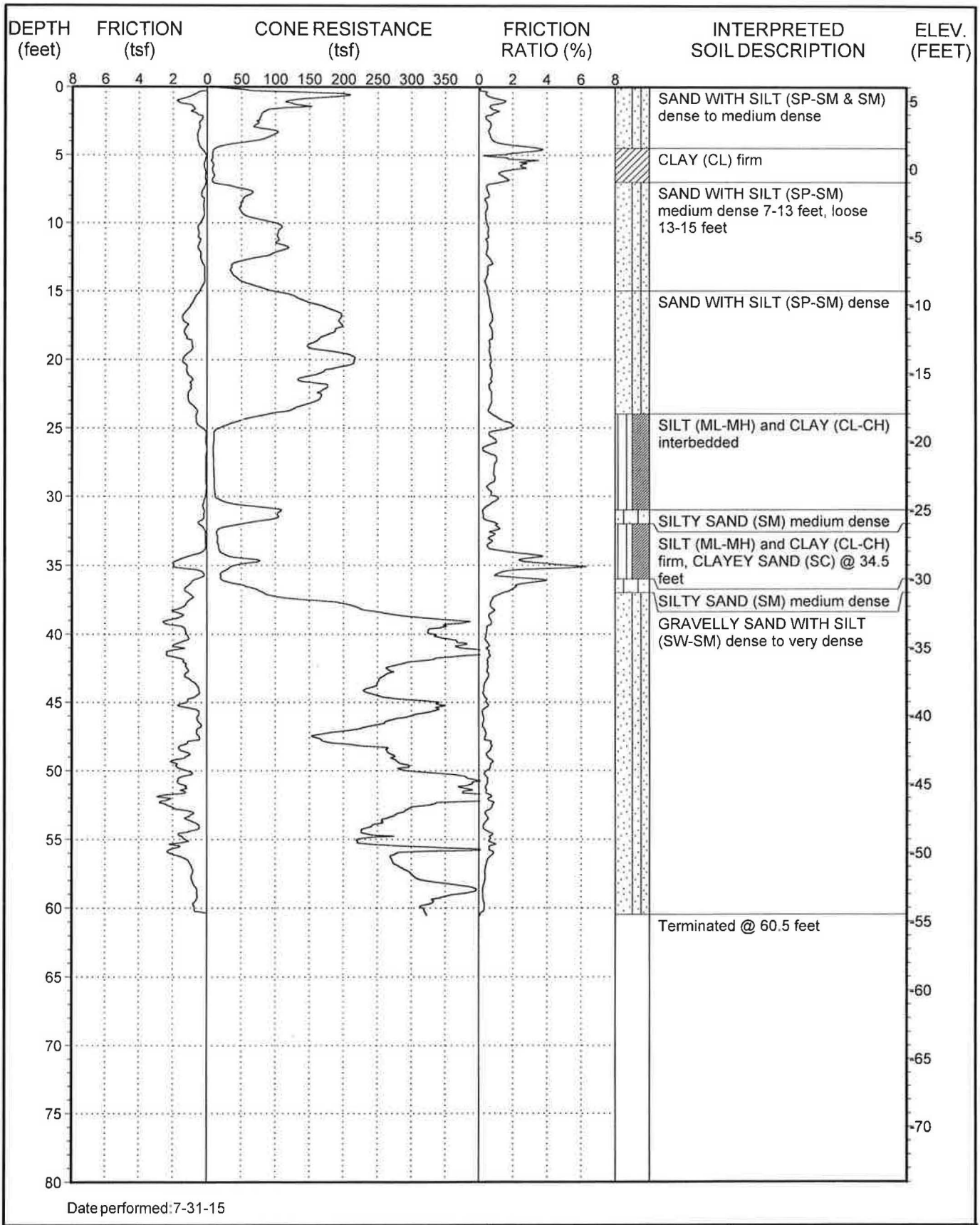
VENICE AUXILARY PUMP PLANT

LOG OF CPT NO. C-1

FIGURE A-2



Date performed: 7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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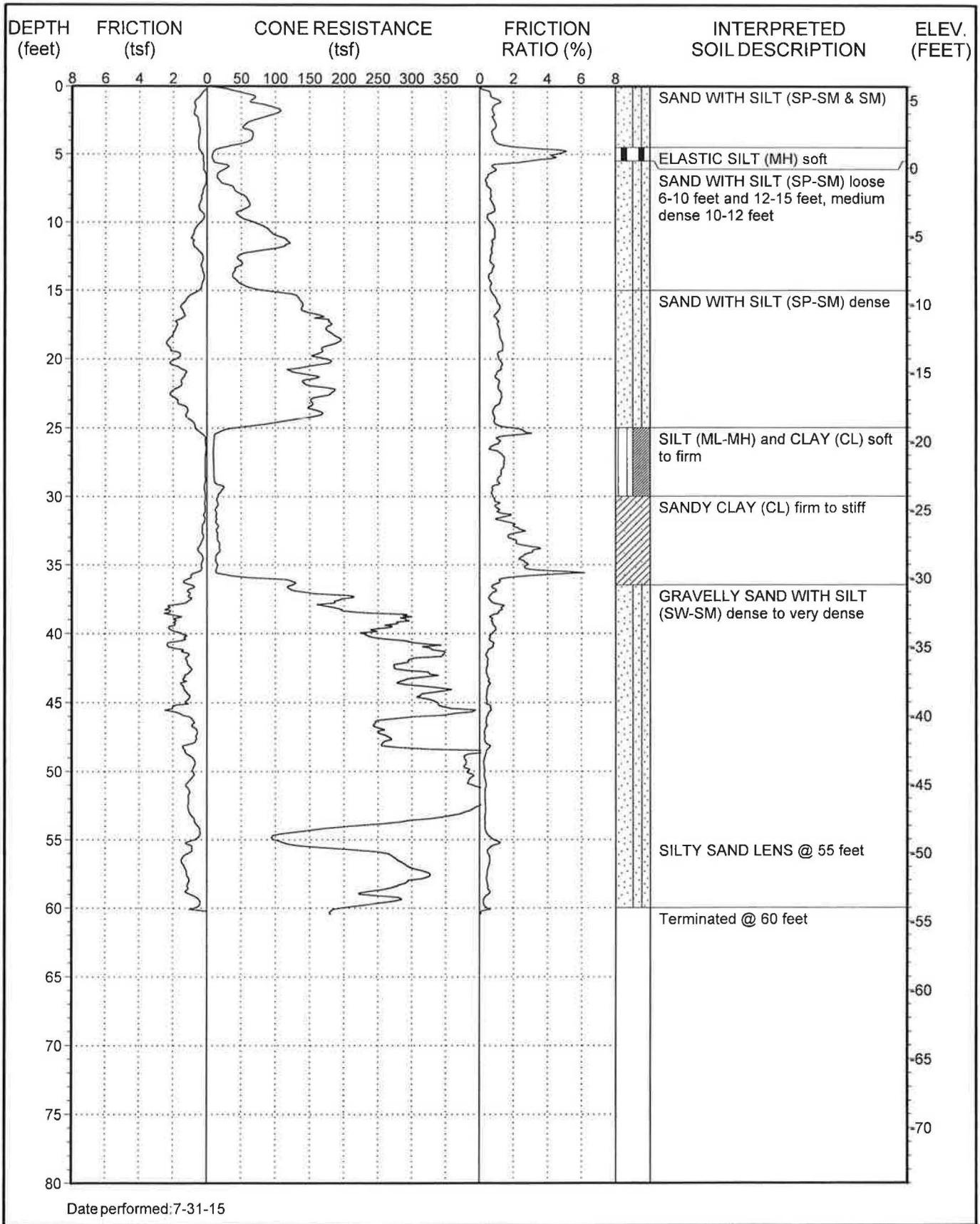
LOG OF CPT NO. C-2

FIGURE A-3



Date performed:7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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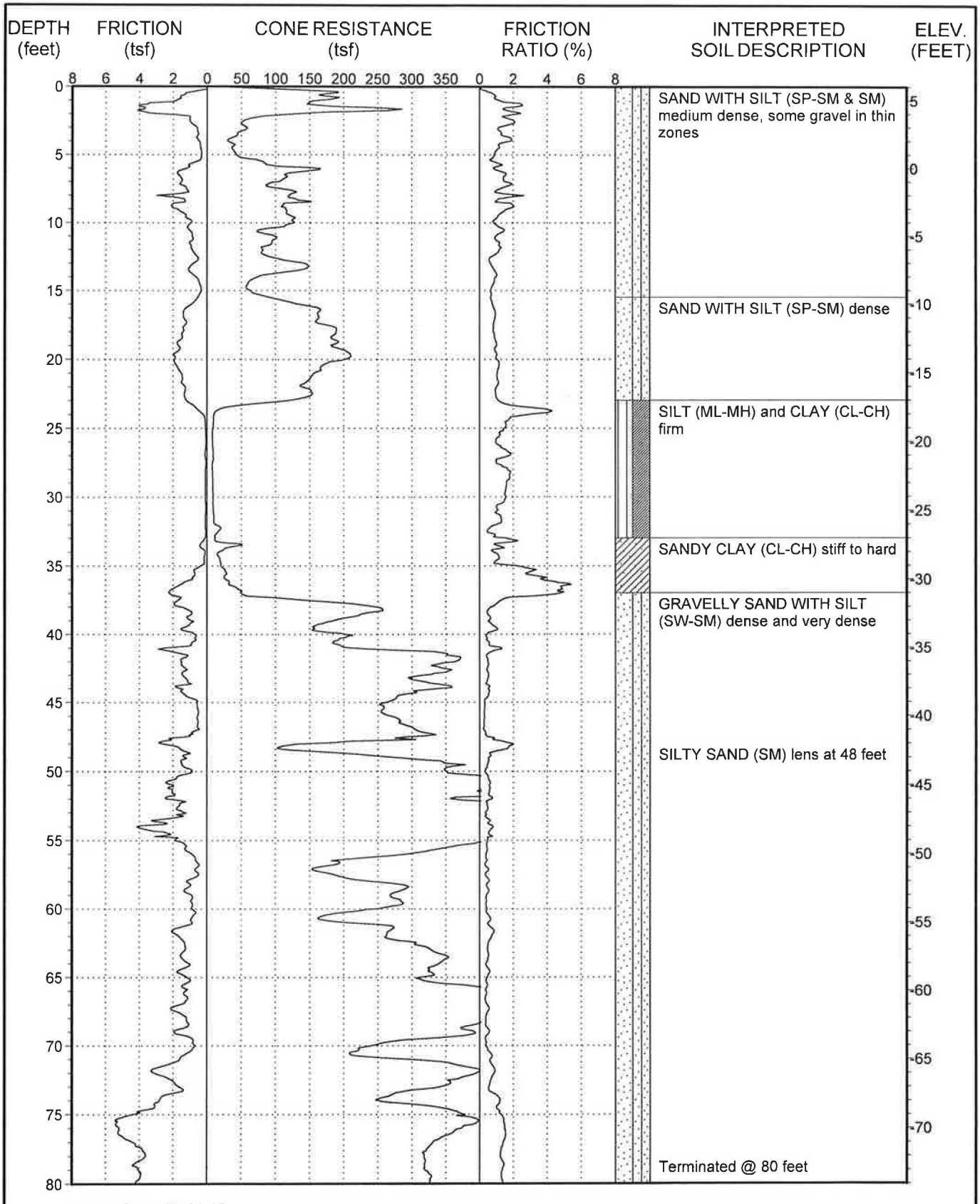
PROJECT NO.: 2500.06I
VENICE AUXILARY PUMP PLANT

LOG OF CPT NO. C-3

FIGURE A-4



Date performed:7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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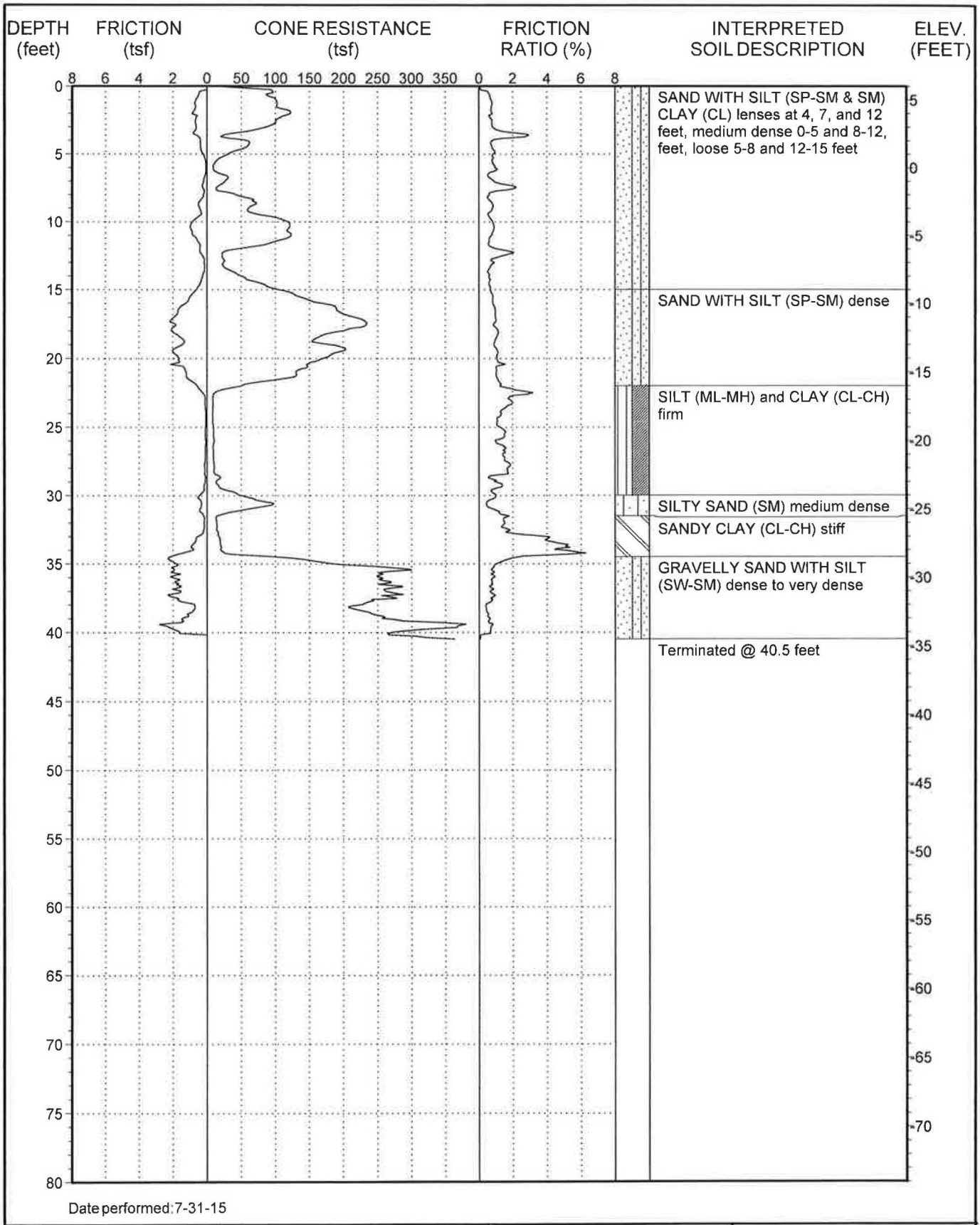
LOG OF CPT NO. C-4

FIGURE A-5



Date performed: 7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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VENICE AUXILARY PUMP PLANT

LOG OF CPT NO. C-5

FIGURE A-6

APPENDIX B

APPENDIX B

EXPLORATORY BORINGS

The subsurface conditions at the site were investigated by drilling and sampling three rotary wash borings. The borings were advanced to depths ranging from 39.5 to 79.5 feet below the existing ground surface. The locations of the explorations are shown on the Site Plan, Figure 2. The latitude and longitude of each boring location and distances from the northeastern and northwestern fences at the site are as follows:

Boring No.	Latitude	Longitude	Distance (feet)	
			from NE Fence	from NW Fence
RW-1	33° 58' 34.48"	-118 27' 40.44"	7	11
RW-2	34.12"	40.71"	49	25
RW-3	33.73"	40.83"	75	68

Relatively undisturbed soil samples were obtained using two types of samplers. Thin walled Shelby tubes were used to obtain samples of relatively compressible silts and clays, in accordance with ASTM D 1587-08. The tubes were 30 inches long, had an inside diameter of 2.87 inches and an outside diameter of 3.00 inches. The Shelby tubes were pushed into the soils by hydraulic pressure. Thicker-walled, brass-ring lined samplers were used to sample mainly more granular soils and some cohesive soils, in accordance with ASTM D 3550-01. The sampler had an inside diameter of 2.42 inches and outside diameter of 3.25 inches. The sampler was driven into the soil using an automatic trip hammer weighing 140 pounds and dropping 30 inches. After seating the sampler into the soil 4 inches, the number of blows needed to drive the sampler 12 inches was recorded as the penetration resistance.

Relatively disturbed samples were also obtained using a split-spoon sampler by means of the Standard Penetration Test (SPT, ASTM D 1586-11). The spoon sampler was driven into the soil by a 140-pound hammer dropping 30 inches, employing the automatic trip hammer described above. The number of blows for each 6 inches of penetration was recorded and is presented on the logs. The blowcount for the first increment should be considered the seating blows while the sum of blows for the last 12 inches of penetration is considered the Standard Penetration Test blowcount. These values are the raw uncorrected blowcounts.

Bulk samples of the soils within the upper 4 feet were obtained with an auger at all boring locations.

The field explorations for the investigation were performed under the continuous technical supervision of GPI's representative, who visually inspected the site, maintained detailed logs of the borings, classified the soils encountered, and obtained relatively undisturbed samples for examination and laboratory testing. The soils encountered in the borings were classified in the field and through further examination in the laboratory in accordance with the Unified Soils Classification System. Detailed logs of the borings are presented in Figures B-1 to B-3 in this appendix. Laboratory test results of moisture content, density,

fines content (fraction passing No. 200 sieve) and Atterberg Limits are presented on the logs. For other laboratory tests, the type of test performed is shown with the following abbreviations:

CON – Consolidation Test
DS – Direct Shear Test
UC – Unconfined Compression Test
UU – Unconsolidated Undrained Triaxial Test

At selected depth intervals, soils were screened for organic vapors using a photo-ionization detector (Multi-Rae E-033). Organic vapors were not detected for any of the samples.

Upon completion of the borings, the boreholes were bailed (drilling mud removed) and groundwater level was measured. The boreholes were then backfilled with cement-bentonite grout to within approximately 2 feet from the ground surface and the balance was filled with soil. The grout was pumped from the bottom of the borehole up. Excess soil cuttings were placed in 55-gallon drums and hauled off site. The ground surface elevations at the exploration locations were estimated from a Google Earth and should be considered to be very approximate.

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	**SILTY SAND (SM)** brown, slightly moist, trace gravel, medium dense	5
		5 10 14	S			
48.9		0 1	D	5	**ELASTIC SILT (MH)** grey, wet, very soft LL=62, PI=33, PI=29, CON	
27.1	91	5 7	D		**SILTY SAND (SM)** grey, wet, loose to medium dense @ 7 feet, DS	0
		2 5 8	S	10	@ 10 feet, fines content 15.6%	
23.5	96	8 10	D		**SAND (SP)** grey, wet, medium dense @ 13 feet, fines content 2%	-5
		8 10 12	S	15	**SAND WITH SILT (SP-SM)** grey, wet, medium dense	-10
23.8	99	15 29	D			
		9 14 14	S	20	@ 20 feet, fines content 7.7%	-15
24.4	95	14 20	D		@ 23 feet, DS	
42.6	79		T	25	**LEAN CLAY WITH SAND (CL)** grey, wet, firm LL=40, PL=23, PI=17, CON, UC	-20
34.1	89					
18.3	100				**SANDY SILT (ML)** grey, wet, firm	
					LEAN CLAY (CL) grey, wet, firm	
25.5	103	2 4	D	30	**SANDY SILT (ML)** grey, wet, firm	
17.3	110					
			T		**SANDY CLAY (CL)** grey, wet, firm with CLAYEY SAND (SC) @ 32 feet, fines content 49.8%	-25
10.6	126	17 25	D	35	**GRAVELLY SAND WITH SILT (SW-SM)** grey, wet, dense	-30
		20 22 45	S		@ 38 feet, fines content 10.0%	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-7-15

EQUIPMENT USED: 5 " Rotary Wash

GROUNDWATER LEVEL (ft): 8

GPI

PROJECT NO.: 2500.061

VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-1

FIGURE B-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
13.6	120	22 30	D	40	@ 40 feet, DS **SAND WITH SILT (SP-SM)** grey, wet, dense with variable gravel content	-35
		21 23 25	S			
		29 40	D	45		-40
		16 20 24	S			
					Total depth 49 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-7-15
EQUIPMENT USED: 5 " Rotary Wash
GROUNDWATER LEVEL (ft): 8

GPI

PROJECT NO.: 2500.06I
VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-1

FIGURE B-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
				0	**SILTY SAND (SM)** brown, moist, medium dense, with gravel	5
		6 7 5	S			
		8 9 14	S	5	@ 5 feet, fines content 25.1% grey below 5 feet	0
19.2	93	11 12	D		wet below 7 feet	
		3 5 9	S	10	@ 10 feet, fines content 17.7%	-5
22.0	103	14 19	D		@ 13 feet, DS, sea shells	
		8 12 12	S	15	**SAND WITH SILT (SP-SM)** grey wet, medium dense to dense @ 15 feet, fines content 6.8%	-10
23.6	100	15 25	D			
		5 6 11	S	20	@ 20 feet, fines content 11.8%	-15
24.3	96	11 19	D		@ 23 feet, DS	
76.2	56		T	25	**FAT CLAY (CH)** grey, wet, firm LL=72, PL=30, PI=43, CON, UU	-20
			T		**CLAY WITH SAND (CL)** grey, wet, firm	
40.1	80			30	@ 29 feet, UC	
					CLAYEY SAND (SC) grey, wet, trace gravel	-25
17.0	120		T		**CLAY WITH SAND (CL)** grey, wet, firm @ 33 feet, fines content 27.9%	
15.9	121			35	**SILTY SAND (SM)** grey, wet	-30
					SAND WITH SILT (SW-SM) grey, wet, medium dense to dense, with gravel	
		15 18	S		@ 39 feet, fines content 9.2 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-6-15
EQUIPMENT USED: 5 " Rotary Wash
GROUNDWATER LEVEL (ft): 9

GPI

PROJECT NO.: 2500.06I
VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-2

FIGURE B-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
		17		40	**SAND WITH SILT AND GRAVEL (SW-SM to SP-SM)** variable silt and gravel content, grey, wet, dense	-35
8.7	128	28 52	D			
		25 29 20	S	45	@ 45 feet, fines content 9.7%	-40
7.7		24 29	D			
		18 21 22	S	50	**SAND WITH SILT (SP-SM)** no gravel, grey, wet, dense to very dense, hard sandy silt lens at 51 feet @ 50 feet, fines content 7.0%	-45
20.2	105	22 36	D		@ 53 feet, DS	
		15 25 27	S	55	@ 56 feet, fines content, 10.5%	-50
18.2	107	26 29	D			
		29 34 43	S	60	variable silt and gravel content with silty fine sand layers below 60 feet @ 61 feet, fines content 7.9%	-55
18.5	108	32 45	D			
		21 35 25	S	65		-60
12.7	110	40 50/5"	D	70		-65
		18 50 33	S			
25.9	100	30 39	D	75		-70
		17 30 38	S		Boring Terminated at 79.5 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-6-15

EQUIPMENT USED: 5 " Rotary Wash

GROUNDWATER LEVEL (ft): 9

GPI

PROJECT NO.: 2500.06I

VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-2

FIGURE B-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
			B	0	**SILTY SAND (SM)** brown, slightly moist, loose to medium dense, with gravel	5
		3 5 4	S			
		7 12 9	S	5	@ 5 feet, fines content 19.9% grey, wet, below 5 feet, variable silt content	0
8.4	118	9 17	D		interlayered sand with silt (SP-SM) @ 8 feet, fiens content 8.5%, DS	
		3 4 6	S	10	@ 10 feet, fines content 20%	-5
23.0	100	4 7	D			
		10 8 7	S	15	**SAND WITH SILT (SP-SM)** grey, wet, medium dense @ 15 feet, fines content 7.5%	-10
25.4	97	15 23	D			
		8 7 7	S	20	@ 20 feet, fines content 5.3%	-15
46.2	75		T		**LEAN CLAY (CL)** grey, wet, firm, with trace of sand @ 23 feet, UU @ 23.6 feet, LL=45, PL=26, PI=19	
43.8	73		T	25		-20
25.2	100			30	**CLAYEY SAND (SC)** grey, wet, firm/loose	-25
14.2	118		T		**CLAY WITH SAND (CL)** grey, wet, firm	
12.7	117				**CLAYEY SAND (SC)** grey, wet @ 34 feet, fines content 46.5%	
10.0	128	15 29	D	35	**SAND WITH SILT AND GRAVEL (SW-SM)** grey, wet, dense	-30
		19 29 27	S		Total Depth 39.5 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-6-15

EQUIPMENT USED: 5 " Rotary Wash

GROUNDWATER LEVEL (ft): 8

GPI

PROJECT NO.: 2500.06I

VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-3

FIGURE B-3

APPENDIX C

APPENDIX C

LABORATORY TESTS

INTRODUCTION

Representative undisturbed soil samples and bulk samples were carefully packaged in the field and sealed to prevent moisture loss. The samples were then transported to our Cypress office for examination and testing assignments. Laboratory tests were performed on selected representative samples as an aid in classifying the soils and to evaluate the physical properties of the soils affecting foundation design and construction procedures. Detailed descriptions of the laboratory tests are presented below under the appropriate test headings. Test results are presented on the boring logs and in the figures that follow.

MOISTURE CONTENT AND DRY DENSITY

Moisture content and dry density were determined from a number of the ring and Shelby tube samples. The samples were first trimmed to obtain volume and wet weight and then were dried in accordance with ASTM D 2216. After drying, the weight of each sample was measured, and moisture content and dry density were calculated. Moisture content and dry density values are presented on the boring logs in Appendix B.

COMPACTION TEST

A maximum dry density/optimum moisture test was performed in accordance with ASTM D 1557 on a representative bulk composite sample of the upper 4 feet of the on-site soils. The test results are graphically presented in Figure C-1 and summarized below.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	OPTIMUM MOISTURE* (%)	MAXIMUM DRY DENSITY* (pcf)
RW-1, -2, -3	0-4	Silty Sand with Gravel (SM)	9.0	125

Note: * includes rock correction

EXPANSION INDEX

One expansion index test was performed in accordance with D 4829 on a composite bulk sample, representative of the soils in the upper 4 feet of the site. The test results are presented below:

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	EXPANSION INDEX
Composite RW-1, 2,3	0-4	Silty Sand with gravel (SM)	0

ATTERBERG LIMITS

Liquid and plastic limits were determined for selected samples in accordance with ASTM D 4318. The results of the Atterberg Limits tests are presented in Figure C-2.

GRAIN SIZE DISTRIBUTION

A total of 24 soil samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve. For 16 of the samples, the retained material was run through a standard set of sieves in accordance with ASTM D 422. The weight of soil retained on each sieve was recorded and the total dry weight was calculated. The grain size distribution data from the full sieve analyses is presented in Figures C-3 through C-8. A summary of the percentages passing the No. 200 sieve (ASTM D1140) is presented below.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
RW-1	32	Clayey Sand (SC)	49.8
	38	Gravelly Sand with Silt (SP-SM)	10.0
	43	Sand with Silt and Gravel (SW-SM)	9.8
RW-2	61	Sand with Silt and Gravel (SW-SM)	7.9
RW-3	8	Sand with Silt (SP-SM)	8.5
	10	Silty Sand (SM)	20.0
	15	Sand with Silt (SP-SM)	7.5
	20	Sand with Silt (SP-SM)	5.3

CONSOLIDATION

One-dimensional consolidation testing was performed on several undisturbed samples in accordance with ASTM D 2435. After trimming the ends, the samples were placed in the consolidometer and loaded to 0.25 or 0.4ksf. Thereafter, the samples were incrementally loaded to a maximum load of either 12.8 or 16 ksf. The samples were inundated at 0.4, or 0.5 ksf. Sample deformation was measured to 0.0001 inch. Rebound behavior was investigated by unloading the samples back to either 0.4 or 0.8 ksf. Results of the consolidation tests, in the form of percent consolidation versus log pressure, are presented in Figures C-9 to C-11.

DIRECT SHEAR

Direct shear tests were performed on remolded bulk samples and undisturbed samples in accordance with ASTM D 3080. The bulk sample was remolded to approximately 95 percent of maximum density (ASTM D1557). The samples were placed in the shear machine, and a normal load was applied. The samples were inundated, allowed to consolidate, and then were sheared to failure. The tests were repeated on additional test

specimens under increased normal loads. Shear stress and sample deformation were monitored throughout the test. The results of the direct shear tests are presented in Figures C-12 to C-19.

UNCOFINED COMPRESSION TESTS

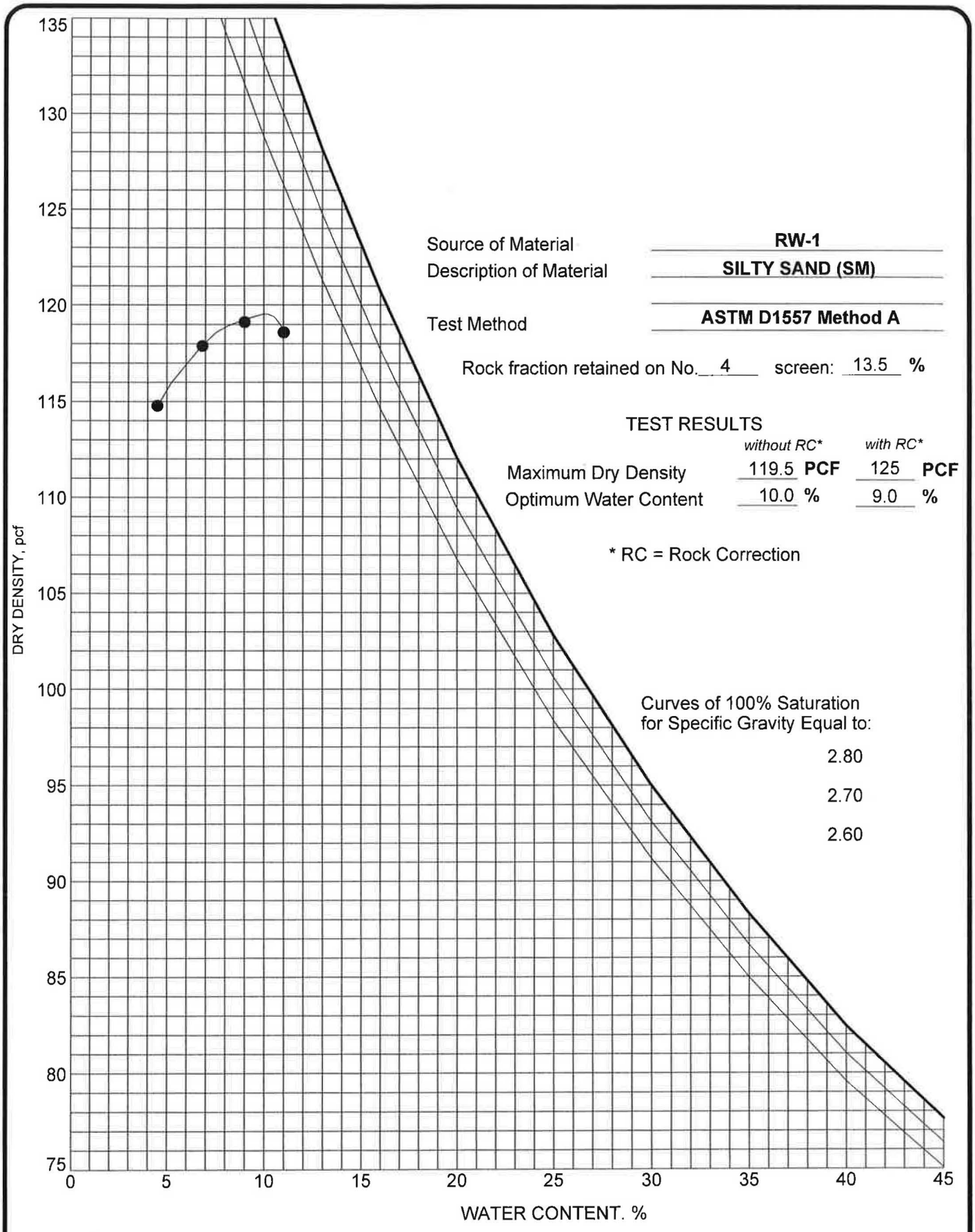
Unconfined compression tests were performed on two samples of cohesive soils in accordance with ASTM D 2166. Detailed test results are presented in Figures C-20 and C-21.

UNCONSOLIDATED UNDRAINED TRIAXIAL TESTS

Unconsolidated undrained triaxial tests were performed on two samples of cohesive soils in accordance with ASTM D 2850. Detailed test results are presented in Figures C-22 and C-23.

SOIL CORROSIVITY

Soil corrosivity testing on samples from shallow depths was performed by AP Engineering and Testing. Test results are presented in Figure C-24 at the end of this appendix.



Source of Material: **RW-1**

Description of Material: **SILTY SAND (SM)**

Test Method: **ASTM D1557 Method A**

Rock fraction retained on No. 4 screen: 13.5 %

TEST RESULTS

	*without RC**	*with RC**
Maximum Dry Density	119.5 **PCF**	125 **PCF**
Optimum Water Content	10.0 %	9.0 %

* RC = Rock Correction

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

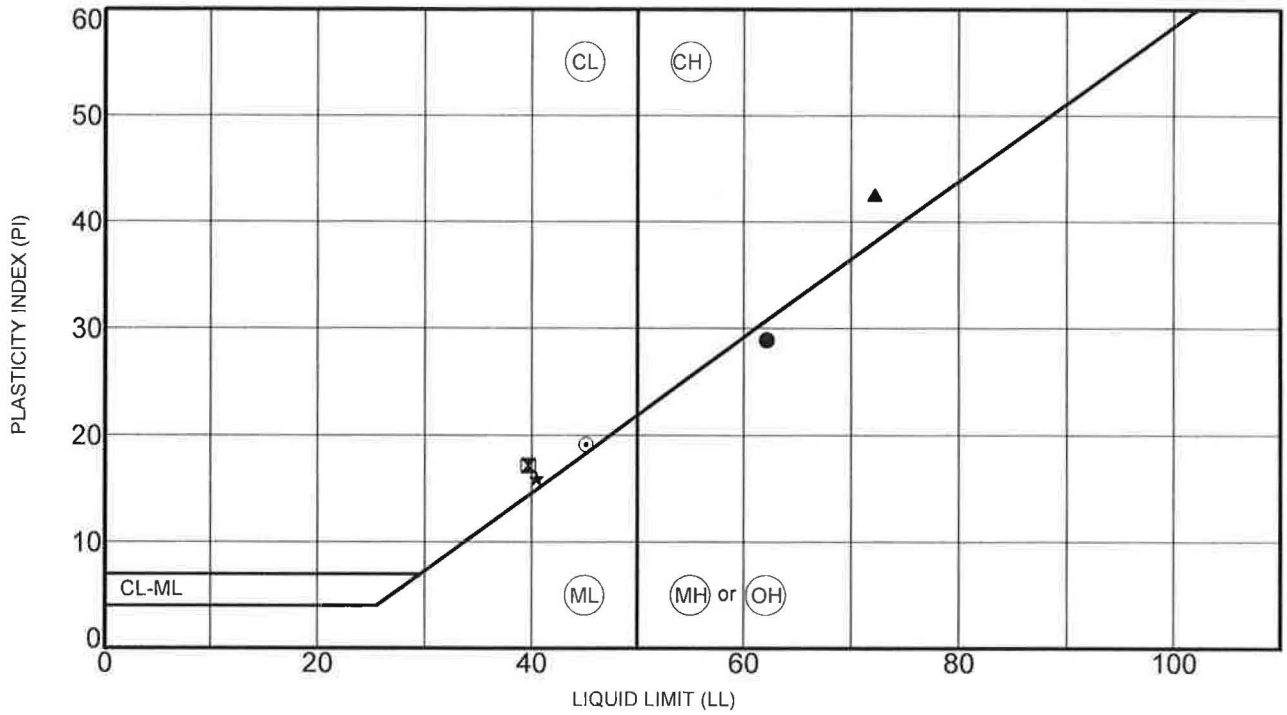
PROJECT: VENICE AUXILARY PUMP PLANT

PROJECT NO.2500.06I

GPI

MAXIMUM DENSITY - OPTIMUM MOISTURE TEST

FIGURE C1



	SAMPLE LOCATION		LL	PL	PI	Fines, %	Classification
●	RW-1	5-6	62	33	29		ELASTIC SILT (MH)
⊠	RW-1	26.1	40	23	17		LEAN CLAY WITH SAND (CL)
▲	RW-2	26.8	72	30	43		FAT CLAY (CH)
★	RW-2	29.6	40	25	16		SANDY CLAY (CL)
⊙	RW-3	23.6	45	26	19		LEAND CLAY WITH SAND (CL)

PROJECT: VENICE AUXILARY PUMP PLANT

PROJECT NO. 2500.06I

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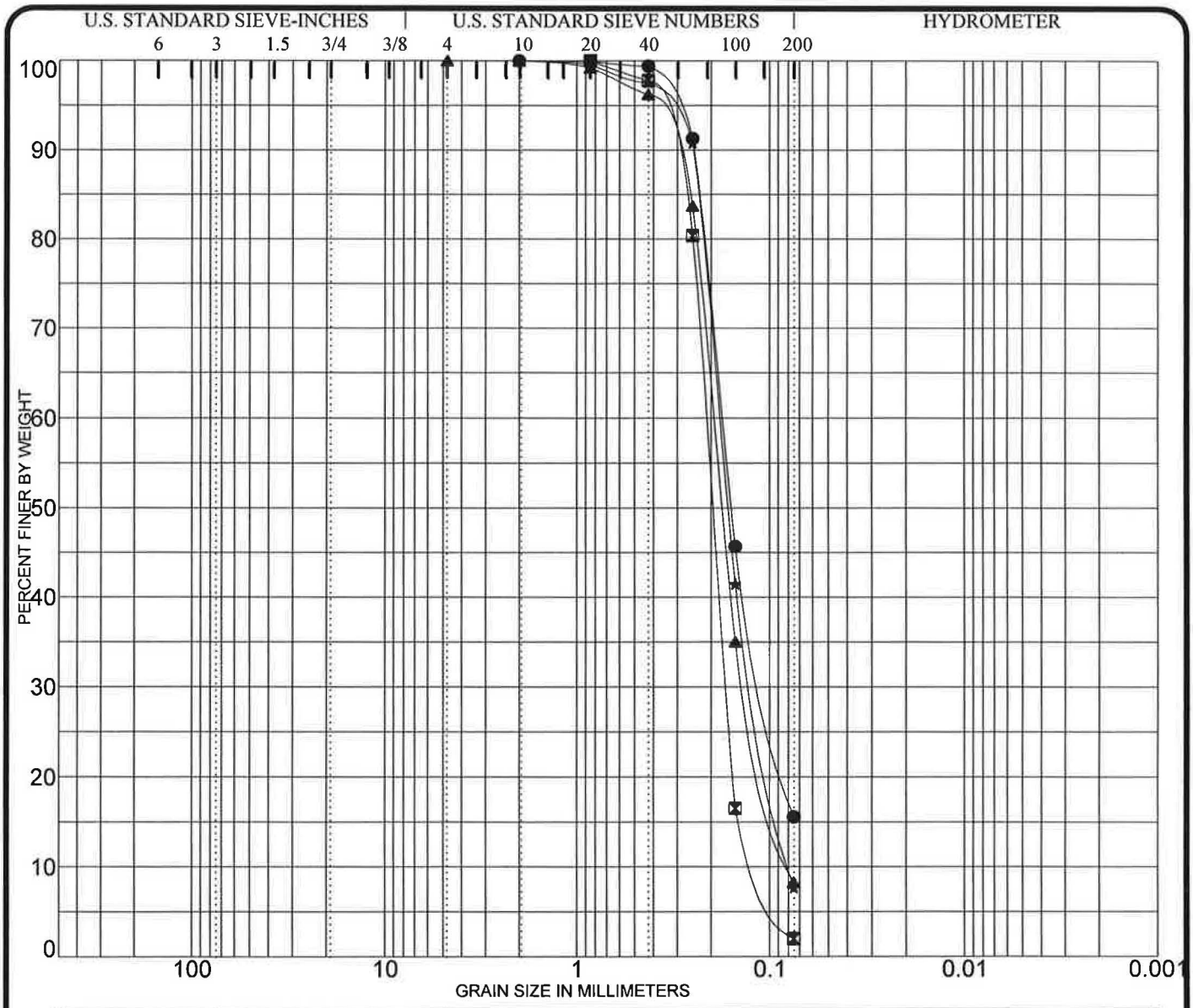
ATTERBERG LIMITS TEST RESULTS

FIGURE C-2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-1	10.0	SILTY SAND (SM)						
⊠	RW-1	12-13	SAND (SP)					1.20	1.9
▲	RW-1	15.0	SAND WITH SILT (SP-SM)					1.13	2.5
★	RW-1	20-21	SAND WITH SILT (SP-SM)					0.98	2.3

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-1	10.0	2.00	0.18	0.105		0.0	84.4	15.6	
⊠	RW-1	12-13	0.85	0.21	0.167	0.1099	0.0	98.0	2.0	
▲	RW-1	15.0	4.75	0.19	0.132	0.0784	0.0	91.7	8.3	
★	RW-1	20-21	2.00	0.18	0.118	0.0786	0.0	92.3	7.7	

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO. 2500.06I

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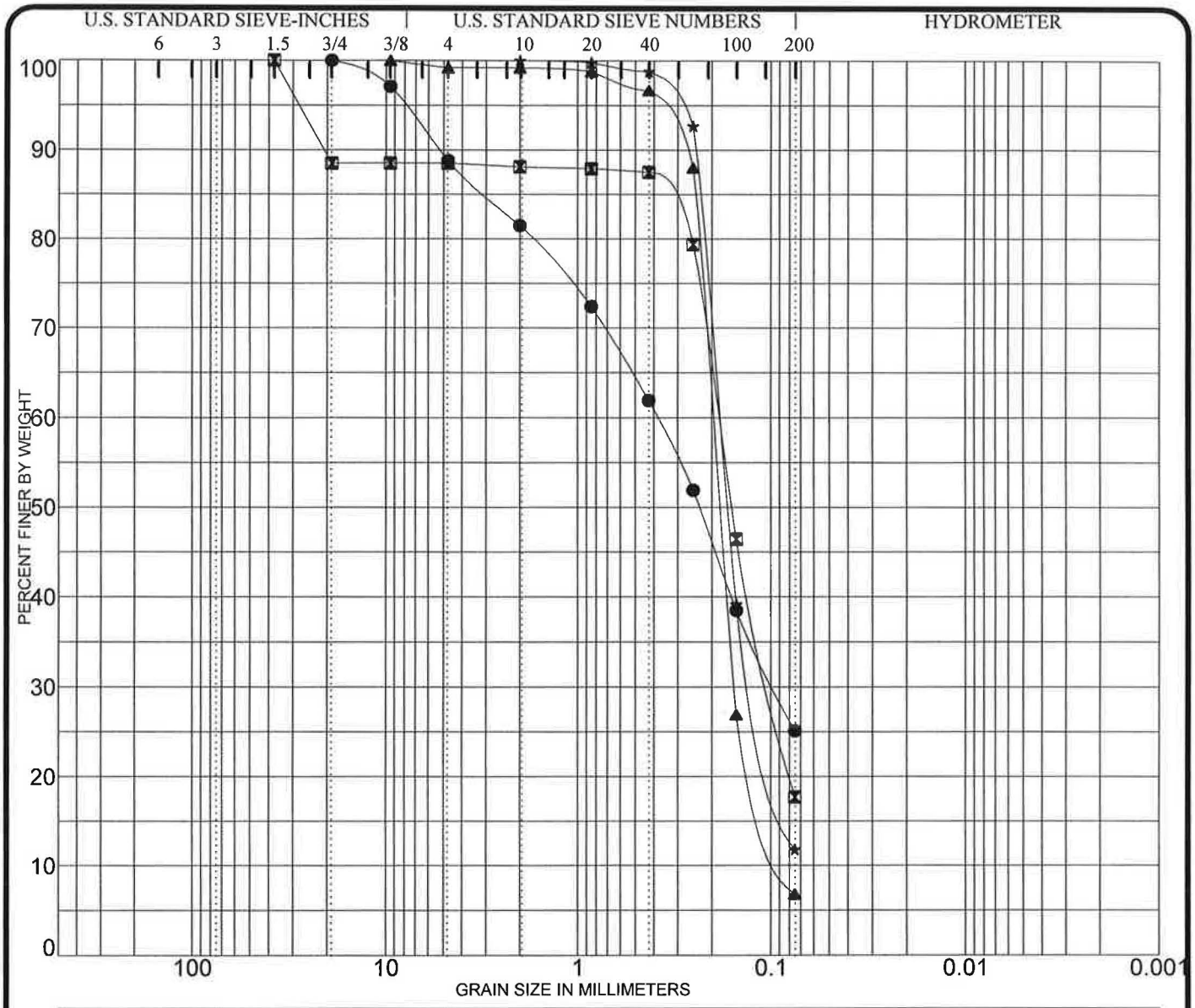
GRAIN SIZE DISTRIBUTION

FIGURE C-3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-2	5-6	SILTY SAND (SM) WITH GRAVEL						
⊠	RW-2	10-11	SILTY SAND (SM) WITH GRAVEL						
▲	RW-2	15-16	SAND WITH SILT (SP-SM)					1.43	2.4
★	RW-2	20-21	SAND WITH SILT (SP-SM)					1.08	2.6

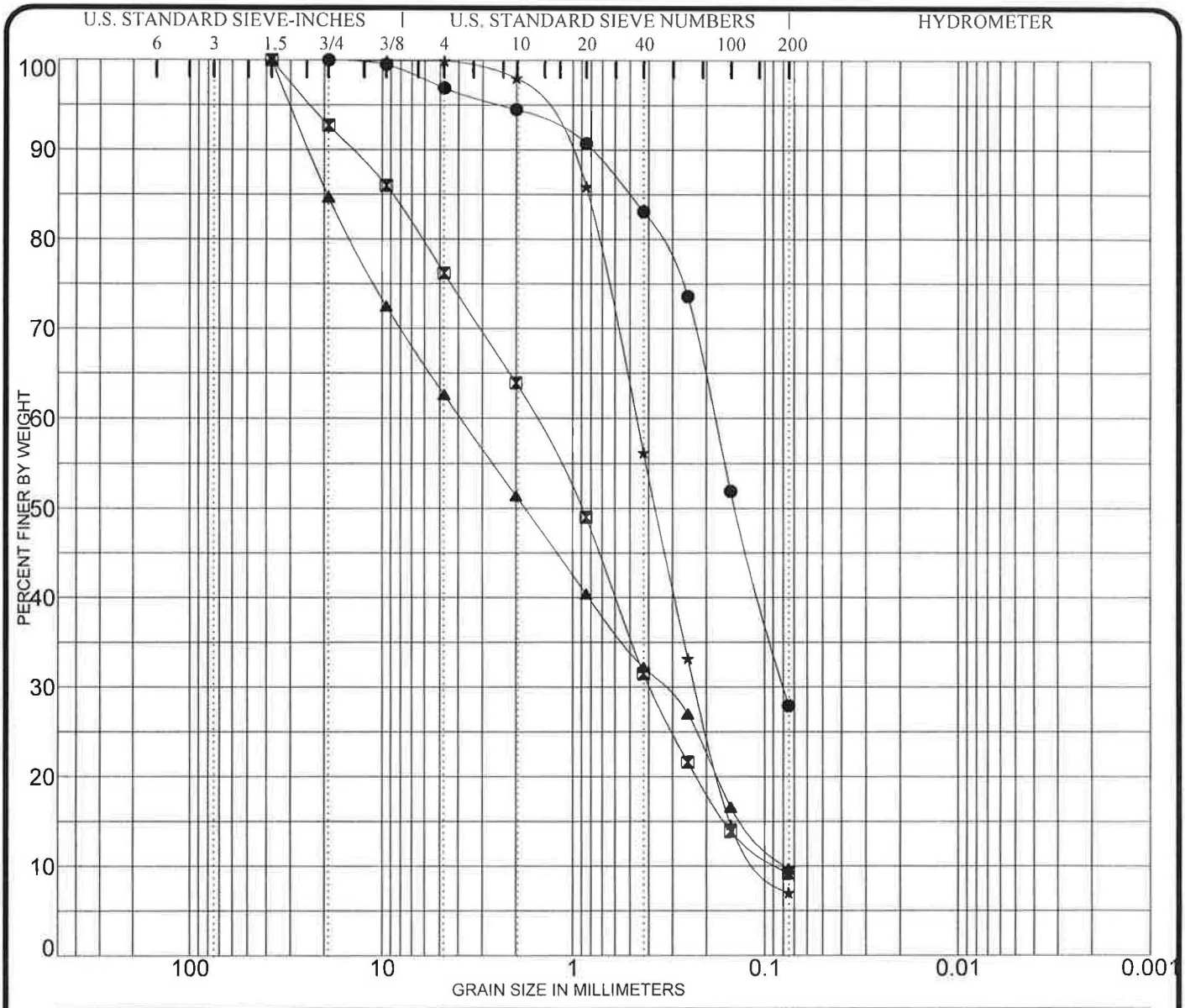
	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-2	5-6	19.00	0.38	0.097		11.2	63.7	25.1	
⊠	RW-2	10-11	37.50	0.19	0.101		11.5	70.8	17.7	
▲	RW-2	15-16	9.50	0.20	0.154	0.0838	0.8	92.4	6.8	
★	RW-2	20-21	2.00	0.18	0.119		0.0	88.2	11.8	

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO. 2500.06I

GPI

GRAIN SIZE DISTRIBUTION

FIGURE C-4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-2	33-34	SILTY SAND (SM)						
⊠	RW-2	39-40	SAND WITH SILT (SW-SM)					1.14	18.9
▲	RW-2	45-46	SAND WITH SILT (SP-SM)					0.38	50.3
★	RW-2	50-51	SAND WITH SILT (SP-SM)					1.14	4.7

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-2	33-34	19.00	0.18	0.080		3.1	69.0	27.9	
⊠	RW-2	39-40	37.50	1.60	0.392	0.0844	23.8	67.0	9.2	
▲	RW-2	45-46	37.50	3.89	0.340	0.0773	37.4	52.9	9.7	
★	RW-2	50-51	19.00	0.46	0.229	0.0986	0.1	92.9	7.0	

PROJECT: VENICE AUXILARY PUMP PLANT

PROJECT NO. 2500.06I

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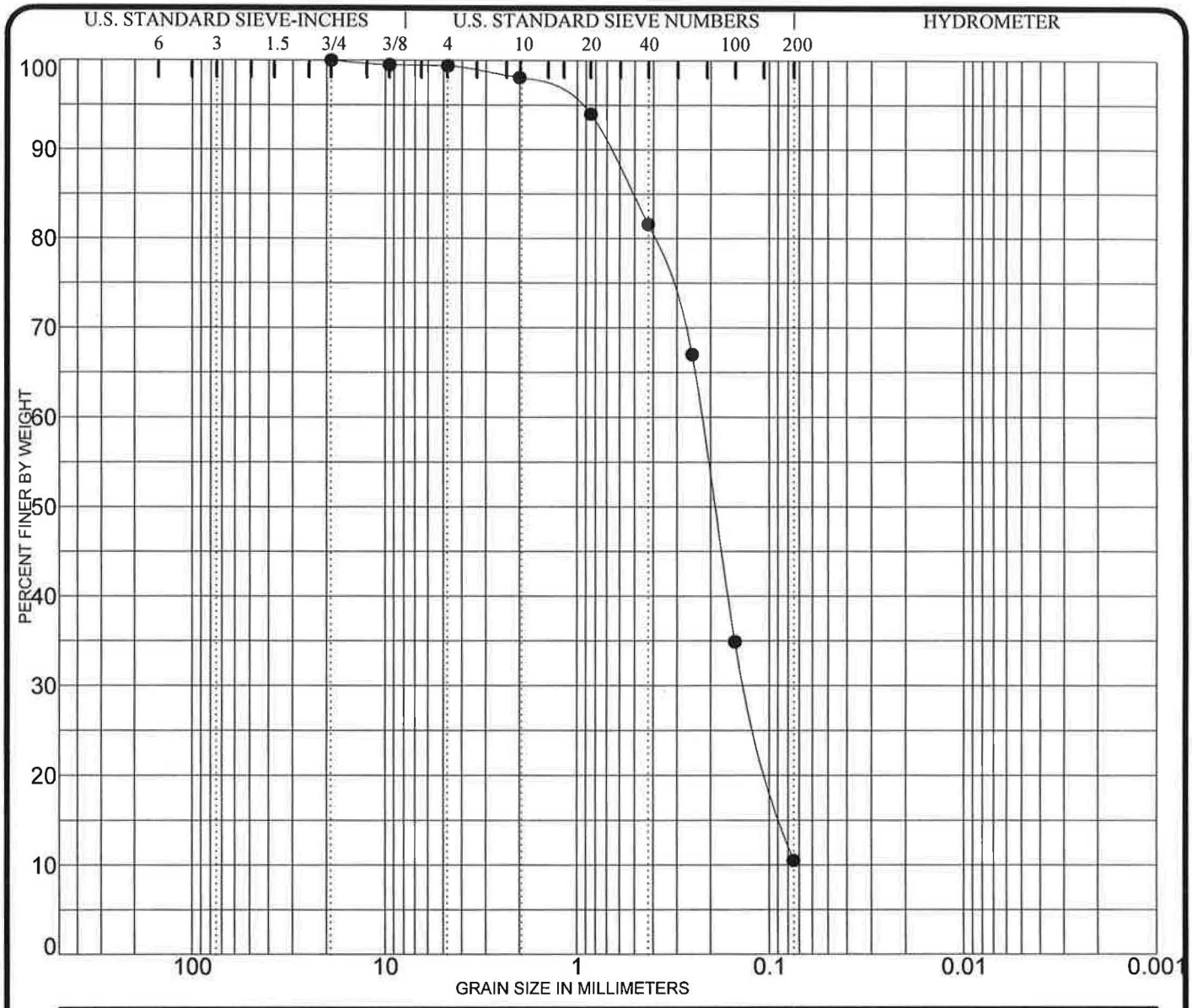
GRAIN SIZE DISTRIBUTION

FIGURE C-5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-2	56-57	SAND WITH SILT (SP-SM)					1.03	3.0

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-2	56-57	19.00	0.22	0.131		0.6	88.9	10.5	

PROJECT: VENICE AUXILARY PUMP PLANT

PROJECT NO. 2500.06I

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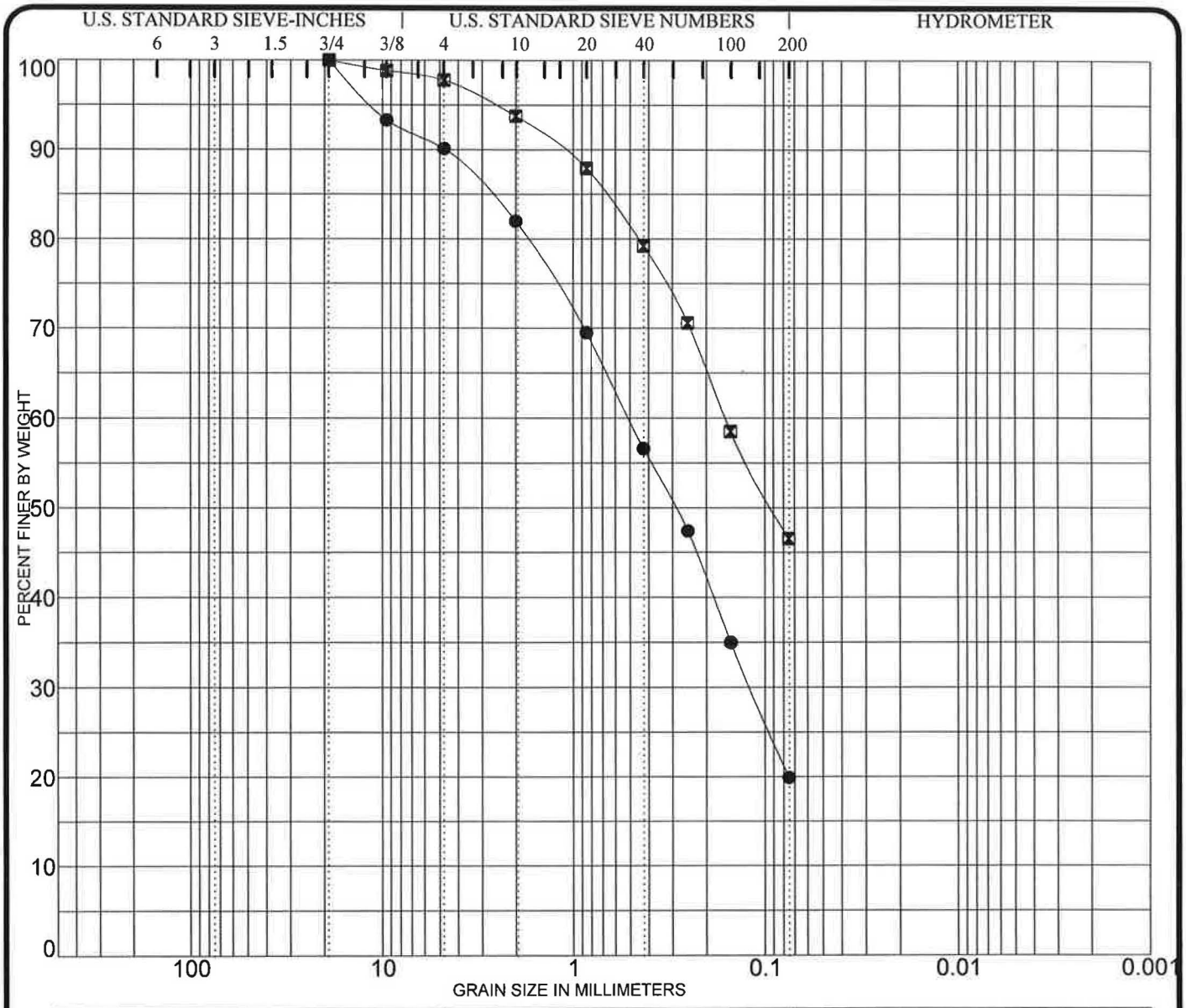
GRAIN SIZE DISTRIBUTION

FIGURE C-6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-3	5-6	SILTY SAND (SM)						
⊠	RW-3	34.0	CLAYEY SAND (SC)						

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-3	5-6	19.00	0.51	0.119		9.9	70.2	19.9	
⊠	RW-3	34.0	19.00	0.16			2.2	51.2	46.5	

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO. 2500.06I

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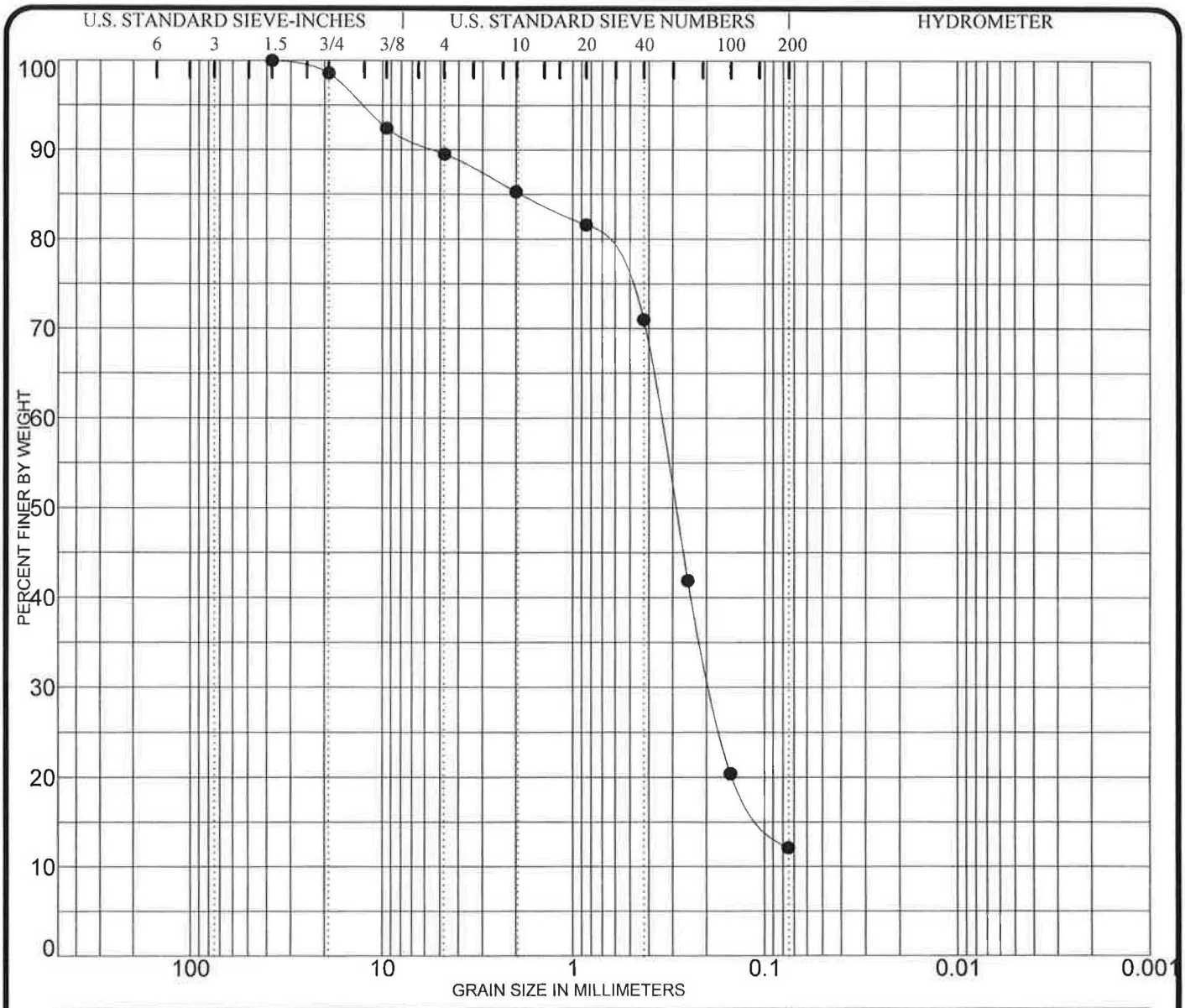
GRAIN SIZE DISTRIBUTION

FIGURE C-7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location	Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-1,2,3 0-4	SILTY SAND WITH GRAVEL (SM)					1.62	5.5

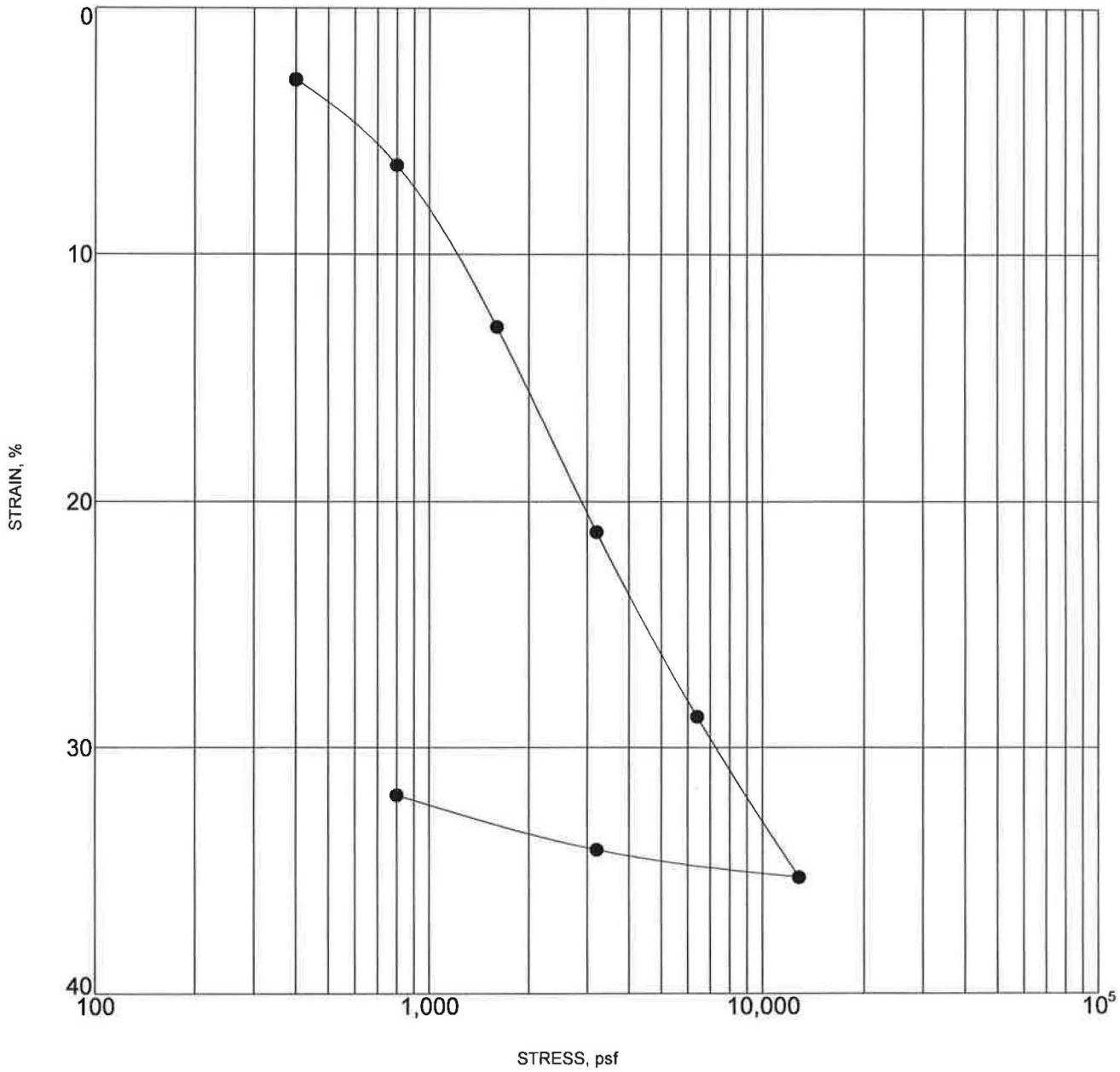
	Sample Location	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-1,2,3 0-4	37.50	0.35	0.188		10.5	77.4	12.1	

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO. 2500.06I

GPI

GRAIN SIZE DISTRIBUTION

FIGURE C-8



Sample inundated at 400 psf

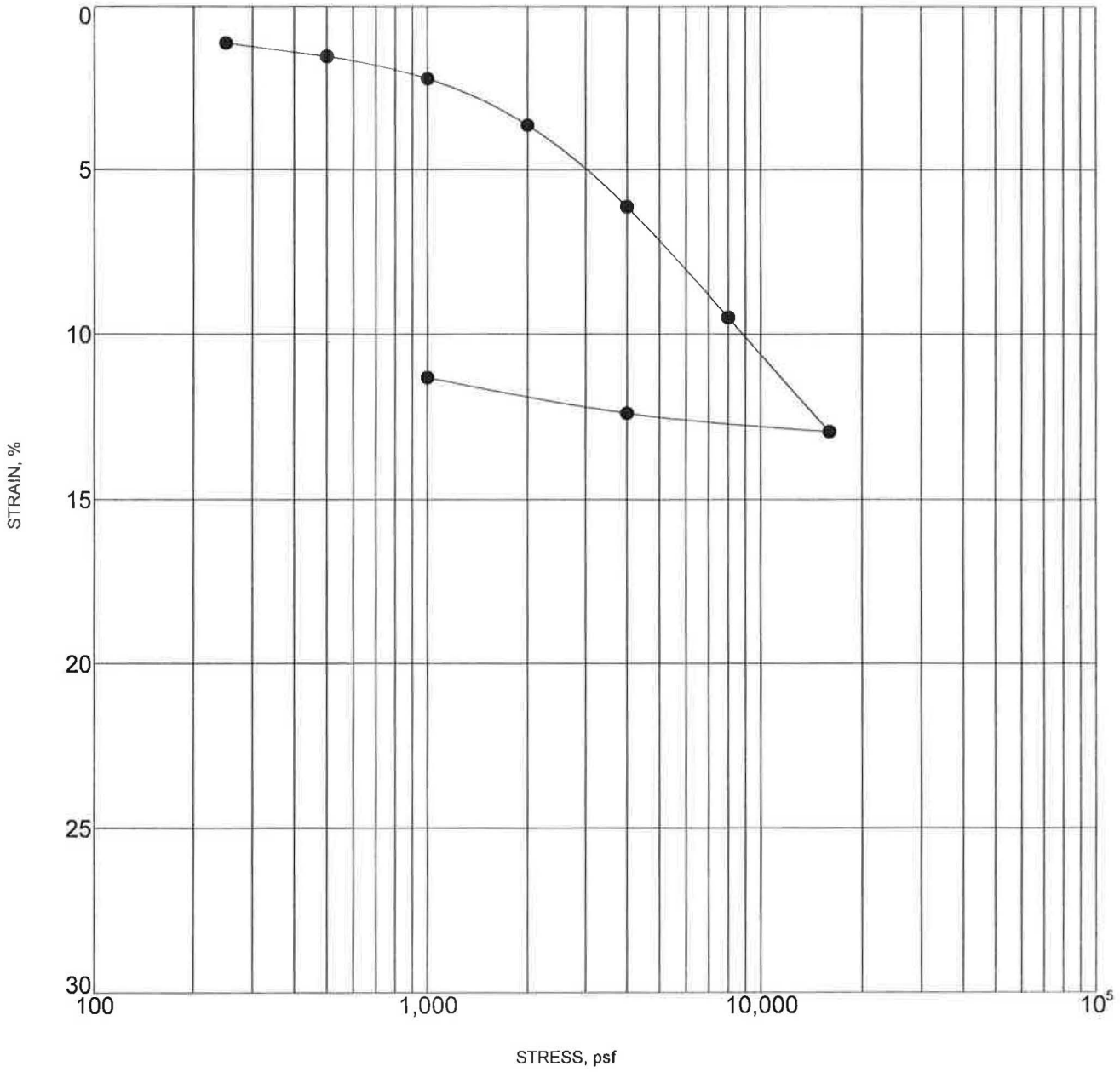
	Sample Location		Classification	DD,pcf	MC,%
●	RW-1	5-6	ELASTIC SILT (MH)		

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.: 2500.06I

GPI

CONSOLIDATION TEST RESULTS

FIGURE C-9



Sample inundated at 500 psf

	Sample Location		Classification	DD,pcf	MC,%
●	RW-1	26.1	LEAN CLAY WITH SAND (CL)		

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.: 2500.06I

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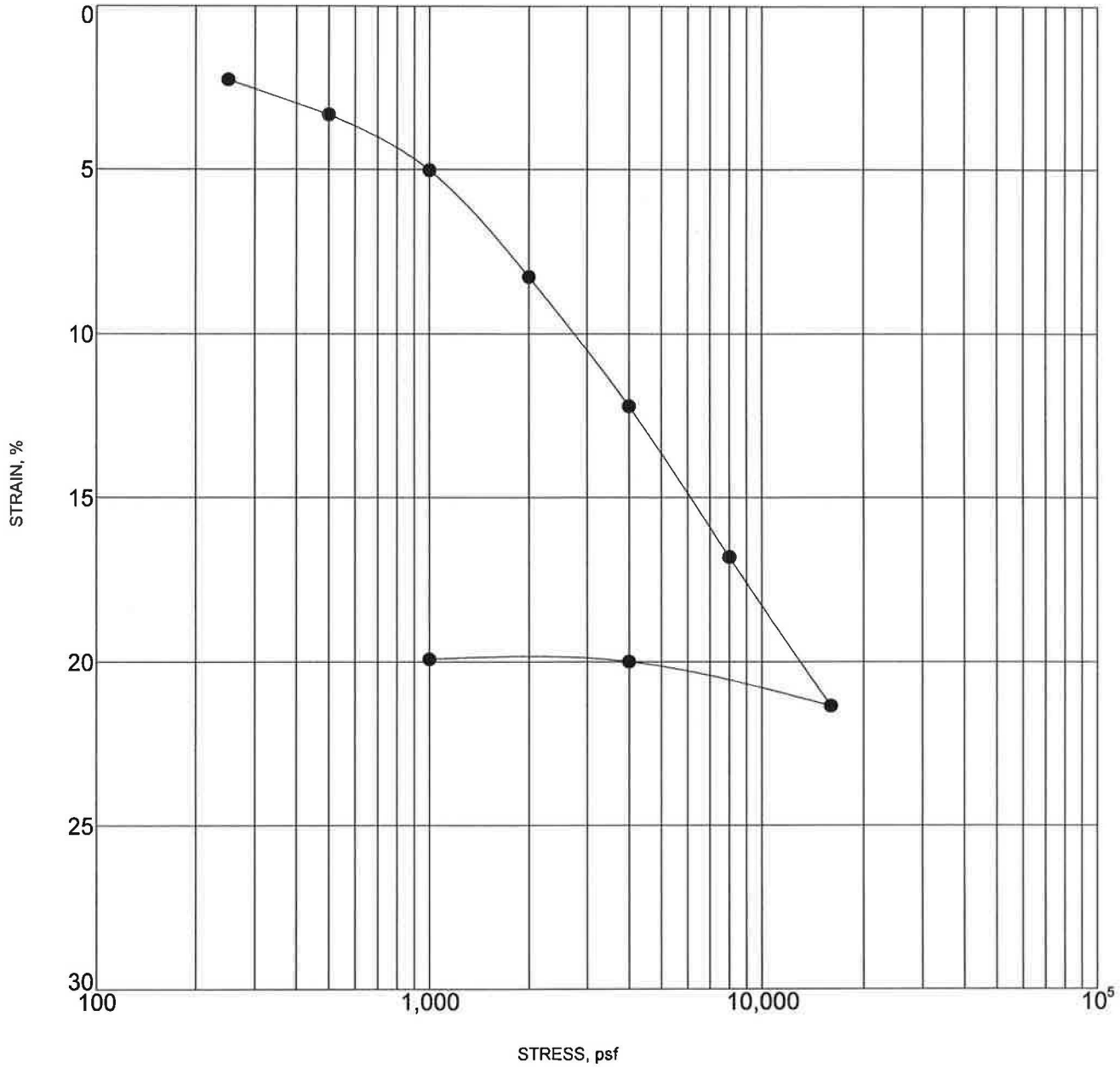
CONSOLIDATION TEST RESULTS

FIGURE C-10



Sample inundated at 500 psf

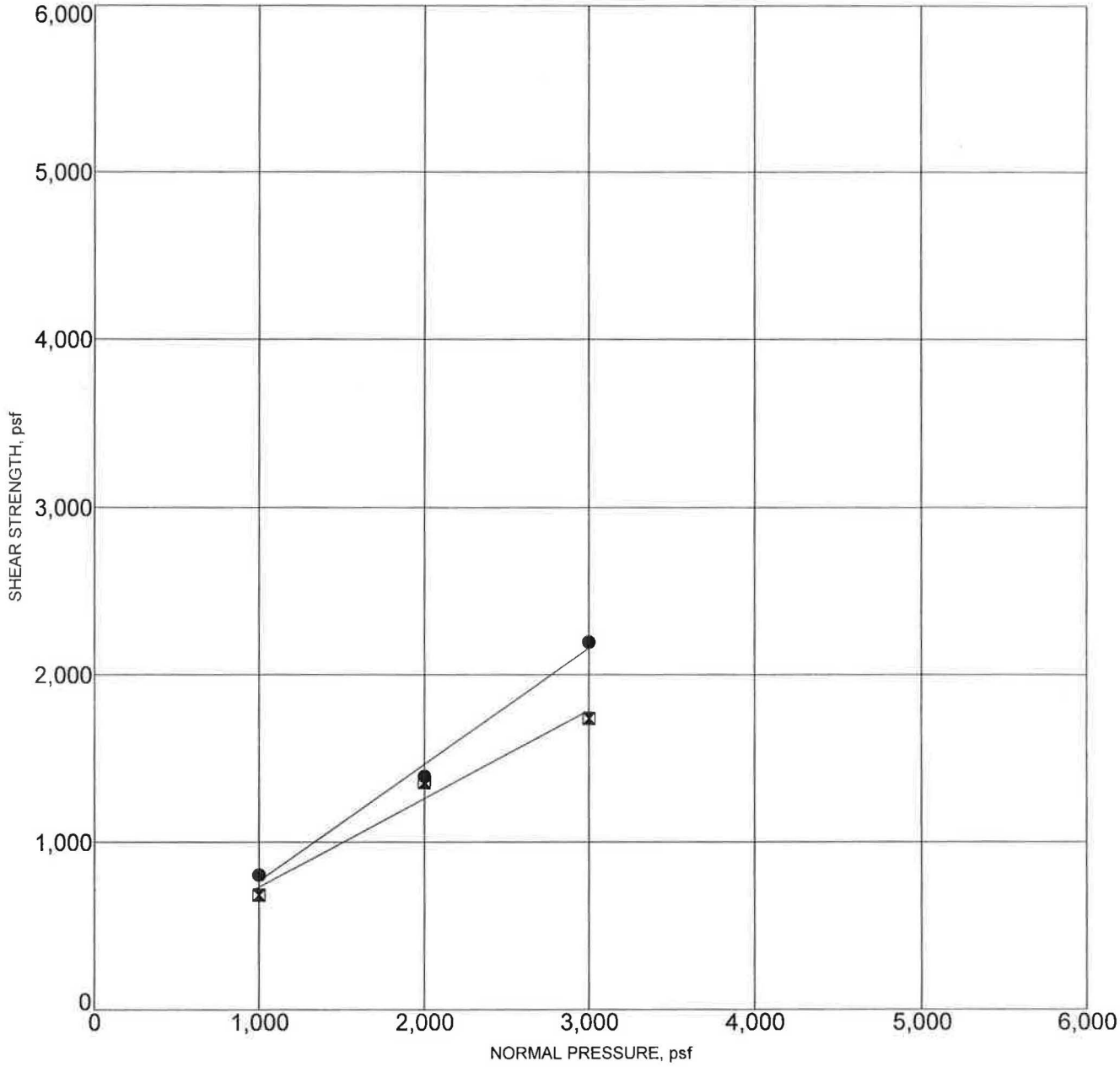
	Sample Location		Classification	DD,pcf	MC,%
●	RW-2	26.8	FAT CLAY (CH)		

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.: 2500.06I

GPI

CONSOLIDATION TEST RESULTS

FIGURE C-11



● **PEAK STRENGTH**
Friction Angle= 35 degrees
Cohesion= 72 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 28 degrees
Cohesion= 204 psf

Sample Location		Classification	DD,pcf	MC,%
RW-1	7-8	SILTY SAND (SM)	91	27.1

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

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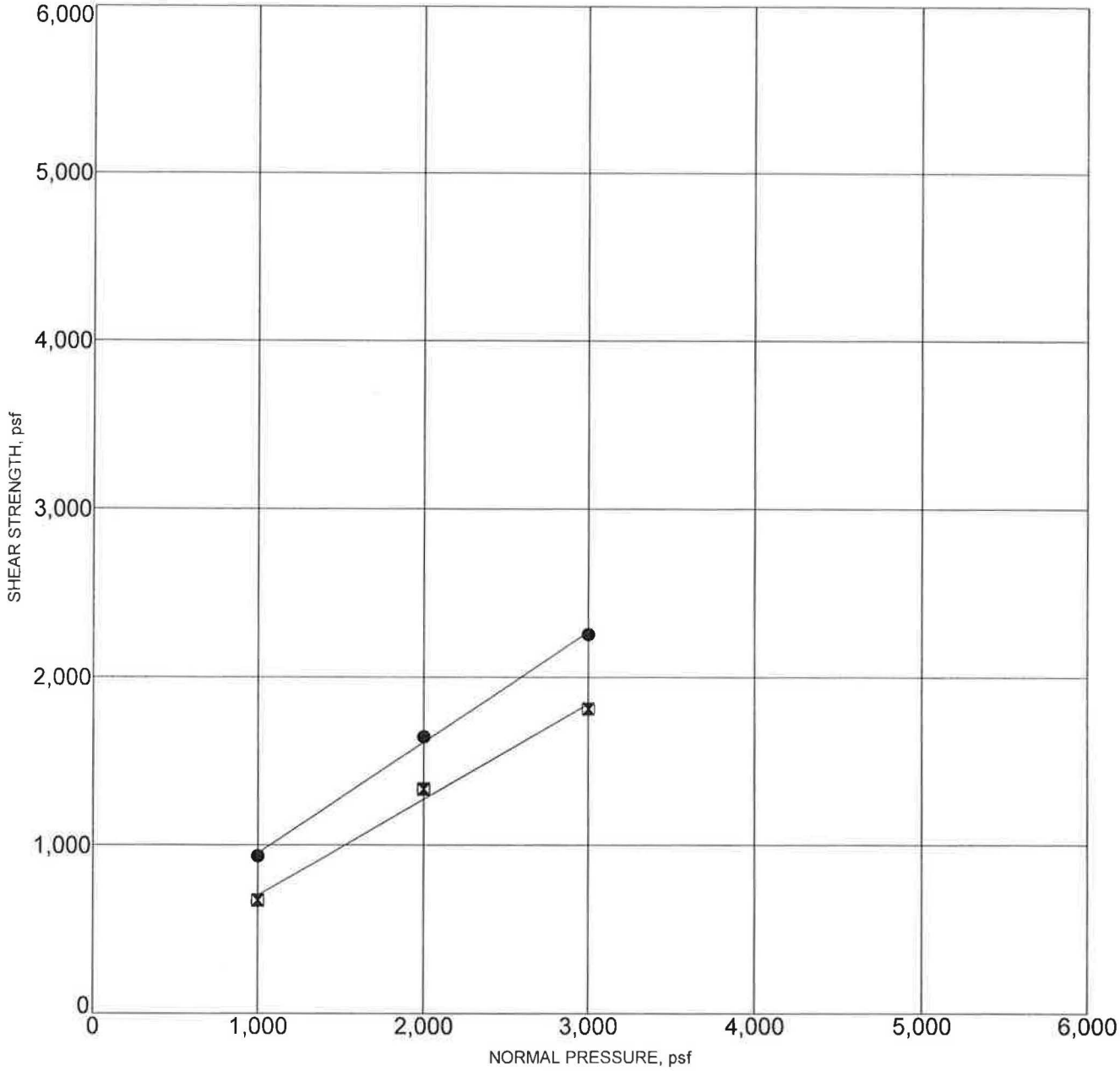
DIRECT SHEAR TEST RESULTS

FIGURE C-12



● **PEAK STRENGTH**
Friction Angle= 33 degrees
Cohesion= 292 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 30 degrees
Cohesion= 132 psf

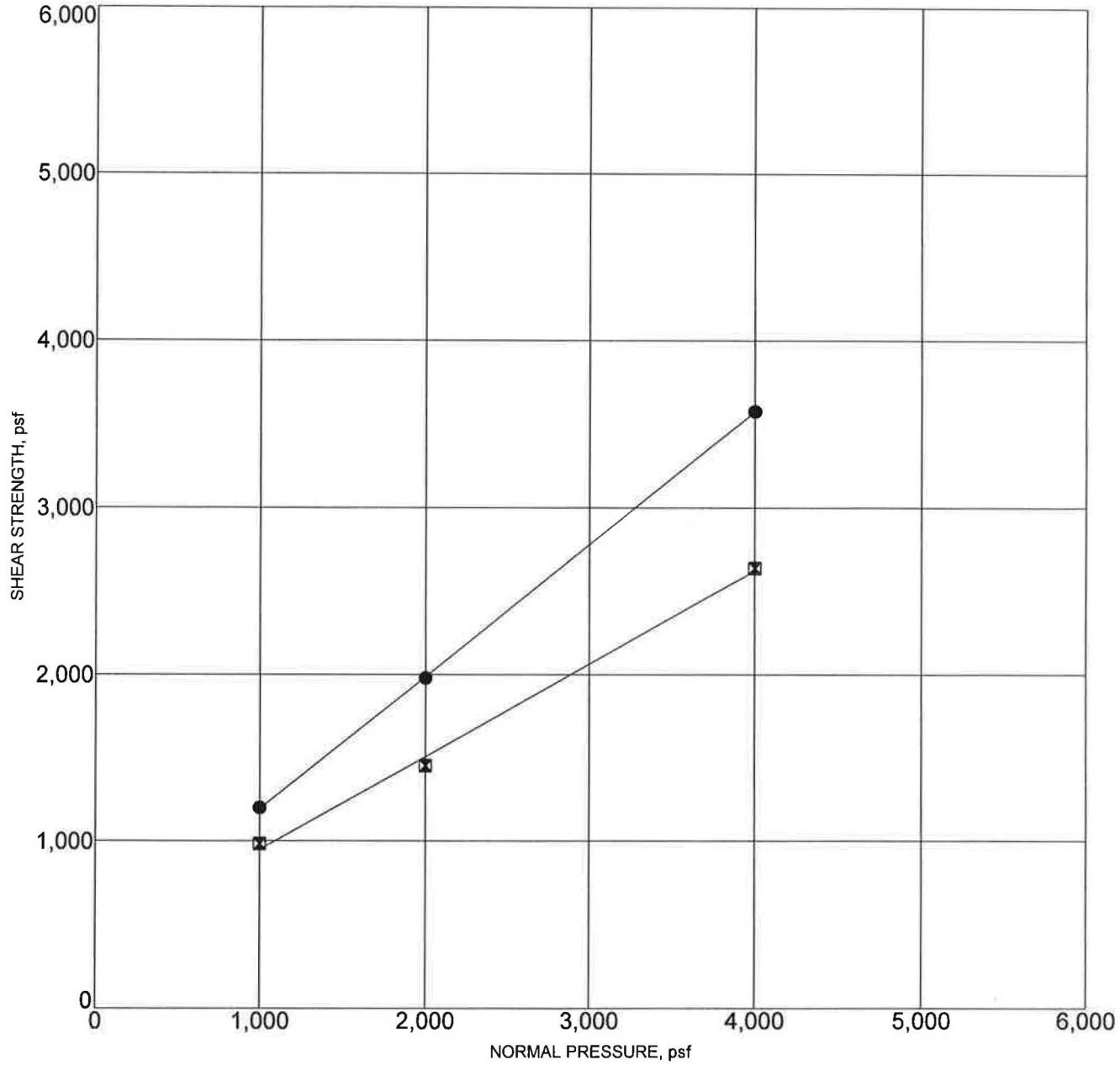
Sample Location		Classification	DD,pcf	MC,%
RW-1	23-24	SAND WITH SILT (SP-SM)	95	24.4

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-13



● **PEAK STRENGTH**
Friction Angle= 38 degrees
Cohesion= 402 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 29 degrees
Cohesion= 390 psf

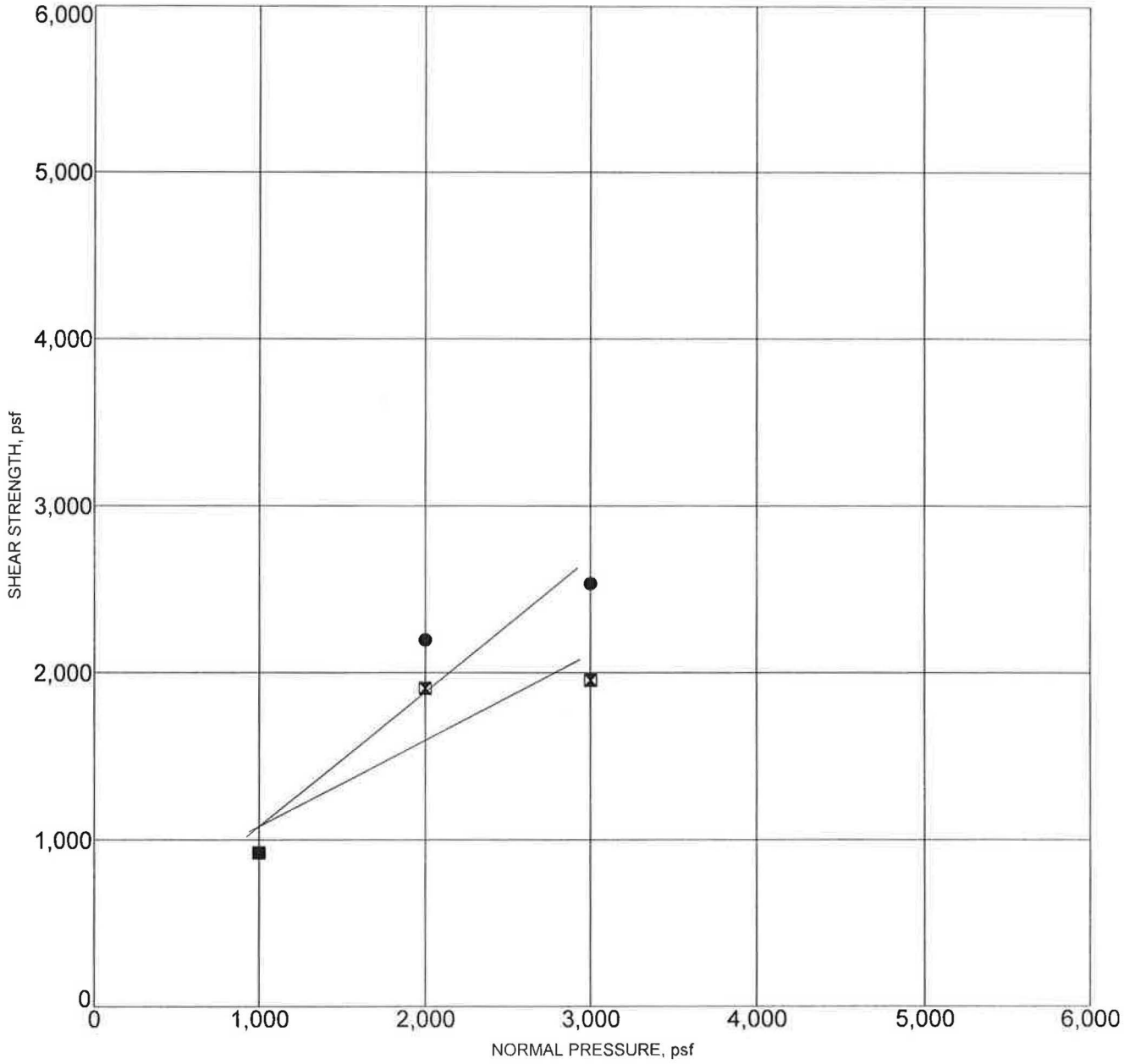
Sample Location		Classification	DD,pcf	MC,%
RW-1	40.0	SAND WITH SILT AND GRAVEL (SP-SM)	120	13.6

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-14



● **PEAK STRENGTH**
Friction Angle= 39 degrees
Cohesion= 276 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 27 degrees
Cohesion= 564 psf

Note: Sample contains sea shells (may have impacted results)

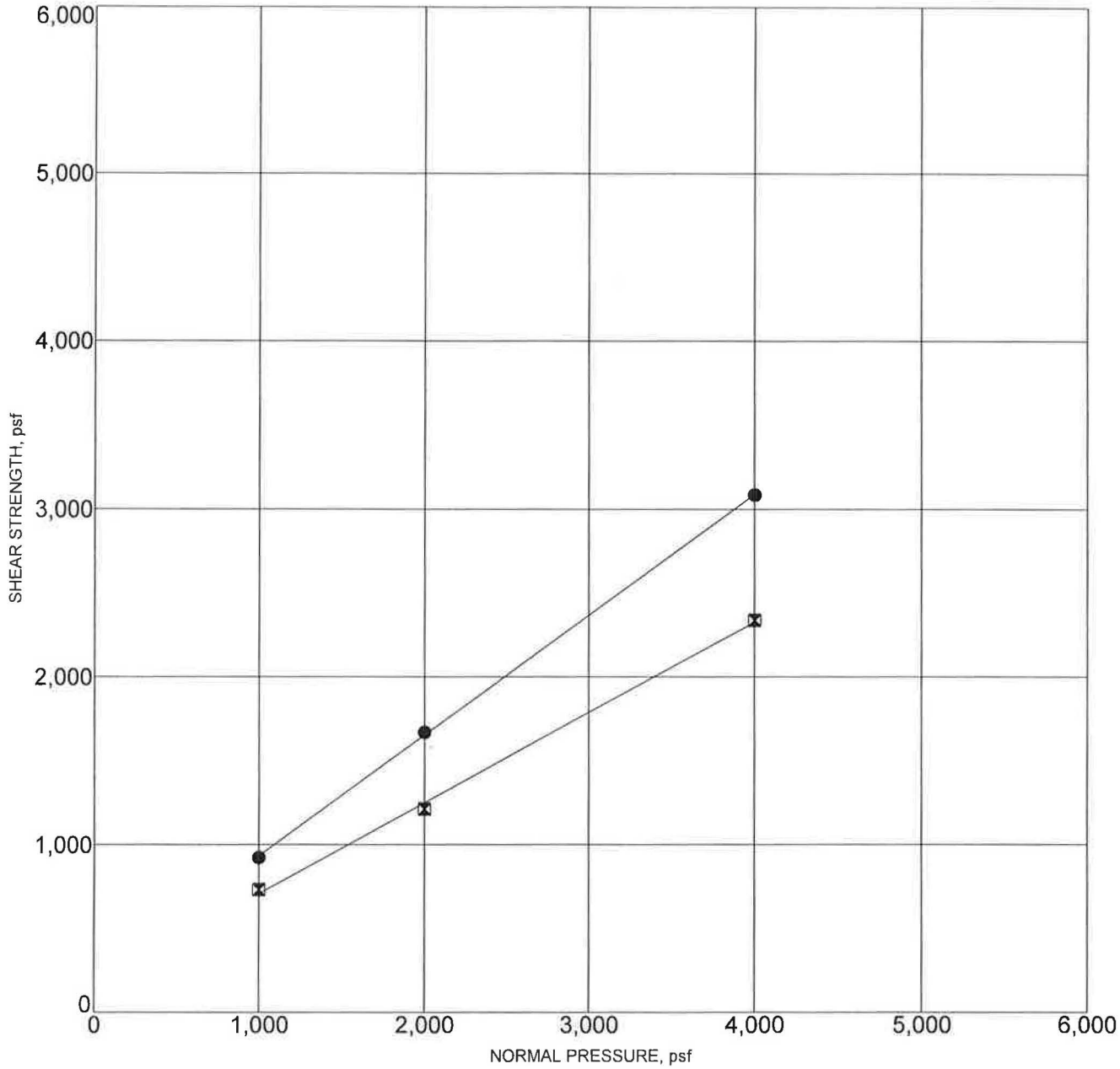
Sample Location		Classification	DD,pcf	MC,%
RW-2	13-14	SILTY SAND (SM)	103	22.0

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-15



● **PEAK STRENGTH**
Friction Angle= 36 degrees
Cohesion= 216 psf

⧗ **ULTIMATE STRENGTH**
Friction Angle= 28 degrees
Cohesion= 168 psf

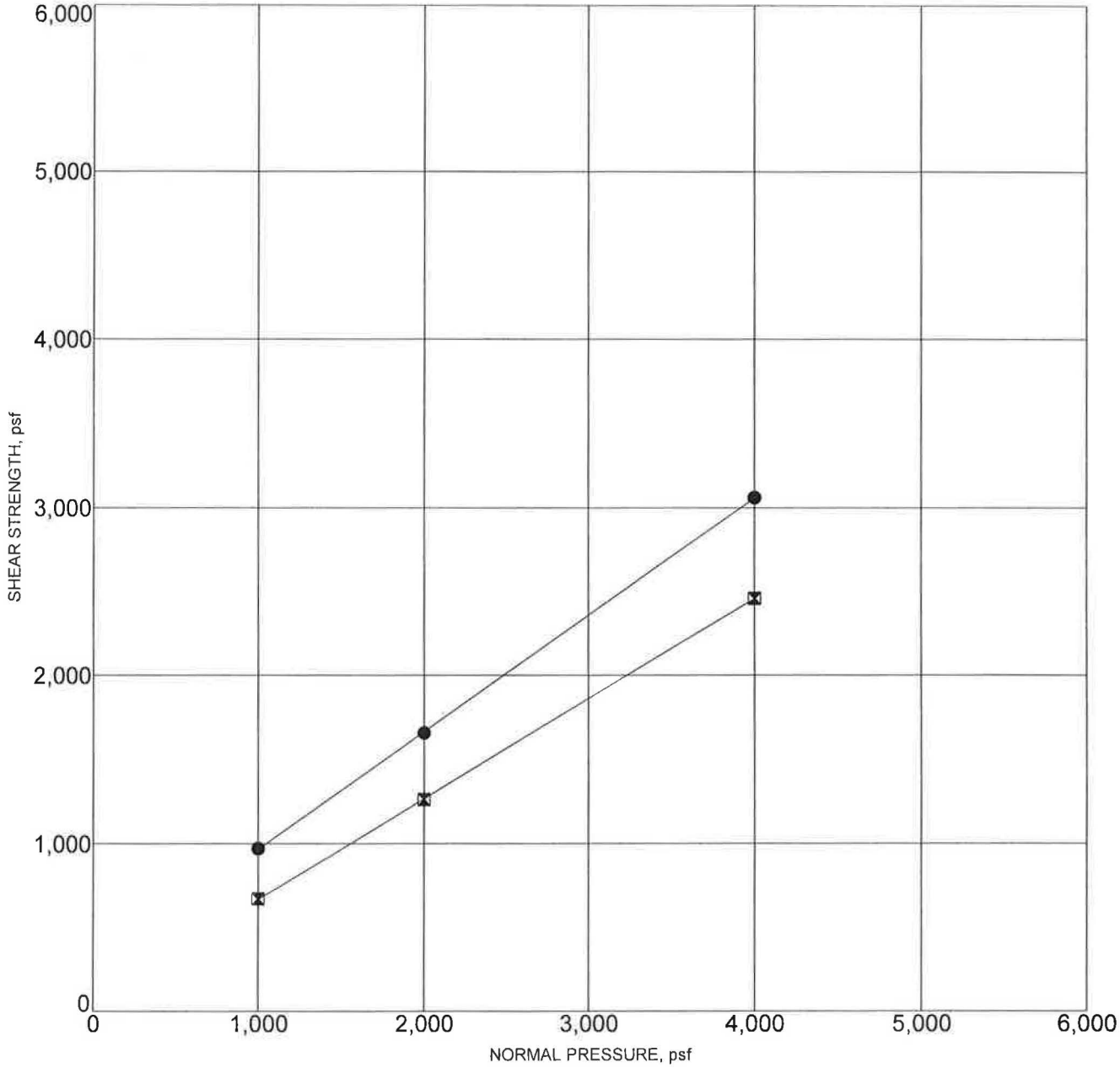
Sample Location		Classification	DD,pcf	MC,%
RW-2	23-24	SAND WITH SILT (SP-SM)	96	24.3

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-16



● **PEAK STRENGTH**
Friction Angle= 35 degrees
Cohesion= 270 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 31 degrees
Cohesion= 72 psf

Sample Location		Classification	DD,pcf	MC,%
RW-2	53-54	SAND WITH SILT (SP-SM)	105	20.2

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

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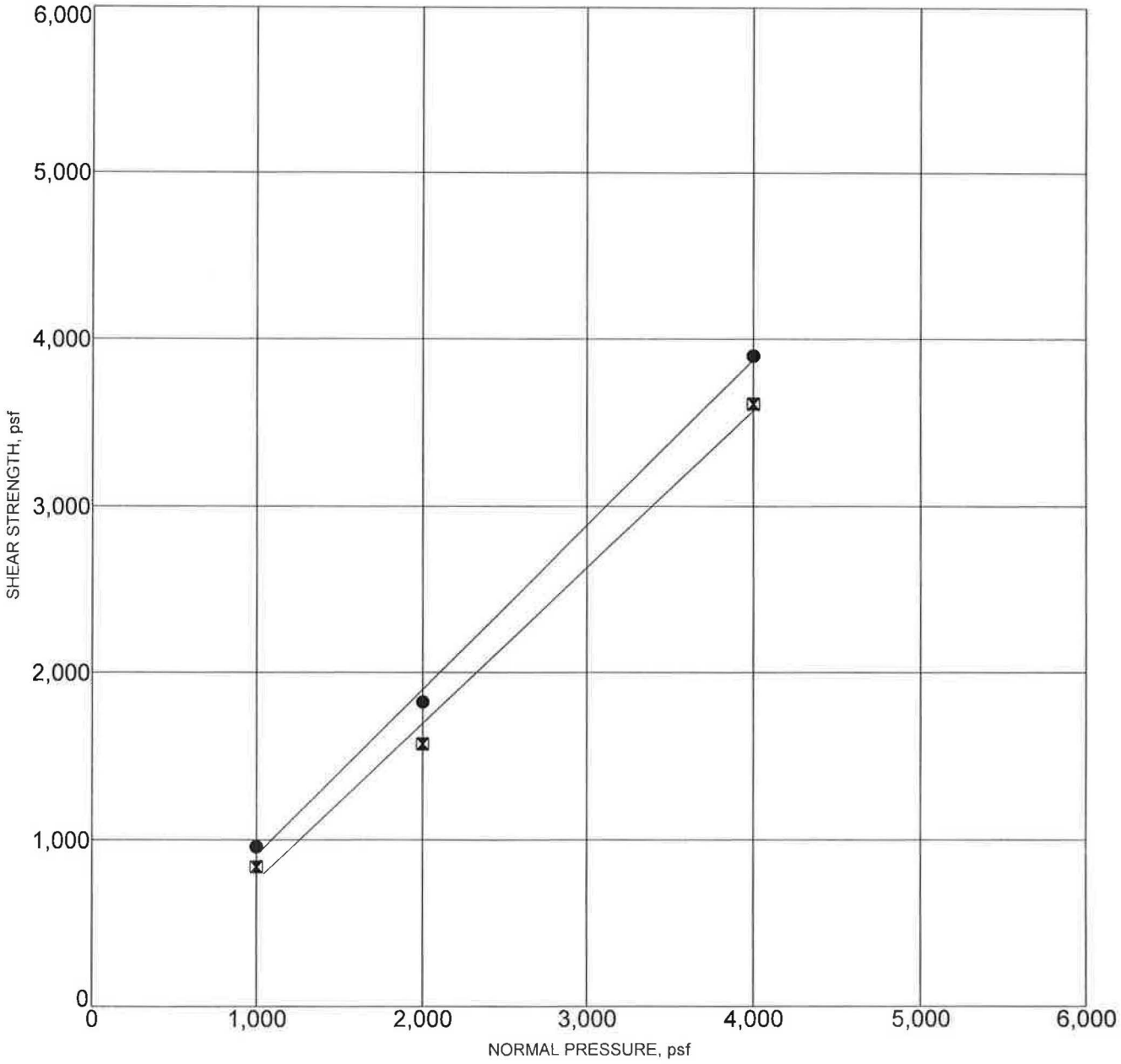
DIRECT SHEAR TEST RESULTS

FIGURE C-17



● **PEAK STRENGTH**
Friction Angle= 44 degrees
Cohesion= 0 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 41 degrees
Cohesion= 0 psf

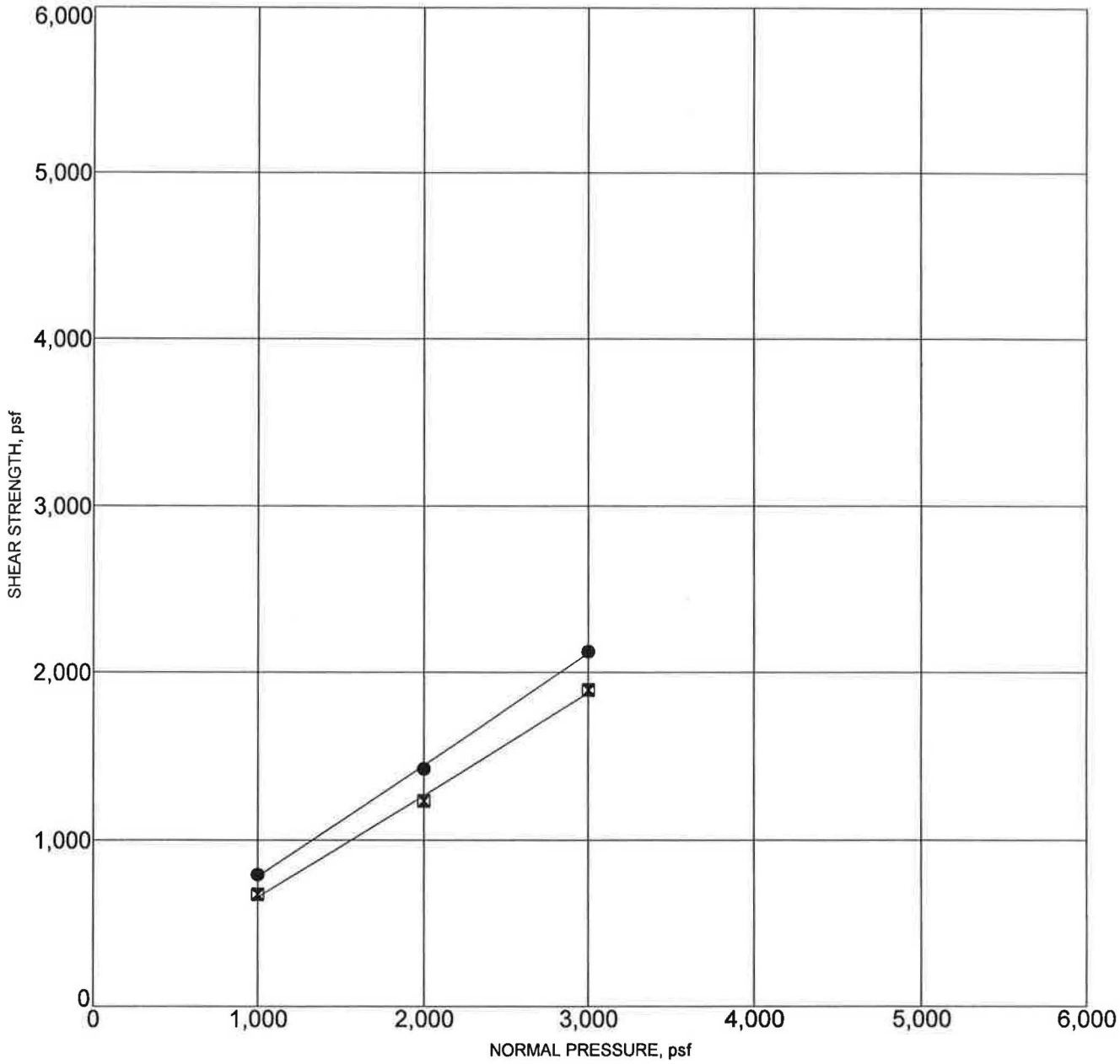
Sample Location		Classification	DD,pcf	MC,%
RW-3	8-9	SAND WITH SILT AND GRAVEL (SP-SM)	118	8.4

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.061

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-18



● **PEAK STRENGTH**
Friction Angle= 34 degrees
Cohesion= 116 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 31 degrees
Cohesion= 44 psf

Note: Sample remolded to 95% of the maximum dry density

Sample Location		Classification	DD,pcf	MC,%
RW-1,2,3	0-4	SILTY SAND (SM)	114	10.0

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

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DIRECT SHEAR TEST RESULTS

FIGURE C-19

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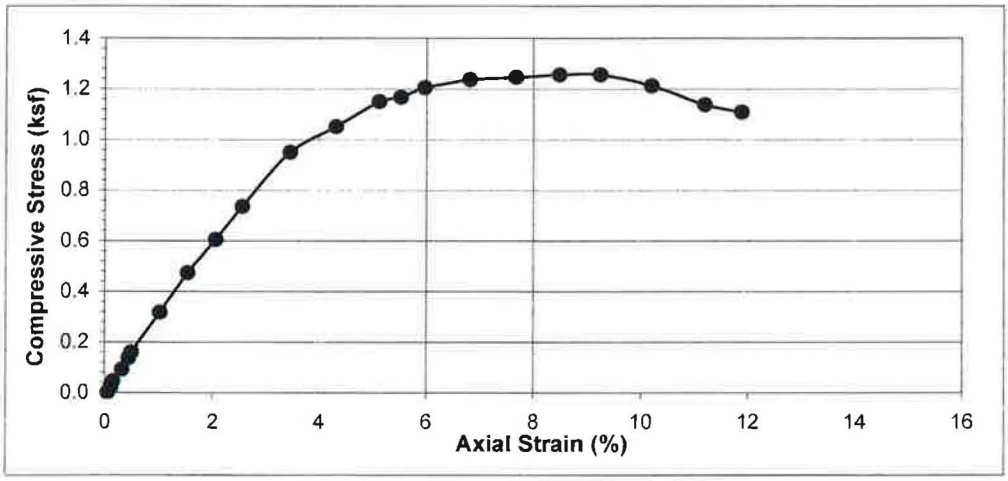
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

UNCONFINED COMPRESSION TEST RESULTS
ASTM D 2166

Project Name:	VAPP	Sample Type:	Shelby Tube
Project No.:	2500.06I	Soil Description	Clay
Boring No.:	RW-1	Dry Density (pcf):	78.5
Sample No.:	-	Moisture Content (%)	42.6
Depth (feet):	25-25.6	Test Date:	08/26/15
Sample Diameter (inch):	2.831	Wt. Wet Soil+Container(gms)	575.37
Sample Height (inch):	5.884	Wt. Dry Soil+Container(gms)	447.46
Sample Weight (gms):	1088.17	Wt. Container (gms)	147.13





Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.003	6.30	0.00	0.05
1	0.007	6.30	0.02	0.12
2	0.009	6.30	0.05	0.15
4	0.019	6.32	0.09	0.32
6	0.026	6.32	0.14	0.44
7	0.029	6.33	0.16	0.49
14	0.060	6.36	0.32	1.02
21	0.090	6.39	0.47	1.53
27	0.121	6.43	0.60	2.06
33	0.150	6.46	0.74	2.55
43	0.203	6.52	0.95	3.45
48	0.254	6.58	1.05	4.32
53	0.301	6.63	1.15	5.12
54	0.325	6.66	1.17	5.52
56	0.351	6.69	1.20	5.97
58	0.401	6.75	1.24	6.82
59	0.452	6.82	1.25	7.68
60	0.500	6.88	1.26	8.50
61	0.544	6.94	1.26	9.25
59	0.600	7.01	1.21	10.20
56	0.658	7.09	1.14	11.18
55	0.699	7.14	1.11	11.88

FIGURE C-20

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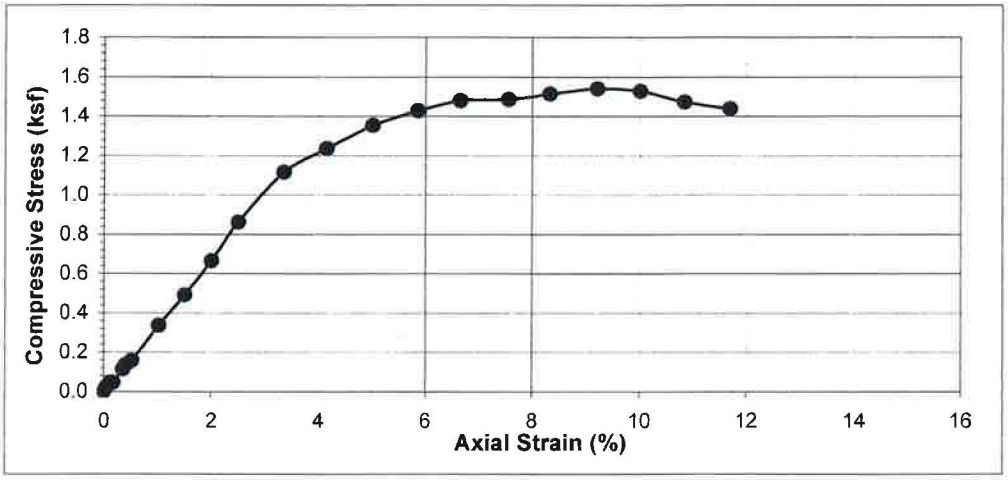
UNCONFINED COMPRESSION TEST RESULTS
ASTM D 2166

Project Name:	VAPP	Sample Type:	Shelby Tube
Project No.:	2500.06I	Soil Description	Clay
Boring No.:	RW-2	Dry Density (pcf):	79.9
Sample No.:	-	Moisture Content (%)	40.1
Depth (feet):	29-29.6	Test Date:	08/26/15
Sample Diameter (inch):	2.847	Wt. Wet Soil+Container(gms)	626.18
Sample Height (inch):	5.994	Wt. Dry Soil+Container(gms)	489.4
Sample Weight (gms):	1120.80	Wt. Container (gms)	148.08





Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.000	6.37	0.00	0.00
1	0.003	6.37	0.02	0.05
2	0.007	6.37	0.05	0.12
2	0.010	6.38	0.05	0.17
5	0.021	6.39	0.11	0.35
6	0.024	6.39	0.14	0.40
7	0.031	6.40	0.16	0.52
15	0.061	6.43	0.34	1.02
22	0.090	6.46	0.49	1.50
30	0.120	6.50	0.67	2.00
39	0.150	6.53	0.86	2.50
51	0.201	6.59	1.11	3.35
57	0.249	6.64	1.24	4.15
63	0.300	6.70	1.35	5.01
67	0.351	6.76	1.43	5.86
70	0.399	6.82	1.48	6.66
71	0.453	6.89	1.48	7.56
73	0.499	6.94	1.51	8.32
75	0.552	7.01	1.54	9.21
75	0.600	7.07	1.53	10.01
73	0.650	7.14	1.47	10.84
72	0.701	7.21	1.44	11.70

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UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (UU,Q)
ASTM D 2850

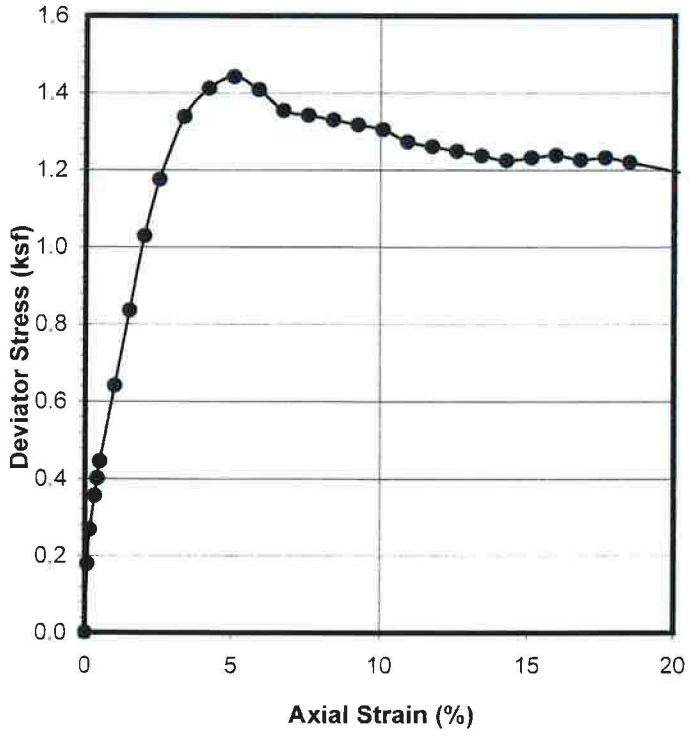
Client Name:	Geotechnical Professionals, Inc.		Tested By:	ST	Date: 08/25/15
Project Name:	VAPP		Checked by:	AP	Date: 08/26/15
Project No.:	2500.06I				
Boring No.:	RW-2				
Sample No.:	-	Depth (feet): 25-25.6			
Soil Description	Clay		Sample Type:	Shelby Tube	

Sample Diameter (inch):	2.866	Wet Unit Weight (pcf):	98.3
Sample Hieght (inch):	5.954	Dry Unit Weight (pcf):	55.8
Sample Weight (gms):	991.76	Moisture Content (%):	76.2
Wt. Wet Soil+Container(gms)	1135.32	Void Ratio for Gs=2.7:	2.02
Wt. Dry Soil+Container(gms)	708.23	% Saturation:	101.8
Wt. Container (gms)	147.65		

TEST DATA

Cell Pressure (ksf):	1.00
Back Pressure (ksf):	0.0
Eff. Confining Pressure (ksf):	1.00
Shear Rate (%/min):	0.3
Maximum Deviator Stress (ksf):	1.44
Ultimate Deviator Stress (ksf):	1.19
Ultimate Undrained Shear Strength (ksf):	0.60
Axial Strain @ Maximum Stress (%)	5.04





Load (lbs)	Def. (inch)	Area (sq.in)	Deviator Stress (ksf)	Axial Strain (%)
0	0.000	6.45	0.00	0.00
8	0.005	6.46	0.18	0.08
12	0.010	6.46	0.27	0.17
16	0.020	6.47	0.36	0.34
18	0.025	6.48	0.40	0.42
20	0.030	6.48	0.44	0.50
29	0.060	6.52	0.64	1.01
38	0.090	6.55	0.84	1.51
47	0.120	6.58	1.03	2.02
54	0.150	6.62	1.17	2.52
62	0.200	6.68	1.34	3.36
66	0.250	6.73	1.41	4.20
68	0.300	6.79	1.44	5.04
67	0.350	6.85	1.41	5.88
65	0.400	6.92	1.35	6.72
65	0.450	6.98	1.34	7.56
65	0.500	7.04	1.33	8.40
65	0.550	7.11	1.32	9.24
65	0.600	7.17	1.30	10.08
64	0.650	7.24	1.27	10.92
64	0.700	7.31	1.26	11.76
64	0.750	7.38	1.25	12.60
64	0.800	7.45	1.24	13.44
64	0.850	7.53	1.22	14.28
65	0.900	7.60	1.23	15.12
66	0.950	7.68	1.24	15.96
66	1.000	7.75	1.23	16.80
67	1.050	7.83	1.23	17.64
67	1.100	7.91	1.22	18.47
67	1.200	8.08	1.19	20.15

FIGURE C-22

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UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (UU,Q)
ASTM D 2850

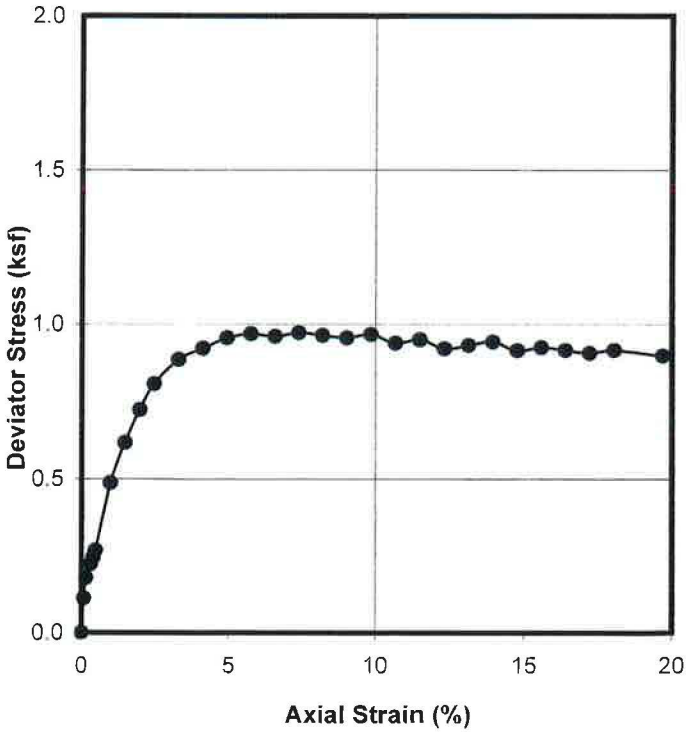
Client Name:	Geotechnical Professionals, Inc.		Tested By:	ST	Date: 08/25/15
Project Name:	VAPP		Checked by:	AP	Date: 08/26/15
Project No.:	2500.06				
Boring No.:	RW-3				
Sample No.:	-	Depth (feet): 23-23.6			
Soil Description	Clay		Sample Type:	Shelby Tube	

Sample Diameter (inch):	2.864	Wet Unit Weight (pcf):	110.0
Sample Hieght (inch):	6.095	Dry Unit Weight (pcf):	75.2
Sample Weight (gms):	1134.67	Moisture Content (%):	46.2
Wt. Wet Soil+Container(gms)	1280.03	Void Ratio for Gs=2.7:	1.24
Wt. Dry Soil+Container(gms)	922.39	% Saturation:	100.7
Wt. Container (gms)	148.60		

TEST DATA

Cell Pressure (ksf):	1.00
Back Pressure (ksf):	0.0
Eff. Confining Pressure (ksf):	1.00
Shear Rate (%/min):	0.3
Maximum Deviator Stress (ksf):	0.97
Ultimate Deviator Stress (ksf):	0.90
Ultimate Undrained Shear Strength (ksf):	0.45
Axial Strain @ Maximum Stress (%)	7.38





Load (lbs)	Def. (inch)	Area (sq.in)	Deviator Stress (ksf)	Axial Strain (%)
0	0.000	6.44	0.00	0.00
5	0.005	6.45	0.11	0.08
8	0.010	6.45	0.18	0.16
10	0.020	6.46	0.22	0.33
11	0.025	6.47	0.24	0.41
12	0.030	6.47	0.27	0.49
22	0.060	6.51	0.49	0.98
28	0.090	6.54	0.62	1.48
33	0.120	6.57	0.72	1.97
37	0.150	6.60	0.81	2.46
41	0.200	6.66	0.89	3.28
43	0.250	6.72	0.92	4.10
45	0.300	6.78	0.96	4.92
46	0.350	6.83	0.97	5.74
46	0.400	6.89	0.96	6.56
47	0.450	6.96	0.97	7.38
47	0.500	7.02	0.96	8.20
47	0.550	7.08	0.96	9.02
48	0.600	7.15	0.97	9.84
47	0.650	7.21	0.94	10.66
48	0.700	7.28	0.95	11.48
47	0.750	7.35	0.92	12.31
48	0.800	7.42	0.93	13.13
49	0.850	7.49	0.94	13.95
48	0.900	7.56	0.91	14.77
49	0.950	7.63	0.92	15.59
49	1.000	7.71	0.92	16.41
49	1.050	7.78	0.91	17.23
50	1.100	7.86	0.92	18.05
50	1.200	8.02	0.90	19.69

FIGURE C-23

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CORROSION TEST RESULTS

Client Name: Geotechnical Professionals, Inc.
Project Name: VAPP
Project No.: 2500.06I

AP Job No.: 15-0845
Date 08/26/15

Boring No.	Sample Type	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
Composite	Bag	0-4	SM	1067	7.7	919	667
RW-2	Bag	26-26.3	CH	93	7.4	1691	10192

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

APPENDIX B

EXPLANATION OF BORING LOGS

VENICE DUAL FORCE MAIN
Los Angeles, California

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL	GW	Well-graded gravels or gravel-sand mixtures, little or no fines	FINE GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic silts and very fine sand, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
		GP	Poorly-graded gravels or gravel-sand mixture, little or no fines			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		GM	Silty gravels, gravel-sand-silt mixtures			OL	Organic silts and organic silt-clays of low plasticity
		GC	Clayey gravels, gravel-sand-clay mixtures				
	SAND	SW	Well-graded sands or sand with gravel, little or no fines		SILTS AND CLAYS LL>50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		SP	Poorly-graded sands or sand with gravel, little or no fines			CH	Inorganic clays of hogh plasticity, fat clays
		SM	Silty sands, sand-silt mixtures			OH	Organic clays of medium to high plasticity
		SC	Clayey sands, sand-clay mixtures	HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

SAMPLE COLUMN SYMBOLS

- Standard penetration test (SPT) sample
- Shelby tube sample
- Modified California split spoon sample
- Bulk sample
- P — Piston sample
- Continuous soil or rock core
- NR — No recovery

BLOWS/FOOT - Summation of blow counts for deepest 12 inches is sampling interval
RQD% - Rock quality designation in percent

DESCRIPTION COLUMN SYMBOLS

- Dashed lines separating soil strata represent inferred boundaries between sampled intervals or no recovery intervals and may be distinct or gradual transitions
- Solid lines represent distinct or gradual boundaries observed within sampled intervals
- Description right of bracket symbol represents soil conditions within the depth interval defined by the bracket length
- Description right of arrow symbol represents soil conditions to the next deeper boundary line unless otherwise noted
- Water level at time of drilling
- Water level after at least 12 hours from time of drilling

LABORATORY TEST ABBREVIATIONS

ATT	Atterberg Limits	CORR	Corrosion	S	Grain Size Analysis
COLL	Collapse Potential	DS	Direct Shear	SE	Sand Equivalent
COMP	Compaction	EI	Expansion Index	SG	Specific Gravity
CON	Consolidation	OC	Organic Content	TX	Triaxial Test
R	R-Value	PERM	Permeability	UC	Unconfined Compression Test
H	Hydrometer Test			#200	No. 200 Wash Sieve Analysis

NOTES

1. Soil descriptions are in accordance with the USCS as set forth by ASTM D2488 "Standard Practice for Description and Identification Soil (Visual-Manual Procedure)."
2. Soil color described according to Munsell Soil Color Chart. Rock color described according to Munsell Rock-Color Chart
3. Soil descriptions in these borings are generalized representations and based upon visual classification of cuttings and/or samples during drilling. Descriptions and related information in these borings depict subsurface conditions at the specific location and at the time of drilling only. Soil conditions at other locations may differ from conditions observed at the boring locations. Also, soil and groundwater conditions may change with time at these locations.

P:\12075.000.0\12075.006.0\GINT\12075.006.0 LOGS.GPJ

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A

BORING LOCATION: Northing 1814021.085, Easting 6421835.287

DATE STARTED: 8/15/08 | DATE FINISHED: 8/15/08

DRILLING METHOD: Mud Rotary

HAMMER WEIGHT: 140 lbs | DROP: 30 in

SAMPLER: SPT, CA Modified, Shelby Tube

NOTES:
Drilling Contractor: SoCal Drilling Company
Drilling Equipment: Mayhew-1000
Logged By: T. Naing

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
					Surface Elevation: 4.84' datum is ground surface				
	1	1		Bulk	SILTY SAND (SM): light brownish gray (10YR 6/2), dry, ~70% fine to coarse sand, ~20% fines, ~10% fine gravel				COMP
	3	2		4 5 5	POORLY GRADED SAND (SP): olive brown (2.5Y 4/2), moist, ~95% fine sand, ~5% fines	0			
	5	3		0 0 0	SANDY SILT (ML): dark gray (2.5Y 4/1), wet, ~55% low plasticity fines, ~45% fine sand (pushed)	0			<#200= 56%
	8	4		3 5 7	SILTY SAND (SM): dark gray (2.5Y 4/1), ~70% fine sand, ~30% low plasticity fines, with seashells large shell fragments	0	25.1	90.5	
	10	5		4 8 9	POORLY GRADED SAND with SILT (SP-SM): dark gray (2.5Y 4/1), ~90% fine sand, ~10% low plasticity fines, with seashells	0			
	12	6		5 3 2		0	20.8	99.0	
	14				SILTY SAND (SM): dark gray (2.5Y 4/1), ~70% fine sand, ~30% low plasticity fines, with seashells				

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	16	7		8 10 10	SILTY SAND (SM): continued	0.1			
	17								
	18								
	19								
	20	8		10 16 18		0	24.7	97.9	
	21								
	22								
	23				LEAN CLAY with SAND (CL): greenish black (5GY 2.5/1), moist, ~85% fines, ~15% fine sand, medium plasticity, soft				
	24								
	25	9		0 0 0	(pushed)	3.5			ATT S H <#200 =84% CORR COMPOSITE 25-40' CON TX CORR
	26								
	27								
	28	10					30.8	88.1	
	29				SILTY SAND (SM): dark gray (2.5Y 4/1), wet, ~55% fine to medium sand, ~45% low plasticity fines, abundant shell fragments				
	30			5	fine sand				
	31	11		1 1	medium sand	0			S H <#200=
	32								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
									44%
	33	12		2 5 8	SILTY SAND (SM)/SANDY SILT (ML): very dark grayish brown (2.5Y 3/2), moist, ~50% fine to medium sand, ~50% nonplastic to low plasticity fines, trace coarse sand	0	14.9	121.0	ATT S H <#200= 50%
	34								
	35			7	SILTY SAND (SM): very dark greenish gray (GLEY 3/1), wet, ~85% fine to medium sand, ~15% low plasticity fines, trace fine subrounded gravel				
	36	13		7 9		0			CON S <#200= 16%
	37								
	38	14		12 25 25	POORLY GRADED SAND with SILT (SP-SM): very dark greenish gray (10Y 3/1), wet, ~80% fine to coarse sand, ~10% fine subangular to subrounded gravel, ~10% fines	0	8.5	121.9	DS
	39								
	40			20	fine to coarse gravel				
	41	15		26 24		0			<#200= 11%
	42								
	43				POORLY GRADED SAND with SILT and GRAVEL (SP-SM): very dark greenish gray (10Y 3/1), wet, ~65% fine to coarse sand, ~30% fine to coarse gravel, ~5% fines, hard drilling				
	44								
	45	16		39 48		0	12.1	126.2	
	46								
	47								
	48								
	49								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS Moisture Content (%)	LABORATORY TESTS Dry Density (pcf)	LABORATORY TESTS Other Tests
	50			16	POORLY GRADED SAND with SILT and GRAVEL (SP-SM): continued				
		17		18		0			S <#200= 6%
	51			22					
	52								
	53				POORLY GRADED SAND with SILT (SP-SM): very dark greenish gray (10Y 3/1), wet, ~80% fine to coarse sand, ~10% fine subrounded gravel, ~10% fines				
	54								
	55			24					
		18		60/6"		0	14.3	116.5	DS
	56								
	57								
	58								
	59								
	60			16	interbedded with fine sand and silt layers of ~1" thick				
		19		19		0			<#200= 11%
	61			23					
	62								
	63								
	64								
	65			29					
		20		50/5"		0	23.8	101.3	
	66								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	67				POORLY GRADED SAND with SILT (SP-SM): continued				
	68								
	69								
	70			24					
		21		30					
	71			36		5.2			
	72				Bottom of boring at 71.5 feet bgs. Sample at 10 feet was missed in this boring. Sample #5 (SPT: 10-11.5) was collected from stepout boring G-1B, drilled a few feet away for shallower monitoring well. Sample at 12.5 feet was collected using SPT in G-1A and CA Modified in G-1B. Boring converted into monitoring well. Boring is ~12' north of Hurricane Street and ~12' west of northeast fence.				
	73								
	74								
	75								
	76								
	77								
	78								
	79								
	80								
	81								
	82								
	83								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1B

BORING LOCATION: Northing 1814023.456; Easting 6421840.813

DATE STARTED: 8/18/08 | DATE FINISHED: 8/18/08

DRILLING METHOD: Mud Rotary

HAMMER WEIGHT: 140 lbs | DROP: 30 in

SAMPLER: SPT, CA Modified, Shelby Tube

NOTES:
Drilling Contractor: SoCal Drilling Company
Drilling Equipment: Mayhew-1000
Logged By: T. Naing

Surface Elevation: 4.94'

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	1			Bulk	SILTY SAND (SM): light brownish gray (10YR 6/2), dry, ~70% fine to coarse sand, ~20% fines, ~10% fine gravel				
	2								
	3	2		4 5 5	POORLY GRADED SAND (SP): olive brown (2.5Y 4/2), moist, ~95% fine sand, ~5% fines	0			
	4								
	5			0	SANDY SILT (ML): dark gray (2.5Y 4/1), wet, ~55% low plasticity fines, ~45% fine sand				
	6	3		0 0	(pushed)	0			
	7				SILTY SAND (SM): dark gray (2.5Y 4/1), ~70% fine sand, ~30% low plasticity fines				
	8	4		3 5	large shell fragments	0			
	9		NR	7					
	10			4	POORLY GRADED SAND with SILT (SP-SM): dark gray (2.5Y 4/1), ~90% fine sand, ~10% low plasticity fines with seashells				
	11	5		8 9		0			
	12			10					
	13	6		11 11		0			
	14				SILTY SAND (SM): dark gray (2.5Y 4/1), ~70% fine sand, ~30% low plasticity fines with seashells				
	15								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1B (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	16	7		8 10 10	SILTY SAND (SM): continued	0			
	17								
	18								
	19								
	20			10					
	21	8		16 18		0			
	22								
	23								
	24				LEAN CLAY with SAND (CL): greenish black (5GY 2.5/1), moist, ~85% fines, ~15% fine sand, medium plasticity, soft				
	25								
	26				Bottom of boring at 25.5 feet bgs. Boring converted into monitoring well. Boring is ~13' north of Hurricane Street and ~10' west of the northeast fence.				
	27								
	28								
	29								
	30								
	31								
	32								

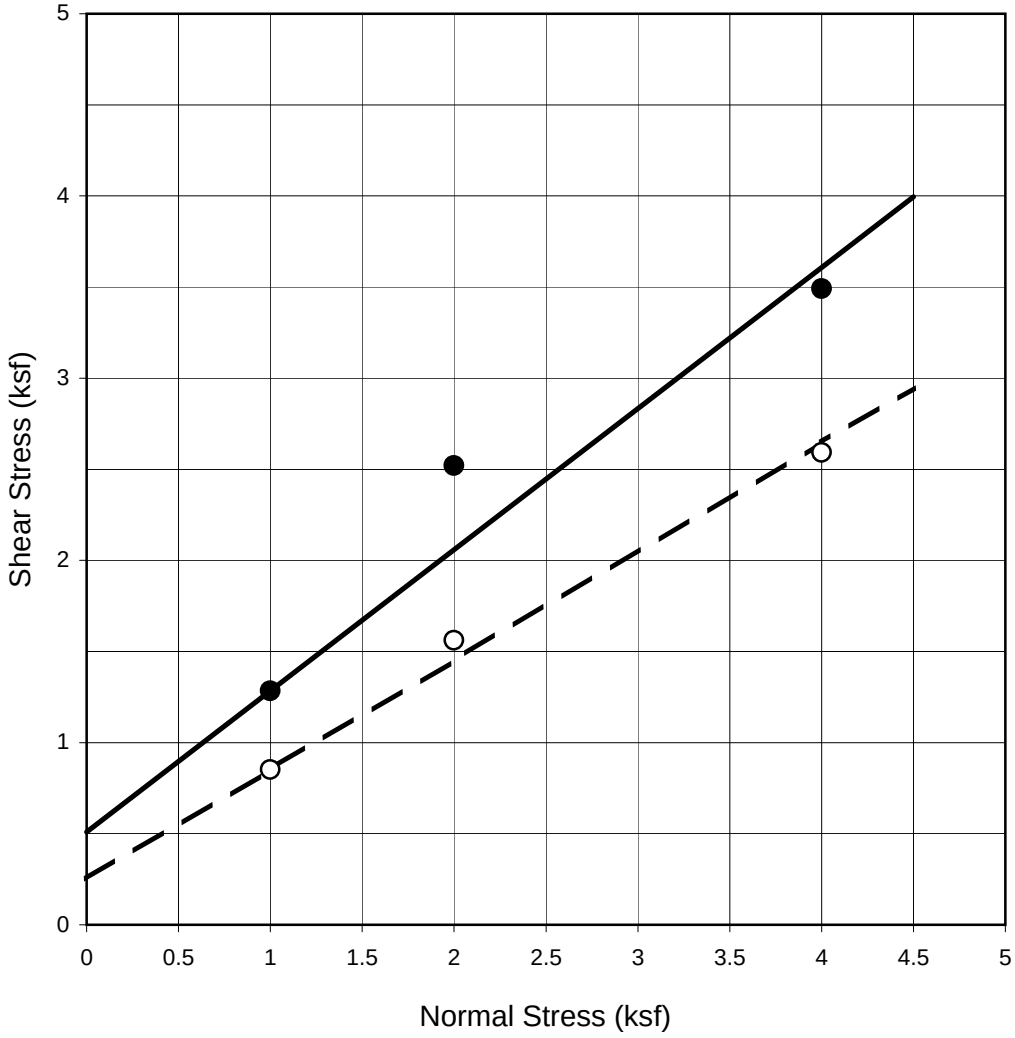
GEO3 PID 6 INCH

AP Engineering & Testing, Inc.

PERCENT PASSING NO. 200 SIEVE

Client:	AMEC Geomatrix	AP Lab No.:	28-0929
Project Name:	Venice Dual Force Main	Date:	09/22/08
Project Number:	14403.000		

Boring No.	Sample No.	Sample Depth (ft)	Percent Fine (%)
G-1	3	6-6.5	56.4
G-1	15	40-41.5	11.0
G-1	19	60-61.5	10.8
G-7	14	45-46.5	14.2
G-8	9	25-26.5	39.2
G-8	13	40-41.5	4.7
G-8	15	45-46	18.1
G-8	18	55-56.5	22.7
G-9	6	15-16.5	3.3
G-9	11	37-37.5	6.6
G-9	14	45-46.5	10.3
G-9	15	47.5-48	3.8
G-9	16	50-51.5	7.0
G-10	11	35-36.5	4.7
G-10	13	40-41.5	2.6
G-10	15	45-46.5	2.8
G-10	19	60-61.5	31.6
G-10	21	70-71	48.6
G-11	2	5-6.5	6.7
G-11	8	25-26.5	10.0
G-11	10	32.5-34	11.1
G-11	17	50	6.8
G-12	8	21-21.5	8.6
G-12	10	30-33	9.6
G-12	12	31.9	9.5
G-12	20	55-56.5	10.3



Project Name:	:	Venice Dual Force Main
Project No.	:	14403.000
Boring No.	:	G-1
Sample No.	:	14
Depth (ft)	:	38.5-38.9
Sample Type	:	Mod. Cal.
Soil Type	:	Poorly Graded Sand with silt
Test Condition	:	Saturated Drained
Initial Dry Density	:	121.9 pcf
Moisture Content (before)	:	8.5 %
Moisture Content (after)	:	15.3 %

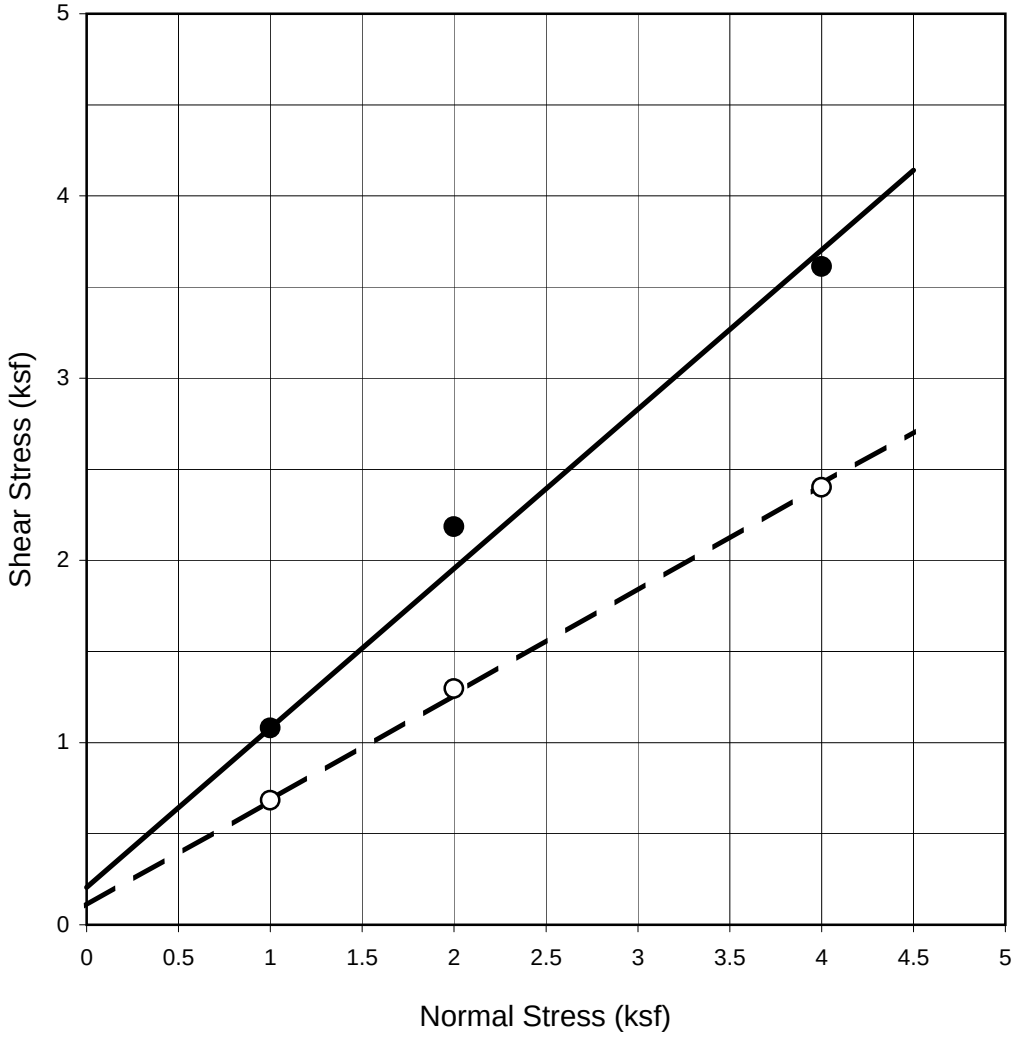
	Peak	Ultimate
Cohesion (psf) :	500	250
Friction Angle :	38 °	31 °

Normal Stress (ksf)	Shear Stress Peak (ksf)	Shear Stress Ultimate (ksf)
1	1.284	0.852
2	2.520	1.562
4	3.492	2.592

AP Engineering & Testing, Inc.

DIRECT SHEAR
TEST RESULTS
(ASTM D 3080)

Mar-09 Figure No.



Project Name:	:	Venice Dual Force Main
Project No.	:	14403.000
Boring No.	:	G-1
Sample No.	:	18
Depth (ft)	:	55-56
Sample Type	:	Mod. Cal.
Soil Type	:	Poorly Graded Sand with silt
Test Condition	:	Saturated Drained
Initial Dry Density	:	116.5 pcf
Moisture Content (before)	:	14.3 %
Moisture Content (after)	:	16.5 %

	Peak	Ultimate
Cohesion (psf) :	200	100
Friction Angle :	41 °	30 °

Normal Stress (ksf)	Shear Stress Peak (ksf)	Shear Stress Ultimate (ksf)
1	1.080	0.684
2	2.184	1.296
4	3.612	2.400

AP Engineering & Testing, Inc.

DIRECT SHEAR
TEST RESULTS
(ASTM D 3080)

Mar-09 Figure No.

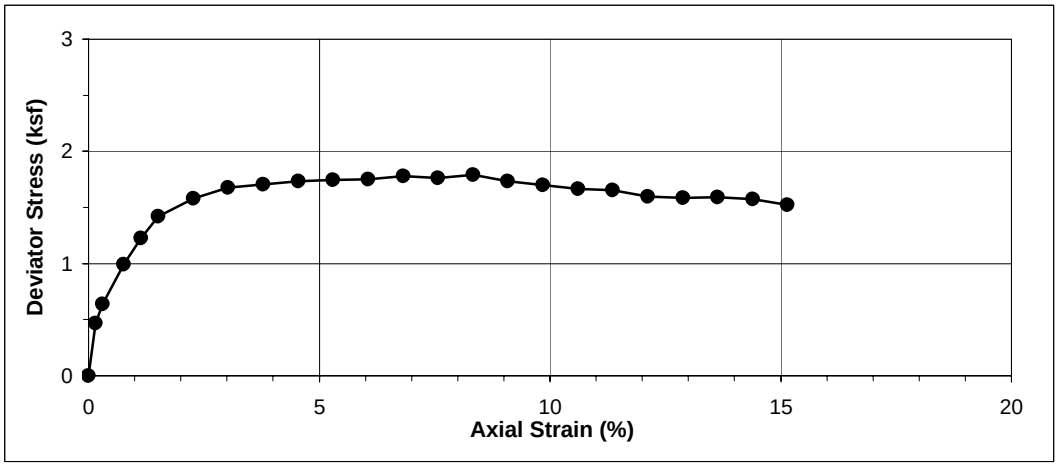
AP Engineering & Testing, Inc.

GEOTECHNICAL TESTING LABORATORY

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Project Name:	Venice Dual Force Main	Sample Type:	Shelby Tube
Work Order:	14403.000	Soil Description	Gray Silty Clay
Boring No.:	G-1	Dry Density (pcf):	77.0
Sample No.:	10	Moisture Content (%)	43.4
Depth (feet):	27.5-29.5	Test Date:	9/18/2008

Sample Diameter (inch):	2.875	Wt. Wet Soil+Container(gms)	733.54
Sample Hieght (inch):	6.60	Wt. Dry Soil+Container(gms)	570.46
Sample Weight (gms):	1242.28	Wt. Container (gms)	194.91



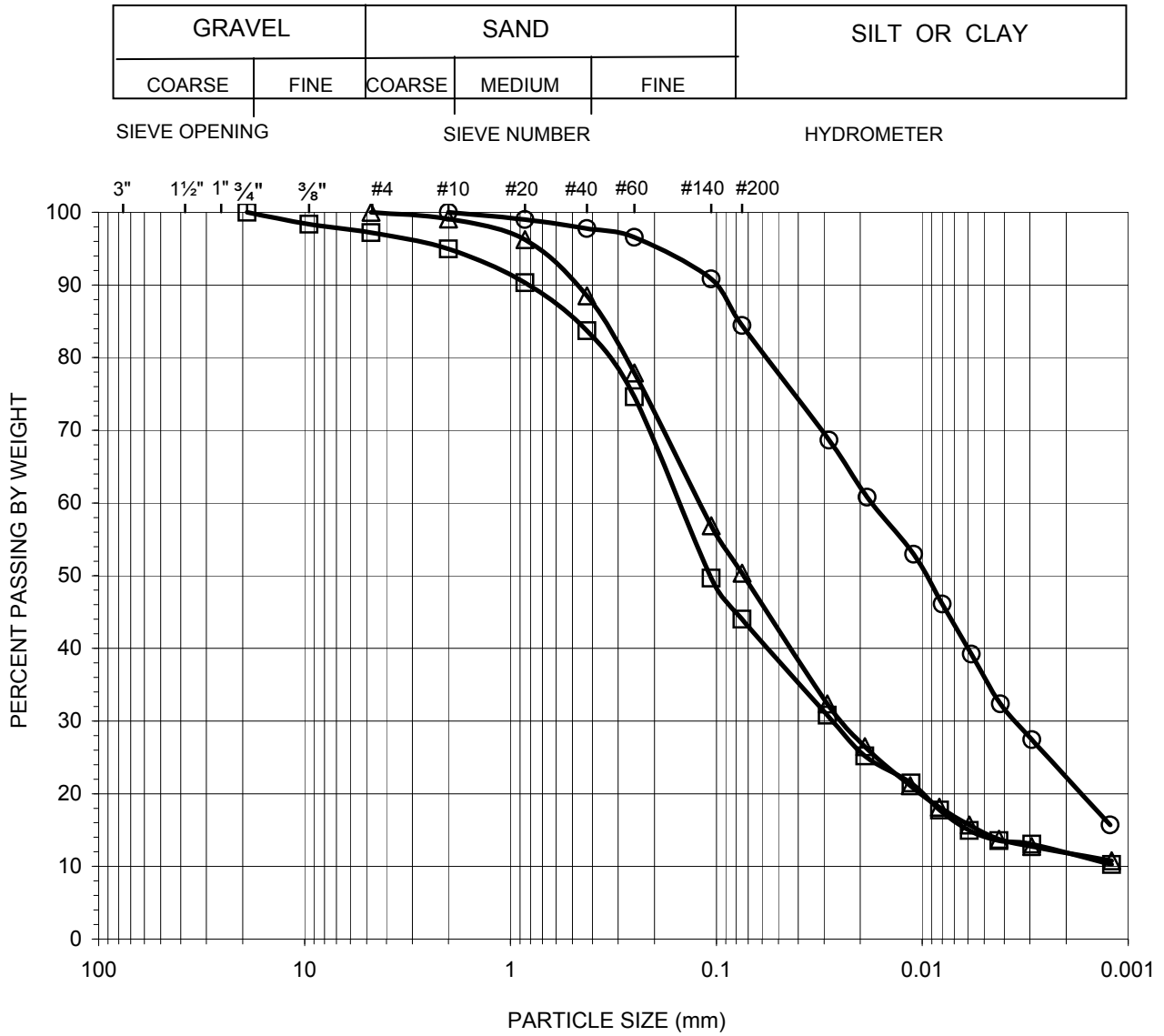
Confining Pressure : 1.20 ksf

Load (lbs)	Deformation (inch)	Area (sq.in)	Deviator Stress (ksf)	Axial Strain (%)
0	0.00	6.49	0.00	0.00
21	0.01	6.50	0.47	0.15
29	0.02	6.51	0.64	0.30
45	0.05	6.54	0.99	0.76
56	0.075	6.57	1.23	1.14
65	0.10	6.59	1.42	1.52
73	0.15	6.64	1.58	2.27
78	0.20	6.69	1.68	3.03
80	0.25	6.75	1.71	3.79
82	0.30	6.80	1.74	4.55
83	0.35	6.86	1.74	5.30
84	0.40	6.91	1.75	6.06
86	0.45	6.97	1.78	6.82
86	0.50	7.02	1.76	7.58
88	0.55	7.08	1.79	8.33
86	0.60	7.14	1.73	9.09
85	0.65	7.20	1.70	9.85
84	0.70	7.26	1.67	10.61
84	0.75	7.32	1.65	11.36
82	0.80	7.39	1.60	12.12
82	0.85	7.45	1.58	12.88
83	0.90	7.52	1.59	13.64
83	0.95	7.58	1.58	14.39
81	1.00	7.65	1.52	15.15

AP Engineering & Testing, Inc.

GRAIN SIZE DISTRIBUTION CURVE
ASTM D 422

Project Name: Venice Dual Force Main Tested by: DK Date: 09/17/08
Project Number: 14403.000 Checked by: AP Date: 10/08/08

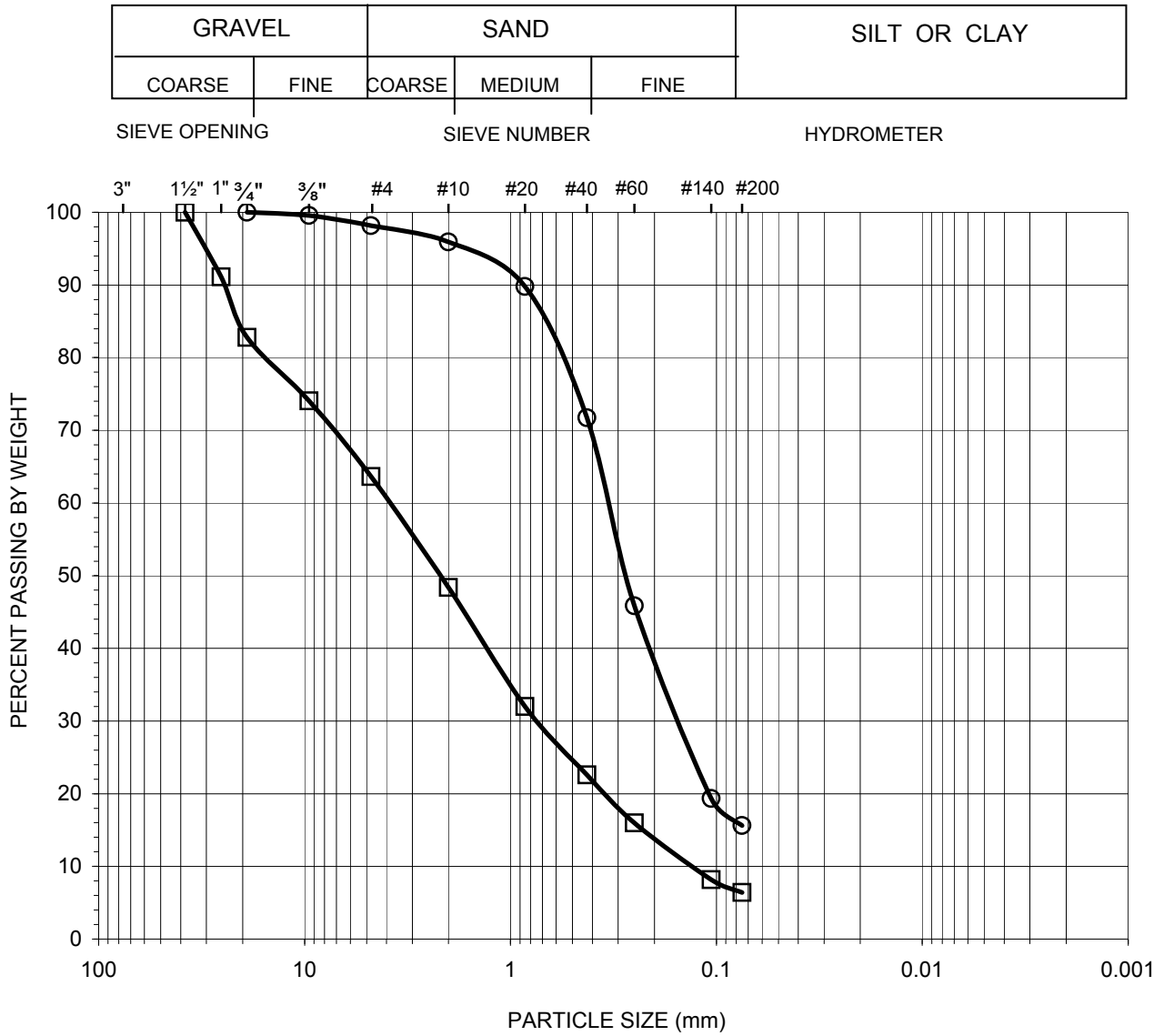


Symbol	Boring No.	Sample No.	Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Fines		
○	G-1	9	25-26.5	0.00	15.57	84.43	N/A	CL
□	G-1	11	30-31.5	2.79	53.21	44.00	N/A	SM
△	G-1	12	33.5-33.9	0.00	49.65	50.35	N/A	ML

AP Engineering & Testing, Inc.

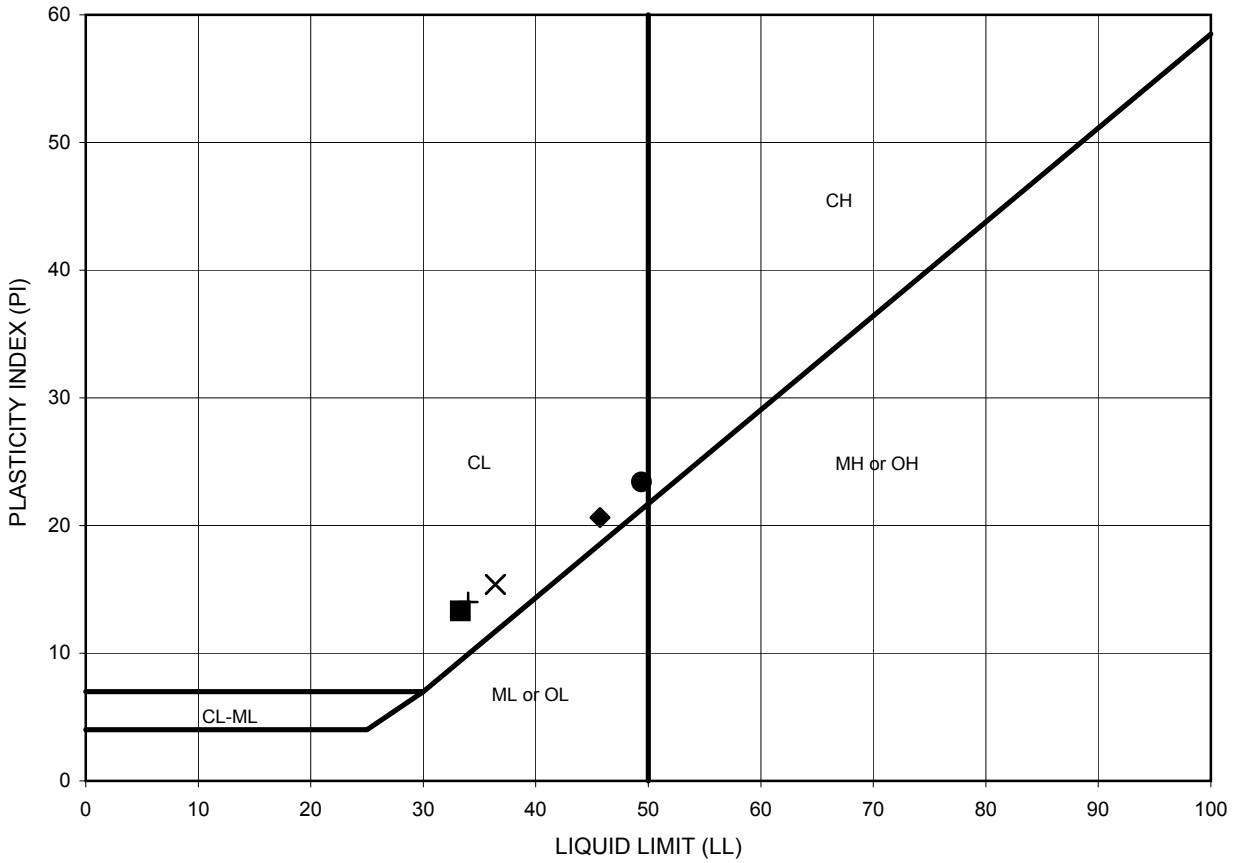
GRAIN SIZE DISTRIBUTION CURVE
ASTM D 422

Project Name: Venice Dual Force Main Tested by: DK Date: 09/17/08
Project Number: 14403.000 Checked by: AP Date: 10/08/08



Symbol	Boring No.	Sample No.	Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Fines		
○	G-1	13	35-36.5	1.84	82.54	15.62	N/A	SM
□	G-1	17	50-51.5	36.35	57.24	6.41	N/A	SW-SM

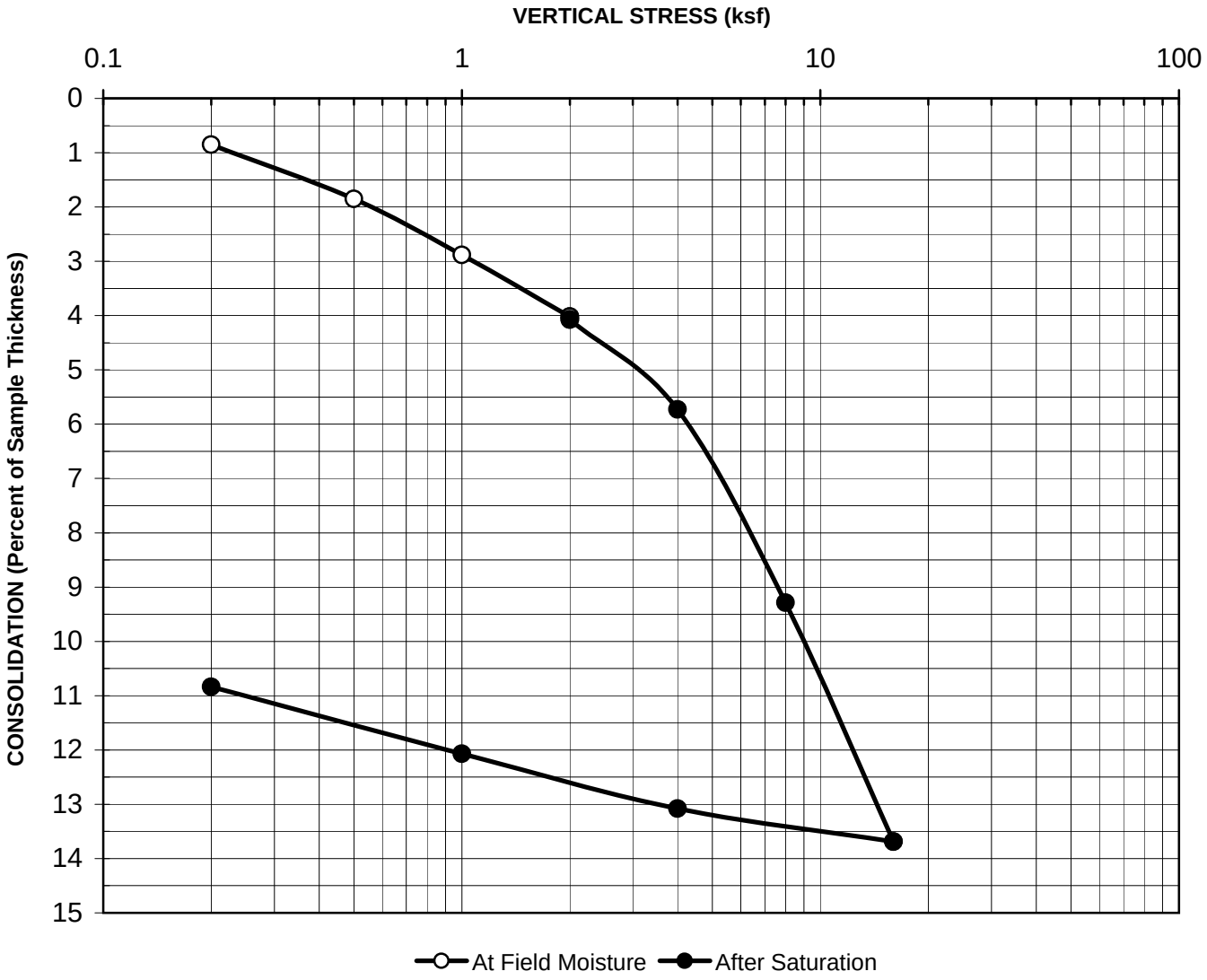
AP Engineering & Testing, Inc.



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	U.S.C.S Symbol
♦	G-1	9	25-26.5	46	25	21	CL
	G-1	12	33.5-33.9	NP	NP	NP	ML
■	G-7	7	20-21.5	33	20	13	CL
●	G-7	18	60-61.5	49	26	23	CL
X	G-8	19	60-61.5	36	21	15	CL
+	G-9	18	60-61.5	34	20	14	CL

ATTERBERG LIMITS
ASTM D 4318-93

Project Name: Venice Dual Force Main
Project No.: 14403.000
Date: 09/17/08
AP No: 28-0929 **Figure No.:**



Boring No. :	G-1	Initial Dry Unit Weight (pcf):	88.1
Sample No.:	10	Initial Moisture Content (%):	30.8
Depth (feet):	27.5-29.5	Final Moisture Content (%):	28.4
Sample Type:	Mod. Cal	Assumed Specific Gravity:	2.7
Soil Description:	Gray Silty Clay	Initial Void Ratio:	0.91

AP Engineering & Testing, Inc.

PROJECT NAME: Venice Dual Force Main

PROJECT NO.: 14403.000

AP LAB NO.: 28-0929

CONSOLIDATION TEST RESULTS
ASTM D 2435

Sep-08

AP Engineering & Testing, Inc.

COMPACTION TEST

Client: AMEC Geomatrix
Project Name: Venice Dual Force Main
Project No. : 14403.000
Location: G-1
Sample No. : 1
Visual Sample Description: Brown Silty Sand w/gravel

AP Number: 28-0929
Tested By: JT Date: 09/26/08
Calculated By: KM Date: 10/09/08
Checked By: AP Date: 10/09/08
Depth (ft): 0-2

Compaction Method: [X] ASTM D1557 [ ] ASTM D698
Preparation Method: [ ] Moist [X] Dry

METHOD: C
MOLD VOLUME (CU.FT): 0.0752

Trial No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	7230	7042	7245	7322		
Wt. of Mold (gm.)	2647	2647	2647	2647		
Net Wt. of Soil (gm.)	4583	4395	4598	4675		
Container No.						
Wt. of Container (gm.)	154.50	196.30	193.50	154.10		
Wet Wt. of Soil + Cont. (gm.)	939.90	912.70	1229.20	1135.10		
Dry Wt. of Soil + Cont. (gm.)	854.75	871.68	1151.31	1043.93		
Moisture Content (%)	12.16	6.07	8.13	10.25		
Wet Density (pcf)	134.37	128.85	134.80	137.05		
Dry Density (pcf)	119.80	121.47	124.66	124.32		

Maximum Dry Density (pcf): **126.0**
Optimum Moisture Content (%): **9.0**

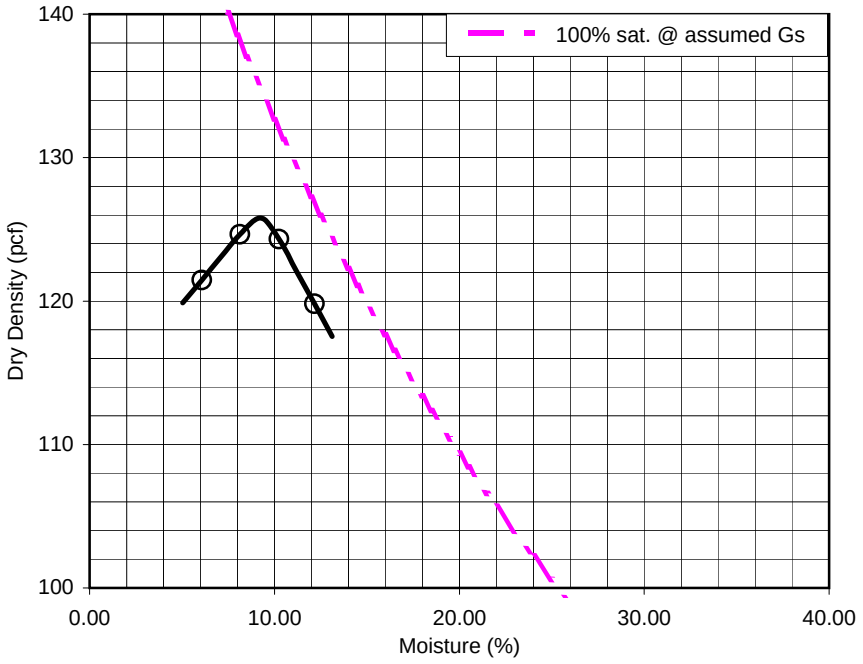
Assumed Specific Gravity = 2.7

PROCEDURE USED

[ ] Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

[ ] Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

[X] Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + 3/4 in <30%



AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Geomatrix
Project Name: Venice Dual Force Main
Project No.: 14403.000

AP Job No.: 28-0929
Date 09/17/08

Boring No.	Sample No.	Depth (ft)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
G-1	10	27.5-29.5	CL	92	7.2	190	1805
G-1	Mixed	25-40	SM/ML	200	7.1	88	1459
G-9	8	25-27.3	CL	230	9.4	37	1587
G-9	Mixed	35-50	SM	1000	7.1	58	205

NOTES: Resistivity Test and pH: California Test Methods 532 and 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

2607 Pomona Boulevard, Pomona, CA 91768
Tel. (909) 869-6316 Fax. (909)869-6318

LOG OF TEST BORING

CORRECTED COPY: 03-27-96

LAB NO. : 140- 4360 PROJECT: VENICE AREA RELIEF SEWER

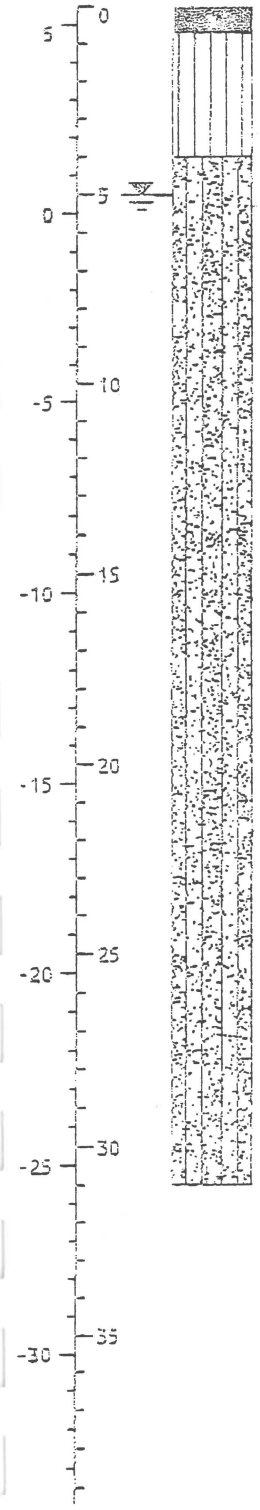
BORING NO.: 8 ELEVATION: 5.5' DRILLING DATE: 08-11-94

BORING LOCATION: 21' N/o NCF Hurricane St. and 92' E/o C/L Canal Ct.

DRILL RIG TYPE: CME-75 using 8" hollow stem augers

DEPTH TO STANDING WATER: 5' DEPTH TO WATER SEEPAGE: none

DRILLER: Ramirez LOGGER: Roth ENGINEER: James



ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/FOOT	USCS	Field Description	Standard Penetration Readings 1st 6"	2nd 6"	3rd 6"
			8" AC pavement in fair condition.			
		ML	Brown sandy silt with a trace of gravel. Moist and soft.			
		SP-SM	Brown poorly graded sand with some silt. Moist and dense. Color changed to dark gray at 5'. Encountered groundwater at 5'.	1	3	7
				2	3	4
				3	6	7
				4	5	7
			Encountered a 2' fat clay lense at 25' depth.	2	2	2
				3	4	3
			Encountered groundwater at 5' depth.			
			OVA = 0 for all sample depths.			

LOG OF TEST BORING

CORRECTED COPY: 03-27-96

LAB NO. : 140- 4360 PROJECT: VENICE AREA RELIEF SEWER

BORING NO.: 8 ELEVATION: 5.5' DRILLING DATE: 08-11-94

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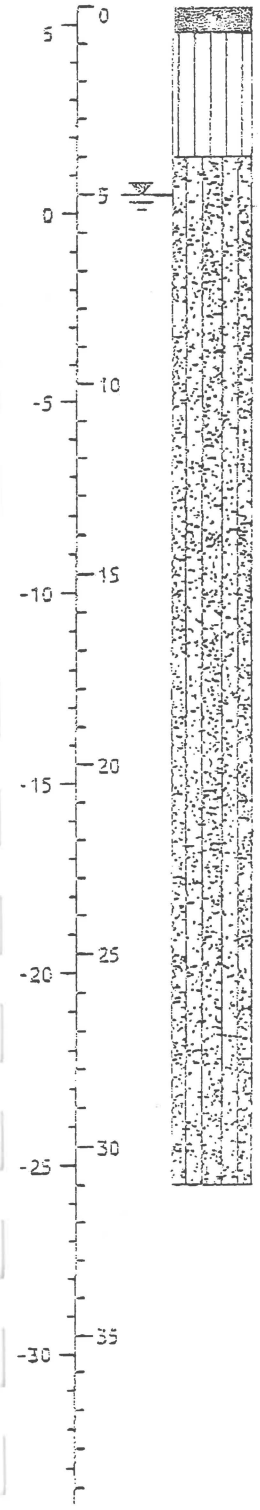
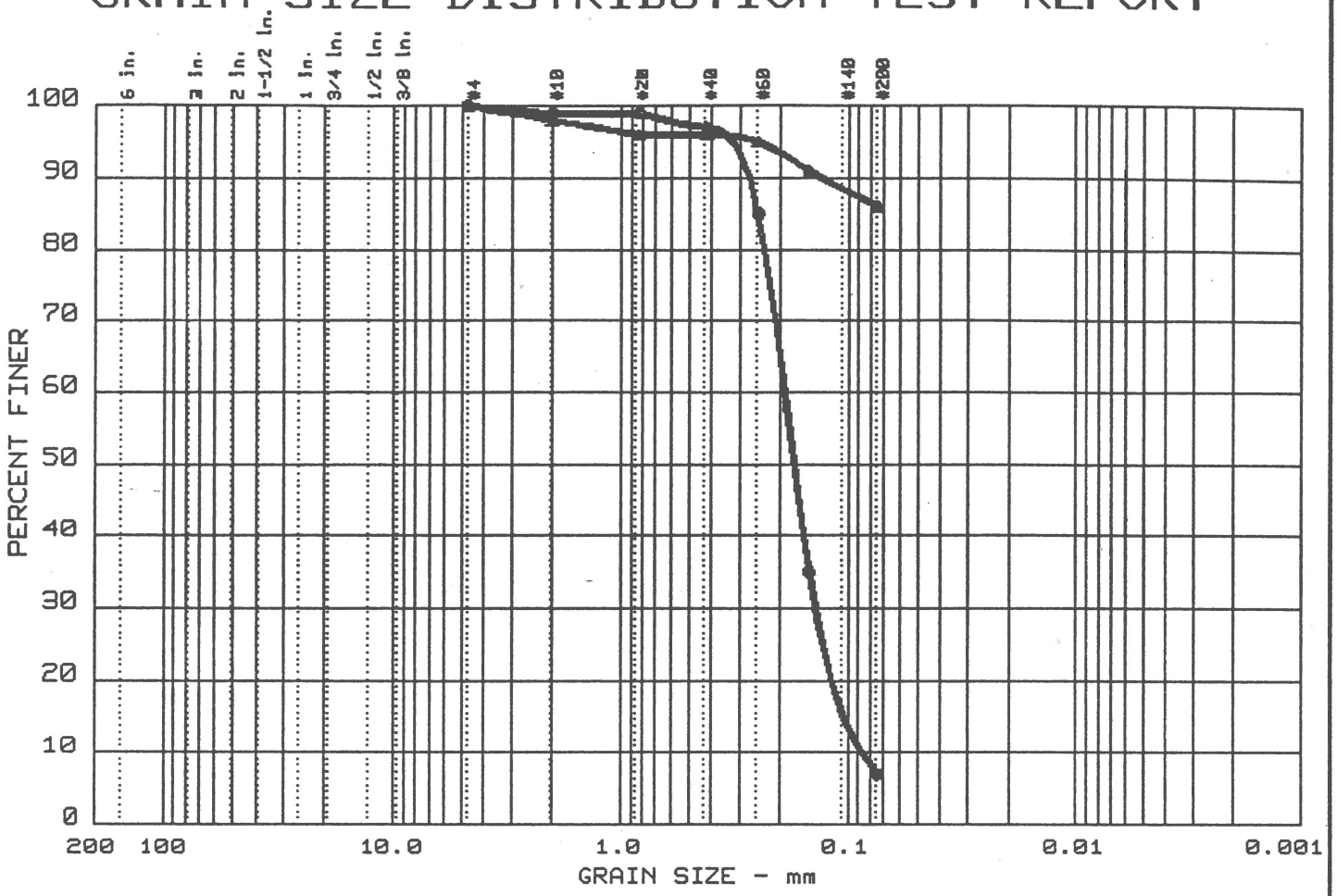


ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/FOOT	USCS	Field Description	Standard Penetration Readings 1st 6"	2nd 6"	3rd 6"
			8" AC pavement in fair condition.			
		ML	Brown sandy silt with a trace of gravel. Moist and soft.			
		SP-SM	Brown poorly graded sand with some silt. Moist and dense. Color changed to dark gray at 5'. Encountered groundwater at 5'.	1	3	7
				2	3	4
				3	6	7
				4	5	7
			Encountered a 2' fat clay lense at 25' depth.	2	2	2
				3	4	3
			Encountered groundwater at 5' depth.			
			OVA = 0 for all sample depths.			

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	93.0	7.0	
▲	0.0	0.0	14.0	86.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	-	N/P	0.25	0.19	0.17	0.140	0.1047	0.0870	1.17	2.2
▲	52	25								

MATERIAL DESCRIPTION	USCS	AASHTO
● POORLY GRADED SAND WITH SILT	SP-SM	A-3
▲ FAT CLAY	CH	A-7-6(23.9)

Project No.: 140-4360
Project: VENICE AREA RELIEF SEWER (PHASE I)
● Location: B-8 @ 20' DEPTH
▲ Location: B-8 @ 25' DEPTH

Date: 10-03-94 BY: JV/PTF

GRAIN SIZE DISTRIBUTION TEST REPORT

CITY OF LOS ANGELES - STANDARDS DIVISION

Remarks:
-
-
-
-

Figure No. -

Lab. No.: 140-4360

CITY OF LOS ANGELES
DEPARTMENT OF GENERAL SERVICES
STANDARDS DIVISION
2319 DORRIS PLACE
LOS ANGELES, CA 90031
(213) 485-2242

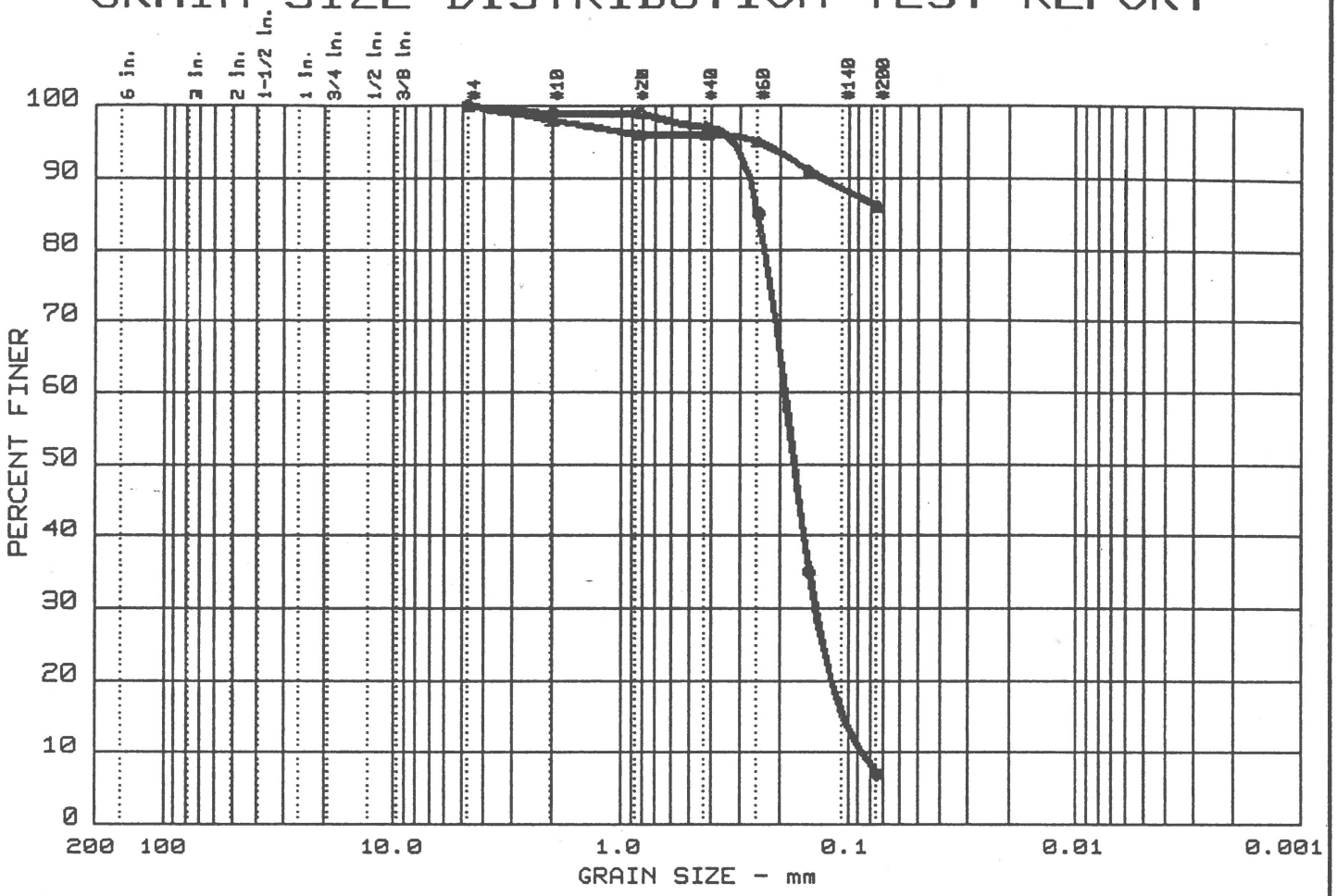
TEST BORING DATA

Job Title: VENICE AREA RELIEF SEWER (PHASE I) W.O. No.: E2000461

Test Boring No.	7						8					
Sample Depth, ft.	5	10	15	20	25	30	5	10	15	20	25	30
In Place Dry Density, pcf	124		100	107		99						
Field Moisture, %	9.9		23.0	21.3		25.7						
Lab. Max. Dry Density, pcf	125											
Lab. Optimum Moisture, %	9											
Relative Compaction, %	99											
Mechanical Analysis (% Passing)												
3/4"												
No. 4						100				100	100	
No. 10						99				99	98	
No. 20			100			98				99	96	
No. 40			99			98				97	96	
No. 60			83			97				85	95	
No. 100			33			95				35	91	
No. 200			6			86				7	86	
5 μ (Micron), %												
Liquid Limit			--			33				--	52	
Plasticity Index			N/P			14				N/P	25	
Sand Equivalent									41			
Expansion Index												
Unconfined Compression				132								

SOIL COMPACTION FAX TEL:213-847-3761 Apr 02'96 13:56 No.008 P.12

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	93.0	7.0	
▲	0.0	0.0	14.0	86.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	-	N/P	0.25	0.19	0.17	0.140	0.1047	0.0870	1.17	2.2
▲	52	25								

MATERIAL DESCRIPTION	USCS	AASHTO
● POORLY GRADED SAND WITH SILT	SP-SM	A-3
▲ FAT CLAY	CH	A-7-6(23.9)

Project No.: 140-4360
Project: VENICE AREA RELIEF SEWER (PHASE I)
● Location: B-8 @ 20' DEPTH
▲ Location: B-8 @ 25' DEPTH

Date: 10-03-94 BY: JV/PTF

GRAIN SIZE DISTRIBUTION TEST REPORT

CITY OF LOS ANGELES - STANDARDS DIVISION

Remarks:
-
-
-
-

Figure No. -

Lab. No.: 140-4360

CITY OF LOS ANGELES
DEPARTMENT OF GENERAL SERVICES
STANDARDS DIVISION
2319 DORRIS PLACE
LOS ANGELES, CA 90031
(213) 485-2242

TEST BORING DATA

Job Title: VENICE AREA RELIEF SEWER (PHASE I) W.O. No.: E2000461

Test Boring No.	7						8					
Sample Depth, ft.	5	10	15	20	25	30	5	10	15	20	25	30
In Place Dry Density, pcf	124		100	107		99						
Field Moisture, %	9.9		23.0	21.3		25.7						
Lab. Max. Dry Density, pcf	125											
Lab. Optimum Moisture, %	9											
Relative Compaction, %	99											
Mechanical Analysis (% Passing)												
3/4"												
No. 4						100				100	100	
No. 10						99				99	98	
No. 20			100			98				99	96	
No. 40			99			98				97	96	
No. 60			83			97				85	95	
No. 100			33			95				35	91	
No. 200			6			86				7	86	
5 μ (Micron), %												
Liquid Limit			--			33				--	52	
Plasticity Index			N/P			14				N/P	25	
Sand Equivalent									41			
Expansion Index												
Unconfined Compression				132								

SOIL COMPACTION FAX TEL:213-847-3761 Apr 02'96 13:56 No.008 P.12

APPENDIX C



GeoKinetics
Geotechnical & Environmental Engineers

Preliminary Subsurface Methane Gas Investigation at Venice Auxiliary Pumping Station 133 East Hurricane Street Los Angeles, California

Prepared by

GeoKinetics

77 Bunsen
Irvine, CA 92618
Tel 949.502.5353, Fax 949.502.5354

Prepared for

Geotechnical Engineering Group
Mr. Christoper F. Johnson
1149 South Broadway
Los Angeles, California 90015

August 20, 2015

1.0 Introduction: GeoKinetics has completed a subsurface methane gas investigation at the proposed Venice Auxiliary Pumping Plant located at 133 Hurricane Street, in the City of Los Angeles. The location of the subject property is shown in Figure 1 while a recent aerial photograph of the site is provided as Figure 2. We understand that the proposed auxiliary pumping plant will consist of a wet well / valve vault, an electrical building and a diversion structure on the approximate 7,850 square foot property. The subject property is located in the Playa Del Rey Oil Field as it has been mapped by the California Department of Conservation, Division of Oil, Gas & Geothermal Resources (DOGGR). No oil wells are shown to exist at the property based upon our review of the DOGGR oil field map. The closest mapped oil well (Allied Petroleum Corp., "Rawco – Woodford", #1) is located approximately 55 feet southwest of the subject property. As a result, it is within a Methane Zone designated by LADBS. It will therefore be necessary to incorporate methane gas mitigation measures into the design of the proposed structures in accordance with LADBS requirements

Under the current building code, the nature and extent of the required mitigation measures are partially dependent upon the concentration and pressure of any methane gas that may be present at the site. The current investigation has been performed for the purpose of documenting the concentration and pressure of methane gas in the subsurface of the subject property such that appropriate mitigative improvements can be specified. This report presents the results of the subsurface gas investigation as well as associated methane mitigation recommendations in accordance with typical LADBS requirements.

2.0 Background: The presence of methane gas in the subsurface is common within former oil production areas and other locations where organic material - such as grass, leaves, wood, manure, etc. - are present in the soil. Biogenic methane is generated by the bacteriological digestion, or biodegradation, of organic matter in the absence of oxygen. Methane of thermogenic or petrogenic origin may also be present in surficial soils as a result of its upward migration from deeper oil and gas bearing zones. Our experience indicates methane gas is common and can be found in the soil at a relatively high percentage of building sites in southern California. Methane is not toxic, however it is combustible and potentially explosive at concentrations above 55,000 ppm in the presence of oxygen. This concentration is referred to as its Lower Explosive Level or LEL. Methane is lighter than air and therefore has a natural tendency to rise to the ground surface where it typically dissipates into the atmosphere. The presence of non-pressurized methane at shallow depths beneath the ground surface is normally not problematic. The rates at which the methane is generated and/or migrates towards the ground surface are slow enough such that the gas dissipates naturally under normal circumstances. However, as methane migrates to the ground surface, the

potential exists for its accumulation beneath slab-on-grade foundation systems or other relatively impermeable ground coverings. If the gas accumulates to high concentrations, and becomes pressurized, and a crack or other penetration is present in the floor slab of the structure, detectable levels of methane may enter the interior of the building. Improvements - such as sub-slab vent lines or gas membranes - are generally required by LADBS as a precautionary measure for new structures at Methane Zone sites.

3.0 Field Investigation: The field work associated with the methane gas investigation at the subject property included the installation and monitoring of five (5) multi-stage subsurface gas probes. The locations of these gas probes are shown in Figure 2. The subsurface gas probes were installed on August 6th, 2015 and they were subsequently monitored on August 7th and 11th, 2015. The gas probes were installed using 6" hollow stem auger drilling equipment. A schematic illustrating the general configuration of the gas probes is provided as Figure 3. The LADBS guidelines require that individual sampling tips be installed at depths of 5, 10, and 20 feet below the lowest floor level of the proposed structures. However, based on the known groundwater depth of approximately 8 feet bgs, probes were proposed to be installed on site at depths of 2, 5 and 7 feet bgs. Per LADBS guidelines, five shallow probes would be installed at a depth of 5' bgs and then two deeper probes would be installed at the two locations with the highest methane readings. However, in order to save time and reduce costs, all five borings were advanced to 8' bgs and probe tips were installed at 2, 5 and 7' bgs in each of the five borings. All five borings were logged in the field under the supervision of a registered engineering geologist. Copies of the boring logs for this project are included as Attachment A for your reference. As indicated, the upper four to five feet primarily consisted of moist fine grained sands. Clay, silty-clay and sandy estuarine deposits were noted just below the fine grain sands in each boring.

The sampling tips of the current installation were embedded within a 12-inch interval of washed Monterey #3 sand. Bentonite clay seals were placed above and below each sand interval in order to isolate the gas sampling tips. Gas tight quick connect fittings were installed on the ends of the polyethylene tubing at the ground surface in order to seal the probes between monitoring events. Flush-mounted vaults were installed at the ground surface to protect the installations.

As discussed previously, the installations were monitored on August 7th and 11th, 2015. All monitoring was performed during periods of falling barometric pressure. The subsurface gas pressure relative to atmospheric, and the concentrations of methane, oxygen, and carbon dioxide, were measured in the subsurface probes during each monitoring event. The monitoring equipment that was utilized and the associated detection limits, or resolutions, are summarized in Table 1. As indicated, subsurface gas pressures were

measured to the nearest 0.05 inches of water prior to each sampling event using a Magnahelic gauge while the barometric pressure was measured and recorded to the nearest 0.1 inches of mercury using a digital barometer. The gas probe methane, oxygen, and carbon dioxide concentrations were measured in the field using a portable, methane specific, LandTec GEM2000-Plus infra-red gas analyzer. A volume of gas equivalent to approximately ten times that of the ¼-inch diameter polyethylene gas probe tube was extracted through the LandTec GEM2000-Plus during the monitoring process. Steady state readings were generally obtained after approximately two tubing volumes of gas had been extracted. The highest methane reading displayed in each instance was recorded. The LandTec GEM2000-Plus was calibrated at the beginning and the end of each day of monitoring using a certified mixture of 15% methane, 15% carbon dioxide, and 70% nitrogen calibration gas (Note: all gas concentrations referred to in this report are on a volumetric basis). A Photovac Flame Ionization Detector (FID) was used to confirm combustible gas levels at selected probes where sufficient oxygen was present in the probe to operate the FID. The gas levels measured with both detectors were found to be consistent. Combustible gas concentrations in excess of 450 ppm were not detected with the FID.

Ambient gas levels in the air four feet above the ground surface were recorded at the site periodically during the monitoring. In each instance, the measured gas level fell within the following range:

Gas	Measured Range
Methane	<0.1%
Carbon Dioxide	<0.1%
Oxygen	20.8% – 20.9%

4.0 Results: The pressures and concentrations measured in each of the subsurface gas probes during the monitoring events are summarized in Table 2. As indicated, three of the 7' deep probe tips were flooded with water during the monitoring events. Also as indicated, the highest methane gas detection on site was 1,000 ppm (0.1%) at 5 feet bgs at probe P-5. Methane gas was not detected at any of the other gas probe installations. The site FID readings ranged from 0 to 449 ppm for the probes with enough oxygen to record a reading. This is consistent with the LandTec GEM2000-Plus readings.

The soil gas pressures measured in the gas probes range from 0.00 to 0.50 inches of water. This pressure range is normal and consistent with normal

barometric variations. There was no indication of elevated soil gas pressures associated with methane generation or migration.

The concentration of oxygen in the atmosphere at sea level is approximately 21%. The subsurface oxygen levels were found to be slightly to moderately depressed below typical atmospheric levels at each of the gas probe installations. The lowest subsurface oxygen level recorded at the site was 2.5% while the average oxygen concentration measured in the gas probes was approximately 14.6%. The average concentration of carbon dioxide in the atmosphere at sea level is approximately 0.03%. Subsurface carbon dioxide levels were slightly to moderately elevated above typical atmospheric levels in each of the gas probes. The highest carbon dioxide concentration measured at the site was 3.2% while the average carbon dioxide concentration measured in the gas probes was approximately 1.3%. The slightly to moderately depressed subsurface oxygen levels and slightly to moderately elevated carbon dioxide levels suggest residual organic matter entrained within the near surface soils is being biodegraded under aerobic conditions.

Based upon the measured methane levels and the corresponding soil gas pressures, we conclude the property should be classified as a Level II site with a Design Methane Pressure of #2" of water in accordance with LADBS guidelines. A copy of the LADBS methane testing compliance form for this project is included as Attachment B for your reference.

As discussed previously, the property is shown to be located within a Methane Zone. The following primary methane mitigation measures are typically required by LADBS for new Level II slab-on-grade structures within the methane zone:

1. **Sub-Slab Vent System:** A series of perforated vent lines and an associated 2" thick gravel blanket must be installed beneath the floor slab of the proposed structure. The perforated vent lines are connected to solid vent piping that extends through the walls or pipe chases of the building to outlets above the roof line. A dewatering system (sump and pump) must be installed if the design high groundwater level for the project is not at least one foot below the lowest vent piping elevation. A dewatering system is not necessary for on-grade structures for this project. However, structures that extend below approximately 5’ bgs will likely need either a dewatering system, or be constructed hydrostatically. If the hydrostatic option is selected, a modification from LADBS will likely be required in order to remove the sub-slab venting system requirement.

2. **Impervious Membrane:** A continuous gas membrane is required below the floor slab of the structures. This membrane must be sealed against footings, pilings, and utilities to form a gas-tight barrier beneath the buildings.

3. **Utility Trench Dams:** A section of impervious backfill consisting of compacted native soil or sand / cement slurry must be installed in utility trenches that extend beneath the perimeter of the buildings in order to prevent methane gas from migrating beneath the structure through sand bedding or backfill.

4. **Conduit Seals:** Gas tight seals must be installed on all conduits (e.g. electrical, cable T.V., telephone, etc.) that extend to the interior of the structure. The purpose of these seals is to prevent methane gas from entering subsurface cracks or discontinuities in the conduits and subsequently migrating to the interior of the buildings.

There are exceptions in the City Methane Ordinance (Ordinance No. 175790) that allow some of the requirements outlined above to be omitted, or modified, under certain conditions. These possible exceptions should be considered as the building plans are developed in order to determine the specific mitigative measures that will be required for the project.

5.0 Closing: This investigation has been performed with the degree of skill and care ordinarily exercised by engineers practicing in this, and similar, localities. No other warranty, expressed or implied, is given regarding the conclusions or professional opinions presented in this report. The scope of this report is limited to the matters expressly covered herein. This report is presented for the sole use of the Geotechnical Engineering Group and may not be relied upon by any other party without written authorization from GeoKinetics. All recommendations, findings, and conclusions presented in this report are based upon facts and circumstances as they existed at the time this report was prepared. A change in any fact or circumstance upon which this report is based may necessitate re-evaluation and/or modification of the recommendations, findings, and conclusions presented herein. Due to the nature of this type of investigation, uncertainty exists with respect to the subsurface conditions that are present between boring / sampling locations. The subsurface methane concentrations at the site could vary over time and may change in response to site modifications. The methane levels identified in this report represent the concentrations that were measured at the time of the

current investigation. Higher or lower concentrations could occur in the future. If the level of inherent uncertainty is unacceptable, additional sampling and/or testing should be considered.

We hope this information is helpful to you. Please do not hesitate to contact the undersigned if you have any questions or comments.

Sincerely,
GEOKINETICS, INC.

Kevin J. Lea, RCE
Senior Engineer

attachments

REGISTERED PROFESSIONAL ENGINEER
KEVIN J. LEA
NO. C- 67844
EXP. 6-30-17
CIVIL
STATE OF CALIFORNIA

Geoffrey Stokes, CEG / PG
Senior Geologist

PROFESSIONAL GEOLOGIST
Geoffrey Daniel Stokes
NO. 2266
CERTIFIED
ENGINEERING
GEOLOGIST
Exp. 7-31-17
STATE OF CALIFORNIA

Table 1. Gas Probe Monitoring Equipment & Parameters

Parameter	Equipment	Detection Limit or Resolution	Range
Barometric Pressure	Digital Barometer	0.1" of Hg	25 to 36 in Hg
Gas Probe Pressure	Pressure Gauge	0.1" of H_2O	-5 to +5 in H_2O
Methane Concentration	LandTec GEM2000-Plus Infrared Gas Analyzer	0.1%	0.1% to 100%
	FID	0.1 ppm	0.1 to 1,000 ppm
		1 ppm	1 to 10,000 ppm
Carbon Dioxide Concentration	LandTec GEM2000-Plus Infrared Gas Analyzer	0.1%	0.1% to 50%
Oxygen Concentrations	LandTec GEM2000-Plus Infrared Gas Analyzer	0.1%	0.1% to 25%

133 Hurricane Street - Methane Investigation
Los Angeles, California
Multi-Stage Gas Probe Monitoring Results

GAS PROBE #	MONITORING DATE	PROBE DEPTH (feet)	GAS CONCENTRATION (%)			GAS PROBE PRESSURE (IN H_20)	BAROMETRIC PRESSURE (IN Hg)	FID (ppm)
			CH_4	CO_2	O_2			
P-1	8/7/2015	2	0.00	1.4	18.7	0.00	29.9	0.0
	8/11/2015		0.00	1.5	19.0	0.00	29.9	0.0
	8/7/2015	5	0.00	1.6	17.7	0.00	29.9	6.6
	8/11/2015		0.00	2.1	17.8	0.00	29.9	0.8
	8/7/2015	7	0.00	0.1	15.9	0.00	29.9	200.0
	8/11/2015		flooded				29.9	-
P-2	8/7/2015	2	0.00	0.8	18.8	0.00	29.9	0.0
	8/11/2015		0.00	1.1	18.7	0.00	29.9	0.2
	8/7/2015	5	0.00	2.2	14.9	0.00	29.9	9.6
	8/11/2015		0.00	3.2	14.8	0.00	29.9	4.6
	8/7/2015	7	0.00	0.4	16.7	0.50	29.9	449.0
	8/11/2015		0.00	1.6	6.9	0.00	29.9	flameout
P-3	8/7/2015	2	0.00	0.8	17.6	0.00	29.9	0.9
	8/11/2015		0.00	1.2	17.7	0.00	29.9	0.3
	8/7/2015	5	0.00	3.7	9.2	0.00	29.9	flameout
	8/11/2015		0.00	3.9	10.0	0.00	29.9	flameout
	8/7/2015	7	0.00	0.2	9.9	0.00	29.9	flameout
	8/11/2015		0.00	0.6	2.5	0.00	29.9	flameout
P-4	8/7/2015	2	0.00	0.6	19.9	0.00	29.9	0.0
	8/11/2015		0.00	0.3	19.8	0.00	29.9	0.0
	8/7/2015	5	0.00	0.5	7.7	0.00	29.9	flameout
	8/11/2015		0.00	0.8	8.2	0.00	29.9	flameout
	8/7/2015	7	flooded				29.9	-
	8/11/2015		flooded				29.9	-
P-5	8/7/2015	2	0.00	0.5	18.4	0.00	29.9	10.6
	8/11/2015		0.00	0.9	18.1	0.00	29.9	0.7
	8/7/2015	5	0.10	0.4	13.2	0.00	29.9	flameout
	8/11/2015		0.00	2.0	13.7	0.00	29.9	flameout
	8/7/2015	7	flooded				29.9	-
	8/11/2015		flooded				29.9	-

Background	8/7/2015	Pre-Monitoring	0.00	0.0	20.9	-	29.9	1.4
	8/11/2015		0.00	0.0	20.8	-	29.9	0.0
	8/7/2015	Post-Monitoring	0.00	0.0	20.9	-	29.9	1.6
	8/11/2015		0.00	0.0	20.8	-	29.9	1.3

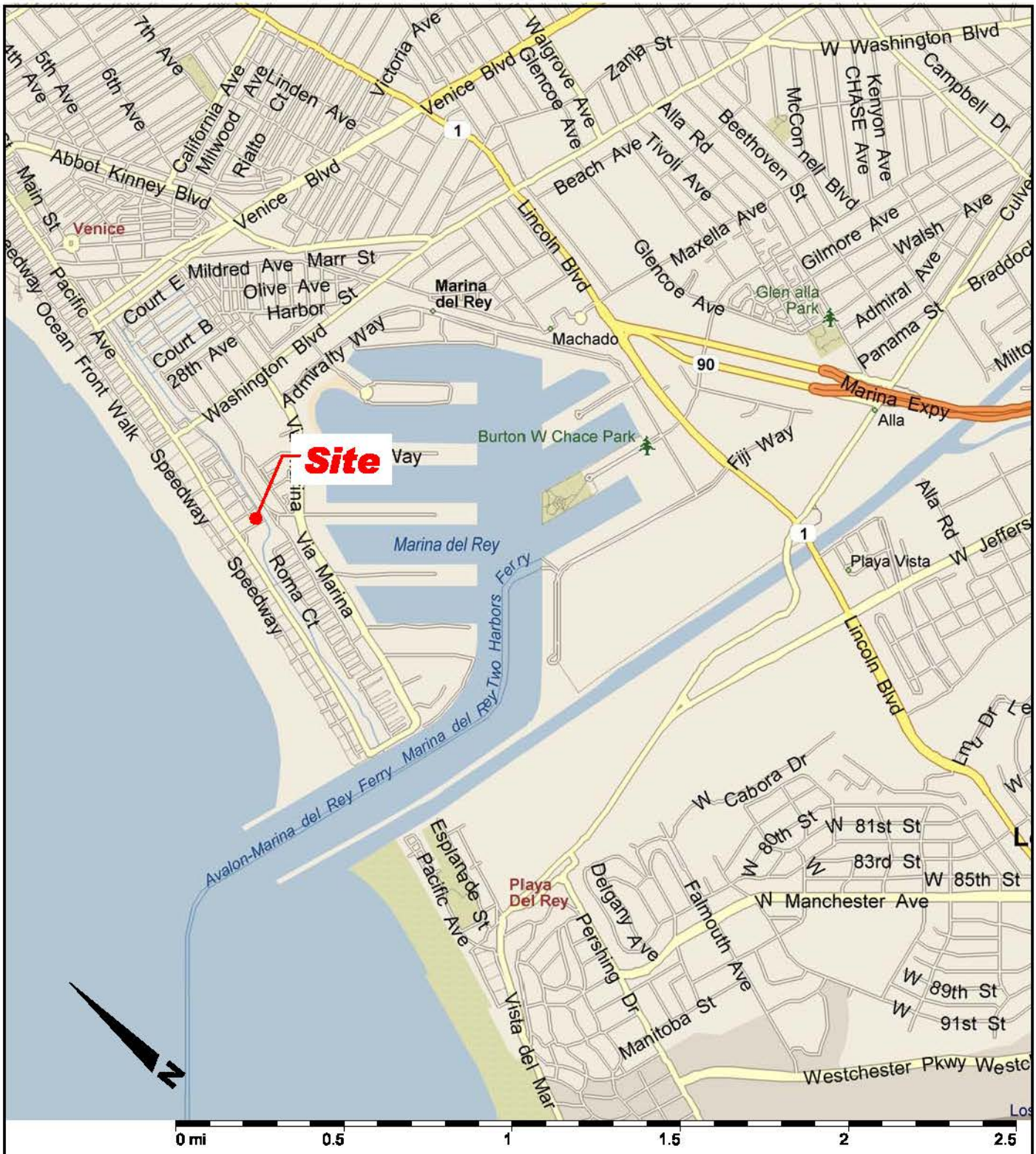
Level I: 0 - 100 ppm (0% to 0.01%)

Level II: 101 - 1,000 ppm (>0.01% to 0.1%)

Level III: 1,001 - 5,000 ppm (>01% to 0.5%)

Level IV: 5,001 to 12,500 ppm (>0.5% to 1.25%)

Level V: Greater than 12,500 ppm (>1.25%)



GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI - Venice

Date: August 2015

Site Location Map

133 East Hurricane Street
Venice, California

Figure 1



Legend

P-5 Approximate Location of Multi-Stage Gas Probe Location & Designation

1,000 Methane Concentration in Parts per Million (ppm)

ND Methane Concentration Below Detection Limit in Parts per Million (ppm)

0 25 50 ft

Approximate Scale

GeoKinetics
Geotechnical & Environmental Engineers

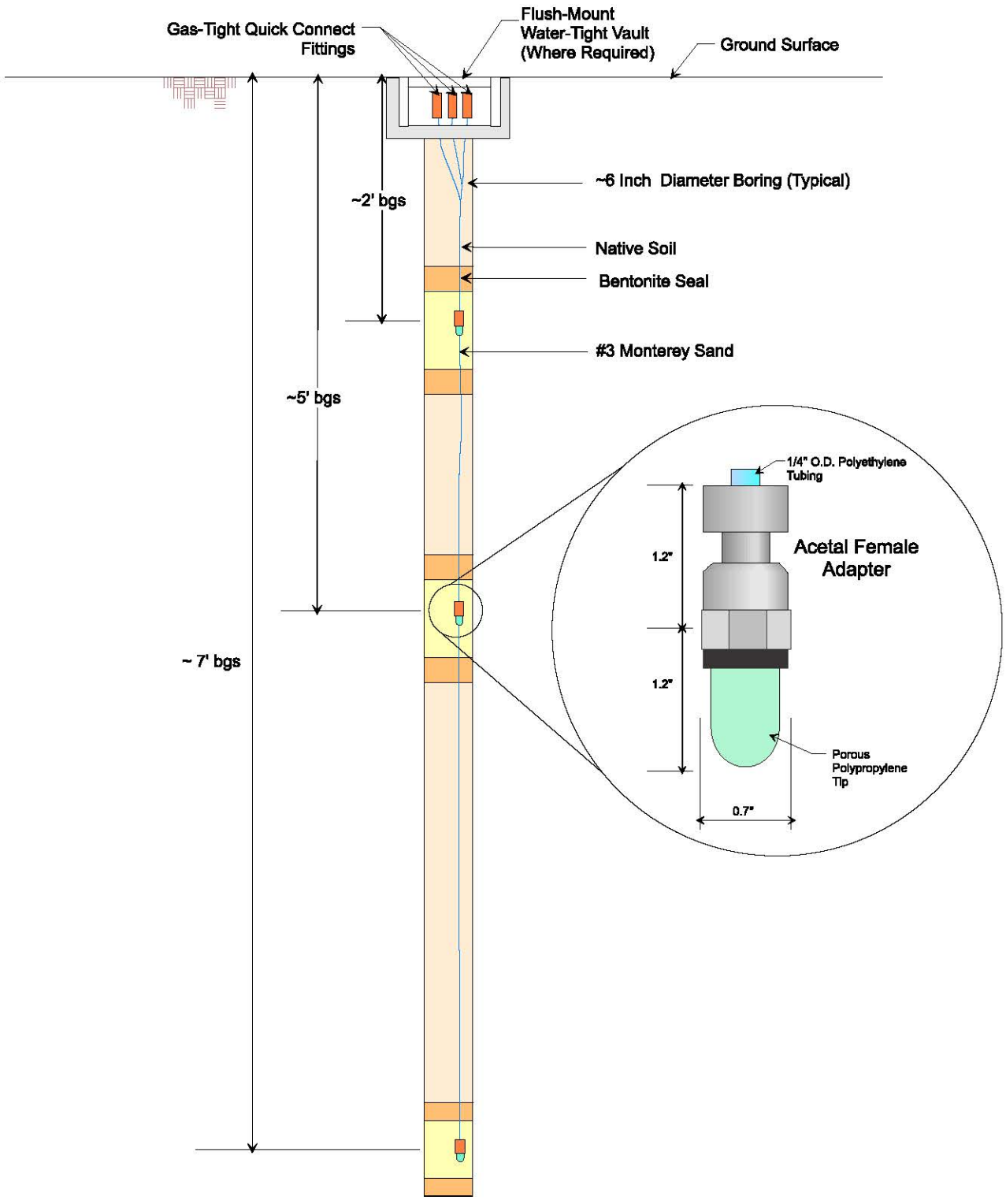
Project Name: GPI - Venice

Date: August 2015

Aerial Photograph

133 East Hurricane Street
Venice, California

Figure 1



Note: Probe Depths May Vary From One Installation to Another Due to sub-surface Conditions.

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Geotechnical & Environmental Engineers

Project Name: GPI - Venice

Date: August 2015

Gas Probe Schematic

Figure 3

Attachment A

Boring Logs

BORING LOG NO.: P-1

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
					SP-SM	Fill: SAND with silt (SP-SM), fine-grained, trace gravel, slightly moist, medium dense, brown.				
				2	SP	@1' SAND (SP), fine-grained, moist, medium dense, brown.				
				4	SP	@4' SAND (SP), fine-grained, moist, medium dense, light brown.				
				6	CL	Estuarine Deposits: @5' Silty CLAY (CL), elastic, very moist, soft, dark gray.				
				8		Total Depth = 8 ft bgs Groundwater not encountered. Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: P-2

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
				2	SP-SM	Fill: SAND with silt (SP-SM), fine-grained, trace gravel, slightly moist, medium dense, brown. Cobble at 18"				
				4	SP	@2.5' SAND (SP), fine-grained, moist, medium dense, brown reddish-brown; contains trace clay pods (gray). @4 SAND (SP), fine-grained, moist, medium dense, light brown.				
				6	CL	Estuarine Deposits: @5' Silty CLAY (CL), elastic, very moist, soft, bluish-gray.				
				8	ML-SM	@6' Sandy SILT (ML) to silty SAND (SM), fine grained sand, very moist, soft/loose, bluish-gray. Total Depth = 8 ft bgs Seepage at 8 ft Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: P-3

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
				0	SP-SM	Fill: SAND with silt (SP-SM), fine-grained, trace gravel, slightly moist, medium dense, brown.				
				2	SP	@2' SAND (SP), fine-grained, moist, medium dense, brown.				
						@3' SAND (SP), fine-grained, moist, medium dense, light brown, contains pods of Clay (gray).				
				4						
				6	SM	Estuarine Deposits: @6' Silty SAND (SM), fine-grained, very moist, medium dense, bluish-gray.				
				8		Total Depth = 8 ft bgs Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: P-4

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
				0	SP	Fill: SAND (SP) fine-grained, slightly moist, loose to medium dense, mottled reddish-brown and grayish-brown.				
						@1' SAND (SP), fine-grained, moist, medium dense, light brown.				
				2		@3.5' contains pods of clay (gray)				
				4	CL	Estuarine Deposits: @4' CLAY (CL), very moist, soft, dark gray, contains some organics (decomposing plant material).				
				6	ML+ SM	@5.5' Sandy SILT (ML) to Silty SAND (SM), fine-grained sand, very moist, soft/loose, bluish gray.				
				8		Total Depth = 8 ft bgs Seepage at 8 ft Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: P-5

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
				0	SP-SM	Fill: SAND with Silt (SP-SM) trace gravel, trace brick and metal debris, slightly moist, loose to medium dense, brown.				
						@1' cobble (concrete debris)				
				2						
						@2.5' SAND (SP), fine grained, moist, medium dense, light brown.				
				4	CL	Estuarine Deposits: @4.5' CLAY (CL), very moist, soft, dark gray, contains some organics (decomposing plant material).				
						@5' Sandy SILT (ML) to Silty SAND (SM) fine grained sand, very moist, soft/loose, bluish gray.				
				6	ML+SM					
				8		Total Depth = 8 ft bgs Slight seepage at 8 ft Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

Attachment B

Methane Gas Investigation Compliance Certificate

FORM 1 - CERTIFICATE OF COMPLIANCE FOR METHANE TEST DATA

Part 1: Certification Sheet

Site: Venice Auxiliary Pumping Station Project

Address: 133 East Hurricane Street, Los Angeles, California.

Legal Description: APN # 4225008904

Building Use: Auxiliary Pump Station

Name of Engineer:	Kevin J. Lea GeoKinetics	**Registered Civil / Soil Engineer Stamp:**
Mailing Address:	77 Bunsen Irvine, CA 92618	
Telephone:	(949) 502-5353	
Testing Laboratory:	GeoKinetics License # 10234	

REGISTERED PROFESSIONAL ENGINEER
KEVIN J. LEA
NO. C- 67844
EXP. 6-30-17
CIVIL
STATE OF CALIFORNIA

I hereby certify that I have tested the above site for the purpose of methane mitigation, and that all procedures were conducted by a City of Los Angeles licensed testing agency in conformity with the requirements of the LADBS Information Bulletin P/BC 2002-101. Where the inspection and testing of all or part of the work above is delegated, full responsibility shall be assumed by the licensed engineer or geologist whose signature is affixed thereon.

Signed: _____ **Date:** 8-20-15

Required Data:

- Project is in a *METHANE ZONE*
- Depth to ground water observed during testing was: 7-8 feet below existing ground surface.
- Depth of Historical High Ground Water Table Elevation* is ~5 ft below existing ground surface.
- Design Methane Concentration**: 1,000 parts per million in volume (ppmv).
- Design Methane Pressure***: ≤ 2 inches of water column.
- Methane Design Level: II

De-watering:

- De-watering is Required for all construction below approximately 5' bgs. This condition can be potentially removed using a hydrostatic design under LADBS modification.
- Pump discharge rate N/A gallons per minute.
- Reference geology or soil report: N/A

Additional Investigation:

- Additional investigation was Not conducted.

Latest Grading on Site:

- Date of last grading on site was: Years ago
- Explanation of the effect on soil gas survey results by grading operations: N/A
- Building Excavation: Not Yet Initiated

Notes:

* Historical High Ground Water Table Elevation Shall mean the highest recorded elevation of ground water based on historical records and field investigations as determined by the engineer for the methane mitigation system.

** Design Methane Concentration shall mean the highest recorded measured methane concentration from either shallow soil gas test or any gas probe set on the site.

*** Design Methane Pressure shall mean the highest total pressure measured from any Gas Probe Set on the site.

As a covered entity under Title II of the Americans with Disabilities Act, the City of Los Angeles does not discriminate on the basis of disability and, upon request, will provide reasonable accommodation to ensure equal access to its programs, services and activities. For efficient handling of information internally and in the internet, conversion to this new format of code related and administrative information bulletins including MGD and RGA that were previously issued will allow flexibility and timely distribution of information to the public.

Appendix H

Hydrology Technical Memorandum

Watearth™
Water Resources + Green Infrastructure

HYDROLOGY TECHNICAL MEMORANDUM

Project: **Los Angeles Venice Auxiliary Pumping Plant EIR**
Client: ICF International/City of Los Angeles
Prepared By: Jennifer J. Walker, P.E., D.WRE, CFM, QSD
Date: 8-25-2016
Purpose: Memorandum of Hydrology Modeling Results

Note: Draft memorandum released under the authority of Jennifer J. Walker, P.E. (C77079), D.WRE, CFM on 8/25/2016 and should not be used for design or construction.

This memorandum documents hydrologic, hydraulic, water quality, and Low Impact Development (LID) modeling results for the construction of the Los Angeles Venice Auxiliary Pumping Plant (VAPP). The project is anticipated to include post-construction stormwater Best Management Practices (BMPs) and Low Impact Development (LID) features. Because detailed design has not been completed, hydrologic, hydraulic, and LID analyses are based on the general concept and layouts provided by the City and the design engineer, Arcadis, and described in the Venice Auxiliary Pumping Plant proposal project description and Preliminary Design Report (PDR). A hydraulic analysis of the Grand Canal to evaluate potential for impacts related to the temporary cofferdam during the construction phase is also included based on available data. Items excluded from the Environmental Impacts Report (EIR) as part of the Initial Study (IS) are not discussed in detail in this technical memorandum.

In accordance with the City of Los Angeles *Developed Best Management Practices Handbook, Low Impact Development Manual, Part B Planning Activities*, 4th Edition, published June 2011 (*LID Manual*), several stormwater Best Management Practices (BMPs) alternatives are analyzed as a post-construction water quality and hydrologic treatment measure for development of the VAPP site. As discussed below, due to low saturated hydraulic conductivity and infiltration rates of soils at the site, shallow depths to seasonally high groundwater, and potential for liquefaction, design modifications are required and the use of lined bioretention with an underdrain or a planter box is assumed.

Alternative 1 mitigates post-construction hydrologic and water quality impacts from the VAPP site using lined bioretention with an underdrain, while Alternative 2 uses a combination of a planter box and lined bioretention. The potential use of vegetated swales was also evaluated; however, this alternative is not included in this memorandum as it resulted in water quality and hydrologic impacts from the VAPP site.

While the final design may include use of a different LID feature or water quality and hydrology treatment, it is assumed that these will be designed to meet or exceed the performance of the LID features documented in this memorandum. Additionally, modifications to the geometric configurations and layouts of the evaluated LID alternatives may be made during the final design provided the same performance is achieved.

The goals established for this project include:

- ✓ Meet City of Los Angeles LID and stormwater treatment criteria;
- ✓ Mitigate increased runoff from the VAPP site using LID and reduce proposed peak flows in the Grand Canal to existing conditions levels;

- ✓ Mitigate increased pollutant loads from the VAPP site using LID and reduce pollutant loads in the Grand Canal to existing conditions levels;
- ✓ No adverse impacts to 100-year water surface elevations (WSELs) or increased flooding risk associated with construction of the proposed cofferdam or diversion structure during construction.

EXISTING CONDITIONS

Existing conditions for the project are described based on evaluation of prior reports, available data, and results of the site reconnaissance. As shown in Exhibit 1, the proposed VAPP site is located on the existing vacant lot at the northeast corner of Hurricane Street and Canal Court, across and immediately north of the existing Venice Pumping Plant (VPP). For purposes of the Environmental Impacts Results (EIR), the project consists of three lots in the vicinity of the existing VPP. In addition to the VAPP site, there are two possible staging areas: 1) adjacent to the existing VPP at the intersection of Canal Court and Hurricane Street and 2) across the Grand Canal from the proposed VAPP site, both on vacant land. The project is located within the Venice Community Planning Area and Council District 11, as well as within the Venice Coastal Zone Specific Plan area (Appendix Y). Refer to Exhibits 2 and 4 for an aerial and topographic view of the site, the existing VPP, and the two possible staging areas. The recently constructed VDFM is shown in Appendix F.

The VAPP Project Site is currently vacant and a gravel/earthen lot with relatively flat slopes. The impervious cover is zero-percent (Exhibit 2). Similarly, the two possible staging areas are also currently vacant with zero-percent impervious cover. The staging area located at the intersection of Canal Court and Hurricane Street is relatively flat and consists of bare earth with little vegetation. The staging area across the Grand Canal from the VAPP site includes bare soil, existing infrastructure (concrete pavement, stairway/railing, and pipes) and is partially vegetated. The vegetation is mostly native vegetation within the intertidal zone and non-native above the intertidal zone. Land use of the area surrounding the Project Site is considered Residential/Medium Residential (Exhibit 7). The existing peak flows from the area contributing to the existing outfall at Hurricane Street will not increase in proposed conditions as they will be mitigated using BMPs.

While all three lots are addressed for construction-phase items, only the VAPP site is included in the pre- and post-construction hydrologic and water quality analyses.

Existing conditions are discussed in the sections below for the following categories:

- Surface Water Quality
- Hydrology
- Hydraulics
- Flooding and Hazards

Surface Water Quality

The Project Site is currently vacant and land cover consists primarily dirt and gravel, with an existing impervious cover of zero-percent (Exhibit 2). Photos are included in Appendix O. Land use around the site includes a mix of land use types and is generally classified as Residential/Medium Residential (Exhibit 7). The two potential staging areas appear to have similar land use as the VAPP site.

The existing VAPP site does not include water quality or stormwater controls, such as stormwater Best Management Practices (BMPs), Low Impact Development (LID) features, or hydromodification management facilities. Additionally, stormwater detention and other flood control features are also not present on-site. Instead, the existing site manages rainfall and stormwater runoff by overland sheet flow towards the Venice Grand Canal or to the off-site storm drain system at Hurricane Street.

Typical Pollutants from Project Site

Stormwater runoff from the existing site is typical of an undeveloped area, which typically includes low levels of pollutants. Total Suspended Solids (TSS) and Chemical Oxygen Demand (COD) are common in vacant or open areas. Foot traffic and construction pollutants and trash are likely due to the upcoming development of the VAPP and surrounding neighborhood runoff may also contribute to the present on-site pollutants.

Additionally, nutrients from fertilizers as well as herbicides and pesticides associated with landscape maintenance are likely to be present in stormwater runoff from the vicinity into the Grand Canal, as a photo shows from the site reconnaissance in Appendix O. In addition, as shown in the photos included in Appendix O, many of the drainage inlets in roadways adjacent to the site include screens or grates to prevent or limit trash from entering the storm drain system and discharging to the receiving water (Venice Grand Canal). Due to urban runoff and human activities around the Venice Grand Canal shoreline, pollutants such as Fecal Coliform bacteria are expected to be present in the stormwater runoff into the Grand Canal.

Table 1 summarizes typical pollutants of concern based on land use. The majority of the pollutants are from the February 2014 County of Los Angeles Department of Public Works *Low Impact Development Standards Manual*. Also included in this table are other pollutants that the U.S. EPA recognizes to be typically associated with land use present on the Project Site.

TABLE 1: POLLUTANTS OF CONCERN BY LAND USE

Land Use	Pollutants of Concern								
	Suspended Solids[2]	Total Phosphorus[2]	Total Nitrogen[2]	Total Organic Nitrogen[2]	Cadmium, Total[2]	Chromium, Total[2]	Copper Total[2]	Lead Total[2]	Zinc, Total[2]
High Density Single Family Residential	•	•			[4]	[4]	•	•	•
Multi-Family Residential	•				[4]	[4]	•		•
Mixed Residential	•	•	•		[4]	[4]	•	•	•
Commercial	•	•	•	•	[4]	[4]	•	•	•
Industrial	•	•	•	•	[4]	[4]	•	•	•
Transportation (streets, roads)	•	•	•	•	[4]	[4]	•	•	•
Institutional (educational facilities)	•				[4]	[4]	•		•
Vacant/Undeveloped[5]	•	•	•	•				•	•

[1] Adapted from Table A-3 of the *Technical Manual for Stormwater Best Management Practices in the County of Los Angeles* (February 2004) and the Southern California Coastal Water Research Project Land Use Specific Storm Water Monitoring Data. X= exceedance of "standard" by observed median/average concentration; blank = no exceedance of "standard" by observed median/average concentration.
[2] Derived from Table 11 of the 2012 Los Angeles County MS4 Permit (page 104).
[3] Critical facilities include automobile dismantling (SIC 50xx), automobile repair (SIC 75xx), metal fabrication (SIC 34xx), motor freight (SIC 42xx), automobile dealerships (SIC 55xx), chemical manufacturing (SIC 28xx), and machinery manufacturing (SIC 35xx).
[4] No available date to determine if these pollutants of concern originate from this land use. Pollutant is assumed to be produced by this land use unless otherwise proven by the project applicant.
[5] Based on 2006 U.S. EPA *Guide to Stormwater Pollutant Concentrations*.

Pollutants of Concern Based on Receiving Water Impairment

The *Clean Water Act* (CWA) requires that states adopt water quality standards for receiving waters. Water quality standards designate beneficial uses for the receiving water and include criteria required to support those beneficial uses. Water quality criteria are either narrative statements related to the quality of water to support a particular use or maximum concentrations of levels of pollutants (i.e., bacteria, etc.). As part of the CWA, when monitoring data indicates

that a pollutant is exceeded, the receiving water is classified as impaired and placed on the *CWA Section 303(d) List of Water Quality Limited Segments Requiring TMDLs* (303(d) List). A Total Maximum Daily Load (TMDL) is then developed for the pollutant(s) causing the impairment. The purpose of the TMDL is to limit the amount of pollutant(s) discharged to the receiving water from all sources (i.e., stormwater runoff, wastewater, agriculture).

There are several pollutants of concern related to the receiving body of water and include those pollutants with a developed TMDL requirement, other pollutants listed on the 303(d) List, and pollutants of concern for the Ballona Creek watershed management area based on the *Ballona Estuary, & Sepelveda Channel Bacteria TMDL, Coordinated Monitoring Plan* from the Los Angeles County (Appendix M). The project is located adjacent to the Grand Canal just upstream of the confluence with the Ballona Lagoon in the Ballona Creek watershed. Table 2 lists the pollutants from the EPA 303(d) list for Ballona Creek and includes pollutants that have a completed TMDL, pollutants that require development of a TMDL, and pollutants that are being addressed by actions other than a TMDL.

TABLE 2: BALLONA CREEK 303(d) LIST

Pollutant	Pollutant Category	Potential Source	Source Category
Cadmium (sediment)	Metals/Metalloids	Point Source	Unspecified Point Source
Cadmium (sediment)	Metals/Metalloids	Nonpoint Source	Unspecified Nonpoint Source
Coliform Bacteria	Pathogens	Point Source	Unspecified Point Source
Coliform Bacteria	Pathogens	Nonpoint Source	Unspecified Nonpoint Source
Copper, Dissolved	Metals/Metalloids	Nonpoint Source	Unspecified Nonpoint Source
Cyanide	Other Inorganics	Source Unknown	Source Unknown
Lead	Metals/Metalloids	Source Unknown	Source Unknown
Selenium	Metals/Metalloids	Source Unknown	Source Unknown
Toxicity	Toxicity	Source Unknown	Source Unknown
Trash	Trash	Source Unknown	Source Unknown
Viruses (enteric)	Pathogens	Point Source	Unspecified Point Source
Viruses (enteric)	Pathogens	Nonpoint Source	Unspecified Nonpoint Source
Zinc	Metals/Metalloids	Source Unknown	Source Unknown

Appendix Z includes a map obtained from the County of Los Angeles *Low Impact Development Handbook* that illustrates the TMDLs that are in effect for Los Angeles County as of October 2013. Multiple TMDLs are in effect for the Ballona Creek Watershed for the following pollutants:

- Metals
- Toxics
- Trash
- Bacteria

Table 3 and Appendix Z list the pollutants of concern for the Ballona Creek watershed management area, within which the Project Site falls.

TABLE 3: TIER 3 POLLUTANTS OF CONCERN FOR THE BALLONA CREEK WATERSHED MANAGEMENT AREA

Parameter	Parameter
pH	Cyanide, Total Recoverable
E. coli Bacteria[1]	Copper, Total Recoverable
Total Coliform Bacteria[1]	Lead, Total Recoverable
Fecal Coliform Bacteria[1]	Mercury, Total Recoverable
Enterococcus Bacteria[1]	Selenium, Total Recoverable

[1]Apply only to discharges to the estuary and the ocean.

Baseline Sampling Data

The City of Los Angeles requested water quality sampling on June 5, 2015 before the project began. Samples were collected in the morning and early afternoon on July 1, 2015. The following water quality parameters were determined for the baseline: pH, temperature, Dissolved Oxygen (DO), turbidity, and Total Suspended Solids (TSS). A visual assessment for any floating hydrocarbons was also performed. Samples were obtained from the Grand Canal at three locations near the project area: Site 1 was at the construction site at a culvert on Hurricane Street, Site 2 was at the VAPP station at the upstream incoming tide, and Site 3 was at the VAPP station at the downstream outgoing tide.

The project areas were photographed during two field reconnaissance visits. On sampling day, there was a high tide at 10:21 AM (3.9 ft) and a low tide at 3:58 PM (-0.9 ft). Note that the datum was not specified in the sampling report. Site 2 was sampled at 10:04 AM and Site 3 was sampled at 1:35 PM. No anthropogenic particles or hydrocarbons were observed at any of the sites.

The TSS at Station 2 was 40 mg/L and at Station 3 was 51.2 mg/L. The complete results of this study are included in the Venice Auxiliary Pumping Plant (VAPP) Water Quality Sampling Report (Appendix K), including pH, Temperature, Dissolved Oxygen (DO), and Turbidity.

In addition to the project sampling, water quality samples were collected as part of the *Grand Canal West Bank Erosion Control Project* between May 29th and July 17th, 2015. Two stations, Galleon and Ballona/Grand, in the study were in proximity to the Project Site. The Galleon station is one block north of the Project Site, or approximately 225 ft. The Ballona/Grand station is located at the junction of the Grand Canal and Ballona Lagoon. The water quality parameters that were measured were DO, pH, temperature, TSS, turbidity and floatables. TSS at the Galleon station ranged from 4 to 17.8 mg/L during the sampling period. TSS at the Ballona/Grand station ranged from 14.3 to 42.5 mg/L, which is comparable to the project TSS sampling results. Complete water quality results from the Grand Canal West Bank Erosion Control Project are in Table 1 in Appendix AB.

Total Maximum Daily Loads

A total maximum daily load (TMDL) is a regulatory term in the *U.S. Clean Water Act* (CWA), describing the value of the maximum amount of a pollutant that may enter a water body while still meeting water quality standards. There are several listed TMDLs for the Ballona Creek area in Table 4 below, from the Los Angeles Region's *Basin Plan* (Appendix R). Among those listed are: trash, cadmium, copper, lead, selenium, zinc, chlordane, DDTs, Total PCBs, Total PAHs, E. coli bacteria, fecal coliform, *Enterococcus*, and total coliform. The loading capacities for each pollutant are:

TABLE 4: TMDLs For Ballona Creek

Pollutant	Loading Capacity (ug/L)
Trash	0
Total Recoverable Metals	
Copper	18
Lead	55
Selenium	5
Zinc	119
Toxic Pollutants (Sediment)	
Cadmium	1.2
Copper	34
Lead	46.7
Silver	1
Chlordane	0.5
DDT	1.58
Total PCBs	22.7
Total PAH	4,022
E. Coli (MPN)	126
Fecal Coliform (MPN)	200

Summary

Table 5 summaries potential pollutants from the site based on land use along with pollutants of concern from the various sources described above and Table 6 summarizes pollutants of concern specific to Ballona Creek.

TABLE 5: SUMMARY OF POTENTIAL POLLUTANTS AND POLLUTANTS[1] OF CONCERN

Nutrients	Metals	Organics	Other	Pathogens	Sediment/Solids	Inorganics
Algae	Aluminum	BOD	Chloride	Coliform Bacteria	Suspended Solids	Cyanide
Ammonia	Cadmium	COD	Hydrocarbons	Viruses	Total Dissolved Solids	
Organic Nitrogen	Chromium	Polycyclic Aromatic Hydrocarbons	pH		Turbidity	
Total Nitrogen	Copper	Polychlorinated biphenyls	Sulfate			
Total Phosphorous	Lead		Trash			
	Mercury		Chlordane			
	Selenium		DDT			
	Silver					
	Zinc					

[1] Pollutants from the 2010 U.S. EPA approved 303(d) list.

TABLE 6: POLLUTANTS OF CONCERN FOR BALLONA CREEK

Constituent	Constituent of Concern	Indicating Increasing Trend	Comparison to 303(d) List	TMDL
Cyanide	•			
Enterococcus	•			
Fecal Coliform	•		•	
Total Coliform	•		•	
Total Copper	•			•
Total Lead	•			•
Total Selenium			•	•
Dissolved Copper			•	
Dissolved Lead	•		•	
Dissolved Zinc			•	•
MBAS		•		
Potassium		•		
Bicarbonate		•		

[1]TMDLs determined from the *Ballona Estuary, & Sepelveda Channel Bacteria TMDL, Coordinated Monitoring Plan*, City of Los Angeles, April 23, 2008.

Table 7A is a table of pollutants typical in vacant and open area land uses, such as for the existing site conditions.

Table 7A: Typical Pollutant Concentrations for Pre-Project Conditions

Pollutant	Concentration (lbs/acre-yr)	Annual Load from VAPP Site[1] (lbs/yr)
TSS	3.00	0.54
TP	0.03	0.0054
TKN	1.50	0.27
NH_3-N	N/A	-
NO_2+NO_3-N	0.30	0.054
BOD	N/A	-
COD	2.00	0.36
Pb	0.00	0
Zn	N/A	-
Cu	N/A	-

[1]Concentrations are courtesy of the EPA *Guide to Stormwater Pollutant Concentrations*, 2006 and annual loads based on the 0.18-acre VAPP site, representing vacant/open space land use.

Table 7B is a table of pollutants typical in light industrial land uses, such as for the proposed site conditions.

Table 7B: Typical Pollutant Concentrations for Post-Project Conditions

Pollutant	Concentration[1] (lbs/acre-yr)	Annual Load[1] from VAPP Site (lbs/yr)
TSS	860.00	154.8
TP	1.30	0.234
TKN	3.80	0.684
NH_3-N	0.20	0.036
NO_2+NO_3-N	1.30	0.234
BOD	NA	-
COD	NA	-
Pb	2.40	0.432
Zn	7.30	1.314
Cu	0.50	0.09

[1]Concentrations are courtesy of the EPA *Guide to Stormwater Pollutant Concentrations*, 2006 and annual loads based on the 0.18-acre VAPP site, representing light industrial land use.

Hydrology

Elevations within the VAPP site range from a low of approximately four feet (ft) in the southwestern portion of the site to a high of approximately six ft near the center of the site (Exhibit 4). The vertical datum for the topographic data is North American Vertical Datum (NAVD) 88. Off-site flows into or through the VAPP site are minimal. The stormwater runoff currently flows from the site and adjacent lots into an existing storm drain inlet at the end of Hurricane Street, which discharges into the Grand Canal. The area surrounding the VAPP is relatively low, only reaching heights of five feet, as shown in Exhibit 4. The approximate elevation of the bank area is five feet and gradually slopes towards the Grand Canal eventually reaching one-foot above mean sea level. Overland flow for the VAPP site is generally southwest to northeast.

The two staging areas also appear to drain to the Grand Canal or Ballona Lagoon. The possible staging area located at the intersection of Canal Court and Hurricane Street partially drains to the existing storm drain inlet at Hurricane Street and Esplanade, but also appears to sheet flow to the Ballona Lagoon just downstream of the confluence of the Grand Canal with the Ballona Lagoon (Exhibit 4). The additional optional construction staging area across the Grand Canal appears to sheet flow into the Grand Canal system (Exhibit 4). The Project Site is located a significant distance from existing stormwater spreading grounds shown in Exhibit 10.

The Grand Canal is located directly adjacent to the VAPP site and overland flow in the vicinity is generally east towards the canal system. The confluence of the Ballona Lagoon with the Venice Grand Canal is located approximately 150 ft southeast of the VAPP site (Exhibit 16). The construction staging area is adjacent to the Venice Pumping Plant along the Ballona Lagoon and an additional optional construction staging area is immediately across the Grand Canal from the VAPP site (Exhibit 2). Extreme event stormwater runoff that exceeds capacity of the on-site and public storm drain systems flows towards Ballona Lagoon. The Ballona Lagoon flows to the Marina Del Rey harbor through a tide gate.

The existing, undeveloped VAPP site as well as the two possible staging areas do not include water quality or stormwater controls, such as stormwater BMPs, LID features, or hydromodification management facilities. Additionally, stormwater detention and other flood control features were not observed on-site. Instead, the existing site manages rainfall and stormwater runoff via overland flow into the adjacent roadway, drain inlets, and underground storm drain systems, which discharge into the Grand Canal adjacent to the site.

As discussed previously, impervious cover at the currently vacant VAPP site, which is a gravel lot, is zero-percent (Exhibit 2) and stormwater management and runoff is typical of urbanized runoff from other sites within the vicinity. Land use of the adjacent lots consists of buildings, driveways, and sidewalks and is generally considered Residential/Medium Residential (Exhibit 7); however, the two possible staging areas are also currently vacant and zero-percent impervious cover.

The drainage areas and associated discharge locations of the VAPP site and two possible staging areas are not expected to change due to the project. As development is not proposed on the two

staging areas, there is no increase in peak flows or runoff volumes between existing and proposed conditions. As such, these two staging areas are included in the overall Grand Canal watershed modeling, but are not modeled separately. The drainage area to the existing 24-in outfall at the Grand Canal is approximately 5 ac (Exhibit 6B) and the estimated existing peak flow is 3 cfs for the 25-year event, based on the Los Angeles County *Hydrology Manual*. The capacity of the 24-in RCP is approximately 16 cfs, based on an assumed slope of 0.5-percent, which is sufficient.

As discussed in the hydrology section, existing conditions peak discharges from the VAPP site are estimated at 72.9 cubic feet per second (cfs), 165.7 cfs, and 263.8 cfs for the two-year, 24-hour, ten-year, 24-hour, and 100-year, 24-hour design storm events, respectively. However, because of the high level of impervious cover of 75% in proposed conditions, peak flows and runoff volumes are significantly higher from the same site without mitigation than the existing undeveloped condition. The increases in peak flows for the two-year, ten-year, and 100-year storm events will be managed through the use of BMPs and therefore, changes to the existing storm drain are not proposed. While the proposed peak discharges may vary slightly depending on the selected alternative, the proposed peak discharges will be less than or equal to the existing peak discharges.

The water budget for the undeveloped VAPP site includes high amounts of infiltration and evapotranspiration due to the gravel and vacant area (pervious areas) with depressions and other low spots for temporary rainfall ponding. Stormwater runoff from the Project Site in existing, undeveloped conditions is estimated at 35.6 in (1.0 in/year [yr]), based on continuous simulation analysis of the period of record from 1970 – 2005. Table 6 in Appendix C includes the results for the project and additional details on runoff rates and modeling assumptions for existing conditions and the two LID alternatives.

While minimal erosion is expected from the majority of the VAPP site post-construction due to the high-level of impervious cover in proposed conditions, there is potential for erosion and sedimentation at the discharge location at the Grand Canal. As the two staging areas will be used only temporarily during construction, conditions at these two lots are expected to be similar between pre- and post-construction.

Hydraulics

From aerial photographs (Exhibit 2) and visual observations during site reconnaissance, the VAPP site and two staging areas drain via overland flow into the Grand Canal or into storm drain inlets and storm drain systems in the adjacent streets, which discharge into the Grand Canal. Stormwater runoff from the VAPP site and adjacent lots enters the conveyance system through the storm drain inlet at Hurricane Street and Esplanade. The outfall pipe from this inlet appears to be a 24-inch (in) Reinforced Concrete Pipe (RCP) with concrete wing walls and discharges into the Grand Canal. The drainage area to the outfall at the Grand Canal is approximately 5 acres (ac) as shown in Exhibit 6B and the estimated existing peak flow is 3 cfs for the 25-year event, which is based on the Los Angeles County *Hydrology Manual*. The capacity of the 24-in RCP is approximately 16 cfs, based on an assumed slope of 0.5-percent, which is sufficient.

The Grand Canal in the vicinity of the VAPP site and staging areas consists of an earthen channel with partially vegetated side slopes. Vegetation consists of densely planted native vegetation, sparsely planted areas, areas with volunteer plants/weeds, and bare earthen areas (Appendix O).

Marina Tidal Gates

The Ballona Lagoon and the Venice Grand Canal are bounded by two tidal gates; The Marina Tide Gates to the south and the Washington Blvd. Tide Gates to the north. The Ballona Lagoon abuts the Marina Tide Gates, southerly of the Project Site and the Venice Grand Canal. The Ballona Lagoon and the Venice Grand Canal conflux at the Venice Pumping Plant. The Venice Grand Canals extend north from the Venice Pumping Plant to the Washington Boulevard (Blvd) Tide Gates, and averages about 50 ft wide. The Ballona Lagoon and Venice Grand Canal are exposed to Pacific Ocean currents via the Marina Tidal Gates that connect to the Marina Del Rey Harbor and the Santa Monica Bay via tidal waters. Both Tidal Gates are automated and centrally controlled from the Venice Pumping Plant. They open during high and low tides for tidal flushing of the Ballona Lagoon and Venice Grand Canal. Based on the Department of Public Works, Bureau of Engineering Venice Tide Gates Engineering drawings (Appendix AD), there are five tide gates beneath Washington Blvd along the Venice Grand Canal. The dimension measured from the center of the lid when closed to the top of the frame is three feet for each gate.

The Grand Canal Conceptual Plan-Hydrology Plan (*Grand Canal Hydrology Plan*) prepared by Philip Williams Associates, Ltd. in October, 2007 included hydraulic modeling within the Environmental Fluid Dynamics Code model (Appendix G). According to the report, the tides in the Grand Canal vary between -1.3 ft and 0.9 ft mean sea level (MSL) from mid-April to mid-October. From mid-October to mid-April, the tidal range is between -1.3 ft MSL and 0.3 ft MSL. For the modeling performed in the *Grand Canal Hydrology Plan*, the minimum water level may be as low as the bottom elevations as the Grand Canal dries out at the lowest tides. However, we understand from City staff that the Grand Canal does not actually dry out during operational conditions. The maximum water level is determined by the Marina Del Rey tide gates' operational setting, as stated in the *Grand Canal Hydrology Plan*.

Dry mode for this model refers to the time-period between Mid-April to Mid-October where significant rainfall is unlikely and the gates are closed when the Marina water exceeds 2.25 ft MSL and the Marina water level is more than 0.25 ft higher than the Ballona Lagoon water level. Wet mode for this model refers to the time-period between mid-October to mid-April where significant rainfall is possible and the gates are closed when the Marina water level exceeds 0.0 ft MSL and the Marina water level is more than 0.25 ft higher than the Ballona Lagoon water level. The hydrology of the area examined by the *Grand Canal Hydrology Plan* was not the actual current condition because of the construction plans underway for the Marina Del Rey Tide Gates.

The variations of the tides according to the *Grand Canal Hydrology Plan* allows for almost a full meter's depth change according to the mean tidal changes. The water surface of the Grand Canal

is not discussed. The closest base flood elevation (BFE) to the Grand Canal is 9 ft, located in Marina Del Rey (Exhibit 3). In Marina Del Rey, the flood zone is AE. In the Pacific Ocean, the BFE from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel (Exhibit 3) is 15 feet and is considered in the VE flood zone. According to FEMA, the VE flood zone is characterized as areas subjected to inundation by the one-percent annual chance flood event with additional hazards due to storm-induced velocity wave action.

A personal interview was conducted on October 12, 2015 with a representative of Mariposa Landscapes (email exchange with Luis Valenzuela included in Appendix N), the company contracted to perform manual tidal flushing. According to Mr. Valenzuela, to flush the Venice Canals, tide gates on the Washington Boulevard (Blvd) culverts are opened for two to six hours per day approximately twice per week. The day of the week varies due to changes in the tides. When the tide gates are open, high tide and low tide in the Grand Canal are dampened by 0.3 to 0.6 ft. During a 50-year design storm event, predicted water levels in the Grand Canal peak at 2.2 ft MSL and drain completely at the next low tide, per the *Grand Canal Hydrology Plan*.

Existing Venice Pumping Plant

The focus of the hydraulics analysis is on potential hydraulic impacts of the cofferdam in the Grand Canal. The pump stations and force mains are not evaluated as part of this study. From the Project Overview and Description (2015), the Venice Pumping Plant (VPP) is at risk for reaching maximum capacity during extreme wet weather events, as well as, being in need of maintenance. In order to offset this, an additional pipeline the Venice Dual Force Main (VDFM) is planned to help provide redundancy, to relieve capacity from the main pipeline, and to allow the main pipeline to be taken offline for required maintenance. The VAPP would serve as an additional pumping plant to supplement the flows required for the wastewaters to the discharge vault located two miles southeast of the existing VPP.

The existing VPP contains five 400-horsepower pumps designed to handle 18 million gallons per day at 100 feet total dynamic head each. The pumps require much needed maintenance as there have been times where two pumps have been out of service during heavy wet weather events (Project Overview, 2015). As a result, rental pumps have been brought in to help supplement pumping of flows during heavy wet weather events.

Flooding and Hazards

Flood Plain

As shown on Exhibit 3, the Project Site is located in Zone X within the regulatory 500-year flood plain of the Grand Canal. The Flood Insurance Rate Map (FIRM) Panel shown in the exhibit is 6037C1752F. These panels were updated September 26, 2008. Areas shown within the shaded Zone X are the areas between the limits of the base flood and the 0.2-percent annual chance, or 500-year floodplain. This means the area is classified as a moderate flood hazard area.

There is no flood plain or flood fill proposed as part of this project and no houses, buildings, or structures will be placed within the 100-year flood plain as a result of this project. However, a cofferdam and diversion structure will be constructed within the Grand Canal and will

temporarily partially obstruct flows within the Grand Canal. A hydraulic model was developed for the Grand Canal and these items are analyzed in the Hydraulic Analysis section below.

Tsunami, Seiche, and Mudflow

The Project Site is located within a tsunami hazard zone (Exhibit 11). The project is not located within a seiche or landslide/mudflow hazard zone. We understand that the design engineers (Arcadis) are responsible for designing the project; VAPP site, structures, and equipment; and structures within the Grand Canal will be designed to withstand possible tsunami hazards.

Sea Level Rise

The project will need to consider sea level rise as a flood risk and we understand that Arcadis is handling sea level rise and tsunami protection as part of the design process. The Venice, California area is expected to be exposed to the 100-year sea level rise risk based on information in the USGS and USC studies (see Appendix Q for the *Sea Level Rise Vulnerability Study* for the City of Los Angeles, prepared by the University of Southern California Sea Grant Program, 2013). The project has an expected life of 75 years and is expected to be exposed to risk from sea level rise. The project is also located near Ballona Lagoon which is classified as a major channel by the USC. Major water bodies are exposed to more flux in tides and may therefore have an increased risk of flooding during a 100-year flooding event. According to the Sea Level Rise Exposure Maps in Appendix Q, the VAPP is within the expected 100-year sea level rise area.

The issues related to sea level rise are more concerning in the short-term as opposed to the long-term, planning and preparation-wise. According to the California Coastal Commission *Report of Sea Level Rise*, August 12, 2015 (Appendix L), any climate induced increase in storm frequency and magnitude will induce short- term changes in sea level. Most flooding and erosion damage are due to storm surges and wind-driven waves. The most severe impacts tend to occur when a storm surge coincides with the high tide and periods of high sea level rise.

According to the *Report of Sea Level Rise*, if the frequency or intensity of storms changes as a result of climate change, the frequency of high sea level rise extremes will also change. If the frequency does not change, sea level rise will increase coastal exposure to storm-driven surge and high waves, magnifying impacts to coastal areas.

Subsidence may also play a role in sea level rise. Since sea level rise is equal to the change in absolute sea level minus the change in the height of solid earth surface, withdrawal of natural resources can lower land surface. Groundwater and natural gas withdrawal is of concern along the west coast of California. An increase in subsidence may also increase sea level rise without taking into account the various other factors that contribute to the causes of sea level rise, per the *Report of Sea Level Rise*.

Sea level rise is expected to occur by the Intergovernmental Panel on Climate Change (IPCC) (Appendix Q). With projections ranging from 18 centimeters (cm) (0.59 ft) at the lowest projection to 59 cm (1.94 ft) for the highest projection by the year 2100, the VAPP project should consider the possibility of each projection and occurrence of sea level rise to compare it

to the 75-year life expectancy of the completed VAPP project. The United States Geological Survey (USGS) has mapped out the inundation risk of the project. The project area could experience the effects of sea level rise if levels inundate at 200 centimeters. It must also be taken into to account the added risk due to the Grand Canal being part of the project. Therefore, a risk of inundation at 150 centimeters must be taken into account. The exhibits for the mapped inundation risks may be viewed in Appendix S.

According to the USC report on sea level rise, the beaches of Venice, California are already retreating. Natural sand nourishment has been declining since the 1960s and the area is vulnerable to flooding and inundation due to being at sea level.

Low Impact Development and Post-Construction Best Management

The nature of this project will require the use of post-construction BMPs in order to mitigate the stormwater runoff and maintain the water quality of the area according to the City of Los Angeles *LID Manual*. In the case of the VAPP site, the LID designs need to meet the standards set by the City of Los Angeles but will also need to meet the environmental standards of feasibility. Certain types of BMPs that are allowed to be used are not considered feasible due to the high groundwater levels and soil types present in the project area. There is also the potential for liquefaction that requires the design of the design of the BMP to withstand the risk of it. The soil type for the site is indicated in the Geotechnical Report prepared by the City of Los Angeles and dated December 14, 2015 (Appendix U) and the soil types for the vicinity are shown in Exhibit 8.

Exhibit 11 illustrates areas most susceptible to inundation due to tsunami. As shown in Exhibit 12, the project area is located within an area that is susceptible to liquefaction. Due to this, certain LID approaches for mitigation may not be suitable for the area or may require structural design modifications.

Groundwater levels are likely too high to use bioretention or bioinfiltration with an underdrain. With a combined surface storage and drain rock layer depth of approximately four ft plus a clearance of five ft below the bottom of the LID and seasonally high groundwater, the groundwater would need to be nine ft below natural ground, which seems much lower than the assumed depth of one ft above sea level from the geotechnical report. As stated in the geotechnical report (Appendix U), “Measured groundwater levels in the project area have generally varied between elevations of -2 to +4 feet of sea level. Groundwater levels beneath the site fluctuate as the result of seasonal variations and tidal fluctuations. Based on the available geotechnical data, a baseline groundwater elevation of one foot above sea level has been selected for the project.”

The site is located within 50 feet of a steep slope (20% or greater) along the Grand Canal bank shoreline, is prone to liquefaction geotechnical hazards, and the proposed landscaped area rates a categorization of 3 due to its size in accordance with Table 4.3 of the City’s *LID Manual*, making capture and use BMPs infeasible. Due to the infeasibility of capture and use BMPs, it is assumed that the final design will meet LID and water quality treatment requirements through

the use of BMPs. The best would be surface level LID approaches that simply filter water as opposed to emphasizing infiltration.

Bioinfiltration was considered as an alternative based on the feasibility checklist within the City's *LID Manual* and native soil infiltration rates in the project area, but was discarded because of the depth to seasonally high groundwater, which prohibits the required five- to ten-foot of clearance required between the bottom of infiltration BMPs and the depth to seasonally high groundwater to be achieved. Bioinfiltration is designed for partial infiltration of runoff and partial biotreatment. These features have an elevated underdrain above a gravel sump designed to facilitate infiltration and nitrification/denitrification.

This type of BMP can be used in areas where there is little to no hazard associated with infiltration where infiltration screening does not allow for infiltration BMPs due to low infiltration rates or high depths of fill soils. The surface soils of this area have a high depth of fill and a high groundwater level. The seasonal groundwater level makes this type of design difficult because of the fluctuating groundwater levels that can be higher than allowed by the City's criteria. The risk of liquefaction in this area may also require design modifications for this type of design.

Based on site constraints, the following were considered as potentially feasible alternatives and evaluated in the hydrologic and LID analysis described in the following section:

- Alternative 1 – lined bioretention with underdrain
- Alternative 2 - planter box (drains building) and lined bioretention with underdrain

The first alternative evaluated is lined bioretention with the use of an underdrain. The underdrain will be at the bottom of the gravel storage layer (drain rock) with zero offset height. This type of BMP design is a bioretention treatment control that is completely contained within an impermeable structure with an underdrain and does not allow for infiltration. With vertical, impermeable walls this type of BMP can be placed near structures or sidewalks with proper structural design. This type of design may be considered more feasible for the area due to the impermeable walls that would be more acceptable to the soils in the area and the risk of liquefaction. Additionally, the impermeable liner is needed to do the lack of clearance between the bottom of the LID and the depth to seasonally high groundwater.

The size of the Alternative 1 bioretention area would be 700 sq. ft. and 18 in deep within the proposed Pocket Park area, with a bottom saturated hydraulic conductivity of zero to simulate the liner. Due to geometric constraints associated with the proposed width of the park space, vertical walls (0:1 H:V side slopes) are assumed to achieve the required two-foot minimum bottom width and 18 in surface depth. While the proposed surface area of the lined bioretention exceeds the minimum requirement from the *LID Manual*, the larger size is needed to mitigate peak flows and water quality impacts from the VAPP site, as no infiltration occurs with this alternative. Details on modeling and results are discussed in the Hydrologic Analysis and Water Quality Analysis sections below.

The second alternative is the use of a planter box to drain the building and a 380 sq. ft. lined bioretention with an underdrain to drain the remainder of the VAPP site. The planter box is sized at 62 sq. ft. and 12 in deep. It would have an underdrain and hydraulic conductivity similar to the lined bioretention alternative. Planter boxes have impermeable walls and function similarly to bioretention facilities with underdrains; however, it would be situated adjacent to the building and capture stormwater runoff from the building roof. The configuration of the lined bioretention would be similar to Alternative 1. While the proposed combined surface areas exceed the minimum requirement from the *LID Manual*, the larger size is needed to mitigate peak flows and water quality impacts from the VAPP site, as no infiltration occurs with this alternative. Details on modeling and results are discussed in the Hydrologic Analysis and Water Quality Analysis sections below.

The proposed LID features are also planned to meet requirements in the City's *LID Manual*. Specifically, for Alternative 1, the required minimum BMP surface area of 277 square feet (sq. ft.) was calculated using the BMP Design Criteria in Table 4.5 in the handbook, based on a 2.5 in/hr infiltration rate, 48-hour surface drain down time, and a ponding depth of 1.5 feet (ft) for lined bioretention and vegetative swale alternatives. Using a ponding depth of 1.0 ft for a planter box for the building runoff area changes the minimum BMP surface area for the lined bioretention basin in Alternative 2 to 230 sq. ft. and the planter box minimum BMP surface area is 62 sq. ft. The goal of the LID features is to provide stormwater quality benefits and to more closely mimic undeveloped site hydrology. Refer to Exhibit 17 for the proposed LID layout alternatives of the project and note that sizes larger than the minimum are required to mitigate peak flow and water quality impacts from the VAPP site. A different LID feature could be used other than the alternatives that were analyzed, but the same performance must be achieved.

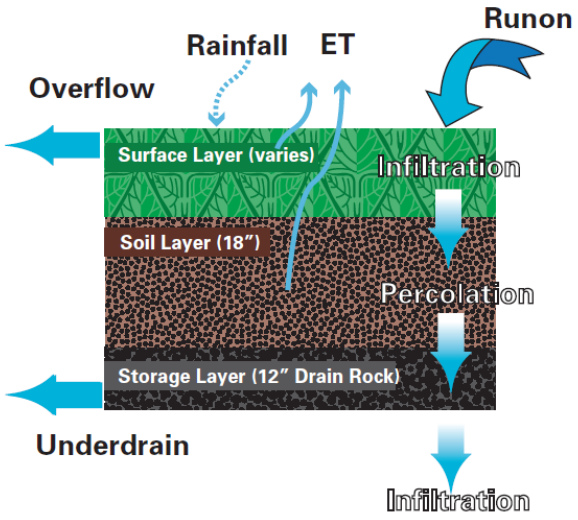
LID features are required to retain 100-percent of the stormwater quality design volume (SWQDv) on-site through a combination of infiltration, evapotranspiration, and stormwater harvest and use unless it is demonstrated that it is technically infeasible to do so. For this project, the SWQDv is approximately 1.0 in, which is the 85th-percentile, 24-hour event obtained from the City of Los Angeles 85th percentile precipitation isoheytal map for the Project Site location. The City of Los Angeles *LID Manual* specifies that the LID must be sized for at least the volume of water calculated using the recommended formula from the Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998) which determines the 85th percentile 24-hour runoff event and maximized capture stormwater volume for an area using a 48 to 72-hour drawdown time.

Alternatively, as stated in the *LID Manual*, the LID can be sized to accommodate the volume of annual runoff based on unit basin storage water quality volume and treat 80 percent or more volume as recommended in the *California Stormwater Best Management Practices Handbook – Industrial/Commercial* (2003), or it can be sized from a 0.75 inch storm event. This project will use a high removal efficiency biofiltration BMP within the park area sized to capture 1.5 times the runoff volume and meet the minimum sizing requirements in the LID Manual.

HYDROLOGIC ANALYSIS

The U.S. Environmental Protection Agency's (EPA)'s Storm Water Management Model (SWMM) 5.1 was utilized for the LID design storm and continuous simulation modeling in this project. The current version of SWMM includes LID controls and detailed analysis options not previously included in SWMM5. The SWMM model is also a publicly-available model. The SWMM model accounts for infiltration through various LID layers, evapotranspiration, infiltration into the native soil, and overflows and discharge from the LID facilities as illustrated in Figure 1.

Figure 1: LID Components and Processes Modeled in SWMM



Recent studies by the EPA cited in the report entitled *SUSTAIN – A Framework for Placement of Best Management Practices in Urban Watersheds to Protect Water Quality* found similar results for analysis of aggregated (lumped) LID controls in drainage sub-areas of 100 ac or more as compared to micro-drainage sub-areas for each lot and LID control (distributed approach). For a 128-acre drainage sub-area, the difference in peak flows between the aggregated and distributed approaches computed in the EPA study is four-percent. Similar positive findings with regards to the aggregated approach were also reported by the City of Portland's Bureau of Environmental Services in a paper entitled *Modeling Non-Directly Connected Impervious Areas in Dense Neighborhoods.*

Since the area of the VAPP site is approximately 0.18 ac and well under the threshold for using the aggregated method, the aggregated modeling approach was used for this project to increase modeling efficiencies even though Alternative 2 includes two different types of LID features. Whether one or multiple LID features are used in the final design to treat runoff from the entire VAPP site, peak flow rates are still expected to be within one-percent of those computed using

the distributed approach and runoff volumes are expected to be within approximately three-percent.

The VAPP Project Site is located in the Santa Monica Beach-Frontal Santa Monica Bay watershed (Exhibit 5) and within the Santa Monica groundwater Basin (Exhibit 9). Exhibit 6A illustrates the three drainage areas used in the hydrologic modeling along with the locations of nodes in the SWMM model. The modeled drainage areas include: North of Washington, South of Washington, and Site (VAPP Site). Both of the staging areas are included in the South of Washington drainage area and existing conditions on the sites are included in the model in both pre- and post-project models as activities within the staging areas will be during the construction-phase only. The land use of the area surrounding the Project Site is medium residential (Exhibit 7). The VAPP site is currently classified as vacant/open area with a zero-percent impervious cover as are both of the possible staging areas.

The off-site drainage areas contribute to nodes within the Grand Canal using conduit connections in SWMM to represent hydrological routing, although hydrologic lagging or attenuation of runoff hydrographs is not included in the routing. The South of Washington and Site drainage areas combine with the upstream flows in the Grand Canal at the combination node.

The Direct Determination Runoff method is used to estimate runoff and generate hydrographs from the site within the SWMM model. Rainfall hyetographs are developed using the rainfall data downloaded from the Los Angeles County Department of Public Works Hydrology website as shown in Exhibits 13 through 15, and adjusted using the Design Storm Unit Hyetograph table from Appendix A in the Los Angeles County Department of Public Works Hydrology Manual (*Hydrology Manual*), dated January 2006 (Appendix B).

Table 1 in Appendix C lists hydrologic parameters associated with the site and the two Grand Canal drainage areas. Proposed conditions parameters are based on the concept site plans and Venice Auxiliary Pumping Plant Design report (*PDR*) provided by Arcadis (Appendix E) and the assumed LID size and configuration complies with the City of Los Angeles *LID Manual*. Existing conditions parameters are estimated from available data.

According to the City's *Geotechnical Report* dated December 14, 2015, artificial fill soils exist within the site as the result of previous construction and/or previous construction activities on the site. In general, the depth of fill is expected to be approximately three to four ft within the site. The fill materials generally consist of silty sand and sand with some construction debris. Given the depths of the proposed LID features, the bottom of the LID feature will likely be below the fill materials. Therefore, soils parameters are based on the assumed underlying native soils.

Alluvial sediments encountered in the borings contain primarily coarse-grained soils consisting of gravels, sands, and silty sands with interlayered fine grained soils consisting of silts and clays. Coarse-grained alluvial materials range widely in type and consistency from poorly graded sands and gravels to silty and clayey sands. Generally, the coarse alluvium soils are typically brown or light brown in color though they may be gray or olive with high fine contents in the case of silty or clayey sands. The coarse-grained materials are moist to wet, loose to very dense with varying amounts of silt, clay, gravel, and cobbles. The fine-grained materials are typically moist to wet.

Fine-grained alluvium consists of lean and fat (low to high plasticity) silts and clays of very soft to hard consistency. Generally, the fine-grained alluvial soils are brown, dark brown, dark gray or greenish gray in color. Seashells and seashell fragments were observed in many of the samples collected from the borings. These materials were observed to be interspersed anywhere within the matrix of the soil and as concentrated lenses and layers of several inches in thickness.

Since the alluvial sediments are indicated to vary in type and consistency from sands and gravels to silt, clay, gravel, and cobbles and the geotechnical report addresses "surface soils", native underlying soils at the VAPP site is assumed to be Yolo Clay Loam (Exhibit 8) with saturated hydraulic conductivity rates of approximately 0.040 inches/hour (from standard tables from the EPA *Sustain User's Manual*, as the geotechnical report did not include saturated hydraulic conductivity rates or other values needed for modeling).

The suction head and initial deficit parameters shown in Table 2 of Appendix C are estimated for a clay loam from standard soils texture tables and further details on data sources are included in this table. Soil types for the project area and watershed drainage areas were determined by using the soil types found in Exhibit 8 (Soil Map) and taking percentages of the three soil types present in the project area to estimate composite values. The three types of soil used from the map were Yolo Loam as loam, Chino Silt Loam as silt loam, and Yolo Clay Loam as clay loam. Green & Ampt parameters for these soils types were also estimated from standard *Sustain* tables.

Design Storm Results

The two-year, ten-year, and 100-year, 24-hour design storm events are modeled to assess runoff during an event similar to the water quality event, an event representative of storm drain sizing, and an extreme flood control event. As shown in Table 1 of Appendix C, the two-year, 24-hour, ten-year, 24-hour and 100-year, 24-hour rainfall depths at the site are 2.02, 3.72 and 5.85 inches (in), respectively. Exhibits 13, 14, and 15 each detail the rainfall depths. As indicated above, the design storm rainfall data is derived from the Los Angeles County *Hydrology Manual* (Appendix B). The rainfall hyetographs are used by SWMM to compute the design storm runoff hydrographs from the site.

As shown in Table 5 of Appendix C, proposed conditions peak flows at the site with the Alternative 1 LID (lined bioretention with underdrain) features are 67-percent less than existing flows from the site for the two-year, 24-hour event and 64-percent and 29-percent less than existing for the ten-year, 24-hour and 100-year, 24-hour events, respectively. Specifically, the existing two-year peak flow is 0.06 cubic feet per second (cfs) and the proposed two-year peak flow is 0.02 cfs, the ten-year existing peak flow is 0.14 cfs and the proposed peak flow is 0.05 cfs, and the 100-year existing peak flow is 0.24 cfs and the proposed peak flow is 0.17 cfs.

Also shown in Table 5 of Appendix C, proposed conditions peak flows in the Grand Canal with the Alternative 1 LID features are essentially zero-percent change from existing flows for the two-year, ten-year, 24-hour, and 100-year 24-hour events. Specifically, the existing two-year peak flow is 72.9 cfs and the proposed two-year peak flow is 72.8 cfs, the ten-year existing peak flow is 165.7 cfs and the proposed peak flow is 165.6 cfs, and the 100-year existing and proposed peak flows are 263.8 cfs.

The Alternative 2 (planter box and lined bioretention) proposed conditions peak flows from the site are also 67-percent less than existing flows from the site for the two-year, 24-hour event, seven-percent less for the ten-year, 24-hour event, and no change from the existing to proposed 100-year, 24-hour event. Specifically, the existing two-year peak flow is 0.06 cfs and the proposed 2-year peak flow is 0.02 cfs, the ten-year existing peak flow is 0.14 cfs and the proposed peak flow is 0.13 cfs, and both the 100-year existing and proposed peak flows are 0.24 cfs.

Similar to Alternative 1, the Alternative 2 proposed conditions peak flows in the Grand Canal essentially do not change or are slightly less from existing to proposed for the two-year, ten-year, and 100-year, 24-hour events. Specifically, the existing two-year peak flow is 72.9 cfs and the proposed 2-year peak flow is 72.8 cfs, the ten-year existing peak flow is 165.7 cfs and the proposed peak flow is also 165.7 cfs, and the 100-year existing and proposed peak flows are both 263.8 cfs.

Figures 2A through 4A depict runoff hydrographs from the site for the 2-year, 24-hour, 10-year, 24-hour and 100-year, 24-hour design storm events, respectively. Initial discharges are due to the assumed growing media saturation of 30-percent for the design storm events. Figures 2B through 4B depict runoff hydrographs from the Grand Canal system for the 2-year, 24-hour, 10-year, 24-hour and 100-year, 24-hour design storm events, respectively. The hydrograph in the Grand Canal is adjacent to the VAPP site where the flows from all three drainage areas combine at the Node “GrandCanal” and includes pre- and post-project discharges from the VAPP site.

As described, the proposed LID conditions peak flows and runoff volumes are illustrated by the maximum value of the runoff hydrographs and the area under the hydrograph curves, respectively. Additionally, the shapes of the proposed LID conditions runoff hydrographs generally match the shapes of the undeveloped conditions runoff hydrographs for the larger design storm events. Note that final modeling of underdrain sizes and retention times may result in additional hydrograph lagging.

Figure 2A: 2-Year, 24-Hour Design Storm Runoff Hydrographs From Site

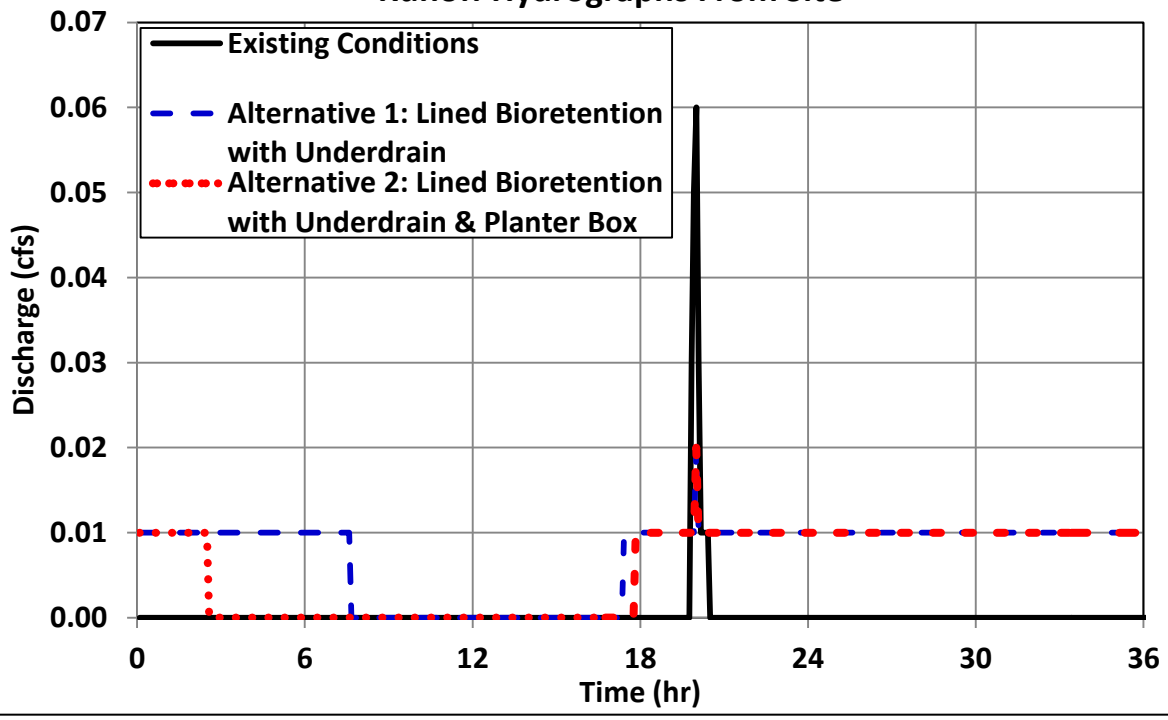
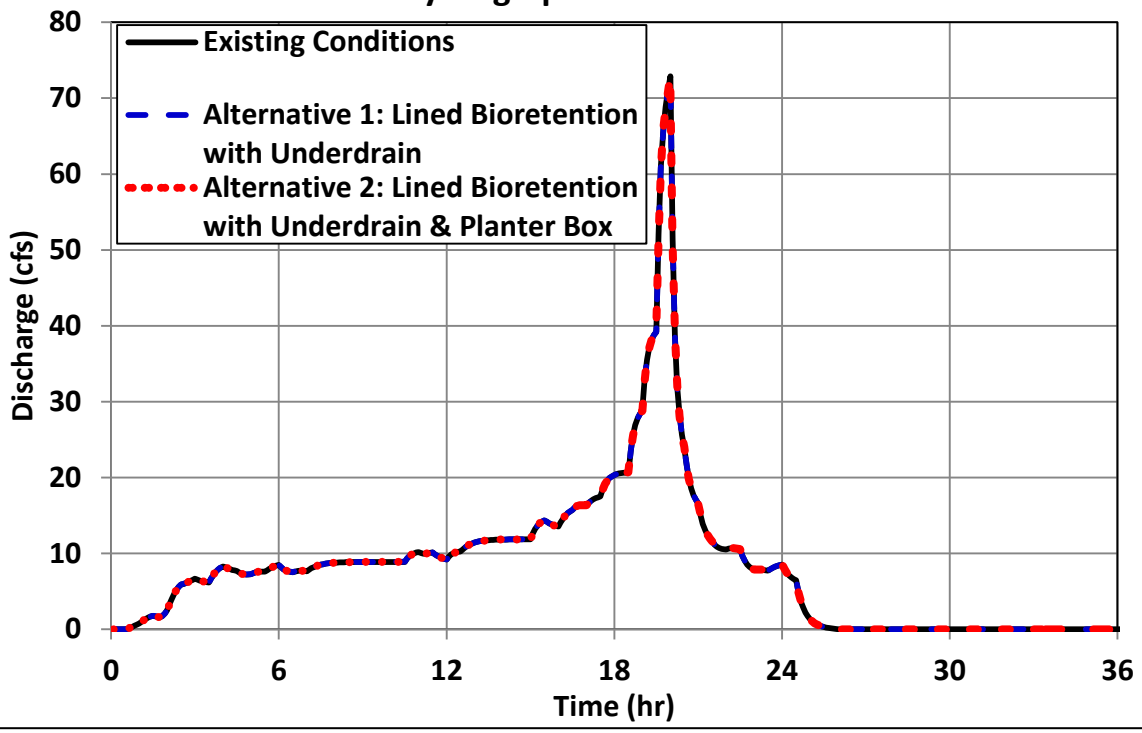


Figure 2B: 2-Year, 24-Hour Design Storm Runoff Hydrographs From Grand Canal



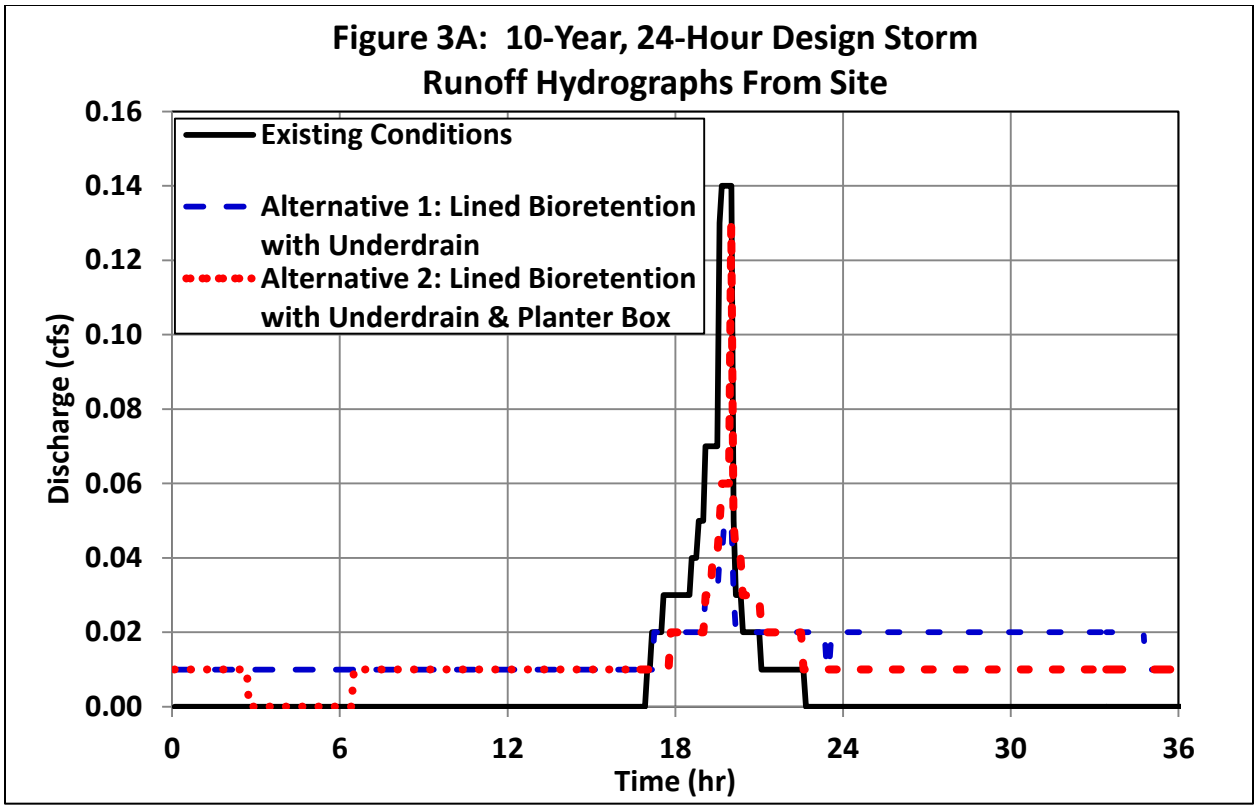


Figure 3A: 10-Year, 24-Hour Design Storm
Runoff Hydrographs From Site
Existing Conditions
Alternative 1: Lined Bioretention with Underdrain
Alternative 2: Lined Bioretention with Underdrain & Planter Box
Discharge (cfs)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0
6
12
18
24
30
36
Time (hr)

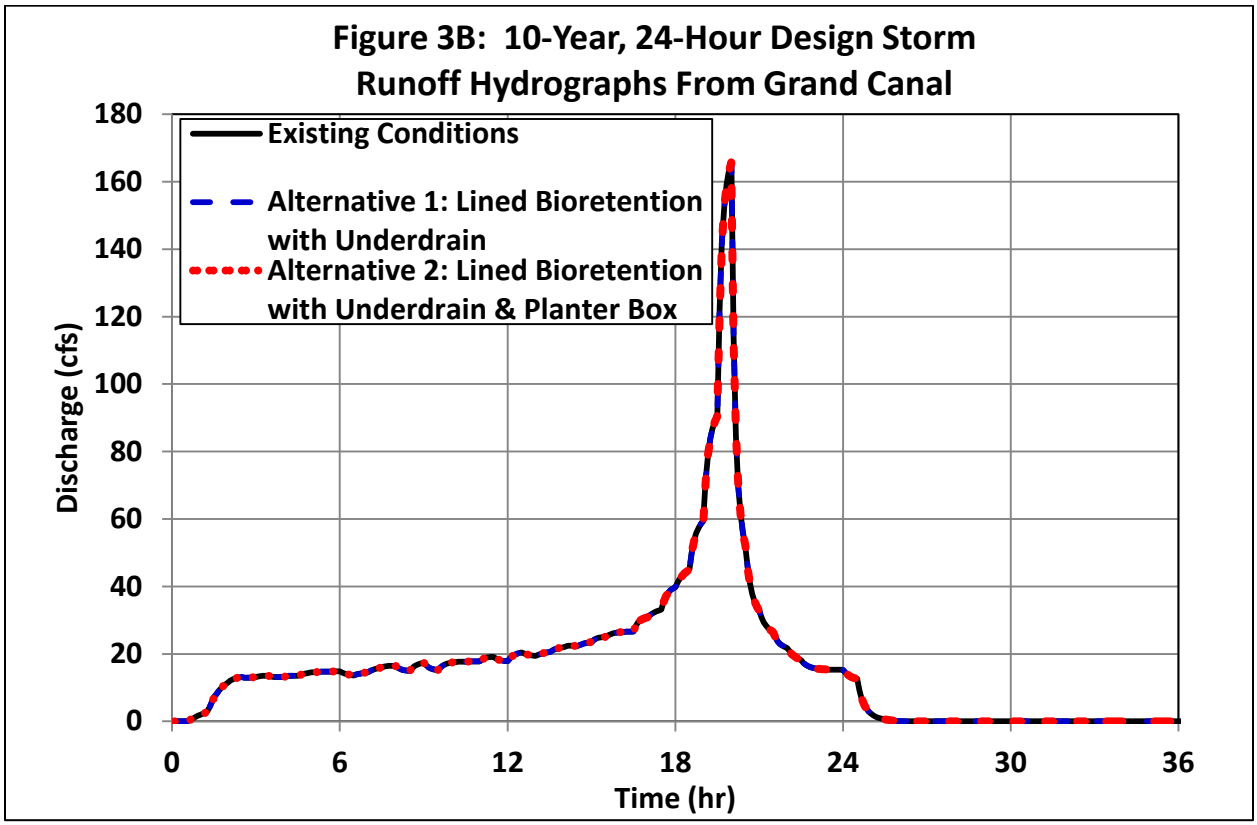


Figure 3B: 10-Year, 24-Hour Design Storm
Runoff Hydrographs From Grand Canal
Existing Conditions
Alternative 1: Lined Bioretention with Underdrain
Alternative 2: Lined Bioretention with Underdrain & Planter Box
Discharge (cfs)
180
160
140
120
100
80
60
40
20
0
0
6
12
18
24
30
36
Time (hr)

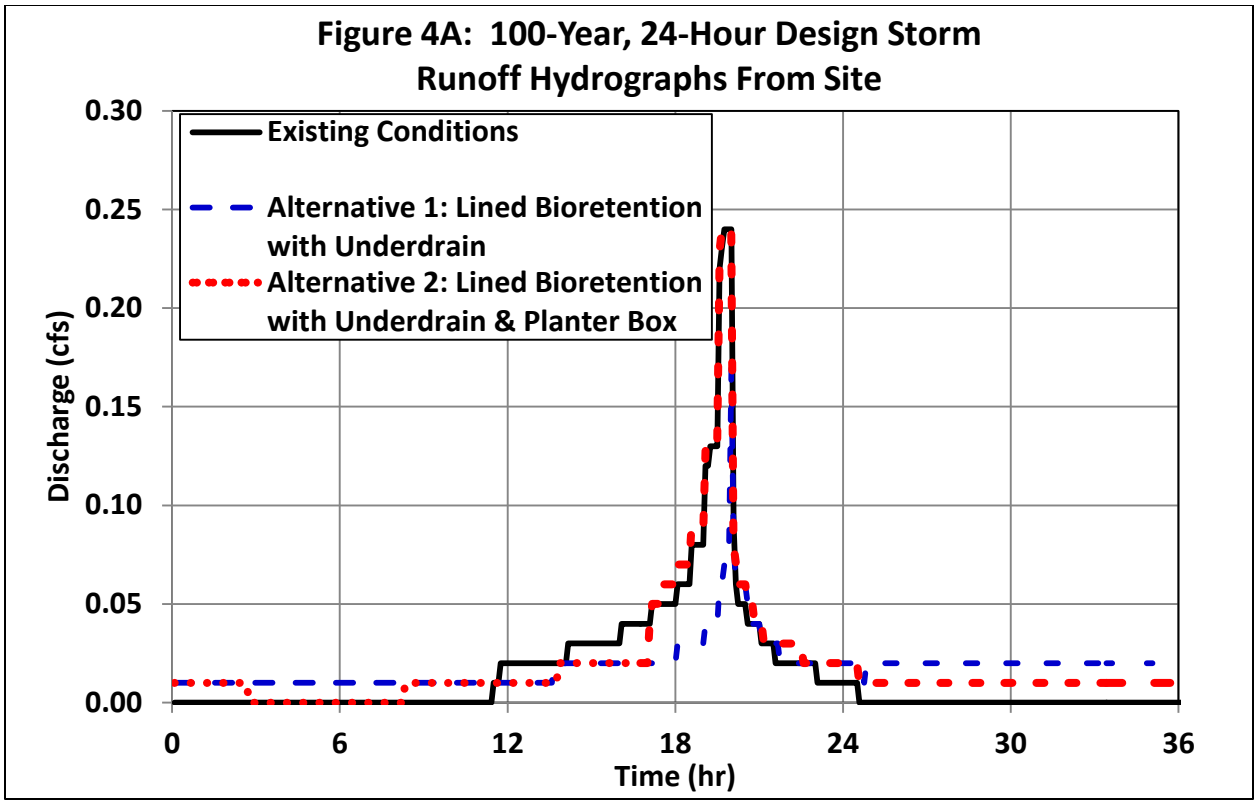


Figure 4A: 100-Year, 24-Hour Design Storm
Runoff Hydrographs From Site
Existing Conditions
Alternative 1: Lined Bioretention with Underdrain
Alternative 2: Lined Bioretention with Underdrain & Planter Box
Discharge (cfs)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
6
12
18
24
30
36
Time (hr)

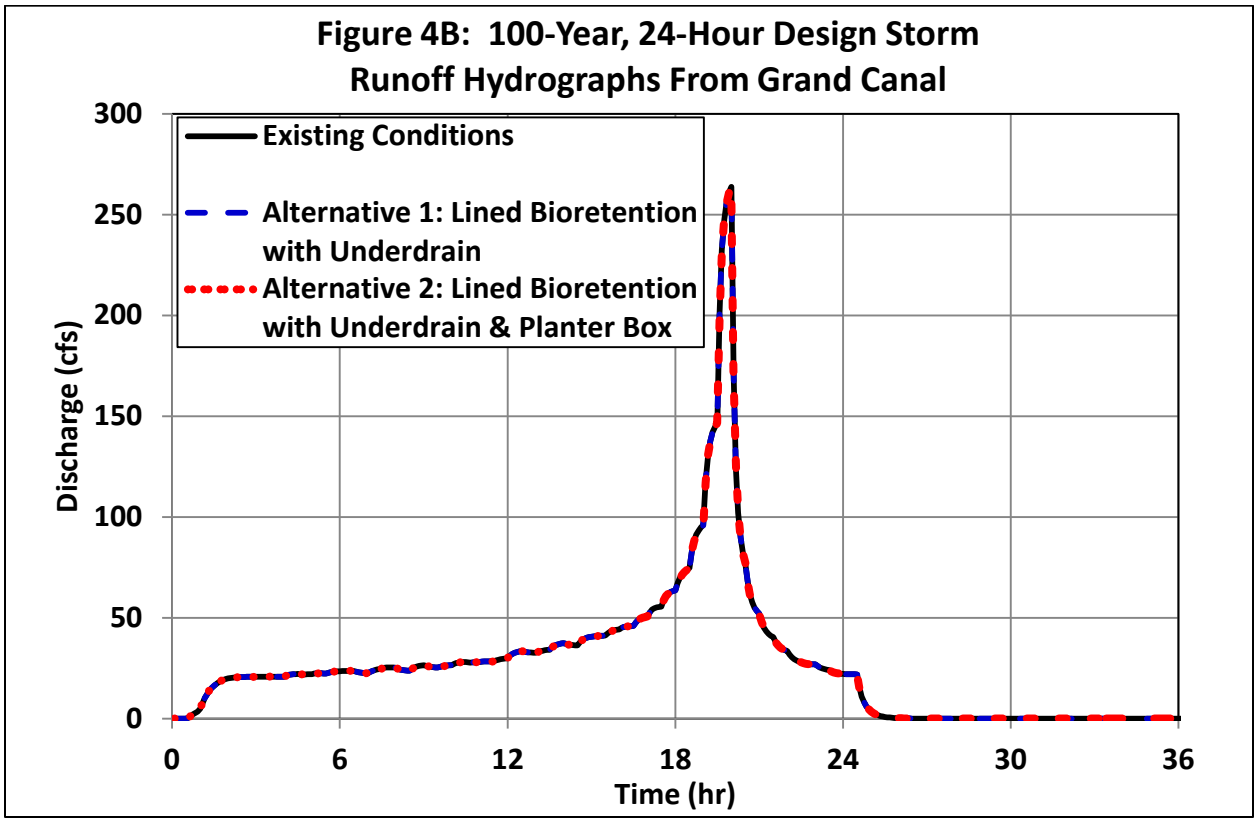


Figure 4B: 100-Year, 24-Hour Design Storm
Runoff Hydrographs From Grand Canal
Existing Conditions
Alternative 1: Lined Bioretention with Underdrain
Alternative 2: Lined Bioretention with Underdrain & Planter Box
Discharge (cfs)
300
250
200
150
100
50
0
0
6
12
18
24
30
36
Time (hr)

Figures 5 through 7 illustrate storage depths within the following layers of the LID feature alternatives at the site:

- 18-inch surface storage layer of lined bioretention with underdrain
- 12-inch surface storage layer of planter box
- 30-inch drain rock layer of lined bioretention
- 30-inch drain rock layer of planter box

Due to impermeable bottoms, underdrains are included in the lined bioretention and planter box alternatives and are assumed to be located at the bottom of the drain rock layer.

Note that typical assumptions were made regarding the geometric configuration of the LID features (Table 4 of Appendix C). Additionally, assumptions on impervious area treated by the LID feature are listed in Table 3 of Appendix C. During the final design and modeling, it is possible that the hydrologic performance can be improved through changes in geometric configuration of the bioretention or incorporation of additional LID features.

The Alternative 1 proposed lined bioretention with underdrain functions as expected and fills to a depth of approximately 18 in in the 100-year, 24-hour event with a drain down time from the maximum storage level of approximately 15 hours. The maximum level during the ten-year, 24-hour event is just over 8 in with a corresponding drain down time of approximately 9 hours. The maximum level during the two-year, 24-hour event is approximately 2 in with a corresponding drain down time of approximately 3 ½ hours.

The water surface in the drain rock layer reaches a maximum of approximately 9 in in the 2-year event, 25.5 in in the 10-year event, and about 29 in in the 100-year design storm events. While the drain down time is much longer than for the surface storage, this is due to the required underdrain in the City's *LID Manual* criteria, which provides additional water quality and hydrologic benefits. Any vector control requirements should be addressed during the final design; however, this storage is located underground as opposed to above ground.

Similarly, the Alternative 2 proposed lined bioretention with underdrain also functions as expected and fills to a depth of 18 in in the 100-year, 24-hour event with a drain down time from the maximum storage level of approximately 15 hours. The maximum level during the ten-year, 24-hour event is also 18 in with a corresponding drain down time of just over 16 ½ hours. The maximum level during the two-year, 24-hour event is 5.5 in with a corresponding drain down time of nearly 7 hours.

The Alternative 2 proposed planter box feature also functions as expected and fills to a depth of approximately 12 in in the 100-year, 24-hour event and drains down from the maximum storage level in approximately 10 hours. The maximum level during the ten-year, 24-hour event is also 12 in with a corresponding drain down time of just over 11 hours. The maximum level during the two-year, 24-hour event is approximately 6 in with a corresponding drain down time of almost 8 hours. The water surface in the drain rock layer reaches a maximum of approximately 20 in in the 2-year event, approximately 27 in in the 10-year, and approximately 28 in in the 100-year design storm events.

Figure 5: 2-Year Hydrographs from Biofiltration Features

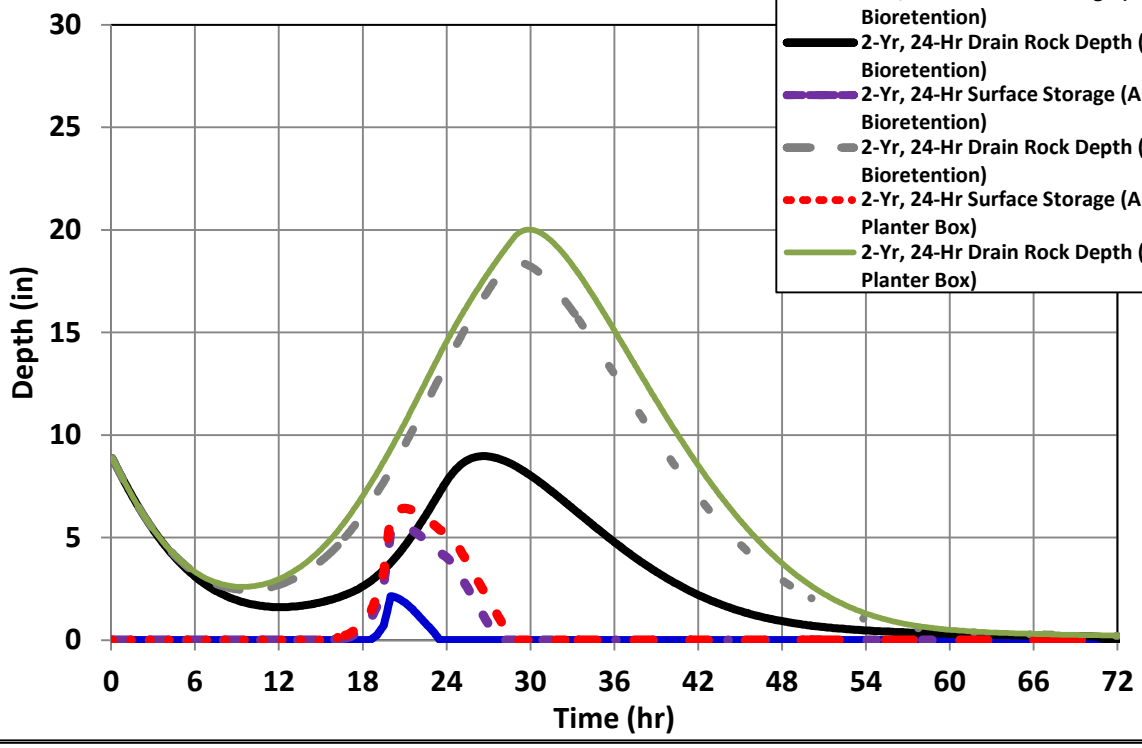
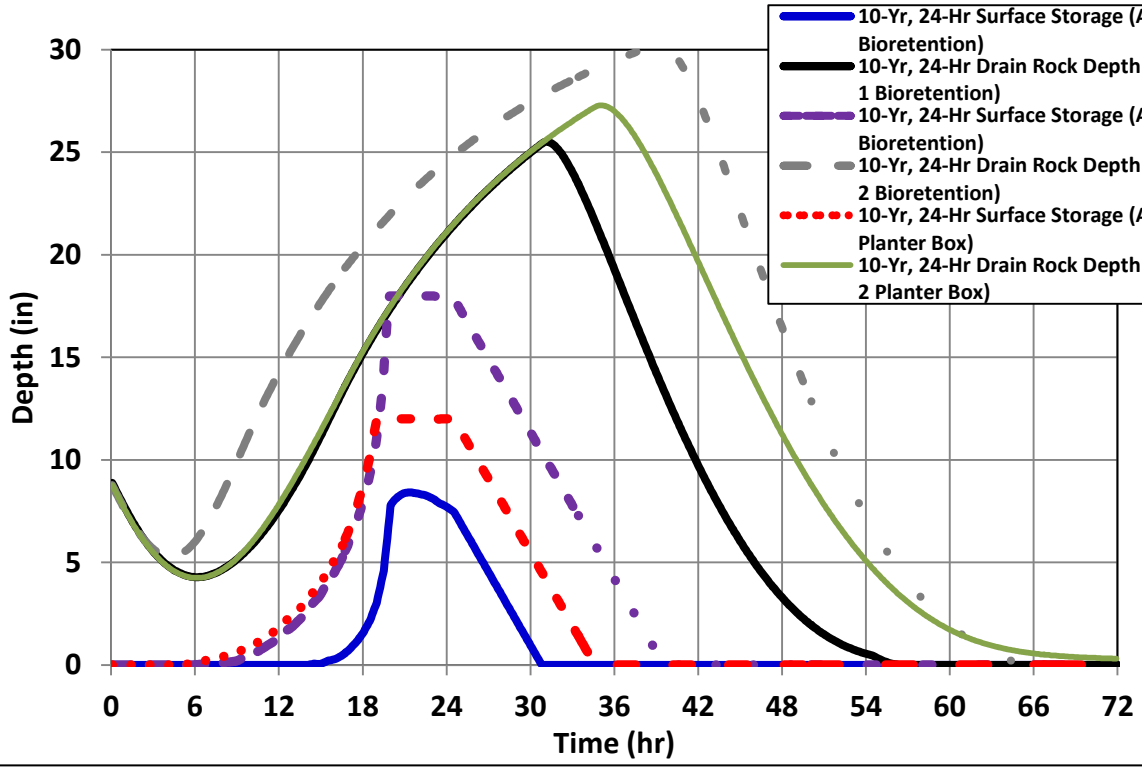
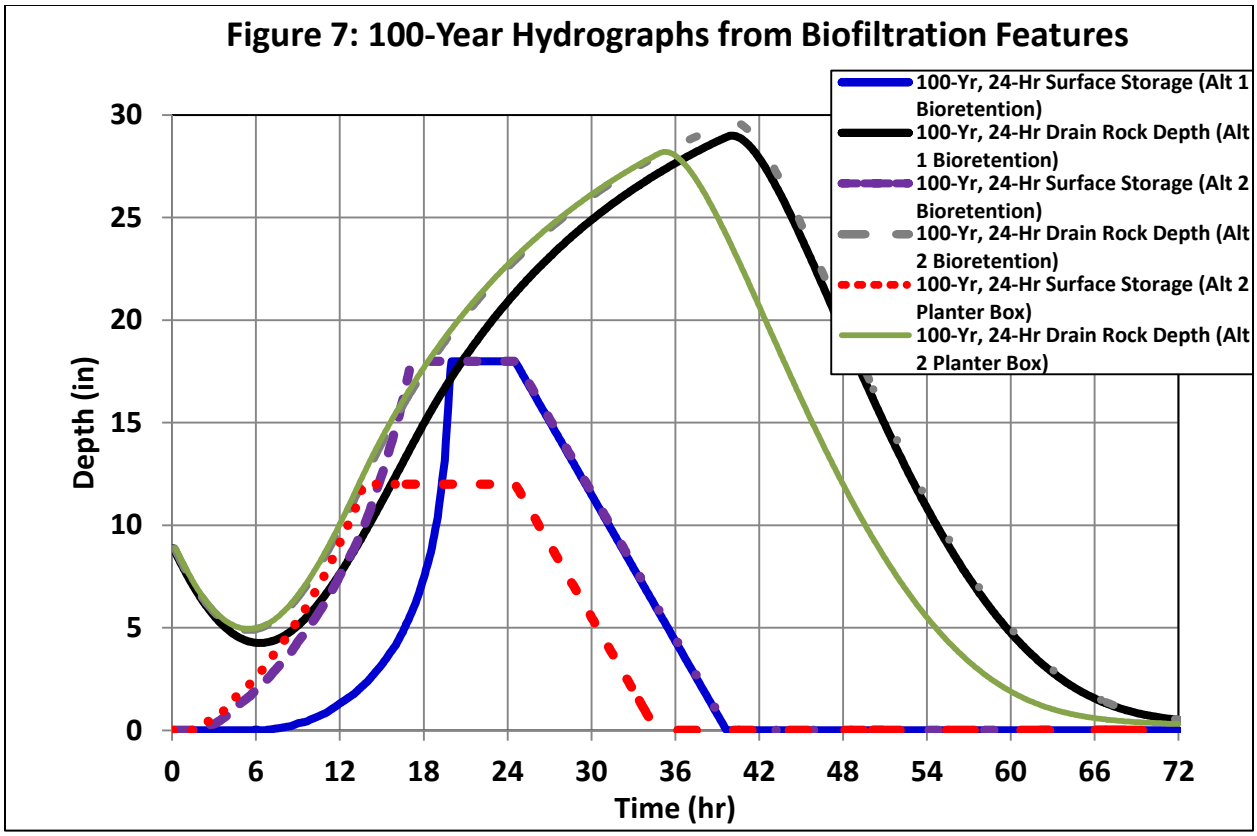


Figure 6: 10-Year Hydrographs from Biofiltration Features





Continuous Simulation Results

A continuous simulation modeling analysis was performed based on 1970 – 2005 rainfall data obtained from the U.S. EPA's National Stormwater Calculator for the Santa Monica Pier gauge, which is located in closest proximity to the site. Average monthly evaporation data is also used from this gauge. While hourly data is used in the continuous simulation modeling analysis, daily events are summarized in this figure. Figure 8 illustrates historical daily rainfall totals during the period of record from 1970 – 2005 recorded at the Santa Monica Pier gauge. Days without rain are not shown on this graph.

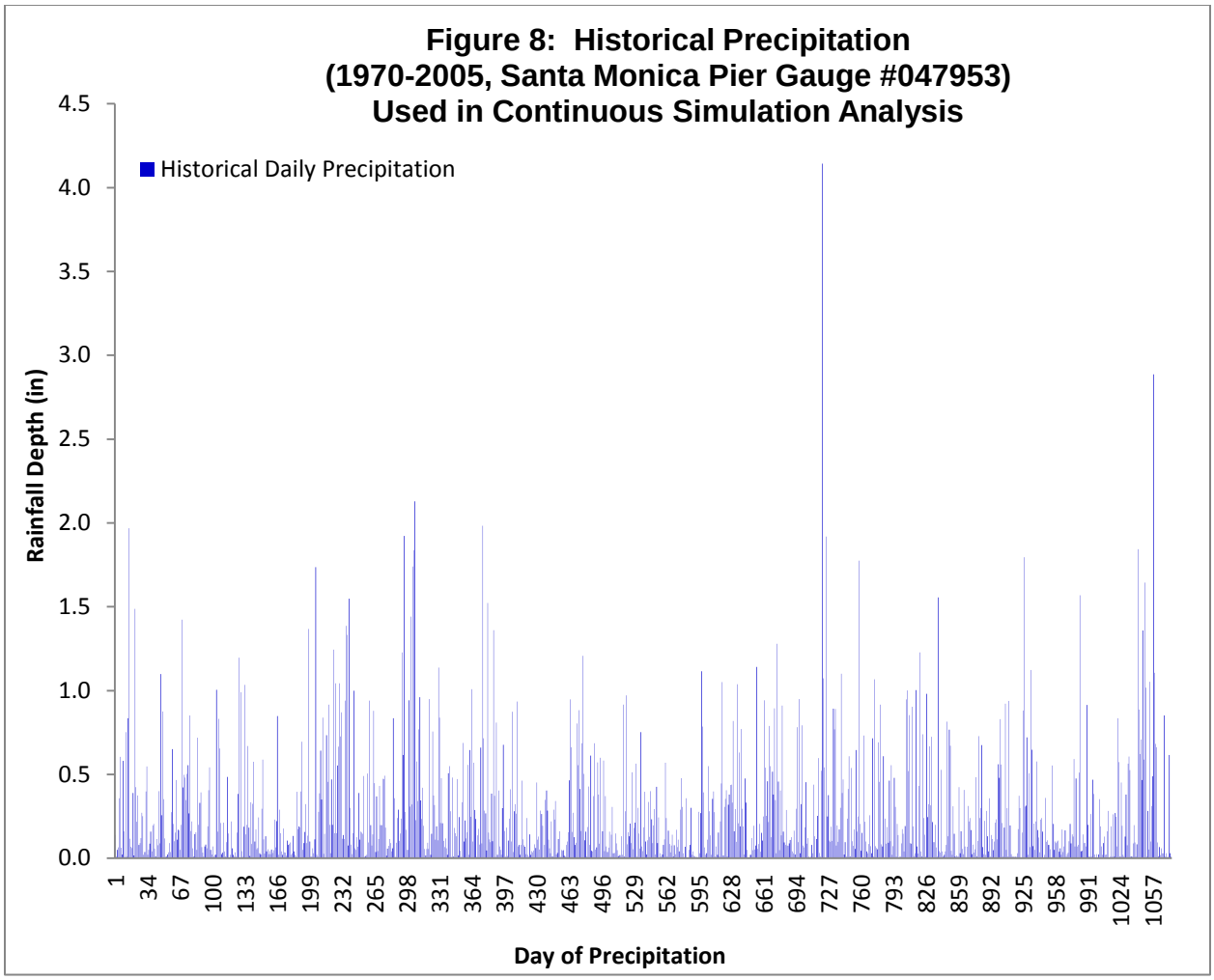


Table 6 in Appendix C includes water balance results for the continuous simulation analysis and summarizes infiltration, runoff, evapotranspiration, and precipitation. Annual maximum peak discharges from the site and in the Grand Canal are depicted in Figures 9A and 9B, respectively. For the entire period of analysis, maximum annual discharges from the VAPP site are less than or equal to existing discharges from the site. In all years, maximum annual discharges from the Grand Canal are equal to or less than existing discharges during the period of record between 1970 and 2005. Note that the actual results may change somewhat during final design and modeling depending on the final extent and configuration of LID features and impervious cover within the site.

Figure 9A: Maximum Annual Peak Discharge from Continuous Simulation Analysis at Site

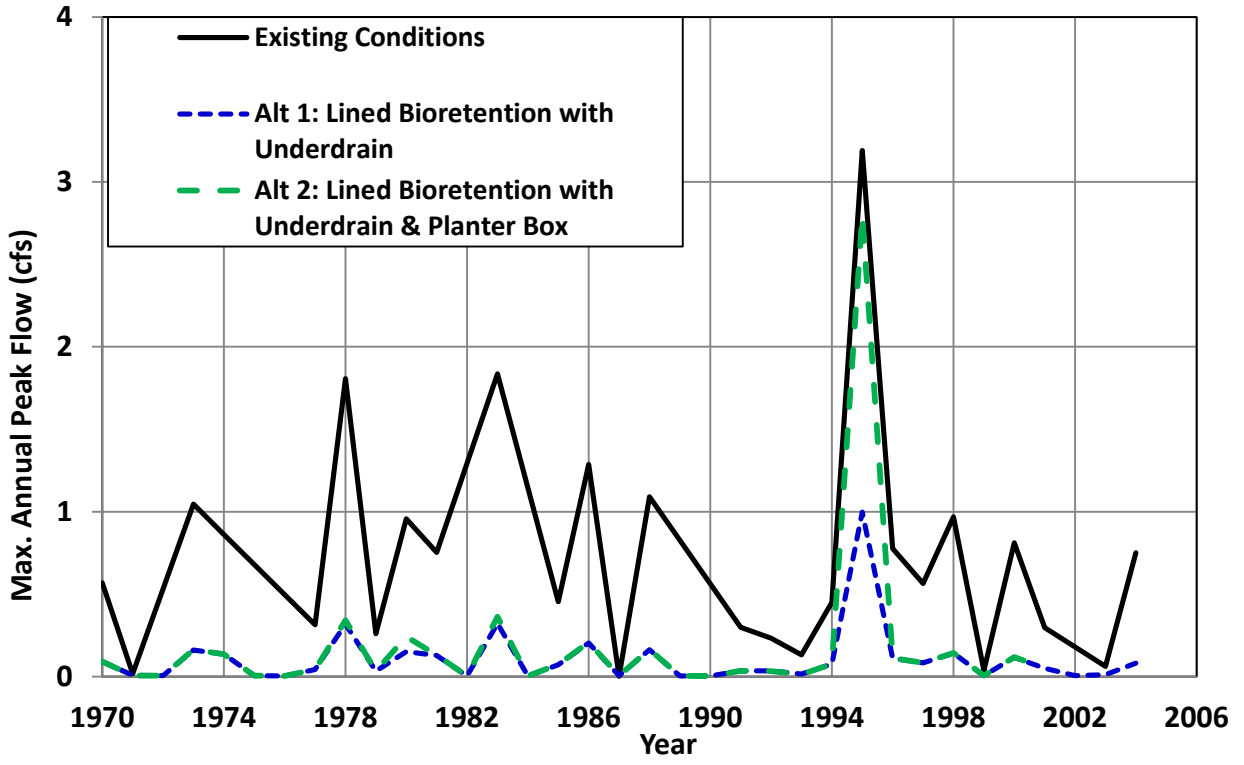
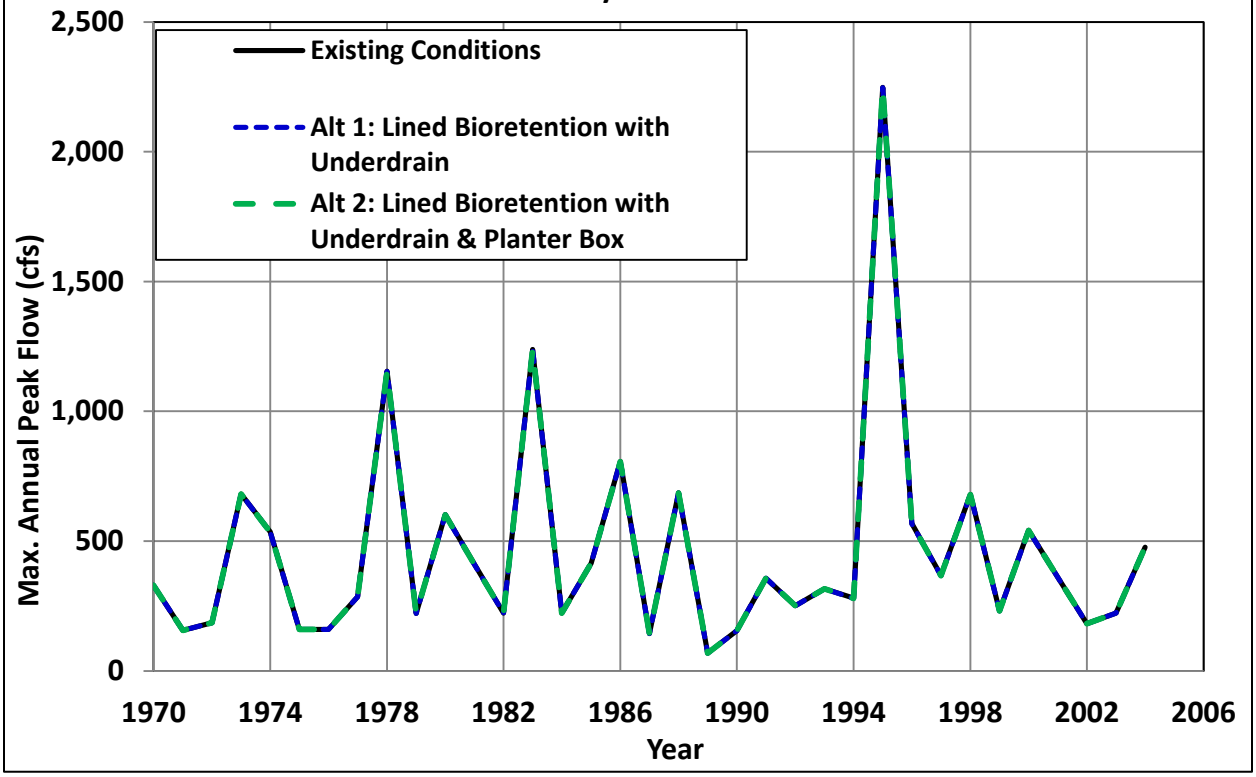


Figure 9B: Maximum Annual Peak Discharge from Continuous Simulation Analysis at Grand Canal

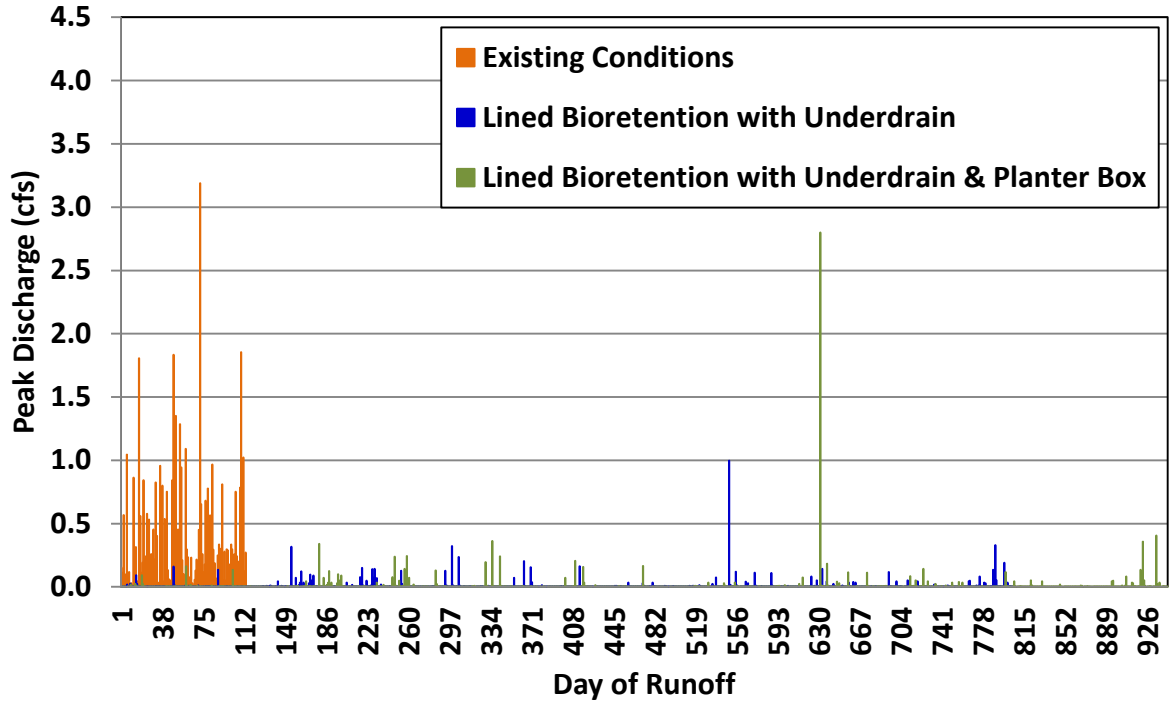


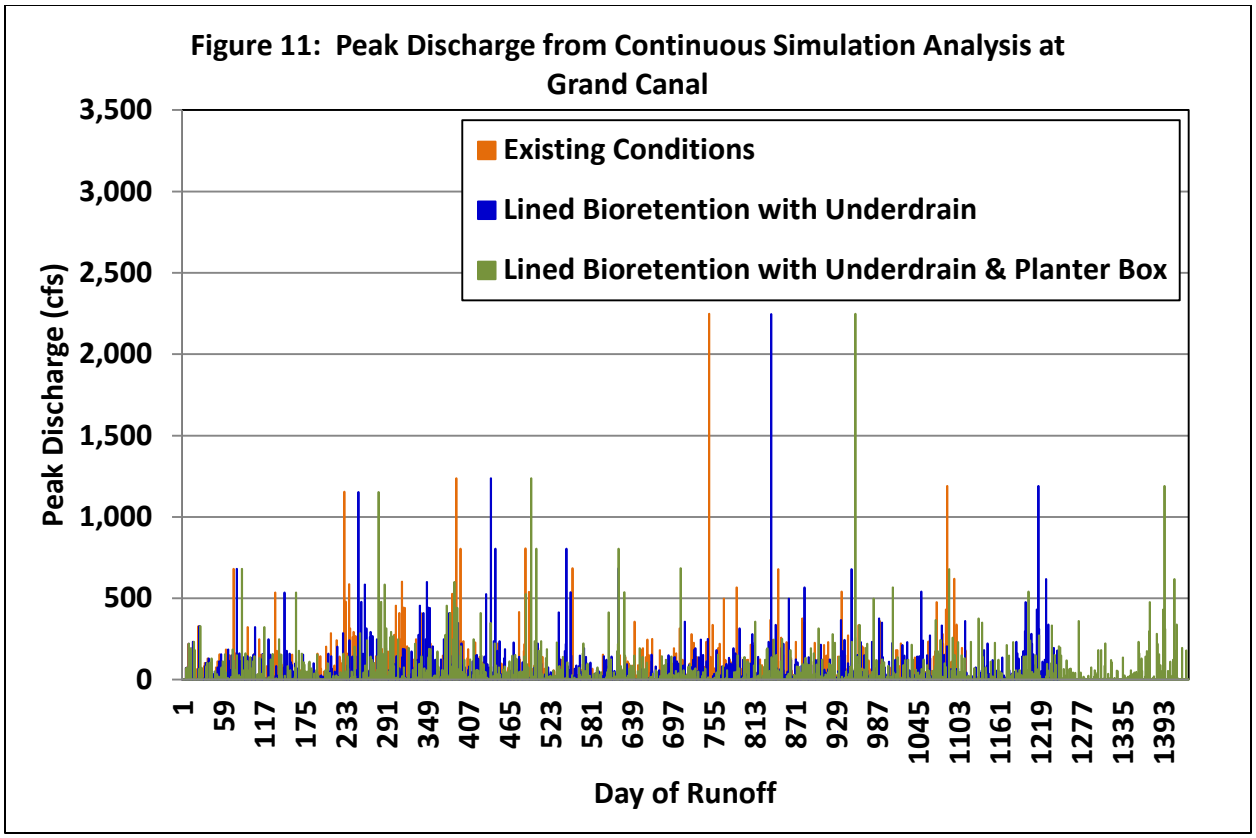
While a full hydromodification hydrology and hydraulics (HEC-RAS) frequency analysis is beyond the scope of this study, peak discharge impacts in the two-, ten-, and 100-year events are evaluated in the design storm section and continuous simulation modeling results are evaluated for maximum annual peak discharges and exceedance frequency curves. Additionally, the final design is required to comply with hydromodification hydrology and hydraulics (HEC-RAS) analyses for multiple design storm events (two-, five-, ten-, 25-, and 50-year) as specified in the City's *LID Handbook*.

Table 6 in Appendix C includes water balance results for the continuous simulation analysis and summarizes infiltration, runoff, evapotranspiration, and precipitation. During the simulated time-period, 300.74 in of rain occurred. Proposed Alternatives 1 LID conditions runoff at the site is reduced by 69-percent as compared to existing conditions and Alternative 2 conditions is reduced by 12-percent. There is essentially no change or less runoff for both Alternatives within the Grand Canal.

Figures 10 and 11 graphically illustrates runoff in existing and proposed conditions at the site. Note that the day of runoff (x-axis) is for each event and that the days do not correlate for each event. While, there are additional days of runoff from the proposed alternatives, this is due to the delayed discharge from the various layers of the LID features. The general pattern is that proposed LID peak discharges are less than existing peak discharges for both Alternatives 1 and 2.

Figure 10: Peak Discharge from Continuous Simulation Analysis at Site





Discharge exceedance frequency curves and flow duration graphs are provided in Figures 12 and 13. As illustrated in the discharge exceedance frequency curves, both proposed Alternatives 1 and 2 LID conditions flows from the site are equal or less than existing conditions for the range of events contained within the historical 1970 – 2005 rainfall data from the Santa Monica Pier gauge. For the flow duration curves, the proposed LID conditions flow durations appear to exceed existing conditions due to the slow, trickling release of runoff from the site.

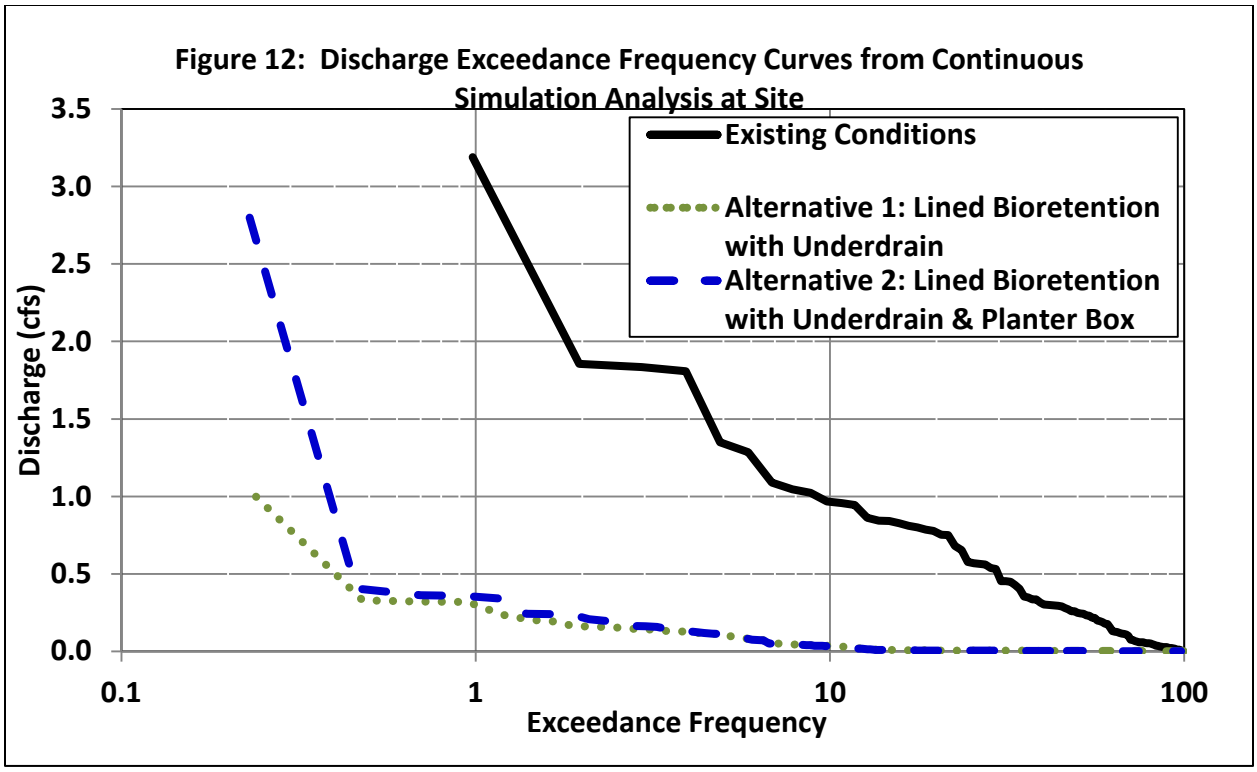


Figure 12: Discharge Exceedance Frequency Curves from Continuous Simulation Analysis at Site
Existing Conditions
Alternative 1: Lined Bioretention with Underdrain
Alternative 2: Lined Bioretention with Underdrain & Planter Box
Discharge (cfs)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.1
1
10
100
Exceedance Frequency

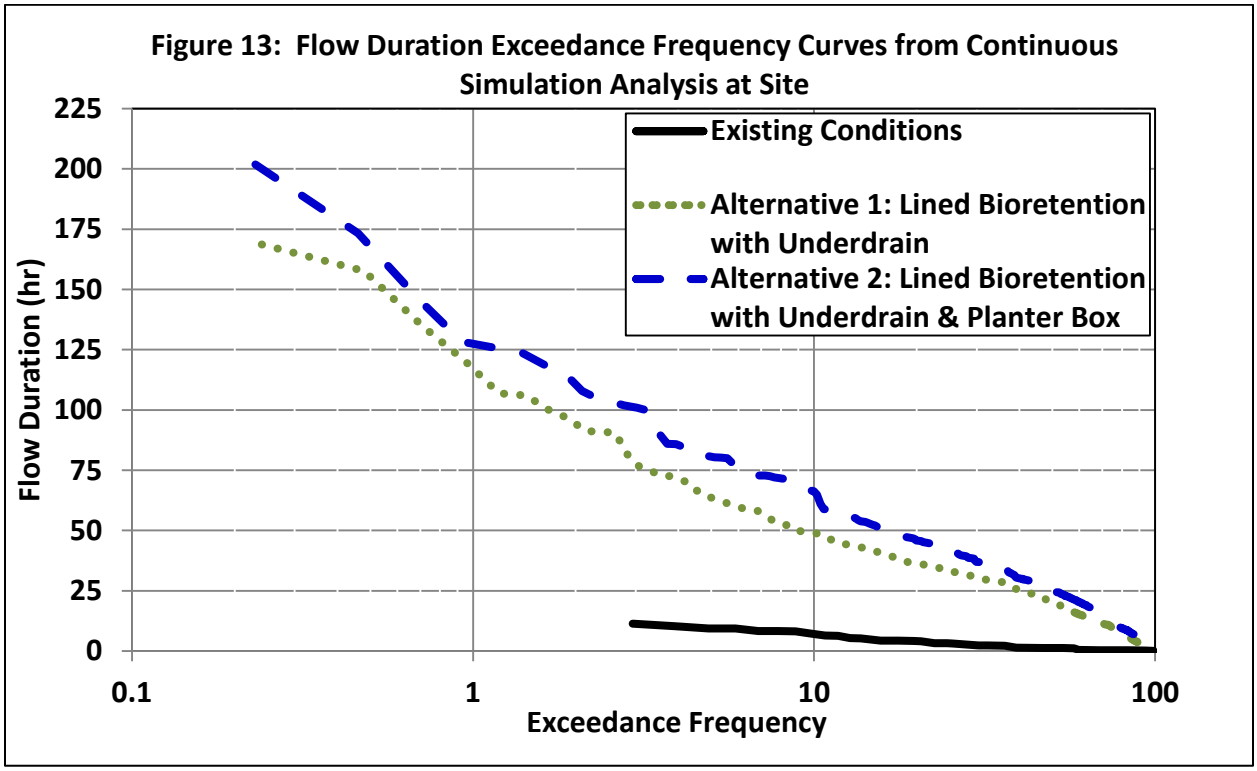


Figure 13: Flow Duration Exceedance Frequency Curves from Continuous Simulation Analysis at Site
Existing Conditions
Alternative 1: Lined Bioretention with Underdrain
Alternative 2: Lined Bioretention with Underdrain & Planter Box
Flow Duration (hr)
225
200
175
150
125
100
75
50
25
0
0.1
1
10
100
Exceedance Frequency

WATER QUALITY ANALYSIS

Development of the VAPP site is anticipated to change the pollutant loading from the site into the Grand Canal and mitigation is needed to maintain pollutant loads from the site and within the Grand Canal at or below existing conditions. As described above, LID features are planned to mitigate hydrologic and water quality impacts from the site. This section includes discussions on pollutant removal performance of LID, water quality methodology, and water quality modeling results.

Pollutant Removal Performance of LID

The most significant water quality benefit of LID is removal of stormwater runoff from the storm drain system or receiving waters. The first flush of stormwater runoff during a rainfall event typically contains higher concentrations of pollutants than later rainfall. By directing this runoff through LID features and providing retention, infiltration into the various layers of the LID feature and/or the native soils below the LID, and evapotranspiration, the pollutants do not reach the receiving body of water.

Other pollutant removal processes achieved through LID include physical, chemical, and biological processes. Physical processes include filtering of sediment and pollutants, such as metals absorbed to the sediment. Degradation of fecal coliform bacteria also occurs by drying out and exposure to ultraviolet (UV) light from sun exposure. Biological processes include bioremediation and biodegradation. For example, hydrocarbons may be broken down by soil microorganisms.

Phytoremediation, or pollutant removal by plants, includes pollutant uptake into and bioaccumulation within the plants, release of some pollutants from plants into the atmosphere, and breakdown of pollutants at the soil-plant root interface. For the latter process, mycorrhizal fungi play an important role by attaching to the roots and extending microfilaments into the soil, which significantly increases the functional surface area of plant roots. Because native, or indigenous, plants have evolved to the unique microclimate of an area and typically have deeper roots and greater levels of micorrhizal fungi, incorporating these elements into LID may represent an increased opportunity for carbon sequestration in mitigating climate change.

The water quality benefits of LID are well documented with regards to TSS, fecal coliform bacteria, metals, hydrocarbons, and other pollutants. LID is also effective at removing nutrients (N and P) provided that background levels in the native soil and growing media are not excessive. Nitrate (NO_3) removal through LID requires specific design modifications to create anaerobic conditions and an energy source (Carbon) required for denitrification.

While the actual pollutant removal performance of GI features varies with pollutant loading, contributing drainage area, magnitude of rainfall event, antecedent moisture conditions, and specific design, typical pollutant removal rates are listed in Table 8 below. Table 7 in Appendix C includes event mean concentration (EMC) values for modeled pollutants for pre-project and post-project land use at the VAPP site. The specific pollutant removal rates for the various LID alternatives at the VAPP site used in the SWMM modeling are in Table 8 in Appendix C.

Additionally, nutrient removal rates may vary substantially due to potential for leaching from growing media and/or underlying soil as well as specific anaerobic conditions required for denitrification required to remove nitrate (NO_3).

See Appendix C for all tables of hydrology modeling data and results, including EMC values for the North of Washington and South of Washington drainage areas. As indicated previously, the two staging areas are included in the South of Washington drainage area and the land use is classified as vacant for both pre-project and post-project conditions.

TABLE 8: TYPICAL POLLUTANT REMOVAL RATES[1] FOR LID FEATURES

LID Features	Pollutant Percent Removal				
	TSS	Nitrogen	Phosphorus	Bacteria	Heavy Metals
Detention Basin (dry)[4]	30-65	13-45	15-45	<30	15-45
Retention Basin[4]	50-80	30-65	30-65	<30	50-80
Constructed Wetlands[4]	50-80	<30	15-45	<30	50-80
Infiltration Basin[4]	50-80	50-80	50-80	65-100	50-80
Infiltration Trench/Dry Wells[4]	50-80	50-80	15-45	65-100	50-80
Permeable Pavement[4]	65-100	65-100	30-65	65-100	65-100
Swales[4]	30-65	15-45	15-45	<30	15-45
Vegetated Filter Strips[4]	50-80	50-80	50-80	<30	30-65
Bioretention[3,5]	85[5]	32-99[3]	72[5]	70-92[3]	54-99[3]

[1]Ranges varying with particle size, pollutant loading and site conditions.

[2]Bioretention rates anticipated to be applicable for Rain Gardens as well.
[3]From selected field and laboratory studies summarized in *Bioretention Technology: Overview of Current Practice and Future Needs* by Davis, Hunt, Traver, and Clar in March, 2009 Journal of Environmental Engineering.
[4]LID percent removal numbers were obtained from the U.S. EPA *Handbook Urban Runoff and Pollution Prevention Planning.*
[5]National Pollutant Removal Database/Other Sources Summarized by *Cost and Pollutant Removal of Storm-water Treatment Practices by* Weiss, Gulliver, and Erickson in May/June, 2007 *ASCE Journal of Water Resources Planning and Management*,

Water Quality Modeling Methodology

Pollutants selected and modeled for this report were based on the EPA's 303(d) list of pollutants of concern, those pollutants requiring a TMDL, pre-project sampling performed by the City, and pollutants of concern that were measured in previous Ballona Lagoon and Los Angeles land studies. The most common of the pollutants were selected based upon a comparison of the concentration rates and appearance in the land use changes that would occur post-construction when the project area changed from vacant area land use to light industrial land use. The following pollutants were modeled in the EPA SWMM model of the VAPP site and the Grand Canal watershed:

- total suspended solids (TSS);
- chemical oxygen demand (COD);
- total copper;
- total lead;
- total zinc;
- fecal coliform.

While selenium was listed as a pollutant of concern, it was assumed that it would be similar to other metals modeled in this report as data was not readily available on removal rates.

Table 9 below lists the Event Mean Concentration (EMC) and Table 10 lists the pollutant percent removal values for each pollutant modeled included in the water quality analysis. Both the two-year design storm event and the 36-year continuous simulation modeling runs were used for the water quality analysis. While representative, the two-year event is larger than the "water quality" event, it was used as a representative event and may overestimate pollutant loading that would occur in the "water quality" event. The two-year rainfall event is 2.02 in, the ten-year event is 3.72 in, and the 100-year rainfall event is 5.85 in the project area at the VAPP site. Table 1 in Appendix C shows the rainfall depths in the other two drainage areas contributing to the site and the Grand Canal.

TABLE 9: PRE-PROJECT AND POST-PROJECT EVENT MEAN CONCENTRATION VALUES[1] FOR VAPP SITE

Pollutant	Site	
	Pre-Project (Vacant)	Post-Project (Industrial)
	EMC	EMC
TSS (mg/L)	164.7	229.4
COD (mg/L)	40.0	65.0
Total Copper (µg/l)	9.1	31.0
Total Lead (µg/l)	30.0	114.0
Total Zinc (µg/l)	38.8	565.6
Fecal Coliform (MPN/100 L)	2,174.8	653,070.4

[1] Most Event Mean Concentration (EMC) values are from Table 7, *The Green Visions Plan for 21st Century Southern California*, 2006 (Appendix W). COD and Lead are from the EPA *Guide to Urban Stormwater Pollutant Concentrations*, 2006.

TABLE 10: POLLUTANT REMOVAL BY VARIOUS BIOFILTRATION PRACTICES

Pollutant	% Removal		
	Lined Bioretention[8]	Planter Box[8]	Vegetated Swale[9]
Total Suspended Solids (TSS)[1]	85	85	52[5]
Chemical Oxygen Demand (COD)[2]	40	40	40
Total Copper[3,4]	66	66	26
Total Lead[3,5]	63	63	13
Total Zinc[3,5]	68	68	38
Fecal Coliform[6]	81	81	30[7]

Notes
[1] Total Suspended Solids (TSS) removal rates based on National Pollutant Removal Database/Other Sources Summarized by Cost and Pollutant Removal of Storm-water Treatment Practices by Weiss, Gulliver, and Erikson in May/June, 2007 ASCE Journal of Water Resources Planning and Management
[2] Removal rates for Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD) were not readily available. Chemical Oxygen Demand (COD) is the representative pollutant for modeling purposes. COD removal based on average organics removal of 40% or greater as documented in *Stormwater Management* Volume 3/Issue 1, February/March, 2015 article entitled *Soil Media Protects Salmon from Toxic Runoffs.* Vegetated swale assumed to bioretention due to required two feet of growing media.

[3] While Selenium is listed as a 303(d) pollutant of concern, it is not modeled as data is not readily available. Selenium removal by bioretention is expected to be similar to Total Copper, Total Lead, and Total Zinc.
[4] Total copper has an assumed removal rate, based on average removal rates for Total Lead and Total Zinc.
[5] Total Lead and Total Zinc removal rates for all features and TSS removal rates for vegetated swale based on *The Green Vision s Plan for the 21st Century Southern California* (Appendix W) prepared by the University of Southern California, dated April 2006.
[6] Fecal Coliform removal rates based on average from selected field and laboratory studies summarized in *Bioretention Technology: Overview of Current Practice and Future Needs* by Davis, Hunt, Traver, and Clar in March 2009, Journal of Engineering.
[7] Fecal Coliform removal rates for vegetated swales were obtained from the U.S. EPA *Handbook Urban Runoff and Pollution Prevention Planning.*
[8] Lined bioretention and planter box assumed to have similar removal rates to bioretention in the literature.
[9] Removal rates may be underestimated for vegetated swales due to required two feet of growing media.

Water Quality Modeling Results

Table 9 in Appendix C shows the pollutant effluent concentrations from the site with the two alternatives compared to the concentrations associated with existing conditions. For Alternative 1 (lined bioretention with underdrain), TSS increases are 0.3 lbs higher in the two-year event and 5.8 lbs less in the continuous simulation. However, COD is 1.0 lbs higher in the two-year event, but 0.4 lbs less annually. Copper, Lead, and Zinc are essentially zero in both existing conditions and proposed conditions for the two-year event and annually. Fecal Coliform has a 2.6 lbs increase in proposed conditions for the two-year event, but has no change annually.

Table 10 in Appendix C compares the pollutant effluent concentrations between existing conditions and the two Alternatives within the Grand Canal adjacent to the VAPP site. For Alternative 1 in the Grand Canal, the TSS is also increased in the two-year by 0.3 lbs and reduced 5.8 lbs annually, and COD has an increase of 1.0 lbs in the two-year event, but annually has a 0.4 lbs reduction. Copper, Lead, Zinc and Fecal Coliform do not change in the two-year event or annually.

The results for Alternative 2 are generally the same or just slightly less than Alternative 1. For Alternative 2 (planter box and bioretention), TSS increases are 0.1 lbs higher in the two-year event and also 5.8 lbs less in the continuous simulation. COD is 0.8 lbs higher in the two-year event, but 0.4 lbs less annually, similar to Alternative 1. Copper, Lead, and Zinc are zero lbs in both existing conditions and proposed conditions for the two-year event and annual continuous simulation. Fecal Coliform increases by 2.5 lbs in proposed conditions for the two-year event, but has no change annually.

In the Grand Canal, the Alternative 2 results for the two-year event indicate that TSS increases by 0.1 lbs and COD has an increase of 0.8 lbs. Annually, TSS decreases 5.8 lbs and COD

decreases 0.4 lbs, similar to Alternative 1. However, like Alternative 1, there is no change for the other pollutants during the two-year event or annual continuous simulation.

While annual pollutant loads are not increased from the VAPP site or in the Grand Canal for the modeled, we recommend that a vegetated filter strip be used as pre-treatment BMP to further reduce the TSS, COD and fecal coliform concentrations from the site in the two-year event and any remaining pollutants discharging to the Grand Canal. In Alternative 1, all impervious cover on the site should be disconnected and drain through the vegetated filter strip by overland flow. For Alternative 2, all portions of the site not draining to the planter box should be disconnected and drain through the vegetated filter strip by overland flow. Additionally, if Alternative 2 is selected the planter box underdrain should drain into the lined bioretention if site grading permits. Use of this pre-treatment BMP will also further reduce peak discharges from the site in smaller design storm events as well as concentrate removal of sediment and other maintenance activities outside of the primary BMP. Alternatively, a manufactured BMP could be used for pre-treatment.

HYDRAULIC ANALYSIS

This section discusses the proposed cofferdam and diversion structure within the Grand Canal, and the hydraulic analysis of the proposed cofferdam during construction-phase of the project.

Proposed Cofferdam and Diversion Structure

Construction of a temporary coffer dam during the construction of the VAPP facility is necessary to ensure dry bedding conditions for the underground structure foundations, per the *PDR* by Arcadis (Appendix E). Additionally, a diversion structure must be installed in the Grand Canal to maintain the existing operation of the VPP while the VAPP is under construction. A shaped invert from the diversion structure will direct flow to either the VPP or the VAPP.

Based on the PDR by Arcadis, the preliminary cofferdam proposed for the VAPP project will be constructed of soldier piles and sheeting and located in the Grand Canal adjacent to the site during the construction phase of the project. The cofferdam will be removed once construction is completed, but the diversion structure will remain in place and be utilized post-construction. According to the PDR by Arcadis, the dimensions of the cofferdam are 95 ft in length by 23 ft wide, whereas the width of the Grand Canal in the vicinity ranges from approximately 65 to 70 ft.

The required diversion structure will be 17 ft by 17 ft and located adjacent to the cofferdam and top of the structure will be at or below the existing bottom of the Grand Canal. It will be constructed of concrete with a City approved plastic liner. The diversion access tunnel structure is 66 in and located at the northern edge of the site and is connected to the cofferdam structure around the existing influent sewer (see *PDR* plans in Appendix E).

The design of the cofferdam is proposed to be flush to the bottom of the Grand Canal. However, there is a bottom seal added to keep the Cell 1 of the cofferdam water-tight and to resist buoyancy forces from groundwater. The seal also serves as a working platform for the workers to

construct the underground structures. The material of this seal is not discussed in the proposal, schematics, or PDR.

Scour may occur along a cofferdam depending on tidal currents, river currents, or wave-induced currents. A practical method of preventing scour is to deposit a blanket of crushed rock or heavy gravel around the cofferdam either before or immediately after the cofferdam sheet piles are set. Another method is to lay a mattress of filter fabric, covering it with rock to secure it in place. Scour and erosion control will be required as part of the cofferdam construction. Additionally, the bottom of the Grand Canal should be restored to existing conditions upon completion of construction.

Hydraulic Model

A Hydrologic Engineering Center-River Analysis System (HEC-RAS) hydraulic analysis of the Grand Canal was performed in version 4.1.0 to simulate the effects of the cofferdam and diversion structure partial obstructions during the construction phase of the project (Exhibit 16). Post-project conditions are not modeled as the partial obstruction of the Grand Canal will occur only during construction-phase of this project. The HEC-RAS hydraulic model is widely used and was developed by the U.S. Army Corps of Engineers (USACE).

Topographic survey data of the Grand Canal was provided by Arcadis (Appendix H) for the vicinity of the VAPP site and Library of Congress Historical data (Appendix P) was used upstream of the VAPP site at cross-section 1959.76 and this data appears to be based on MSL elevations. The survey data used to develop the HEC-RAS hydraulic model is based on the North American Geodetic Vertical Datum (NGVD) 1929 datum, and appears to be consistent with the cross-section depiction of the Grand Canal from the Library of Congress. Cross-section locations are depicted in Exhibit 16 and the cross-sections and WSELs are shown in Appendix J.

The cofferdam and diversion structure are modeled as blocked obstructions within the affected cross-sections. The crossing and tide gates at Washington Blvd were not included in the hydraulic model as development of a detailed hydraulic model was beyond the scope of this study. As such, the differences in WSEL from these structures were assumed to be similar in existing conditions and proposed conditions (construction-phase) modeled. A Manning's Roughness Coefficient (n-value) of 0.04 was assumed for the channel and an n-value of 0.12 was used in the overbanks to represent developed areas.

Starting water surface elevation (WSEL) data was obtained from the *Grand Canal Hydrology Plan*at the Marina Del Rey tide gate location. This tidal elevation is assumed to approximate conditions at the confluence of the Grand Canal and Ballona Lagoon. The dry, wet, and extreme wet starting water surface elevations were used as the downstream boundary conditions in various model scenarios.

The Dry Mode tides ranges shown in Table 1 of Appendix G are from mid-April to mid-October during the dry season when the Marina water level exceeds 2.25 ft Mean Sea Level (MSL). Wet Mode is from mid-October to mid-April (rainy season) and the water level exceeds 0.0 ft MSL. During both of these conditions, the water levels exceed the Ballona Lagoon water level and the

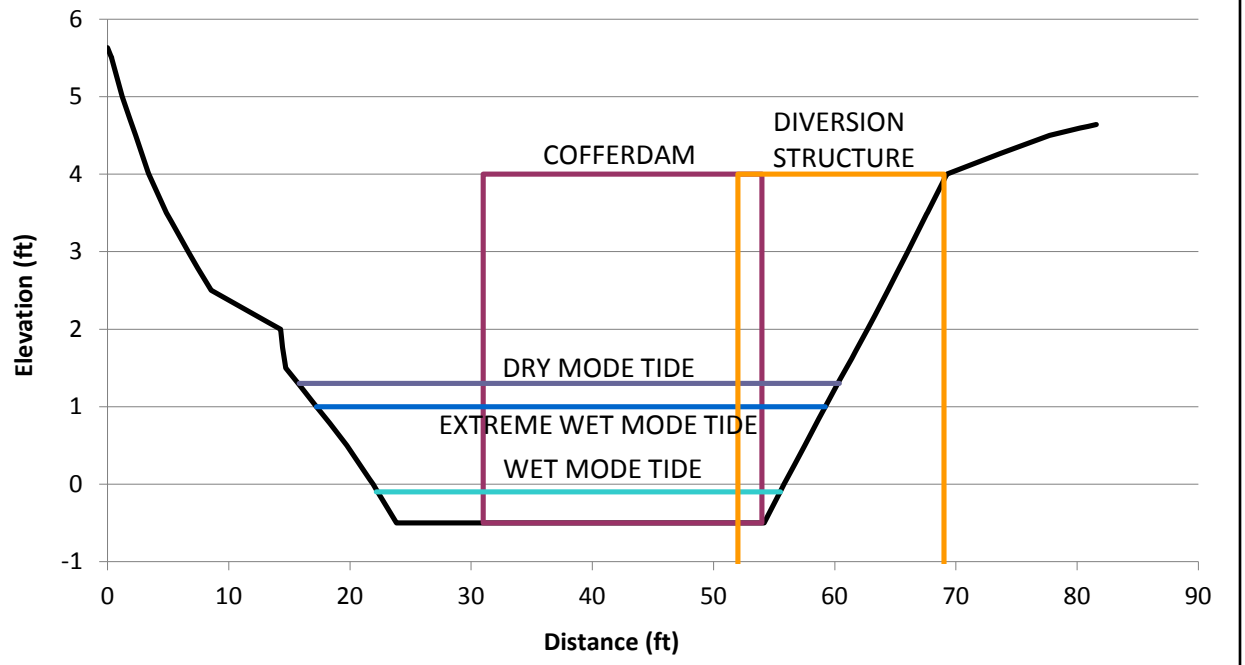
gates are closed until the Marina water level drops below the Lagoon water level. The Wet Mode, Extreme Flood event refers to operations during the rainy season when significant rainfall events are predicted. During this condition, the maximum water level predicted for the Wet Mode, Extreme Flood event operations are lower than the maximum water level during Dry Mode operations, which explains why the Dry Mode maximum WSELs computed in HEC-RAS are higher than the Wet Mode and Wet Mode, Extreme Flood scenarios.

The Wet Mode, Extreme Flood Event model from the *Grand Canal Hydrology Plan* modeled the Wet Mode as a 50-year, 96-hour event as opposed to the 100-year, 24-hour event evaluated in this study. The other events (Dry Mode and Wet Mode) were based on tidal influence only and did not include simulation of rainfall events. As detailed hydraulic model development was beyond the scope of this study and due to similarities in rainfall depth between the 100-year, 24-hour and 50-year, 96-hour events the Wet Mode event was assumed to provide an adequate basis for comparison. The Wet Mode rainfall frequency is weighted 13% of the year and Dry Mode inundation represents the remaining 87% of the year, according to the *Grand Canal Hydrology Plan*. According to NOAA Atlas 14, Volume 6, Version 2, the 50-year, 96-hour precipitation depth is approximately 10 in at the Santa Monica Pier station (Appendix V).

Figure 14 is an illustration of the Grand Canal cross-section adjacent to the site with the cofferdam and diversion structure temporary obstructions and tide elevations from the *Grand Canal Hydrology Plan*. The existing conditions model and proposed conditions model with the blocked obstruction were run with the following different starting WSELs (downstream boundary conditions) to estimate potential hydraulic impacts during construction phase by checking whether the proposed 100-year, 24-hour WSELs overtop the banks of the Grand Canal:

1. Dry Mode starting water surface elevation of 2.1 ft MSL (NGVD 1929)
2. Wet Mode, Extreme flood starting water surface elevation at 1.8 ft MSL (NGVD 1929)
3. Wet Mode starting water surface at 0.7 ft MSL (NGVD 1929).

FIGURE 14: Grand Canal XS Elevation Model



The design storm flow in the Grand Canal of 263.8 cfs was derived from the 100-year, 24-hour SWMM design storm model results and is consistent for existing and proposed conditions as no significant changes in runoff from the project are expected during construction. This design storm peak discharge is used in the existing and proposed Dry Mode, Wet Mode, and Extreme Wet Mode models. Based on our understanding of the operation of the tide gates, it is unlikely that the tide gates would be operated in the Dry Mode during a 100-year, 24-hour design storm event. To represent an extreme event, the 100-year 24-hour design storm event was analyzed with the starting WSEL from the Dry Mode. Additional simulations using the Dry Mode starting WSEL and essentially zero flow, or 0.01 cfs, were also modeled for the existing and proposed conditions comparisons and the results are shown in Table 11 below.

The following scenarios were modeled in HEC-RAS:

1. Existing Conditions – Dry Mode, Design Storm Flows
2. Proposed Conditions – Dry Mode, Design Storm Flows
3. Existing Conditions – Dry Mode, Zero Flows
4. Proposed Conditions – Dry Mode, Zero Flows
5. Existing Conditions – Wet Mode, Design Storm Flows
6. Proposed Conditions – Wet Mode, Design Storm Flows
7. Existing Conditions – Extreme Wet Mode, Design Storm Flows
8. Proposed Conditions – Extreme Wet Mode, Design Storm Flows

As shown in Table 11 below, there are increases in the WSELs with a maximum of 1.31 ft due to the proposed Project using Dry Mode starting WSELs and the design storm flows and no change in WSELs using the Dry Mode WSELs and zero flows. There is a maximum increase of 1.33 ft due to the proposed Project using the Extreme Wet Mode and Wet Mode WSELs and design storm flows. Table 12 reports the freeboard results from the Wet Mode models, which have the least amount of freeboard in proposed conditions. However, in all scenarios, the flow is contained within the channel banks as indicated by the freeboard available based on the left and right top of bank elevations. As such, there is no adverse impact to WSELs for rainfall events up to and including the 100-year, 24-hour event during the temporary construction of the cofferdam and diversion structure. Detailed hydraulic calculations and modeling results are attached as Appendix I. The temporary cofferdam is also not likely to cause significant impacts to operation of the tide gates at either end of the Grand Canal and Ballona Lagoon system.

TABLE 11: 100-YEAR, 24-HOUR WSEL SUMMARY TABLE FOR VARIOUS STARTING WSELS

	1% WSEL (ft)											
	Pre-Project	Post-Project	Δ Pre & Post	Pre-Project	Post-Project	Δ Pre & Post	Pre-Project	Post-Project	Δ Pre & Post	Pre-Project	Post-Project	Δ Pre & Post
Cross-Section	Dry Mode, Design Storm Flows (263.8 cfs)			Dry Mode, Zero Flows			Wet Mode, Extreme Flood, Design Storm Flows (263.8 cfs)			Wet Mode (263.8 cfs)		
1959.76	2.86	3.64	0.78	2.10	2.10	0.00	2.75	3.63	0.88	2.65	3.65	1.00
241.75	2.41	3.40	0.99	2.10	2.10	0.00	2.24	3.39	1.14	2.08	3.41	1.33
214.79	2.38	2.90	0.53	2.10	2.10	0.00	2.20	2.88	0.68	2.03	2.92	0.89
166.66	2.31	2.67	0.36	2.10	2.10	0.00	2.12	2.63	0.51	1.91	2.70	0.79
127.09	2.27	2.29	0.02	2.10	2.10	0.00	2.06	2.16	0.09	1.84	2.36	0.52
37.75	2.10	2.10	0.00	2.10	2.10	0.00	1.80	1.80	0.00	0.93	0.93	0.00

Note: The site is located between cross-sections 127.09 and 241.75. The cofferdam is included in cross-sections 127.09 to 214.79 and the diversion structure is included in cross-section 214.79.

TABLE 12: FREEBOARD SUMMARY DURING THE 100-YEAR, 24-HOUR EVENT FOR WET MODE STARTING WSEL

	1% WSEL (ft)										
	Pre-Project					Post-Project					Δ
Cross-Section	1% WSEL (ft)	Left Bank Elev	Right Bank Elev	Left Freeboard	Right Freeboard	1% WSEL (ft)	Left Bank Elev	Right Bank Elev	Left Freeboard	Right Freeboard	Pre & Post
1959.76	2.65	4.00	4.00	1.35	1.35	3.65	4.00	4.00	0.35	0.35	1.00
241.75	2.08	4.00	4.00	1.92	1.92	3.41	4.00	4.00	0.59	0.59	1.33
214.79	2.03	4.00	4.00	1.98	1.98	2.92	4.00	4.00	1.08	1.08	0.89
166.66	1.91	4.00	4.00	2.09	2.09	2.70	4.00	4.00	1.30	1.30	0.79
127.09	1.84	4.00	4.00	2.16	2.16	2.36	4.00	4.00	1.64	1.64	0.52
37.75	0.93	4.00	4.00	3.07	3.07	0.93	4.00	4.00	3.07	3.07	0.00

Note: The site is located between cross-sections 127.09 and 241.75. The cofferdam is included in cross-sections 127.09 to 214.79 and the diversion structure is included in cross-section 214.79.

CONCLUSIONS

The VAPP project meets established hydrology, hydraulics, and water quality goals for the project:

- ✓ Meet City of Los Angeles LID and stormwater treatment criteria;
- ✓ Mitigate increased runoff from the VAPP site using LID and reduce proposed peak flows in the Grand Canal to existing conditions levels;
- ✓ Mitigate increased pollutant loads from the VAPP site using LID and reduce pollutant loads in the Grand Canal to existing conditions levels;
- ✓ No adverse impacts to 100-year WSELs or increased flooding risk associated with construction of the proposed cofferdam or diversion structure during construction.

Erosion control/energy dissipation is needed from the site discharge into the Grand Canal or it should outfall into the adjacent storm drain prior to discharging into the Grand Canal and also needs to meet the Venice Land Use requirements. Since there are small increases in the two-year, 24-hour design storm event TSS, COD, and fecal coliform, it is recommended that all impervious cover, including roof drains be disconnected and drain over a vegetated filter strip into the lined bioretention with the exception of areas draining to the planter box in Alternative 2. Alternatively, a manufactured product that removes TSS could be used. The pollutants can be further reduced by vegetated filter strips as indicated in the reference in Appendix T.

Detailed water budget modeling results from EPA SWMM are included in Appendix D.
To ensure the long-term functionality of the LID features and performance of the site, development of and compliance with an Operations & Maintenance (O&M) Plan is critical. Additionally, proper construction sequencing is critical to avoid premature sedimentation of the facilities.

Development of the VAPP site represents a significant opportunity for sustainability and LID within a densely urbanized area and for implementation of Green Infrastructure and LID for the City of Los Angeles as well as to provide pumping capacity to successfully manage wet weather flows and avoid raw sewage discharges or overflows into the Grand Canal and the Ballona Lagoon. Thank-you for the opportunity to collaborate on this visionary project.

EXHIBITS

Exhibit 1 – Vicinity Map
Exhibit 2 – Aerial Photograph
Exhibit 3 – FIRM
Exhibit 4 – Topographic Map
Exhibit 5 – Subwatershed Map
Exhibit 6A – Drainage Area Map
Exhibit 6B – Storm Drainage Area Map
Exhibit 7 – Land Use
Exhibit 8 – Soil Map
Exhibit 9 – Groundwater Basins Map

Exhibit 10 – Spreading Grounds
Exhibit 11 – Tsunami Hazard Map
Exhibit 12 – Liquefaction Map
Exhibit 13 – 2-Year Rainfall
Exhibit 14 – 10-Year Rainfall
Exhibit 15 – 100-Year Rainfall
Exhibit 16 – HEC-RAS Cross-Sections
Exhibit 17 – LID Layout

APPENDICES

Appendix A – References
Appendix B - Design Storm Unit Hyetograph (Appendix A)
Appendix C – Tables of Hydrology Modeling Data and Results
Appendix D – EPA SWMM Water Budget Results
Appendix E – Venice Auxiliary Pumping Plant Design, Preliminary Design Report
Appendix F – Venice Dual Force Main Exhibit
Appendix G – Grand Canal Conceptual Plan-Hydrology Plan
Appendix H – Survey of Venice Auxiliary Pumping Plant Site
Appendix I – Hydraulic Modeling Results
Appendix J – HEC-RAS Cross-Sections of Grand Canal
Appendix K – Venice Auxiliary Pumping Plant (VAPP) Water Quality Sampling Report
Appendix L – California Coastal Commission Sea Level Rise Policy Guidance
Appendix M – Ballona Estuary, & Sepelveda Channel Bacteria TMDL, Coordinated Monitoring Plan
Appendix N – Interview Documentation Related To Tide Gates
Appendix O – Site Photos/Descriptions
Appendix P – Cross Section of Grand Canal, Plan Sheet D-29976, Venice Canals Rehabilitation, Sheet No. 7 of 26
Appendix Q – Sea Level Rise Vulnerability Study for the City of Los Angeles
Appendix R – Los Angeles RWQCB Basin Plan (Chapter 7)
Appendix S – United States Geological Survey Sea Level Rise Inundation Maps
Appendix T – Vegetated Buffer Strip
Appendix U – Geotechnical Report, Venice Auxiliary Pumping Plant
Appendix V – NOAA Atlas 14
Appendix W – The Green Visions Plan for 21st Century Southern California (Table 7)
Appendix X – EPA Guide to Urban Stormwater Pollutant Concentrations (Tables 4-1 and 4-3)
Appendix Y – Local Coastal Land Use Program-Venice (Exhibit 1 Vicinity)
Appendix Z – County of Los Angeles Low Impact Development Handbook
Appendix AA – Models (Electronic)
Appendix AB – Grand Canal West Bank Erosion Control Water Quality Data
Appendix AC—Grand Canal West Bank Erosion Control Project
Appendix AD – Venice Tide Gates Emergency Replacement Drawings

EXHIBITS



0 200 400 800 Feet

N

Datum: NAD83
Units: US Feet

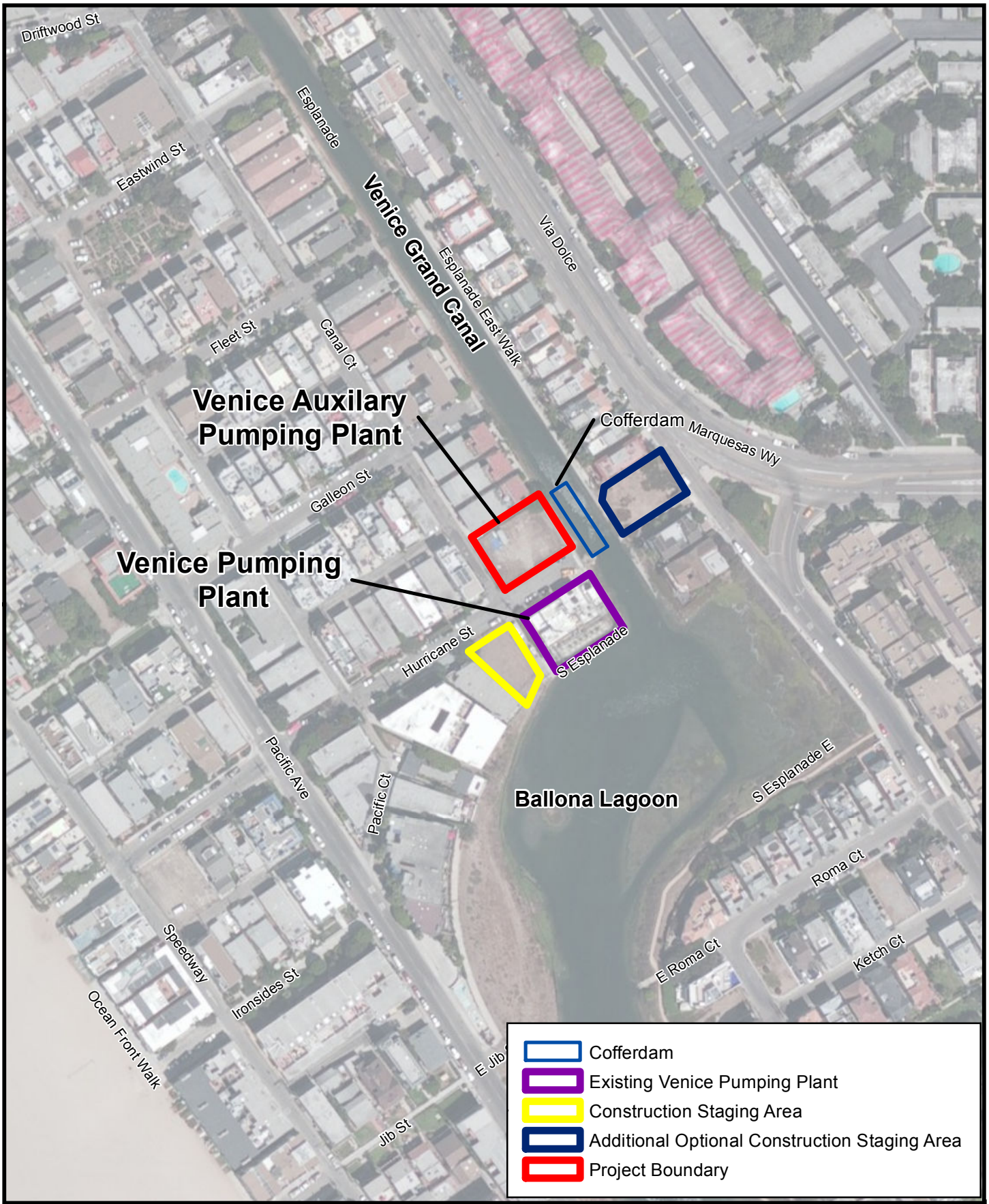


Venice Auxilary Pumping Plant Project
Los Angeles, Ca
Vicinity Map

Watearth™
Water Resources + Green Infrastructure

Date: Feb 11, 2016

Exhibit 7



Venice Auxilary Pumping Plant Project
Los Angeles, Ca

Aerial Photograph

Watearth™
Water Resources + Green Infrastructure

Date: Feb 11, 2016

Exhibit 2



0 330 660 1,320 Feet

Datum: NAD83
Units: US Feet

N

Venice Auxilary Pumping Plant Project Los Angeles, Ca

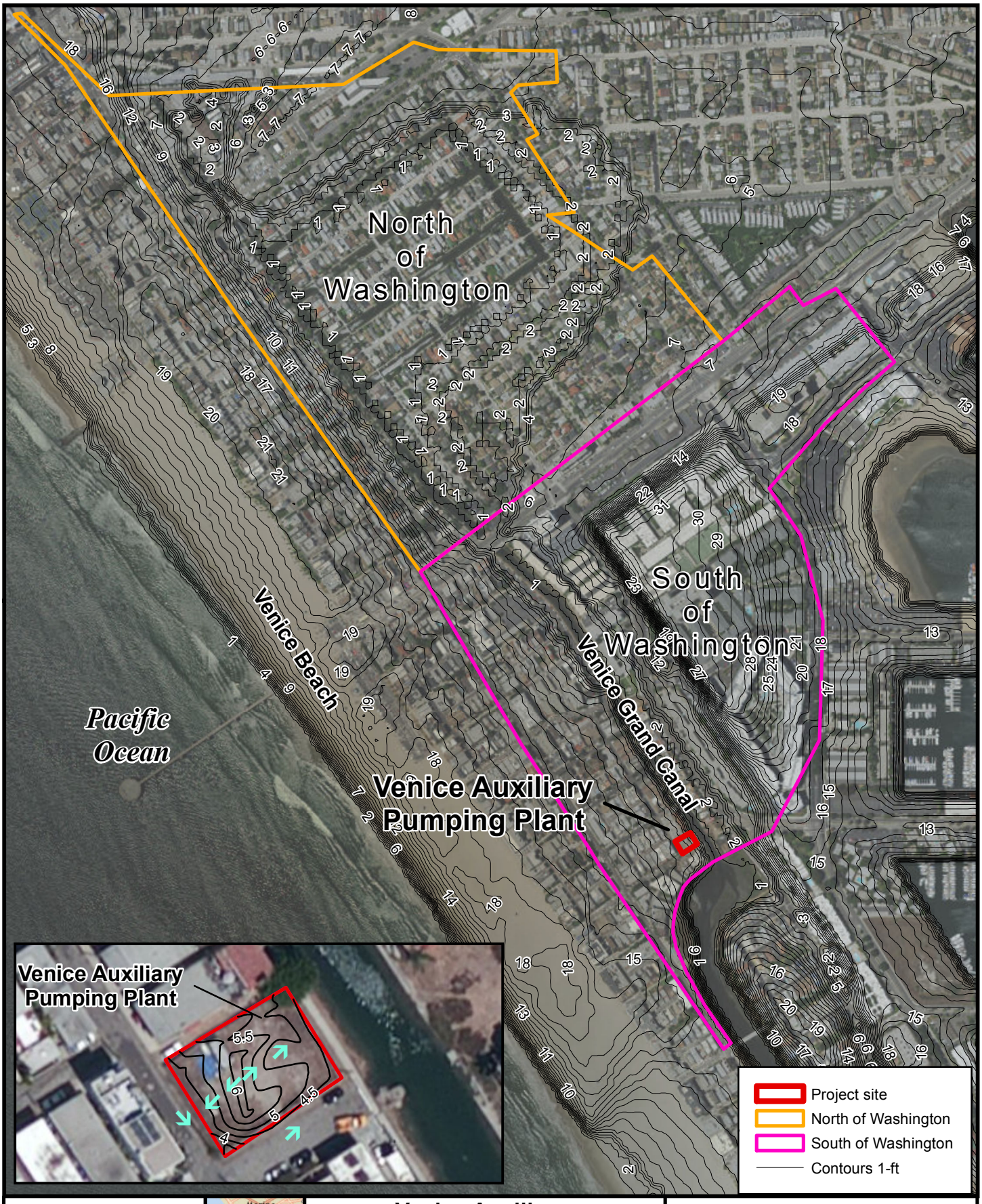
FIRM Panel Map

EFFECTIVE FIRM PANEL NO. 6037C1752F

Watearth™
Water Resources + Green Infrastructure

Date: Feb 11, 2016

Exhibit 1



0 200 400 800 Feet

N

Datum: NAD83
Units: US Feet



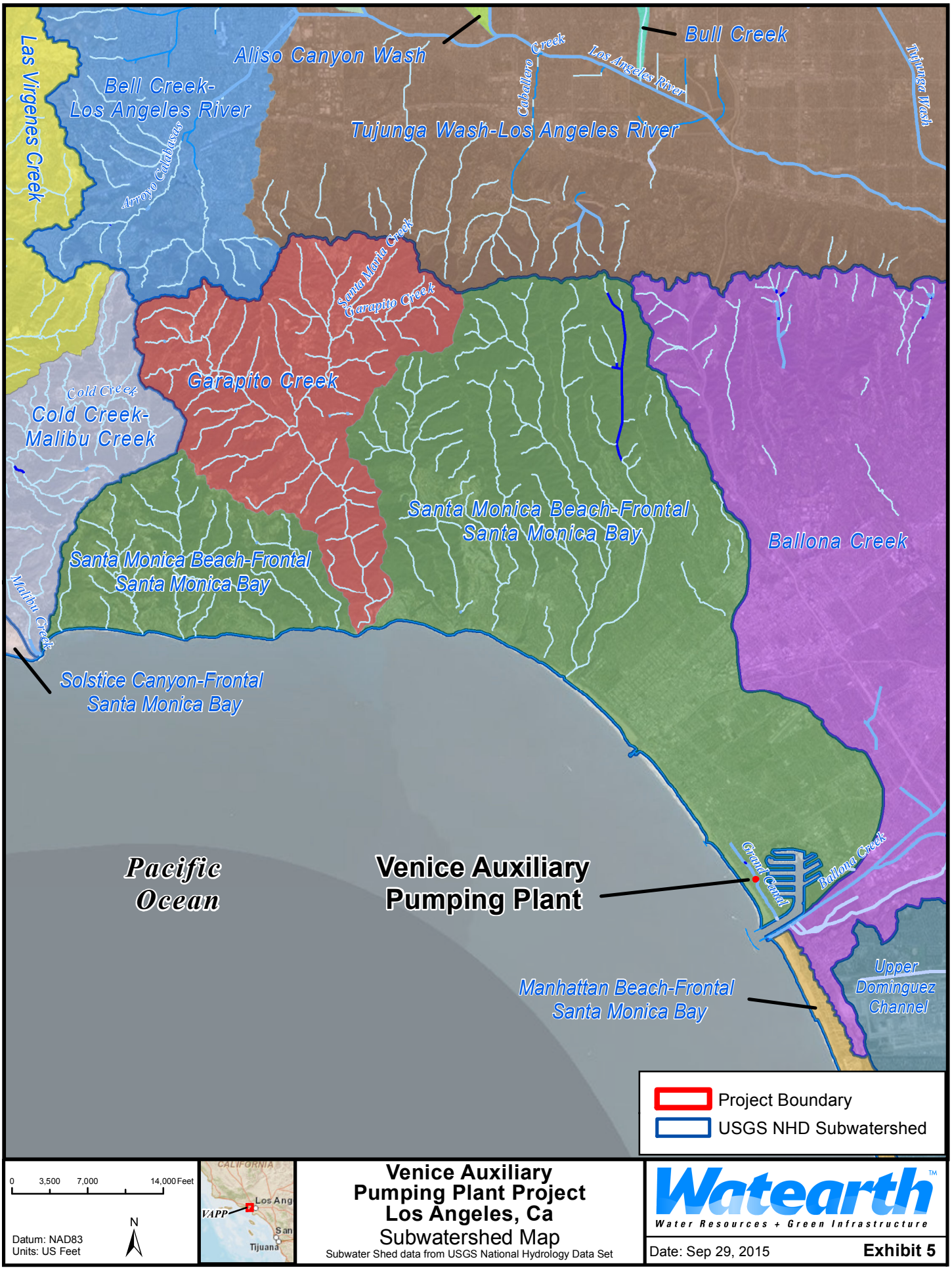
Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
Topographic Map

Elevation data from USGS National Elevation data set

Watearth™
Water Resources + Green Infrastructure

Date: Sep 29, 2015

Exhibit 4



Venice Auxiliary Pumping Plant Project Los Angeles, Ca

Subwatershed Map

Subwater Shed data from USGS National Hydrology Data Set

Watearth™
Water Resources + Green Infrastructure

Date: Sep 29, 2015

Exhibit 5



Venice Auxilary Pumping Plant Project Los Angeles, Ca

Drainage Area Map

Drainage data from USGS National Hydrology Data Set

Watearth™
Water Resources + Green Infrastructure

Date: Feb 10, 2016

Exhibit 6A



0 60 120 240 Feet

N

Datum: NAD83
Units: US Feet

Venice Auxilary Pumping Plant Project Los Angeles, Ca

Storm Drainage Area Map

Watearth™
Water Resources + Green Infrastructure

Date: Feb 05, 2016

Exhibit 6B



0 250 500 1,000 Feet

N

Datum: NAD83
Units: US Feet

VAPP

Venice Auxilary Pumping Plant Project Los Angeles, Ca

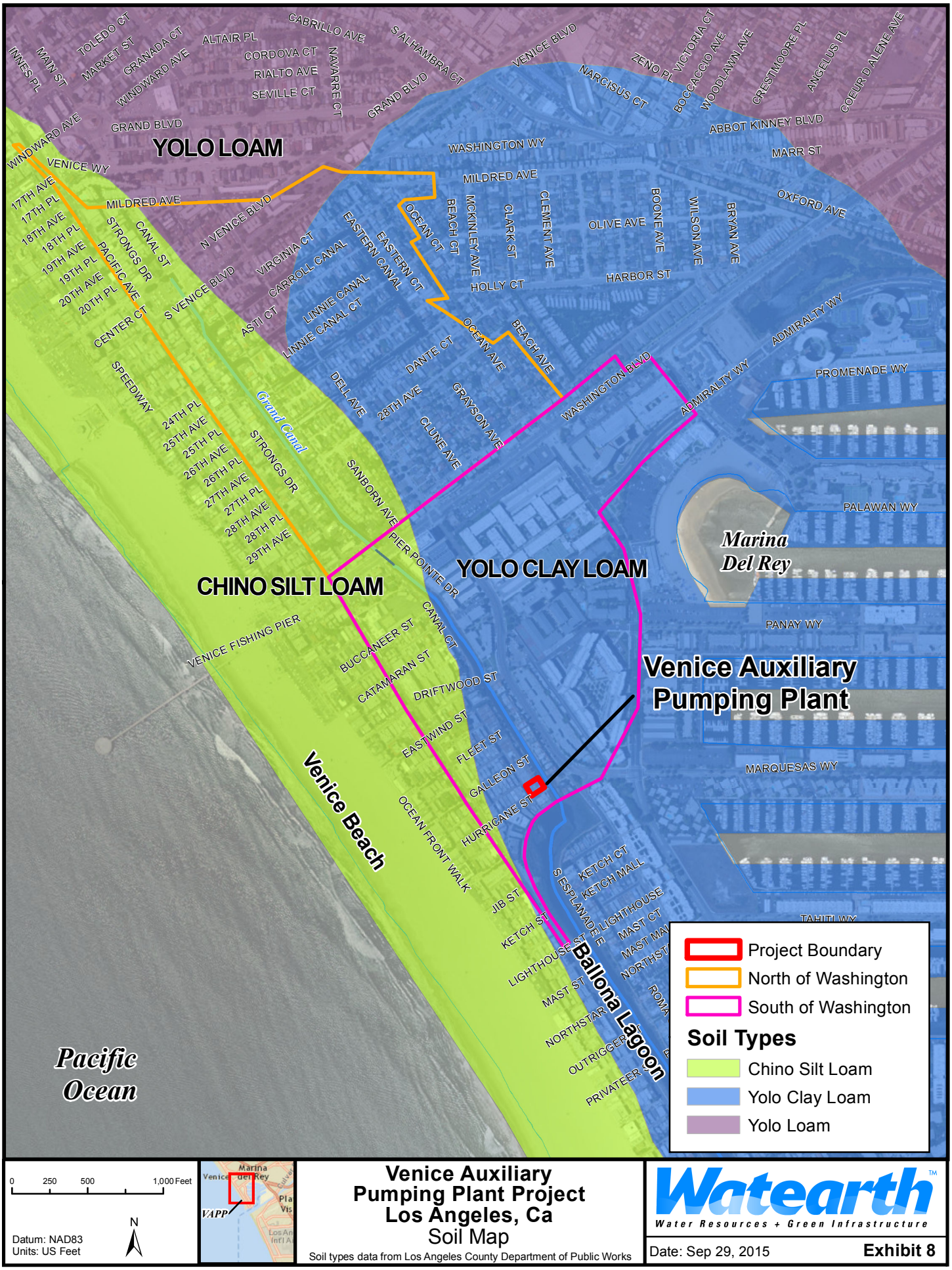
Land Use

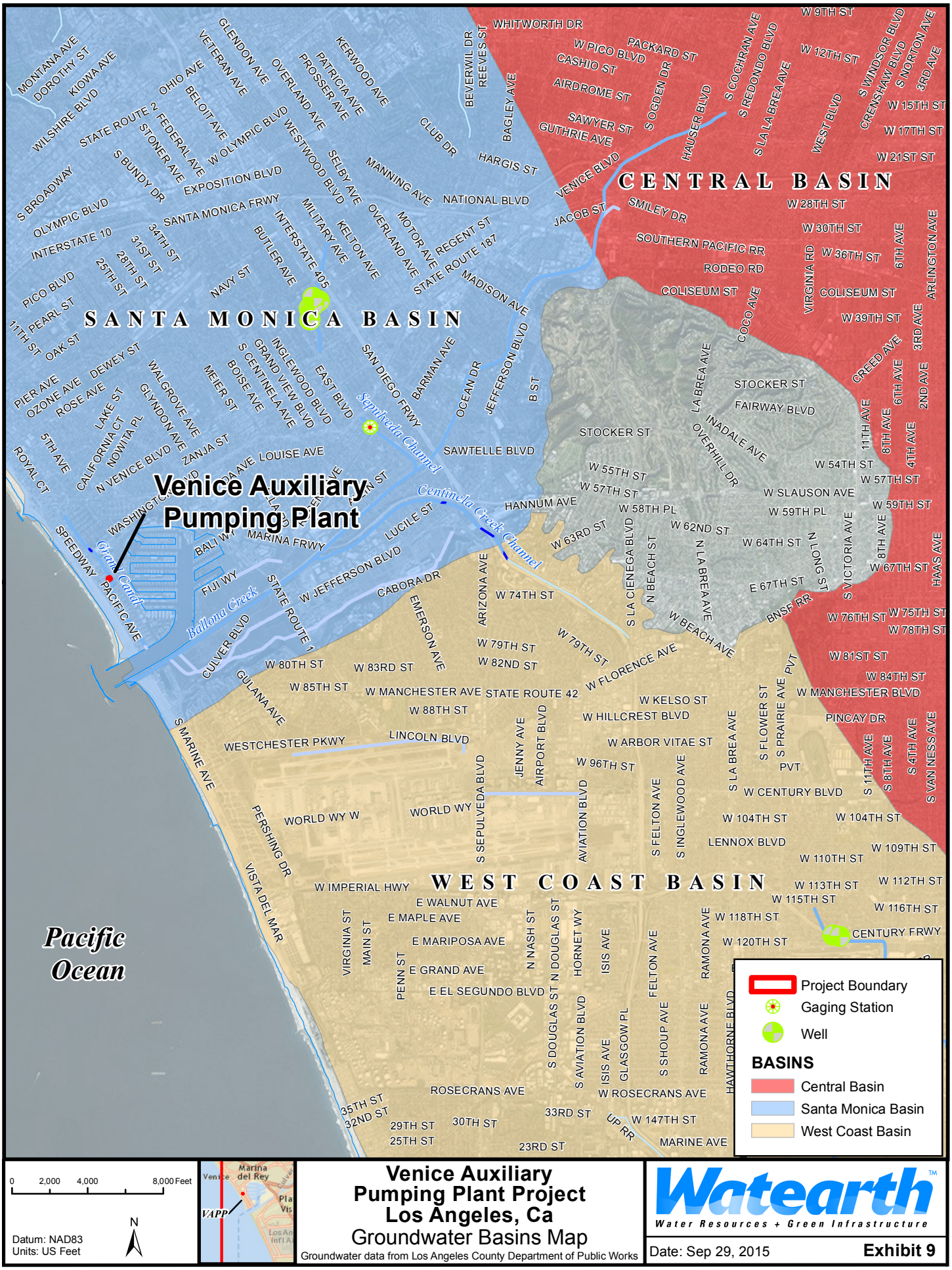
Land Use data from Los Angeles County Department of Public Works

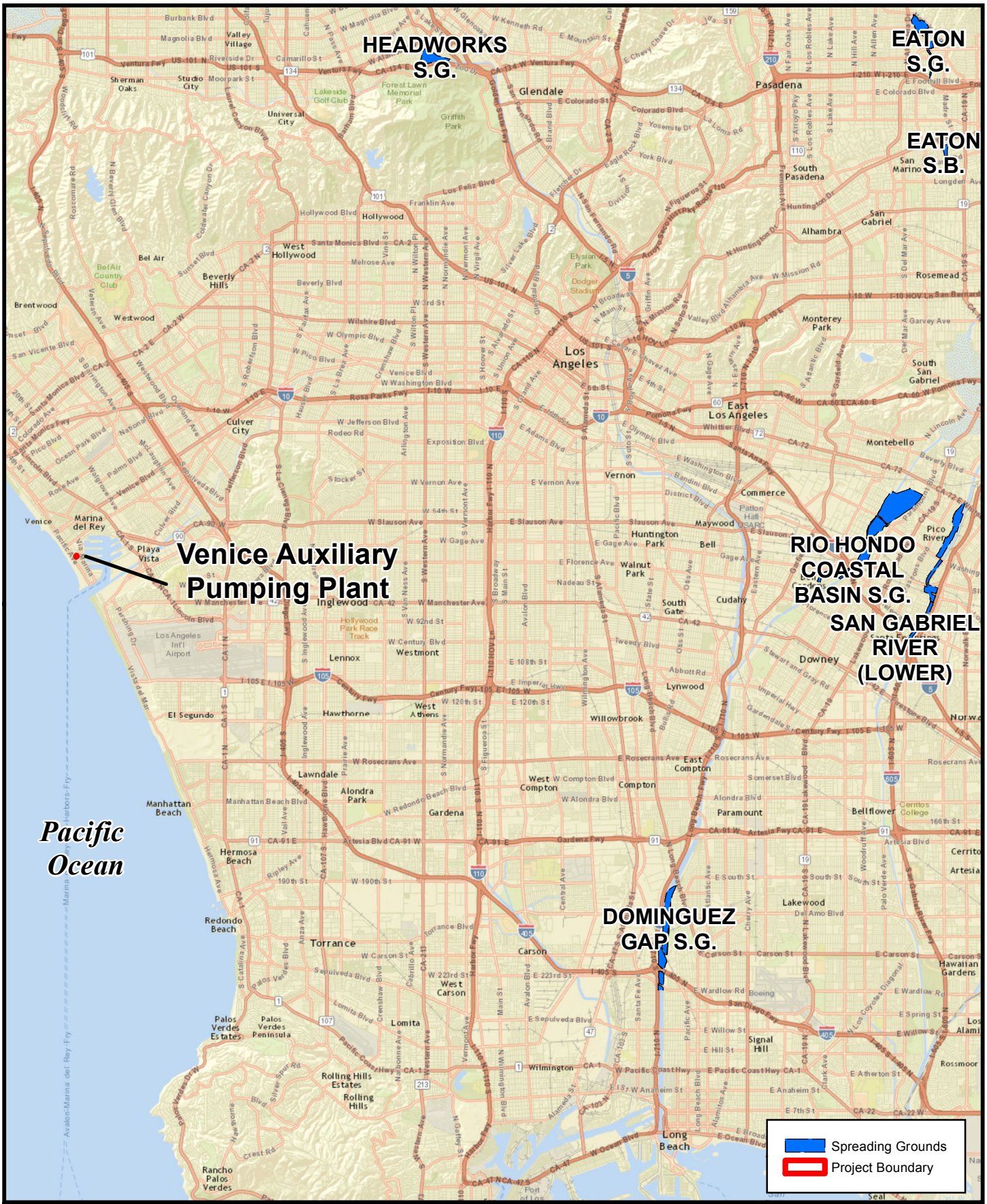
Watearth™
Water Resources + Green Infrastructure

Date: Feb 11, 2016

Exhibit 9


YOLO LOAM
CHINO SILT LOAM
YOLO CLAY LOAM
Venice Auxiliary Pumping Plant
Marina Del Rey
Pacific Ocean
Venice Beach
Ballona Lagoon
Grand Canal
WINDWARD AVE
VENICE WY
MILDRED AVE
N VENICE BLVD
S VENICE BLVD
CANAL ST
PACIFIC AVE
STRONGS DR
CENTER CT
SPEEDWAY
VENICE FISHING PIER
BUCCANEER ST
CATAMARAN ST
DRIFTWOOD ST
EASTWIND ST
FLEET ST
GALLEON ST
HURRICANE ST
OCEAN FRONT WALK
JIB ST
KETCH ST
LIGHTHOUSE ST
MAST ST
NORTHSTAR
OUTRIGGER
PRIVATEER
S ESPLANADE
KETCH CT
KETCH MALL
LIGHTHOUSE CT
MAST CT
CANAL CT
SANBORN AVE
PIER POINTE DR
DELL AVE
CLUNE AVE
GRAYSON AVE
DANTE CT
OCEAN AVE
BEACH AVE
WASHINGTON BLVD
ADMIRALTY WY
PROMENADE WY
PALAWAN WY
PANAY WY
MARQUESAS WY
TAHITI WY
ABBOT KINNEY BLVD
MARR ST
OXFORD AVE
HARBOR ST
HOLLY CT
OLIVE AVE
BOONE AVE
WILSON AVE
BRYAN AVE
CLEMENT AVE
CLARK ST
MCKINLEY AVE
BEACH CT
OCEAN CT
EASTERN CANAL
EASTERN CT
CARROLL CANAL
VIRGINIA CT
LINNIE CANAL
LINNIE CANAL CT
ASTI CT
VENICE BLVD
GRAND BLVD
CABRILLO AVE
S ALHAMBRA CT
NAVARRE CT
CORDOVA CT
RIALTO AVE
SEVILLE CT
ALTAIR PL
TOLEDO CT
MARKET ST
GRANADA CT
MAIN ST
INNES PL
NARCISUS CT
ZENO PL
VICTORIA CT
BOCCACCIO AVE
WOODLAWN AVE
CRESTMOORE PL
ANGELUS PL
COEUR D ALENE AVE
WASHINGTON WY
17TH AVE
17TH PL
18TH AVE
18TH PL
19TH AVE
19TH PL
20TH AVE
20TH PL
24TH PL
25TH AVE
25TH PL
26TH AVE
26TH PL
27TH AVE
27TH PL
28TH AVE
28TH PL
29TH AVE
Project Boundary
North of Washington
South of Washington
Soil Types
Chino Silt Loam
Yolo Clay Loam
Yolo Loam
0
250
500
1,000 Feet
N
Datum: NAD83
Units: US Feet
Marina del Rey
Venice
VAPP
Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
Soil Map
Soil types data from Los Angeles County Department of Public Works
Watearth
Water Resources + Green Infrastructure
Date: Sep 29, 2015
Exhibit 8


CENTRAL BASIN
SANTA MONICA BASIN
WEST COAST BASIN
Venice Auxiliary Pumping Plant
Pacific Ocean
Project Boundary
Gaging Station
Well
BASINS
Central Basin
Santa Monica Basin
West Coast Basin
0 2,000 4,000 8,000 Feet
N
Datum: NAD83
Units: US Feet
VAPP
Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
Groundwater Basins Map
Groundwater data from Los Angeles County Department of Public Works
Watearth
Water Resources + Green Infrastructure
Date: Sep 29, 2015
Exhibit 9



0 5,000 10,000 20,000 Feet

N

Datum: NAD83
Units: US Feet

CALIFORNIA
Angeles
San Diego

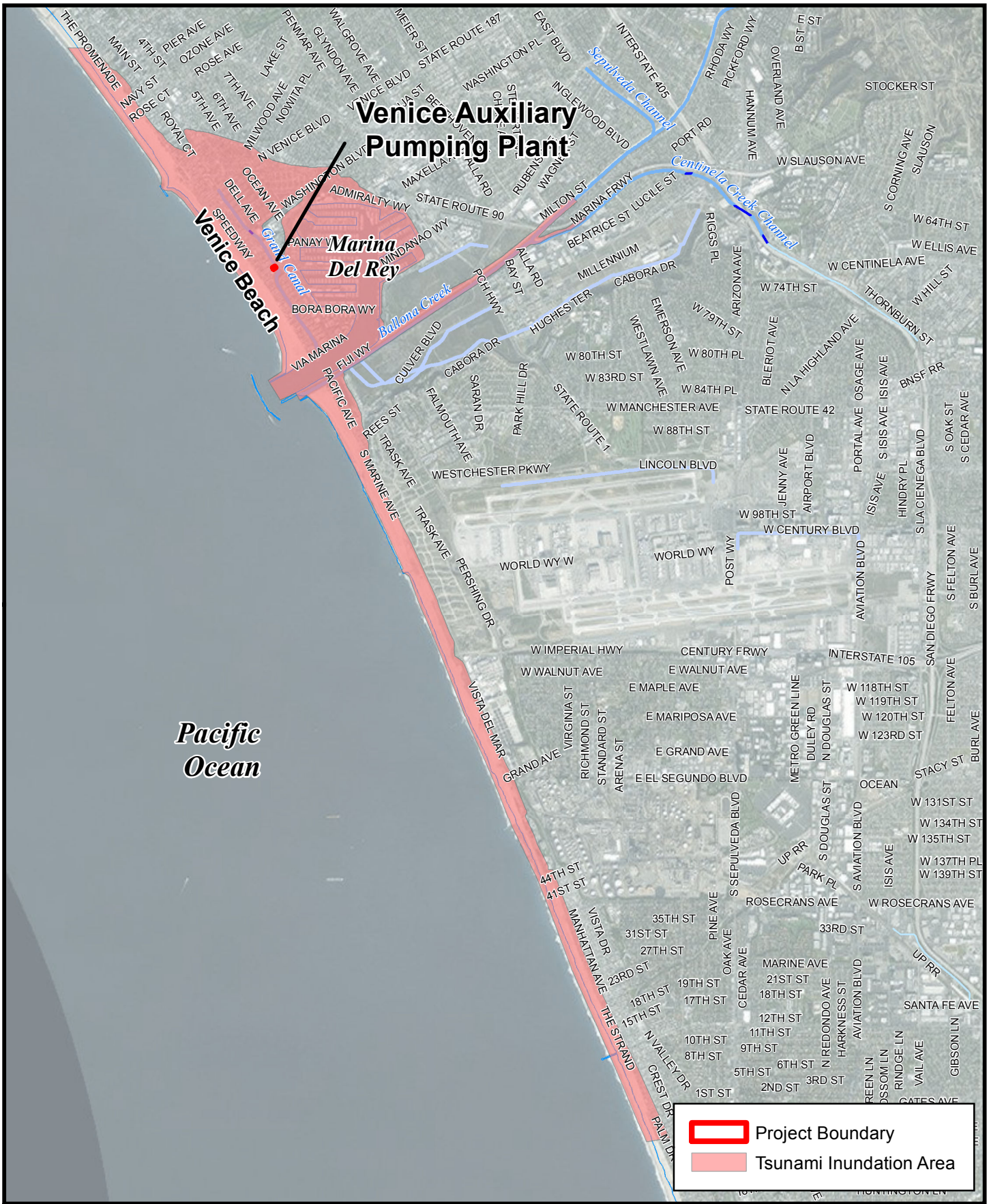
Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
Stormwater Spreading Grounds Map

Spreading Grounds data from Los Angeles Co. Department of Public Works

Watearth™
Water Resources + Green Infrastructure

Date: Sep 29, 2015

Exhibit 10



0 1,750 3,500 7,000 Feet

N

Datum: NAD83
Units: US Feet

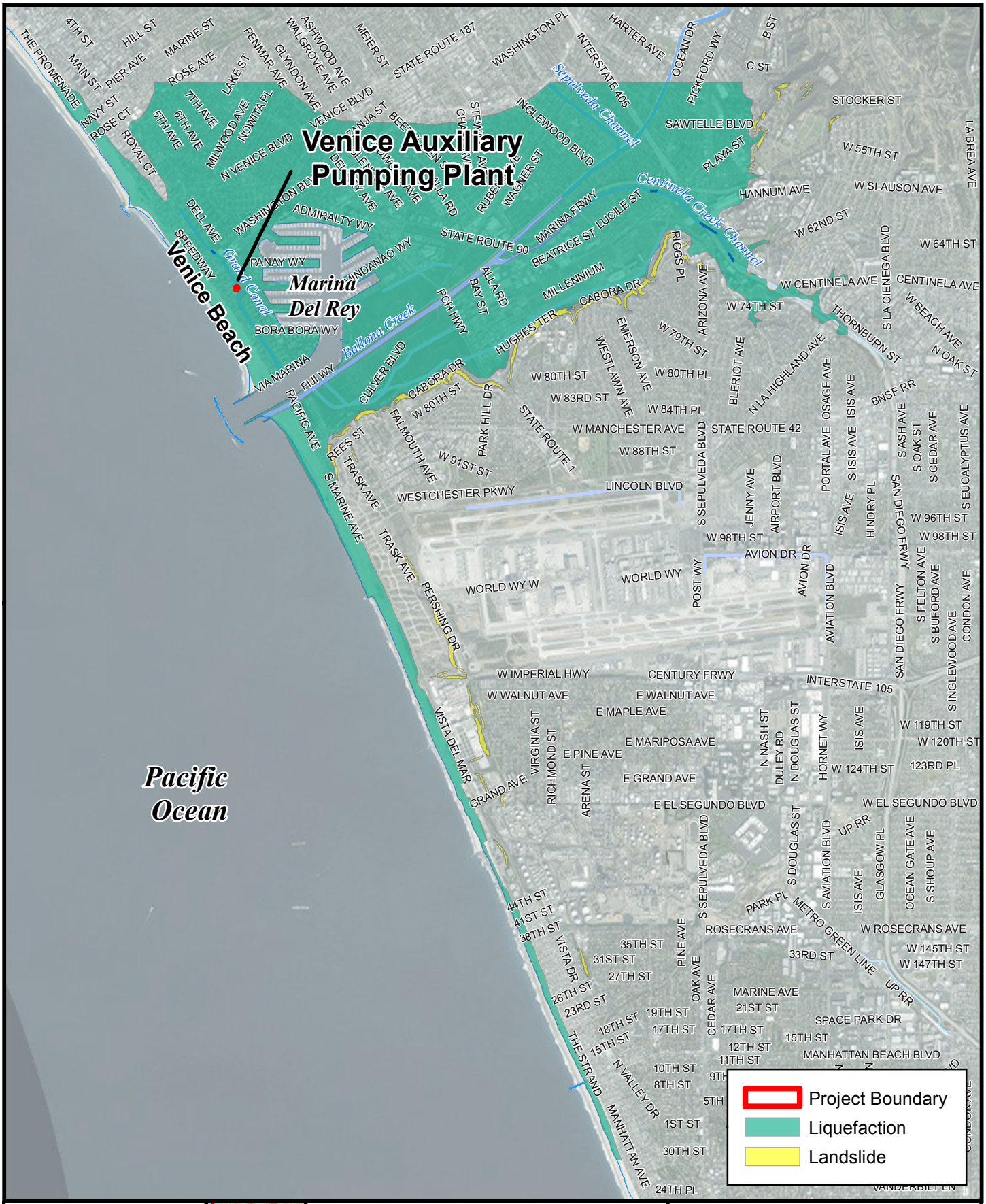
Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
Tsunami Hazard Map

Tsunami data from CEMA, CGS, and USC.

Watearth™
Water Resources + Green Infrastructure

Date: Sep 29, 2015

Exhibit 11



0 2,000 4,000 8,000 Feet

N

Datum: NAD83
Units: US Feet

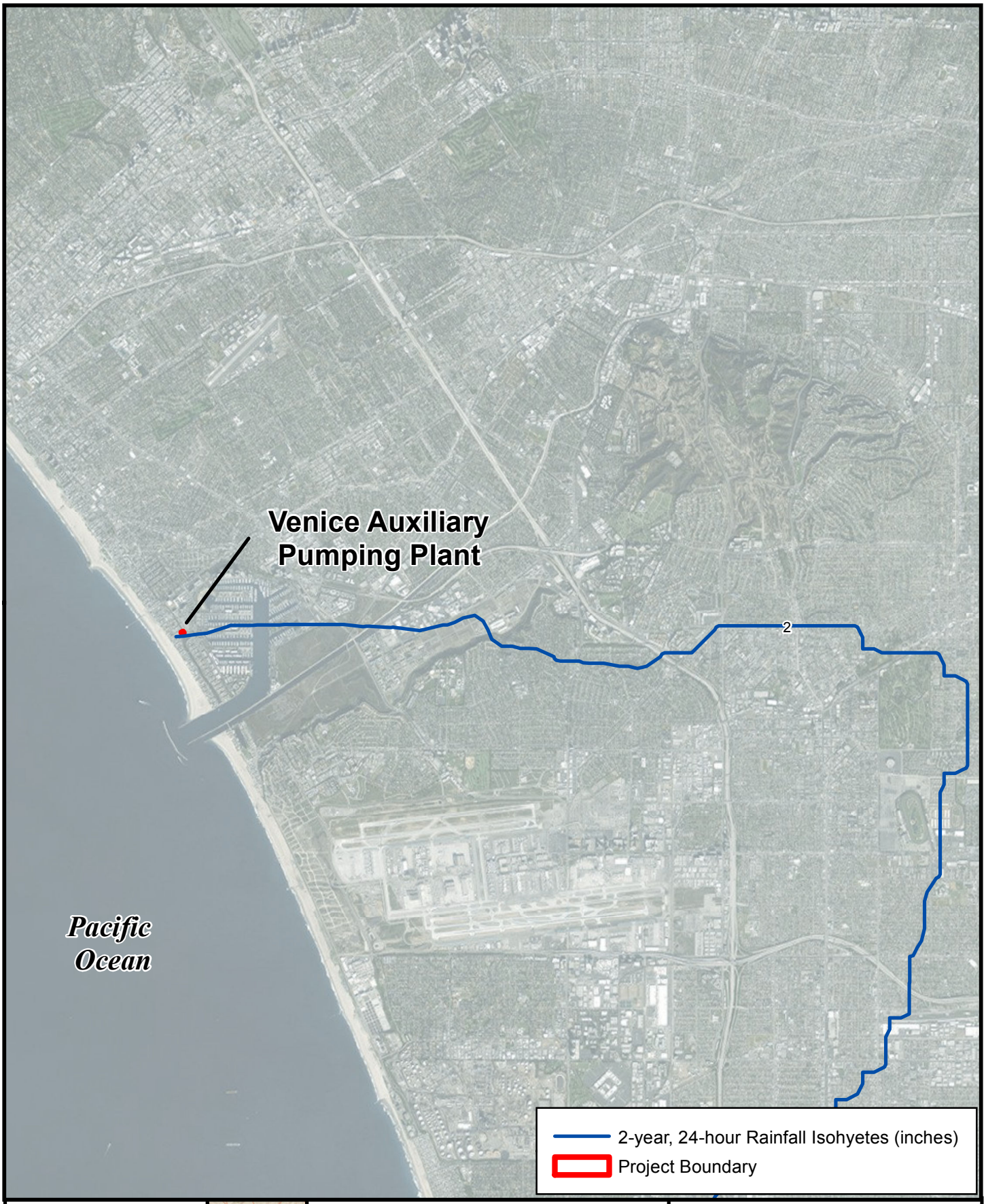
Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
Liquefaction Map

Liquification data from California State Department of Conservation

Watearth™
Water Resources + Green Infrastructure

Date: Sep 30, 2015

Exhibit 12



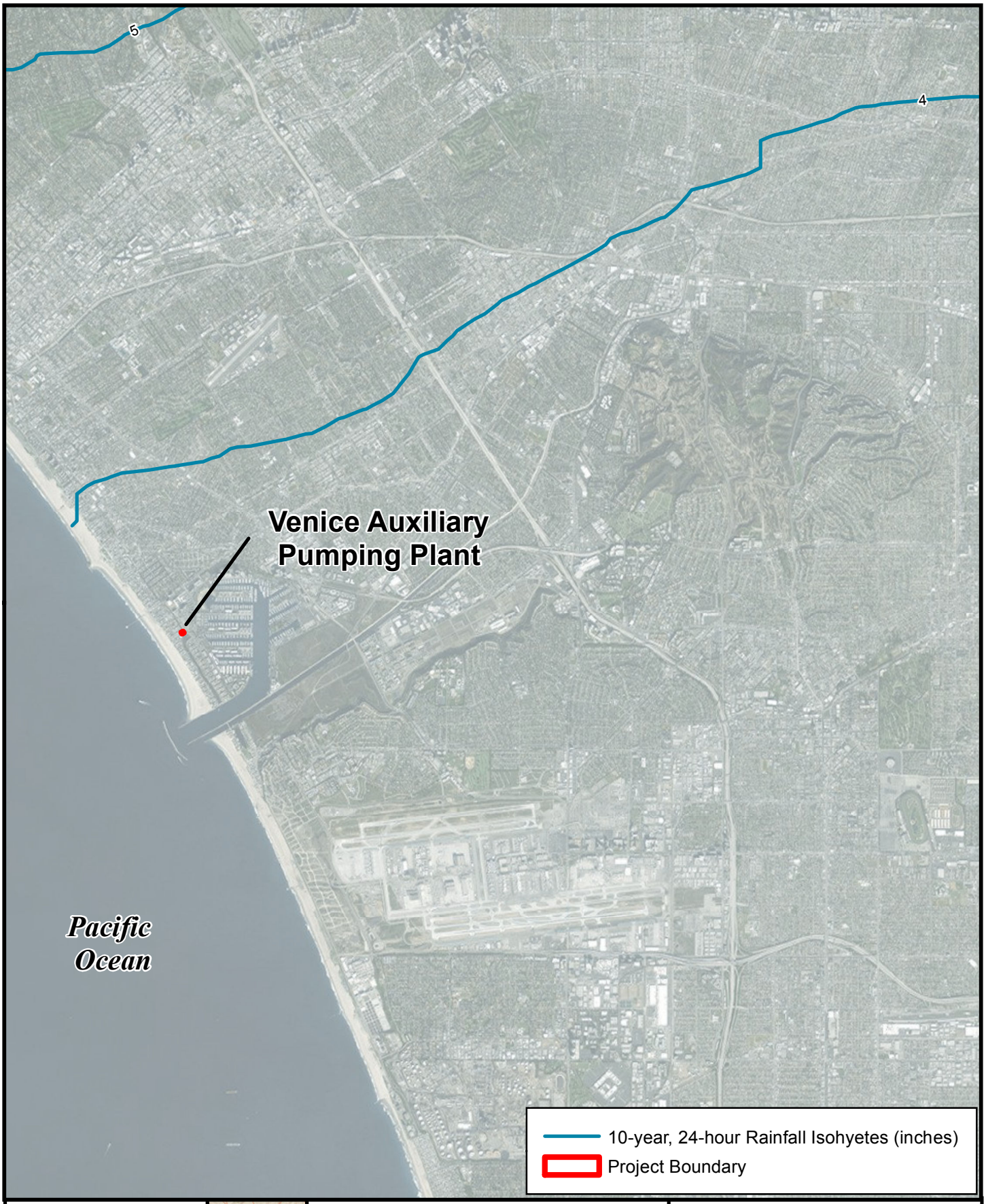
Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
2-Year Rainfall

Rainfall data from Los Angeles County Department of Public Works

Watearth™
Water Resources + Green Infrastructure

Date: Sep 29, 2015

Exhibit 13



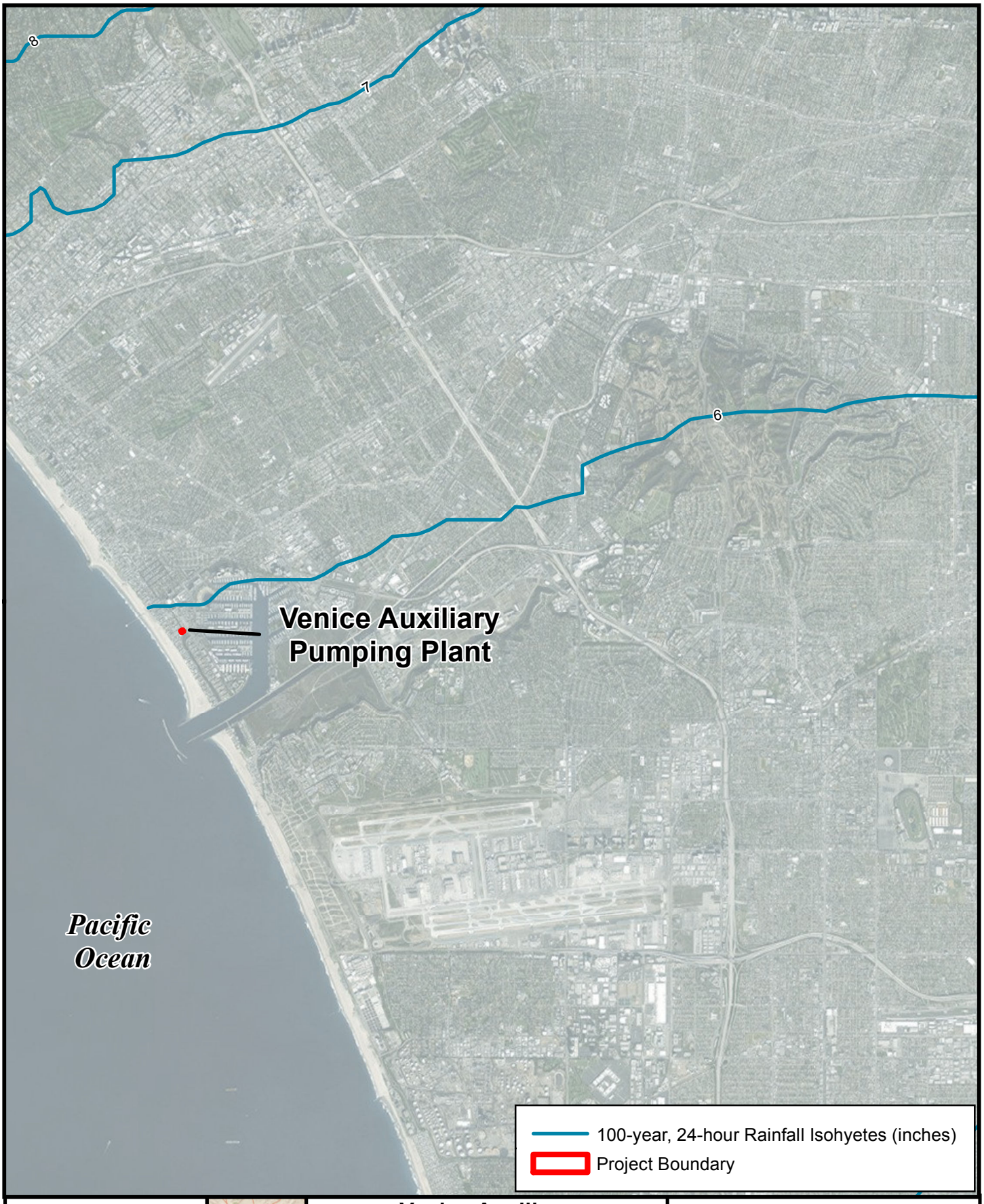
Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
10-Year Rainfall

Rainfall data from Los Angeles County Department of Public Works

Watearth™
Water Resources + Green Infrastructure

Date: Sep 29, 2015

Exhibit 14



Venice Auxiliary Pumping Plant Project
Los Angeles, Ca
100-Year Rainfall

Rainfall data from Los Angeles County Department of Public Works

Watearth™
Water Resources + Green Infrastructure

Date: Sep 29, 2015

Exhibit 15



0 50 100 200 Feet

N

Datum: NAD83
Units: US Feet

Marina del Rey
Venice
VAPP

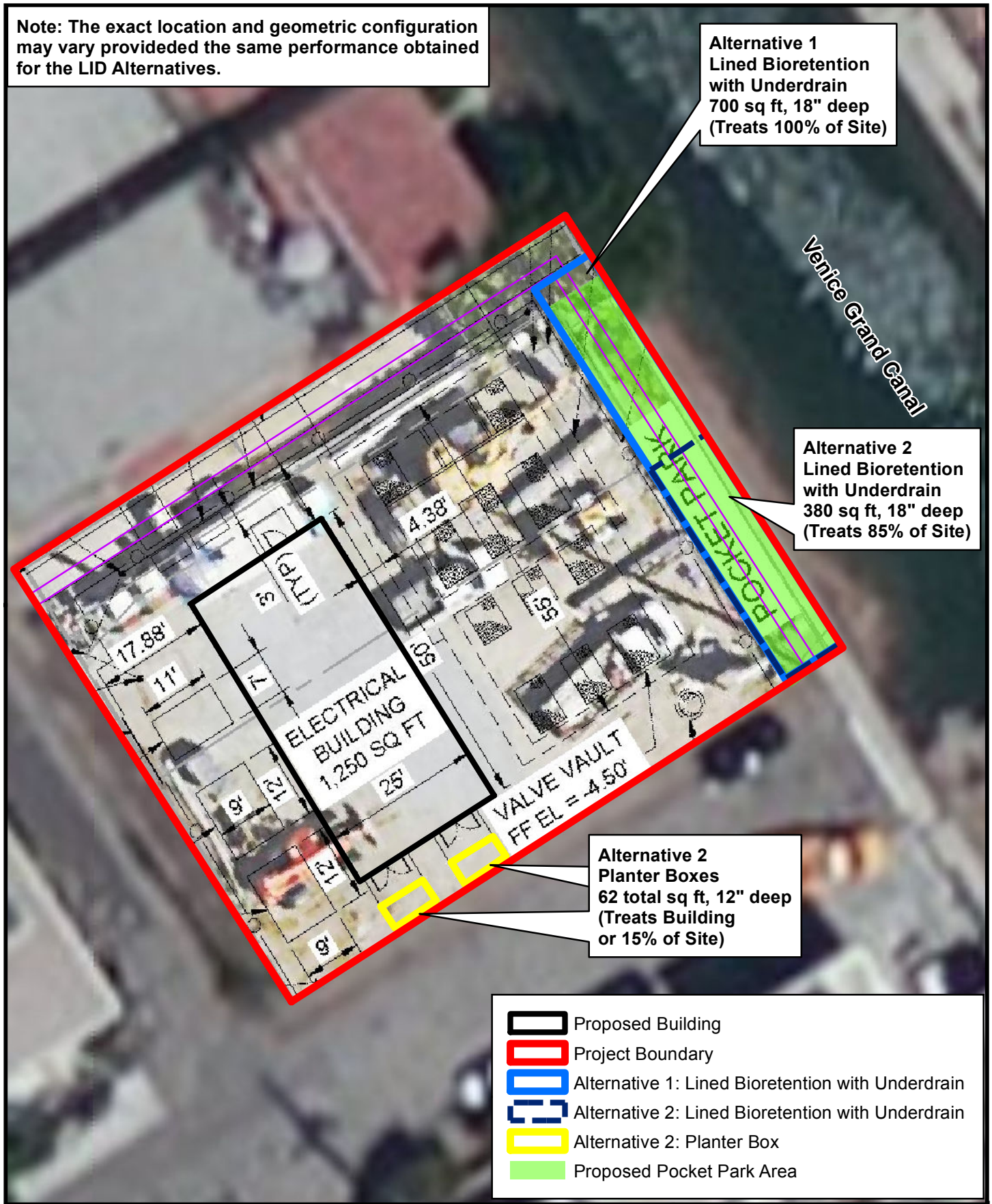
Venice Auxilary Pumping Plant Project
Los Angeles, Ca

HEC-RAS Cross-Sections

Watearth™
Water Resources + Green Infrastructure

Date: Feb 10, 2016

Exhibit 16



0 5 10 20 Feet

N

Datum: NAD83
Units: US Feet

Venice Auxilary Pumping Plant Project Los Angeles, Ca

LID Layout

Watearth™
Water Resources + Green Infrastructure

Date: Feb 04, 2016

Exhibit 17

APPENDIX A
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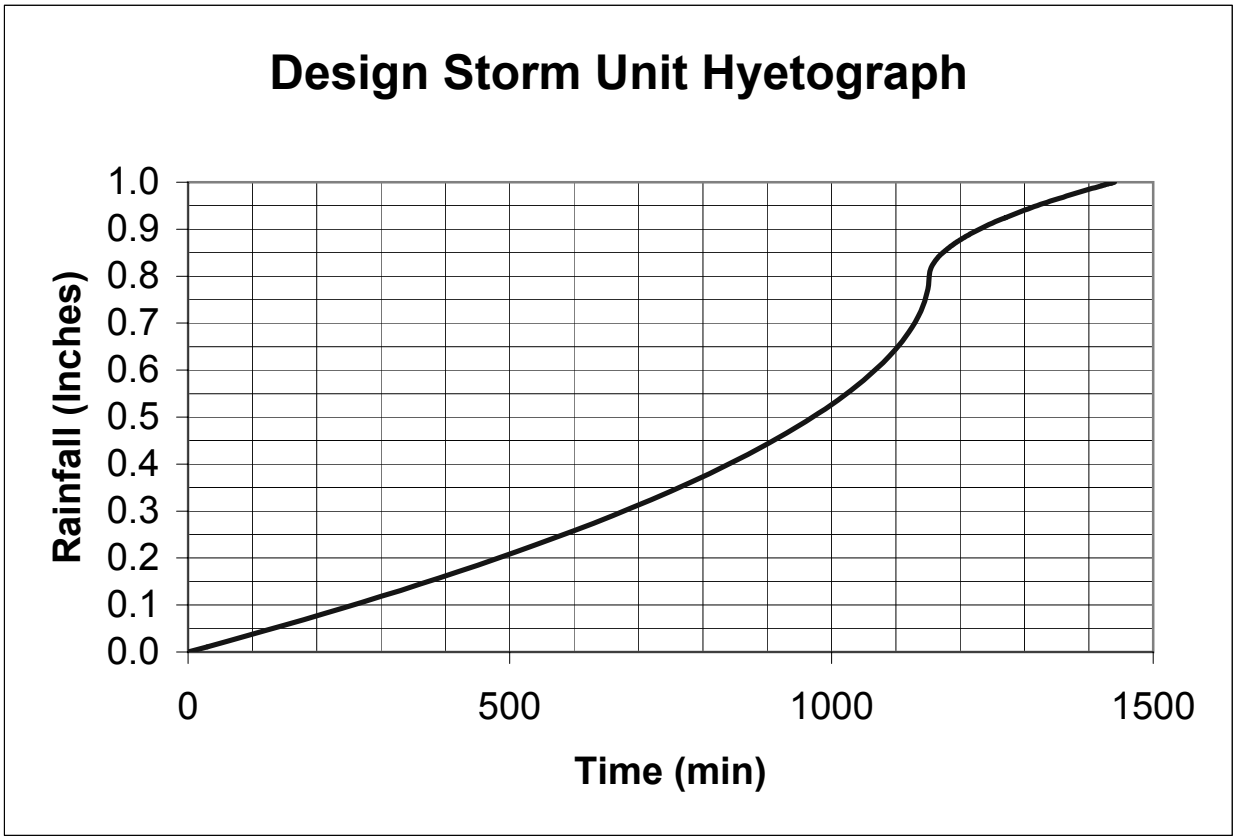
APPENDIX B
DESIGN STORM UNIT HYETOGRAPH (APPENDIX A)

Temporal Distribution of Unit Hyetograph

(Time in minutes, Depth in inches)

Time	Depth	Time	Depth	Time	Depth	Time	Depth
0	0.000000	1110	0.661694	1185	0.863440	1232	0.901435
30	0.011110	1115	0.670680	1186	0.864452	1233	0.902105
60	0.022361	1120	0.680257	1187	0.865450	1234	0.902772
90	0.033758	1125	0.690568	1188	0.866434	1235	0.903434
120	0.045307	1130	0.701824	1189	0.867406	1240	0.906691
150	0.057015	1135	0.714364	1190	0.868366	1245	0.909862
180	0.068889	1136	0.717072	1191	0.869313	1250	0.912954
210	0.080937	1137	0.719860	1192	0.870250	1255	0.915973
240	0.093166	1138	0.722738	1193	0.871175	1260	0.918923
270	0.105586	1139	0.725713	1194	0.872090	1265	0.921810
300	0.118206	1140	0.728799	1195	0.872995	1270	0.924638
330	0.131037	1145	0.746492	1196	0.873889	1275	0.927409
360	0.144090	1150	0.772454	1197	0.874775	1280	0.930129
390	0.157377	1151	0.780923	1198	0.875651	1285	0.932799
420	0.170913	1152	0.800000	1199	0.876518	1290	0.935422
450	0.184711	1153	0.809944	1200	0.877377	1295	0.938000
480	0.198790	1154	0.814358	1201	0.878227	1300	0.940537
510	0.213168	1155	0.817800	1202	0.879069	1305	0.943034
540	0.227865	1156	0.820732	1203	0.879903	1310	0.945492
570	0.242905	1157	0.823335	1204	0.880730	1315	0.947915
600	0.258314	1158	0.825702	1205	0.881549	1320	0.950302
630	0.274121	1159	0.827890	1206	0.882361	1325	0.952657
660	0.290362	1160	0.829936	1207	0.883166	1330	0.954980
690	0.307075	1161	0.831864	1208	0.883964	1335	0.957272
720	0.324307	1162	0.833694	1209	0.884755	1340	0.959535
750	0.342111	1163	0.835440	1210	0.885540	1345	0.961770
780	0.360552	1164	0.837112	1211	0.886318	1350	0.963978
810	0.379705	1165	0.838721	1212	0.887091	1355	0.966159
840	0.399666	1166	0.840272	1213	0.887857	1360	0.968316
870	0.420552	1167	0.841772	1214	0.888618	1365	0.970448
900	0.442511	1168	0.843225	1215	0.889372	1370	0.972558
930	0.465738	1169	0.844636	1216	0.890121	1375	0.974644
960	0.490493	1170	0.846009	1217	0.890865	1380	0.976709
970	0.499144	1171	0.847347	1218	0.891603	1385	0.978752
980	0.508022	1172	0.848652	1219	0.892336	1390	0.980775
990	0.517145	1173	0.849926	1220	0.893064	1395	0.982778
1000	0.526538	1174	0.851172	1221	0.893787	1400	0.984761
1010	0.536225	1175	0.852392	1222	0.894505	1405	0.986726
1020	0.546239	1176	0.853588	1223	0.895218	1410	0.988673
1030	0.556617	1177	0.854760	1224	0.895926	1415	0.990602
1040	0.567402	1178	0.855910	1225	0.896630	1420	0.992514
1050	0.578651	1179	0.857039	1226	0.897330	1425	0.994410
1060	0.590431	1180	0.858149	1227	0.898024	1430	0.996289
1070	0.602830	1181	0.859241	1228	0.898715	1435	0.998152
1080	0.615962	1182	0.860315	1229	0.899401	1440	1.000000
1090	0.629985	1183	0.861372	1230	0.900083		
1100	0.645118	1184	0.862414	1231	0.900761		


Design Storm Unit Hyetograph
Rainfall (Inches)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
500
1000
1500
Time (min)

APPENDIX C
TABLES OF HYDROLOGY MODELING DATA AND RESULTS

TABLE 1: SUMMARY OF HYDROLOGIC PARAMETERS FOR SITE

Hydrologic Parameters																	
Drainage Area	Area (ac)	24-hr Rainfall Data (in.)			Impervious Cover (%)		Overland Flow Length (ft)		Width (A/L) (ft)		Slope		Depression Storage (in)		Manning's n-value Impervious	Manning's n-value Pervious	
		2-yr	10-yr	100-yr	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Impervious	Pervious		Exist	Prop
Site	0.18	2.02	3.72	5.85	0.0	75.0	95	95	83	83	2.48%	2.48%	0.06	0.25	0.012	0.023	0.240
North of Washington	102.18	2.10	3.88	6.10	68.5	68.5	115	115	38,702	38,702	0.12%	0.12%	0.06	0.25	0.012	0.200	0.200
South of Washington	93.22	2.05	3.78	5.94	82.6	82.6	115	115	35,310	35,310	0.02%	0.02%	0.06	0.25	0.012	0.200	0.200

Notes:

1. Hydrologic modeling performed in EPA SWMM 5.1.
2. Site assumed to route to outlet in existing and proposed conditions with 0% disconnected impervious cover.
3. Evaporation data based on the EPA National Storwater Calculator, Gauge 047953 (Santa Monica Pier Station).
4. Existing Site's Manning's n-value for pervious assumed based on gravel ground cover.
5. Continuous simulation model based on 1970 - 2006 data from Gauge Santa Monica Pier Station ID 047953 obtained from the EPA National Stormwater Calculator.
6. 24-hour rainfall data and hyetograph obtained from LA County.

TABLE 2: GREEN & AMPT SOILS PARAMETERS

Site	Native Soil Green & Ampt Parameters			Growing Media Green & Ampt Parameters							
	Suction Head (in)	Conductivity (in/hr)	Initial Deficit	Media Depth (in)	Suction Head (in)	Conductivity (in/hr)	Initial Deficit	Field Capacity	Effective Porosity	Wilting Point	Conductivity Slope
Site	8.270	0.040	0.267	18	2.4	1.18	0.312	0.105	0.437	0.047	8.0
North of Washington	6.949	0.136	0.317	-	-	-	-	-	-	-	-
South of Washington	8.270	0.040	0.267	-	-	-	-	-	-	-	-

Notes:

1. Native soil based on underlying soil type data from Los Angeles County Department of Public Works. See Geotechnical Report for information on the site's surface soil types: Artificial Fill and Alluvial Course Grained Soil.
2. Yolo Loam assumed as loam, Chino Silt Loam as silt loam, and Yolo Clay Loam as clay loam textures. Yolo Clay Loam Soil Type values used for drainage area South of Washington, as it's the predominant soil group.
3. Saturated hydraulic conductivity and suction head for native soil based on sandy clay values from EPA *SUSTAIN User's Manual* .
4. Initial moisture deficit for Western U.S. assumed from www.water-research.net.
5. Suction head values assumed for growing media from EPA *SUSTAIN User's Manual* . The conductivity value was selected to simulate long-term saturated hydraulic conductivity in the event of loss of capacity over time.
6. Loamy sand classification assumed for growing media.
7. Conductivity slope assumed from standard tables in SWMM5.0.021 User's Manual based on sandy loam growing media.

TABLE 3: LID FEATURES AREAS AND CONTRIBUTING AREAS FOR SITE

LID Feature	Avg. LID Area (sq. ft.[1])	LID % of Site	Drainage Area (sq. ft.)	Initially Saturated %[2]	% Impervious Area Treated[3]	Outflow to Pervious
Alternative 1: Lined Bioretention with Underdrain	700	8.9%	7,845	0/30	100%	No
Alternative 2: Lined Bioretention with Underdrain	380	5.7%	6,649	0/30	85%	No
Alternative 2: Planter Box	62	5.2%	1,196	0/30	15%	No

Notes:

1. Average surface area of LID feature used in SWMM modeling with a 2' minimum bottom width. The BMP minimum surface area required is 277 sq. ft. for Alternative 1 Bioretention, 230 sq. ft. for Alternative 2 Bioretention, and 62 sq. ft. for Alternative 2 Planter Box, and based on the water quality requirements in the City of Los Angeles Development Best Management Practices Handbook, Low Impact Development Manual, June 2011. However, the Bioretention surface areas are increased to mitigate impacts.
2. The % initially saturated for the LID growing media is 0% for the continuous simulation and 30% for the design storm.
3. % impervious area treated is percent of entire impervious area in 0.18-acre project drainage area as the aggregated method of LID modeling is used due to the site size. The planter box is treating the building roof area.

TABLE 4: LID CONFIGURATIONS FOR SITE

LID Feature	Avg. Surface Depth (in)	Surface Slope (%)	Top Width (ft)	Side Slope (H:V)	Surface Veg. Volume Fraction	Manning's n-value	Depth Soil Media (in)	Initial Media Saturation (%)	Storage/Drain Rock (in)	Void Ratio	Underdrain?	Drain Coefficent
Lined Bioretention with Underdrain	18.0	0.00%	---	---	0	0.24	36	30	30	0.5	Yes-0" above gravel bottom layer	0.2
Planter Box	12.0	0.00%	---	---	0	0.24	36	30	30	0.5	Yes-0" above gravel bottom layer	0.2

Notes:

1. Green & Ampt hydraulic parameters for growing media (amended soil) based on sandy loam with a hydraulic conductivity of 1.18 in/hr (see Table 2 for details).
2. For the lined bioretention and planter box alternatives, the saturated hydraulic conductivity of 0.00 in/hr assumed for underlying (native) soil (see Table 2 for details).
3. Initial media saturation used for design storm events only and not continuous simulation model.
4. Bioretention modeled with 0% slope due to SWMM model requirements.

TABLE 5: SITE DESIGN STORM EVENTS RESULTS

	2-yr, 24-hr Design Storm					10-yr, 24-hr Design Storm					100-yr, 24-hr Design Storm				
System Results	**Exist.**	**Alt. 1**	**Alt 1. vs Exist.**	**Alt. 2**	**Alt. 2 vs Exist.**	**Exist.**	**Alt. 1**	**Alt 1. vs Exist.**	**Alt. 2**	**Alt. 2 vs Exist.**	**Exist.**	**Alt. 1**	**Alt 1. vs Exist.**	**Alt. 2**	**Alt. 2 vs Exist.**
Precipitation (in)	2.02	2.02	0%	2.02	0%	3.72	3.72	0%	3.72	0%	5.85	5.85	0%	5.85	0%
Surface Runoff (in)	0.10	1.97	1870%	1.78	1680%	1.16	3.44	197%	3.29	184%	3.03	5.43	79%	5.32	76%
Infiltration (in)	1.90	0.43	-77%	0.45	-76%	2.53	0.58	-77%	0.60	-76%	2.79	0.64	-77%	0.66	-76%
Evaporation (in)	0.01	0.08	700%	0.06	500%	0.03	0.08	167%	0.07	133%	0.03	0.08	167%	0.07	133%
Peak Flows (cfs)	0.06	0.02	-67%	0.02	-67%	0.14	0.05	-64%	0.13	-7%	0.24	0.17	-29%	0.24	0%
Peak Flow in Grand Canal (cfs)	72.9	72.8	0%	72.8	0%	165.7	165.6	0%	165.7	0%	263.8	263.8	0%	263.8	0%

Note: Alternative 1 includes Lined Bioretention with underdrain and Alternative 2 includes a combination of Lined Bioretention with underdrain and Planter Box.

TABLE 6: SITE
CONTINUOUS SIMULATION WATER BALANCE OUTPUT

System Results	Analysis Period Results						
	Exist.	Alt. 1	Alt. 1 vs Exist.	Alt. 1 vs Exist. (%)	Alt. 2	Alt. 2 vs Exist.	Alt. 2 vs Exist. (%)
Precipitation (in)	300.74	300.74	0.00	0%	300.74	0.00	0%
Surface Runoff (in)	37.21	184.50	147.29	396%	192.38	155.17	417%
Infiltration (in)	262.93	60.13	-202.80	-77%	62.30	-200.63	-76%
Evaporation (in)	13.05	84.03	70.98	544%	75.14	62.09	476%
Maximum Peak Flow (cfs)	3.19	1.00	-2.19	-69%	2.80	-0.39	-12%
Maximum Peak Flow in Grand Canal (cfs)	2248.5	2246.5	-2.0	0%	2248.2	-0.3	0%

Notes:

1. Water balance output is for full continuous simulation run.
2. Initial saturation of 0% (wilting point) used for growing media at start of continuous simulation run.
3. Alternative 1 includes Lined Bioretention with underdrain and Alternative 2 includes a combination of Lined Bioretention with underdrain and Planter Box.

TABLE 7: PRE-PROJECT AND POST-PROJECT EVENT MEAN CONCENTRATION VALUES1 FOR VAPP SITE

	Site		North of Washington & South of Washington							
	Pre-Vacant	Post-Industrial	Pre & Post- High Density Residential	Pre & Post-Industrial	Pre & Post-Vacant	Pre & Post-Commercial	Pre & Post-Multi-Family Residential	Pre & Post-Transportation	Pre & Post-Education	Pre & Post-Multi-Mixed Use
Pollutant	EMC	EMC	EMC	EMC	EMC	EMC	EMC	EMC	EMC	EMC
TSS (mg/L)	164.7	229.4	104.7	229.0	164.7	67.4	46.4	75.4	103.0	69.1
COD (mg/L)	40.0	65.0	73.0	65.0	40.0	57.0	73.0	65.0	65.0	65.0
Total Copper (µg/l)	9.1	31.0	15.3	31.0	9.1	34.8	12.2	51.9	21.5	17.3
Total Lead (µg/l)	30.0	114.0	144.0	114.0	30.0	104.0	144.0	114.0	114.0	114.0
Total Zinc (µg/l)	38.8	565.6	80.4	5656.0	38.8	238.5	134.9	279.5	123.7	184.9
Fecal Coliform (MPN/L)	217,480.0	65,307,040.0	108,535,370.0	65,307,040.0	217,480.0	107,165,650.0	n/m	134,016,670.0	n/m	n/m

[1] Most Event Mean Concentration (EMC) values are from Table 7, The Green Visions Plan for 21st Century Southern California, 2006. COD and Lead are from the EPA Guide to Urban Stormwater Pollutant Concentrations, 2006.

[2] Modeled washoff exponent = 1.0 for all pollutants

TABLE 8: POLLUTANT REMOVAL BY VARIOUS BIOFILTRATION PRACTICES

Pollutant	% Removal		
	Bioinfiltration[8]	Planter Box/Lined Bioretention[8]	Vegetated Swale[9]
Total Suspended Solids (TSS)[1]	85	85	52[5]
Chemical Oxygen Demand (COD)[2]	40	40	40
Total Copper[3,4]	66	66	26
Total Lead[3,5]	63	63	13
Total Zinc[3,5]	68	68	38
Fecal Coliform[6]	81	81	30[7]

Notes

1. Total Suspended Solids (TSS) removal rates based on National Pollutant Removal Database/Other Sources Summarized by Cost and Pollutant Removal of Storm-water Treatment Practices by Weiss, Gulliver, and Erickson in May/June, 2007 ASCE Journal of Water Resources Planning and Management.
2. Removal rates for Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD) were not readily available. Chemical Oxygen Demand (COD) is the representative pollutant for modeling purposes. COD removal based on average organics removal of 40% or greater as documented in *Stormwater Management* Volume 3/Issue 1, February/March, 2015 article entitled *Soil Media Protects Salmon from Runoff Toxics*. Vegetated swale assumed to match bioretention due torequired two feet of growing media.
3. While Selenium is listed as a 303(d) pollutant of concern, it is not modeled as data is not readily available. Selenium removal by bioretention is expected to be similar to Total Copper, Total Lead, and Total Zinc
4. Total Copper has an assumed removal rate, based on average removal rates for Total Lead and Total Zinc
5. Total Lead and Total Zinc removal rates for all features and TSS removal rates for vegetated swale based on *The Green Visions Plan for 21st Century Southern California* prepared by the University of Southern California, dated April, 2006.
6. Fecal Coliform removal rates based on average from selected field and laboratory studies summarized in *Bioretention Technology: Overview of Current Practice and Future Needs* by Davis, Hunt, Traver, and Clar in March, 2009 Journal of Environmental Engineering.
7. Fecal coliform removal rates for vegetated swales were obtained from the U.S. EPA *Handbook Urban Runoff and Pollution Prevention Planning*.
8. Bioinfiltration and planter box/lined bioretention assumed to have similar removal rates to bioretention in the literature
9. Removal rates may be underestimated for vegetated swales due to required two feet of growing media

TABLE 9: WATER QUALITY RESULTS FOR SITE

	Pollutant Effluent Concentration											
	TSS		COD		Copper		Lead		Zinc		Fecal Coliform	
	2-Year	Annual	2-Year	Annual	2-Year	Annual	2-Year	Annual	2-Year	Annual	2-Year	Annual
Model	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	LogN	LogN
Existing	0.7	6.9	0.2	1.7	0.0	0.0	0.0	0.0	0.0	0.0	7.6	0.3
Alt. 1	1.0	1.1	1.1	1.3	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.3
Difference	0.3	-5.8	1.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0
Alt. 2	0.8	1.2	0.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	10.1	0.3
Difference	0.1	-5.8	0.8	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0

Notes:

1. Water balance output is for 2-year, 24-hour design storm and annual continuous simulation run.
2. Continuous simulation model based on 1970 - 2005 data from Gauge Santa Monica Pier Station ID 047953 obtained obtained from the EPA National Stormwater Calculator.
3. Alternative 1 includes Lined Bioretention with underdrain and Alternative 2 includes a combination of Lined Bioretention with underdrain and Planter Box.

TABLE 10: WATER QUALITY RESULTS FOR GRAND CANAL

	Pollutant Effluent Concentration											
	TSS		COD		Copper		Lead		Zinc		Fecal Coliform	
	2-Year	Annual	2-Year	Annual	2-Year	Annual	2-Year	Annual	2-Year	Annual	2-Year	Annual
Model	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	lbs	LogN	LogN
Existing	5562.5	18712.8	4745.5	15984.3	1.2	4.1	9.2	31.0	8.5	28.6	14.4	0.5
Alt. 1	5562.8	18707.0	4746.4	15983.9	1.2	4.1	9.2	31.0	8.5	28.6	14.4	0.5
Difference	0.3	-5.8	1.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alt. 2	5562.6	18707.0	4746.3	15983.9	1.2	4.1	9.2	31.0	8.5	28.6	14.4	0.5
Difference	0.1	-5.8	0.8	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

1. Water balance output is for 2-year, 24-hour design storm and annual continuous simulation run.
2. Continuous simulation model based on 1970 - 2005 data from Gauge Santa Monica Pier Station ID 047953 obtained obtained from the EPA National Stormwater Calculator.
3. Alternative 1 includes Lined Bioretention with underdrain and Alternative 2 includes a combination of Lined Bioretention with underdrain and Planter Box.

APPENDIX D
EPA SWMM WATER BUDGET RESULTS

Existing 2-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... YES
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	33.837	2.076
Evaporation Loss	0.730	0.045
Infiltration Loss	8.281	0.508
Surface Runoff	24.835	1.524
Final Storage	0.000	0.000
Continuity Error (%)	-0.027	

********** Runoff Quality Continuity	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs

**********	----------	----------	----------	----------	----------
Initial Buildup	0.000	0.000	0.000	0.000	0.000
Surface Buildup	5562.498	4745.495	1.220	9.197	8.488
Wet Deposition	0.000	0.000	0.000	0.000	0.000
Sweeping Removal	0.000	0.000	0.000	0.000	0.000
Infiltration Loss	0.000	0.000	0.000	0.000	0.000
BMP Removal	0.000	0.000	0.000	0.000	0.000
Surface Runoff	5562.498	4745.495	1.220	9.197	8.488
Remaining Buildup	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.000	0.000	0.000	0.000	0.000

********** FecalColiform	
Runoff Quality Continuity	LogN
**********	----------
Initial Buildup	0.000
Surface Buildup	14.352
Wet Deposition	0.000
Sweeping Removal	0.000
Infiltration Loss	0.000
BMP Removal	0.000
Surface Runoff	14.352
Remaining Buildup	0.000
Continuity Error (%)	0.000

**********	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
**********	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	24.835	8.093
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	24.835	8.093
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

**********	TSS	COD	Copper	Lead	Zinc
Quality Routing Continuity	lbs	lbs	lbs	lbs	lbs
**********	----------	----------	----------	----------	----------
Dry Weather Inflow	0.000	0.000	0.000	0.000	0.000

Wet Weather Inflow	5562.498	4745.495	1.220	9.197	8.488
Groundwater Inflow	0.000	0.000	0.000	0.000	0.000
RDII Inflow	0.000	0.000	0.000	0.000	0.000
External Inflow	0.000	0.000	0.000	0.000	0.000
External Outflow	5562.504	4745.500	1.220	9.197	8.488
Flooding Loss	0.000	0.000	0.000	0.000	0.000
Exfiltration Loss	0.000	0.000	0.000	0.000	0.000
Mass Reacted	0.000	0.000	0.000	0.000	0.000
Initial Stored Mass	0.000	0.000	0.000	0.000	0.000
Final Stored Mass	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	-0.000	-0.000	-0.000	-0.000	-0.000

********** FecalColiform

Quality Routing Continuity	LogN
**********	---
Dry Weather Inflow	0.000
Wet Weather Inflow	14.352
Groundwater Inflow	0.000
RDII Inflow	0.000
External Inflow	0.000
External Outflow	14.352
Flooding Loss	0.000
Exfiltration Loss	0.000
Mass Reacted	0.000
Initial Stored Mass	0.000
Final Stored Mass	0.000
Continuity Error (%)	-0.000

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	2.10	0.00	0.04	0.66	1.41	3.90	35.93	0.669
SouthofWashington	2.05	0.00	0.05	0.34	1.66	4.19	37.08	0.808
Site	2.02	0.00	0.01	1.90	0.10	0.00	0.06	0.052

****
Subcatchment Washoff Summary
****

Subcatchment	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
NorthofWashington	2529.290	2322.629	0.559	4.506	4.089	13.959
SouthofWashington	3032.508	2422.696	0.661	4.691	4.399	14.126
Site	0.700	0.170	0.000	0.000	0.000	7.623
System	5562.498	4745.495	1.220	9.197	8.488	14.352

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:31	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	37.14	73.07	0 20:00	4.19	8.09	0.000
Upstream	JUNCTION	35.93	35.93	0 20:00	3.9	3.9	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	35.93	0 20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

****
Link Pollutant Load Summary
****

Link	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
Connection	2529.296	2322.634	0.559	4.506	4.089	13.959

Analysis begun on: Thu Feb 04 06:03:15 2016
Analysis ended on: Thu Feb 04 06:03:15 2016
Total elapsed time: < 1 sec

Existing 10-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Volume Depth
Runoff Quantity Continuity acre-feet inches
********** --------- -------
Total Precipitation 62.458 3.832
Evaporation Loss 0.804 0.049
Infiltration Loss 11.764 0.722
Surface Runoff 49.912 3.062
Final Storage 0.000 0.000
Continuity Error (%) ..... -0.034

********** Volume Volume
Flow Routing Continuity acre-feet 10^6 gal

**************************	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	49.912	16.264
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	49.912	16.264
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	3.88	0.00	0.04	0.97	2.87	7.97	85.55	0.740
SouthofWashington	3.78	0.00	0.06	0.45	3.27	8.29	80.28	0.866
Site	3.72	0.00	0.03	2.53	1.16	0.01	0.14	0.312

****

Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:31	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	80.42	165.97	0 20:00	8.29	16.3	0.000
Upstream	JUNCTION	85.55	85.55	0 20:00	7.97	7.97	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	85.55	0	20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Feb 04 06:05:43 2016
Analysis ended on: Thu Feb 04 06:05:43 2016
Total elapsed time: < 1 sec

Existing 100-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Volume Depth
Runoff Quantity Continuity acre-feet inches
********** --------- -------
Total Precipitation 98.173 6.024
Evaporation Loss 0.811 0.050
Infiltration Loss 16.908 1.037
Surface Runoff 80.487 4.938
Final Storage 0.000 0.000
Continuity Error (%) ..... -0.034

********** Volume Volume
Flow Routing Continuity acre-feet 10^6 gal

**************************	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	80.487	26.228
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	80.487	26.228
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	6.10	0.00	0.04	1.53	4.54	12.58	136.20	0.744
SouthofWashington	5.94	0.00	0.06	0.50	5.38	13.63	127.67	0.906
Site	5.85	0.00	0.03	2.79	3.03	0.01	0.24	0.518

****

Existing 100-Year

Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:31	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	127.91	264.11	0 20:00	13.6	26.2	0.000
Upstream	JUNCTION	136.20	136.20	0 20:00	12.6	12.6	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	136.20	0 20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Feb 04 06:07:18 2016
Analysis ended on: Thu Feb 04 06:07:18 2016
Total elapsed time: < 1 sec

Existing Continuous Simulation

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
Rainfall File Summary
****

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
047953	JAN-11-1970	MAY-09-2005	5 min	5779	0	0

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... YES
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date JAN-11-1970 00:00:00
Ending Date MAY-09-2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	4901.577	300.741

Existing Continuous Simulation

Evaporation Loss	913.952	56.076
Infiltration Loss	1148.293	70.455
Surface Runoff	3018.983	185.233
Final Storage	0.000	0.000
Continuity Error (%)	-3.665	

********** Runoff Quality Continuity	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs
Initial Buildup	0.000	0.000	0.000	0.000	0.000
Surface Buildup	673661.459	575434.658	147.698	1115.248	1028.934
Wet Deposition	0.000	0.000	0.000	0.000	0.000
Sweeping Removal	0.000	0.000	0.000	0.000	0.000
Infiltration Loss	0.000	0.000	0.000	0.000	0.000
BMP Removal	0.000	0.000	0.000	0.000	0.000
Surface Runoff	673661.459	575434.658	147.698	1115.248	1028.934
Remaining Buildup	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.000	0.000	0.000	0.000	0.000

********** Runoff Quality Continuity	FecalColiform LogN
Initial Buildup	0.000
Surface Buildup	16.434
Wet Deposition	0.000
Sweeping Removal	0.000
Infiltration Loss	0.000
BMP Removal	0.000
Surface Runoff	16.434
Remaining Buildup	0.000
Continuity Error (%)	-0.000

********** Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	3018.983	983.781
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	3018.983	983.781
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000

Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

************************** Quality Routing Continuity	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs
Dry Weather Inflow	0.000	0.000	0.000	0.000	0.000
Wet Weather Inflow	673661.459	575434.658	147.698	1115.248	1028.934
Groundwater Inflow	0.000	0.000	0.000	0.000	0.000
RDII Inflow	0.000	0.000	0.000	0.000	0.000
External Inflow	0.000	0.000	0.000	0.000	0.000
External Outflow	673017.656	574843.458	147.556	1114.101	1027.894
Flooding Loss	0.000	0.000	0.000	0.000	0.000
Exfiltration Loss	0.000	0.000	0.000	0.000	0.000
Mass Reacted	0.000	0.000	0.000	0.000	0.000
Initial Stored Mass	0.000	0.000	0.000	0.000	0.000
Final Stored Mass	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.096	0.103	0.096	0.103	0.101

************************** Quality Routing Continuity	FecalColiform LogN
Dry Weather Inflow	0.000
Wet Weather Inflow	16.434
Groundwater Inflow	0.000
RDII Inflow	0.000
External Inflow	0.000
External Outflow	16.433
Flooding Loss	0.000
Exfiltration Loss	0.000
Mass Reacted	0.000
Initial Stored Mass	0.000
Final Stored Mass	0.000
Continuity Error (%)	0.085

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary

Existing Continuous Simulation

****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	300.74	0.00	48.83	91.90	174.48	484.10	1417.31	0.580
SouthofWashington	300.74	0.00	64.10	46.57	197.31	499.43	1077.30	0.656
Site	300.74	0.00	13.05	262.93	37.21	0.18	3.19	0.124

****
Subcatchment Washoff Summary
****

Subcatchment	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
NorthofWashington	313104.653	287521.711	69.165	557.786	506.152	16.052
SouthofWashington	360307.026	287852.283	78.519	557.416	522.723	16.201
Site	249.780	60.663	0.014	0.045	0.059	10.175
System	673661.459	575434.658	147.698	1115.248	1028.934	16.434

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet

GrandCanal JUNCTION 0.00 0.00 2.00 0 06:01 0.00
Upstream JUNCTION 0.00 0.00 0.00 0 00:00 0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	1080.49	2497.80	9124 15:05	500	984	0.000
Upstream	JUNCTION	1417.31	1417.31	9124 15:05	484	484	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GrandCanal	JUNCTION	309648.00	0.000	0.000
Upstream	JUNCTION	309648.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth

---

Connection DUMMY 1417.31 9124 15:05

****
Conduit Surcharge Summary
****

No conduits were surcharged.

****
Link Pollutant Load Summary
****

Link	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
Connection	3.125e+005	2.869e+005	69.023	556.639	505.111	16.051

Analysis begun on: Thu Feb 04 05:29:28 2016
Analysis ended on: Thu Feb 04 05:30:09 2016
Total elapsed time: 00:00:41

Alternative 1 (Lined Bioretention with Underdrain) 2-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... YES
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Initial LID Storage	0.012	0.001
Total Precipitation	33.837	2.076
Evaporation Loss	0.731	0.045
Infiltration Loss	8.259	0.507
Surface Runoff	24.834	1.524
LID Drainage	0.029	0.002
Final Storage	0.005	0.000
Continuity Error (%)	-0.027	

Alternative 1 (Lined Bioretention with Underdrain) 2-Year

Runoff Quality Continuity	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs
Initial Buildup	0.000	0.000	0.000	0.000	0.000
Surface Buildup	5574.613	4748.956	1.221	9.204	8.520
Wet Deposition	0.000	0.000	0.000	0.000	0.000
Sweeping Removal	0.000	0.000	0.000	0.000	0.000
Infiltration Loss	0.000	0.000	0.000	0.000	0.000
BMP Removal	11.823	2.508	0.001	0.005	0.026
Surface Runoff	5562.790	4746.448	1.220	9.199	8.493
Remaining Buildup	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.000	0.000	0.000	0.000	0.000

Runoff Quality Continuity	FecalColiform LogN
Initial Buildup	0.000
Surface Buildup	14.352
Wet Deposition	0.000
Sweeping Removal	0.000
Infiltration Loss	0.000
BMP Removal	11.174
Surface Runoff	14.352
Remaining Buildup	0.000
Continuity Error (%)	0.000

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	24.863	8.102
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	24.863	8.102
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Quality Routing Continuity	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs

**************************	----------	----------	----------	----------	----------
Dry Weather Inflow	0.000	0.000	0.000	0.000	0.000
Wet Weather Inflow	5562.790	4746.448	1.220	9.199	8.493
Groundwater Inflow	0.000	0.000	0.000	0.000	0.000
RDII Inflow	0.000	0.000	0.000	0.000	0.000
External Inflow	0.000	0.000	0.000	0.000	0.000
External Outflow	5562.795	4746.453	1.220	9.199	8.493
Flooding Loss	0.000	0.000	0.000	0.000	0.000
Exfiltration Loss	0.000	0.000	0.000	0.000	0.000
Mass Reacted	0.000	0.000	0.000	0.000	0.000
Initial Stored Mass	0.000	0.000	0.000	0.000	0.000
Final Stored Mass	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	-0.000	-0.000	-0.000	-0.000	-0.000

********** FecalColiform

Quality Routing Continuity	LogN
**************************	----------
Dry Weather Inflow	0.000
Wet Weather Inflow	14.352
Groundwater Inflow	0.000
RDII Inflow	0.000
External Inflow	0.000
External Outflow	14.352
Flooding Loss	0.000
Exfiltration Loss	0.000
Mass Reacted	0.000
Initial Stored Mass	0.000
Final Stored Mass	0.000
Continuity Error (%)	-0.000

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

Alternative 1 (Lined Bioretention with Underdrain) 2-Year

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	2.10	0.00	0.04	0.66	1.41	3.90	35.93	0.669
SouthofWashington	2.05	0.00	0.05	0.34	1.66	4.19	37.08	0.808
Site	2.02	0.00	0.08	0.43	1.97	0.01	0.02	0.975

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
Site	LinedBioretention	17.12	0.46	0.00	0.00	21.80	8.90	3.77	-0.00

****
Subcatchment Washoff Summary
****

Subcatchment	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
NorthofWashington	2529.290	2322.629	0.559	4.506	4.089	13.959
SouthofWashington	3032.508	2422.696	0.661	4.691	4.399	14.126
Site	0.991	1.123	0.000	0.001	0.005	10.210
System	5562.790	4746.448	1.220	9.199	8.493	14.352

****
Node Depth Summary
****

Alternative 1 (Lined Bioretention with Underdrain) 2-Year

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:01	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	37.10	73.03	0 20:00	4.2	8.1	0.000
Upstream	JUNCTION	35.93	35.93	0 20:00	3.9	3.9	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	35.93	0 20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

****
Link Pollutant Load Summary
****

Link	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
Connection	2529.296	2322.634	0.559	4.506	4.089	13.959

Analysis begun on: Thu Feb 04 06:02:30 2016
Analysis ended on: Thu Feb 04 06:02:30 2016
Total elapsed time: < 1 sec

Alternative 1 (Lined Bioretention with Underdrain) 10-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Initial LID Storage	0.008	0.000
Total Precipitation	62.458	3.832
Evaporation Loss	0.805	0.049
Infiltration Loss	11.734	0.720
Surface Runoff	49.898	3.062
LID Drainage	0.048	0.003
Final Storage	0.002	0.000
Continuity Error (%)	-0.034	

Alternative 1 (Lined Bioretention with Underdrain) 10-Year

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	49.946	16.276
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	49.946	16.276
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	: 30.00 sec
Average Time Step	: 30.00 sec
Maximum Time Step	: 30.00 sec
Percent in Steady State	: 0.00
Average Iterations per Step	: 1.00
Percent Not Converging	: 0.00

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	3.88	0.00	0.04	0.97	2.87	7.97	85.55	0.740
SouthofWashington	3.78	0.00	0.06	0.45	3.27	8.29	80.28	0.866
Site	3.72	0.00	0.08	0.58	3.44	0.02	0.05	0.925

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
Site	LinedBioretention	31.83	0.46	0.00	0.00	35.60	5.95	1.72	-0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:01	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	80.32	165.88	0 20:00	8.3	16.3	0.000
Upstream	JUNCTION	85.55	85.55	0 20:00	7.97	7.97	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours	Max. Height Above Crown	Min. Depth Below Rim

Node	Type	Surcharged	Feet	Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	85.55	0 20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Feb 04 05:48:20 2016
Analysis ended on: Thu Feb 04 05:48:20 2016
Total elapsed time: < 1 sec

Alternative 1 (Lined Bioretention with Underdrain) 100-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Initial LID Storage	0.012	0.001
Total Precipitation	98.173	6.024
Evaporation Loss	0.812	0.050
Infiltration Loss	16.876	1.035
Surface Runoff	80.456	4.936
LID Drainage	0.067	0.004
Final Storage	0.008	0.000
Continuity Error (%)	-0.034	

Alternative 1 (Lined Bioretention with Underdrain) 100-Year

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	80.523	26.240
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	80.523	26.240
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	: 30.00 sec
Average Time Step	: 30.00 sec
Maximum Time Step	: 30.00 sec
Percent in Steady State	: 0.00
Average Iterations per Step	: 1.00
Percent Not Converging	: 0.00

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	6.10	0.00	0.04	1.53	4.54	12.58	136.20	0.744
SouthofWashington	5.94	0.00	0.06	0.50	5.38	13.63	127.67	0.906
Site	5.85	0.00	0.08	0.64	5.43	0.03	0.17	0.928

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
Site	LinedBioretention	50.26	0.46	0.00	3.07	50.03	8.90	5.61	-0.02

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:01	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	127.84	264.05	0 20:00	13.7	26.2	0.000
Upstream	JUNCTION	136.20	136.20	0 20:00	12.6	12.6	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours	Max. Height Above Crown	Min. Depth Below Rim

Node	Type	Surcharged	Feet	Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	136.20	0 20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Feb 04 05:49:47 2016
Analysis ended on: Thu Feb 04 05:49:47 2016
Total elapsed time: < 1 sec

Alternative 1 (Lined Bioretention with Underdrain) Continuous Simulation

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
Rainfall File Summary
****

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
047953	JAN-11-1970	MAY-09-2005	5 min	5779	0	0

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... YES
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date JAN-11-1970 00:00:00
Ending Date MAY-09-2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Initial LID Storage	0.001	0.000

Alternative 1 (Lined Bioretention with Underdrain) Continuous Simulation

Total Precipitation	4901.577	300.741
Evaporation Loss	915.017	56.142
Infiltration Loss	1145.251	70.268
Surface Runoff	3018.537	185.205
LID Drainage	2.656	0.163
Final Storage	0.001	0.000
Continuity Error (%)	-3.670	

********** Runoff Quality Continuity **********	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs
Initial Buildup	0.000	0.000	0.000	0.000	0.000
Surface Buildup	675234.799	575890.572	147.931	1116.108	1033.370
Wet Deposition	0.000	0.000	0.000	0.000	0.000
Sweeping Removal	0.000	0.000	0.000	0.000	0.000
Infiltration Loss	0.000	0.000	0.000	0.000	0.000
BMP Removal	1782.413	470.440	0.234	0.856	4.281
Surface Runoff	673452.385	575420.130	147.697	1115.252	1029.090
Remaining Buildup	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.000	0.000	0.000	0.000	0.000

********** Runoff Quality Continuity **********	FecalColiform LogN
Initial Buildup	0.000
Surface Buildup	16.434
Wet Deposition	0.000
Sweeping Removal	0.000
Infiltration Loss	0.000
BMP Removal	13.360
Surface Runoff	16.434
Remaining Buildup	0.000
Continuity Error (%)	0.000

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	3021.193	984.501
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	3021.193	984.501
Flooding Loss	0.000	0.000

Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

********** Quality Routing Continuity **********	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs
Dry Weather Inflow	0.000	0.000	0.000	0.000	0.000
Wet Weather Inflow	673452.385	575420.130	147.697	1115.252	1029.090
Groundwater Inflow	0.000	0.000	0.000	0.000	0.000
RDII Inflow	0.000	0.000	0.000	0.000	0.000
External Inflow	0.000	0.000	0.000	0.000	0.000
External Outflow	672808.581	574828.930	147.555	1114.105	1028.049
Flooding Loss	0.000	0.000	0.000	0.000	0.000
Exfiltration Loss	0.000	0.000	0.000	0.000	0.000
Mass Reacted	0.000	0.000	0.000	0.000	0.000
Initial Stored Mass	0.000	0.000	0.000	0.000	0.000
Final Stored Mass	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.096	0.103	0.096	0.103	0.101

********** Quality Routing Continuity **********	FecalColiform LogN
Dry Weather Inflow	0.000
Wet Weather Inflow	16.434
Groundwater Inflow	0.000
RDII Inflow	0.000
External Inflow	0.000
External Outflow	16.433
Flooding Loss	0.000
Exfiltration Loss	0.000
Mass Reacted	0.000
Initial Stored Mass	0.000
Final Stored Mass	0.000
Continuity Error (%)	0.085

****
Highest Flow Instability Indexes
****
All links are stable.

Alternative 1 (Lined Bioretention with Underdrain) Continuous Simulation

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	300.74	0.00	48.83	91.90	174.48	484.10	1417.31	0.580
SouthofWashington	300.74	0.00	64.10	46.57	197.31	499.43	1077.30	0.656
Site	300.74	0.00	84.03	60.13	184.50	0.90	1.00	0.613

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
Site	LinedBioretention	2408.21	421.80	0.00	4.00	1983.56	0.85	0.85	-0.05

****
Subcatchment Washoff Summary
****

Subcatchment	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
NorthofWashington	313104.653	287521.711	69.165	557.786	506.152	16.052
SouthofWashington	360307.026	287852.283	78.519	557.416	522.723	16.201
Site	40.707	46.137	0.012	0.050	0.214	11.824

System	673452.386	575420.132	147.697	1115.252	1029.090	16.434

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 06:01	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	1078.30	2495.61	9124 15:05	500	984	0.000
Upstream	JUNCTION	1417.31	1417.31	9124 15:05	484	484	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GrandCanal	JUNCTION	309648.00	0.000	0.000
Upstream	JUNCTION	309648.00	0.000	0.000

****
Node Flooding Summary

****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	1417.31	9124 15:05			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

****
Link Pollutant Load Summary
****

Link	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
Connection	3.125e+005	2.869e+005	69.023	556.639	505.111	16.051

Analysis begun on: Thu Feb 04 05:51:41 2016
Analysis ended on: Thu Feb 04 05:52:39 2016
Total elapsed time: 00:00:58

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) 2-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... YES
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Initial LID Storage	0.008	0.000
Total Precipitation	33.837	2.076
Evaporation Loss	0.731	0.045
Infiltration Loss	8.259	0.507
Surface Runoff	24.834	1.524
LID Drainage	0.026	0.002
Final Storage	0.004	0.000
Continuity Error (%)	-0.027	

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) 2-Year

********** Runoff Quality Continuity **********	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs
Initial Buildup	0.000	0.000	0.000	0.000	0.000
Surface Buildup	5575.075	4749.087	1.221	9.204	8.521
Wet Deposition	0.000	0.000	0.000	0.000	0.000
Sweeping Removal	0.000	0.000	0.000	0.000	0.000
Infiltration Loss	0.000	0.000	0.000	0.000	0.000
BMP Removal	12.440	2.815	0.002	0.006	0.028
Surface Runoff	5562.634	4746.272	1.220	9.198	8.493
Remaining Buildup	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.000	0.000	0.000	0.000	0.000

********** Runoff Quality Continuity **********	FecalColiform LogN
Initial Buildup	0.000
Surface Buildup	14.352
Wet Deposition	0.000
Sweeping Removal	0.000
Infiltration Loss	0.000
BMP Removal	11.198
Surface Runoff	14.352
Remaining Buildup	0.000
Continuity Error (%)	0.000

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	24.860	8.101
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	24.860	8.101
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

********** Quality Routing Continuity **********	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs

**************************	----------	----------	----------	----------	----------
Dry Weather Inflow	0.000	0.000	0.000	0.000	0.000
Wet Weather Inflow	5562.634	4746.272	1.220	9.198	8.493
Groundwater Inflow	0.000	0.000	0.000	0.000	0.000
RDII Inflow	0.000	0.000	0.000	0.000	0.000
External Inflow	0.000	0.000	0.000	0.000	0.000
External Outflow	5562.640	4746.277	1.220	9.198	8.493
Flooding Loss	0.000	0.000	0.000	0.000	0.000
Exfiltration Loss	0.000	0.000	0.000	0.000	0.000
Mass Reacted	0.000	0.000	0.000	0.000	0.000
Initial Stored Mass	0.000	0.000	0.000	0.000	0.000
Final Stored Mass	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	-0.000	-0.000	-0.000	-0.000	-0.000

********** FecalColiform

Quality Routing Continuity	LogN
**************************	----------
Dry Weather Inflow	0.000
Wet Weather Inflow	14.352
Groundwater Inflow	0.000
RDII Inflow	0.000
External Inflow	0.000
External Outflow	14.352
Flooding Loss	0.000
Exfiltration Loss	0.000
Mass Reacted	0.000
Initial Stored Mass	0.000
Final Stored Mass	0.000
Continuity Error (%)	-0.000

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	30.00 sec
Average Time Step	:	30.00 sec
Maximum Time Step	:	30.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) 2-Year

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	2.10	0.00	0.04	0.66	1.41	3.90	35.93	0.669
SouthofWashington	2.05	0.00	0.05	0.34	1.66	4.19	37.08	0.808
Site	2.02	0.00	0.06	0.45	1.78	0.01	0.02	0.879

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
Site	PlanterBox	28.51	0.46	0.00	0.00	32.70	8.90	4.26	-0.02
Site	LinedBioretention	26.51	0.46	0.00	0.00	30.81	8.90	4.16	-0.03

****
Subcatchment Washoff Summary
****

Subcatchment	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
NorthofWashington	2529.290	2322.629	0.559	4.506	4.089	13.959
SouthofWashington	3032.508	2422.696	0.661	4.691	4.399	14.126
Site	0.836	0.947	0.000	0.001	0.004	10.136
System	5562.634	4746.272	1.220	9.198	8.493	14.352

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:01	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	37.10	73.03	0 20:00	4.2	8.1	0.000
Upstream	JUNCTION	35.93	35.93	0 20:00	3.9	3.9	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	35.93	0 20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

****
Link Pollutant Load Summary
****

Link	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
Connection	2529.296	2322.634	0.559	4.506	4.089	13.959

Analysis begun on: Thu Feb 04 06:02:55 2016
Analysis ended on: Thu Feb 04 06:02:55 2016
Total elapsed time: < 1 sec

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) 10-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Initial LID Storage	0.005	0.000
Total Precipitation	62.458	3.832
Evaporation Loss	0.804	0.049
Infiltration Loss	11.735	0.720
Surface Runoff	49.902	3.062
LID Drainage	0.042	0.003
Final Storage	0.002	0.000
Continuity Error (%)	-0.034	

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) 10-Year

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	49.944	16.275
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	49.944	16.275
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	: 30.00 sec
Average Time Step	: 30.00 sec
Maximum Time Step	: 30.00 sec
Percent in Steady State	: 0.00
Average Iterations per Step	: 1.00
Percent Not Converging	: 0.00

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	3.88	0.00	0.04	0.97	2.87	7.97	85.55	0.740
SouthofWashington	3.78	0.00	0.06	0.45	3.27	8.29	80.28	0.866
Site	3.72	0.00	0.07	0.60	3.29	0.02	0.13	0.884

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
Site	PlanterBox	53.04	0.46	0.00	11.74	44.82	8.90	4.93	-0.02
Site	LinedBioretention	49.32	0.46	0.00	3.21	49.80	5.95	1.81	-0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:01	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	80.41	165.97	0 20:00	8.3	16.3	0.000
Upstream	JUNCTION	85.55	85.55	0 20:00	7.97	7.97	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

	Max. Height	Min. Depth

Node	Type	Hours Surcharged	Above Crown Feet	Below Rim Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	85.55	0 20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Feb 04 05:40:24 2016
Analysis ended on: Thu Feb 04 05:40:24 2016
Total elapsed time: < 1 sec

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) 100-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date SEP-15-2015 00:00:00
Ending Date SEP-18-2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Initial LID Storage	0.008	0.000
Total Precipitation	98.173	6.024
Evaporation Loss	0.812	0.050
Infiltration Loss	16.876	1.035
Surface Runoff	80.478	4.938
LID Drainage	0.043	0.003
Final Storage	0.005	0.000
Continuity Error (%)	-0.034	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	80.521	26.239
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	80.521	26.239
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	: 30.00 sec
Average Time Step	: 30.00 sec
Maximum Time Step	: 30.00 sec
Percent in Steady State	: 0.00
Average Iterations per Step	: 1.00
Percent Not Converging	: 0.00

Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	6.10	0.00	0.04	1.53	4.54	12.58	136.20	0.744
SouthofWashington	5.94	0.00	0.06	0.50	5.38	13.63	127.67	0.906
Site	5.85	0.00	0.07	0.66	5.32	0.03	0.24	0.909

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) 100-Year

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
Site	PlanterBox	83.77	0.46	0.00	40.61	46.68	8.90	4.93	-0.01
Site	LinedBioretention	77.90	0.46	0.00	28.93	51.81	8.90	5.62	-0.02

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:01	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	127.92	264.12	0 20:00	13.7	26.2	0.000
Upstream	JUNCTION	136.20	136.20	0 20:00	12.6	12.6	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Max. Height	Min. Depth

Node	Type	Hours Surcharged	Above Crown Feet	Below Rim Feet
GrandCanal	JUNCTION	72.00	0.000	0.000
Upstream	JUNCTION	72.00	0.000	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	136.20	0 20:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Feb 04 05:42:15 2016
Analysis ended on: Thu Feb 04 05:42:15 2016
Total elapsed time: < 1 sec

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) Continuous Simulation

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.010)

****
Rainfall File Summary
****

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
047953	JAN-11-1970	MAY-09-2005	5 min	5779	0	0

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... YES
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date JAN-11-1970 00:00:00
Ending Date MAY-09-2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 30.00 sec

********** Runoff Quantity Continuity **********	Volume acre-feet	Depth inches
Initial LID Storage	0.005	0.000

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) Continuous Simulation

Total Precipitation	4901.577	300.741
Evaporation Loss	914.884	56.134
Infiltration Loss	1145.284	70.270
Surface Runoff	3018.565	185.207
LID Drainage	2.746	0.168
Final Storage	0.001	0.000
Continuity Error (%)	-3.670	

********** Runoff Quality Continuity **********	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs
Initial Buildup	0.000	0.000	0.000	0.000	0.000
Surface Buildup	675298.937	575908.745	147.940	1116.140	1033.529
Wet Deposition	0.000	0.000	0.000	0.000	0.000
Sweeping Removal	0.000	0.000	0.000	0.000	0.000
Infiltration Loss	0.000	0.000	0.000	0.000	0.000
BMP Removal	1846.102	488.105	0.242	0.887	4.437
Surface Runoff	673452.813	575420.615	147.697	1115.253	1029.092
Remaining Buildup	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.000	0.000	0.000	0.000	0.000

********** Runoff Quality Continuity **********	FecalColiform LogN
Initial Buildup	0.000
Surface Buildup	16.434
Wet Deposition	0.000
Sweeping Removal	0.000
Infiltration Loss	0.000
BMP Removal	13.375
Surface Runoff	16.434
Remaining Buildup	0.000
Continuity Error (%)	0.000

********** Flow Routing Continuity **********	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	3021.311	984.539
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	3021.311	984.539
Flooding Loss	0.000	0.000

Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

********** Quality Routing Continuity **********	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs
Dry Weather Inflow	0.000	0.000	0.000	0.000	0.000
Wet Weather Inflow	673452.813	575420.615	147.697	1115.253	1029.092
Groundwater Inflow	0.000	0.000	0.000	0.000	0.000
RDII Inflow	0.000	0.000	0.000	0.000	0.000
External Inflow	0.000	0.000	0.000	0.000	0.000
External Outflow	672809.009	574829.415	147.555	1114.106	1028.051
Flooding Loss	0.000	0.000	0.000	0.000	0.000
Exfiltration Loss	0.000	0.000	0.000	0.000	0.000
Mass Reacted	0.000	0.000	0.000	0.000	0.000
Initial Stored Mass	0.000	0.000	0.000	0.000	0.000
Final Stored Mass	0.000	0.000	0.000	0.000	0.000
Continuity Error (%)	0.096	0.103	0.096	0.103	0.101

********** Quality Routing Continuity **********	FecalColiform LogN
Dry Weather Inflow	0.000
Wet Weather Inflow	16.434
Groundwater Inflow	0.000
RDII Inflow	0.000
External Inflow	0.000
External Outflow	16.433
Flooding Loss	0.000
Exfiltration Loss	0.000
Mass Reacted	0.000
Initial Stored Mass	0.000
Final Stored Mass	0.000
Continuity Error (%)	0.085

****
Highest Flow Instability Indexes
****
All links are stable.

Alternative 2 (Planter Box & Lined Bioretention with Underdrain) Continuous Simulation

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
NorthofWashington	300.74	0.00	48.83	91.90	174.48	484.10	1417.31	0.580
SouthofWashington	300.74	0.00	64.10	46.57	197.31	499.43	1077.30	0.656
Site	300.74	0.00	75.14	62.30	192.38	0.94	2.80	0.640

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
Site	PlanterBox	3995.97	646.08	0.00	84.99	3273.06	8.90	1.77	-0.03
Site	LinedBioretention	3717.21	451.82	0.00	27.77	3243.77	5.95	0.85	-0.03

****
Subcatchment Washoff Summary
****

Subcatchment	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
NorthofWashington	313104.653	287521.711	69.165	557.786	506.152	16.052
SouthofWashington	360307.026	287852.283	78.519	557.416	522.723	16.201

Site	41.156	46.646	0.013	0.050	0.216	11.828
System	673452.835	575420.641	147.697	1115.253	1029.092	16.434

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
GrandCanal	JUNCTION	0.00	0.00	2.00	0 00:01	0.00
Upstream	JUNCTION	0.00	0.00	0.00	0 00:00	0.00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
GrandCanal	JUNCTION	1080.10	2497.41	9124 15:05	500	984	0.000
Upstream	JUNCTION	1417.31	1417.31	9124 15:05	484	484	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GrandCanal	JUNCTION	309648.00	0.000	0.000
Upstream	JUNCTION	309648.00	0.000	0.000

****

Node Flooding Summary
****

No nodes were flooded.

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Connection	DUMMY	1417.31	9124 15:05			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

****
Link Pollutant Load Summary
****

Link	TSS lbs	COD lbs	Copper lbs	Lead lbs	Zinc lbs	FecalColiform LogN
Connection	3.125e+005	2.869e+005	69.023	556.639	505.111	16.051

Analysis begun on: Thu Feb 04 05:44:17 2016
Analysis ended on: Thu Feb 04 05:45:44 2016
Total elapsed time: 00:01:27

APPENDIX E
VENICE AUXILIARY PUMPING PLANT DESIGN, PRELIMINARY DESIGN REPORT

ENGINEERING
CITY OF LOS ANGELES

Venice Auxiliary Pumping Plant Design



Preliminary Design Report

Revised: January 2016

ARCADIS

ARCADIS Design & Consultancy for natural and built assets

Imagine the result

ENGINEERING
CITY OF LOS ANGELES

Los Angeles Department of Public Works – Bureau of Engineering (LADPW-BOE)

Venice Auxiliary Pumping Plant (VAPP)

Preliminary Design Report (PDR)

December 2015

Rev.: January 2016

ARCADIS



Brian J. Leto, PE #80821, BCEE
Project Manager

LADPW BOE – Venice Auxiliary Pumping Plant Project

Preliminary Design Report

Prepared for:
Los Angeles Department of Public Works – Bureau of Engineering

Prepared by:
ARCADIS U.S., Inc.
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California 90071
Tel 213 486 9884
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Our Ref.:
06332002.0000

Date:
December 2015

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1. Executive Summary

1.1 Introduction

The City of Los Angeles (City) currently owns and operates the Venice Pumping Plant (VPP) near the Ballona Lagoon and Venice Beach. The pumping plant is the City's largest pumping plant and is considered a critical facility to convey sewage from the tributary area.

Heavy storms during the 1994-1995 and 2004-2005 resulted in periods of heavy rainfall, infiltrated stormwater, and high sewage flows, which put the VPP within minutes of overflowing into the lagoon. One or more pumps at VPP are occasionally out of service for extended periods which would put the VPP at serious risk during peak wet weather flow conditions.

The main objectives of the Venice Auxiliary Pumping Plant (VAPP) Project are as follows:

- Provide a new pumping plant adjacent to the existing VPP that will house three pumps of similar capacity as the existing pumps at VPP.
- Provide a new electrical building with lavatory, control and server rooms, electrical/mechanical rooms, and a generator room.
- Provide a 24 KW Tier 4 Final Certified Emissions diesel generator.
- Provide site security for both VPP and VAPP.
- Provide VPP and VAPP control capabilities from both VPP and VAPP.

1.2 Related Projects

The following projects are related to the construction of the VAPP Project:

- Manifold Replacement Project
  - Existing manifold was replaced with a new 60-inch steel manifold with connections to the VPP, the existing 48-inch force main, and stub-outs for the VAPP and future 54-inch force main.
- Venice Dual Force Main Project
  - A new 54-inch force main will tie into the new manifold and will discharge at a junction box near the Hyperion Treatment Plant. The new force main will be provided to add capacity and redundancy to the existing 48-inch force main.
- Electrical Generator Upgrades Project
  - The existing generators at VPP, two 750-kW and one 1500-kW, will be replaced to meet Tier 4 Final Certified Emissions.
- Distributed Control Systems Replacement Project

- The City-wide Distributed Control Systems (DCS) replacement program known as LAWINS will be replacing the existing local controllers and aging remote monitoring system with a Honeywell-based DCS.

1.3 Pump Station Design

Current peak flows for VPP and VAPP are as follows (Development of a Conceptual Plan for an Auxiliary Pumping Facility Alternative for the Venice Pump Plant, Carollo, 2014):

- Ultimate Peak Wet Weather Flow: 87 MGD (Design based on 10-year storm event)
- Ultimate Peak Dry Weather Flow: 71 MGD
- Current Peak Wet Weather Flow: 55 MGD (January 6, 2009)
- Current Peak Dry Weather Flow: 36 MGD
- Minimum Low Dry Weather flow: 15 MGD (Design)

The main components of the pump station consists of the following:

- Diversion structure on the existing influent sewer
- Influent piping
- Concrete wet well
- Three submersible pumps
- Discharge piping valves and flow meters
- Sluice gate
- Generator
- Electrical Equipment
- Instrumentation and Controls

A complete hydraulic evaluation was performed. The evaluation was based on the following hydraulic scenarios:

Table 1.1 - Hydraulic Scenarios

Scenario	Pump Operating	FM Operating
A	1 pump / 2 pumps	48” FM only
B	2 pumps/3 pumps/4 pumps / 5 pumps	48” FM only
C	2 pumps/3 pumps/4 pumps / 5 pumps	54” FM only
D	2 pumps/3 pumps/4 pumps / 5 pumps	Both FMs
E	6 pumps/7 pumps/8 pumps	Both FMs

Based on the hydraulic evaluation the results were reviewed with multiple submersible pump manufacturers (Flygt, KSD, and ABS). Flygt’s model CP 3531/905 with a 500-HP is shown in the following two figures below. Refer to **Section 5** for pump curves for KSD and ABS.

Figure 1.1 - Dual Force Main Operating - 1 & 2 Pumps (Flygt)

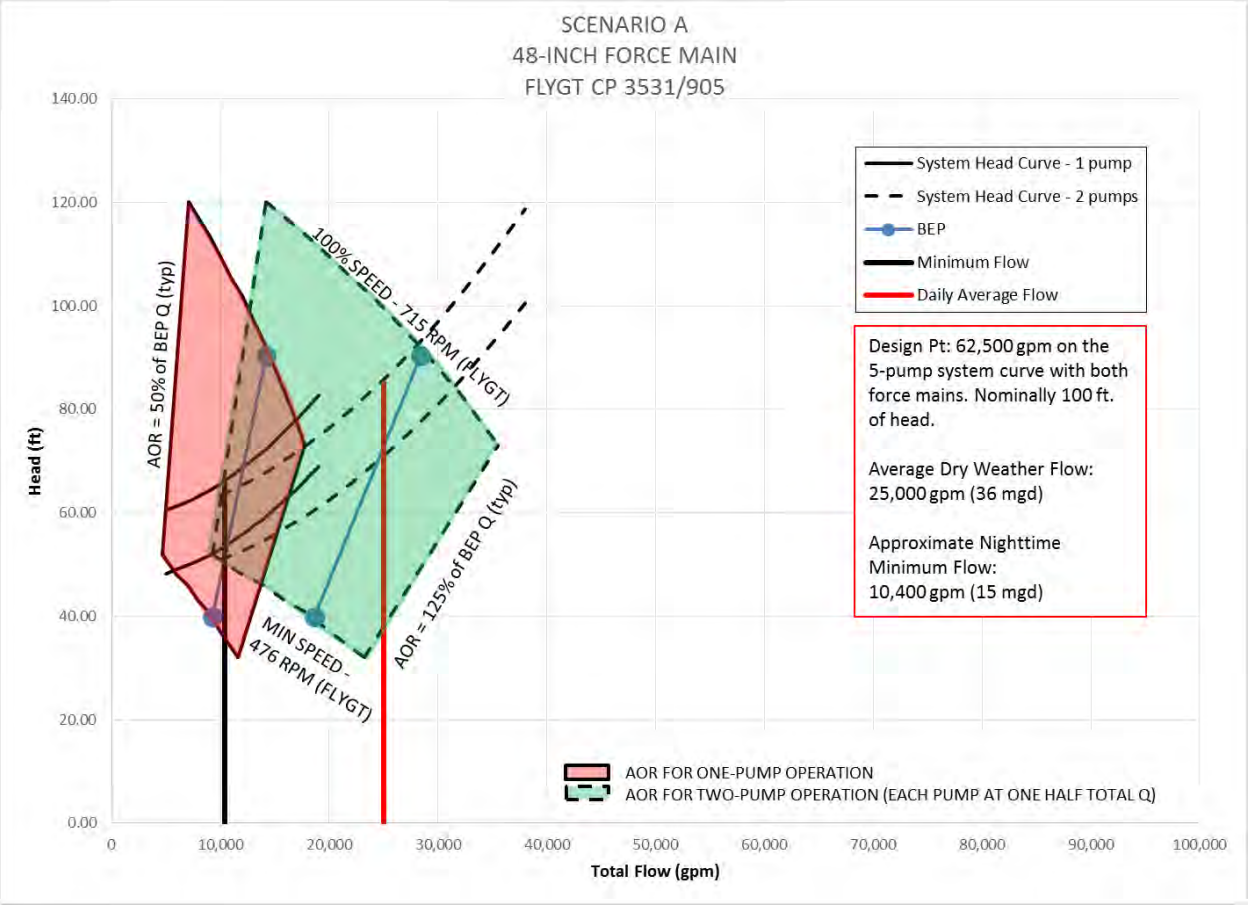
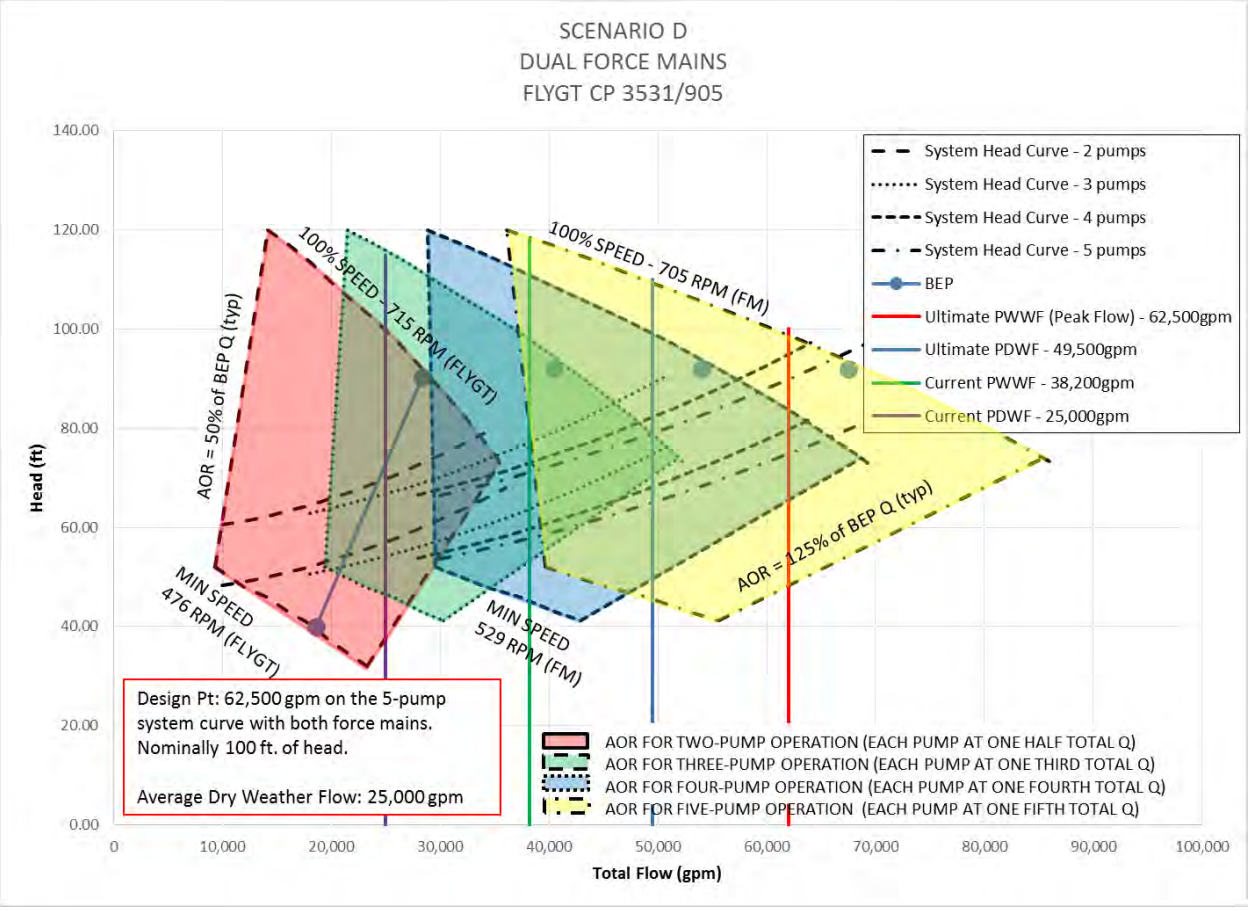


Figure 1.2 - Dual Force Main Operating - 4 & 5 Pumps (Flygt)



After reviewing pump curves from several manufacturers, we concluded Flygt pump was the best selection for this application. Its operating points are the closest to the best efficiency point lines while staying to the right of the BEP lines and provides the best system curve coverage. The following table summarizes the motor size and best hydraulic efficiency for each pump.

Table 1.2 - Motor Information

Manufacturer	Max Required Shaft Power by Pump	Motor Rating (input power)	Best Hydraulic Efficiency
ABS	405	449	82.5%
Flygt	410	500	84.2%
KSB	440	493.5	82.3%

1.4 Site/Civil Design

The VAPP will be located north of the existing VPP across Hurricane Street. The site for the VAPP is approximately 0.18 acres. Improvements include a two-story 50 foot by 25 foot area electrical building, a pump station with associated piping, electrical and security improvements. East of VAPP a small pocket park will be created.

Overhead power lines through the VAPP site will be routed south, along the western property line crossing Hurricane Street, and turning east along Hurricane Street in close proximity to VPP.

Potable water, sewer, electrical and communications will be needed for VAPP. It is anticipated that most connections will be made along Canal Court to avoid conflicts with the manifold and the pump stations.

1.5 Site Security

The VPP site is secured, but it does is not equipped with access monitoring or video surveillance. An access control and video surveillance system will be provided for VPP and VAPP to protect operators working between the two sites.

Features of the security design will include the following:

- Access control and monitoring
- Video surveillance
- Network features

Major equipment list includes:

- Fixed and pan/tilt/zoom video cameras
- Digital video recording equipment
- Computer workstation(s)

1.6 Building Design

The VAPP building will include electrical, mechanical, control, server, generator, and lavatory rooms. Perimeter walls will be reinforced concrete with cool roofing system above the second floor. Finishes include architectural stamped concrete, reveals and architectural impressions. Metal awnings will be provided above each exterior door. Materials will be selected to ensure that oxidation is kept to a minimum.

Interior features include furred walls with insulation and painted gypsum board finishes in occupied spaces, resilient flooring in occupied spaces, and either sealed concrete or sustainable flooring such as epoxy coating in other spaces. A clean agent system will be provided for fire protection.

1.7 Electrical Design

The electrical design required for the VAPP Project will include providing two new 480V services from the two existing 34.5KV primary circuits that serve VPP. A new 34.5KV switching cabinet, two new 34.5KV-480V transformers and two new secondary 480V pull sections will also be provided. Two circuit breakers at the existing VPP will be replaced with two 480V, 1600A power circuit breakers and connected to the VAPP 480V power switchgear. The electrical system will be provided with a 480V motor control center (MCC) to distribute 480V power to common loads.

A small diesel generator will provide backup power to VAPP critical loads in the event of loss of power from LADWP. The generator will provide 24KW of power at 120/240V for lighting, the SCADA system, security and access control system, and air conditioning for the VAPP control and server room.

Major electrical equipment for VAPP is as follows:

- 480VAC switchgear, in a main-tie-main arrangement
- 480VAC MCC for auxiliary equipment
- 500HP rated VFDs with reduced voltage soft start bypass motor controllers

1.8 Instrumentation and Control Design

The VAPP and VPP will operate as a single pump station with their respective wet wells hydraulically linked with similar elevations and even flow split. The VAPP will be monitored and controlled by a local programmable logic controller (PLC). A distributed control system (DCS) will collect information and provide operator interface. The VAPP will operate similar to the existing VPP. The VPP will be integrated into the VAPP network and DCS.

The design of the communications network will include electronic communications for all equipment at the VPP and the VAPP.

1.9 Project Delivery

An important requirement for this project is to install the diversion structure in the Grand Canal. It is important to maintain the existing operation of the VPP while construction for VAPP is implemented. Important below grade preliminary construction sequencing has been developed for this project and is included in this report.

Following City's approval of the Preliminary Design Report for this project, anticipated to be by December 2015, the design and construction of this Project is expected to proceed as follows:

- Detailed Design: December 2015 through September 2016.
- Approval to Construct: January 2018
- Notice-to-Proceed: February 2018
- Substantial Completion: December 2019
- Final Completion: February 2020

The Class C construction cost estimate for this project is **$16,011,000**. The cost opinion was developed using equipment vendor quotations (for major equipment), previous cost data, unit costs and RS Means cost estimating guides as necessary, and is based upon preliminary information defined for equipment selection and layout, piping requirements and routing, mechanical, electrical and instrumentation requirements.

2. Introduction

2.1 Project History and Background

The City of Los Angeles (City) currently owns and operates the Venice Pumping Plant (VPP) near the Ballona Lagoon and Venice Beach. The pumping plant is the City's largest pumping plant and is considered a critical facility to convey sewage from the tributary area.

Per the VPP Dual Force Main Environmental Impact Report (December 2007), heavy storms during 1994-1995 and 2004-2005 resulted in periods of heavy rainfall, infiltrated stormwater, and high sewage flows which put the VPP within minutes of overflowing into the Ballona Lagoon. Peak wet weather flow conditions were met because the City had all five of the VPP pumps running at full capacity. However, one or more pumps at the VPP are occasionally out of service for extended periods which would put the VPP at serious risk during peak wet weather flow conditions.

The City has contracted with ARCADIS for engineering services necessary to increase the pumping capacity and redundancy to allow maintenance to take place without compromising the City's ability to maintain pump station performance during peak wet weather flows.

2.2 Description of Existing Facilities

Flow enters the VPP via a single 66-inch reinforced concrete sewer pipe which discharges into two existing wet wells. Wet well No. 1 serves Pumps 1 through 4, and wet well No. 2 serves Pump No. 5.The VPP includes five (5), 400-hp dry pit centrifugal pumps. The design capacity of each pump is 18 million gallons per day (MGD) at 100 feet total dynamic head (TDH). The pumps are served by a new 60-inch manifold connecting a 48-inch force main and a future second 54-inch force main. Both force mains would be used to convey flows from VPP and VAPP to a diversion structure two miles to the southeast, near the intersection of Vista Del Mar and Gills Street, and ultimately to the Hyperion Treatment Plant (HTP).

2.3 Purpose

The purpose of this Preliminary Design Report (PDR) is to present the basis of design for the Venice Auxiliary Pumping Plant (VAPP), which includes a two-story electrical and control building, three (3) 18-MGD submersible pumps, a diversion structure, and a valve and metering vault.

3. Related Projects

3.1 Manifold Replacement Project

The VPP Discharge Manifold Replacement Project began construction in summer of 2012. The project consists of removing the existing manifold structure and installing a new 60-inch steel manifold with connections to the VPP, the existing 48-inch force main, and stub-outs at both ends for connection to the future 54-inch force main and the VAPP. Construction was completed in August 2015.

3.2 Venice Dual Force Main

The City is in the process of designing and constructing a 54-inch diameter force main in the same vicinity, known as the Venice Dual Force Main Project. The new pipeline alignment will cross Grand Canal from VPP northerly along Hurricane Street to Marquesas Way, then southerly along Via Marina crossing the Marina Del Rey and Ballona Creek Channels to the Coastal Interceptor Sewer (CIS) Diversion Structure on Vista Del Mar near Waterview Street. See **Figure 3.1** for the 54-inch force main route. The new force main will operate as a parallel system in conjunction with the existing 48-inch force main to meet the peak wet weather flow demands experienced at VPP, and to add operational flexibility and reliability. Construction on the Venice Dual Force Main project is expected to be completed in three years once all of the necessary permits have been obtained.

Figure 3.1 - 54-Inch Force Main Route



3.3 Electrical Generator Upgrades

The existing diesel-fueled standby engine-generators at VPP are aging and do not meet the anticipated future regulatory requirements of the Environmental Protection Agency (EPA) Tier 4 Final Certified Emissions Standards. Two new 750-kW Tier 4 rated generators and one new 1,500-kW upgrade for VPP are to be procured and installed through the Venice Dual Force Main Project. This project is currently in design.

3.4 Distributed Control Systems Replacement Project

The City-wide Distributed Control Systems (DCS) Replacement Program is an “in progress” effort known as LAWINS. The LAWINS program is the City-wide replacement of the existing local controllers and aging remote monitoring system with a Honeywell-based DCS. The new control room in the VAPP electrical building will serve as the new control center for DCS main servers and workstations, and as “base” for plant operators. As part of the LAWINS program, the existing process controls at the VPP will be converted to the Honeywell-based DCS system for local and remote control via the DCS workstations located at the VAPP control room.

4. Site Investigation Findings

4.1 Noise and Sound Analysis

ARCADIS conducted noise and sound monitoring at four sensitive locations at the project site. The Baseline Noise Measurement Memo showing the baseline noise levels surrounding the project site during non-construction hours is included in **Appendix A**.

ARCADIS will coordinate with the City and perform additional noise and sound analysis as needed.

4.2 Air Dispersion of Collection System/Wet Well Odors

The VPP is equipped with an exhaust fan that discharges vapors through an existing stack. Based on our preliminary evaluation, we are not anticipating major changes to the existing dispersion stack. However, field investigation of the ventilation fan shows that the flange connecting the fan to the dispersion stack is displaced and odors can exit through the gap at the joint. We recommend replacing the existing fan, with one of comparable capacity, and flange as part of the VAPP project.

Any odors in the Coastal Interceptor Sewer (CIS) piping will be confined to that piping system and be handled as they normally are at the VPP. When the VAPP is in operation, the head spaces of the wet wells are linked by the 66-in sewer, and the exhaust fan can service the entire system. No additional odor control measures are anticipated.

4.3 Surveying

Survey of the VAPP site was completed on April, 20th, 2015. Refer to Topographic Survey in **Appendix B**. Additional survey of Hurricane Street and VPP will be included in the final PDR.

4.4 Permitting Requirements

Permit requirements for the project will be coordinated with LADPW and the Environmental Management Group as needed. **Table 4.1** lists the anticipated permits for the VAPP Project.

Table 4.1 – Anticipated Permits

Agency	Permit
LA Planning Department	Zoning Change
LA Planning Department	CDP-1
California Coastal Commission	CDP-2
USACE	Section 10 or 404 (NW 2, 12, 33)
California Regional Water Quality Control Board	NPDES SWPPP
California Regional Water Quality Control Board	401C Certification
U.S. Fish & Wildlife	Notification
National Marine Fisheries Service	Consultation/Notification
California Department of Conservation, Division of Oil, Gas and Geothermal Resources	Construction Notification
California Department of Health Services	Title 22 Compliance, Section 64630 (via LA County Environmental Services Division
City Department Cultural Affairs	Design Review
California AQMD	Permit to Construct and Permit to Operate
City BOE “B”	Permit for Major Street Construction
City BOE “E or U”	Permit for Excavation in City Streets
City BOE “W”	Permit for Construction in a Watercourse
City Building & Safety	Plan Checks

5. Pump Station Design

5.1 Design Flows

The VPP and VAPP will have an ultimate peak flow capacity of 87 MGD which is based on the ultimate wet weather flows (10-year storm event). This flow was determined by the City's peak wet weather modeling results (Development of a Conceptual Plan for an Auxiliary Pumping Facility Alternative for the Venice Pumping Plant, Carollo, 2014). The current peak wet weather flow was provided by LADPW historical data for the VPP, dated January 06, 2009. The summary of the flows below are the basis of design for the VAPP.

- Ultimate Peak Wet Weather Flow: 87 MGD (Design)
- Ultimate Peak Dry Weather Flow: 71 MGD
- Current Peak Wet Weather Flow: 55 MGD (January 6, 2009)
- Current Peak Dry Weather Flow: 36 MGD
- Minimum Low Dry Weather Flow: 15 MGD (Design)

The VAPP will include three submersible pumps designed to operate in a wastewater environment. They will have the ability to pass 4-inch diameter solids. Further details on the pumps are included in the sections below.

5.2 Major Process Components

The VAPP major process components include the following:

- Diversion structure on the existing influent sewer
- Influent piping
- Concrete wet well
- Three submersible pumps
- Discharge piping valves and flow meters
- Sluice gate
- Electrical equipment
- Generator
- Instrumentation and Controls

The diversion structure will be constructed around the existing influent sewer. The diversion structure will be made of concrete with a City approved plastic liner, and a shaped invert to direct the flow to either the VPP or the VAPP. Access shall be provided via a manhole connecting the diversion structure to the wet well. Additionally, no permanent means to isolate flow to either VPP or VAPP will be provided within this diversion

structure. If isolation of the VPP is required, a temporary plug could be provided in a manhole downstream of the new diversion structure. The VAPP will have a slide gate at the wet well that will be used for isolation.

Influent piping will be provided from the new diversion structure to the new wet well. The pipe will be concrete cylinder pipe lined to protect from corrosion due to hydrogen sulfide. Concrete structures that are exposed to the sewage will also be lined.

The wet well will be a below-grade structure that will contain the wastewater prior to pumping. Access will be limited to this structure, and hatches will be provided for maintenance access. Refer to the drawings in **Appendix B** for additional information on the wet well structure.

The discharge valves and piping will be made of ductile iron. The interior will be lined to protect from wear and corrosion. Check valves will be provided on each discharge line downstream of the pumps. Flow meters will then be installed to confirm flow from each pump. Isolation valves will be provided on each line in order to isolate the pumps, check valves and flow meters for maintenance. All of the valves and flow meters will be located just below grade in a concrete vault. Access hatches will be provided to maintain the equipment.

5.3 Operations & Maintenance Requirements

The VAPP will have three pumps installed and available to operate all times. The operation of the VAPP will be similar to the VPP. The pumps will adjust speed in order to meet a wet well level set point. Three submersible pumps will be provided with variable frequency drives (VFD) that will adjust motor speed to vary discharge flows. Sufficient overlap of pump operating ranges will be provided so that each pump flow condition will allow for the most efficient pump operation.

The VPP and the VAPP will operate independently with separate controls, but because they are located close together and connected via the influent sewer, they will act as one large wet well. The set points for the pumps for each station need to be reviewed and adjustments made during start-up in order to achieve this objective. Ideally the pumps will operate to maintain a constant water surface level using the VFDs and a set of pump operational parameters (e.g. lead, lag 1, lag 2 etc.). The control system will also provide the ability to operate each pumping plant independently if one of the pumping plants needs to be taken out of service for maintenance.

The VAPP will have the ability to be isolated from the influent sewer by a slide gate located at the entrance to the wet well. VPP does not have the capabilities to be isolated, therefore, in order to isolate the VPP for wet well maintenance, a temporary plug will be required at the upstream manhole, otherwise VPP will remain operational at all times.

The VPP currently discharges into a single 48-inch force main. The City is in the process of designing and constructing a second 54-inch force main. Therefore, the VAPP will need to be able to pump through one or both force mains at varying flow conditions. The force main manifold is equipped with motorized valves that can direct flow to each force main. It is anticipated that the control system will open and close the force main isolation valves as required to maintain flows within a minimum and maximum velocity range. The ideal force main velocity range is between 3 feet per second (FPS) to 8 FPS; the low flow limit is to keep solids suspended, and the high flow limit is to prevent pipe scour. Based on this range, **Table 5.1** outlines the suggested force main operational range.

Table 5.1 - Force Main Operating Range

Force Main	Low Flow Limit (3 FPS)	High Flow Limit (8 FPS)
Existing 48-inch	16,900 GPM (24.4 MGD)	45,099 GPM (64.9 MGD)
New 54-inch	21,400 GPM (30.8 MGD)	57,078 GPM (82.2 MGD)

The City will have flexibility once the second force main is operational. Operating outside the ranges is permissible for limited periods of time. Based on a low flow of 10,400 GPM (15 MGD) it is recommended to operate only one force main. A second force main should be used as a back-up, or during wet-weather periods. The control system can be set up to do this operation automatically.

The maintenance requirements for the VAPP process equipment will mainly focus on the submersible pumps. It is recommended that each pump be pulled once per year for inspection. The design will allow for disconnection of the cables at the wet well. This will allow for cable removal without going all the way back to the VFDs in the electrical building.

5.4 Process Mechanical Considerations

It is important that all process mechanical material selection is suitable for sewage and saline environments. It is specifically important in raw wastewater facilities. The design will incorporate corrosion resistant coatings for concrete and piping where appropriate. 316 Stainless steel and approved plastic liners will be specified for components that are directly exposed to wastewater.

The design layout will also consider the need to operate and maintain the process equipment. The need for jib cranes, access hatches, hook points and maintenance space have all been reviewed and will be incorporated where appropriate.

The design of the wet well is based on the latest version of the Hydraulic Institute standards (HI 9.8). The approach length and pitch of the influent sewer are specifically designed to minimize air entrainment and turbulent flow conditions. When flow enters the wet well, there is a baffle structure that will direct the water to the pump intakes. For additional information on the wet well configuration, see the drawings in **Appendix B**.

5.5 Physical Model of Influent Sewer, Wet Well and Pump Intakes

Given the size and configuration of the VAPP, it is recommended that a physical hydraulic model be constructed in order to optimize the intake design. ARCADIS will utilize an independent laboratory to conduct a physical hydraulic model study of the VAPP to optimize the design. A separate report will be issued once the physical modeling is complete. The physical model will not be completed in time for its results to be incorporated in the final PDR; however, the physical model results will be incorporated in the detailed design.

5.5.1 Benefits of Physical Hydraulic Models

The pump manufacturer typically develops pump curves at the manufacturing facility. The head-flow curves, efficiencies, net positive suction head, and power requirements are usually determined by conducting a pump test with the actual prototype pump or a geometrically similar model. This pump test is conducted in a controlled environment with uniform approach flow to the pumps. Therefore, to ensure that the pump will perform as tested at the manufacturing facility; the prototype field installation must also have similarly uniform approach flow conditions.

Failure to provide these uniform approach flow hydraulics can result in pump performance that differs significantly from that predicted from the performance curves. The pump may not operate at its best efficiency point, flow or head may be less than expected, power requirements may vary, and if the approach flow conditions vary enough, significant damage could occur to the pump itself.

Pump sumps are often designed to adhere to the 2012 Hydraulic Institute Standards (HI 2012). A consortium of pump manufactures, engineers, and end users developed these standards. Failure to adhere to these standards can lead to a number of problems including air entrainment, vortex activity, skewed velocity distributions and turbulence at the pump impeller. Research has shown that these conditions can lead to fluctuating loading on pump impellers, vibration, cavitation, and decreased flow and efficiency (Sweeney and Rockwell 1982).

Physical models are used to evaluate the level of temporal velocity fluctuations, or turbulence, within the pump bell. Changes in pressure are directly related to changes in velocity. Therefore, velocity fluctuations, whether temporal, or as a result of skewed approach flow, can cause pressure fluctuations on the pump

impeller. These pressure fluctuations translate into a loading imbalance on the pump shaft, possibly causing vibration or pre-mature bearing wear.

Physical models are also used to evaluate the uniformity of the flow within the pump bell. Should more flow be traveling down one side of a pump bay than the other, such as that which occurs when there is flow separation at the bay entrance, the velocity may be higher on one side of the impeller or the other. This may cause pre-swirl of the flow entering the pump. Depending on the direction of the pre-swirl relative to the pump rotation, this may cause the pump to consume more or less power than anticipated, resulting in the pump operating at a point other than its best efficiency. The pre-swirl may also result in the flow hitting the impeller blade at an angle of attack other than what it was designed for. This can result in localized flow separation on the impeller. These separation zones can cause low-pressure regions, which result in localized areas of cavitation.

In addition to evaluating turbulence and flow uniformity, conducting the physical model may result in reducing the length of lateral required from the gravity collector to the wet well and minimizing the dimensions of the wet well, both of which could result in direct construction cost savings for VAPP.

5.6 Hydraulic Analysis

A complete hydraulic analysis was performed on the VPP and VAPP systems to verify the VAPP pump head and flow requirements. Refer to the preliminary design calculations in **Appendix C**. We referenced the following documents:

- Venice Pump Plant at 39th Avenue and Esplanade Drawings (1958)
- 48-Inch Force Main in 39th Avenue Drawings (1959)
- Venice Pumping Plant Reconstruction Drawings (1985)
- Venice Dual Force Main Drawings (2014)
- TOS S64: Development of a Conceptual Plan for an Auxiliary Pumping Facility Alternative for the Venice Pumping Plant Technical Memorandum (Carollo, 2014)

The VAPP wet well elevation was modeled at (-) 14.1 to (-) 6.1; the discharge elevation range modeled was 40.5 to 44.5. This results in a static head of 46.6 ft. to 58.6 ft. between the VAPP and discharge diversion structure. Friction losses for the two force mains were modeled and resulted in the system head curves included in the figures in **Section 5.7**.

In order for all eight pumps to operate properly the friction losses at VPP need to be similar to the losses at VPP. All of the in-plant losses between the stations were taken into account. Friction losses include losses from valves and fittings inside each of the pump stations up to and including the manifold. All pumps have

the same design points to prevent one station from over powering the other with high flow and higher head losses.

We anticipate the final wet well level set point to be approximately (-) 10.1 when operating both VPP and VAPP. This will allow the water level to fluctuate approximately 4-ft and provide sufficient flexibility for the two wet wells to operate as one and prevent pumps chasing set points. The control system will be designed to adjust the VFDs appropriately so speed changes are controlled and within limits of the equipment.

Multiple hydraulic scenarios were reviewed as listed in **Table 5.2**.

Table 5.2 - Hydraulic Scenarios

Scenario	Pump Operating	FM Operating
A	1 pump / 2 pumps	48” FM only
B	2 pumps/3 pumps/4 pumps / 5 pumps	48” FM only
C	2 pumps/3 pumps/4 pumps / 5 pumps	54” FM only
D	2 pumps/3 pumps/4 pumps / 5 pumps	Both FMs
E	6 pumps/7 pumps/8 pumps	Both FMs

It was determined that scenarios A and D were the most critical to the design selection, so they are included in the figures in **Section 5.7**. Scenario A was selected because it shows the current condition and would provide for the higher head condition on the pumps if the larger force main was unavailable. Scenario D has two force mains operational and the maximum flow required (design condition).

Pumping systems develop transient hydraulic conditions (surge waves) when pumps start and stop. These conditions can damage piping systems if pressure ratings are exceeded. Currently, there are no known problems with transient/surge conditions at the VPP. Since the maximum flow rate through a single force main is not increasing, and the maximum velocity is decreasing as a result of the additional force main, transient conditions should not occur. If the force mains are operated in a manner that results in higher velocities, then new transient issues could develop. Since this is not the intended operation mode, and there are no known transient issues, ARCADIS does not anticipate a transient analysis is required. We suggest that this approach be confirmed during the upcoming PDR review meeting.

As requested in the RFP, the design point for the new pumps at the VAPP shall be 12,500 GPM (18 MGD) at 100 TDH each.

5.7 Pump Sizing and Selection

Following the hydraulic analysis task, the results were reviewed with multiple submersible pump manufactures (Flygt, ABS, and KSB). In the following sections, the pump curves of the most optimal product from each manufacturer are overlaid on the system curves for Scenarios A and D. The minimum and average daily flows are shown on the first figure for each pump manufacturer, and the peak flow is shown on the second. The shaded regions shown in the figures correspond to the Allowable Operating Region (AOR) for each pump operating scenario. The graphs illustrates the overlapping of flow coverage under various flow and head conditions that the pumps will experience. The circle points with the line connecting them represents the Best Efficiency Point (BEP) line for the particular pump. When selecting a pump, it is important to operate as close to this line as possible and determine the ultimate operation of the pumps based on this value. Refer to **Appendix D** for equipment cut sheets.

5.7.1 ITT Flygt

Flygt's model CP 3531/905 with a 500-HP is shown in the two figures below. The minimum and daily averages are shown on the first figure and demonstrate the operational range of this pump selection.

Figure 5.1 - Dual Force Main Operating - 1 & 2 Pumps (Flygt)

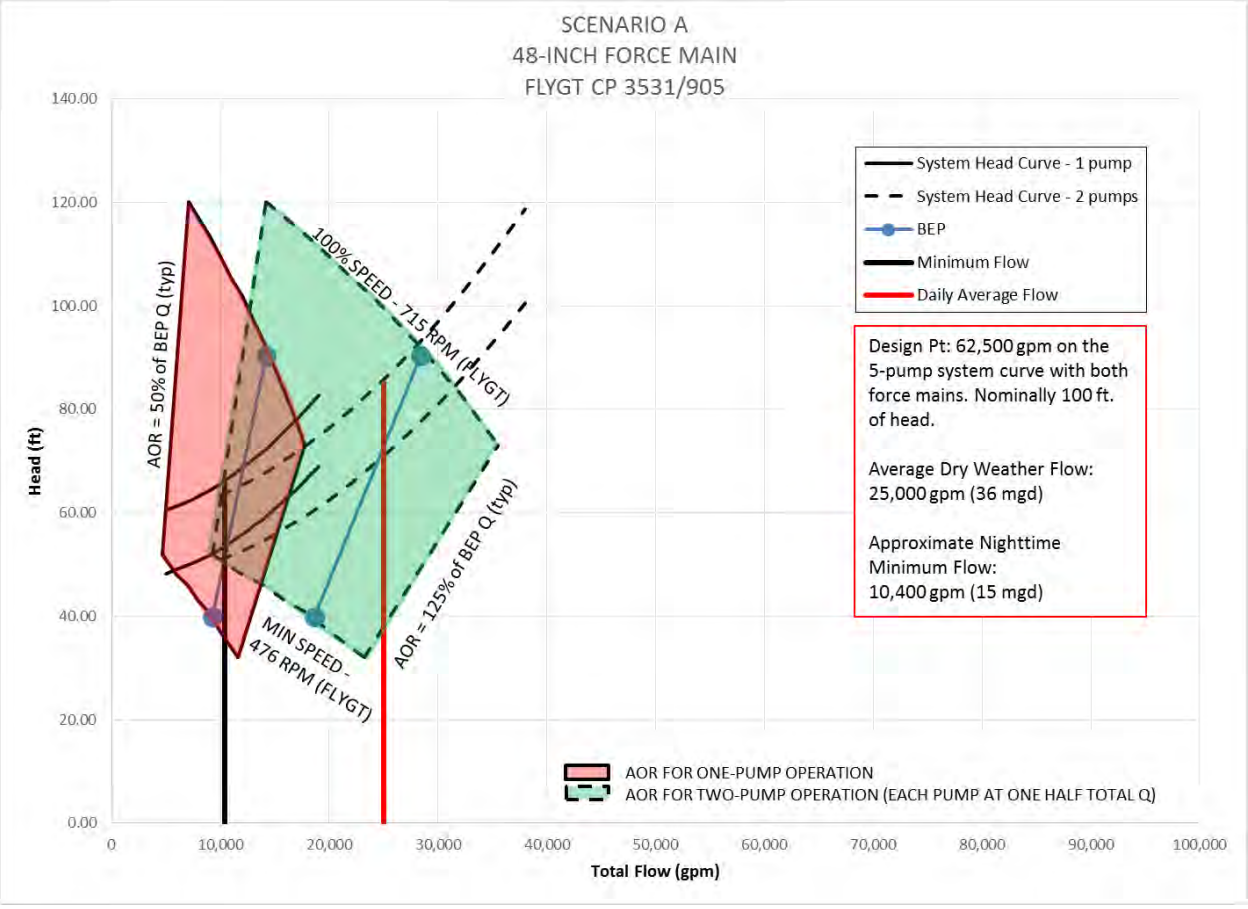
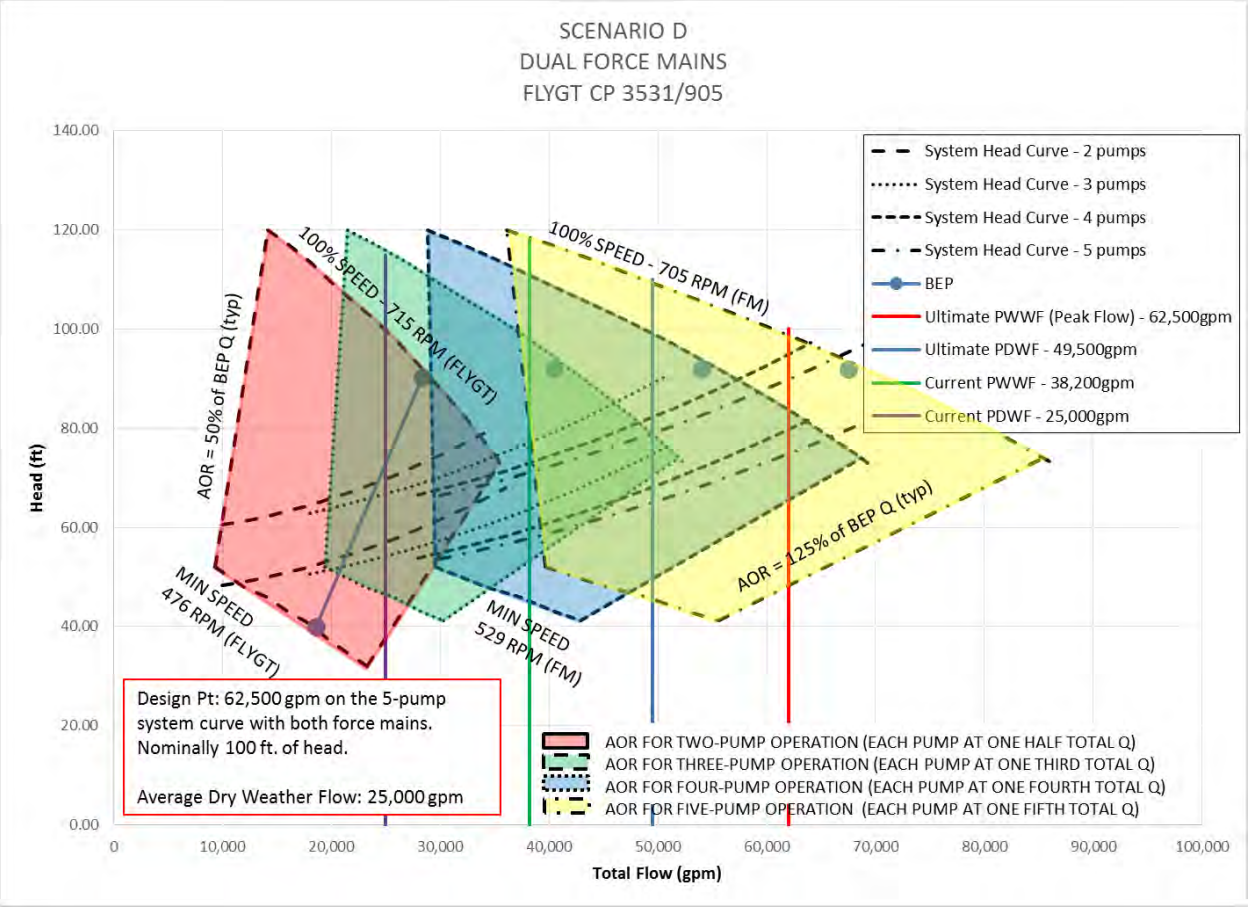


Figure 5.2 - Dual Force Main Operating - 4 & 5 Pumps (Flygt)



5.7.2 ABS

ABS's model AFP 5002 with a 450-HP motor was evaluated in the two figures below.

Figure 5.3 - Dual Force Main Operating - 1 & 2 Pumps (ABS)

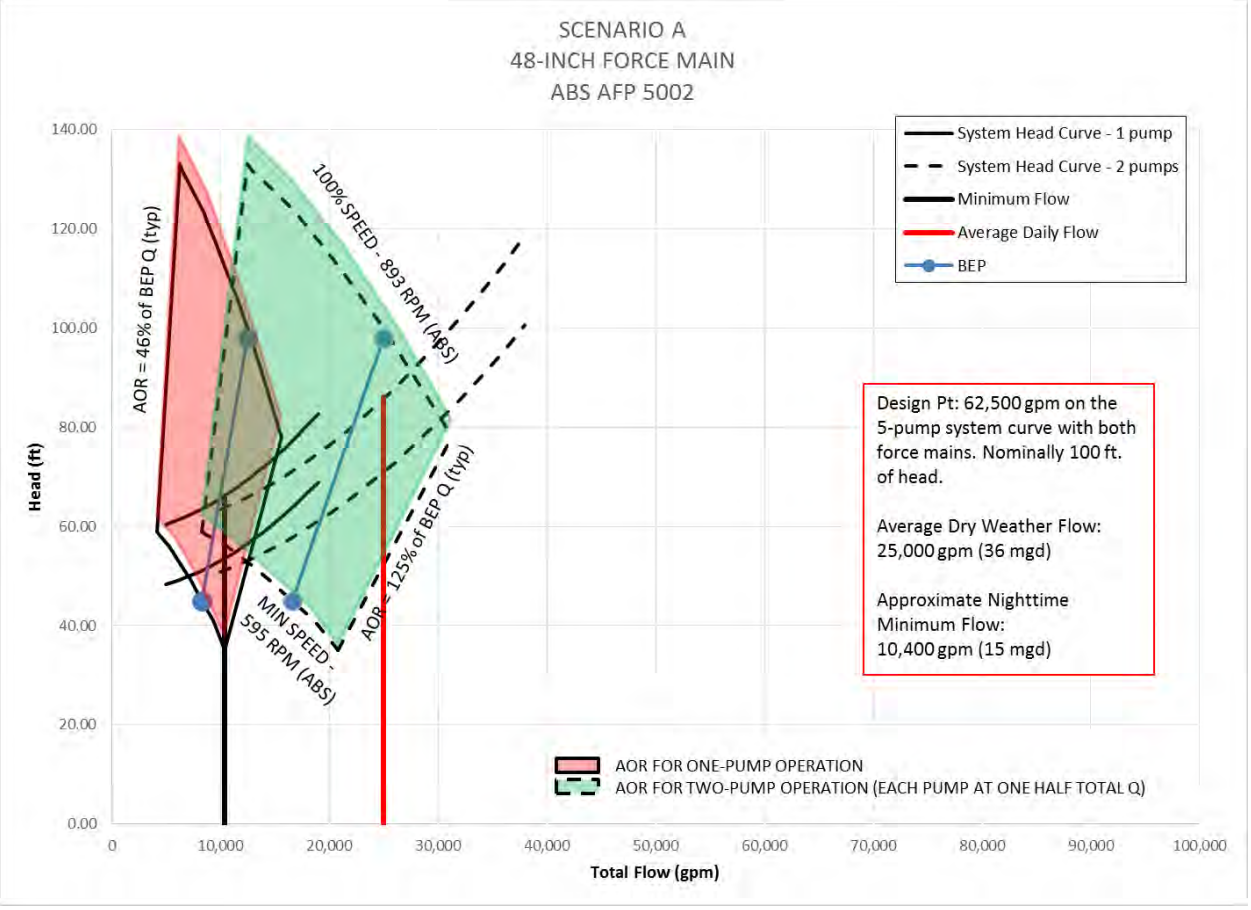
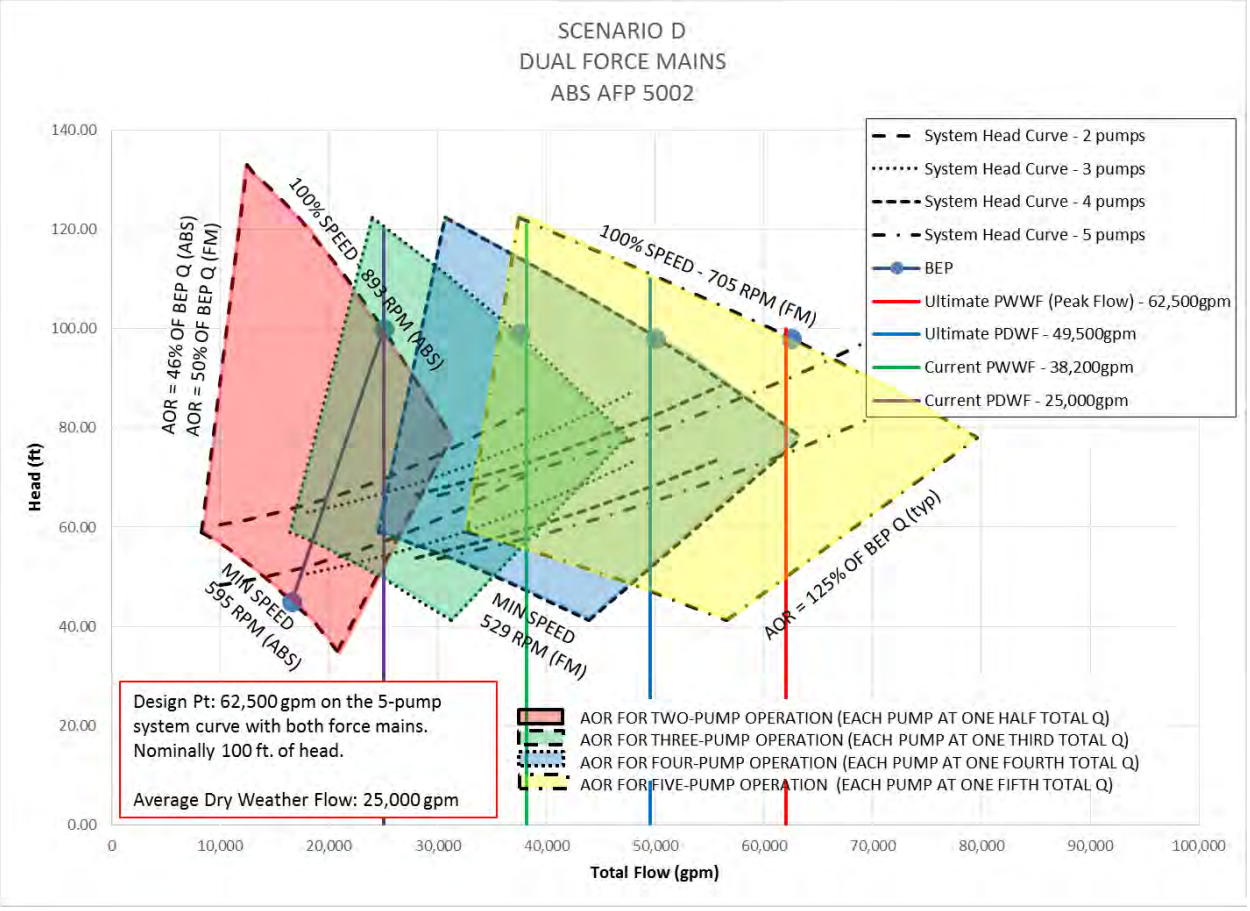


Figure 5.4 - Dual Force Main Operating - 4 & 5 Pumps (ABS)



5.7.3 KSB

KSB's model KRTK 400-710/3508UNG-S with a 500-HP motor was evaluated in the next two figures.

Figure 5.5 - Dual Force Main Operating - 1 & 2 Pumps (KSB)

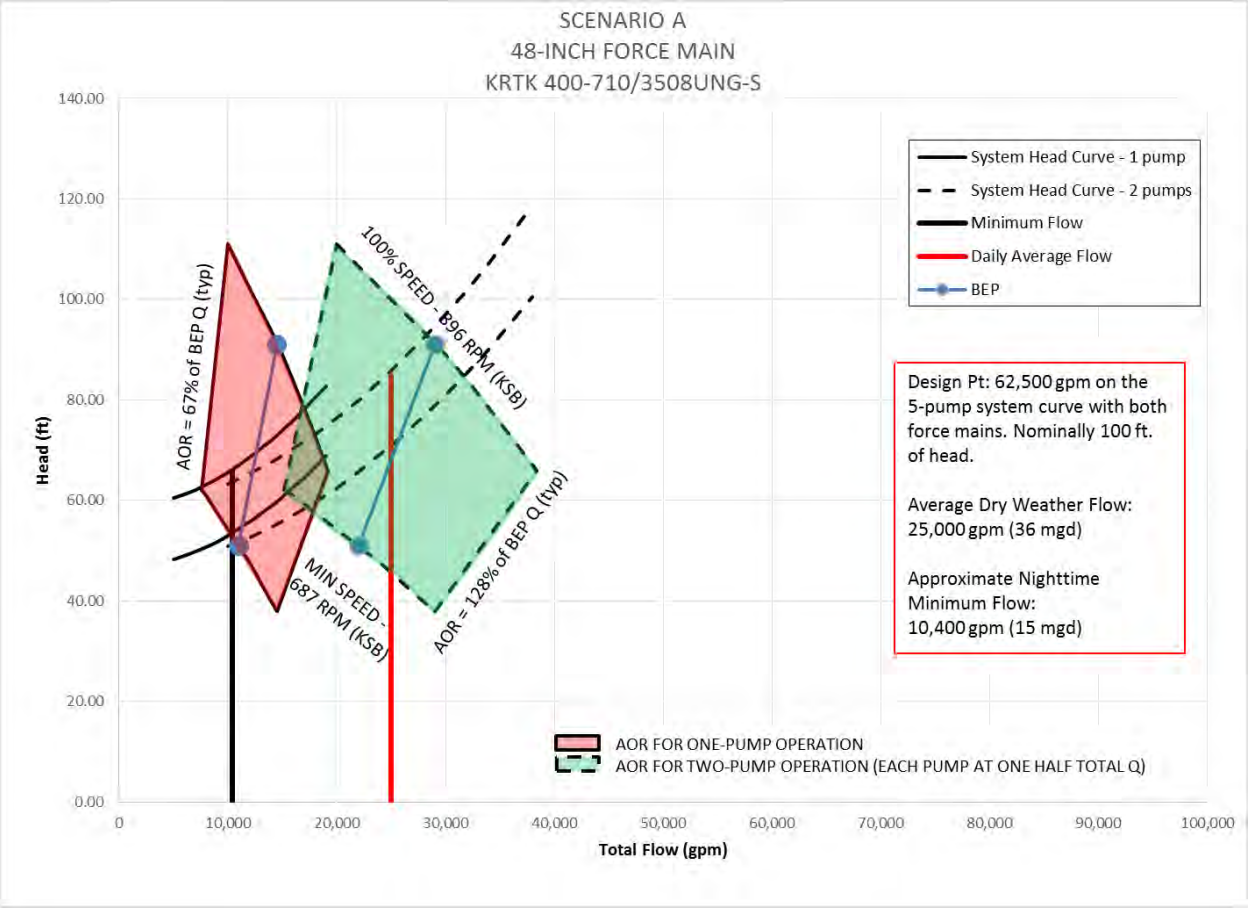
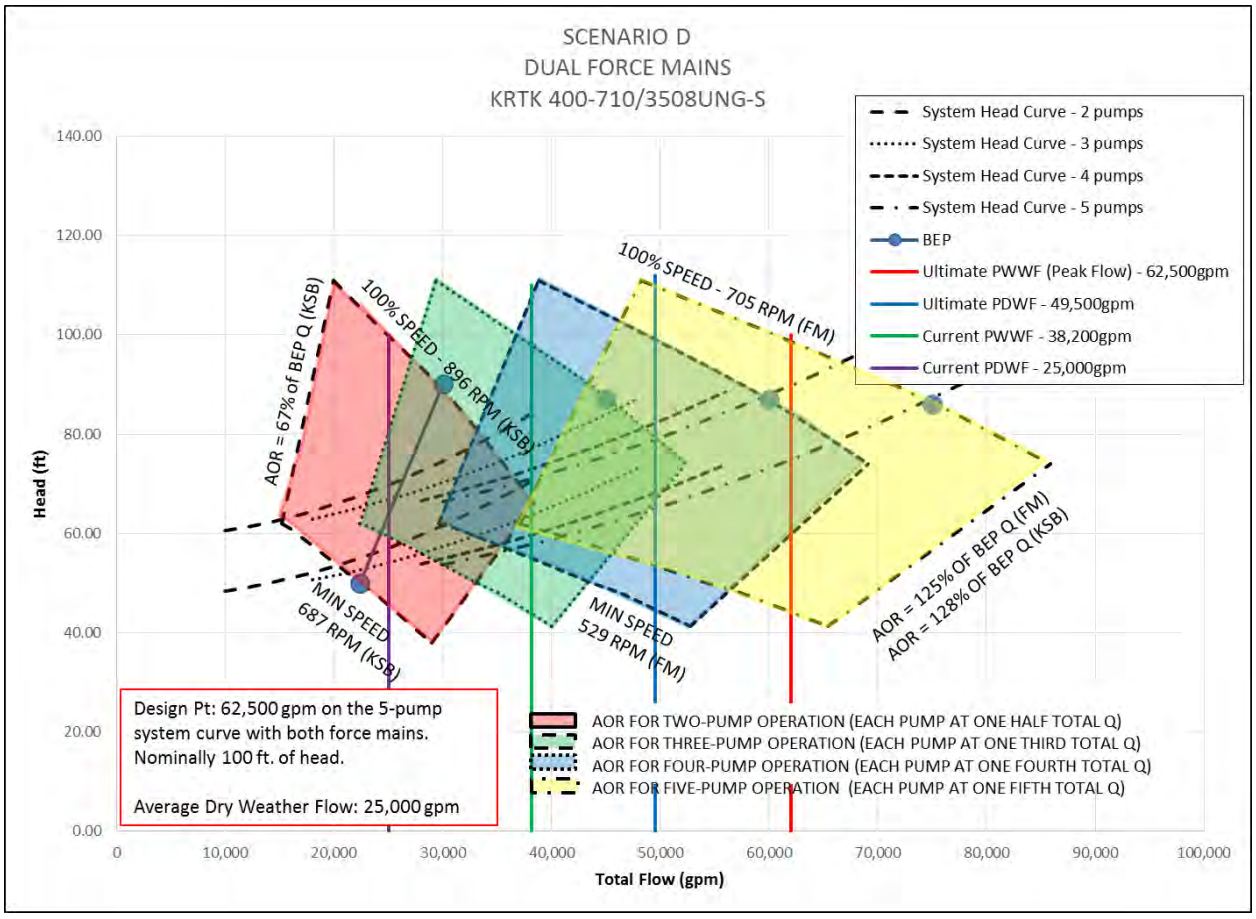


Figure 5.6 - Dual Force Main Operating - 4 & 5 Pumps (KSB)



5.7.4 Pump Summary Above Peak Design Flow

Table 5.3 summarizes the flows and heads when more than five pumps are operating. Based on the information presented to ARCADIS, these conditions have not occurred at the station, but the information is provided for reference.

Table 5.3 - Flow and Head with 6, 7, & 8 Pumps Operating

Manufacturer	6 Pumps			7 Pumps			8 Pumps		
	Max Flow		Head (ft)	Max Flow		Head (ft)	Max Flow		Head (ft)
	(gpm)	(mgd)		(gpm)	(mgd)		(gpm)	(mgd)	
Flygt	78,700	113.3	95	85,000	122.4	100	91,200	131.3	104
ABS	78,700	113.3	95	85,000	122.4	99	91,700	132.1	103
KSB	78,700	113.3	95	85,000	122.4	99	91,300	131.5	103

5.7.5 Discussion

After reviewing the data and pump curves, we concluded the Flygt pump was the best selection for this application; its operating points are the closest to the BEP lines while staying to the right of the BEP lines, and it provides the best system curve coverage. The ABS and KSB model pumps are acceptable and recommended to be included in the specification along with Flygt.

Table 5.4 summarizes the motor size and best hydraulic efficiency for each pump.

Table 5.4 - Motor Information

Manufacturer	Max Required Shaft Power by Pump	Motor Rating (input power)	Best Hydraulic Efficiency
ABS	405	449	82.5%
Flygt	410	500	84.2%
KSB	440	493.5	82.3%

The “Max Required Shaft Power by Pump” column is the maximum power that the pump needs to deliver to the shaft while operating over the entire pump curve. This is what’s on the nameplate. Note that the motor may be able to deliver more power to the shaft, but this is all that would be possible while staying on the pump curve. The “Motor Rating” column is the maximum power required to operate the motor.

5.8 Pump Design Criteria

Table 5.5 summarizes the design criteria for pump selection that will be included in the pump specification for the VAPP. The specification will be based on the information provided in this section for Flygt, KSB and ABS pumps presented, and all will meet these criteria.

Table 5.5 - Design Conditions

Design Flow at First Design Point (gpm)	12,500
Design Total Head at First Design Point (ft)	100
Minimum Pump Efficiency at First Design Point (percent)	80%
Min. Sphere Diameter (in):	4
Discharge Nozzle Dia. (in.):	20
Flow at Second Design Point (gpm)	8,000
Total Head at Second Design Point (ft)	58
Flow at Third Design Point (gpm)	15,000
Total Head at Third Design Point (ft)	70
Head at Zero Flow (ft)	>145
Motor Size (hp)	500
Maximum Speed (rpm)	900
Motor Voltage/Phase/Hertz	460 V/3 Ph /60 Hz

5.9 Connection of VAPP to Manifold

There are no plans to modify any of the existing piping located in the VPP. All modifications will begin at the manifold located in Hurricane Street. The existing manifold was constructed to accommodate a connection for the VAPP on the west side, and it included an isolation valve. The east side of the manifold is planned for the connection of the new 54-inch force main.

The VAPP piping material will match the new manifold. Piping will connect to the manifold with a 42-inch flange at the west end of the manifold. Piping will continue from the manifold back to the new valve vault at the VAPP. Refer to the Yard Piping Plan in **Appendix B** for additional details.

6. Site/Civil Design

6.1 General Arrangement / Site Plan Options

The VAPP will be located just north of the existing VPP, east of the intersection of Canal Court and Hurricane Street in Venice Beach, California. The VAPP site is approximately 0.18 acres in size. Proposed improvements include a two-story, 50-foot long electrical building, a pump station with associated piping electrical and security improvements.

The electrical building is located about 18 feet east of Canal Court, with the long axis oriented North 33º31'00" West, and is set back from the north property line about 18.5 feet. The pump station is to the east of the electrical building with the same long axis orientation and is separated from the electrical building by approximately 4.5 feet. HVAC equipment for the electrical building is located on the ground north of the electrical building. Discharge piping is below grade and oriented perpendicular and/or parallel to the VAPP. The finished floor elevation of the electrical building will be determined during the next phase of design. Beyond the east side of the site, a small pocket park will be created.

Overhead powerlines will be routed south along the western property line crossing Hurricane Street and turning east along Hurricane Street in close proximity to VPP. Refer to drawings in **Appendix B** for the preliminary site plan.

6.2 Grading

The VAPP site has a high point just west of the center of the site, and drainage is to the east from the center of the proposed development and from east to west on the north side of the development. Any stormwater currently flowing from the site is in a sheet flow condition with no concentration. The preliminary site plans in **Appendix B** shows the existing contours. The site elevation ranges from approximately 4 feet to 6.2 feet across the site. Recently, the site has been used as a construction staging area for improvements to the VPP; as such, natural drainage patterns are unknown.

Proposed grading for the site will slope away from the electrical building and pumping plant for a minimum of 5 feet and be directed via swales or similar surface features towards the canal. This follows the existing drainage pattern for the majority of the site.

6.3 Utilities

The following utilities will be needed for the VAPP site: potable water, sewer, electrical and communications. Please see **Section 10**, Electrical Design for information on the electrical requirements and **Section 11** for Telecommunication Network Design. Potable water will be provided for equipment washdown purposes and

for a lavatory that will be located in the electrical building. Sanitary sewer will be provided for the washdown water and for the lavatory. Record drawings and schematics will be used to determine the best connection points to existing utilities. It is anticipated that most connections will be made in Canal Court to avoid conflict with the manifold between the pump stations.

If conflicts are found with existing utilities, the design may change alignment of the proposed utility either vertically, horizontally or both to adapt to the existing environment. Required minimum separations will be maintained. In some cases, it may be more practical to re-route the existing utility. If this is the case, the proposed relocation would be designed and require approval from the utility owner. Close coordination with the electrical design will allow the design of other utilities to avoid conflict with the electrical requirements for this project.

6.4 Site Access

Site access will be from the west via Hurricane Street. A proposed 30-foot wide access road between the VPP and the VAPP will extend for approximately 70 feet between the two sites. It is anticipated that larger vehicles would either “pull in and back out” or “back in and pull out” using the adjacent Hurricane Street and Canal Street as a turnaround. There is insufficient room at the site to provide an on-site turnaround option. Smaller vehicles will be able to execute turning maneuvers within the 30-foot access road width. A total of two parking spaces will be provided at the end of the access road.

It is also anticipated that crane access will be required via the access road, including the parking spaces, to allow a crane to be able to access both the VAPP and VPP. The surcharge loading of the crane on the pavement could be significantly larger than typical H20 design loading; therefore, the largest anticipated crane and loading will be analyzed and used in the development of pavement design. Further, the pavement design may need to provide additional protection from this loading to existing utilities within the access road. These considerations will be factored into the pavement design.

Access to the pocket park from the VAPP site will be provided via a person gate in the fence on the east side of the site.

6.5 Landscaping

Due to the site having minimal open area, minimal landscaping will be required on site. Ground surfaces that are not covered with pavement or structures, shall be covered with a ¾-inch gravel or crushed stone to provide dust and erosion control. A pocket park east of the VAPP site will be landscaped similar to the surrounding areas.

7. Site Security

7.1 Existing Condition

The existing VPP has little to no security provisions. Some personnel doors have broken handles and/or broken locking mechanisms. At one time, there were functioning limit switches on some doors to monitor their position, but most appear to be non-functioning. There is no video surveillance equipment.

7.2 Design Approach

With the advent of the new VAPP Electrical Building and the possibility of no full-time staff at the VPP or VAPP, an access control and video surveillance system will be provided for the VPP and the VAPP to protect operators working between the two sites and for remote monitoring.

Features of the Site Security design will include the following:

- Access Control and Monitoring:
  - All external personnel doors at both facilities to have keyed locks.
  - All external personnel doors at both facilities to have card readers with electric door strikes (keyed locks will permit entry without card). This will require new hardware on existing doors at the VPP. If the existing doors at the VPP cannot be retrofitted, new doors with the appropriate hardware will be specified as part of the design.
  - All external personnel doors at both facilities to have two position switches each, with one reporting to the access control system and one reporting to the Honeywell-based programmable logic controllers at the VAPP and VPP.
  - One vehicle gate and two personnel gates to access the site will be opened/closed manually but will have two position switches each, with one reporting to the access control system and one reporting to the Honeywell-based programmable logic controllers at the VAPP and VPP.
  - A dedicated computer workstation will be provided in the VAPP control room to manage the access control system.
  - The access control system will function as a stand-alone system at the VAPP and VPP using the local telecommunications network. Connectivity of the VAPP and VPP access control system to the City's wide area network will be provided by the City.
  - Intruder detection/infrared sensors to be utilized inside the perimeter fence at the VAPP and VPP. These sensors will be monitored by the access control system.
- Video Surveillance:
  - Closed circuit cameras will be provided to permit an operator to view the VAPP and/or the VPP site and surrounding areas as well as the VAPP control room, VAPP and VPP electrical and mechanical rooms. Fixed and pan/tilt/zoom type cameras will be used.

- A dedicated computer workstation will be provided in the VAPP control room to manage and view the video surveillance system.
- The video surveillance system will function as a stand-alone system at the VAPP and VPP using the local telecommunications network. Connectivity of the VAPP and VPP video surveillance system to the City's wide area network will be provided by the City.

- Network Features:
  - Supporting equipment for site access control and video surveillance monitoring will be rack-mounted in the Server Room adjacent to the Control Room in the VAPP.

7.3 Major Equipment List

- Fixed and pan/tilt/zoom video cameras
- Digital video recording equipment
- Computer workstation(s)

7.4 Operations and Maintenance Requirements

The access control system and the video surveillance system should be maintained in accordance with manufacturer recommendations, industry standard practices and as determined by the City.

8. Building Design

8.1 Existing Condition

The VPP building is a two-story structure constructed of reinforced concrete exterior walls. All of the doors are metal doors and frames. The roofing system is a conventional built-up roofing membrane system. Surrounding the site in all directions are many different apartment and/or condominium buildings which are between two to three levels in height. Many of these adjoining residential buildings are 1960's or 1970's era buildings with stucco finishes and pitched roofs with asphalt composition or tile roofs.

8.2 Design Approach

The VAPP building footprint will include spaces for an electrical equipment room and generator room on the first floor. The second floor will include work stations for computer operators, unisex restroom, mechanical room, and server rooms. Each floor has approximated 1,250 gross square feet.

8.2.1 Exterior

The current design includes building perimeter walls to be constructed on reinforced concrete with a cool roofing system (PVC membrane or similar) above the second level. Proposed architectural finishes include architectural stamped concrete, reveals and architectural impressions; metal awnings over each of the exterior doors with sustainable roofing (Sika Décor, or similar); and painted finish surfaces with colors that would blend in with the surrounding neighborhood. Some windows will be required at the second level for the occupied spaces, all of which will be energy efficient dual-glazed windows. Since the site is near the ocean, careful consideration of all materials will be taken to ensure that oxidation of materials is kept to a minimum. The exterior conceptual design can be enhanced to include other architectural features such as curved, standing seam roofing system and other materials and/or systems to become more of an architectural statement than a simple rectangular concrete structure with architectural features as desired by LADPW.

8.2.2 Interior

Interior features would include furred walls with insulation and painted gypsum board finishes in occupied spaces (including the stairwell); resilient flooring in occupied spaces; either sealed concrete in equipment rooms or other sustainable sprayed on flooring such as epoxy coating; suspended ceiling systems in the occupied spaces; hard lid gypsum board in the restroom and stairwell; exposed ceilings in equipment spaces; ceramic tile floor and wainscot in the unisex restroom; and low-flush toilet fixtures and water savings faucets. As suggested by the LAWINS DCS conversion team, the Server Room will be constructed with a commercially available treatment to prevent radio frequency interference (RFI). Door hardware and security

systems design will be coordinated with LADPW staff so that VAPP electrical building will be consistent with other LADPW facilities. During the initial meetings of the VAPP project, the LAWINS DCS conversion team suggested that a raised computer floor be designed for the Server Room and the Control Room for routing of communication and low-voltage cabling. However, as the preliminary design progressed and the layout of the building and rooms solidified, the use of a raised computer floor was considered an unnecessary complication and will therefore not be included. Routing of communication and low-voltage cabling associated with the computer / DCS equipment will run above the server racks, drop down to floor level in the server room, penetrate the wall separating the server and control room and run underneath the computer workstations in the control room.

8.3 Fire Protection

The following summarizes the electrical building's fire protection requirements per 2013 California Building Code (CBC) and NFPA requirements:

- Building perimeter wall's will be of 1-hour construction wall assembly
- Mechanical room interior walls will be of 1-hour construction wall assembly or fire sprinklers will be provided
- Electrical room battery rack equipment may need to be enclosed in 1-hour construction wall and door assembly. Interior walls of the electrical room will be 1-hour construction if the battery systems have a liquid electrolyte capacity of more than 50 gallons for flooded lead acid, nickel cadmium or valve regulated lead-acid battery; or more than 1,000 pounds for lithium-ion and lithium metal polymer used for facility standby power or emergency power
- Stairway to the second floor will be 1-hour construction rated
- A voluntary fire suppression system will be provided in 5 spaces in lieu of the LAWINS DCS conversion team's recommendation for only the Server Room:
    - Server room
    - Control Room
    - Electrical / Mechanical Equipment Room
    - Switchgear Equipment Room
    - Generator Room
- The system will be a will be a total flooding type clean agent type fire suppression (FM-200) system. The agent used will be HFC-227ea at a concentration of 7%, stored in ASME rated cylinders (one main tank and one reserve tank for each protected area. Detection devices will be cross-zoned smoke and heat detectors. The system will be controlled by a listed (UL and FM) mulit-zone addressable releasing panel.
- A system purge will be incorporated to clear 2nd floor areas after a fire event. The purge will be interlocked with the HVAC fans and controlled by authorized personnel via a key locking system. First floor areas with exterior doors will be cleared naturally, without mechanical ventilation.

- The FM-200 system will tie into the building's fire alarm system for notification of power failure, system trouble, or fire status.
- Ancillary devices include alarm horn and strobes, manual release pull stations and abort button.

8.4 HVAC

The HVAC system sizes were calculated based on the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) climatic design data tables in the area. Refer to **Appendix C** for preliminary calculations. Venice is estimated to see a low of 45 °F and a high of 94 °F. The first floor of the electrical building will be provided with a 20-ton year-round cooling and ventilation unit. The heat from the electrical loads on the first floor is enough to keep the first floor warm in the winter, therefore no heating units will be provided. The second floor will have a 5-ton heat pump. The office and the mechanical room will each have a 40cfm ventilation fan, and the bathroom will be provided with a 140-cfm exhaust fan.

The first floor stand-by generator is enclosed in a separate room and will require an intake and exhaust louver for proper cooling of the generator. Due to the location of the electrical building in a residential neighborhood, acoustic louvers will be used for this application.

9. Structural Design

9.1 General

This section presents the structural design criteria for the VAPP. The intent of this section is to define the design loads of the buildings and structures to ensure all components of the Project meet structural code requirements (code level forces) for life safety.

9.2 Applicable Codes, Standards, and References

The design codes, standards, and references in **Table 9.1** are applicable for the evaluation of structures for the Project.

Table 9.1 - Applicable Structural Codes and Standards

Code/Standard	Application and Project Impact
California Building Code (CBC), 2013 Edition	Specifies minimum structural design loads and design requirements for new facilities constructed in California. This code refers to International Building Code (IBC) 2013, which contains more specific details.
American Society of Civil Engineers (ASCE) Standard No. 7-10, "Minimum Design Loads for Buildings and Other Structures."	Specifies minimum structural design loads and design requirements for new facilities.
ACI 318-11 "Building Code Requirements for Reinforced Concrete."	Specifies generic minimum design criteria for reinforced concrete structures.
ACI 350-06. "Code Requirements for Environmental Engineering Concrete Structures."	Contains minimum design criteria for environmental and liquid retaining concrete structures to provide concrete crack and leakage control measures.

9.3 Geotechnical Criteria

The City of Los Angeles DPW BOE Geotechnical Engineering Group (GEO) will perform a geotechnical investigation of the VAPP site and will prepare a final geotechnical report to summarize the results of the investigation. Findings and recommendations from the geotechnical investigations will form the basis for the structural design criteria of the VAPP.

9.4 Seismic Design

The major active seismic fault that lies closest to the VAPP will be identified in the geotechnical investigation. The peak ground acceleration at the site and the probability of exceedance will also be estimated in the geotechnical investigation.

9.5 Design Loads

The following loads will be used for design of structures for this Project.

9.5.1 Load Definitions

D Dead Load (material weights and fixed equipment)
E Earthquake (seismic) Load
E_m Estimated Maximum Earthquake Force (ASCE 7-10 Section 12.4.3)
F Fluid Load
f_1 Coefficient defined in 2013 CBC Section 1605.2.
H Lateral Pressure of Soil and Water in Soil Loads
L Live Load (except roof live load)
L_r Roof Live Load
W Wind Load

9.5.2 Design Loads

The design loads for dead (D), live (L), fluid (F), wind (W), and earthquake /seismic (E) loads are included in **Table 9.2.**

Table 9.2 - Design Loads

Design Load	Value
Dead Load (D)	
Structure Weight	
Concrete	150 pound per cubic feet (pcf)
Steel	490 pcf
Aluminum	165 pcf
Equipment	Actual weight per vendor

Design Load	Value
Live Loads (L)	
Roof over Building	20 psf minimum
Grade Level Slab Underground Structures	H-20 loading
Fluid Loads (F)	
Hydrostatic Loads	Water density = 62.4 pcf
Wind Loads (W)	
Basic Wind Speed	140 miles per hour (mph)
Exposure	C
Wind Loads Factor	ASCE 7-10 Section 6.5.11
Earthquake (Seismic) Loads (E)	
Seismic Coefficients	
Risk Category	IV
Site Class	D
Site Coefficient (F_a)	1.0
Site Coefficient (F_v)	1.5
Site Coefficients SMs and SDs	SMs=1.660 SDs=1.106
Site Coefficients SM1 and SD1	SM1=0.990 SD1=0.660
Importance Factors	
Structures	I=1.25
Equipment	I_p=1.5
Response Modification Coefficient (R)	
Structures	ASCE 7-10 Table 12.2-1
Mechanical & Electrical Components	ASCE 7-10 Table 13.6-1

Design Load	Value
Non-Building Structures	ASCE 7-10 Table 15.4-2

9.5.3 Load Combinations

The load combinations used for reinforced concrete and steel structural design are included in **Table 9.3**.

Table 9.3 - Load Combinations

Loading Combination	Reference
Reinforced Concrete Strength Design (SD) Method	
U=1.4D	CBC Section 1605.2, EQN: 16.1
U=1.2D+1.6 (L+H)+0.5 Lr	CBC Section 1605.2, EQN: 16.2
U=1.2D+1.6Lr+1.6H+ f_1L+0.5w	CBC Section 1605.2, EQN: 16.3
U=1.2D+1.0W+ f_1L+1.6H+0.5Lr	CBC Section 1605.2, EQN: 16.4
U=1.2D+1.0E+f_1L+1.6H	CBC Section 1605.2, EQN: 16-5
U=0.9D +1.0W+1.6H	CBC Section 1605.2, EQN: 16-6
U=0.9D+1.0E+1.6H	CBC Section 1605.2, EQN: 16-7

9.6 Material Properties

The types of materials considered for structural design are indicated in **Table 9.4**.

Table 9.4 - Material Properties

Material	Reference
Reinforced Concrete	
Shotcrete	4,000 psi
Compressive Strength	f^1c=4000 psi
Reinforcing Steel	ASTM A615, Grade 60

9.7 Acceptance Criteria

The acceptance criteria for ensuring that structural designs meet the CBC and IBC design requirements are summarized in **Table 9.5**.

Table 9.5 - Acceptance Criteria for Structural Design

Criterion		Value
Maximum allowable soil pressure	Normal D,L,F,H loading for slab/mat foundation combinations	2,500 psf
	Wind or Seismic loading combinations only	3,333 psf
Minimum factor of safety for normal (D,L,F,H) loading against buoyancy uplift, sliding, and overturning		1.5
Loading combinations for earthquake (E) or wind (W)	Sliding	E - 1.1; W-1.5
	Overturning	E -1.1; W-1.5
Sliding resistance; soil against concrete friction coefficient		0.35
No net uplift is allowed on any portion of the foundation.		

9.7.1 Design Methods

The Ultimate Stress Design (USD) method will be used for design of reinforced concrete structures including walls, slabs, beams, columns and foundations. Concrete liquid containing structures must use a durability factor in accordance with ACI 350. The Allowable Stress Design (ASD) method will be used for the design of steel and masonry structures. The foundations for all structures will use the actual unfactored loads and the ASD method for sizing footings, slab on grade, and concrete mat foundations.

9.7.2 Deflection Criteria

The maximum allowable deflection for elevated slabs and beams will be as follows:

Live Load (L) only	L/360
Total Load (D+L)	L/240
Concrete Roof (L)	L/240
Concrete Roof Deck (D+L)	L/180

9.7.3 Design Allowables

For concrete USD, the factored design loads will cause bending moment, shear and axial loads in membranes which must be less than or equal to the strength reduction factor (Φ) times the member capabilities, as determined per Chapter 9.3 of ASCE 7-10.

For loading combinations including wind (W) or earthquake (E) design loads, the allowable could be increased by 33 percent to account for the short-term duration of these loads as allowed in 2013 CBC.

9.7.4 Foundation Design Criteria

Foundation design would be acceptable provided it meets the entire acceptance criteria specified in **Table 9.5**.

9.8 Special Inspection

Special inspections will be provided by Contractor and Construction Manager in accordance with CBC Chapter 17 for the following construction items:

- Cast-in-place concrete, except concrete with a compressive strength (f'c) of less than 2,500 psi or site-work concrete.
- Placement of concrete reinforcing steel.
- Earthwork including excavations, backfill compaction and grading.
- Where required by the respective International Code Council Evaluation Service (ICC-ES) evaluation report, special inspection will be required for mechanical couplers, expansion anchors, and adhesive anchors. Expansion anchors and adhesive anchors will be ICC-ES approved and will be designed based on ICC-ES allowable loads.

9.9 Linings

Concrete structures shall be lined to prevent concrete from corroding due to exposure to sewage. Linish shall be placed at a minimum, the highest water level in the structures.

10. Electrical Design

10.1 Existing Condition

The existing VPP is served by two redundant LADPW 480VAC services. Power is received and distributed with 480VAC main-tie-main switchgear. A 480VAC, 1500KW diesel generator and two paralleled 480VAC, 750KW diesel generators provide standby power in the event of loss of LADWP power or for maintenance purposes. The new VAPP will be provided with standby power from the existing VPP generators via the main-tie-main switchgear. No other electrical work is planned for the existing VPP.

10.2 Design Approach – Power Supply and Distribution

With the nature of the VAPP being a working backup / expansion to the VPP, it has been determined that the electrical power supply to VAPP should be provided independently from the VPP. As such, the approach for this project will include two new redundant 480V services from LADWP. This will instill an added degree of reliability and will avoid the dependence on the existing VPP stepdown transformers and existing switchgear for utility power. The two existing 34.5KV primary circuits that serve the VPP will be used due to their proximity. A new 34.5KV switching cabinet, two new 34.5KV-480V three phase padmounted type transformers, and two new exterior secondary (480V) cable pull sections, all owned and maintained by LADWP, will be requested for the new services at the VAPP.

480V three phase power will be accepted from the LADWP padmounted transformers with service entrance rated power switchgear located inside the VAPP Electrical Building. A main-tie-main arrangement will be provided in order to utilize either transformer if necessary to fully power the VAPP. Each main breaker will have an LADWP meter for revenue accounting and a digital meter for local monitoring / connectivity to the control system. The VAPP power switchgear will distribute 480V power to the VAPP pump motor controllers and to a motor control center. See drawings in **Appendix B**.

Standby power for the VAPP pumping operation will be provided by the existing VPP standby generators. The existing VPP 480V switchgear, which receives and manages the VPP standby generator power, will be utilized to provide standby power to the VAPP electrical system. Two 480V, 1600A power circuit breakers will be installed in the existing VPP switchgear and will be connected to the VAPP 480V power switchgear. The removal of two existing 1200A power circuit breakers from the existing VPP switchgear will be necessary to facilitate the installation of the new 1600A power circuit breakers. These new 1600A power circuit breakers will be manually operated and will be normally closed. See drawings in **Appendix B**.

The VAPP switchgear will contain electrically operated main circuit breakers and standby power circuit breakers to function in a similar manner as the VPP switchgear during an LADWP power outage. For example, if LADWP service 1 fails, main breaker 1 will open and the tie breaker will close. This enables

LADWP service 2 to provide power to operate all three VAPP pumps. When LADWP service 1 is restored, the tie breaker will open and main breaker 1 will close, returning the switchgear to its normal operating mode. The similar procedure would occur if LADWP service 2 were to fail. If both LADWP services were to fail, main breaker 1 will open, main breaker 2 will open, the tie breaker will remain open, standby breaker 1 will close and standby breaker 2 will close. This arrangement will permit power to be provided from the existing VPP switchgear, be it from the existing LADWP services or from the VPP generators. All VAPP switchgear feeder breakers will be manually operated and will be normally closed. A circuit breaker remote control panel (CBRCP) will be provided in a safe location in the VAPP Electrical Room for operations staff to manually control the VAPP switchgear circuit breakers if desired.

When both of the utility services at the VPP are available and at least one of the utility services at the new VAPP is available, all 8 pumps can be operated if desired. There are limitations at the existing VPP if only one of the existing utility services is available. The two existing utility transformer banks are rated 1500KVA each, which can only power up to three pumps each.

The operation of the VPP / VAPP pumps while on standby power from the existing VPP diesel generators becomes a choice of various combinations of existing and new pumps as there is not enough standby power to operate all 8 pumps. The existing VPP 1500KW generator and the existing two paralleled 750KW generators operate independently. With new motors for the VAPP pumps rated 500HP each and the existing motors for the VPP pumps are 400HP each, the following scenarios are available:

- The existing 1500 KW generator can provide power for the following pump combinations:
  - 2 VPP pumps and 1 VAPP pump, or
  - 3 VPP pumps
- The existing two paralleled 750KW generators can provide power for the following combinations:
  - 2 VPP pumps and 1 VAPP pump, or
  - 1 VPP pump and 2 VAPP pumps

The VAPP electrical system will also include a small, diesel fueled, Tier 4 certified standby generator to automatically provide power to VAPP critical loads in the event of loss of power from LADWP and the inability of the existing VPP standby generators to provide standby power to the VAPP. The VAPP generator will provide up to 24KW of power at 120/240V for lighting, the SCADA system, the security / access control system, and the air conditioning for the VAPP Control Room. The VAPP generator will be located indoors in a dedicated room to extend its operating life, to provide noise reduction and to aid with the aesthetics requirements of the site location. The VAPP generator will be provided with an integral fuel storage tank to hold enough fuel for up to 8 hours of run time at full load. The application of the VAPP generator power to the critical loads will be through the use of an automatic transfer switch and dedicated panelboard located in the VAPP electrical room. See **Appendix D** for manufacturer's literature on the VAPP generator.

The VAPP electrical system will be provided with a 480V motor control center (MCC) to distribute 480V power to various common loads, such as the large air conditioner(s), motor operated valves, exhaust fans, stepped down power for lighting, controls etc. The VAPP MCC will be provided with an automatic transfer switch so it can be automatically powered by either bus of the VAPP switchgear.

10.3 Design Approach – Equipment and Materials

All indoor switchgear, motor control centers, motor controllers and panelboards will have NEMA 1A or NEMA 12 type enclosures. It is anticipated that equipment operating at 480V will require a 65KAIC short circuit rating and equipment operating at 240/120V will require a 10KAIC short circuit rating. A power system study to establish optimum overcurrent protection coordination and arc flash hazard levels will be provided during construction, likely by the selected switchgear manufacturer.

Each motor controller for the VAPP pumps will consist of 18 pulse clean power type VFD with a constant speed reduced voltage soft starter (RVSS) bypass. Normal operation will be with the VFDs for variable pumping output; the RVSS bypass will be used only when a VFD is not available due to maintenance activity or a failed condition. All VFDs and RVSS motor controllers will be “hard wired” to the VAPP local control system.

All power and control cables will be stranded copper with 600V rated insulation, complying with ASTM B3 and ASTM B8, with flame-retardant, moisture and heat-resistant insulation rated for 90 degrees C in dry or wet locations, listed by UL as Type XHHW-2 complying with UL 44. All power and control cables will be installed in conduit.

Underground conduit ductbanks will be UL listed Schedule 40 PVC type, encased in concrete and reinforced under roadways and heavy traffic areas. Conduits in and around the VAPP Electrical Building will be installed below the floor slab, concealed in the floor slab and concealed in the walls as much as possible to reduce cost and to provide a more aesthetically-pleasing appearance and will be Schedule 40 PVC type. Where exposed conduit is necessary, UL listed galvanized rigid steel type will be used in dry, climate controlled locations, and UL listed PVC coated rigid steel type will be used everywhere else.

The VAPP Electrical Building will be provided with LED type lighting fixtures. Battery backed emergency duty lighting fixtures will also be provided for egress illumination during the period when standby power is not available. The VAPP Electrical Building’s exterior will be provided with low wattage, full cut-off type fixtures with integral photocells for automatic operation for basic personnel access. The VAPP Electrical Building will be provided with manually controlled flood lighting to illuminate the new wet well and valve vault area in the event of a maintenance situation at night. Flood light pollution to nearby properties and the canal will be minimized to the extent possible. The lighting systems will meet the National Electrical

Code (NEC) and all state/county/city code requirements as well as the Illumination Engineering Society (IES) recommendations for lighting levels.

A grounding system (consisting of a buried AWG #4/0 bare copper cable around the VAPP Electrical Building, ground rods, a concrete encased electrode and metallic water pipe bonding) will be provided at the VAPP Electrical Building. All ductbank grounding cables, electrical equipment, building steel, handrails, etc. will be bonded to the grounding system to ensure a safe and properly functioning electrical system.

A fire detection / alarm system will be provided for the VAPP Electrical Building to notify local operations staff and the fire department in the event of a fire. The fire alarm control panel will be located in the VAPP Electrical Building, likely on the first floor with close proximity to an entry door.

10.4 Codes and Standards

The most recent version of the following codes and standards will be followed for the design and construction of this project:

- County of Los Angeles Electrical Code (Title 27) Based on the California Electrical Code
- NFPA 30 Flammable and Combustible Liquids Code
- NFPA 37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
- NFPA 70 National Electrical Code
- NFPA 70E Standard for Electrical Safety in the Workplace
- NFPA 72 National Fire Alarm and Signaling Code
- NFPA 110 Standards for Emergency and Stand-by Generators
- NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities

10.5 Major Equipment List

- 480VAC switchgear, in a main-tie-main arrangement
- 480VAC motor control center for auxiliary equipment
- 500HP rated VFDs with reduced voltage soft start bypass motor controllers
- See **Appendix D** for manufacturer's literature

10.6 Operations and Maintenance Requirements

The electrical gear in the VAPP should be maintained in accordance with manufacturer recommendations and industry standard practices.

11. Instrumentation and Control Design

11.1 General Description

The VAPP will consist of three submersible pumps that withdraw sewage from a wet well and discharge into a common header. Combined with the existing five pumps at VPP, they will provide for a rated capacity of 87 MGD with five duty pumps and three in standby. All pumps will be of similar capacity and functionally equivalent.

Under normal operation, VAPP and VPP will operate as a single, functional pump station with their respective wet wells hydraulically linked with similar elevations and even flow split. All plant logic issues will be coordinated with the City's Waste Collection Service Division (WCSD) Operation Management.

VPP and VAPP discharge to a common header which then splits to separate 48-inch and 54-inch force mains. Each force main can be isolated by ball valves controlled at the VAPP.

11.2 Control System

The VAPP will be monitored and controlled by a local programmable logic controller (PLC). A distributed control system (DCS) will collect information and provide operator interface. The VAPP server room will house the server and network infrastructure for the DCS, which will be integrated to the City network.

The VPP, including its local PLC, will be integrated to the VAPP network and DCS.

The existing operator interface terminal (OIT) at the VPP will be replaced. The OIT and PLC will be replaced by LAWINS prior to the start of the VAPP project. VAPP will have a new OIT and a DCS client access terminal.

11.3 Instrumentation

The following instruments, devices and field signals will be wired to the PLC and monitored by the VAPP OIT and DCS, see drawings in **Appendix B** for P&IDs.

VAPP Site:

- Power
  - ATS Status
  - Generator 1 Status
  - Generator 2 Status

VAPP Wet Well Inlet:

- Slide gate
  - Local/Remote Status
  - Open Limit
  - Closed Limit
  - Position Feedback
  - Position Command

VAPP Wet Well Level:

- Level Transmitter
  - Level
  - Fail Status
- Floats
  - High level
  - Low level

VAPP Pump (typical of 3):

- Drive:
  - Run status
  - Run command
  - Ready status
  - Fail alarm
  - Local/remote status
  - Speed feedback
  - Speed command, switch status,
  - High discharge pressure
  - High temperature alarm
  - Leak
  - Power
- Pressure Transmitter
  - Discharge Pressure
- Flow Meter
  - Discharge Flow
  - Discharge Volume Totalizer

Venice Force Mains

- Isolation Ball Valve Actuator (typical of 2):
  - Local/Remote Status
  - Open Limit
  - Closed Limit
  - Position Feedback
  - Open Command
  - Closed Command
  - Fail Alarm

11.4 Control Strategies

11.4.1 VAPP Wet Well

The VAPP wet well slide gate has provisions for Local or Remote operation. Remote operation allows the PLC to set the desired position, but it is only intended to be changed manually by an operator initiated command. Closing the slide gate will disable VAPP pumps from operating in Remote-Auto.

A level transmitter is used to monitor the wet well level and is the primary method to control the pumps. Float switches are provided for backup level monitoring.

11.4.2 VAPP Pumps

Each pump has provisions for Local or Remote operation. Local control allows for manual control of the pump at the VFD panel in the electrical room. Once a pump is placed into remote at the VFD panel, it can be controlled by the PLC. The DCS workstation will provide access to remote manual equipment control and adjustable setpoints that govern remote automatic control.

In remote, each pump is protected by a low flow alarm. If a pump running without a minimum amount of flow is detected by its discharge flow meter, after a short delay, it is stopped and interlocked. This alarm and interlock must be cleared at the OIT or DCS.

11.4.3 Remote-Manual

When a pump is placed in remote-manual mode, the PLC can start, stop, and vary the pump speed based on operator input. These commands are sent via the DCS or VAPP OIT.

11.4.4 Remote-Auto

Remote-auto control will allow the automatic starting, stopping and speed control of pumps based on programmed setpoints and process conditions. The PLC can also coordinate different pump sequences (operator selectable) in response to wet well levels and provide limited failure and emergency condition management. Failures and abnormal operating conditions will be alarmed locally via annunciation panel at the OIT and via the DCS workstation to alert operations staff.

11.5 VAPP Pumping Sequence Operation

The pump sequencing is used to maintain the required number of pumps in service. The pump station has three duty pumps based on priority 1, 2 and 3. These priorities are coordinated with the operation of the existing pump station.

The wet well level monitoring devices, which consist of a level transmitter and the float level switches, provide the necessary level information to the PLC. This information is used by the PLC for automatic operation of the pump station.

The operational objective of the PLC is to maintain the wet well level setpoint set by the operator. The PLC will start, stop, vary the speed, sequence the operation of the pumps, and set off alarms accordingly, in conjunction with the wet well level feedback from the level monitoring device. The pump speed is controlled by a single PID algorithm whose controlled process variable is the wet well level. The wet well level setpoint is entered by an operator at display. The output of this PID algorithm is transmitted as a speed command to all running pumps. The number of pumps that can be run by the automatic logic is normally limited to two based on coordination with the number of running pumps at VPP. Refer to **Section 11.6**. The wet well level set points, in addition to other adjustable parameters necessary for the operation of the pumps, can be adjusted in the PLC through either the OIT or the DCS workstation.

To maintain the operating level set point in the wet well, the PLC will automatically start the PRIORITY 1 pump selected in the pre-programmed instructions based on the PRIORITY 1 pump start level. As the wet well level varies, the speed of the pump varies accordingly. Once the PRIORITY 1 pump reaches the pump 1 maximum speed, the PRIORITY 2 pump then starts after a hard-coded time delay to maintain the wet well level. The PRIORITY 1 and PRIORITY 2 pumps will both run at the same variable speed to maintain the wet well level set point. If the incoming flow keeps rising, and the PRIORITY 1 and PRIORITY 2 pumps both reach the maximum speed, and PRIORITY 3 pump start level setpoint is reached, the PRIORITY 3 pump then starts after a hard-coded time delay. The PRIORITY 1, PRIORITY 2 and PRIORITY 3 will be running at the same variable speed to maintain the wet well level set point. Under normal operations, the PRIORITY 3 pump provides standby capacity and should not run unless there is an issue with VPP or a risk of an overflow.

As the incoming flow to the wet well decreases, the pumps will reduce speed. If the level reaches the PRIORITY 3 pump stop level setpoint, the PRIORITY 3 pump will stop after a hard-coded time delay. The PRIORITY 1 and PRIORITY 2 pumps will continue to maintain the set level of the wet well. If the incoming flow continues to decrease, the pumps will reduce speed. If the level reaches the PRIORITY 2 pump stop level setpoint, the PRIORITY 2 pump will stop after a hard-coded time delay. The PRIORITY 1 pump will continue to maintain the level set point. If the incoming flow increases beyond the capacity of the PRIORITY 1 pump, the PRIORITY 2 pump is brought back online again, and the cycle continues.

11.5.1 Failure Scenarios

When a Priority 1 or PRIORITY 2 pump fails, is placed Out of Service, is not in Remote-Automatic, or is otherwise not available to the automatic logic for starting, the next pump in the sequence is used for the duty service of the missing pump. All subsequent pumps move down the sequence queue, and a PRIORITY 3 pump becomes a PRIORITY 2 pump.

If the wet well Level reaches the High Level Setpoint or Float, after a hard-coded time delay, the logic above is over-ridden, and an additional pump is forced on. If the level remains above the High Level Setpoint or Float for the hard-coded time delay period, the next pump in the sequence is forced until all three pumps are started.

If the level drops below the Low Level Setpoint or Float, after a hard-coded time delay, the above stopping conditions are bypassed and the pumps are stopped sequentially starting with the last PRIORITY pump, with the hard-coded time delay between stops, until the condition clears.

11.6 VAPP Coordination

The VPP PLC will be updated to communicate with the VAPP PLC. Together, the plants will coordinate to manage pump operation at both plants. Operators can select whether VPP, VAPP, or both plants are enabled for operation. If only one plant is in operation, it relies on its own wet well monitoring and pumping sequence.

If both VPP and VAPP are in operation, pumps are started based on a combined pumping sequence. If either plant indicates a need to start or stop a pump, the combined sequence is used to determine which plant and pump is affected.

11.6.1 Alternate Coordination

The total number of pumps will be normally limited to five. If the wet well level continues to rise to a high level, additional pumps will be started.

When both plants are in operation, a significant difference in wet well level will generate an alarm. Either wet well level can be disabled, resulting in the combined sequence being controlled based on a single wet well.

In the event of communication loss between VPP and VAPP, the plant designated as the primary fail over role will operate as if the other plant is disabled. The remaining standby plant will only operate if its wet well reaches a high level.

11.6.2 VAPP Force Mains

Each force main isolation valve has provisions for Local or Remote operation. Local control is available via the valve control panel in the electrical room. Remote manual operation allows operators to initiate open or closed commands via the OIT or DCS.

In remote-auto, operation of the valves respond to the number of pumps running and flow rates. Remote-auto operation allows the PLC to open and close each valve to maintain the flows within the required limits shown in **Table 5.2**. When more than one scenario is possible, operators will have the option to designate force main selection or rotation based on schedules, timers, or flow range setpoints.

11.6.2.1 Normal Operation

Under normal operation, both isolation valves are controlled in remote-auto. When the hydraulic scenarios dictate that a second force main be placed into operation, pump run and speed commands will be limited to allow sufficient time for the second valve to fully open. If the valve is not in remote, failed, or does not open after a preset amount of time, an alarm will be triggered. If the wet well level continues to rise and the second valve has not opened, the pump operation will override the force main operation and proceed to increase pump speed and/or pumps in service. Flow rate alarms will be triggered if it is calculated that a force main is at risk of settling or scouring after 3 minutes.

11.6.2.2 Alternate Operation

If the isolation valves are left in local or remote-manual, the pump control and force main alarms will still respond as described under Normal Operation.

11.7 Telecommunications Network Design

The design of the communications network will include electronic communications for all equipment at the VPP and the new VAPP.

11.7.1 Existing Conditions

Currently no unified communications network for Ethernet enabled devices is in place at the VPP. The design of the communications network for the VAPP will include implementation of communications for all equipment at the VAPP and VPP.

11.7.2 Delegated Design Approach

The ARCADIS scope of work will be limited to developing performance and design criteria for all telecommunications network equipment. All detailed design of the telecommunications network will be delegated to the Contractor. This approach was selected to lower the level of effort and associated costs for ARCADIS per discussions with the City.

This approach will include development of a telecommunications design criteria specification for a securely converged network for VAPP to provide secure communications infrastructure for different systems including security, process control, and building (HVAC). This will require coordination with City networking personnel regarding City standards and practices.

11.7.3 Delegated Design Scope

The Communications Network Design will include the following:

- Fiber optic cabling between VAPP and VPP
- Communication for cameras at the VAPP and the cameras at the VPP to the security system DVR at the VAPP
- Communications for video surveillance computer workstation(s) at the VAPP
- Communications for PLCs and operator interfaces at VPP and VAPP

11.7.4 Key Assumptions

- ARCADIS will develop telecommunications network design criteria for the VPP and VAPP telecommunications systems and equipment only.
- Detailed design of the telecommunications network will be delegated to the Contractor. ARCADIS will provide performance and design criteria as part of this scope of work.
- The Contractor will employs professional telecommunications design staff qualified to meeting industry best practices.
- ARCADIS review of detailed telecommunications delegated design will verify that the delegated design meets the design intent.

12. Project Delivery

12.1 Project Implementation Schedule

The preliminary construction schedule is shown in **Appendix E**. The preliminary schedule identifies the major work items, timing, and interrelationships between project elements. The schedule was prepared based on the construction sequencing plan discussed in **Section 12.2**.

The VAPP project is anticipated to be advertised and bid during the third quarter of 2017. It is anticipated that the Board will approve the construction contract at the January 2018 Board Meeting and a Notice-to-Proceed will be given in February 2018. Substantial completion is anticipated in December 2019. Final completion including miscellaneous site work, completion of punch list items, and commissioning of the final portions of the work is expected to be complete by February 2020. The overall construction duration is estimated at 24 months. Project completion including the warranty period will follow approximately 1 year later (February 2021).

12.2 Construction Sequencing

Construction at the VAPP will begin with site clearing, shoring, and excavation. Excavation will occur in stages, with shoring installed at each stage to prevent soil collapse or groundwater seepage into the excavation area. Dewatering methods will be required at all times during construction, to promptly remove and dispose of all water from any source entering the excavation sites, see detailed below grade sequence listed below.

Below grade construction sequencing steps are listed below:

1. Construct cofferdam necessary to ensure dry bedding conditions to construct underground structure foundations. **Figure 12-1** shows soldier piles and sheeting. An important feature to note is the divider wall. The two “cells” are integral to our sequencing approach and will minimize City risk. Constructing a cofferdam above and below the existing CIS pipe while keeping it in service, and without damaging it, is a difficult task. The cofferdam must be constructed around the CIS and still provide the shoring/water barrier characteristics of the cofferdam. Combinations of wood lagging/grouting appear to be the most economical.

2. Our sequence is to work in Cell 1 first, leaving Cell 2 untouched. To keep Cell 1 in a dry condition, a bottom seal will be necessary to resist buoyancy forces from groundwater and seal the cell dry. The seal also makes a good working surface from which to form and construct the underground structures. At this time liquefied soils mitigations determined by the City’s Geotechnical Engineering Group (GEC) and ARCADIS will be constructed.

3. The wet well, valve vault, and inlet pipe within Cell 1 are constructed. Once all equipment is constructed, backfilling and compacting will begin.

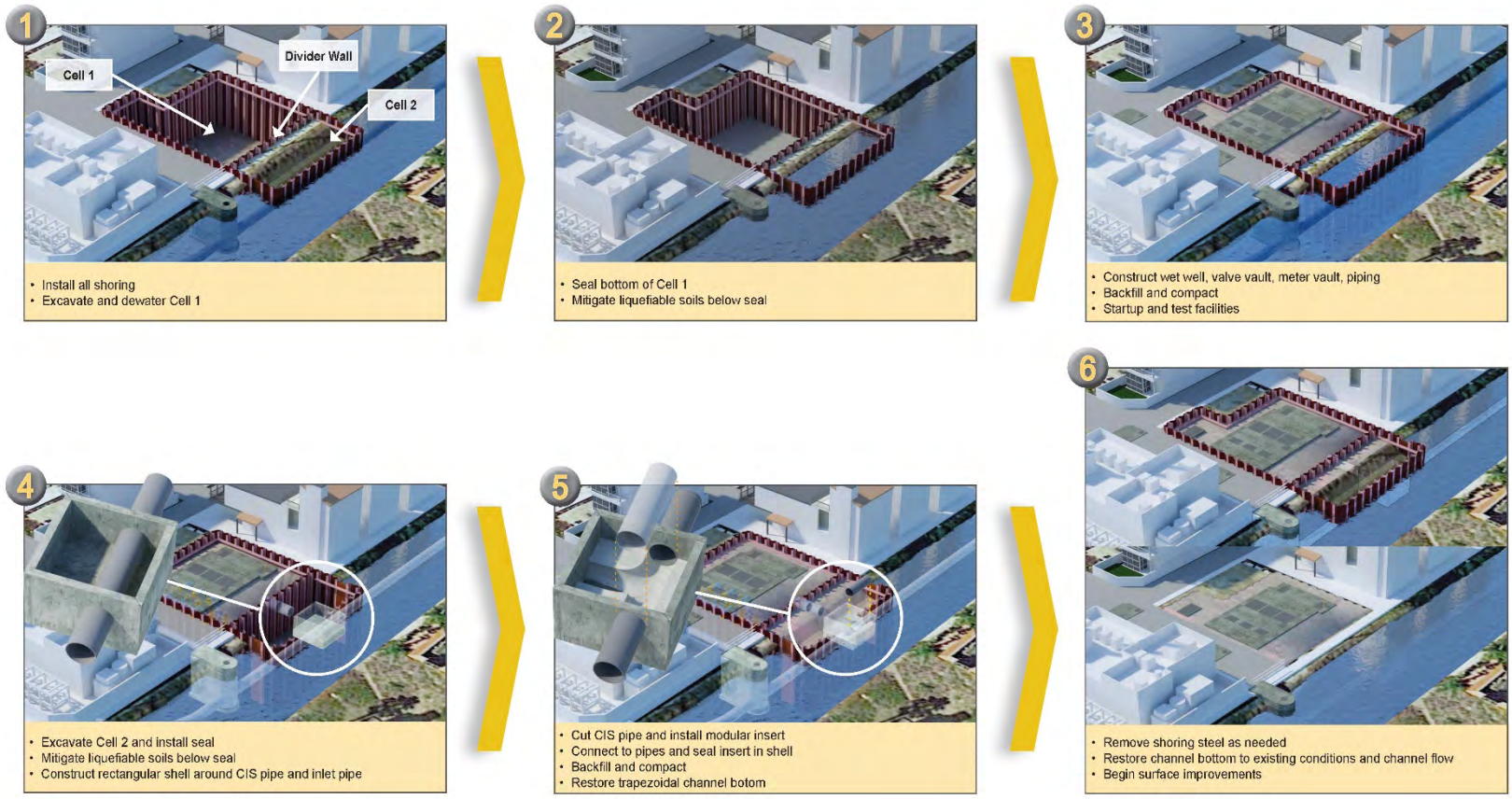
4. Once construction in Cell 1 is complete, Cell 2 can be excavated. The CIS will be protected in place to keep it operational and undamaged during this work. As with Cell 1, a bottom seal is needed, and liquefied soil mitigations will constructed first. After this is complete, the diversion structure will be constructed around the in-service CIS pipe.

5. As Step 4 is being completed, a modular channel insert is constructed. The water bearing surfaces will be lined with a water membrane system. The quality of this installation is much easier for inspectors to check than traditional construction. Once ready, there will be a very short duration to install the insert. As shown, the CIS within the shell is cut and removed and the modular insert dropped in, grouted, and placed in service. The City's risk for spills is virtually eliminated, and the noise/odor impacts are for a very short duration to the neighbors. A key message to the public is that this sequence reduces construction duration, noise, and odor to the maximum extent possible for this key cutover step. The City reduces risk, impacts, and project duration to the neighbors.

6. The final step is to seal the junction structure, backfill and compact. The Cell 1 shoring steel can be removed as needed to a minimum of 5 feet below grade minimizing the possibility of settlement and Cell 2 shoring can be removed. The channel trapezoidal bottom will be restored to existing conditions. Surface improvements in Cell 1 and Cell 2 can now begin.

Construction above grade will include the electrical building. It will be concrete or masonry construction and climate-controlled to house electrical, instrumentation, and control devices.

Figure 12.1 - Phased Construction Sequencing



12.3 Pump Operations Sequence of Work and Bypass Plan and Contingency Plan

Planning and sequencing of the VAPP construction takes into consideration maintaining operation of the VPP and minimizing disturbances caused by temporary flow bypassing. Once the diversion structure is in place and the pipe it surrounds is removed, a portion of the flow can be diverted to the VAPP for pump station testing; The VPP will be online, so we will have the flexibility of testing the new pump station, one pump at a time, with the VPP as backup in case there are any issues.

12.4 Preliminary Construction Approach

Trenches, excavations, and gravity sewer connection at the VAPP will be properly sheeted and braced to ensure safe working conditions and to protect all existing structures in the vicinity from damage. Shoring systems will be approved according to the Construction Safety Orders of the Division of Industrial Safety and the Occupational Safety and Health Act.

Discharge of water from dewatering operations is governed by a National Pollutant Discharge Elimination System (NPDES) permit issued by the Regional Water Quality Control Board (RWQCB). The contractor must perform analyses on the discharged water to identify any possible violation of the NPDES permit, and pre-treat the water before disposal if necessary. The average depth of groundwater is provided in the Geotechnical and Seismic Report.

To avoid construction related sewer overflows to comply with the City's "zero [construction] spill" policy, the Bureau of Contract Administration requires that a spill prevention and response plan be developed and implemented for this project. The Contractor shall meet the requirements as detailed in Sections 7-8.5 and 306-6.1 of the Greenbook as modified by the Brown Book. Prior to commencement of construction, an approved spill prevention and emergency response plan and approved bypass plan are required and shall be available for the Inspector to review. Emergency contact numbers for personnel of the Bureaus of Contract Administration, Engineering, and Sanitation shall be obtained from Bureau of Engineering. The plans shall be submitted to the engineering construction management office which will be coordinated with BOS and construction management administration for review and approval.

Utility research has identified existing underground utilities that may be in jeopardy as a result of excavation, sheeting, and shoring operations. These existing utilities will be shown on the Contract Drawings for reference, but the contractor will be required to pothole certain utilities prior to excavation if it is deemed necessary during construction. Shoring and sheeting will also be installed as necessary to prevent disturbing material that is under adjacent structures or pipes.

13. Opinion of Probable Construction Cost

The Preliminary Opinion of Probable Construction Cost (OPC) is based on an AACE Class 4 Cost Estimate project definition (1% - 15% project drawings). The cost estimate is based on the construction sequencing approach outlined in **Section 12**, and the allowable time of construction shown on the construction schedule in **Appendix E**. Quantities shown are estimates based on descriptions in this PDR and vendor proposals. Project prorates for this estimate were provided by LADPW.

At this level of completion not all work is shown on the drawings. Some work items are based on physical inspections, or observations obtained during the site walk. The estimate is intended to be as comprehensive as possible at the preliminary design stage where much of the work is still at a conceptual level.

Quantities for all work items will be reviewed and updated during detailed design. The cost estimate will be updated with each design submittal and the project level adjustment will be revised with each submittal to reflect increasing levels of completion of the plans and specifications that occur with each submission.

Table 13.1 summarize the estimated project costs. Refer to **Appendix F** for the cost breakdown for the BOE Project Construction Cost Estimate.

Table 13.1 – BOE Project Construction Cost Estimate Summary

Description	Unit	Quantity	Unit Price	Item Total
Diversion Structure	LS	1	$ 653,000	$ 653,000
Sitework	LS	1	$ 393,000	$ 393,000
Earthwork, Cofferdams, Shoring, Dewatering	LS	1	$ 1,740,000	$ 1,740,000
Site Restoration	LS	1	$ 108,000	$ 108,000
Yardpipe	LS	1	$ 219,000	$ 219,000
Wet Well Vault - Concrete	LS	1	$ 811,000	$ 811,000
Valve Vault Concrete	LS	1	$ 254,000	$ 254,000
Submersible Pumps, Motors & VFD's	EA	3	$ 930,000	$ 2,790,000
Wet Well/Valve Vault Mechanical	LS	1	$ 330,000	$ 330,000
Diversion Structure & Tunnel – Structural	LS	1	$ 650,000	$ 650,000
Electrical Building – Structural	LS	1	$ 856,000	$ 856,000

Description	Unit	Quantity	Unit Price	Item Total
Electrical Building – Thermal & Moisture Protection	LS	1	$ 44,000	$ 44,000
Electrical Building – Finishes	LS	1	$ 60,000	$ 60,000
Electrical Building – MEP	LS	1	$ 555,000	$ 555,000
VPP – Electrical	LS	1	$ 260,000	$ 260,000
VPP – Emergency Generator	EA	1	$ 660,000	$ 660,000
Subtotal (1)				**$ 10,383,000**
Mobilization – 0% to 7% of Subtotal (1) – **Used 7%**				$ 727,000
Permit Allowances – 1% to 3% of Subtotal (1) – **Used 2%**				$ 208,000
Other Allowances – 5% of Subtotal (1) – **Used 5%**				$ 520,000
Subtotal (2)				**$ 11,838,000**
Estimating Contingency – 0% to 50% of Subtotal (2) – **Used 15%**				$ 1,776,000
Subtotal (3)				**$ 13,614,000**
Escalation – 3% Per Year of Subtotal (3) – **Used 12% for Construction in 2018**				$ 1,634,000
Subtotal (4)				**$ 15,248,000**
Construction Contingency – 5% to 20% of Subtotal (4) – **Used 5%**				$ 763,000
Total Estimated Project Construction Cost (2017 Escalated Costs)				**$ 16,011,000**

ARCADIS

Appendix **A**

Baseline Noise Measurement Memo

ARCADIS U.S., Inc.
1525 Faraday Avenue
Suite 290
Carlsbad
California 92008
Tel 760 602 3800
Fax 760 602 3838

MEMO

To:
Brian Leto

Copies:
Michael Burrill
Manuel Alvarez

From:
Kevin Fowler

Date:
July 10, 2015

ARCADIS Project No.:
06332002.0000

Subject:
VAPP – Baseline Noise Measurements

Introduction

ARCADIS has completed a baseline noise measurement study for the VAPP Preliminary Design Project. This memo represents a summary of the community ambient noise levels surrounding the proposed project site during non-construction hours. For measurement locations, please refer to Figure 1: Aerial Image Showing Noise Measurement Locations.

Noise Measurement Equipment

The following equipment was used in the field to measure existing ambient baseline noise levels:

- Larson Davis – Model 831 Sound Level Meter with Pre-Amp and Microphone
- Larson Davis – Model CA200 Microphone Calibrator
- Windscreen and Tripod

The sound level meter was field-calibrated prior to and following each noise measurement to ensure accuracy. In accordance with industry standards, the sound level measurements were made with a sound

level meter that conforms to the American National Standards Institute (ANSI) specifications for sound level meters ANSI SI.4 1983 (R2006). All instruments are maintained with the National Bureau of Standards traceable calibrations.

Noise Measurement Methodology

To document the existing ambient noise conditions within the vicinity of the project site during non-construction hours, noise monitoring was conducted with a sound level meter at four separate locations. At each location, data was collected for a continuous 30-minute time period. The noise measurements were conducted during the quiet evening hours between 4:00 p.m. to 6:00 p.m. on Thursday, April 23rd, 2015. For a summary listing of the baseline noise measurement results, please refer to Table 1 below. For a complete set of the raw baseline noise measurement data, please refer to Attachment 1.

Table 1. Summary Results of Baseline Noise Measurements

Location	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L_{90} (dBA)
1	47.9	63.8	41.2	44.2
2	48.6	65.6	42.2	44.1
3	50.1	73.9	44.2	46.0
4	53.0	66.5	44.4	51.2

Please review this memo at your earliest convenience. If you have any questions concerning this project, please contact Kevin Fowler at kevin.fowler@arcadis-us.com.

Sincerely,

Kevin Fowler, INCE
Project Acoustical Scientist

Figure 1: Aerial Image Showing Noise Measurement Locations

Attachment 1: VAPP Raw Baseline Noise Measurement Data

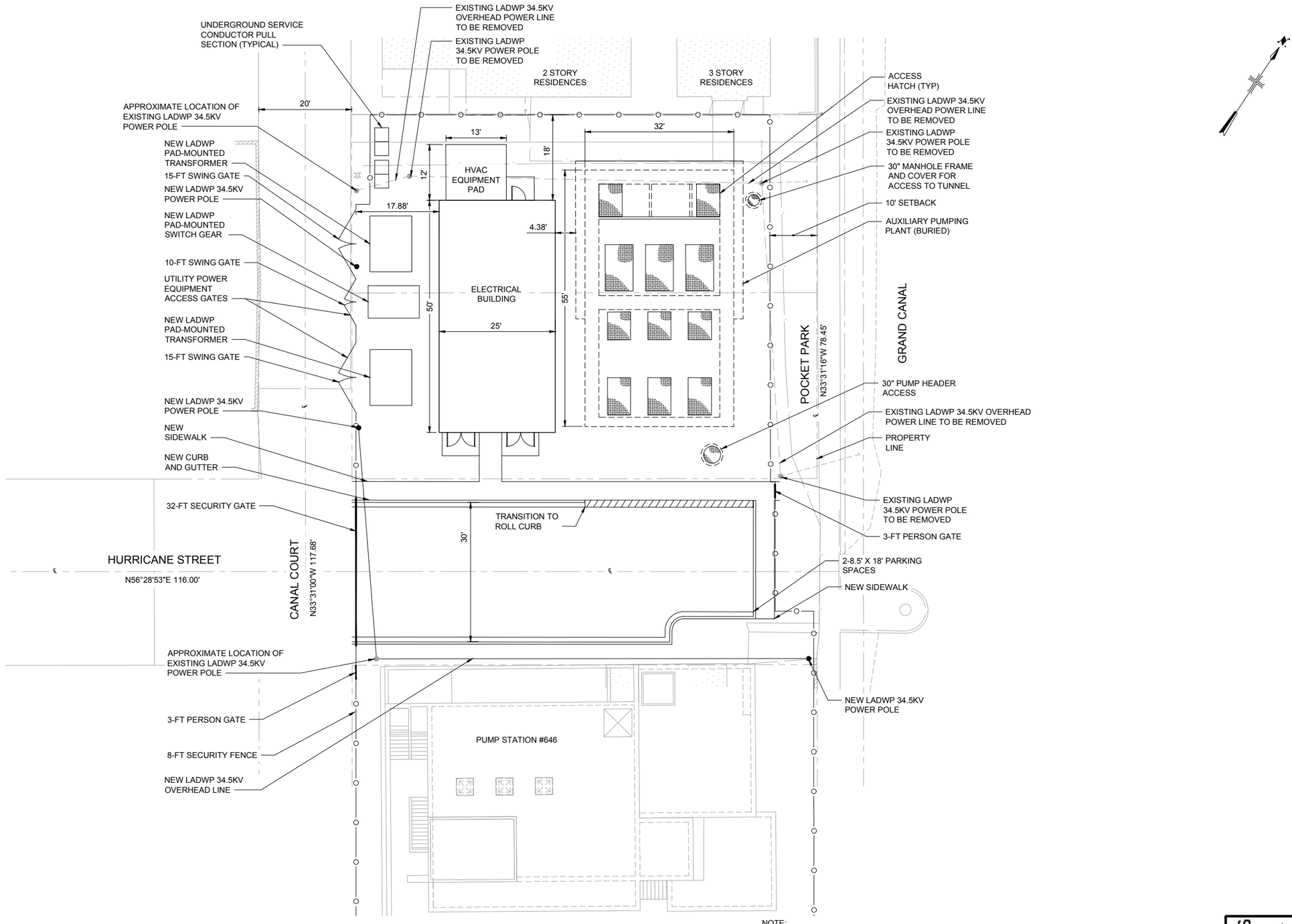
Figure 1


Location 4
Location 2
Location 1
Location 3
© 2015 Google
Google earth
1994
33°58'33.25" N 118°27'40.32" W elev 15 ft eye alt 760 ft

ARCADIS

Appendix **B**

PDR Drawings



NOTE:
EXACT STREET AND ALLEY WIDTHS NOT SURVEYED. STREET AND ALLEY WIDTHS APPROXIMATED FROM GOOGLE EARTH IMAGE

PROPOSED SITE PLAN - OPTION 1
SCALE: 1" = 10'

ENGINEERING
CITY OF LOS ANGELES

BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE:	BY:
-	-	-	-

INDEX NO. D-31898

STRUCTURE NO. SPB0000X

PRELIMINARY NOT FOR CONSTRUCTION

GARY LEE MOORE, P.E.
DESIGN GROUP
CITY ENGINEER
DATE:
LIC. NO.
ENGINEER: ENGINEER
DESIGNED BY: DESIGNER
DRAWN BY: DRAWNBY
CHECKED BY: CHECKBY
APPROVED BY: APPROVEDBY

DEPARTMENT OF PUBLIC WORKS

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: PRELIMINARY SITE PLAN
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

WORK ORDER NO. E6000591
DRAWING NO. C-02
SHEET # OF -- SHEETS

CITY OF LOS ANGELES

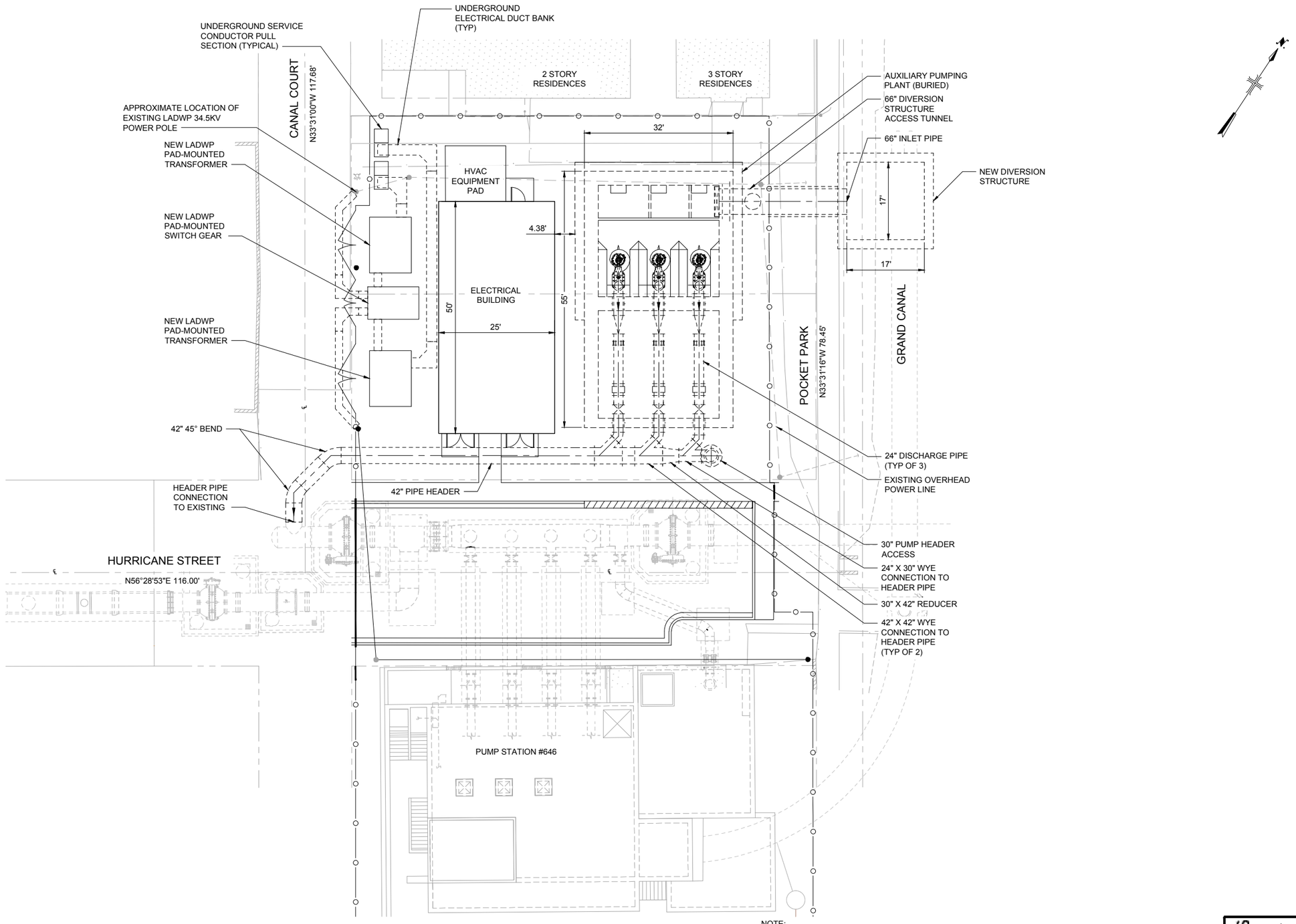
PRELIMINARY DESIGN

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

User:PEDROZA Spec:AUS-NCSMOD File:I:\ACAD\PROJ\06332002\2-SHEETS\02-C-CIVIL\C-2.DWG Scale:1:1 SavedDate:11/23/2015 Time:14:43

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0



NOTE:
EXACT STREET AND ALLEY WIDTHS NOT SURVEYED. STREET AND ALLEY WIDTHS APPROXIMATED FROM GOOGLE EARTH IMAGE

PROPOSED UNDERGROUND PIPING PLAN - OPTION 1
SCALE: 1" = 10'

ENGINEERING
CITY OF LOS ANGELES

BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE:	BY:
-	-	-	-

INDEX NO. D-31898

STRUCTURE NO. SPB0000X

PRELIMINARY NOT FOR CONSTRUCTION

GARY LEE MOORE, P.E.
CITY ENGINEER
DESIGN GROUP
ENGINEER: ENGINEER
DESIGNED BY: DESIGNER
DRAWN BY: DRAWNBY
CHECKED BY: CHECKBY
APPROVED BY: APPROVEDBY
DATE:
LIC. NO.

DEPARTMENT OF PUBLIC WORKS

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: UNDERGROUND PIPING PLAN
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

WORK ORDER NO. E6000591
DRAWING NO. C-03
SHEET # OF -- SHEETS

CITY OF LOS ANGELES

PRELIMINARY DESIGN

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

User:PEDROZA Spec:AUS-NCSMOD File:I:\ACAD\PROJ\06332\002\2-SHEETS\02-C-CIVIL\C-3.DWG Scale:1:1 SavedDate: 11/23/2015 Time: 14:47

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

MATCH LINE : SEE SHEET 2 OF 2

GRAND CANAL

WATER LINE (LOW TIDE)

EARTH

ESPLANADE

N32°43'35"W 78.46'

N32°43'35"W 79.98'

CC WALK

TOP OF SLOPE

GRASS

CHD PWR LINE

2 STORY APARTMENT

3813 S. ESPLANADE
APN: 4225-008-904

LOT 4

VACANT LOT

LOT 5

BLOCK 4
SILVER STRAND
M.B. 7/86

N57°18'00"E 99.99'

N57°18'21"E 99.99'

N57°18'21"E 100.00'

HURRICANE STREET

40.05'

20.025'

20.025'

AC ROAD

CC DWY

CC GUTTER

GRAVEL

PUMP STATION #646
140 HURRICANE ST.

NOTE:
THE INTERIOR OF THIS EXISTING PUMP STATION SITE WAS NOT SURVEYED

3901 S. ESPLANADE
APN: 4225-010-900

LOT 1

BLOCK 5
SILVER STRAND
M.B. 7/86

ROCK SLOPE

D=7°29'36"
R=349.51'
L=45.71'

CANAL COURT

N32°43'24"W 78.45'

N32°43'24"W 235.39'

N32°43'24"W 82.99'

SET SPK&W
LS 7123 6.00' ON PL PROD

LS 3167 NO REF
2.00' ON PL PROD

PATH

DRY PATH

CC PAD

CC RAMP

CC WALL

5' BNK

6' CLF

6' WIRE INF

6' CC WALL W/6' INF

PA

PP

SMH

LID

TOP

TOE

LEGEND

- CENTER LINE
- PROPERTY LINE
- CURB UNLESS OTHERWISE NOTED
- WALL
- X — X — FENCE
- O — O — HANDRAIL
- STREET LIGHT
- FIRE HYDRANT
- GUY WIRE
- SIGN
- POWER POLE
- SURFACE DRAIN

ABBREVIATIONS

AC	ASPHALT CONCRETE
BLK	BLOCK
BW(E)	BLOCK RETAINING
BW	BLOCK WALL
C&G	CURB AND GUTTER
CATV	CABLE TELEVISION
CB	CATCH BASIN
CC	CONCRETE
CCFB	CITY ENGINEER FILE BOOK
CLF	CHAIN LINK FENCE
CP	CORROSION PREVENTION
DD	DRAIN OUTLET
DWY	DRIVEWAY
EG	EDGE OF GUTTER
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVING
ER	EARTH
FL	FLOW LINE
GW	GUY WIRE
INF	IRON FENCE
INV	INVERT
L&T	LEAD AND TACK
M.B.	MAP BOOK
NW'LY	NORTH WESTERLY
OHD	OVERHEAD
OHG	OVERHANG
PA	PLANTING AREA
PL	PROPERTY LINE
PP	POWER POLE
PRO(D)	PRODUCED
PWR	POWER
REF	REFERENCE
S. GATE	SLIDING GATE
SCO	SEWER CLEAN OUT
SE'LY	SOUTH EASTERLY
SMH	SEWER MANHOLE
SPK&W	SPIKE AND WASHER
SW'LY	SOUTH WESTERLY
TC	TOP OF CURB
TCB	TOP OF CATCH BASIN
TEL	TELEPHONE
TOF	TOP OF FLOW
TW	TOP OF WALL
WCOL	WOOD COLUMN
WDF	WOOD FENCE
WHR	WOOD HANDRAIL
WM	WATER METER
YB	YARD BOX
YBE	YARD BOX ELECTRICAL
YBSL	YARD BOX STREET LIGHT

A. REFERENCE DOCUMENT FOR LEGAL DESCRIPTION AND EASEMENTS:

FIRST AMERICAN TITLE COMPANY PRELIMINARY REPORT, ORDER NO. NCS-755549-LA2, DATED SEPTEMBER 16, 2015.

ADDRESS

3813 S. ESPLANADE, LOS ANGELES, CA 90292.
APN: 4225-008-904.

BRIEF LEGAL DESCRIPTION

LOTS 4 AND 5, BLOCK 4 OF SILVER STRAND, M.B. 7/86.

EASEMENT NOTE

5. COVENANTS, CONDITIONS, RESTRICTIONS AND EASEMENTS IN THE DOCUMENT RECORDED IN BOOK 2072 OF DEEDS, PAGE 137. NO EASEMENT MENTIONED. NOT PLOTTED.

B. REFERENCE DOCUMENT FOR LEGAL DESCRIPTION AND EASEMENTS:

FIRST AMERICAN TITLE COMPANY PRELIMINARY REPORT, ORDER NO. NCS-755550-LA2, DATED SEPTEMBER 16, 2015.

ADDRESSES

3901 S. ESPLANADE, 134 & 140 E. HURRICANE STREET, LOS ANGELES, CA 90292.
APN: 4225-010-900.

BRIEF LEGAL DESCRIPTION

LOT 1, BLOCK 5 OF SILVER STRAND, M.B. 7/86.

EASEMENT NOTES

5. COVENANTS, CONDITIONS, RESTRICTIONS AND EASEMENTS IN THE DOCUMENT RECORDED IN BOOK 2072 OF DEEDS, PAGE 137. NO EASEMENT MENTIONED. NOT PLOTTED.

6. COVENANTS, CONDITIONS, RESTRICTIONS AND EASEMENTS IN THE DOCUMENT RECORDED IN BOOK 5844, PAGE 334 OF OFFICIAL RECORDS. NO EASEMENT MENTIONED. NOT PLOTTED.

SCALE: 1" = 10'

NOTES

1. LAND AREAS:
   3813 S. ESPLANADE: 7,845 SQ. FT. 0.180 ACRE.
   3901 S. ESPLANADE: 8,043 SQ. FT. 0.184 ACRE.
   3819 S. VIA DOLCE: 6,961 SQ. FT. 0.159 ACRE.
2. INVERTS SHOWN HEREON WERE MEASURED.

BASIS OF BEARINGS

THE BEARING OF N 32°41'41" W OF THE CENTER LINE OF CANAL COURT DERIVED FROM STATE PLANE COORDINATES NAD83 BETWEEN THE INTERSECTION OF ALLEY AND CANAL COURT (N=1,814,041.05 E=6,421,728.07) AND INTERSECTION OF CANAL COURT AND HURRICANE STREET (N=1,813,942.01 E=6,421,791.64).

STATE PLANE COORDINATES WERE OBTAINED FROM CITY OF LOS ANGELES BUREAU OF ENGINEERING AND SHOULD NOT BE RELIED UPON FOR ACCURACY.

BENCH MARK

CITY OF LOS ANGELES BENCH MARK NO. 16-00334

ELEV=12.51
DATUM: NGVD 1929
YEAR: 1985
DESCRIPTION: WIRE SPK IN W CURB PACIFIC AVE; 52.5FT N OF CTR LINE PRODUCED OF HURRICANE ST

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

PRELIMINARY DESIGN

Surveying & Drafting Services, Inc.
801 Seward Street, Los Angeles, CA 90038
Tel: (323) 366-2882 Fax: (323) 851-1059 Email: GeneralBureau@surveyinganddrafting.com

DATE OF SURVEY: 4-2-15, 9-29-15 | DRAWN BY: A.S., V.L., J.C.
JOB NAME: ARCADIS/HURRICANE | CHECKED BY: O.S.

10-13-15
OFER SHAPIRA
LICENSE NO. L.S. 7123
EXPIRES 12/31/2015

LICENSED LAND SURVEYOR OFER SHAPIRA NO. 7123 Ex. 12-31-15 STATE OF CALIFORNIA

GRAND CANAL

BUREAU OF ENGINEERING

INDEX NO. D-31898
STRUCTURE NO. SPB0000X

REVISIONS: | DATE: | BY:

PRELIMINARY NOT FOR CONSTRUCTION

DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

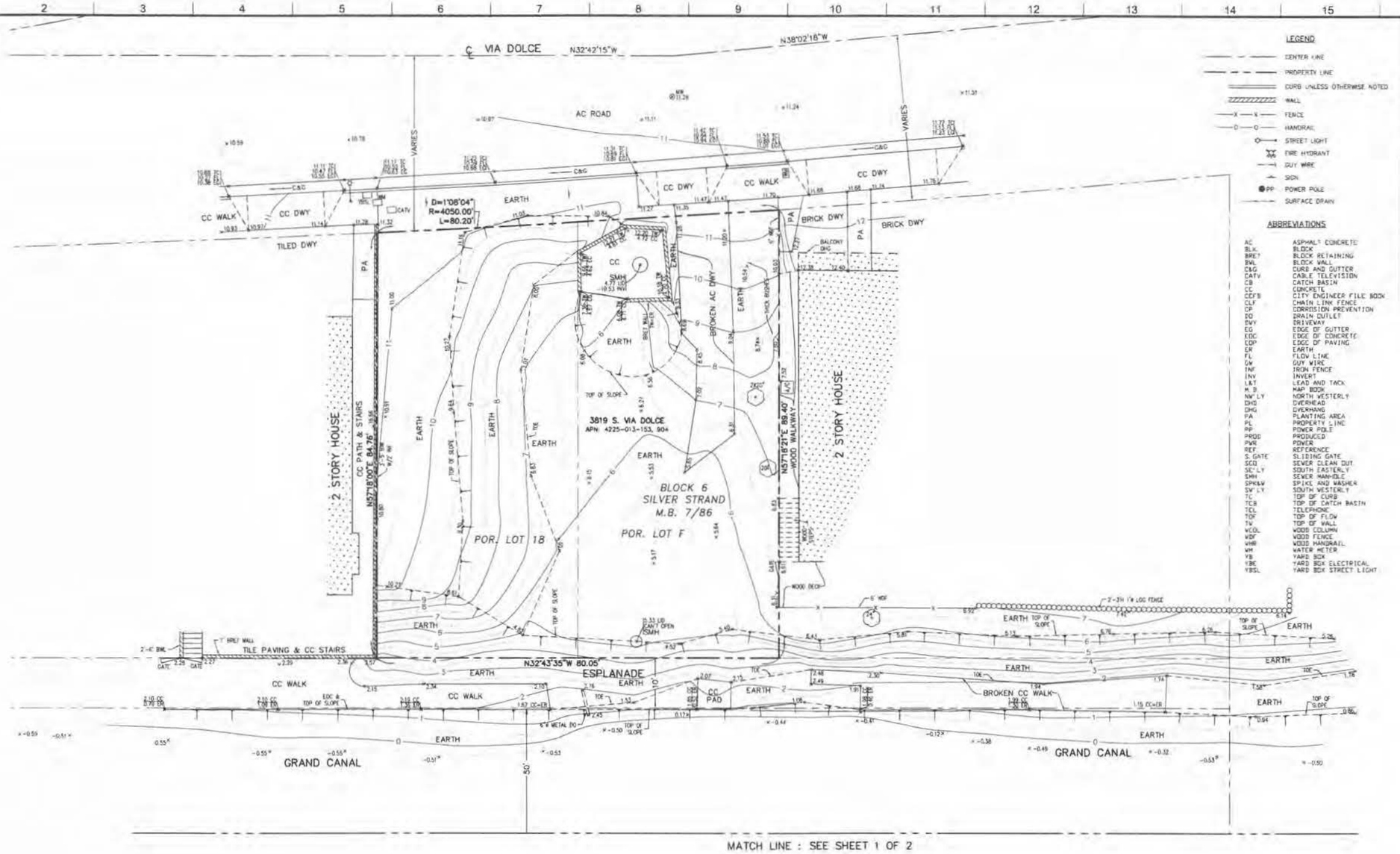
GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: | DATE:
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:

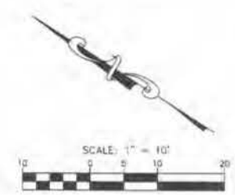
VERTICAL CONTROL: NGVD 1929 (1985)
HORIZONTAL CONTROL: NAD83

SHEET TITLE: TOPOGRAPHIC SURVEY
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST
MARINA DEL REY, CALIFORNIA

WORK ORDER NO. E6000591
DRAWING NO.
SHEET 1 OF 2 SHEETS

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 2300
LOS ANGELES
CA 90071





LEGEND

- CENTER LINE
- PROPERTY LINE
- CURB UNLESS OTHERWISE NOTED
- WALL
- FENCE
- HANDRAIL
- STREET LIGHT
- FIRE HYDRANT
- GUY WIRE
- SIGN
- POWER POLE
- SURFACE DRAIN

ABBREVIATIONS

AC	ASPHALT CONCRETE
BLK	BLOCK
BRET	BLOCK RETAINING
BWL	BLOCK WALL
C&G	CURB AND GUTTER
CATV	CABLE TELEVISION
CB	CATCH BASIN
CC	CONCRETE
CCFB	CITY ENGINEER FILE BOOK
CLF	CHAIN LINK FENCE
CP	CORROSION PREVENTION
DO	DRAIN OUTLET
DWY	DRIVEWAY
EG	EDGE OF GUTTER
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVING
ER	EARTH
FL	FLOW LINE
GW	GUY WIRE
INF	IRON FENCE
INV	INVERT
L&T	LEAD AND TACK
M.B.	MAP BOOK
NW'LY	NORTH WESTERLY
OHD	OVERHEAD
OHG	OVERHANG
PA	PLANTING AREA
PL	PROPERTY LINE
PP	POWER POLE
PROD	PRODUCED
PWR	POWER
REF	REFERENCE
S. GATE	SLIDING GATE
SCO	SEWER CLEAN OUT
SE'LY	SOUTH EASTERLY
SMH	SEWER MANHOLE
SPK&W	SPIKE AND WASHER
SW'LY	SOUTH WESTERLY
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TCB	TOP OF CATCH BASIN
TEL	TELEPHONE
TOF	TOP OF FLOW
TW	TOP OF WALL
WCOL	WOOD COLUMN
WDF	WOOD FENCE
WHR	WOOD HANDRAIL
WM	WATER METER
YB	YARD BOX
YBE	YARD BOX ELECTRICAL
YBSL	YARD BOX STREET LIGHT

C. PRELIMINARY TITLE REPORT WAS NOT PROVIDED

ADDRESS

3819 S. VIA DOLCE, LOS ANGELES, CA 90292
APN: 4225-013-153, 904.

BRIEF LEGAL DESCRIPTION

POR. LOTS 18 AND F, BLOCK 6 OF SILVER STRAND, M.B. 7/86.

EASEMENT NOTE

EASEMENTS, IF ANY, ARE NOT SHOWN HEREON. PRELIMINARY TITLE REPORT WAS NOT PROVIDED.

Surveying & Drafting Services, Inc.
901 Seward Street, Los Angeles, CA 90038
Tel: (323) 386-2882 Fax: (323) 857-1079 Email: mailbox@surveyinganddrafting.com
www.surveyinganddrafting.com

DATE OF SURVEY: 4-2-15, 9-29-15 DRAWN BY: A.S., V.L., J.C.
JOB NAME: ARCADIS/HURRICANE CHECKED BY: O.S.

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER:
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
LIC. NO.
DATE:

VERTICAL CONTROL: NGVD 1929 (1985)
HORIZONTAL CONTROL: NAD83

SHEET TITLE: TOPOGRAPHIC SURVEY
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

WORK ORDER NO. E6000591
DRAWING NO.

INDEX NO. D-31898
STRUCTURE NO. SPB0000X

PRELIMINARY NOT FOR CONSTRUCTION

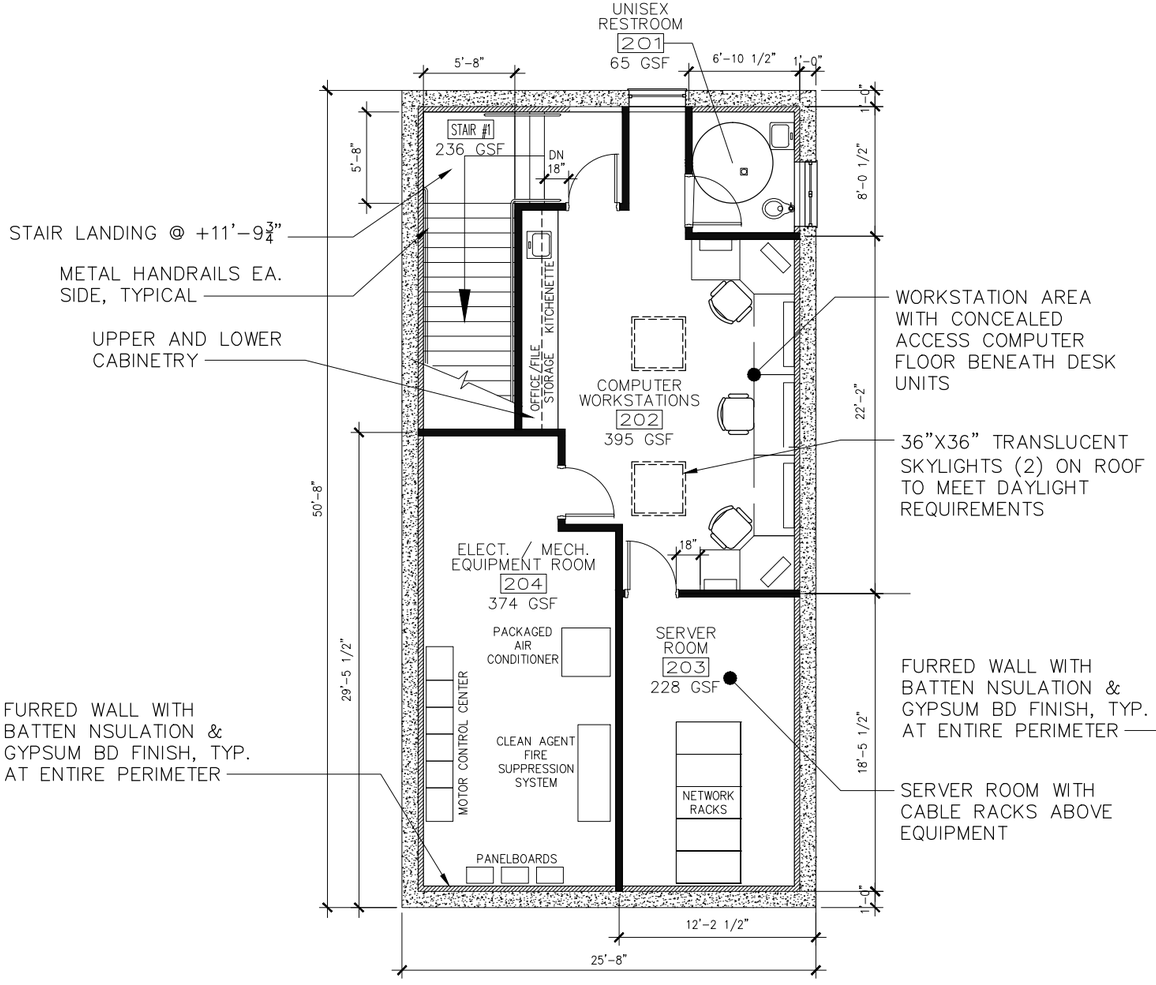
SHEET 2 OF 2 SHEETS

PRELIMINARY DESIGN

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

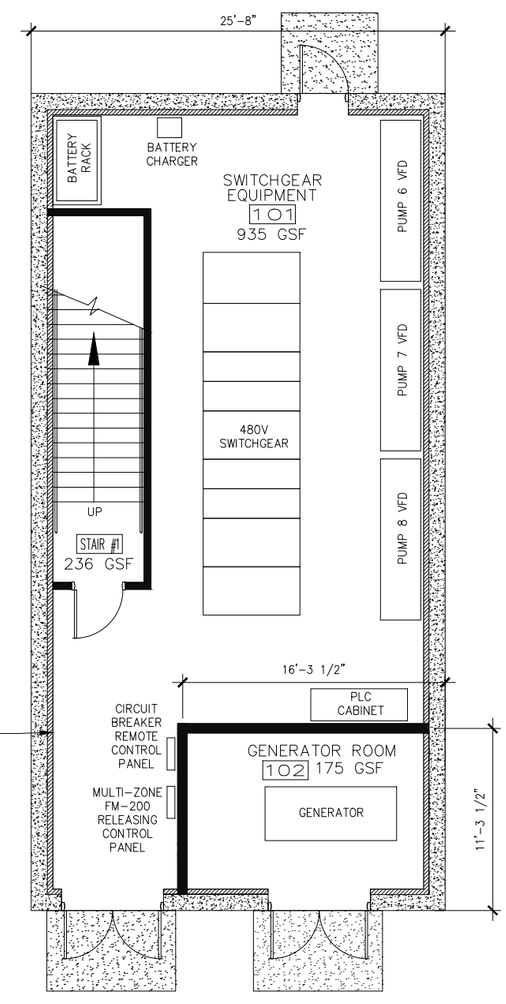
Sheet Version 3.0



SECOND FLOOR PLAN

SCALE: 1/4"=1'-0"

2 / A-01



FIRST FLOOR PLAN

SCALE: 1/4"=1'-0"

1 / A-01

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

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ARCADIS KDG

LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

ENGINEERING CITY OF LOS ANGELES

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

PRELIMINARY NOT FOR CONSTRUCTION

THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER: DATE:
DESIGNED BY: LIC. NO.
DRAWN BY:
CHECKED BY:
APPROVED BY:

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: FLOOR PLANS

PROJECT: VENICE AUXILIARY PUMPING PLANT

ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

WORK ORDER NO. E6000591

DRAWING NO. A-01

SHEET OF -- SHEETS

PRELIMINARY DESIGN

REVISION DATES (DESIGN STAGE ONLY)

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

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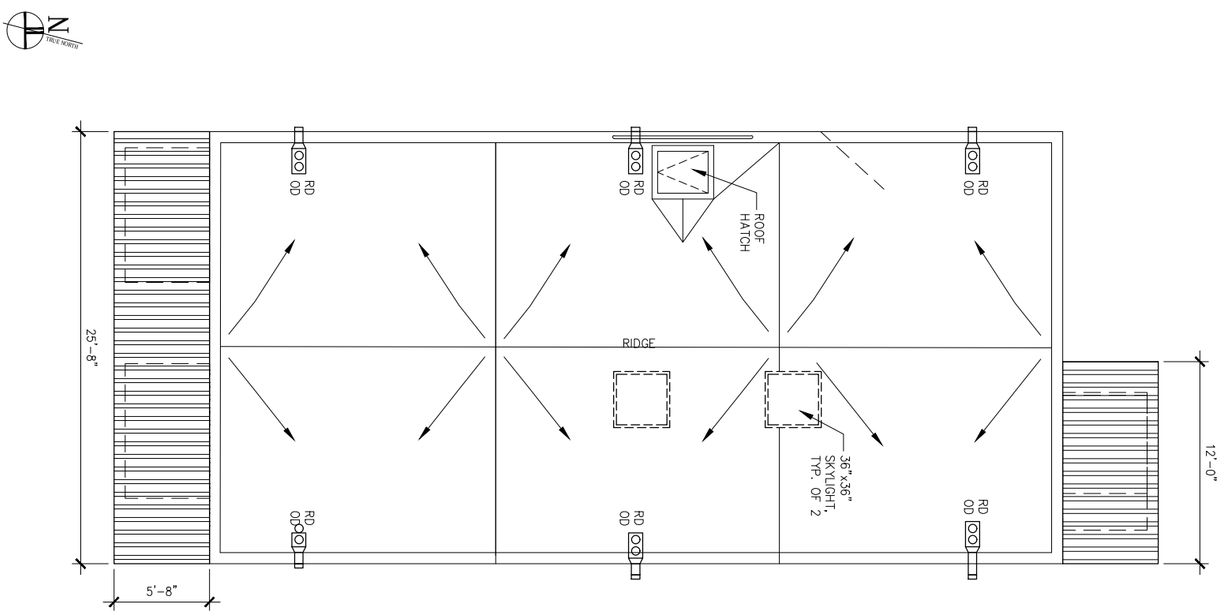


PRELIMINARY DESIGN

ARCADIS
KDG
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS • THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED. • BUREAU OF ENGINEERING

SHEET A-02 OF -- SHEETS

DRAWING NO. E6000591

WORK ORDER NO.

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: ROOF PLAN
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST
MARINA DEL REY, CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP	DATE:
ENGINEER: LIC. NO.	
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	
APPROVED BY:	

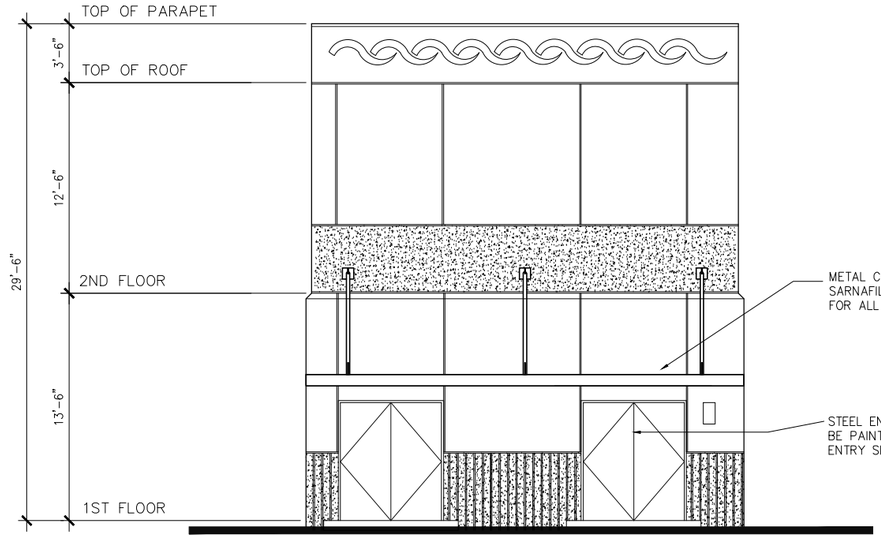
PRELIMINARY NOT FOR CONSTRUCTION

NO.	REVISIONS:	DATE	BY:

INDEX NO. D-31898

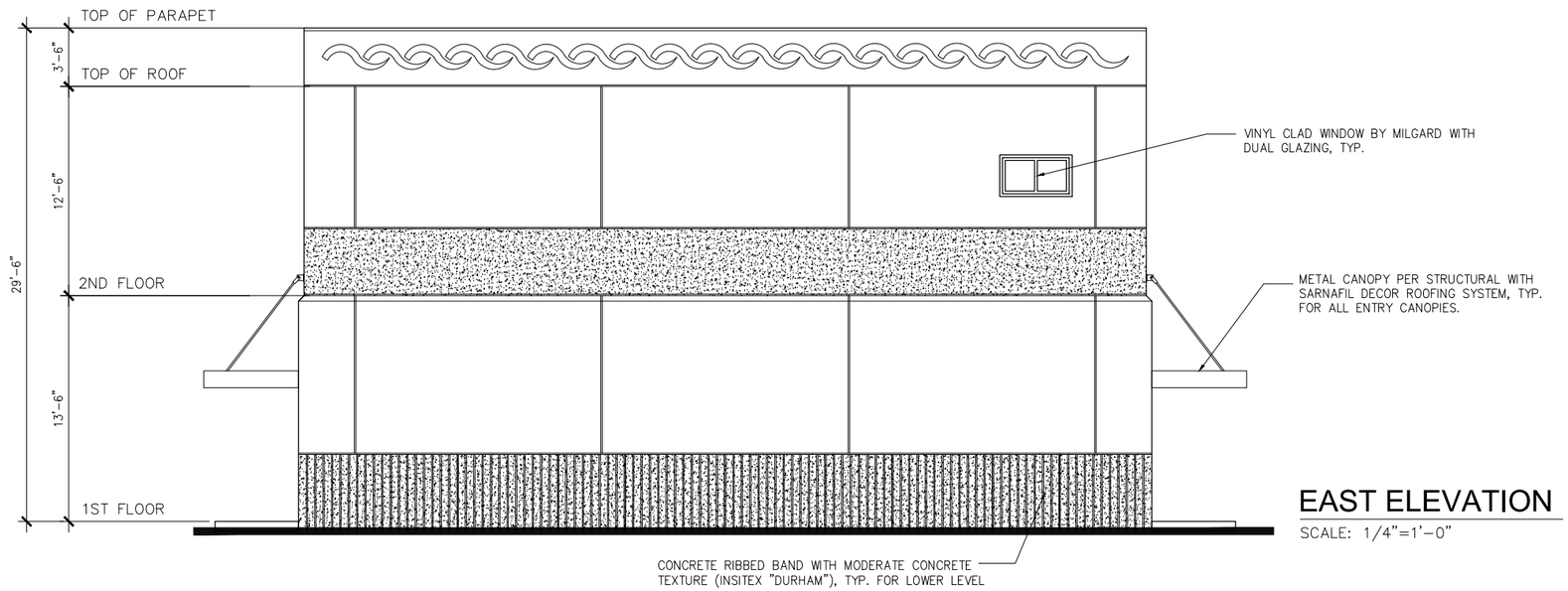
STRUCTURE NO. SPB0000X

ENGINEERING
CITY OF LOS ANGELES



SOUTH ELEVATION

SCALE: 1/4"=1'-0"



EAST ELEVATION

SCALE: 1/4"=1'-0"

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES: (DESIGN STAGE ONLY)

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CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS • BUREAU OF ENGINEERING •

ENGINEERING CITY OF LOS ANGELES

NO.	REVISIONS:	DATE	BY:

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED

PRELIMINARY NOT FOR CONSTRUCTION

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP

ENGINEER:
LIC. NO.
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:
DATE:

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: SOUTH & EAST EXTERIOR ELEVATIONS

PROJECT: VENICE AUXILIARY PUMPING PLANT

ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

KDG

ARCADIS

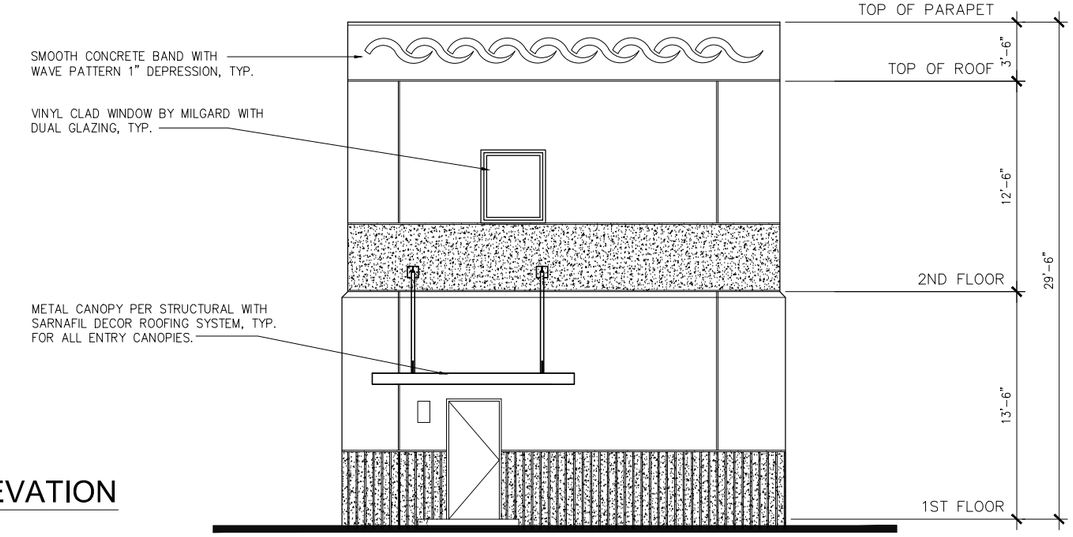
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 2300
LOS ANGELES
CA 90071

WORK ORDER NO. E6000591

DRAWING NO. A-03

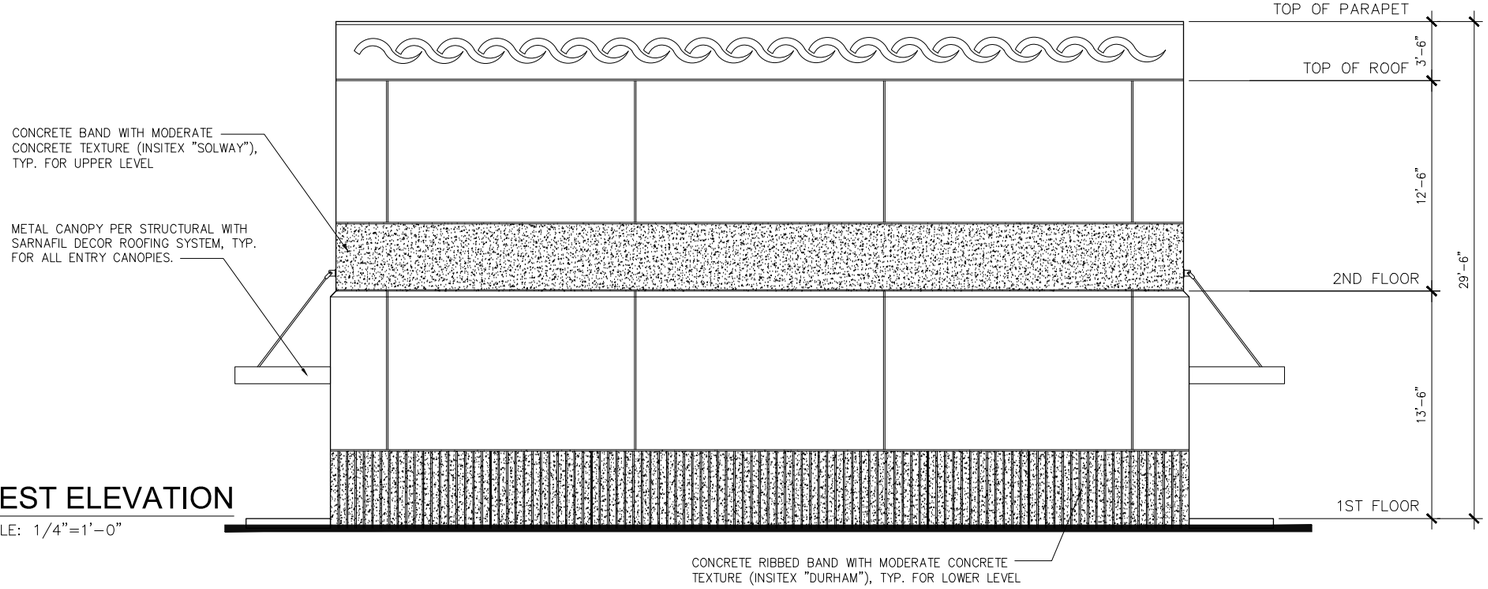
SHEET OF -- SHEETS

PRELIMINARY DESIGN



NORTH ELEVATION

SCALE: 1/4"=1'-0"



WEST ELEVATION

SCALE: 1/4"=1'-0"

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES: (DESIGN STAGE ONLY)

Sheet Version 3.0

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS • THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED

BUREAU OF ENGINEERING

ENGINEERING CITY OF LOS ANGELES

INDEX NO. D-31898

STRUCTURE NO. SPB0000X

NO.	REVISIONS:	DATE	BY:

PRELIMINARY NOT FOR CONSTRUCTION

GARY LEE MOORE, P.E. CITY ENGINEER DATE:

DESIGN GROUP

ENGINEER: LIC. NO.

DESIGNED BY:

DRAWN BY:

CHECKED BY:

APPROVED BY:

DEPARTMENT OF PUBLIC WORKS

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)

HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: NORTH & WEST EXTERIOR ELEVATIONS

PROJECT: VENICE AUXILIARY PUMPING PLANT

ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

KDG

ARCADIS

LEGAL ENTITY: ARCADIS U.S., INC. 445 S. FIGUEROA ST. SUITE 2360 LOS ANGELES CA 90071

WORK ORDER NO. E6000591

DRAWING NO. A-04

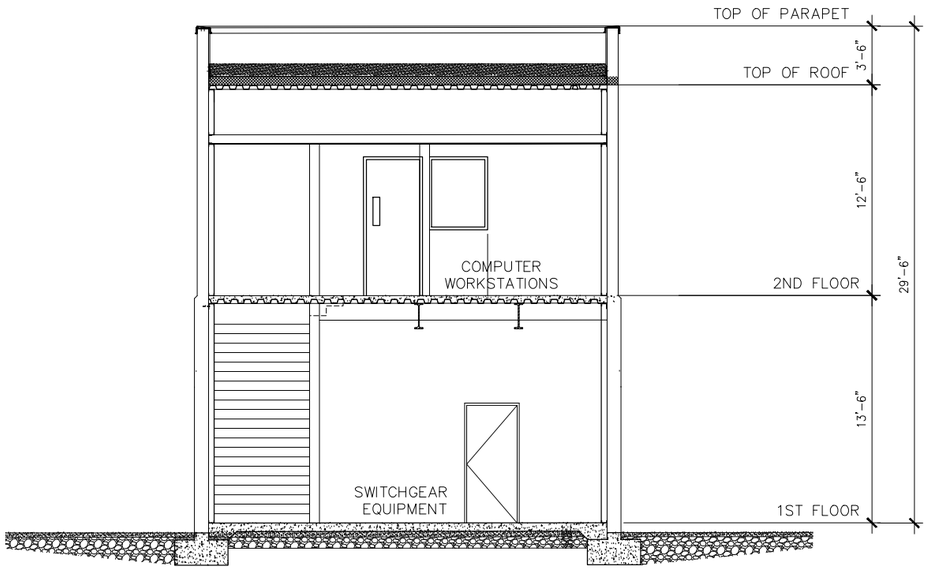
SHEET OF -- SHEETS

PRELIMINARY DESIGN

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

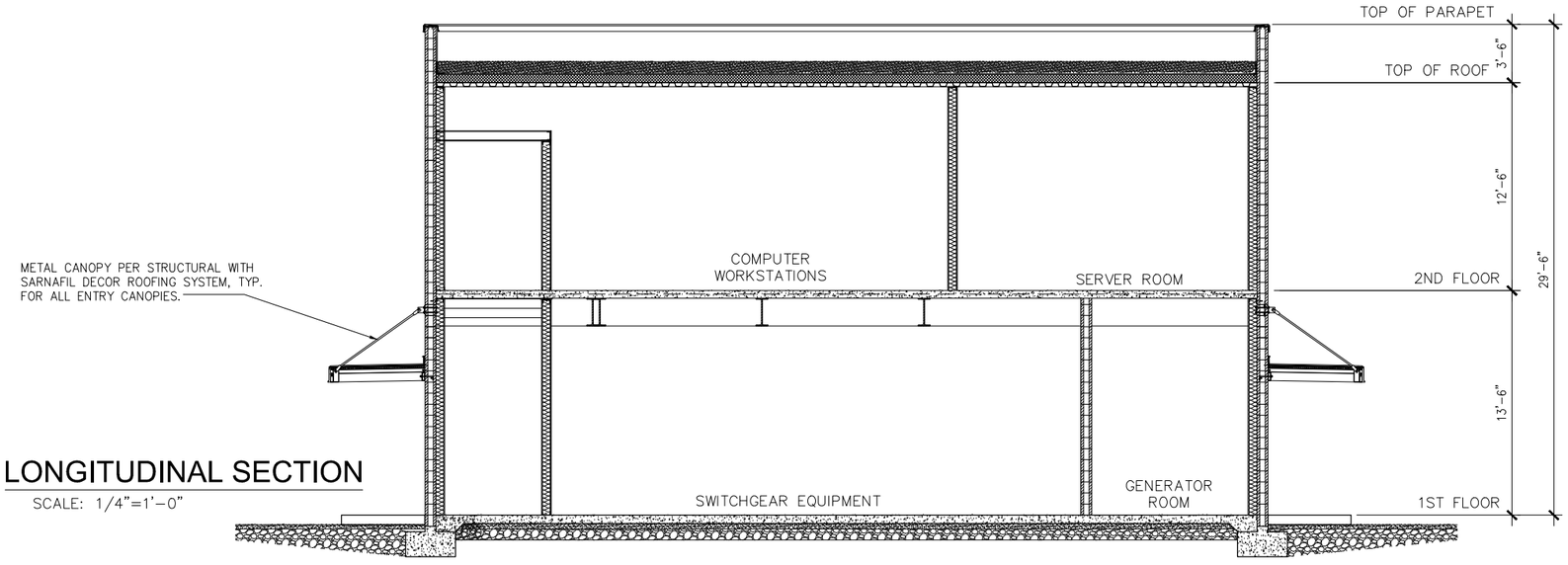
CROSS SECTION

SCALE: 1/4"=1'-0"



LONGITUDINAL SECTION

SCALE: 1/4"=1'-0"



REVISION DATES:
(DESIGN STAGE ONLY)

Sheet Version 3.0

PRELIMINARY DESIGN

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS • BUREAU OF ENGINEERING

ENGINEERING
CITY OF LOS ANGELES

INDEX NO. D-31898

STRUCTURE NO. SPB0000X

NO.	REVISIONS:	DATE	BY:

PRELIMINARY
NOT FOR
CONSTRUCTION

THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED

GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
LIC. NO.
DATE:

ENGINEER:
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: BUILDING SECTIONS
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST
MARINA DEL REY, CALIFORNIA

ARCADIS KDG
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 2360
LOS ANGELES
CA 90071

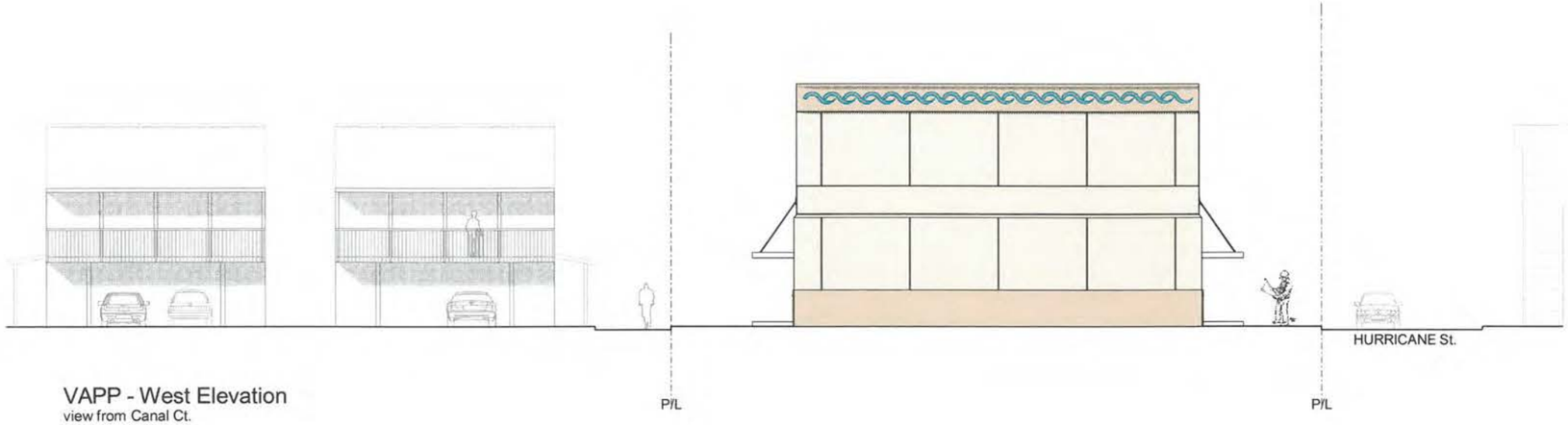
WORK ORDER NO.
E6000591

DRAWING NO.
A-05

SHEET OF -- SHEETS



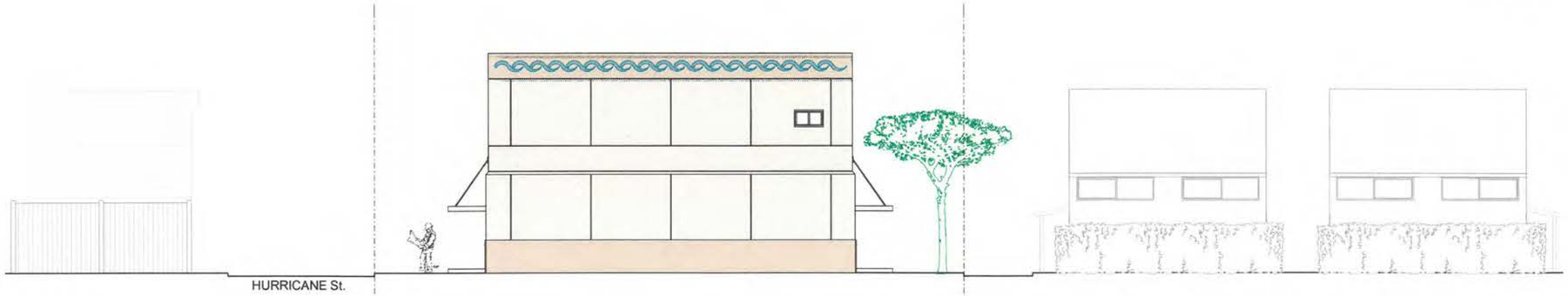
VAPP - South Elevation
view from Hurricane St.



VAPP - West Elevation
view from Canal Ct.



SITE VIEW WITH PROPOSED BUILDING



VAPP - East Elevation
view from Esplanade

PROPOSED BUILDING FOR VENICE AUXILARY PUMPING PLANT

ARCADIS Design & Consultancy for natural and built assets

KDG architects

User:JMEEKER3ORIN Spec:ANSI-NOMCD Files:S:\CADD\1 CADD TTS_PROJECTS\2011\2011015213-VENICE-VPBAPP\DORS\20150210-10-14-FROM DORS\PUMP ROOM\STRUS-1.DWG Scale:1:1 Saved:Date:1/30/2015 Time:09:38

REVISION DATES (DESIGN STAGE ONLY)

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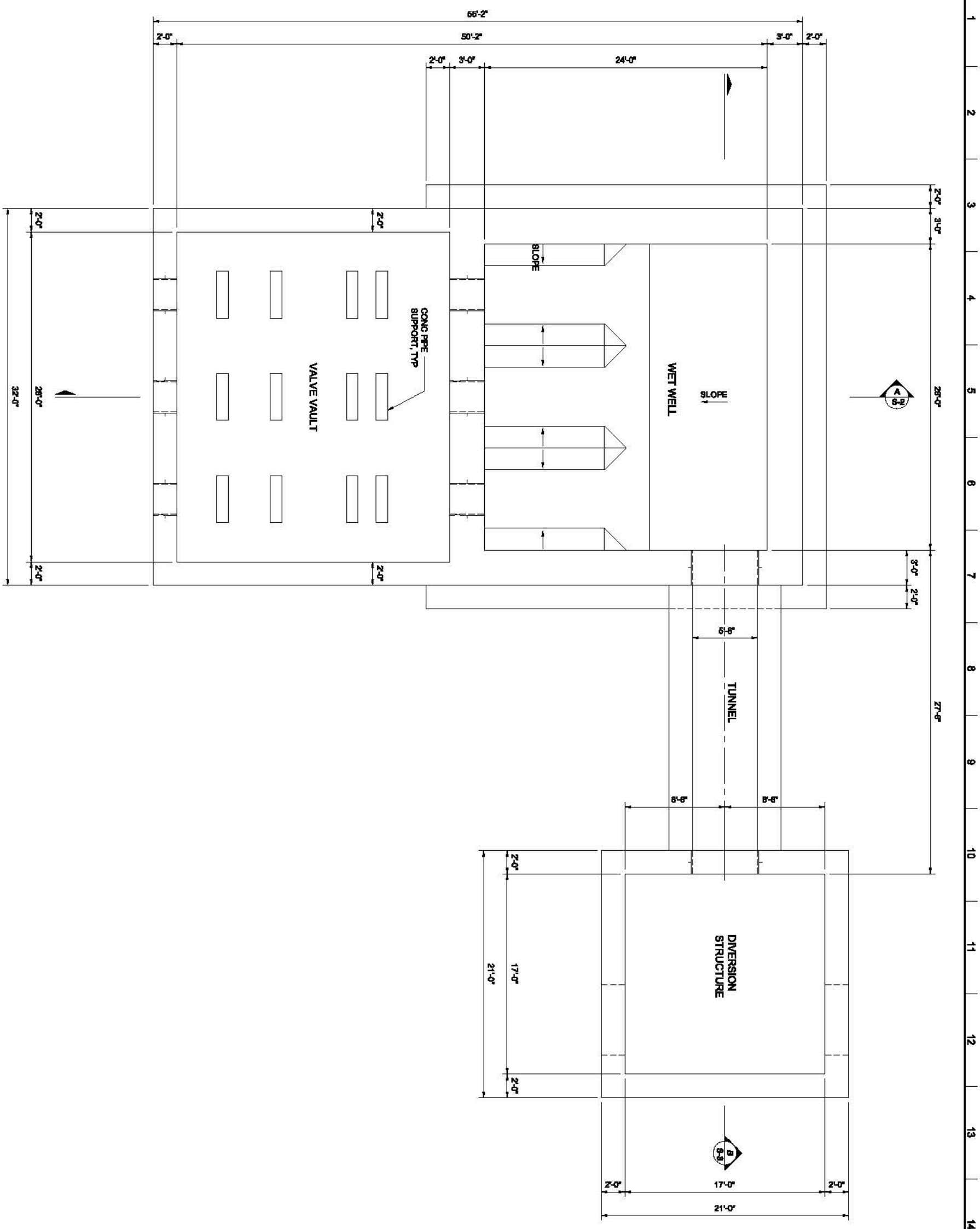

FLOOR PLAN

SCALE: 1/4" = 1'-0"

SCALE: 1/4" = 1'-0"

PRELIMINARY DESIGN

ARCADIS

LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

Beyaz & Patel
16935 West Bernardo Drive, Ste 100
San Diego, California 92127
(858) 451-0374

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

SHEET — OF — SHEETS: S-1

WORK ORDER NO. / DRAWING NO.: E6000591

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.6

SHEET TITLE: FLOOR PLAN

PROJECT: VENICE AUXILIARY PUMPING PLANT

ADDRESS: 140 HURRICANE ST
MARINA DEL REY, CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP			DATE:
ENGINEER:	ENGINEER	LIC. NO.	-
DESIGNED BY:	DESIGNER		-
DRAWN BY:	DRAWNBY		-
CHECKED BY:	CHECKBY		-
APPROVED BY:	APPROVEDBY		-

PRELIMINARY NOT FOR CONSTRUCTION

NO.	REVISIONS:	DATE:	BY:
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-	-	-	-
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-	-	-	-

INDEX NO. D-31898

STRUCTURE NO. SPB0000X

ENGINEERING
CITY OF LOS ANGELES

User:JNEEDERMORIN Spec:AUS-NOMCD FileRS:CADX71CADXTT9_PROJECTS\2711\2015213-VENICE-VPBAPP\DORS\20150210-10-14-FROM DORS\PUMP ROOM\STRUS-2.DWG Scale:1:1 Saved Date:1/30/2015 Time:09:38

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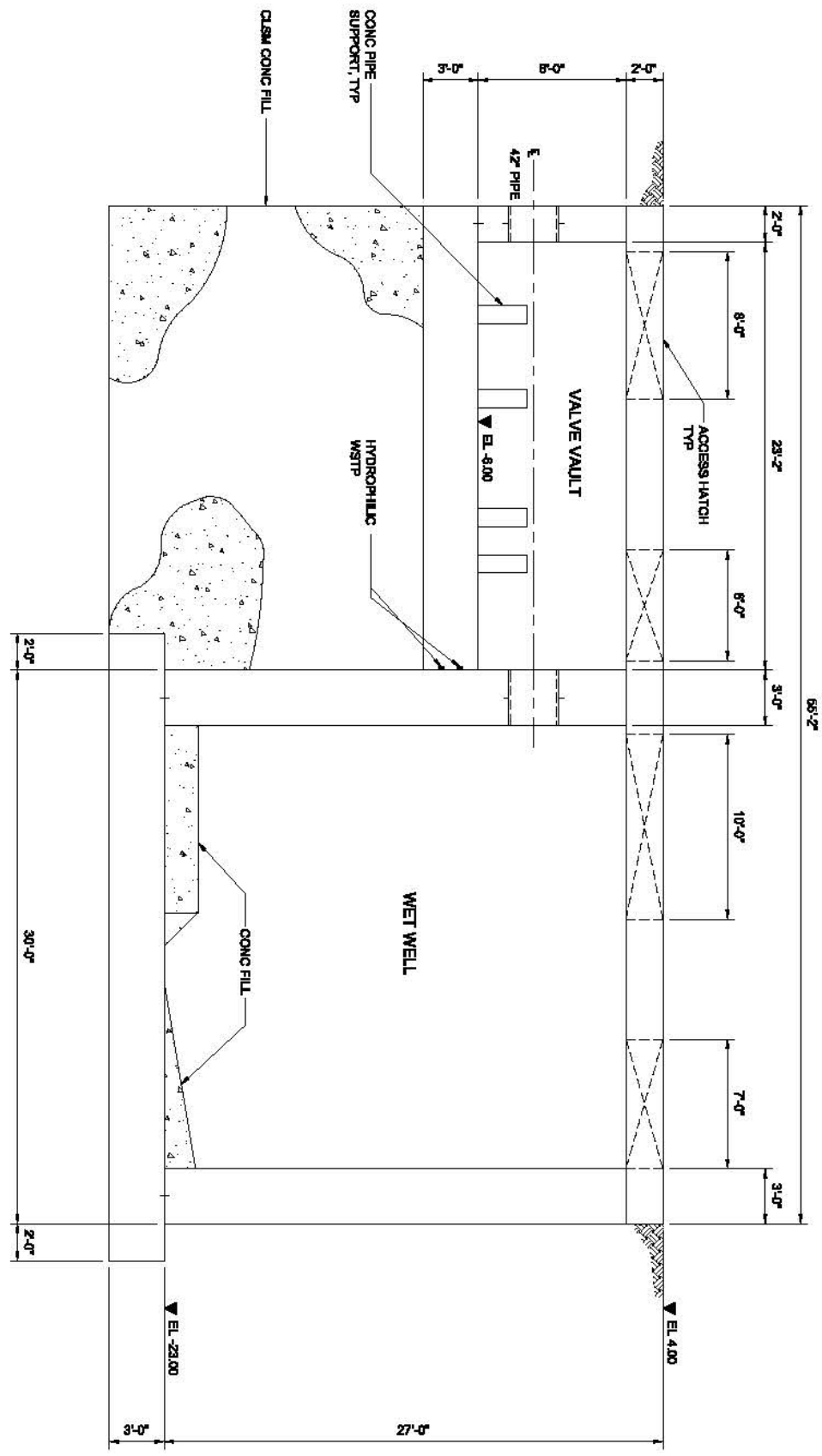

SECTION
SCALE: 1/4" = 1'-0"

A
S-1

SCALE: 1/4" = 1'-0"

PRELIMINARY DESIGN

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

Beyaz & Patel
16935 West Bernardo Drive, Ste 100
San Diego, California 92127
(858) 451-0374

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

SHEET — OF — SHEETS: S-2
WORK ORDER NO.: E6000591
DRAWING NO.:

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.6

SHEET TITLE: SECTION A
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST
MARINA DEL REY, CALIFORNIA

GARY LEE MOORE, P.E. CITY ENGINEER

DESIGN GROUP		LIC. NO.	DATE:
ENGINEER:	ENGINEER		-
DESIGNED BY:	DESIGNER		-
DRAWN BY:	DRAWNBY		-
CHECKED BY:	CHECKBY		-
APPROVED BY:	APPROVEDBY		-

PRELIMINARY NOT FOR CONSTRUCTION

NO.	REVISIONS:	DATE:	BY:
-	-	-	-
-	-	-	-
-	-	-	-
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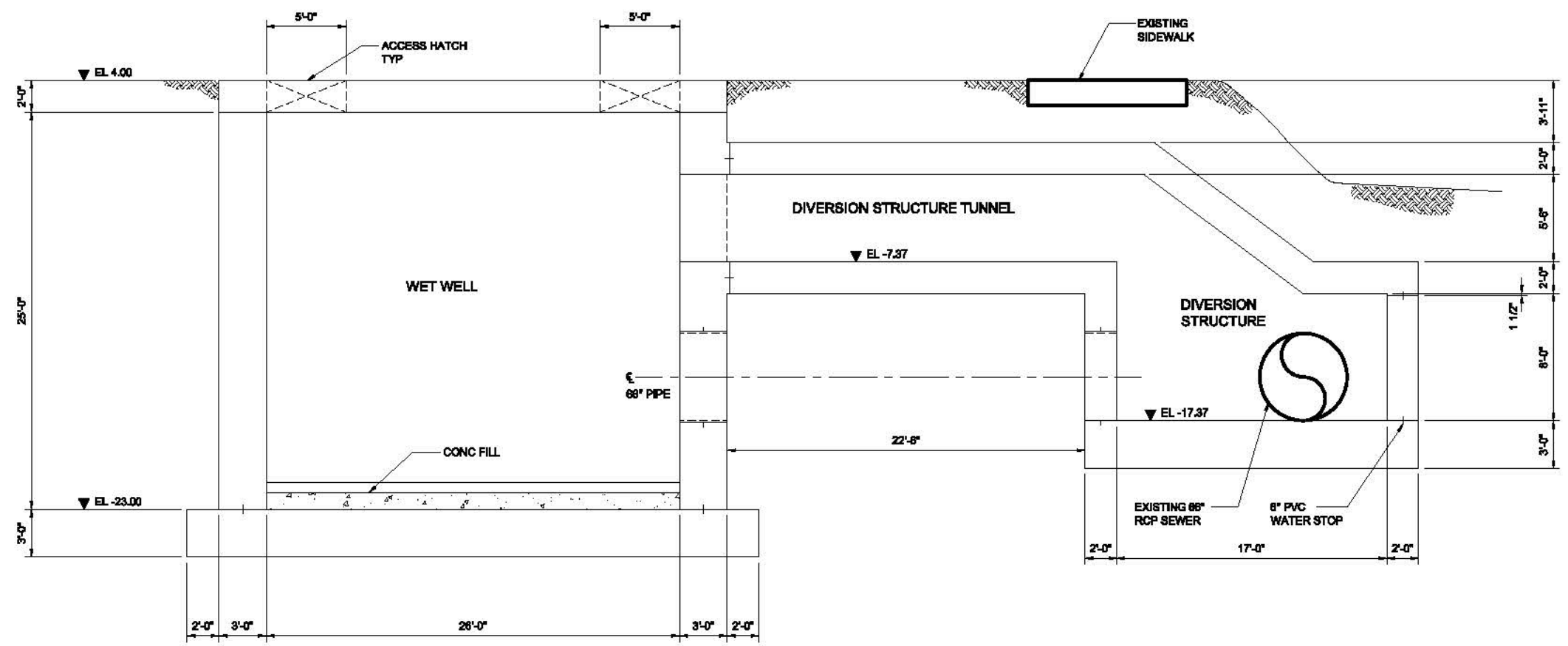
INDEX NO. D-31898
STRUCTURE NO. SPB0000X

ENGINEERING
CITY OF LOS ANGELES



SECTION
SCALE: 1/4" = 1'-0"

B
S-1

SCALE: 1/4" = 1'-0"

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Sheet Version 2.5

BUREAU OF ENGINEERING

ENGINEERING
CITY OF LOS ANGELES

NO.	REVISIONS:	DATE	BY:
-	-	-	-
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-	-	-	-
-	-	-	-
-	-	-	-

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

PRELIMINARY NOT FOR CONSTRUCTION

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E. CITY ENGINEER DATE

ENGINEER: DESIGN GROUP
DESIGNED BY: ENGINEER
DRAWN BY: DESIGNER
CHECKED BY: DRAWNBY
APPROVED BY: CHECKBY
LIC. NO. APPROVEDBY

VERTICAL CONTROL: (BASIS OF) NAVD 88 (GEOID)
HORIZONTAL CONTROL: (BASIS OF) NAD83, ZONE 5, EPOCH 1991.0

SHEET TITLE: SECTION B

PROJECT: VENICE AUXILIARY PUMPING PLANT

ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

Beyaz & Patel
16935 West Bernardo Drive, Ste 100
San Diego, California 92127
(858) 431-0374

ARCADIS
LEGAL ENTITY:
ARCADIS U.S. INC.
445 S. FIGUEROA ST.
SUITE 3600
LOS ANGELES
CA 90071

WORK ORDER NO. E6000591

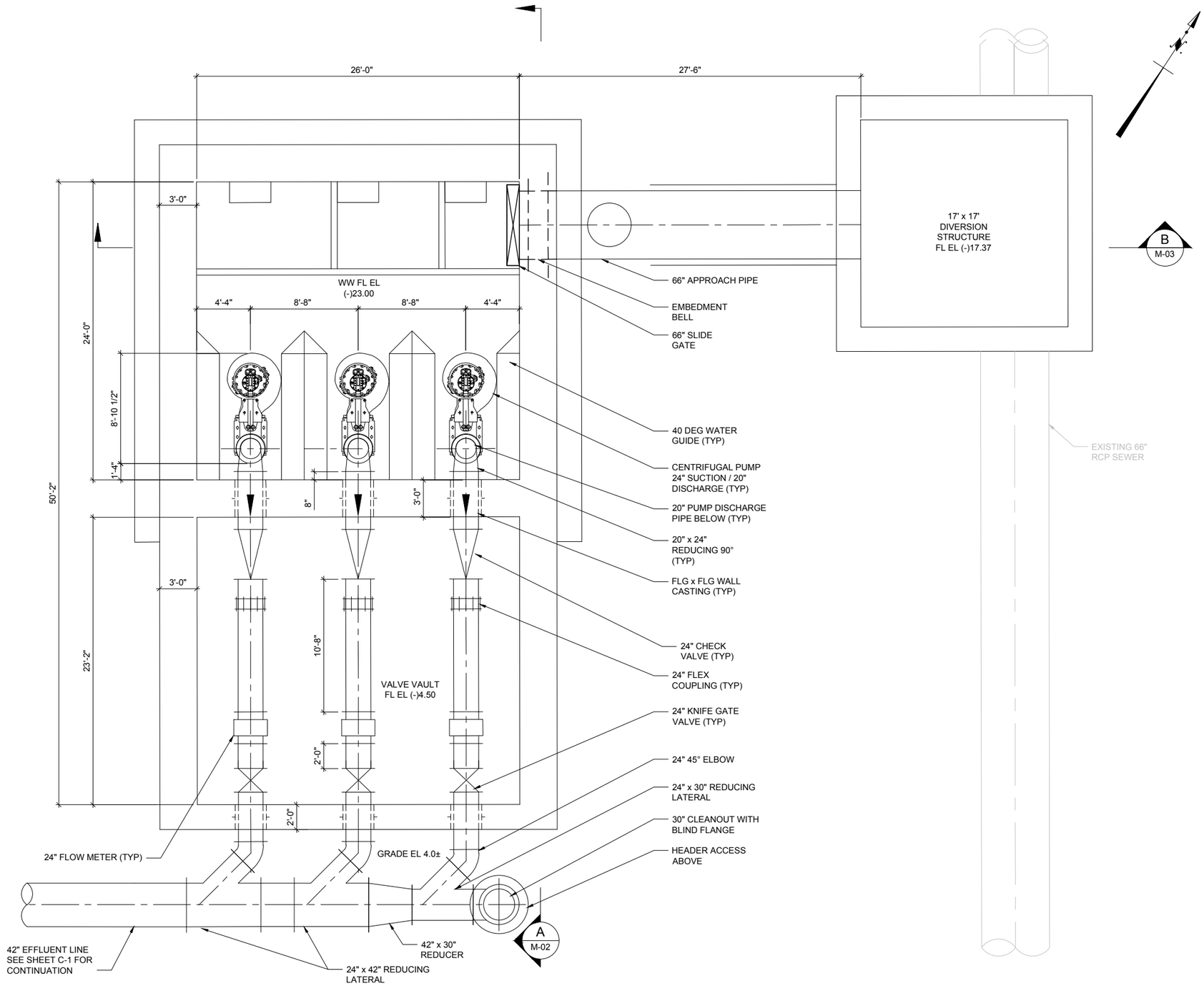
DRAWING NO. S-3

SHEET — OF — SHEETS

PRELIMINARY DESIGN

GENERAL SHEET NOTES

1. APPROACH PIPE LENGTH NEEDS TO BE 5xDIA OF INLET PIPE ≈ 27.5'



PLAN
SCALE: 1/4" = 1'-0"

SCALE: 1/4" = 1'-0"

ENGINEERING
CITY OF LOS ANGELES

BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE:	BY:
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-	-	-	-

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

PRELIMINARY
NOT FOR
CONSTRUCTION

DEPARTMENT OF PUBLIC WORKS

GARY LEE MOORE, P.E.
CITY ENGINEER

DESIGN GROUP

		DATE:
ENGINEER:	ENGINEER	-
DESIGNED BY:	DESIGNER	-
DRAWN BY:	DRAWNBY	-
CHECKED BY:	CHECKBY	-
APPROVED BY:	APPROVEDBY	-

LIC. NO.

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: PLAN

PROJECT: VENICE AUXILIARY PUMPING PLANT

ADDRESS: 140 HURRICANE ST
MARINA DEL REY, CALIFORNIA

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

WORK ORDER NO.
E6000591

DRAWING NO.
M-01

SHEET 7 OF -- SHEETS

PRELIMINARY DESIGN

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User:PEDROZA Spec:AUS-NCSMOD File:I:\ACAD\PROJ\06332002\2-SHEETS\05-M-MECHANICAL-HVAC\M-1.DWG Scale:1:1 SavedDate:10/9/2015 Time:08:55

REVISION DATES (DESIGN STAGE ONLY)

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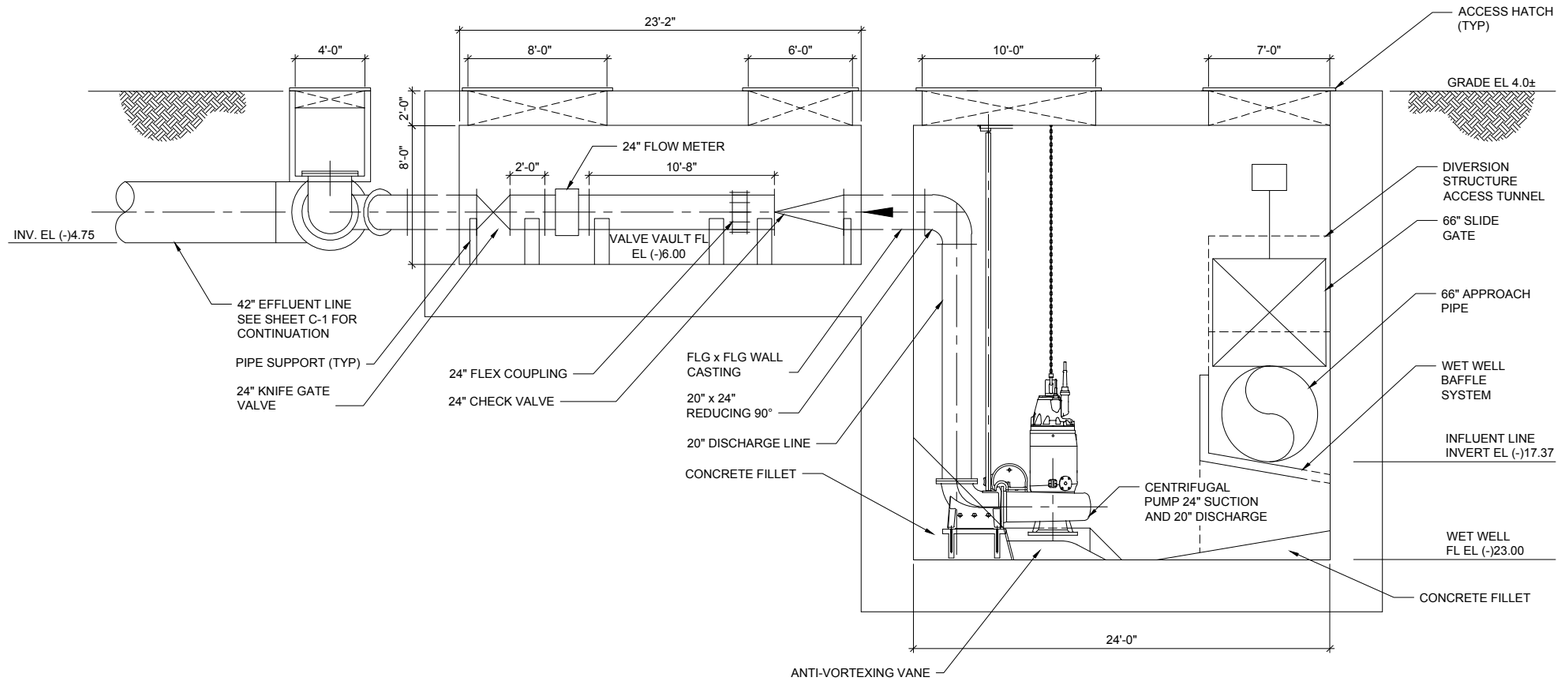

M-01	SECTION A
SCALE: 1/4" = 1'-0"	M-02

0 2' 4' 8'
SCALE: 1/4" = 1'-0"

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: ENGINEER LIC. NO.
DESIGNED BY: DESIGNER DATE:
DRAWN BY: DRAWNBY
CHECKED BY: CHECKBY
APPROVED BY: APPROVEDBY

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: SECTION A
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST
MARINA DEL REY, CALIFORNIA

WORK ORDER NO. E6000591
DRAWING NO. M-02
SHEET 7 OF -- SHEETS

ENGINEERING CITY OF LOS ANGELES

NO. REVISIONS: DATE: BY:

INDEX NO. D-31898
STRUCTURE NO. SPB0000X

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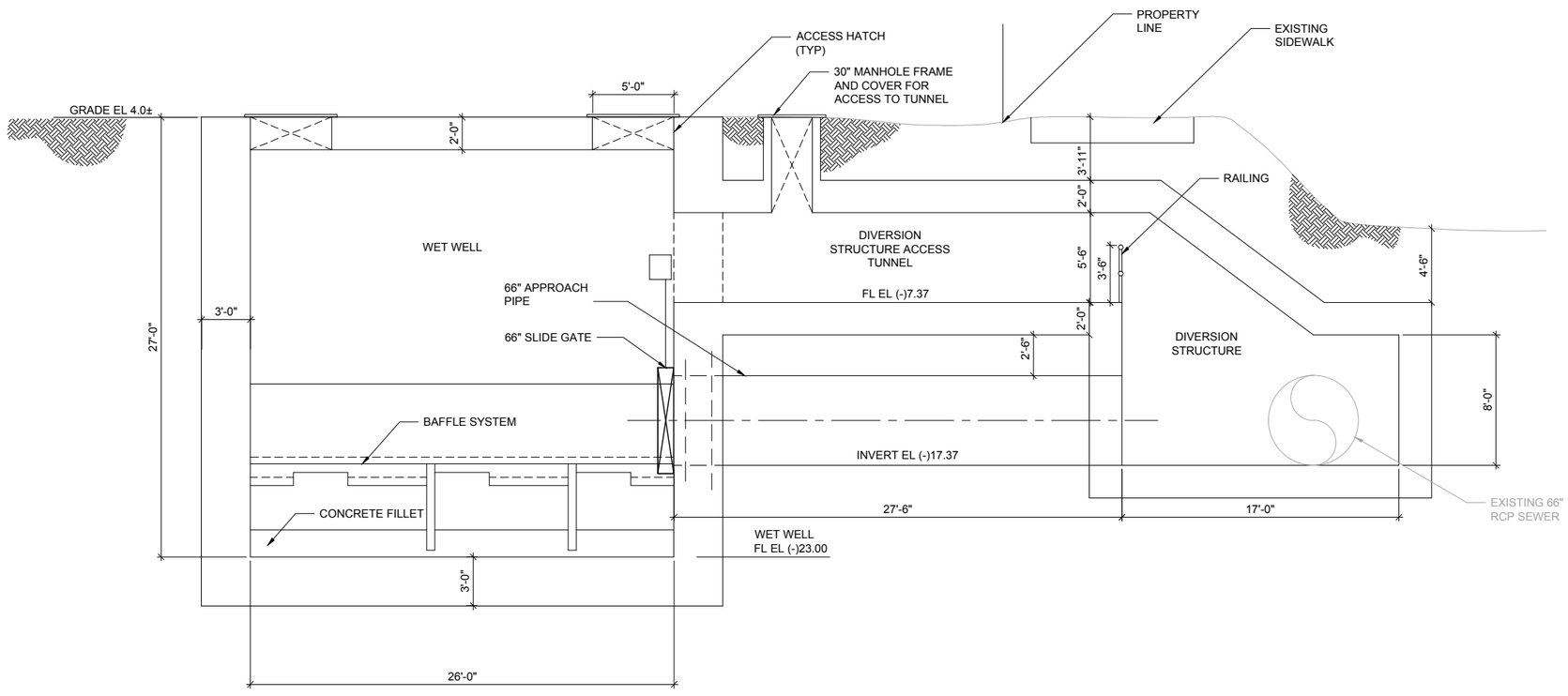

M-01	SECTION B
SCALE: 1/4" = 1'-0"	M-03

0 2' 4' 8'
SCALE: 1/4" = 1'-0"

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: ENGINEER
DESIGNED BY: DESIGNER
DRAWN BY: DRAWNBY
CHECKED BY: CHECKBY
APPROVED BY: APPROVEDBY
LIC. NO.
DATE:

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: SECTION B
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

WORK ORDER NO. E6000591
DRAWING NO. M-03
SHEET 8 OF -- SHEETS

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-	-	-	-

INDEX NO. D-31898
STRUCTURE NO. SPB0000X

ENGINEERING CITY OF LOS ANGELES

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REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

PRELIMINARY DESIGN

EXISTING VPP SWITCHGEAR

2000AF
2000AT

EXISTING BUS 2: 480V, 3P, 3W, 3200A, 65KAIC

EXISTING BUS 1: 480V, 3P, 3W, 3200A, 65KAIC

3200AF
3200AT

1600AF
1600AT

VFD

EXISTING DWP PRIMARY CIRCUIT 34.5KV

1500KW GENERATOR

PUMP P3

PUMP P4

PUMP P5

PUMP P1

PUMP P2

750KW GENREATOR

750KW GENERATOR

EXISTING VPP

NEW VAPP

NEW LADWP PADMOUNTED SWITCH CABINET

NEW LADWP PAD-MOUNTED TRANSFORMER 34.5KV-480V, 2000KVA

VAPP SWITCHGEAR

3000/5 (3)

METER

EO

3200AF
3000AT

CB CONTROLS

CIRCUIT BREAKER REMOTE CONTROL PANEL CBRCP-VAPP

INTEGRAL SOURCE MONITORING AND CIRCUIT BREAKER CONTROL LOGIC

BUS 2: 480V, 3P, 3W, 3200A, 65KAIC

BUS 1: 480V, 3P, 3W, 3200A, 65KAIC

1600AF
900AT

800AF
480AT

VFD/RVSS

PUMP P6

PUMP P7

PUMP P8

MCC-VAPP

BUS: 600 AMP, 3PH, 3W, 65 KAIC

TRANSFORMER 480-120/240V, 1 PHASE, 25KVA

LP

ATS-VAPP1: 480V, 600A, 3P, 3W, 65KAIC

UPS-VAPP

UPS

SCADA

ATS-VAPP2 240V, 100A, 2P, 22KAIC

G-VAPP 240V, 1-PH, 3W 24KW/24KVA

G

100AF
100AT

KEY NOTES:

1. TAP EXISTING OVERHEAD 34.5KV CIRCUIT AND ROUTE TO NEW LADWP TRANSFORMERS.
2. REPLACE EXISTING 1200A BREAKER WITH 1600A BREAKER FOR STANDBY POWER FEEDER.

VAPP SWITCHGEAR 480V LOAD SUMMARY

LOAD DESCRIPTION	KVA	HP	AMP
SERVICE 1			
PUMP 7		500	590
PUMP 8		500	590
MCC-VAPP	166		200
TOTAL	1146		1380
SERVICE 2			
PUMP 6		500	590
TOTAL	490		590
GRAND SUBTOTAL LOAD	**1636**		**1970**
25% OF LARGEST MOTOR			**148**
GRAND TOTAL LOAD	**1758**		**2118**

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

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REVISION DATES (DESIGN STAGE ONLY)

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CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

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ENGINEERING
CITY OF LOS ANGELES

NO.	REVISIONS:	DATE:	BY:
-	-	-	-

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

PRELIMINARY
NOT FOR
CONSTRUCTION

CITY ENGINEER
GARY LEE MOORE, P.E.
DATE
LIC. NO.

DESIGN GROUP:	
ENGINEER:	
DESIGNED BY:	
DRAWN BY:	
CHECKED BY:	
APPROVED BY:	

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: ONE LINE DIAGRAM

PROJECT: VENICE AUXILIARY PUMPING PLANT

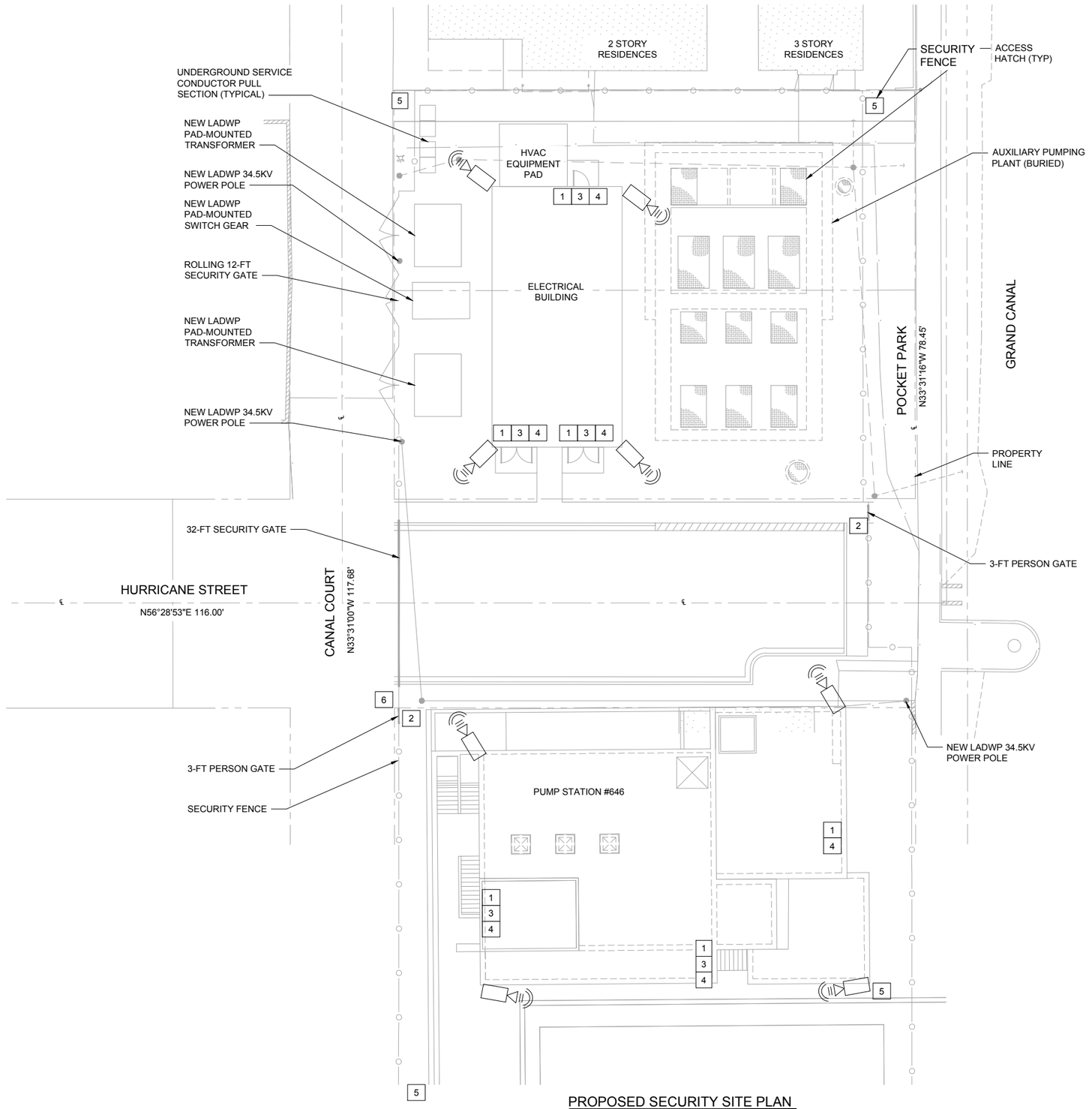
ADDRESS: 140 HURRICANE ST.
MARINA DEL REY, CALIFORNIA

WORK ORDER NO.
E6000591

DRAWING NO.
E-4

SHEET 61 OF -- SHEETS

PRELIMINARY DESIGN



PROPOSED SECURITY SITE PLAN
SCALE: 1" = 10'

LEGEND

1 KEYED DOOR LOCK
2 PAD LOCK
3 CARD READER (DOOR LOCK RELEASE)
4 DOOR POSITION SWITCH
5 INFRARED INTRUSION SENSOR
6 KNOX BOX (FIRE DEPARTMENT)
PAN, TILT, ZOOM CAMERA
FIXED CAMERA

SCALE: 1" = 10'

ENGINEERING
CITY OF LOS ANGELES

BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE	BY:
-	-	-	-

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

PRELIMINARY NOT FOR CONSTRUCTION

DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

GARY LEE MOORE, P.E. CITY ENGINEER
LIC. NO. DATE

DESIGN GROUP:	
ENGINEER:	ENGINEER
DESIGNED BY:	DESIGNER
DRAWN BY:	DRAWNBY
CHECKED BY:	CHECKBY
APPROVED BY:	APPROVEDBY

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: PRELIMINARY SECURITY SITE PLAN
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST. MARINA DEL REY, CALIFORNIA

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

WORK ORDER NO.
E6000591

DRAWING NO.
E-8

SHEET ----OF -- SHEETS

PRELIMINARY DESIGN

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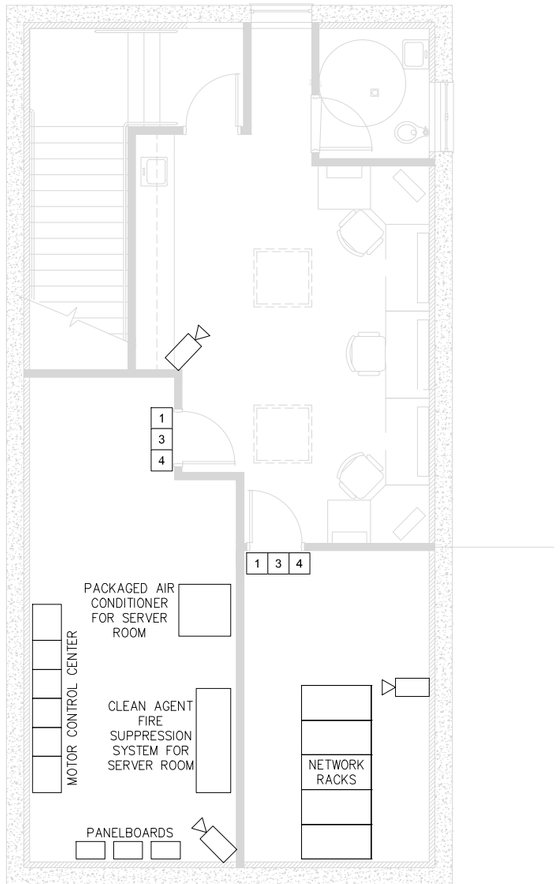
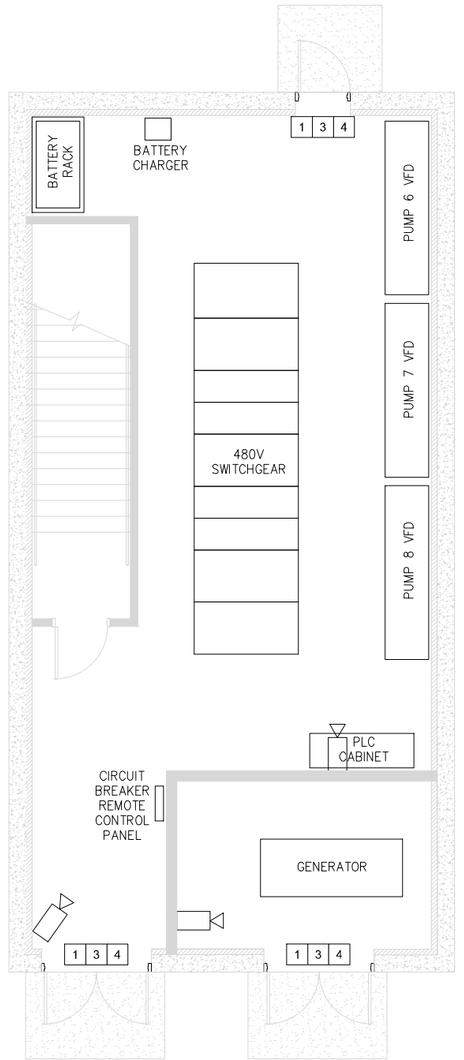


SECOND FLOOR PLAN
SCALE: 1/4" = 1'



FIRST FLOOR PLAN
SCALE: 1/4" = 1'

SCALE: 1/4" = 1'-0"

LEGEND

1	KEYED DOOR LOCK
2	PAD LOCK
3	CARD READER (DOOR LOCK RELEASE)
4	DOOR POSITION SWITCH
5	INFRARED INTRUSION SENSOR
6	KNOX BOX (FIRE DEPARTMENT)
	PAN, TILT, ZOOM CAMERA
	FIXED CAMERA

BUREAU OF ENGINEERING
ENGINEERING
CITY OF LOS ANGELES

NO.	REVISIONS:	DATE:	BY:
–	–	–	–

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

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CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83 ZONE 5, EPOCH 1991.5

SHEET TITLE: PRELIMINARY SECURITY SITE PLAN 2
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

CITY ENGINEER

	DESIGN GROUP	LIC. NO.	DATE
GARY LEE MOORE, P.E.			–
ENGINEER:	ENGINEER		–
DESIGNED BY:	DESIGNER		–
DRAWN BY:	DRAWNBY		–
CHECKED BY:	CHECKBY		–
APPROVED BY:	APPROVEDBY		–

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

WORK ORDER NO.
E6000591
DRAWING NO.
E-9
SHEET ----OF -- SHEETS

PRELIMINARY DESIGN

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User:PEDROZA Spec:AUS-NCSMOD File:I:\ACAD\PROJ\063320022\2-SHEETS\06-E-ELECTRICAL\E-9.DWG Scale:1:1 SavedDate: 11/6/2015 Time: 16:45

Sheet Version 3.0

DEVICE IDENTIFICATION LEGEND

LETTER	FIRST LETTER: MEASURED OR INITIATING VARIABLE	FIRST LETTER: MODIFIER	SUCCEEDING LETTERS: READOUT OR PASSIVE FUNCTION	SUCCEEDING LETTERS: OUTPUT FUNCTION	SUCCEEDING LETTERS: MODIFIER
	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	CONDUCTIVITY (ELECTRICAL)		CONTROLLER	CONTROL	CLOSED
D	DENSITY (MASS), SPECIFIC GRAVITY	DIFFERENTIAL	DIFFERENTIAL		
E	VOLTAGE (EMF)		PRIMARY ELEMENT		
F	FLOW RATE	RATIO (FRACTION)	RATIO		
G	STATUS		GLASS		
H	HAND (MANUALLY INITIATED)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME-SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE, HUMIDITY	MOMENTARY			MIDDLE, INTERMEDIATE
N	SEQUENCE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE (RESTRICTION)		OPEN
P	PRESSURE, VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECH. ANALYSIS			VALVE, DAMPER, OR LOUVER	
W	WEIGHT, FORCE		WELL		
X	MOTION	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE, OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION			DRIVE, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

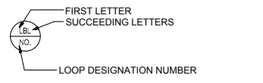
GENERAL INSTRUMENT SYMBOLS

- FIELD MOUNTED INSTRUMENT
- INSTRUMENT MOUNTED ON FACE OF CONTROL PANEL/MCC (IN CONTROL/ELECTRICAL ROOM)
- INSTRUMENT MOUNTED BEHIND OR INSIDE OF CONTROL PANEL/MCC (IN CONTROL/ELECTRICAL ROOM)
- INSTRUMENT MOUNTED ON FACE OF LOCAL CONTROL PANEL
- INSTRUMENT MOUNTED BEHIND OR INSIDE OF LOCAL CONTROL PANEL
- INSTRUMENT SHARING COMMON HOUSING
- PILOT LIGHT MOUNTED ON LOCAL CONTROL STATION OR ACTUATOR
- PILOT LIGHT MOUNTED ON FACE OF CONTROL PANEL/MCC
- PILOT LIGHT MOUNTED ON FACE OF LOCAL CONTROL PANEL
- CONTROL INTERLOCK FUNCTION, SEE SCHEMATICS AND SYSTEM SPECIFICATIONS FOR SPECIFIC FUNCTION

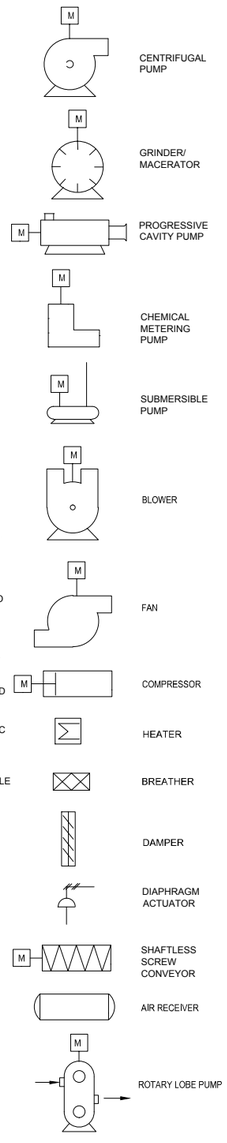
CONTROL SYSTEM INTERFACE SYMBOLS

- SHARED DISPLAY/CONTROL ACCESSIBLE TO OPERATOR ON MAIN CONTROL CONSOLE
- PANEL MOUNTED AUXILIARY OPERATOR DEVICE NOT NORMALLY ON MAIN CONTROL CONSOLE
- SHARED DISPLAY/CONTROL FIELD MOUNTED
- CONNECTION TO/FROM FIELD MOUNTED PLC OR RTU
- CONNECTION TO/FROM A CENTRAL OR MASTER PLC OR RTU NORMALLY ACCESSIBLE TO OPERATOR

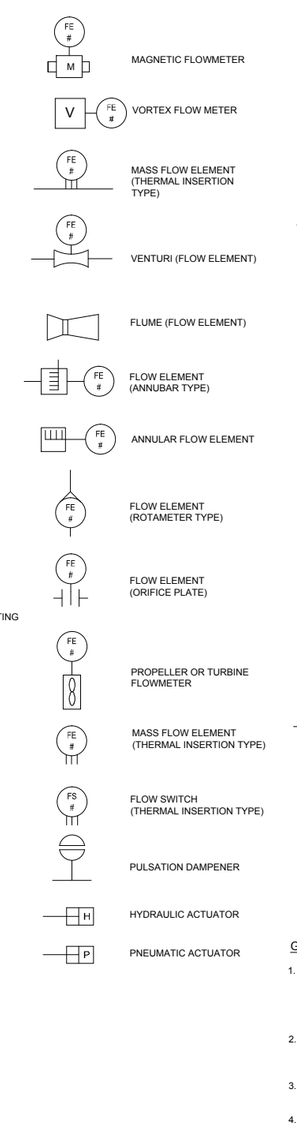
TAG NUMBERS AND ADDITIONAL DESIGNATIONS



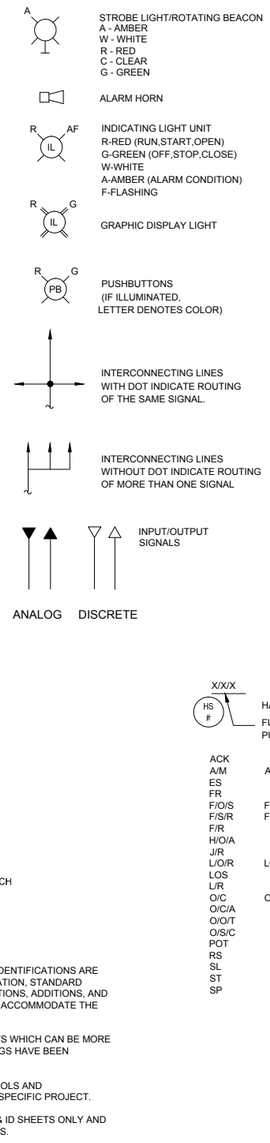
PROCESS SYMBOLS



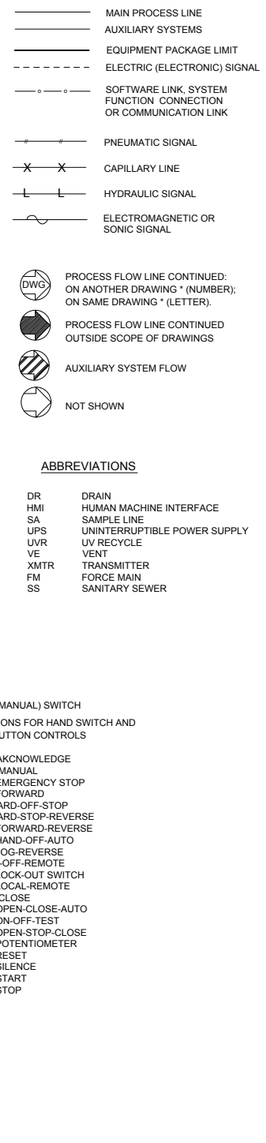
PRIMARY ELEMENTS SYMBOLS



ELECTRICAL SYMBOLS



LINE SYMBOLS



ABBREVIATIONS

DR	DRAIN
HMI	HUMAN MACHINE INTERFACE
SA	SAMPLE LINE
UPS	UNINTERRUPTIBLE POWER SUPPLY
UVR	UV RECYCLE
VE	VENT
XMTR	TRANSMITTER
FM	FORCE MAIN
SS	SANITARY SEWER

ACK	AKCNOWLEDGE
A/M	AUTO-MANUAL
ES	EMERGENCY STOP
FR	FORWARD
F/O/S	FORWARD-OFF-STOP
F/S/R	FORWARD-STOP-REVERSE
F/R	FORWARD-REVERSE
H/O/A	HAND-OFF-AUTO
J/R	JOG-REVERSE
LO/R	LOCAL-OFF-REMOTE
LOS	LOCK-OUT SWITCH
L/R	LOCAL-REMOTE
O/C	OPEN-CLOSE
O/C/A	OPEN-CLOSE-AUTO
O/O/T	ON-OFF-TEST
O/S/C	OPEN-STOP-CLOSE
POT	POTENTIOMETER
RS	RESET
SL	SILENCE
ST	START
SP	STOP

GENERAL NOTES

1. IN GENERAL, THE P & ID SYMBOLS AND DEVICE IDENTIFICATIONS ARE BASED ON INTERNATIONAL SOCIETY OF AUTOMATION, STANDARD PRACTICE ISA-5.1-1984 (R1992). SOME MODIFICATIONS, ADDITIONS, AND ALTERATIONS HAVE BEEN MADE AS NEEDED TO ACCOMMODATE THE PROJECT REQUIREMENTS.
2. SOME CONTROL AND INTERLOCK REQUIREMENTS WHICH CAN BE MORE CLEARLY ILLUSTRATED ON SCHEMATIC DRAWINGS HAVE BEEN OMITTED FROM THE P & ID DRAWINGS.
3. THIS IS A GENERAL LEGEND SHEET. SOME SYMBOLS AND ABBREVIATIONS MAY NOT BE UTILIZED ON THIS SPECIFIC PROJECT.
4. PIPING AND EQUIPMENT LEGEND APPLIES TO P & ID SHEETS ONLY AND MAY DIFFER FROM LEGENDS FOR OTHER SHEETS.

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING
ENGINEERING
CITY OF LOS ANGELES

GARY LEE MOORE, P.E.
CITY ENGINEER
LIC. NO.
DATE

DESIGN GROUP
ENGINEER:
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:

DATE: BY:
NO. REVISIONS:

STRUCTURE NO. SPB0000X
INDEX NO. D-31898

THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED

PRELIMINARY NOT FOR CONSTRUCTION

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)
HORIZONTAL CONTROL: (SAMPLE) NAD83 ZONE 5, EPOCH 1991.5

SHEET TITLE: PROCESS AND INSTRUMENTATION SYMBOLS AND ABBREVIATIONS
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST MARINA DEL REY, CALIFORNIA

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

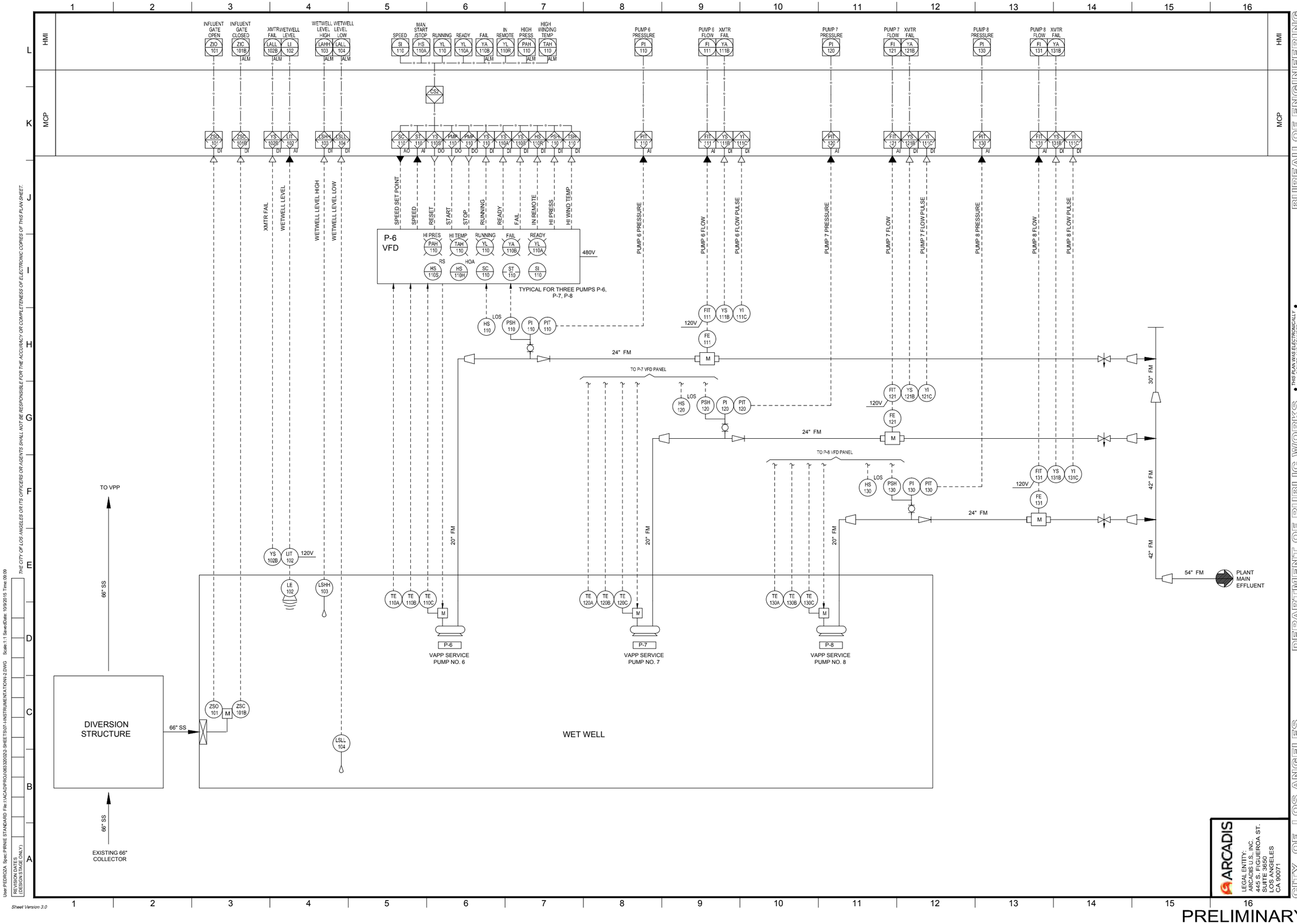
WORK ORDER NO.
E6000591
DRAWING NO.
I-01
SHEET 1 OF -- SHEETS

REVISION DATES (DESIGN STAGE ONLY)

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

User:PEDROZA Sync:PRNIE STANDARD File:I:\ACAD\PROJ\063320\2\2-SHEETS\07-INSTRUMENTATION\I-01.DWG Scale:1:1 SavedDate: 10/9/2015 Time:09:02
Sheet Version 3.0

PRELIMINARY DESIGN



THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

User:PERDOZA Spec:PRNE STANDARD File:I:\ACAD\PROJ\083200\02-SHEETS\07-INSTRUMENTATION\I-2.DWG Scale:1:1 SavedDate: 10/9/2015 Time:09:09

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

BUREAU OF ENGINEERING

ENGINEERING
CITY OF LOS ANGELES

NO.	REVISIONS:	DATE:	BY:
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

PRELIMINARY NOT FOR CONSTRUCTION

THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

CITY ENGINEER

GARY LEE MOORE, P.E.

DESIGN GROUP	LIC. NO.	DATE
ENGINEER:		-
DESIGNED BY:	DESIGNER	-
DRAWN BY:	DRAWNBY	-
CHECKED BY:	CHECKBY	-
APPROVED BY:	APPROVEDBY	-

VERTICAL CONTROL: (SAMPLE) NAVD 88 (2000)

HORIZONTAL CONTROL: (SAMPLE) NAD83, ZONE 5, EPOCH 1991.5

SHEET TITLE: VAPP SERVICE PUMPS P&ID

PROJECT: VENICE AUXILIARY PUMPING PLANT

ADDRESS: 140 HURRICANE ST. MARINA DEL REY, CALIFORNIA

ARCADIS

LEGAL ENTITY:
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LOS ANGELES
CA 90071

WORK ORDER NO. E6000591

DRAWING NO. I-02

SHEET 1 OF -- SHEETS

PRELIMINARY DESIGN

ARCADIS

Appendix **C**

Preliminary Design Calculations

ARCADIS

Hydraulic Calculations

Auxiliary Pump Hydraulics Evaluation

Project: Venice Auxiliary Pumpi **Author:** N. Pailma **Original Date:** 2/18/2015
Job No.: TO#41 **Updated Date:** 7/2/2015
Checked by: R. Vargus **Checked Date:** 5/18/2015

The purpose of these calculations is to evaluate addition of auxiliary pumps for the Venice APP and determine which manufacturer and model would be suitable to handle the design conditions established for the exisiting pumps.

Assumptions:

The design point of the original pumps is 12,000 gpm at 100 ft of head. A secondary operating point is 8,000 gpm at 58 ft. There are 5 existing pumps that pump to a common 48 inch force main, each rated for 18 MGD @ 100 ft TDH. The goal for the auxiliary pump station is to supplement and provide additional reliability to the existing pump station by adding the capacity of 3 additinal pumps matching the perfomance points of the exisitng pumps, 18 MGD @ 100 ft, discharging to the common force main. Several scenarios exist for the pump system including discharge to the existing common 48" force main, discharge to future common 54" force main, and discharge to both 48" & 54" force mains. The scenario for which these calculations model, is 3 pumps on a discharge header combining with existing pump flow in the common 48" force main.

Calculations:

See attached sheets.

- Worksheet to generate System Head Curve for 1 Pump
- Worksheet to generate System Head Curve for 2 Pumps
- Worksheet to generate System Head Curve for 3 Pumps
- Worksheet for pump curves and NPSH evaluation
- Chart for System Head Curves and Flygt Pump hydraulics

Conclusions:

For flow coverage and NPSH considerations, Flygt, ABS , KSB and HOMA have a compatible pump.

DRAFT

City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE THE TOTAL DYNAMIC HEAD (TDH) REQUIRED TO PUMP FROM AUXILIARY PUMP PLANT WET WELL TO THE COMMON FORCE MAIN IN ORDER TO SIZE THE INFLUENT PUMPS.

SCENARIO:

One pump operation scenario to represent Average Flow Condition. Plant reports single pump operation during average conditions.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm per pump
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
$g = 32.2$ ft/s^2

Segment	Diam. (in)	Fitting	Length (ft)	Flow (gpm)	Velocity (fps)	$V^2/2g$ (ft)	K	Fitting Loss (ft)	C=110 Pipe Loss (ft)	C=120 Pipe Loss (ft)
Wet Well										
	24	bell entrance		12500	8.9	1.22	0.04	0.05	0.00	0.00
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.00	0.00
	24	straight run	8	12500	8.9	1.22	0.00	0.00	0.10	0.09
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.00	0.00
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.00	0.00
Pump in Dry Pit		pump								
	20	straight run	8	12500	12.8	2.53	0.00	0.00	0.25	0.21
	20	90 ell-SR		12500	12.8	2.53	0.30	0.76	0.00	0.00
	20	reducer	**13**	12500	12.8	2.53	use eqn/table		0.41	0.35
	16	rotovalve		12500	19.9	6.18	0.04	0.27	0.00	0.00
	16	straight run	6	12500	19.9	6.18	0.00	0.00	0.55	0.47
	16	gate valve		12500	19.9	6.18	0.10	0.62	0.00	0.00
	16	increaser	**11**	12500	19.9	6.18	use eqn/table		1.04	0.89
	20	90 ell-SR		12500	12.8	2.53	0.30	0.76	0.00	0.00
	20	straight run	6	12500	12.8	2.53	0.00	0.00	0.19	0.16
	20	increaser		12500	12.8	2.53	use eqn/table		0.00	0.00
	20	45 ell		12500	12.8	2.53	0.23	0.58	0.00	0.00
	24	22.5 ell		12500	8.9	1.22	0.15	0.18	0.00	0.00
	20	straight run	20	12500	12.8	2.53	0.00	0.00	0.62	0.53
	20	22.5 ell		12500	12.8	2.53	0.15	0.38	0.00	0.00
	20	45 ell		12500	12.8	2.53	0.23	0.58	0.00	0.00
	20	straight run	5	12500	12.8	2.53	0.00	0.00	0.15	0.13
	20	gate valve		12500	12.8	2.53	0.10	0.25	0.00	0.00
	20	increaser	**62**	12500	12.8	2.53	use eqn/table		1.91	1.63
	54	tee side		12500	1.8	0.05	0.72	0.03	0.00	0.00
TOTAL			**139**					**5.32**	**5.23**	**4.45**

LWL in wet well -14.1 *(3' above bottom of wet well)*
HWL in wet well -6.1
Low discharge El. 40.5
High discharge El. 44.5 *(Junction Structure w/ 48"FM Full)*

Max Static Head = 58.6 ft
Min Static Head = 46.6 ft

	C=110	C=120
Total Headloss (ft) =	10.55	9.77
+ 10% safety factor	1.05	0.98
	11.60	10.75
Max TDH (ft) =	**70.18**	
Min TDH (ft) =		**57.32**

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
0.2 ° Ell.	0.01	
0.26 ° Ell.	0.01	
0.7 ° Ell.	0.02	
1 ° Ell.	0.03	
1.4 ° Ell.	0.03	
2 ° Ell.	0.04	
2.5 ° Ell.	0.04	
2.8 ° Ell.	0.04	
3 ° Ell.	0.05	
4 ° Ell.	0.05	
11.25 ° Ell.	0.09	
12 ° Ell.	0.09	
17 ° Ell.	0.11	
22.5 ell	0.15	
22.5 ° Ell.	0.15	
30 ° Ell.	0.14	
40 ° Ell.	0.17	
45 ell	0.23	
45 ° Ell.	0.23	
90 ell-LR	0.20	
90 ell-SR	0.30	
tee thru	0.24	
tee side	0.72	
wye thru	0.24	
wye side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*

calculate multiple results using data tables

DRAFT

City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE THE TOTAL DYNAMIC HEAD (TDH) REQUIRED TO PUMP FROM AUXILIARY PUMP PLANT WET WELL TO THE COMMON FORCE MAIN IN ORDER TO SIZE THE INFLUENT PUMPS.

SCENARIO:

One pump operation scenario to represent Average Flow Condition. Plant reports single pump operation during average conditions.

gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
wye as elbow thru	1.00	
wye as elbow side	1.00	
Mag Meter	0.19	
Sluice Gate	0.80	
ball valve	1.00	

Table of Equivalent Lengths (Le/Di) for Reducers / Increasers
(Use only for preliminary head loss calculations)

Do/Di (Note 1)	Sudden Expansion	Pipe Reducer
0.9	9	3
0.8	27	8
0.7	65	18
0.6	150	38
0.5	370	85
0.4	1000	220
1.1	1.5	NA
1.2	5	NA
1.3	8.5	NA
1.4	12.5	NA
1.5	16	NA
1.7	22	NA
2	28	NA
2.5	35	NA
2.7	37	NA
3	40	NA
4	44	NA

Note1: Do/Di = downstream diameter / upstream diameter

Equivalent Length = h_L
h_L = (Le/Di) x Pipe ID

Increaser / Reducer Calculations:

(upstream D) Di (in) x Do (out)	Do/Di	(from table) Le/D	**Equivalent Length (ft)**	flow (gpm)	Velocity (fps)	Equiv Loss (ft)	equiv K value
20 x 16	0.8	8.0	**13**	12500	12.8	0.41	0.16
16 x 20	1.3	8.5	**11**	12500	19.9	1.04	0.17
20 x 54	2.7	37.0	**62**	12500	12.8	1.91	0.76
30 x 24	0.8	8.0	**20**	12500	5.7	0.09	0.17
24 x 30	1.3	8.5	**17**	12500	8.9	0.22	0.18
30 x 42	1.4	12.5	**31**	12500	5.7	0.13	0.27
2 x 1	0.5	85.0	**14**	12500	1276.6	32210.88	1.27
2 x 1	0.5	85.0	**14**	12500	1276.6	32210.88	1.27
2 x 1	0.5	85.0	**14**	12500	1276.6	32210.88	1.27
2 x 1	0.5	85.0	**14**	12500	1276.6	32210.88	1.27

Data Table to generate system head curve (see pdf)

1 Pump Flow (gpm)	TDH Low (ft)	TDH High (ft)
	57	70.18
0	46.57	58.58
1,000	46.65	58.67
2,000	46.88	58.92
3,000	47.26	59.33
4,000	47.76	59.88
5,000	48.40	60.57
6,000	49.18	61.41
7,000	50.08	62.38
8,000	51.11	63.49
9,000	52.27	64.74
10,000	53.55	66.13
11,000	54.96	67.65
12,500	57.32	70.18
13,000	58.16	71.09
14,000	59.95	73.01
15,000	61.85	75.06
16,000	63.88	77.24
17,000	66.04	79.56
18,000	68.31	82.00
19,000	70.71	84.57
20,000	73.22	87.27
21,000	75.86	90.10
22,000	78.62	93.06
23,000	81.50	96.15
24,000	84.50	99.37

DRAFT

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Venice Auxiliary Pumping Plant

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In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm per pump
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
Wet Well Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.21	0.26	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.18	0.09	0.000	0.000
Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.11	0.06	0.000	0.000
Pump 8 Connection	42	tee thru		37500	8.7	1.17	0.24	0.28	0.000	0.000
	42	straight run	22	37500	8.7	1.17	0.00	0.00	0.141	0.120
	42	Mag Meter		37500	8.7	1.17	0.19	0.22	0.000	0.000
	42	straight run	22	37500	8.7	1.17	0.00	0.00	0.141	0.120
	42	45 ell		37500	8.7	1.17	0.23	0.27	0.000	0.000
	42	straight run	3	37500	8.7	1.17	0.00	0.00	0.019	0.016
	42	45 ell		37500	8.7	1.17	0.23	0.27	0.000	0.000
	42	straight run	3	37500	8.7	1.17	0.00	0.00	0.019	0.016
	42	tee as elbow side		37500	8.7	1.17	1.00	1.17	0.000	0.000
	54	straight run	5	37500	5.3	0.43	0.00	0.00	0.009	0.008
	54	ball valve		37500	5.3	0.43	1.00	0.43	0.000	0.000
	54	straight run	5	37500	5.3	0.43	0.00	0.00	0.009	0.008
Connection to Manifold										
TOTAL			**110**					**7.08**	**1.01**	**0.86**

LWL in wet well -14.1 *(3' above bottom of wet well)*
HWL in wet well -6.1
Low discharge El. -3.0 *at manifold connection*
High discharge El. 1.0

Headloss (ft) = 8.09 7.94

Max Static Head (ft) = 15.1 ft
Min Static Head (ft) = 3.1 ft

Pump Piping Total Headloss (ft)

Max TDH (ft) =	**23.20**
Min TDH (ft) =	**11.04**

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
0.2 ° Ell.	0.01	
0.26 ° Ell.	0.01	
0.7 ° Ell.	0.02	
1 ° Ell.	0.03	
1.4 ° Ell.	0.03	
2 ° Ell.	0.04	
2.5 ° Ell.	0.04	
2.8 ° Ell.	0.04	
3 ° Ell.	0.05	
4 ° Ell.	0.05	
11.25 ° Ell.	0.09	
12 ° Ell.	0.09	
17 ° Ell.	0.11	

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System Head Curve

DETERMINE THE TOTAL DYNAMIC HEAD (TDH) REQUIRED TO PUMP FROM AUXILIARY PUMP PLANT WET WELL TO THE COMMON FORCE MAIN IN ORDER TO SIZE THE INFLUENT PUMPS.

SCENARIO:

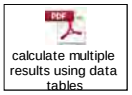
One pump operation scenario to represent Average Flow Condition. Plant reports single pump operation during average conditions.

22.5 ell	0.15	
22.5 ° Ell.	0.15	
30 ° Ell.	0.14	
40 ° Ell.	0.17	
45 ell	0.23	
45 ° Ell.	0.23	
90 ell-LR	0.20	
90 ell-SR	0.30	
tee thru	0.24	
tee side	0.72	
wye thru	0.24	
wye side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
wye as elbow thru	1.00	
wye as elbow side	1.00	
Mag Meter	0.19	
Sluice Gate	0.80	
ball valve	1.00	

Reducer	Do/Di	Do/Di	upstream D Di (in)	use sheet Re Le/D	Le (ft)	k
30x24	24/30	0.8	30	8	20	0.21
24x30	30/24	1.25	24	8.5	17	0.18
30x42	42/30	1.4	42	16	56	0.11

Data Table to generate system head curve (see pdf)

1 Pump Flow (gpm)	TDH Low (ft)	TDH High (ft)
	11	23.20
0	3.1	15.11
1,000	3.15	15.16
2,000	3.31	15.33
3,000	3.57	15.59
4,000	3.93	15.96
5,000	4.39	16.43
6,000	4.95	17.00
7,000	5.62	17.68
8,000	6.38	18.45
9,000	7.24	19.33
10,000	8.20	20.31
11,000	9.26	21.39
12,500	11.04	23.20
13,000	11.69	23.86
14,000	13.05	25.24
15,000	14.50	26.72
16,000	16.06	28.31
17,000	17.72	29.99
18,000	19.48	31.78
19,000	21.33	33.67
20,000	23.28	35.65
21,000	25.34	37.74
22,000	27.49	39.92
23,000	29.74	42.21
24,000	32.08	44.60



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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

One pump operation

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		12500	5.7	0.50	0.24	0.12	0.000	0.000
	30	straight run	11	12500	5.7	0.50	0.00	0.00	0.047	0.040
	42	increaser		12500	2.9	0.13	0.21	0.03	0.000	0.000
New Pump 8 Connection	42	tee thru		12500	2.9	0.13	0.24	0.03	0.000	0.000
	42	straight run	22	12500	2.9	0.13	0.00	0.00	0.018	0.016
	42	Mag Meter		12500	2.9	0.13	0.19	0.02	0.000	0.000
	42	straight run	22	12500	2.9	0.13	0.00	0.00	0.018	0.016
	42	45 ° Ell.		12500	2.9	0.13	0.30	0.04	0.000	0.000
	42	straight run	3	12500	2.9	0.13	0.00	0.00	0.003	0.002
	42	45 ° Ell.		12500	2.9	0.13	0.30	0.04	0.000	0.000
	42	straight run	3	12500	2.9	0.13	0.00	0.00	0.003	0.002
	42	tee as elbow side		12500	2.9	0.13	1.00	0.13	0.000	0.000
	54	straight run	5	12500	1.8	0.05	0.00	0.00	0.001	0.001
	54	ball valve		12500	1.8	0.05	1.00	0.05	0.000	0.000
	54	straight run	5	12500	1.8	0.05	0.00	0.00	0.001	0.001
Connection to 54" Manifold										
Fittings	48	tee side		12500	2.2	0.08	0.72	0.05	0.00	0.00
	48	90 ell-SR		12500	2.2	0.08	0.30	0.02	0.00	0.00
	48	ball valve		12500	2.2	0.08	1.00	0.08	0.00	0.00
	48	Mag Meter		12500	2.2	0.08	0.19	0.01	0.00	0.00
	48	4.5° Ell.		12500	2.2	0.08	0.05	0.00	0.00	0.00
	48	22.5 ° Ell.		12500	2.2	0.08	0.15	0.01	0.00	0.00
	48	60.0 ° Ell.		12500	2.2	0.08	0.30	0.02	0.00	0.00
	48	22.5 ° Ell.		12500	2.2	0.08	0.15	0.01	0.00	0.00
	48	22.5 ° Ell.		12500	2.2	0.08	0.15	0.01	0.00	0.00
	48	22.5 ° Ell.		12500	2.2	0.08	0.15	0.01	0.00	0.00
	48	22.5 ° Ell.		12500	2.2	0.08	0.15	0.01	0.00	0.00
	48	22.5 ° Ell.		12500	2.2	0.08	0.15	0.01	0.00	0.00
	48	1.0° Ell.		12500	2.2	0.08	0.03	0.00	0.00	0.00
	48	13.0° Ell.		12500	2.2	0.08	0.10	0.01	0.00	0.00
	48	0.5° Ell.		12500	2.2	0.08	0.02	0.00	0.00	0.00
	48	7.0° Ell.		12500	2.2	0.08	0.07	0.01	0.00	0.00
	48	4.0° Ell.		12500	2.2	0.08	0.05	0.00	0.00	0.00
	48	4.0° Ell.		12500	2.2	0.08	0.05	0.00	0.00	0.00
	48	4.0° Ell.		12500	2.2	0.08	0.05	0.00	0.00	0.00
	48	4.0° Ell.		12500	2.2	0.08	0.05	0.00	0.00	0.00
	48	4.0° Ell.		12500	2.2	0.08	0.05	0.00	0.00	0.00
	48	5.0° Ell.		12500	2.2	0.08	0.05	0.00	0.00	0.00
	48	5.0° Ell.		12500	2.2	0.08	0.05	0.00	0.00	0.00
	48	sluice gate		12500	2.2	0.08	0.80	0.06	0.00	0.00
	48	tee thru		12500	2.2	0.08	0.24	0.02	0.00	0.00
	48	exit		12500	2.2	0.08	1.00	0.08	0.00	0.00
Pipe Length	48	straight run	10430	12500	2.2	0.08	0.00	0.00	4.57	3.89
TOTAL			**10540**				**13**	**5**	**5**	**4**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

One pump operation

LWL at AVPP	-14.1	*at manifold connection*	**Total Headloss (ft) =**	9.82	9.05
HWL at AVPP	-6.1		+ 10% safety factor	0.98	0.91
Low discharge El.	40.5			10.80	9.96
High discharge El.	44.5				
			Max TDH (ft) =	**69.37**	
Max Static Head =	58.6	ft	**Min TDH (ft) =**		**56.53**
Min Static Head =	46.6	ft			

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	57	69.37
0	46.57	58.57
1,000	46.65	58.66
2,000	46.86	58.89
3,000	47.21	59.27
4,000	47.68	59.78
5,000	48.28	60.43
6,000	48.99	61.21
7,000	49.83	62.12
8,000	50.79	63.16
9,000	51.86	64.32
10,000	53.05	65.61
11,000	54.35	67.02
12,500	56.53	69.37
13,000	57.31	70.22
14,000	58.96	72.00
15,000	60.72	73.90
16,000	62.60	75.93
17,000	64.59	78.08
18,000	66.69	80.34
19,000	68.90	82.73
20,000	71.22	85.23
21,000	73.66	87.86
22,000	76.20	90.60
23,000	78.86	93.46
24,000	81.62	96.44

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

Two pump operation. All pumps are discharging the same flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
$g = 32.2$ ft/s^2

Segment	Diam. (in)	Fitting	Length (ft)	Flow (gpm)	Velocity (fps)	$V^2/2g$ (ft)	K	Fitting Loss (ft)	C=110 Pipe Loss (ft)	C=120 Pipe Loss (ft)
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 54" Manifold										
Fittings	48	tee side		25000	4.4	0.31	0.72	0.22	0.00	0.00
	48	90 ell-SR		25000	4.4	0.31	0.30	0.09	0.00	0.00
	48	ball valve		25000	4.4	0.31	1.00	0.31	0.00	0.00
	48	Mag Meter		25000	4.4	0.31	0.19	0.06	0.00	0.00
	48	4.5° Ell.		25000	4.4	0.31	0.05	0.02	0.00	0.00
	48	22.5 ° Ell.		25000	4.4	0.31	0.15	0.05	0.00	0.00
	48	60.0 ° Ell.		25000	4.4	0.31	0.30	0.09	0.00	0.00
	48	22.5 ° Ell.		25000	4.4	0.31	0.15	0.05	0.00	0.00
	48	22.5 ° Ell.		25000	4.4	0.31	0.15	0.05	0.00	0.00
	48	22.5 ° Ell.		25000	4.4	0.31	0.15	0.05	0.00	0.00
	48	22.5 ° Ell.		25000	4.4	0.31	0.15	0.05	0.00	0.00
	48	22.5 ° Ell.		25000	4.4	0.31	0.15	0.05	0.00	0.00
	48	1.0° Ell.		25000	4.4	0.31	0.03	0.01	0.00	0.00
	48	13.0° Ell.		25000	4.4	0.31	0.10	0.03	0.00	0.00
	48	0.5° Ell.		25000	4.4	0.31	0.02	0.01	0.00	0.00
	48	7.0° Ell.		25000	4.4	0.31	0.07	0.02	0.00	0.00
	48	4.0° Ell.		25000	4.4	0.31	0.05	0.02	0.00	0.00
	48	4.0° Ell.		25000	4.4	0.31	0.05	0.02	0.00	0.00
	48	4.0° Ell.		25000	4.4	0.31	0.05	0.02	0.00	0.00
	48	4.0° Ell.		25000	4.4	0.31	0.05	0.02	0.00	0.00
	48	4.0° Ell.		25000	4.4	0.31	0.05	0.02	0.00	0.00
	48	5.0° Ell.		25000	4.4	0.31	0.05	0.02	0.00	0.00
	48	5.0° Ell.		25000	4.4	0.31	0.05	0.02	0.00	0.00
	48	sluice gate		25000	4.4	0.31	0.80	0.24	0.00	0.00
	48	tee thru		25000	4.4	0.31	0.24	0.07	0.00	0.00
	48	exit		25000	4.4	0.31	1.00	0.31	0.00	0.00
Pipe Length	48	straight run	10430	25000	4.4	0.31	0.00	0.00	16.46	14.02
TOTAL			**10540**				**13**	**7**	**17**	**15**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

Two pump operation. All pumps are discharging the same flow.

LWL at AVPP	-14.1	*at manifold connection*	**Total Headloss (ft) =**	24.72	22.15
HWL at AVPP	-6.1		+ 10% safety factor	2.47	2.22
Low discharge El.	40.5			27.19	24.37
High discharge El.	44.5				
			Max TDH (ft) =	**85.76**	
Max Static Head =	58.6	ft	**Min TDH (ft) =**		**70.94**
Min Static Head =	46.6	ft			

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 2-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	71	85.76
0	46.57	58.57
1,000	46.77	58.80
2,000	47.32	59.42
3,000	48.20	60.40
4,000	49.37	61.72
5,000	50.85	63.37
6,000	52.62	65.35
7,000	54.67	67.64
8,000	57.01	70.25
9,000	59.63	73.17
10,000	62.52	76.39
11,000	65.68	79.91
12,500	70.94	85.76
13,000	72.82	87.86
14,000	76.79	92.28
15,000	81.03	96.99
16,000	85.53	101.99
17,000	90.29	107.28
18,000	95.31	112.86
19,000	100.59	118.72
20,000	106.12	124.87
21,000	111.92	131.30
22,000	117.97	138.01
23,000	124.27	145.01
24,000	130.83	152.28

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.77	58.80
4,000	47.32	59.42
6,000	48.20	60.40
8,000	49.37	61.72
10,000	50.85	63.37
12,000	52.62	65.35
14,000	54.67	67.64
16,000	57.01	70.25
18,000	59.63	73.17
20,000	62.52	76.39
22,000	65.68	79.91
25,000	70.94	85.76
26,000	72.82	87.86
28,000	76.79	92.28
30,000	81.03	96.99
32,000	85.53	101.99
34,000	90.29	107.28
36,000	95.31	112.86
38,000	100.59	118.72
40,000	106.12	124.87
42,000	111.92	131.30
44,000	117.97	138.01
46,000	124.27	145.01
48,000	130.83	152.28

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

Two pump operation, with one pump running from existing pump station. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 54" Manifold										
Fittings	48	tee side		37500	6.6	0.69	0.72	0.49	0.00	0.00
	48	90 ell-SR		37500	6.6	0.69	0.30	0.21	0.00	0.00
	48	ball valve		37500	6.6	0.69	1.00	0.69	0.00	0.00
	48	Mag Meter		37500	6.6	0.69	0.19	0.13	0.00	0.00
	48	4.5° Ell.		37500	6.6	0.69	0.05	0.03	0.00	0.00
	48	22.5 ° Ell.		37500	6.6	0.69	0.15	0.10	0.00	0.00
	48	60.0 ° Ell.		37500	6.6	0.69	0.30	0.21	0.00	0.00
	48	22.5 ° Ell.		37500	6.6	0.69	0.15	0.10	0.00	0.00
	48	22.5 ° Ell.		37500	6.6	0.69	0.15	0.10	0.00	0.00
	48	22.5 ° Ell.		37500	6.6	0.69	0.15	0.10	0.00	0.00
	48	22.5 ° Ell.		37500	6.6	0.69	0.15	0.10	0.00	0.00
	48	22.5 ° Ell.		37500	6.6	0.69	0.15	0.10	0.00	0.00
	48	1.0° Ell.		37500	6.6	0.69	0.03	0.02	0.00	0.00
	48	13.0° Ell.		37500	6.6	0.69	0.10	0.07	0.00	0.00
	48	0.5° Ell.		37500	6.6	0.69	0.02	0.01	0.00	0.00
	48	7.0° Ell.		37500	6.6	0.69	0.07	0.05	0.00	0.00
	48	4.0° Ell.		37500	6.6	0.69	0.05	0.03	0.00	0.00
	48	4.0° Ell.		37500	6.6	0.69	0.05	0.03	0.00	0.00
	48	4.0° Ell.		37500	6.6	0.69	0.05	0.03	0.00	0.00
	48	4.0° Ell.		37500	6.6	0.69	0.05	0.03	0.00	0.00
	48	4.0° Ell.		37500	6.6	0.69	0.05	0.03	0.00	0.00
	48	5.0° Ell.		37500	6.6	0.69	0.05	0.03	0.00	0.00
	48	5.0° Ell.		37500	6.6	0.69	0.05	0.03	0.00	0.00
	48	sluice gate		37500	6.6	0.69	0.80	0.55	0.00	0.00
	48	tee thru		37500	6.6	0.69	0.24	0.16	0.00	0.00
	48	exit		37500	6.6	0.69	1.00	0.69	0.00	0.00
Pipe Length	48	straight run	10430	37500	6.6	0.69	0.00	0.00	34.86	29.67
TOTAL			**10540**				**13**	**10**	**36**	**30**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

Two pump operation, with one pump running from existing pump station. All pumps discharge equal flow.

LWL at AVPP	-14.1	*at manifold connection*
HWL at AVPP	-6.1	
Low discharge El.	40.5	
High discharge El.	44.5	
Max Static Head =	58.6	ft
Min Static Head =	46.6	ft

Total Headloss (ft) =	45.43	40.12
+ 10% safety factor	4.54	4.01
	49.97	44.14
Max TDH (ft) =	**108.54**	
Min TDH (ft) =		**90.71**

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees - AVPP

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	91	108.54
0	46.57	58.57
1,000	46.95	59.01
2,000	47.97	60.17
3,000	49.57	61.99
4,000	51.73	64.44
5,000	54.42	67.49
6,000	57.64	71.14
7,000	61.36	75.36
8,000	65.60	80.15
9,000	70.33	85.50
10,000	75.55	91.41
11,000	81.25	97.86
12,500	90.71	108.54
13,000	94.10	112.37
14,000	101.23	120.43
15,000	108.83	129.01
16,000	116.89	138.11
17,000	125.42	147.73
18,000	134.40	157.86
19,000	143.84	168.51
20,000	153.74	179.66
21,000	164.08	191.32
22,000	174.87	203.48
23,000	186.11	216.14
24,000	197.79	229.30

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.95	59.01
4,000	47.97	60.17
6,000	49.57	61.99
8,000	51.73	64.44
10,000	54.42	67.49
12,000	57.64	71.14
14,000	61.36	75.36
16,000	65.60	80.15
18,000	70.33	85.50
20,000	75.55	91.41
22,000	81.25	97.86
25,000	90.71	108.54
26,000	94.10	112.37
28,000	101.23	120.43
30,000	108.83	129.01
32,000	116.89	138.11
34,000	125.42	147.73
36,000	134.40	157.86
38,000	143.84	168.51
40,000	153.74	179.66
42,000	164.08	191.32
44,000	174.87	203.48
46,000	186.11	216.14
48,000	197.79	229.30

Flow to generate system head curve for 3

2-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	46.97	59.02
6,000	48.03	60.23
9,000	49.70	62.12
12,000	51.95	64.67
15,000	54.77	67.86
18,000	58.13	71.66
21,000	62.03	76.06
24,000	66.47	81.06
27,000	71.42	86.65
30,000	76.89	92.82
33,000	82.87	99.56
37,500	92.79	110.73
39,000	96.35	114.73
42,000	103.84	123.15
45,000	111.81	132.12
48,000	120.28	141.64
51,000	129.23	151.71
54,000	138.67	162.32
57,000	148.59	173.46
60,000	158.98	185.14
63,000	169.86	197.34
66,000	181.20	210.08
69,000	193.02	223.34
72,000	205.30	237.13

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

Two pump operation, with one pump running from existing pump station. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 54" Manifold										
Fittings	48	tee side		50000	8.9	1.22	0.72	0.88	0.00	0.00
	48	90 ell-SR		50000	8.9	1.22	0.30	0.37	0.00	0.00
	48	ball valve		50000	8.9	1.22	1.00	1.22	0.00	0.00
	48	Mag Meter		50000	8.9	1.22	0.19	0.23	0.00	0.00
	48	4.5° Ell.		50000	8.9	1.22	0.05	0.06	0.00	0.00
	48	22.5 ° Ell.		50000	8.9	1.22	0.15	0.18	0.00	0.00
	48	60.0 ° Ell.		50000	8.9	1.22	0.30	0.37	0.00	0.00
	48	22.5 ° Ell.		50000	8.9	1.22	0.15	0.18	0.00	0.00
	48	22.5 ° Ell.		50000	8.9	1.22	0.15	0.18	0.00	0.00
	48	22.5 ° Ell.		50000	8.9	1.22	0.15	0.18	0.00	0.00
	48	22.5 ° Ell.		50000	8.9	1.22	0.15	0.18	0.00	0.00
	48	22.5 ° Ell.		50000	8.9	1.22	0.15	0.18	0.00	0.00
	48	1.0° Ell.		50000	8.9	1.22	0.03	0.04	0.00	0.00
	48	13.0° Ell.		50000	8.9	1.22	0.10	0.12	0.00	0.00
	48	0.5° Ell.		50000	8.9	1.22	0.02	0.02	0.00	0.00
	48	7.0° Ell.		50000	8.9	1.22	0.07	0.09	0.00	0.00
	48	4.0° Ell.		50000	8.9	1.22	0.05	0.06	0.00	0.00
	48	4.0° Ell.		50000	8.9	1.22	0.05	0.06	0.00	0.00
	48	4.0° Ell.		50000	8.9	1.22	0.05	0.06	0.00	0.00
	48	4.0° Ell.		50000	8.9	1.22	0.05	0.06	0.00	0.00
	48	4.0° Ell.		50000	8.9	1.22	0.05	0.06	0.00	0.00
	48	5.0° Ell.		50000	8.9	1.22	0.05	0.06	0.00	0.00
	48	5.0° Ell.		50000	8.9	1.22	0.05	0.06	0.00	0.00
	48	sluice gate		50000	8.9	1.22	0.80	0.98	0.00	0.00
	48	tee thru		50000	8.9	1.22	0.24	0.29	0.00	0.00
	48	exit		50000	8.9	1.22	1.00	1.22	0.00	0.00
Pipe Length	48	straight run	10430	50000	8.9	1.22	0.00	0.00	59.35	50.52
TOTAL			**10540**				**13**	**13**	**60**	**51**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

Two pump operation, with one pump running from existing pump station. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	73.16	64.22
HWL at AVPP	-6.1	+ 10% safety factor	7.32	6.42
Low discharge El.	40.5		80.48	70.64
High discharge El.	44.5			
		Max TDH (ft) =	**139.05**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**117.21**
Min Static Head =	46.6 ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

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SCENARIO:

Two pump operation, with one pump running from existing pump station. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees - AVPP

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	117	139.05
0	46.57	58.57
1,000	47.19	59.28
2,000	48.83	61.17
3,000	51.41	64.12
4,000	54.88	68.07
5,000	59.20	73.01
6,000	64.36	78.89
7,000	70.33	85.69
8,000	77.10	93.41
9,000	84.66	102.02
10,000	93.01	111.52
11,000	102.12	121.89
12,500	117.21	139.05
13,000	122.61	145.20
14,000	133.99	158.12
15,000	146.10	171.89
16,000	158.95	186.49
17,000	172.52	201.91
18,000	186.82	218.15
19,000	201.85	235.20
20,000	217.58	253.06
21,000	234.03	271.73
22,000	251.19	291.19
23,000	269.05	311.45
24,000	287.61	332.51

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	47.19	59.28
4,000	48.83	61.17
6,000	51.41	64.12
8,000	54.88	68.07
10,000	59.20	73.01
12,000	64.36	78.89
14,000	70.33	85.69
16,000	77.10	93.41
18,000	84.66	102.02
20,000	93.01	111.52
22,000	102.12	121.89
25,000	117.21	139.05
26,000	122.61	145.20
28,000	133.99	158.12
30,000	146.10	171.89
32,000	158.95	186.49
34,000	172.52	201.91
36,000	186.82	218.15
38,000	201.85	235.20
40,000	217.58	253.06
42,000	234.03	271.73
44,000	251.19	291.19
46,000	269.05	311.45
48,000	287.61	332.51

Flow to generate system head curve for 3

2-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	47.20	59.30
6,000	48.90	61.23
9,000	51.55	64.26
12,000	55.12	68.32
15,000	59.57	73.39
18,000	64.88	79.43
21,000	71.03	86.43
24,000	78.02	94.37
27,000	85.82	103.23
30,000	94.43	113.00
33,000	103.83	123.68
37,500	119.41	141.35
39,000	124.99	147.68
42,000	136.74	160.99
45,000	149.25	175.18
48,000	162.52	190.21
51,000	176.55	206.11
54,000	191.33	222.84
57,000	206.86	240.42
60,000	223.13	258.84
63,000	240.13	278.08
66,000	257.87	298.15
69,000	276.34	319.05
72,000	295.54	340.76

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

Two pump operation, with one pump running from existing pump station. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 54" Manifold										
Fittings	48	tee side		62500	11.1	1.91	0.72	1.37	0.00	0.00
	48	90 ell-SR		62500	11.1	1.91	0.30	0.57	0.00	0.00
	48	ball valve		62500	11.1	1.91	1.00	1.91	0.00	0.00
	48	Mag Meter		62500	11.1	1.91	0.19	0.36	0.00	0.00
	48	4.5° Ell.		62500	11.1	1.91	0.05	0.10	0.00	0.00
	48	22.5 ° Ell.		62500	11.1	1.91	0.15	0.29	0.00	0.00
	48	60.0 ° Ell.		62500	11.1	1.91	0.30	0.57	0.00	0.00
	48	22.5 ° Ell.		62500	11.1	1.91	0.15	0.29	0.00	0.00
	48	22.5 ° Ell.		62500	11.1	1.91	0.15	0.29	0.00	0.00
	48	22.5 ° Ell.		62500	11.1	1.91	0.15	0.29	0.00	0.00
	48	22.5 ° Ell.		62500	11.1	1.91	0.15	0.29	0.00	0.00
	48	22.5 ° Ell.		62500	11.1	1.91	0.15	0.29	0.00	0.00
	48	1.0° Ell.		62500	11.1	1.91	0.03	0.06	0.00	0.00
	48	13.0° Ell.		62500	11.1	1.91	0.10	0.19	0.00	0.00
	48	0.5° Ell.		62500	11.1	1.91	0.02	0.04	0.00	0.00
	48	7.0° Ell.		62500	11.1	1.91	0.07	0.13	0.00	0.00
	48	4.0° Ell.		62500	11.1	1.91	0.05	0.10	0.00	0.00
	48	4.0° Ell.		62500	11.1	1.91	0.05	0.10	0.00	0.00
	48	4.0° Ell.		62500	11.1	1.91	0.05	0.10	0.00	0.00
	48	4.0° Ell.		62500	11.1	1.91	0.05	0.10	0.00	0.00
	48	4.0° Ell.		62500	11.1	1.91	0.05	0.10	0.00	0.00
	48	5.0° Ell.		62500	11.1	1.91	0.05	0.10	0.00	0.00
	48	5.0° Ell.		62500	11.1	1.91	0.05	0.10	0.00	0.00
	48	sluice gate		62500	11.1	1.91	0.80	1.53	0.00	0.00
	48	tee thru		62500	11.1	1.91	0.24	0.46	0.00	0.00
	48	exit		62500	11.1	1.91	1.00	1.91	0.00	0.00
Pipe Length	48	straight run	10430	62500	11.1	1.91	0.00	0.00	89.68	76.35
TOTAL			**10540**				**13**	**17**	**91**	**77**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 48-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 54-INCH FORCE MAIN

SCENARIO:

Two pump operation, with one pump running from existing pump station. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	107.66	94.20
HWL at AVPP	-6.1	+ 10% safety factor	10.77	9.42
Low discharge El.	40.5		118.43	103.63
High discharge El.	44.5			
		Max TDH (ft) =	**177.00**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**150.20**
Min Static Head =	46.6 ft			

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SCENARIO:

Two pump operation, with one pump running from existing pump station. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees - AVPP

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	150	177.00
0	46.57	58.57
1,000	47.48	59.62
2,000	49.91	62.41
3,000	53.70	66.76
4,000	58.80	72.60
5,000	65.15	79.87
6,000	72.72	88.53
7,000	81.48	98.55
8,000	91.42	109.90
9,000	102.51	122.57
10,000	114.74	136.53
11,000	128.09	151.77
12,500	150.20	177.00
13,000	158.11	186.03
14,000	174.77	205.02
15,000	192.50	225.24
16,000	211.30	246.67
17,000	231.17	269.31
18,000	252.09	293.15
19,000	274.07	318.18
20,000	297.08	344.40
21,000	321.13	371.78
22,000	346.21	400.34
23,000	372.32	430.06
24,000	399.45	460.93

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	47.48	59.62
4,000	49.91	62.41
6,000	53.70	66.76
8,000	58.80	72.60
10,000	65.15	79.87
12,000	72.72	88.53
14,000	81.48	98.55
16,000	91.42	109.90
18,000	102.51	122.57
20,000	114.74	136.53
22,000	128.09	151.77
25,000	150.20	177.00
26,000	158.11	186.03
28,000	174.77	205.02
30,000	192.50	225.24
32,000	211.30	246.67
34,000	231.17	269.31
36,000	252.09	293.15
38,000	274.07	318.18
40,000	297.08	344.40
42,000	321.13	371.78
44,000	346.21	400.34
46,000	372.32	430.06
48,000	399.45	460.93

Flow to generate system head curve for 3

3-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	47.50	59.64
6,000	49.97	62.48
9,000	53.85	66.91
12,000	59.05	72.86
15,000	65.54	80.27
18,000	73.27	89.11
21,000	82.24	99.33
24,000	92.40	110.92
27,000	103.74	123.86
30,000	116.25	138.11
33,000	129.92	153.68
37,500	152.55	179.45
39,000	160.65	188.67
42,000	177.70	208.08
45,000	195.86	228.74
48,000	215.12	250.64
51,000	235.47	273.79
54,000	256.90	298.16
57,000	279.42	323.75
60,000	303.00	350.55
63,000	327.65	378.55
66,000	353.35	407.76
69,000	380.11	438.15
72,000	407.92	469.73

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

One pump operation

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
$g = 32.2$ ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		12500	5.7	0.50	0.24	0.12	0.000	0.000
	30	straight run	11	12500	5.7	0.50	0.00	0.00	0.047	0.040
	42	increaser		12500	2.9	0.13	0.21	0.03	0.000	0.000
New Pump 8 Connection	42	tee thru		12500	2.9	0.13	0.24	0.03	0.000	0.000
	42	straight run	22	12500	2.9	0.13	0.00	0.00	0.018	0.016
	42	Mag Meter		12500	2.9	0.13	0.19	0.02	0.000	0.000
	42	straight run	22	12500	2.9	0.13	0.00	0.00	0.018	0.016
	42	45 º Ell.		12500	2.9	0.13	0.30	0.04	0.000	0.000
	42	straight run	3	12500	2.9	0.13	0.00	0.00	0.003	0.002
	42	45 º Ell.		12500	2.9	0.13	0.30	0.04	0.000	0.000
	42	straight run	3	12500	2.9	0.13	0.00	0.00	0.003	0.002
	42	tee as elbow side		12500	2.9	0.13	1.00	0.13	0.000	0.000
	54	straight run	5	12500	1.8	0.05	0.00	0.00	0.001	0.001
	54	ball valve		12500	1.8	0.05	1.00	0.05	0.000	0.000
	54	straight run	5	12500	1.8	0.05	0.00	0.00	0.001	0.001
Connection to 48" Force Main										
	54	tee thru		12500	1.8	0.05	0.24	0.01	0.0000	0.00
	54	straight run	5	12500	1.8	0.05	0.00	0.00	0.0012	0.00
	54	increaser	0	12500	1.8	0.05	0.03	0.00	0.0000	0.00
Ex Pump 1 Connection	60	tee thru		12500	1.4	0.03	0.24	0.01	0.0000	0.00
	60	straight run	5	12500	1.4	0.03	0.00	0.00	0.0007	0.00
Ex Pump 2 Connection	60	tee thru		12500	1.4	0.03	0.24	0.01	0.0000	0.00
	60	straight run	5	12500	1.4	0.03	0.00	0.00	0.0007	0.00
Ex Pump 3 Connection	60	tee thru		12500	1.4	0.03	0.24	0.01	0.0000	0.00
	60	straight run	5	12500	1.4	0.03	0.00	0.00	0.0007	0.00
Ex Pump 4 Connection	60	tee thru		12500	1.4	0.03	0.24	0.01	0.0000	0.00
	54	reducer	0	12500	1.8	0.05	0.05	0.00	0.0000	0.00
Ex Pump 5 Connection	54	tee thru		12500	1.8	0.05	0.24	0.01	0.0000	0.00
	54	straight run	10	12500	1.8	0.05	0.00	0.00	0.0025	0.00
Connection to 54" Force Main										
	54	ball valve		12500	1.8	0.05	1.00	0.05	0.00	0.00
	54	90 ell-SR		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	90 ell-SR		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	8.5º Ell.		12500	1.8	0.05	0.07	0.00	0.00	0.00
	54	30.0º Ell.		12500	1.8	0.05	0.18	0.01	0.00	0.00
	54	57.5º Ell.		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	4.5º Ell.		12500	1.8	0.05	0.05	0.00	0.00	0.00
	54	2.5º Ell.		12500	1.8	0.05	0.04	0.00	0.00	0.00
	54	10.0º Ell.		12500	1.8	0.05	0.09	0.00	0.00	0.00
	54	23.5º Ell.		12500	1.8	0.05	0.15	0.01	0.00	0.00
	54	3.5º Ell.		12500	1.8	0.05	0.05	0.00	0.00	0.00
	54	26.5º Ell.		12500	1.8	0.05	0.17	0.01	0.00	0.00
	54	5.5º Ell.		12500	1.8	0.05	0.06	0.00	0.00	0.00
	54	2.5º Ell.		12500	1.8	0.05	0.04	0.00	0.00	0.00
	54	38.0º Ell.		12500	1.8	0.05	0.20	0.01	0.00	0.00

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

One pump operation

	54	42.5º Ell.		12500	1.8	0.05	0.31	0.01	0.00	0.00
	54	8.0º Ell.		12500	1.8	0.05	0.07	0.00	0.00	0.00
	54	12.5º Ell.		12500	1.8	0.05	0.10	0.00	0.00	0.00
	54	43.5º Ell.		12500	1.8	0.05	0.39	0.02	0.00	0.00
	54	10.0º Ell.		12500	1.8	0.05	0.09	0.00	0.00	0.00
	54	44.5º Ell.		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	8.5º Ell.		12500	1.8	0.05	0.07	0.00	0.00	0.00
	54	Sluice Gate		12500	1.8	0.05	0.80	0.04	0.00	0.00
	54	45 º Ell.		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	Wye thru side		12500	1.8	0.05	1.00	0.05	0.00	0.00
	54	exit		12500	1.8	0.05	1.00	0.05	0.00	0.00
Pipe Length	54	straight run	10079.9	12500	1.8	0.05	0.00	0.00	2.49	2.12
TOTAL			**10220**				**16**	**5**	**3**	**3**

LWL at AVPP	-14.1	*at manifold connection*	**Total Headloss (ft) =**	7.69	7.24
HWL at AVPP	-6.1		+ 10% safety factor	0.77	0.72
Low discharge El.	40.5			8.46	7.96
High discharge El.	44.5				
			Max TDH (ft) =	**67.03**	
Max Static Head =	58.6	ft	**Min TDH (ft) =**		**54.53**
Min Static Head =	46.6	ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

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Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

One pump operation

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	55	67.03
0	46.57	58.57
1,000	46.63	58.63
2,000	46.80	58.81
3,000	47.07	59.10
4,000	47.44	59.50
5,000	47.91	60.00
6,000	48.48	60.61
7,000	49.15	61.32
8,000	49.91	62.13
9,000	50.77	63.05
10,000	51.73	64.06
11,000	52.78	65.18
12,500	54.53	67.03
13,000	55.16	67.70
14,000	56.49	69.12
15,000	57.92	70.63
16,000	59.44	72.24
17,000	61.05	73.94
18,000	62.76	75.75
19,000	64.55	77.65
20,000	66.44	79.65
21,000	68.43	81.74
22,000	70.50	83.93
23,000	72.66	86.22
24,000	74.92	88.61

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

Where:
L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
$g = 32.2$ ft/s^2

Segment	Diam. (in)	Fitting	Length (ft)	Flow (gpm)	Velocity (fps)	$V^2/2g$ (ft)	K	Fitting Loss (ft)	C=110 Pipe Loss (ft)	C=120 Pipe Loss (ft)
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 º Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 º Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to manifold	54	tee thru		25000	3.5	0.19	0.24	0.05	0.0000	0.00
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.0044	0.00
	54	increaser	0	25000	3.5	0.19	0.03	0.01	0.0000	0.00
Ex Pump 1 Connection	60	tee thru		25000	2.8	0.12	0.24	0.03	0.0000	0.00
	60	straight run	5	25000	2.8	0.12	0.00	0.00	0.0027	0.00
Ex Pump 2 Connection	60	tee thru		25000	2.8	0.12	0.24	0.03	0.0000	0.00
	60	straight run	5	25000	2.8	0.12	0.00	0.00	0.0027	0.00
Ex Pump 3 Connection	60	tee thru		25000	2.8	0.12	0.24	0.03	0.0000	0.00
	60	straight run	5	25000	2.8	0.12	0.00	0.00	0.0027	0.00
Ex Pump 4 Connection	60	tee thru		25000	2.8	0.12	0.24	0.03	0.0000	0.00
	54	reducer	0	25000	3.5	0.19	0.05	0.01	0.0000	0.00
Ex Pump 5 Connection	54	tee thru		25000	3.5	0.19	0.24	0.05	0.0000	0.00
	54	straight run	10	25000	3.5	0.19	0.00	0.00	0.0089	0.01
Connection to 54" Force Main										
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.00	0.00
	54	90 ell-SR		25000	3.5	0.19	0.30	0.06	0.00	0.00
	54	90 ell-SR		25000	3.5	0.19	0.30	0.06	0.00	0.00
	54	8.5º Ell.		25000	3.5	0.19	0.07	0.01	0.00	0.00
	54	30.0º Ell.		25000	3.5	0.19	0.18	0.03	0.00	0.00
	54	57.5º Ell.		25000	3.5	0.19	0.30	0.06	0.00	0.00
	54	4.5º Ell.		25000	3.5	0.19	0.05	0.01	0.00	0.00
	54	2.5º Ell.		25000	3.5	0.19	0.04	0.01	0.00	0.00
	54	10.0º Ell.		25000	3.5	0.19	0.09	0.02	0.00	0.00
	54	23.5º Ell.		25000	3.5	0.19	0.15	0.03	0.00	0.00
	54	3.5º Ell.		25000	3.5	0.19	0.05	0.01	0.00	0.00
	54	26.5º Ell.		25000	3.5	0.19	0.17	0.03	0.00	0.00
	54	5.5º Ell.		25000	3.5	0.19	0.06	0.01	0.00	0.00
	54	2.5º Ell.		25000	3.5	0.19	0.04	0.01	0.00	0.00
	54	38.0º Ell.		25000	3.5	0.19	0.20	0.04	0.00	0.00

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation. All pumps discharge equal flow.

	54	42.5º Ell.		25000	3.5	0.19	0.31	0.06	0.00	0.00
	54	8.0º Ell.		25000	3.5	0.19	0.07	0.01	0.00	0.00
	54	12.5º Ell.		25000	3.5	0.19	0.10	0.02	0.00	0.00
	54	43.5º Ell.		25000	3.5	0.19	0.39	0.07	0.00	0.00
	54	10.0º Ell.		25000	3.5	0.19	0.09	0.02	0.00	0.00
	54	44.5º Ell.		25000	3.5	0.19	0.30	0.06	0.00	0.00
	54	8.5º Ell.		25000	3.5	0.19	0.07	0.01	0.00	0.00
	54	Sluice Gate		25000	3.5	0.19	0.80	0.15	0.00	0.00
	54	45 º Ell.		25000	3.5	0.19	0.30	0.06	0.00	0.00
	54	Wye thru side		25000	3.5	0.19	1.00	0.19	0.00	0.00
	54	exit		25000	3.5	0.19	1.00	0.19	0.00	0.00
Pipe Length	54	straight run	10079.9	25000	3.5	0.19	0.00	0.00	8.97	7.64
TOTAL			**10220**				**16**	**7**	**10**	**8**

LWL at AVPP	-14.1	*at manifold connection*	**Total Headloss (ft) =**	17.04	15.58
HWL at AVPP	-6.1		+ 10% safety factor	1.70	1.56
Low discharge El.	40.5			18.74	17.14
High discharge El.	44.5				
			Max TDH (ft) =	**77.31**	
Max Static Head =	58.6	ft	**Min TDH (ft) =**		**63.71**
Min Static Head =	46.6	ft			

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Venice Auxiliary Pumping Plant

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SCENARIO:

Two pump operation. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	64	77.31
0	46.57	58.57
1,000	46.71	58.72
2,000	47.08	59.14
3,000	47.68	59.80
4,000	48.50	60.70
5,000	49.53	61.82
6,000	50.77	63.18
7,000	52.21	64.76
8,000	53.85	66.55
9,000	55.70	68.57
10,000	57.74	70.80
11,000	59.98	73.25
12,500	63.71	77.31
13,000	65.05	78.78
14,000	67.87	81.85
15,000	70.89	85.14
16,000	74.10	88.64
17,000	77.50	92.34
18,000	81.09	96.25
19,000	84.87	100.36
20,000	88.84	104.67
21,000	93.00	109.19
22,000	97.34	113.91
23,000	101.87	118.83
24,000	106.59	123.96

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.71	58.72
4,000	47.08	59.14
6,000	47.68	59.80
8,000	48.50	60.70
10,000	49.53	61.82
12,000	50.77	63.18
14,000	52.21	64.76
16,000	53.85	66.55
18,000	55.70	68.57
20,000	57.74	70.80
22,000	59.98	73.25
25,000	63.71	77.31
26,000	65.05	78.78
28,000	67.87	81.85
30,000	70.89	85.14
32,000	74.10	88.64
34,000	77.50	92.34
36,000	81.09	96.25
38,000	84.87	100.36
40,000	88.84	104.67
42,000	93.00	109.19
44,000	97.34	113.91
46,000	101.87	118.83
48,000	106.59	123.96

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation with one pump running from the exsiting pump station. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

Where:
L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
$g = 32.2\ ft/s^2$

Segment	Diam. (in)	Fitting	Length (ft)	Flow (gpm)	Velocity (fps)	$V^2/2g$ (ft)	K	Fitting Loss (ft)	C=110 Pipe Loss (ft)	C=120 Pipe Loss (ft)
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to manifold	54	tee thru		25000	3.5	0.19	0.24	0.05	0.0000	0.00
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.0044	0.00
	54	increaser	0	25000	3.5	0.19	0.03	0.01	0.0000	0.00
Ex Pump 1 Connection	60	tee thru		37500	4.3	0.28	0.24	0.07	0.0000	0.00
	60	straight run	5	37500	4.3	0.28	0.00	0.00	0.0056	0.00
Ex Pump 2 Connection	60	tee thru		37500	4.3	0.28	0.24	0.07	0.0000	0.00
	60	straight run	5	37500	4.3	0.28	0.00	0.00	0.0056	0.00
Ex Pump 3 Connection	60	tee thru		37500	4.3	0.28	0.24	0.07	0.0000	0.00
	60	straight run	5	37500	4.3	0.28	0.00	0.00	0.0056	0.00
Ex Pump 4 Connection	60	tee thru		37500	4.3	0.28	0.24	0.07	0.0000	0.00
	54	reducer	0	37500	5.3	0.43	0.05	0.02	0.0000	0.00
Ex Pump 5 Connection	54	tee thru		37500	5.3	0.43	0.24	0.10	0.0000	0.00
	54	straight run	10	37500	5.3	0.43	0.00	0.00	0.0188	0.02
Connection to 54" Force Main										
	54	ball valve		37500	5.3	0.43	1.00	0.43	0.00	0.00
	54	90 ell-SR		37500	5.3	0.43	0.30	0.13	0.00	0.00
	54	90 ell-SR		37500	5.3	0.43	0.30	0.13	0.00	0.00
	54	8.5° Ell.		37500	5.3	0.43	0.07	0.03	0.00	0.00
	54	30.0° Ell.		37500	5.3	0.43	0.18	0.08	0.00	0.00
	54	57.5° Ell.		37500	5.3	0.43	0.30	0.13	0.00	0.00
	54	4.5° Ell.		37500	5.3	0.43	0.05	0.02	0.00	0.00
	54	2.5° Ell.		37500	5.3	0.43	0.04	0.02	0.00	0.00
	54	10.0° Ell.		37500	5.3	0.43	0.09	0.04	0.00	0.00
	54	23.5° Ell.		37500	5.3	0.43	0.15	0.06	0.00	0.00
	54	3.5° Ell.		37500	5.3	0.43	0.05	0.02	0.00	0.00
	54	26.5° Ell.		37500	5.3	0.43	0.17	0.07	0.00	0.00
	54	5.5° Ell.		37500	5.3	0.43	0.06	0.03	0.00	0.00
	54	2.5° Ell.		37500	5.3	0.43	0.04	0.02	0.00	0.00

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
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System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation with one pump running from the exsiting pump station. All pumps discharge equal flow.

	54	38.0º Ell.		37500	5.3	0.43	0.20	0.09	0.00	0.00
	54	42.5º Ell.		37500	5.3	0.43	0.31	0.13	0.00	0.00
	54	8.0º Ell.		37500	5.3	0.43	0.07	0.03	0.00	0.00
	54	12.5º Ell.		37500	5.3	0.43	0.10	0.04	0.00	0.00
	54	43.5º Ell.		37500	5.3	0.43	0.39	0.17	0.00	0.00
	54	10.0º Ell.		37500	5.3	0.43	0.09	0.04	0.00	0.00
	54	44.5º Ell.		37500	5.3	0.43	0.30	0.13	0.00	0.00
	54	8.5º Ell.		37500	5.3	0.43	0.07	0.03	0.00	0.00
	54	Sluice Gate		37500	5.3	0.43	0.80	0.34	0.00	0.00
	54	45 º Ell.		37500	5.3	0.43	0.30	0.13	0.00	0.00
	54	Wye thru side		37500	5.3	0.43	1.00	0.43	0.00	0.00
	54	exit		37500	5.3	0.43	1.00	0.43	0.00	0.00
Pipe Length	54	straight run	10079.9	37500	5.3	0.43	0.00	0.00	18.99	16.17
TOTAL			**10220**				**16**	**9**	**20**	**17**

LWL at AVPP	-14.1	*at manifold connection*	**Total Headloss (ft) =**	29.07	26.12
HWL at AVPP	-6.1		+ 10% safety factor	2.91	2.61
Low discharge El.	40.5			31.98	28.73
High discharge El.	44.5				
			Max TDH (ft) =	**90.55**	
Max Static Head =	58.6	ft	**Min TDH (ft) =**		**75.30**
Min Static Head =	46.6	ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation with one pump running from the exsiting pump station. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
rotovalve	0.04	
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	75	90.55
0	46.57	58.57
1,000	46.81	58.84
2,000	47.46	59.57
3,000	48.48	60.71
4,000	49.87	62.26
5,000	51.60	64.20
6,000	53.69	66.52
7,000	56.11	69.22
8,000	58.86	72.29
9,000	61.95	75.72
10,000	65.36	79.51
11,000	69.10	83.66
12,500	75.30	90.55
13,000	77.52	93.02
14,000	82.21	98.22
15,000	87.22	103.77
16,000	92.53	109.66
17,000	98.15	115.89
18,000	104.09	122.46
19,000	110.33	129.37
20,000	116.87	136.62
21,000	123.72	144.20
22,000	130.87	152.12
23,000	138.33	160.36
24,000	146.08	168.94

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.81	58.84
4,000	47.46	59.57
6,000	48.48	60.71
8,000	49.87	62.26
10,000	51.60	64.20
12,000	53.69	66.52
14,000	56.11	69.22
16,000	58.86	72.29
18,000	61.95	75.72
20,000	65.36	79.51
22,000	69.10	83.66
25,000	75.30	90.55
26,000	77.52	93.02
28,000	82.21	98.22
30,000	87.22	103.77
32,000	92.53	109.66
34,000	98.15	115.89
36,000	104.09	122.46
38,000	110.33	129.37
40,000	116.87	136.62
42,000	123.72	144.20
44,000	130.87	152.12
46,000	138.33	160.36
48,000	146.08	168.94

Flow to generate system head curve for 3

2-Pump (gpm	TDH Low (ft)	TDH High (ft)
	SHC-2AVPP-1VPP	2AVPP-1VPP-
0	46.57	58.57
3,000	46.82	58.85
6,000	47.51	59.62
9,000	48.60	60.84
12,000	50.07	62.48
15,000	51.92	64.54
18,000	54.14	67.00
21,000	56.72	69.87
24,000	59.66	73.13
27,000	62.95	76.77
30,000	66.60	80.81
33,000	70.58	85.22
37,500	77.21	92.55
39,000	79.59	95.18
42,000	84.60	100.72
45,000	89.95	106.63
48,000	95.63	112.91
51,000	101.65	119.55
54,000	107.99	126.55
57,000	114.67	133.92
60,000	121.67	141.65
63,000	129.00	149.73
66,000	136.66	158.17
69,000	144.64	166.97
72,000	152.94	176.12

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation with two pumps running from the exsiting pump station. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

Segment	Diam. (in)	Fitting	Length (ft)	Flow (gpm)	Velocity (fps)	$V^2/2g$ (ft)	K	Fitting Loss (ft)	C=110 Pipe Loss (ft)	C=120 Pipe Loss (ft)
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to manifold										
	54	tee thru		25000	3.5	0.19	0.24	0.05	0.0000	0.00
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.0044	0.00
	54	increaser	0	25000	3.5	0.19	0.03	0.01	0.0000	0.00
Ex Pump 1 Connection	60	tee thru		37500	4.3	0.28	0.24	0.07	0.0000	0.00
	60	straight run	5	37500	4.3	0.28	0.00	0.00	0.0056	0.00
Ex Pump 2 Connection	60	tee thru		50000	5.7	0.50	0.24	0.12	0.0000	0.00
	60	straight run	5	50000	5.7	0.50	0.00	0.00	0.0096	0.01
Ex Pump 3 Connection	60	tee thru		50000	5.7	0.50	0.24	0.12	0.0000	0.00
	60	straight run	5	50000	5.7	0.50	0.00	0.00	0.0096	0.01
Ex Pump 4 Connection	60	tee thru		50000	5.7	0.50	0.24	0.12	0.0000	0.00
	54	reducer	0	50000	7.0	0.76	0.05	0.04	0.0000	0.00
Ex Pump 5 Connection	54	tee thru		50000	7.0	0.76	0.24	0.18	0.0000	0.00
	54	straight run	10	50000	7.0	0.76	0.00	0.00	0.0321	0.03
Connection to 54" Force Main										
	54	ball valve		50000	7.0	0.76	1.00	0.76	0.00	0.00
	54	90 ell-SR		50000	7.0	0.76	0.30	0.23	0.00	0.00
	54	90 ell-SR		50000	7.0	0.76	0.30	0.23	0.00	0.00
	54	8.5° Ell.		50000	7.0	0.76	0.07	0.05	0.00	0.00
	54	30.0° Ell.		50000	7.0	0.76	0.18	0.14	0.00	0.00
	54	57.5° Ell.		50000	7.0	0.76	0.30	0.23	0.00	0.00
	54	4.5° Ell.		50000	7.0	0.76	0.05	0.04	0.00	0.00
	54	2.5° Ell.		50000	7.0	0.76	0.04	0.03	0.00	0.00
	54	10.0° Ell.		50000	7.0	0.76	0.09	0.07	0.00	0.00
	54	23.5° Ell.		50000	7.0	0.76	0.15	0.11	0.00	0.00
	54	3.5° Ell.		50000	7.0	0.76	0.05	0.04	0.00	0.00
	54	26.5° Ell.		50000	7.0	0.76	0.17	0.13	0.00	0.00
	54	5.5° Ell.		50000	7.0	0.76	0.06	0.05	0.00	0.00
	54	2.5° Ell.		50000	7.0	0.76	0.04	0.03	0.00	0.00

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
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System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation with two pumps running from the exsiting pump station. All pumps discharge equal flow.

	54	38.0° Ell.		50000	7.0	0.76	0.20	0.15	0.00	0.00
	54	42.5° Ell.		50000	7.0	0.76	0.31	0.24	0.00	0.00
	54	8.0° Ell.		50000	7.0	0.76	0.07	0.05	0.00	0.00
	54	12.5° Ell.		50000	7.0	0.76	0.10	0.08	0.00	0.00
	54	43.5° Ell.		50000	7.0	0.76	0.39	0.30	0.00	0.00
	54	10.0° Ell.		50000	7.0	0.76	0.09	0.07	0.00	0.00
	54	44.5° Ell.		50000	7.0	0.76	0.30	0.23	0.00	0.00
	54	8.5° Ell.		50000	7.0	0.76	0.07	0.05	0.00	0.00
	54	Sluice Gate		50000	7.0	0.76	0.80	0.61	0.00	0.00
	54	45 ° Ell.		50000	7.0	0.76	0.30	0.23	0.00	0.00
	54	Wye thru side		50000	7.0	0.76	1.00	0.76	0.00	0.00
	54	exit		50000	7.0	0.76	1.00	0.76	0.00	0.00
Pipe Length	54	straight run	10079.9	50000	7.0	0.76	0.00	0.00	32.34	27.53
TOTAL			**10220**				**16**	**12**	**33**	**28**

LWL at AVPP	-14.1	*at manifold connection*	**Total Headloss (ft) =**	45.17	40.23
HWL at AVPP	-6.1		+ 10% safety factor	4.52	4.02
Low discharge El.	40.5			49.68	44.25
High discharge El.	44.5				
			Max TDH (ft) =	**108.25**	
Max Static Head =	58.6	ft	**Min TDH (ft) =**		**90.82**
Min Static Head =	46.6	ft			

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Venice Auxiliary Pumping Plant

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SCENARIO:

Two pump operation with two pumps running from the exsiting pump station. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
rotovalve	0.04	
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	91	108.25
0	46.57	58.57
1,000	46.94	59.00
2,000	47.95	60.14
3,000	49.55	61.93
4,000	51.69	64.36
5,000	54.38	67.38
6,000	57.60	71.00
7,000	61.33	75.19
8,000	65.58	79.96
9,000	70.32	85.28
10,000	75.57	91.16
11,000	81.30	97.59
12,500	90.82	108.25
13,000	94.23	112.08
14,000	101.42	120.12
15,000	109.08	128.69
16,000	117.21	137.79
17,000	125.82	147.42
18,000	134.89	157.56
19,000	144.43	168.22
20,000	154.42	179.39
21,000	164.88	191.07
22,000	175.80	203.26
23,000	187.17	215.96
24,000	199.00	229.16

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.94	59.00
4,000	47.95	60.14
6,000	49.55	61.93
8,000	51.69	64.36
10,000	54.38	67.38
12,000	57.60	71.00
14,000	61.33	75.19
16,000	65.58	79.96
18,000	70.32	85.28
20,000	75.57	91.16
22,000	81.30	97.59
25,000	90.82	108.25
26,000	94.23	112.08
28,000	101.42	120.12
30,000	109.08	128.69
32,000	117.21	137.79
34,000	125.82	147.42
36,000	134.89	157.56
38,000	144.43	168.22
40,000	154.42	179.39
42,000	164.88	191.07
44,000	175.80	203.26
46,000	187.17	215.96
48,000	199.00	229.16

Flow to generate system head curve for 3

2-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	46.96	59.01
6,000	48.01	60.19
9,000	49.66	62.06
12,000	51.90	64.57
15,000	54.70	67.72
18,000	58.05	71.48
21,000	61.95	75.84
24,000	66.37	80.80
27,000	71.33	86.34
30,000	76.80	92.46
33,000	82.79	99.15
37,500	92.73	110.26
39,000	96.30	114.24
42,000	103.80	122.62
45,000	111.81	131.56
48,000	120.31	141.04
51,000	129.31	151.07
54,000	138.79	161.65
57,000	148.77	172.76
60,000	159.22	184.41
63,000	170.17	196.60
66,000	181.59	209.32
69,000	193.48	222.56
72,000	205.86	236.34

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City of Los Angeles
Venice Auxiliary Pumping Plant

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SCENARIO:

Two pump operation with three pumps running from the exsiting pump station. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
$g = 32.2\ ft/s^2$

Segment	Diam. (in)	Fitting	Length (ft)	Flow (gpm)	Velocity (fps)	$V^2/2g$ (ft)	K	Fitting Loss (ft)	C=110 Pipe Loss (ft)	C=120 Pipe Loss (ft)
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to manifold										
	54	tee thru		25000	3.5	0.19	0.24	0.05	0.0000	0.00
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.0044	0.00
	54	increaser	0	25000	3.5	0.19	0.03	0.01	0.0000	0.00
Ex Pump 1 Connection	60	tee thru		37500	4.3	0.28	0.24	0.07	0.0000	0.00
	60	straight run	5	37500	4.3	0.28	0.00	0.00	0.0056	0.00
Ex Pump 2 Connection	60	tee thru		50000	5.7	0.50	0.24	0.12	0.0000	0.00
	60	straight run	5	50000	5.7	0.50	0.00	0.00	0.0096	0.01
Ex Pump 3 Connection	60	tee thru		62500	7.1	0.78	0.24	0.19	0.0000	0.00
	60	straight run	5	62500	7.1	0.78	0.00	0.00	0.0145	0.01
Ex Pump 4 Connection	60	tee thru		62500	7.1	0.78	0.24	0.19	0.0000	0.00
	54	reducer	0	62500	8.8	1.19	0.05	0.06	0.0000	0.00
Ex Pump 5 Connection	54	tee thru		62500	8.8	1.19	0.24	0.29	0.0000	0.00
	54	straight run	10	62500	8.8	1.19	0.00	0.00	0.0485	0.04
Connection to 54" Force Main										
	54	ball valve		62500	8.8	1.19	1.00	1.19	0.00	0.00
	54	90 ell-SR		62500	8.8	1.19	0.30	0.36	0.00	0.00
	54	90 ell-SR		62500	8.8	1.19	0.30	0.36	0.00	0.00
	54	8.5° Ell.		62500	8.8	1.19	0.07	0.08	0.00	0.00
	54	30.0° Ell.		62500	8.8	1.19	0.18	0.21	0.00	0.00
	54	57.5° Ell.		62500	8.8	1.19	0.30	0.36	0.00	0.00
	54	4.5° Ell.		62500	8.8	1.19	0.05	0.06	0.00	0.00
	54	2.5° Ell.		62500	8.8	1.19	0.04	0.05	0.00	0.00
	54	10.0° Ell.		62500	8.8	1.19	0.09	0.11	0.00	0.00
	54	23.5° Ell.		62500	8.8	1.19	0.15	0.18	0.00	0.00
	54	3.5° Ell.		62500	8.8	1.19	0.05	0.06	0.00	0.00
	54	26.5° Ell.		62500	8.8	1.19	0.17	0.20	0.00	0.00
	54	5.5° Ell.		62500	8.8	1.19	0.06	0.07	0.00	0.00
	54	2.5° Ell.		62500	8.8	1.19	0.04	0.05	0.00	0.00

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation with three pumps running from the exsiting pump station. All pumps discharge equal flow.

	54	38.0° Ell.		62500	8.8	1.19	0.20	0.24	0.00	0.00
	54	42.5° Ell.		62500	8.8	1.19	0.31	0.37	0.00	0.00
	54	8.0° Ell.		62500	8.8	1.19	0.07	0.08	0.00	0.00
	54	12.5° Ell.		62500	8.8	1.19	0.10	0.12	0.00	0.00
	54	43.5° Ell.		62500	8.8	1.19	0.39	0.46	0.00	0.00
	54	10.0° Ell.		62500	8.8	1.19	0.09	0.11	0.00	0.00
	54	44.5° Ell.		62500	8.8	1.19	0.30	0.36	0.00	0.00
	54	8.5° Ell.		62500	8.8	1.19	0.07	0.08	0.00	0.00
	54	Sluice Gate		62500	8.8	1.19	0.80	0.95	0.00	0.00
	54	45 ° Ell.		62500	8.8	1.19	0.30	0.36	0.00	0.00
	54	Wye thru side		62500	8.8	1.19	1.00	1.19	0.00	0.00
	54	exit		62500	8.8	1.19	1.00	1.19	0.00	0.00
Pipe Length	54	straight run	10079.9	62500	8.8	1.19	0.00	0.00	48.86	41.60
TOTAL			**10220**				**16**	**15**	**50**	**42**

LWL at AVPP	-14.1	*at manifold connection*	**Total Headloss (ft) =**	65.16	57.76
HWL at AVPP	-6.1		+ 10% safety factor	6.52	5.78
Low discharge El.	40.5			71.67	63.53
High discharge El.	44.5				
			Max TDH (ft) =	**130.24**	
Max Static Head =	58.6	ft	**Min TDH (ft) =**		**110.10**
Min Static Head =	46.6	ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH THE 54-IN FORCE MAIN TO THE COMMON POINT OF DISCHARGE WITH THE 48-INCH FORCE MAIN

SCENARIO:

Two pump operation with three pumps running from the exsiting pump station. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
rotovalve	0.04	
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	110	130.24
0	46.57	58.57
1,000	47.11	59.19
2,000	48.57	60.85
3,000	50.87	63.45
4,000	53.97	66.95
5,000	57.83	71.33
6,000	62.46	76.55
7,000	67.82	82.61
8,000	73.91	89.48
9,000	80.73	97.16
10,000	88.25	105.63
11,000	96.47	114.89
12,500	110.10	130.24
13,000	114.99	135.74
14,000	125.28	147.32
15,000	136.25	159.65
16,000	147.89	172.74
17,000	160.19	186.57
18,000	173.17	201.15
19,000	186.80	216.46
20,000	201.09	232.51
21,000	216.04	249.29
22,000	231.63	266.80
23,000	247.87	285.03
24,000	264.76	303.97

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	47.11	59.19
4,000	48.57	60.85
6,000	50.87	63.45
8,000	53.97	66.95
10,000	57.83	71.33
12,000	62.46	76.55
14,000	67.82	82.61
16,000	73.91	89.48
18,000	80.73	97.16
20,000	88.25	105.63
22,000	96.47	114.89
25,000	110.10	130.24
26,000	114.99	135.74
28,000	125.28	147.32
30,000	136.25	159.65
32,000	147.89	172.74
34,000	160.19	186.57
36,000	173.17	201.15
38,000	186.80	216.46
40,000	201.09	232.51
42,000	216.04	249.29
44,000	231.63	266.80
46,000	247.87	285.03
48,000	264.76	303.97

Flow to generate system head curve for 3

2-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	47.13	59.20
6,000	48.63	60.90
9,000	50.99	63.58
12,000	54.17	67.17
15,000	58.15	71.66
18,000	62.91	77.03
21,000	68.44	83.25
24,000	74.71	90.32
27,000	81.73	98.22
30,000	89.48	106.93
33,000	97.96	116.46
37,500	112.01	132.25
39,000	117.06	137.91
42,000	127.67	149.82
45,000	138.98	162.52
48,000	150.99	175.99
51,000	163.69	190.23
54,000	177.07	205.24
57,000	191.14	221.01
60,000	205.89	237.54
63,000	221.32	254.82
66,000	237.42	272.85
69,000	254.19	291.63
72,000	271.62	311.15

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE THE TOTAL DYNAMIC HEAD (TDH) REQUIRED TO PUMP FROM AUXILIARY PUMP PLANT WET WELL TO THE COMMON FORCE MAIN IN ORDER TO SIZE THE INFLUENT PUMPS.

SCENARIO:

Three pump operation

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$
(Hazen-Williams)

Where:
L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 per pump
N = Number of Pumps 5 pumps in operation
Q = Flow (gpm) = 62500 total flow to 54" FM
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$
(Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
Connection to 54" Manifold										
Fittings	54	tee thru		12500	1.8	0.05	0.24	0.01	0.00	0.00
	54	tee thru		12500	1.8	0.05	0.24	0.01	0.00	0.00
	54	tee thru		12500	1.8	0.05	0.24	0.01	0.00	0.00
	54	tee thru		12500	1.8	0.05	0.24	0.01	0.00	0.00
	54	tee thru		12500	1.8	0.05	0.24	0.01	0.00	0.00
	54	tee thru		12500	1.8	0.05	0.24	0.01	0.00	0.00
	54	ball valve		12500	1.8	0.05	1.00	0.05	0.00	0.00
	54	90 ell-SR		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	90 ell-SR		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	8.5º Ell.		12500	1.8	0.05	0.07	0.00	0.00	0.00
	54	30.0º Ell.		12500	1.8	0.05	0.18	0.01	0.00	0.00
	54	57.5º Ell.		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	4.5º Ell.		12500	1.8	0.05	0.05	0.00	0.00	0.00
	54	2.5º Ell.		12500	1.8	0.05	0.04	0.00	0.00	0.00
	54	10.0º Ell.		12500	1.8	0.05	0.09	0.00	0.00	0.00
	54	23.5º Ell.		12500	1.8	0.05	0.15	0.01	0.00	0.00
	54	3.5º Ell.		12500	1.8	0.05	0.05	0.00	0.00	0.00
	54	26.5º Ell.		12500	1.8	0.05	0.17	0.01	0.00	0.00
	54	5.5º Ell.		12500	1.8	0.05	0.06	0.00	0.00	0.00
	54	2.5º Ell.		12500	1.8	0.05	0.04	0.00	0.00	0.00
	54	38.0º Ell.		12500	1.8	0.05	0.20	0.01	0.00	0.00
	54	42.5º Ell.		12500	1.8	0.05	0.31	0.01	0.00	0.00
	54	8.0º Ell.		12500	1.8	0.05	0.07	0.00	0.00	0.00
	54	12.5º Ell.		12500	1.8	0.05	0.10	0.00	0.00	0.00
	54	43.5º Ell.		12500	1.8	0.05	0.39	0.02	0.00	0.00
	54	10.0º Ell.		12500	1.8	0.05	0.09	0.00	0.00	0.00
	54	44.5º Ell.		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	8.5º Ell.		12500	1.8	0.05	0.07	0.00	0.00	0.00
	54	Sluice Gate		12500	1.8	0.05	0.80	0.04	0.00	0.00
	54	45 º Ell.		12500	1.8	0.05	0.30	0.01	0.00	0.00
	54	Wye thru side		12500	1.8	0.05	1.00	0.05	0.00	0.00
	54	exit		12500	1.8	0.05	1.00	0.05	0.00	0.00
Pipe Length	54	straight run	10079.9	12500	1.8	0.05	0.00	0.00	2.49	2.12
TOTAL			**10080**				**8.87**	**0.42**	**2.49**	**2.12**

54in FM Empty	-3.0 *at manifold connection*	**Total Headloss (ft) =**	2.91	2.54
54in FM Full	1.5	+ 10% safety factor	0.29	0.25
Low discharge El.	-3.0		3.20	2.79
High discharge El.	45.0 *0.0*			
		Max TDH (ft) =	**51.20**	
Max Static Head =	48.0 ft	**Min TDH (ft) =**		**-1.71**
Min Static Head =	-4.5 ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE THE TOTAL DYNAMIC HEAD (TDH) REQUIRED TO PUMP FROM AUXILIARY PUMP PLANT WET WELL TO THE COMMON FORCE MAIN IN ORDER TO SIZE THE INFLUENT PUMPS.

SCENARIO:

Three pump operation

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ell	0.30	
22.5 ell	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 3-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	-2	51.20
0	-1.71	51.20
1,000	-1.71	51.20
2,000	-1.71	51.20
3,000	-1.71	51.20
4,000	-1.71	51.20
5,000	-1.71	51.20
6,000	-1.71	51.20
7,000	-1.71	51.20
8,000	-1.71	51.20
9,000	-1.71	51.20
10,000	-1.71	51.20
11,000	-1.71	51.20
12,500	-1.71	51.20
13,000	-1.71	51.20
14,000	-1.71	51.20
15,000	-1.71	51.20
16,000	-1.71	51.20
17,000	-1.71	51.20
18,000	-1.71	51.20
19,000	-1.71	51.20
20,000	-1.71	51.20
21,000	-1.71	51.20
22,000	-1.71	51.20
23,000	-1.71	51.20
24,000	-1.71	51.20

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	-2	51.20
0	-1.71	51.20
2,000	-1.71	51.20
4,000	-1.71	51.20
6,000	-1.71	51.20
8,000	-1.71	51.20
10,000	-1.71	51.20
12,000	-1.71	51.20
14,000	-1.71	51.20
16,000	-1.71	51.20
18,000	-1.71	51.20
20,000	-1.71	51.20
22,000	-1.71	51.20
25,000	-1.71	51.20
26,000	-1.71	51.20
28,000	-1.71	51.20
30,000	-1.71	51.20
32,000	-1.71	51.20
34,000	-1.71	51.20
36,000	-1.71	51.20
38,000	-1.71	51.20
40,000	-1.71	51.20
42,000	-1.71	51.20
44,000	-1.71	51.20
46,000	-1.71	51.20
48,000	-1.71	51.20

3 Pumps

3-Pump (gpm	TDH Low (ft)	TDH High (ft)
	-1.71	51.20
0	-1.71	51.20
3,000	-1.71	51.20
6,000	-1.71	51.20
9,000	-1.71	51.20
12,000	-1.71	51.20
15,000	-1.71	51.20
18,000	-1.71	51.20
21,000	-1.71	51.20
24,000	-1.71	51.20
27,000	-1.71	51.20
30,000	-1.71	51.20
33,000	-1.71	51.20
37,500	-1.71	51.20
39,000	-1.71	51.20
42,000	-1.71	51.20
45,000	-1.71	51.20
48,000	-1.71	51.20
51,000	-1.71	51.20
54,000	-1.71	51.20
57,000	-1.71	51.20
60,000	-1.71	51.20
63,000	-1.71	51.20
66,000	-1.71	51.20
69,000	-1.71	51.20
72,000	-1.71	51.20

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

One pump operation. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		12500	5.7	0.50	0.24	0.12	0.000	0.000
	30	straight run	11	12500	5.7	0.50	0.00	0.00	0.047	0.040
	42	increaser		12500	2.9	0.13	0.21	0.03	0.000	0.000
New Pump 8 Connection	42	tee thru		12500	2.9	0.13	0.24	0.03	0.000	0.000
	42	straight run	22	12500	2.9	0.13	0.00	0.00	0.018	0.016
	42	Mag Meter		12500	2.9	0.13	0.19	0.02	0.000	0.000
	42	straight run	22	12500	2.9	0.13	0.00	0.00	0.018	0.016
	42	45 ° Ell.		12500	2.9	0.13	0.30	0.04	0.000	0.000
	42	straight run	3	12500	2.9	0.13	0.00	0.00	0.003	0.002
	42	45 ° Ell.		12500	2.9	0.13	0.30	0.04	0.000	0.000
	42	straight run	3	12500	2.9	0.13	0.00	0.00	0.003	0.002
	42	tee as elbow side		12500	2.9	0.13	1.00	0.13	0.000	0.000
	54	straight run	5	12500	1.8	0.05	0.00	0.00	0.001	0.001
	54	ball valve		12500	1.8	0.05	1.00	0.05	0.000	0.000
	54	straight run	5	12500	1.8	0.05	0.00	0.00	0.001	0.001
Connection to 48" Force Main										
Fittings	48	tee side		5363	1.0	0.01	0.72	0.01	0.00	0.00
	48	90 ell-SR		5363	1.0	0.01	0.30	0.00	0.00	0.00
	48	ball valve		5363	1.0	0.01	1.00	0.01	0.00	0.00
	48	Mag Meter		5363	1.0	0.01	0.19	0.00	0.00	0.00
	48	4.5° Ell.		5363	1.0	0.01	0.05	0.00	0.00	0.00
	48	22.5 ° Ell.		5363	1.0	0.01	0.15	0.00	0.00	0.00
	48	60.0 ° Ell.		5363	1.0	0.01	0.30	0.00	0.00	0.00
	48	22.5 ° Ell.		5363	1.0	0.01	0.15	0.00	0.00	0.00
	48	22.5 ° Ell.		5363	1.0	0.01	0.15	0.00	0.00	0.00
	48	22.5 ° Ell.		5363	1.0	0.01	0.15	0.00	0.00	0.00
	48	22.5 ° Ell.		5363	1.0	0.01	0.15	0.00	0.00	0.00
	48	22.5 ° Ell.		5363	1.0	0.01	0.15	0.00	0.00	0.00
	48	1.0° Ell.		5363	1.0	0.01	0.03	0.00	0.00	0.00
	48	13.0° Ell.		5363	1.0	0.01	0.10	0.00	0.00	0.00
	48	0.5° Ell.		5363	1.0	0.01	0.02	0.00	0.00	0.00
	48	7.0° Ell.		5363	1.0	0.01	0.07	0.00	0.00	0.00
	48	4.0° Ell.		5363	1.0	0.01	0.05	0.00	0.00	0.00
	48	4.0° Ell.		5363	1.0	0.01	0.05	0.00	0.00	0.00
	48	4.0° Ell.		5363	1.0	0.01	0.05	0.00	0.00	0.00
	48	4.0° Ell.		5363	1.0	0.01	0.05	0.00	0.00	0.00
	48	4.0° Ell.		5363	1.0	0.01	0.05	0.00	0.00	0.00
	48	5.0° Ell.		5363	1.0	0.01	0.05	0.00	0.00	0.00
	48	5.0° Ell.		5363	1.0	0.01	0.05	0.00	0.00	0.00
	48	sluice gate		5363	1.0	0.01	0.80	0.01	0.00	0.00
	48	tee thru		5363	1.0	0.01	0.24	0.00	0.00	0.00
	48	exit		5363	1.0	0.01	1.00	0.01	0.00	0.00
Pipe Length	48	straight run	10430	5363	1.0	0.01	0.00	0.00	0.95	0.81
TOTAL			**10540**				**13**	**4**	**2**	**1**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

One pump operation. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	5.83	5.60
HWL at AVPP	-6.1	+ 10% safety factor	0.58	0.56
Low discharge El.	40.5		6.41	6.16
High discharge El.	44.5			
		Max TDH (ft) =	**64.98**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**52.73**
Min Static Head =	46.6 ft			

DRAFT

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

One pump operation. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	53	64.98
0	46.57	58.57
1,000	46.61	58.62
2,000	46.74	58.75
3,000	46.94	58.96
4,000	47.23	59.26
5,000	47.59	59.64
6,000	48.03	60.09
7,000	48.54	60.63
8,000	49.13	61.24
9,000	49.80	61.94
10,000	50.54	62.71
11,000	51.36	63.56
12,500	52.73	64.98
13,000	53.22	65.49
14,000	54.27	66.58
15,000	55.38	67.74
16,000	56.58	68.98
17,000	57.84	70.29
18,000	59.18	71.68
19,000	60.60	73.15
20,000	62.09	74.69
21,000	63.65	76.31
22,000	65.29	78.01
23,000	67.00	79.78
24,000	68.78	81.63

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 48" Force Main										
Fittings	48	tee side		10725	1.9	0.06	0.72	0.04	0.00	0.00
	48	90 ell-SR		10725	1.9	0.06	0.30	0.02	0.00	0.00
	48	ball valve		10725	1.9	0.06	1.00	0.06	0.00	0.00
	48	Mag Meter		10725	1.9	0.06	0.19	0.01	0.00	0.00
	48	4.5° Ell.		10725	1.9	0.06	0.05	0.00	0.00	0.00
	48	22.5 ° Ell.		10725	1.9	0.06	0.15	0.01	0.00	0.00
	48	60.0 ° Ell.		10725	1.9	0.06	0.30	0.02	0.00	0.00
	48	22.5 ° Ell.		10725	1.9	0.06	0.15	0.01	0.00	0.00
	48	22.5 ° Ell.		10725	1.9	0.06	0.15	0.01	0.00	0.00
	48	22.5 ° Ell.		10725	1.9	0.06	0.15	0.01	0.00	0.00
	48	22.5 ° Ell.		10725	1.9	0.06	0.15	0.01	0.00	0.00
	48	22.5 ° Ell.		10725	1.9	0.06	0.15	0.01	0.00	0.00
	48	1.0° Ell.		10725	1.9	0.06	0.03	0.00	0.00	0.00
	48	13.0° Ell.		10725	1.9	0.06	0.10	0.01	0.00	0.00
	48	0.5° Ell.		10725	1.9	0.06	0.02	0.00	0.00	0.00
	48	7.0° Ell.		10725	1.9	0.06	0.07	0.00	0.00	0.00
	48	4.0° Ell.		10725	1.9	0.06	0.05	0.00	0.00	0.00
	48	4.0° Ell.		10725	1.9	0.06	0.05	0.00	0.00	0.00
	48	4.0° Ell.		10725	1.9	0.06	0.05	0.00	0.00	0.00
	48	4.0° Ell.		10725	1.9	0.06	0.05	0.00	0.00	0.00
	48	4.0° Ell.		10725	1.9	0.06	0.05	0.00	0.00	0.00
	48	5.0° Ell.		10725	1.9	0.06	0.05	0.00	0.00	0.00
	48	5.0° Ell.		10725	1.9	0.06	0.05	0.00	0.00	0.00
	48	sluice gate		10725	1.9	0.06	0.80	0.04	0.00	0.00
	48	tee thru		10725	1.9	0.06	0.24	0.01	0.00	0.00
	48	exit		10725	1.9	0.06	1.00	0.06	0.00	0.00
Pipe Length	48	straight run	10430	10725	1.9	0.06	0.00	0.00	3.44	2.93
TOTAL			**10540**				**13**	**6**	**4**	**4**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	10.19	9.55
HWL at AVPP	-6.1	+ 10% safety factor	1.02	0.96
Low discharge El.	40.5		11.21	10.51
High discharge El.	44.5			
		Max TDH (ft) =	**69.78**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**57.08**
Min Static Head =	46.6 ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

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SCENARIO:

Two pump operation. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	57	69.78
0	46.57	58.57
1,000	46.65	58.66
2,000	46.87	58.89
3,000	47.23	59.28
4,000	47.72	59.81
5,000	48.35	60.47
6,000	49.10	61.28
7,000	49.98	62.22
8,000	50.99	63.29
9,000	52.12	64.50
10,000	53.38	65.84
11,000	54.77	67.32
12,500	57.08	69.78
13,000	57.91	70.66
14,000	59.67	72.53
15,000	61.55	74.52
16,000	63.55	76.65
17,000	65.67	78.91
18,000	67.92	81.29
19,000	70.29	83.80
20,000	72.77	86.44
21,000	75.38	89.21
22,000	78.11	92.10
23,000	80.96	95.12
24,000	83.93	98.27

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.65	58.66
4,000	46.87	58.89
6,000	47.23	59.28
8,000	47.72	59.81
10,000	48.35	60.47
12,000	49.10	61.28
14,000	49.98	62.22
16,000	50.99	63.29
18,000	52.12	64.50
20,000	53.38	65.84
22,000	54.77	67.32
25,000	57.08	69.78
26,000	57.91	70.66
28,000	59.67	72.53
30,000	61.55	74.52
32,000	63.55	76.65
34,000	65.67	78.91
36,000	67.92	81.29
38,000	70.29	83.80
40,000	72.77	86.44
42,000	75.38	89.21
44,000	78.11	92.10
46,000	80.96	95.12
48,000	83.93	98.27

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 48" Force Main										
Fittings	48	tee side		16087	2.9	0.13	0.72	0.09	0.00	0.00
	48	90 ell-SR		16087	2.9	0.13	0.30	0.04	0.00	0.00
	48	ball valve		16087	2.9	0.13	1.00	0.13	0.00	0.00
	48	Mag Meter		16087	2.9	0.13	0.19	0.02	0.00	0.00
	48	4.5° Ell.		16087	2.9	0.13	0.05	0.01	0.00	0.00
	48	22.5 ° Ell.		16087	2.9	0.13	0.15	0.02	0.00	0.00
	48	60.0 ° Ell.		16087	2.9	0.13	0.30	0.04	0.00	0.00
	48	22.5 ° Ell.		16087	2.9	0.13	0.15	0.02	0.00	0.00
	48	22.5 ° Ell.		16087	2.9	0.13	0.15	0.02	0.00	0.00
	48	22.5 ° Ell.		16087	2.9	0.13	0.15	0.02	0.00	0.00
	48	22.5 ° Ell.		16087	2.9	0.13	0.15	0.02	0.00	0.00
	48	22.5 ° Ell.		16087	2.9	0.13	0.15	0.02	0.00	0.00
	48	1.0° Ell.		16087	2.9	0.13	0.03	0.00	0.00	0.00
	48	13.0° Ell.		16087	2.9	0.13	0.10	0.01	0.00	0.00
	48	0.5° Ell.		16087	2.9	0.13	0.02	0.00	0.00	0.00
	48	7.0° Ell.		16087	2.9	0.13	0.07	0.01	0.00	0.00
	48	4.0° Ell.		16087	2.9	0.13	0.05	0.01	0.00	0.00
	48	4.0° Ell.		16087	2.9	0.13	0.05	0.01	0.00	0.00
	48	4.0° Ell.		16087	2.9	0.13	0.05	0.01	0.00	0.00
	48	4.0° Ell.		16087	2.9	0.13	0.05	0.01	0.00	0.00
	48	4.0° Ell.		16087	2.9	0.13	0.05	0.01	0.00	0.00
	48	5.0° Ell.		16087	2.9	0.13	0.05	0.01	0.00	0.00
	48	5.0° Ell.		16087	2.9	0.13	0.05	0.01	0.00	0.00
	48	sluice gate		16087	2.9	0.13	0.80	0.10	0.00	0.00
	48	tee thru		16087	2.9	0.13	0.24	0.03	0.00	0.00
	48	exit		16087	2.9	0.13	1.00	0.13	0.00	0.00
Pipe Length	48	straight run	10430	16087	2.9	0.13	0.00	0.00	7.28	6.20
TOTAL			**10540**				**13**	**6**	**8**	**7**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	14.46	13.25
HWL at AVPP	-6.1	+ 10% safety factor	1.45	1.32
Low discharge El.	40.5		15.90	14.57
High discharge El.	44.5			
		Max TDH (ft) =	**74.47**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**61.14**
Min Static Head =	46.6 ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	63	76.44
0	46.57	58.57
1,000	46.70	58.71
2,000	47.06	59.10
3,000	47.63	59.72
4,000	48.41	60.57
5,000	49.40	61.64
6,000	50.58	62.93
7,000	51.97	64.43
8,000	53.56	66.14
9,000	55.34	68.07
10,000	57.32	70.20
11,000	59.49	72.54
12,500	63.11	76.44
13,000	64.41	77.84
14,000	67.15	80.80
15,000	70.09	83.96
16,000	73.21	87.32
17,000	76.52	90.88
18,000	80.02	94.64
19,000	83.70	98.60
20,000	87.58	102.76
21,000	91.63	107.11
22,000	95.87	111.67
23,000	100.30	116.42
24,000	104.91	121.37

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.70	58.71
4,000	47.06	59.10
6,000	47.63	59.72
8,000	48.41	60.57
10,000	49.40	61.64
12,000	50.58	62.93
14,000	51.97	64.43
16,000	53.56	66.14
18,000	55.34	68.07
20,000	57.32	70.20
22,000	59.49	72.54
25,000	63.11	76.44
26,000	64.41	77.84
28,000	67.15	80.80
30,000	70.09	83.96
32,000	73.21	87.32
34,000	76.52	90.88
36,000	80.02	94.64
38,000	83.70	98.60
40,000	87.58	102.76
42,000	91.63	107.11
44,000	95.87	111.67
46,000	100.30	116.42
48,000	104.91	121.37

Flow to generate system head curve for 3

3-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	46.70	58.71
6,000	47.06	59.10
9,000	47.63	59.72
12,000	48.41	60.57
15,000	49.40	61.64
18,000	50.58	62.93
21,000	51.97	64.43
24,000	53.56	66.14
27,000	55.34	68.07
30,000	57.32	70.20
33,000	59.49	72.54
37,500	63.11	76.44
39,000	64.41	77.84
42,000	67.15	80.80
45,000	70.09	83.96
48,000	73.21	87.32
51,000	76.52	90.88
54,000	80.02	94.64
57,000	83.70	98.60
60,000	87.58	102.76
63,000	91.63	107.11
66,000	95.87	111.67
69,000	100.30	116.42
72,000	104.91	121.37

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 48" Force Main										
Fittings	48	tee side		21449	3.8	0.22	0.72	0.16	0.00	0.00
	48	90 ell-SR		21449	3.8	0.22	0.30	0.07	0.00	0.00
	48	ball valve		21449	3.8	0.22	1.00	0.22	0.00	0.00
	48	Mag Meter		21449	3.8	0.22	0.19	0.04	0.00	0.00
	48	4.5° Ell.		21449	3.8	0.22	0.05	0.01	0.00	0.00
	48	22.5 ° Ell.		21449	3.8	0.22	0.15	0.03	0.00	0.00
	48	60.0 ° Ell.		21449	3.8	0.22	0.30	0.07	0.00	0.00
	48	22.5 ° Ell.		21449	3.8	0.22	0.15	0.03	0.00	0.00
	48	22.5 ° Ell.		21449	3.8	0.22	0.15	0.03	0.00	0.00
	48	22.5 ° Ell.		21449	3.8	0.22	0.15	0.03	0.00	0.00
	48	22.5 ° Ell.		21449	3.8	0.22	0.15	0.03	0.00	0.00
	48	22.5 ° Ell.		21449	3.8	0.22	0.15	0.03	0.00	0.00
	48	1.0° Ell.		21449	3.8	0.22	0.03	0.01	0.00	0.00
	48	13.0° Ell.		21449	3.8	0.22	0.10	0.02	0.00	0.00
	48	0.5° Ell.		21449	3.8	0.22	0.02	0.00	0.00	0.00
	48	7.0° Ell.		21449	3.8	0.22	0.07	0.02	0.00	0.00
	48	4.0° Ell.		21449	3.8	0.22	0.05	0.01	0.00	0.00
	48	4.0° Ell.		21449	3.8	0.22	0.05	0.01	0.00	0.00
	48	4.0° Ell.		21449	3.8	0.22	0.05	0.01	0.00	0.00
	48	4.0° Ell.		21449	3.8	0.22	0.05	0.01	0.00	0.00
	48	4.0° Ell.		21449	3.8	0.22	0.05	0.01	0.00	0.00
	48	5.0° Ell.		21449	3.8	0.22	0.05	0.01	0.00	0.00
	48	5.0° Ell.		21449	3.8	0.22	0.05	0.01	0.00	0.00
	48	sluice gate		21449	3.8	0.22	0.80	0.18	0.00	0.00
	48	tee thru		21449	3.8	0.22	0.24	0.05	0.00	0.00
	48	exit		21449	3.8	0.22	1.00	0.22	0.00	0.00
Pipe Length	48	straight run	10430	21449	3.8	0.22	0.00	0.00	12.40	10.56
TOTAL			**10540**				**13**	**7**	**13**	**11**

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Venice Auxiliary Pumping Plant

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System Head Curve

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SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	20.17	18.20
HWL at AVPP	-6.1	+ 10% safety factor	2.02	1.82
Low discharge El.	40.5		22.19	20.02
High discharge El.	44.5			
		Max TDH (ft) =	**80.76**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**66.59**
Min Static Head =	46.6 ft			

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Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	69	82.63
0	46.57	58.57
1,000	46.75	58.77
2,000	47.23	59.30
3,000	48.00	60.15
4,000	49.05	61.30
5,000	50.37	62.75
6,000	51.95	64.49
7,000	53.80	66.52
8,000	55.91	68.83
9,000	58.27	71.42
10,000	60.88	74.28
11,000	63.75	77.42
12,500	68.53	82.63
13,000	70.24	84.51
14,000	73.86	88.46
15,000	77.72	92.67
16,000	81.82	97.15
17,000	86.17	101.90
18,000	90.76	106.90
19,000	95.60	112.17
20,000	100.67	117.70
21,000	105.99	123.49
22,000	111.54	129.54
23,000	117.33	135.84
24,000	123.36	142.41

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.75	58.77
4,000	47.23	59.30
6,000	48.00	60.15
8,000	49.05	61.30
10,000	50.37	62.75
12,000	51.95	64.49
14,000	53.80	66.52
16,000	55.91	68.83
18,000	58.27	71.42
20,000	60.88	74.28
22,000	63.75	77.42
25,000	68.53	82.63
26,000	70.24	84.51
28,000	73.86	88.46
30,000	77.72	92.67
32,000	81.82	97.15
34,000	86.17	101.90
36,000	90.76	106.90
38,000	95.60	112.17
40,000	100.67	117.70
42,000	105.99	123.49
44,000	111.54	129.54
46,000	117.33	135.84
48,000	123.36	142.41

Flow to generate system head curve for 3

3-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	46.75	58.77
6,000	47.23	59.30
9,000	48.00	60.15
12,000	49.05	61.30
15,000	50.37	62.75
18,000	51.95	64.49
21,000	53.80	66.52
24,000	55.91	68.83
27,000	58.27	71.42
30,000	60.88	74.28
33,000	63.75	77.42
37,500	68.53	82.63
39,000	70.24	84.51
42,000	73.86	88.46
45,000	77.72	92.67
48,000	81.82	97.15
51,000	86.17	101.90
54,000	90.76	106.90
57,000	95.60	112.17
60,000	100.67	117.70
63,000	105.99	123.49
66,000	111.54	129.54
69,000	117.33	135.84
72,000	123.36	142.41

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Venice Auxiliary Pumping Plant

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Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 48" Force Main										
Fittings	48	tee side		26811	4.8	0.35	0.72	0.25	0.00	0.00
	48	90 ell-SR		26811	4.8	0.35	0.30	0.11	0.00	0.00
	48	ball valve		26811	4.8	0.35	1.00	0.35	0.00	0.00
	48	Mag Meter		26811	4.8	0.35	0.19	0.07	0.00	0.00
	48	4.5° Ell.		26811	4.8	0.35	0.05	0.02	0.00	0.00
	48	22.5 ° Ell.		26811	4.8	0.35	0.15	0.05	0.00	0.00
	48	60.0 ° Ell.		26811	4.8	0.35	0.30	0.11	0.00	0.00
	48	22.5 ° Ell.		26811	4.8	0.35	0.15	0.05	0.00	0.00
	48	22.5 ° Ell.		26811	4.8	0.35	0.15	0.05	0.00	0.00
	48	22.5 ° Ell.		26811	4.8	0.35	0.15	0.05	0.00	0.00
	48	22.5 ° Ell.		26811	4.8	0.35	0.15	0.05	0.00	0.00
	48	22.5 ° Ell.		26811	4.8	0.35	0.15	0.05	0.00	0.00
	48	1.0° Ell.		26811	4.8	0.35	0.03	0.01	0.00	0.00
	48	13.0° Ell.		26811	4.8	0.35	0.10	0.04	0.00	0.00
	48	0.5° Ell.		26811	4.8	0.35	0.02	0.01	0.00	0.00
	48	7.0° Ell.		26811	4.8	0.35	0.07	0.02	0.00	0.00
	48	4.0° Ell.		26811	4.8	0.35	0.05	0.02	0.00	0.00
	48	4.0° Ell.		26811	4.8	0.35	0.05	0.02	0.00	0.00
	48	4.0° Ell.		26811	4.8	0.35	0.05	0.02	0.00	0.00
	48	4.0° Ell.		26811	4.8	0.35	0.05	0.02	0.00	0.00
	48	4.0° Ell.		26811	4.8	0.35	0.05	0.02	0.00	0.00
	48	5.0° Ell.		26811	4.8	0.35	0.05	0.02	0.00	0.00
	48	5.0° Ell.		26811	4.8	0.35	0.05	0.02	0.00	0.00
	48	sluice gate		26811	4.8	0.35	0.80	0.28	0.00	0.00
	48	tee thru		26811	4.8	0.35	0.24	0.08	0.00	0.00
	48	exit		26811	4.8	0.35	1.00	0.35	0.00	0.00
Pipe Length	48	straight run	10430	26811	4.8	0.35	0.00	0.00	18.74	15.95
TOTAL			**10540**				**13**	**8**	**20**	**17**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	27.27	24.36
HWL at AVPP	-6.1	+ 10% safety factor	2.73	2.44
Low discharge El.	40.5		30.00	26.80
High discharge El.	44.5			
		Max TDH (ft) =	**88.57**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**73.37**
Min Static Head =	46.6 ft			

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SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	75	90.31
0	46.57	58.57
1,000	46.81	58.83
2,000	47.45	59.55
3,000	48.46	60.68
4,000	49.84	62.21
5,000	51.57	64.13
6,000	53.65	66.44
7,000	56.06	69.11
8,000	58.81	72.16
9,000	61.89	75.56
10,000	65.30	79.33
11,000	69.04	83.46
12,500	75.24	90.31
13,000	77.47	92.77
14,000	82.16	97.95
15,000	87.17	103.47
16,000	92.50	109.34
17,000	98.13	115.55
18,000	104.08	122.11
19,000	110.34	129.00
20,000	116.90	136.22
21,000	123.78	143.79
22,000	130.95	151.69
23,000	138.44	159.92
24,000	146.22	168.48

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.81	58.83
4,000	47.45	59.55
6,000	48.46	60.68
8,000	49.84	62.21
10,000	51.57	64.13
12,000	53.65	66.44
14,000	56.06	69.11
16,000	58.81	72.16
18,000	61.89	75.56
20,000	65.30	79.33
22,000	69.04	83.46
25,000	75.24	90.31
26,000	77.47	92.77
28,000	82.16	97.95
30,000	87.17	103.47
32,000	92.50	109.34
34,000	98.13	115.55
36,000	104.08	122.11
38,000	110.34	129.00
40,000	116.90	136.22
42,000	123.78	143.79
44,000	130.95	151.69
46,000	138.44	159.92
48,000	146.22	168.48

Flow to generate system head curve for 3

3-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	46.81	58.83
6,000	47.45	59.55
9,000	48.46	60.68
12,000	49.84	62.21
15,000	51.57	64.13
18,000	53.65	66.44
21,000	56.06	69.11
24,000	58.81	72.16
27,000	61.89	75.56
30,000	65.30	79.33
33,000	69.04	83.46
37,500	75.24	90.31
39,000	77.47	92.77
42,000	82.16	97.95
45,000	87.17	103.47
48,000	92.50	109.34
51,000	98.13	115.55
54,000	104.08	122.11
57,000	110.34	129.00
60,000	116.90	136.22
63,000	123.78	143.79
66,000	130.95	151.69
69,000	138.44	159.92
72,000	146.22	168.48

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 48" Force Main										
Fittings	48	tee side		32173	5.7	0.51	0.72	0.36	0.00	0.00
	48	90 ell-SR		32173	5.7	0.51	0.30	0.15	0.00	0.00
	48	ball valve		32173	5.7	0.51	1.00	0.51	0.00	0.00
	48	Mag Meter		32173	5.7	0.51	0.19	0.10	0.00	0.00
	48	4.5° Ell.		32173	5.7	0.51	0.05	0.03	0.00	0.00
	48	22.5 ° Ell.		32173	5.7	0.51	0.15	0.08	0.00	0.00
	48	60.0 ° Ell.		32173	5.7	0.51	0.30	0.15	0.00	0.00
	48	22.5 ° Ell.		32173	5.7	0.51	0.15	0.08	0.00	0.00
	48	22.5 ° Ell.		32173	5.7	0.51	0.15	0.08	0.00	0.00
	48	22.5 ° Ell.		32173	5.7	0.51	0.15	0.08	0.00	0.00
	48	22.5 ° Ell.		32173	5.7	0.51	0.15	0.08	0.00	0.00
	48	22.5 ° Ell.		32173	5.7	0.51	0.15	0.08	0.00	0.00
	48	1.0° Ell.		32173	5.7	0.51	0.03	0.02	0.00	0.00
	48	13.0° Ell.		32173	5.7	0.51	0.10	0.05	0.00	0.00
	48	0.5° Ell.		32173	5.7	0.51	0.02	0.01	0.00	0.00
	48	7.0° Ell.		32173	5.7	0.51	0.07	0.04	0.00	0.00
	48	4.0° Ell.		32173	5.7	0.51	0.05	0.03	0.00	0.00
	48	4.0° Ell.		32173	5.7	0.51	0.05	0.03	0.00	0.00
	48	4.0° Ell.		32173	5.7	0.51	0.05	0.03	0.00	0.00
	48	4.0° Ell.		32173	5.7	0.51	0.05	0.03	0.00	0.00
	48	4.0° Ell.		32173	5.7	0.51	0.05	0.03	0.00	0.00
	48	5.0° Ell.		32173	5.7	0.51	0.05	0.03	0.00	0.00
	48	5.0° Ell.		32173	5.7	0.51	0.05	0.03	0.00	0.00
	48	sluice gate		32173	5.7	0.51	0.80	0.40	0.00	0.00
	48	tee thru		32173	5.7	0.51	0.24	0.12	0.00	0.00
	48	exit		32173	5.7	0.51	1.00	0.51	0.00	0.00
Pipe Length	48	straight run	10430	32173	5.7	0.51	0.00	0.00	26.25	22.35
TOTAL			**10540**				**13**	**9**	**27**	**23**

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City of Los Angeles
Venice Auxiliary Pumping Plant

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By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

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SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	35.73	31.70
HWL at AVPP	-6.1	+ 10% safety factor	3.57	3.17
Low discharge El.	40.5		39.30	34.87
High discharge El.	44.5			
		Max TDH (ft) =	**97.87**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**81.44**
Min Static Head =	46.6 ft			

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Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	83	99.41
0	46.57	58.57
1,000	46.88	58.91
2,000	47.70	59.84
3,000	49.01	61.31
4,000	50.78	63.29
5,000	53.00	65.77
6,000	55.66	68.74
7,000	58.74	72.18
8,000	62.26	76.10
9,000	66.19	80.48
10,000	70.54	85.32
11,000	75.30	90.62
12,500	83.20	99.41
13,000	86.04	102.56
14,000	92.01	109.20
15,000	98.39	116.28
16,000	105.16	123.80
17,000	112.32	131.75
18,000	119.88	140.13
19,000	127.82	148.95
20,000	136.16	158.19
21,000	144.88	167.86
22,000	153.98	177.95
23,000	163.47	188.47
24,000	173.34	199.40

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.88	58.91
4,000	47.70	59.84
6,000	49.01	61.31
8,000	50.78	63.29
10,000	53.00	65.77
12,000	55.66	68.74
14,000	58.74	72.18
16,000	62.26	76.10
18,000	66.19	80.48
20,000	70.54	85.32
22,000	75.30	90.62
25,000	83.20	99.41
26,000	86.04	102.56
28,000	92.01	109.20
30,000	98.39	116.28
32,000	105.16	123.80
34,000	112.32	131.75
36,000	119.88	140.13
38,000	127.82	148.95
40,000	136.16	158.19
42,000	144.88	167.86
44,000	153.98	177.95
46,000	163.47	188.47
48,000	173.34	199.40

Flow to generate system head curve for 3

3-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	46.88	58.91
6,000	47.70	59.84
9,000	49.01	61.31
12,000	50.78	63.29
15,000	53.00	65.77
18,000	55.66	68.74
21,000	58.74	72.18
24,000	62.26	76.10
27,000	66.19	80.48
30,000	70.54	85.32
33,000	75.30	90.62
37,500	83.20	99.41
39,000	86.04	102.56
42,000	92.01	109.20
45,000	98.39	116.28
48,000	105.16	123.80
51,000	112.32	131.75
54,000	119.88	140.13
57,000	127.82	148.95
60,000	136.16	158.19
63,000	144.88	167.86
66,000	153.98	177.95
69,000	163.47	188.47
72,000	173.34	199.40

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Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

Where:
L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		25000	5.8	0.52	0.24	0.12	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	Mag Meter		25000	5.8	0.52	0.19	0.10	0.000	0.000
	42	straight run	22	25000	5.8	0.52	0.00	0.00	0.066	0.057
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	45 ° Ell.		25000	5.8	0.52	0.30	0.16	0.000	0.000
	42	straight run	3	25000	5.8	0.52	0.00	0.00	0.009	0.008
	42	tee as elbow side		25000	5.8	0.52	1.00	0.52	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
	54	ball valve		25000	3.5	0.19	1.00	0.19	0.000	0.000
	54	straight run	5	25000	3.5	0.19	0.00	0.00	0.004	0.004
Connection to 48" Force Main										
Fittings	48	tee side		37536	6.7	0.69	0.72	0.50	0.00	0.00
	48	90 ell-SR		37536	6.7	0.69	0.30	0.21	0.00	0.00
	48	ball valve		37536	6.7	0.69	1.00	0.69	0.00	0.00
	48	Mag Meter		37536	6.7	0.69	0.19	0.13	0.00	0.00
	48	4.5° Ell.		37536	6.7	0.69	0.05	0.03	0.00	0.00
	48	22.5 ° Ell.		37536	6.7	0.69	0.15	0.10	0.00	0.00
	48	60.0 ° Ell.		37536	6.7	0.69	0.30	0.21	0.00	0.00
	48	22.5 ° Ell.		37536	6.7	0.69	0.15	0.10	0.00	0.00
	48	22.5 ° Ell.		37536	6.7	0.69	0.15	0.10	0.00	0.00
	48	22.5 ° Ell.		37536	6.7	0.69	0.15	0.10	0.00	0.00
	48	22.5 ° Ell.		37536	6.7	0.69	0.15	0.10	0.00	0.00
	48	22.5 ° Ell.		37536	6.7	0.69	0.15	0.10	0.00	0.00
	48	1.0° Ell.		37536	6.7	0.69	0.03	0.02	0.00	0.00
	48	13.0° Ell.		37536	6.7	0.69	0.10	0.07	0.00	0.00
	48	0.5° Ell.		37536	6.7	0.69	0.02	0.01	0.00	0.00
	48	7.0° Ell.		37536	6.7	0.69	0.07	0.05	0.00	0.00
	48	4.0° Ell.		37536	6.7	0.69	0.05	0.03	0.00	0.00
	48	4.0° Ell.		37536	6.7	0.69	0.05	0.03	0.00	0.00
	48	4.0° Ell.		37536	6.7	0.69	0.05	0.03	0.00	0.00
	48	4.0° Ell.		37536	6.7	0.69	0.05	0.03	0.00	0.00
	48	4.0° Ell.		37536	6.7	0.69	0.05	0.03	0.00	0.00
	48	5.0° Ell.		37536	6.7	0.69	0.05	0.03	0.00	0.00
	48	5.0° Ell.		37536	6.7	0.69	0.05	0.03	0.00	0.00
	48	sluice gate		37536	6.7	0.69	0.80	0.55	0.00	0.00
	48	tee thru		37536	6.7	0.69	0.24	0.17	0.00	0.00
	48	exit		37536	6.7	0.69	1.00	0.69	0.00	0.00
Pipe Length	48	straight run	10430	37536	6.7	0.69	0.00	0.00	34.92	29.73
TOTAL			**10540**				**13**	**10**	**36**	**30**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	45.50	40.18
HWL at AVPP	-6.1	+ 10% safety factor	4.55	4.02
Low discharge El.	40.5		50.05	44.20
High discharge El.	44.5			
		Max TDH (ft) =	**108.62**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**90.77**
Min Static Head =	46.6 ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

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SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	92	109.88
0	46.57	58.57
1,000	46.96	59.01
2,000	48.00	60.18
3,000	49.64	62.04
4,000	51.86	64.53
5,000	54.64	67.65
6,000	57.97	71.39
7,000	61.83	75.72
8,000	66.22	80.64
9,000	71.14	86.14
10,000	76.57	92.22
11,000	82.51	98.86
12,500	92.36	109.88
13,000	95.90	113.83
14,000	103.34	122.15
15,000	111.28	131.01
16,000	119.71	140.43
17,000	128.63	150.38
18,000	138.04	160.87
19,000	147.93	171.90
20,000	158.29	183.46
21,000	169.14	195.55
22,000	180.46	208.16
23,000	192.26	221.30
24,000	204.52	234.97

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	46.96	59.01
4,000	48.00	60.18
6,000	49.64	62.04
8,000	51.86	64.53
10,000	54.64	67.65
12,000	57.97	71.39
14,000	61.83	75.72
16,000	66.22	80.64
18,000	71.14	86.14
20,000	76.57	92.22
22,000	82.51	98.86
25,000	92.36	109.88
26,000	95.90	113.83
28,000	103.34	122.15
30,000	111.28	131.01
32,000	119.71	140.43
34,000	128.63	150.38
36,000	138.04	160.87
38,000	147.93	171.90
40,000	158.29	183.46
42,000	169.14	195.55
44,000	180.46	208.16
46,000	192.26	221.30
48,000	204.52	234.97

Flow to generate system head curve for 3

3-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	46.96	59.01
6,000	48.00	60.18
9,000	49.64	62.04
12,000	51.86	64.53
15,000	54.64	67.65
18,000	57.97	71.39
21,000	61.83	75.72
24,000	66.22	80.64
27,000	71.14	86.14
30,000	76.57	92.22
33,000	82.51	98.86
37,500	92.36	109.88
39,000	95.90	113.83
42,000	103.34	122.15
45,000	111.28	131.01
48,000	119.71	140.43
51,000	128.63	150.38
54,000	138.04	160.87
57,000	147.93	171.90
60,000	158.29	183.46
63,000	169.14	195.55
66,000	180.46	208.16
69,000	192.26	221.30
72,000	204.52	234.97

DRAFT

City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

Headloss Equations:

In Pipes: $h_f = 0.002083L(100/C)^{1.85}Q^{1.85}/d^{4.8655}$ (Hazen-Williams)

Where:

L = Pipe length (ft)
C = H-W rough coeff. = 110 120
Q = Flow (gpm) = 12500 gpm to 48" FM Q (MGD) =
d = Pipe diameter (in)

In Fittings: $h_f = KV^2/2g$ (Darcy-Weisbach)

K = Fitting resistance coeff.
V = Velocity (ft/s)
g = 32.2 ft/s^2

									C=110	C=120
Segment	**Diam. (in)**	**Fitting**	**Length (ft)**	**Flow (gpm)**	**Velocity (fps)**	**$V^2/2g$ (ft)**	**K**	**Fitting Loss (ft)**	**Pipe Loss (ft)**	**Pipe Loss (ft)**
VAPP Wet Well										
New Pump 6 Suction	30	bell entrance		12500	5.7	0.50	0.04	0.02	0.000	0.000
	24	reducer		12500	8.9	1.22	0.10	0.12	0.000	0.000
Pump in Wet Well		pump		12500						
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	20	12500	8.9	1.22	0.00	0.00	0.255	0.217
	24	90 ell-SR		12500	8.9	1.22	0.30	0.37	0.000	0.000
	24	straight run	5	12500	8.9	1.22	0.00	0.00	0.064	0.054
Valve Vault				12500						
	24	check valve		12500	8.9	1.22	1.20	1.46	0.000	0.000
	24	straight run	3	12500	8.9	1.22	0.00	0.00	0.038	0.033
	24	gate valve		12500	8.9	1.22	0.10	0.12	0.000	0.000
	24	tee as elbow side		12500	8.9	1.22	1.00	1.22	0.000	0.000
Connection to VAPP Header				12500						
	24	straight run	11	12500	8.9	1.22	0.00	0.00	0.140	0.120
	30	increaser		12500	5.7	0.50	0.12	0.06	0.000	0.000
New Pump 7 Connection	30	tee thru		25000	11.3	2.00	0.24	0.48	0.000	0.000
	30	straight run	11	25000	11.3	2.00	0.00	0.00	0.171	0.145
	42	increaser		25000	5.8	0.52	0.21	0.11	0.000	0.000
New Pump 8 Connection	42	tee thru		37500	8.7	1.17	0.24	0.28	0.000	0.000
	42	straight run	22	37500	8.7	1.17	0.00	0.00	0.141	0.120
	42	Mag Meter		37500	8.7	1.17	0.19	0.22	0.000	0.000
	42	straight run	22	37500	8.7	1.17	0.00	0.00	0.141	0.120
	42	45 ° Ell.		37500	8.7	1.17	0.30	0.35	0.000	0.000
	42	straight run	3	37500	8.7	1.17	0.00	0.00	0.019	0.016
	42	45 ° Ell.		37500	8.7	1.17	0.30	0.35	0.000	0.000
	42	straight run	3	37500	8.7	1.17	0.00	0.00	0.019	0.016
	42	tee as elbow side		37500	8.7	1.17	1.00	1.17	0.000	0.000
	54	straight run	5	37500	5.3	0.43	0.00	0.00	0.009	0.008
	54	ball valve		37500	5.3	0.43	1.00	0.43	0.000	0.000
	54	straight run	5	37500	5.3	0.43	0.00	0.00	0.009	0.008
Connection to 48" Force Main										
Fittings	48	tee side		42898	7.6	0.90	0.72	0.65	0.00	0.00
	48	90 ell-SR		42898	7.6	0.90	0.30	0.27	0.00	0.00
	48	ball valve		42898	7.6	0.90	1.00	0.90	0.00	0.00
	48	Mag Meter		42898	7.6	0.90	0.19	0.17	0.00	0.00
	48	4.5° Ell.		42898	7.6	0.90	0.05	0.04	0.00	0.00
	48	22.5 ° Ell.		42898	7.6	0.90	0.15	0.13	0.00	0.00
	48	60.0 ° Ell.		42898	7.6	0.90	0.30	0.27	0.00	0.00
	48	22.5 ° Ell.		42898	7.6	0.90	0.15	0.13	0.00	0.00
	48	22.5 ° Ell.		42898	7.6	0.90	0.15	0.13	0.00	0.00
	48	22.5 ° Ell.		42898	7.6	0.90	0.15	0.13	0.00	0.00
	48	22.5 ° Ell.		42898	7.6	0.90	0.15	0.13	0.00	0.00
	48	22.5 ° Ell.		42898	7.6	0.90	0.15	0.13	0.00	0.00
	48	1.0° Ell.		42898	7.6	0.90	0.03	0.03	0.00	0.00
	48	13.0° Ell.		42898	7.6	0.90	0.10	0.09	0.00	0.00
	48	0.5° Ell.		42898	7.6	0.90	0.02	0.02	0.00	0.00
	48	7.0° Ell.		42898	7.6	0.90	0.07	0.06	0.00	0.00
	48	4.0° Ell.		42898	7.6	0.90	0.05	0.04	0.00	0.00
	48	4.0° Ell.		42898	7.6	0.90	0.05	0.04	0.00	0.00
	48	4.0° Ell.		42898	7.6	0.90	0.05	0.04	0.00	0.00
	48	4.0° Ell.		42898	7.6	0.90	0.05	0.04	0.00	0.00
	48	4.0° Ell.		42898	7.6	0.90	0.05	0.04	0.00	0.00
	48	5.0° Ell.		42898	7.6	0.90	0.05	0.04	0.00	0.00
	48	5.0° Ell.		42898	7.6	0.90	0.05	0.04	0.00	0.00
	48	sluice gate		42898	7.6	0.90	0.80	0.72	0.00	0.00
	48	tee thru		42898	7.6	0.90	0.24	0.22	0.00	0.00
	48	exit		42898	7.6	0.90	1.00	0.90	0.00	0.00
Pipe Length	48	straight run	10430	42898	7.6	0.90	0.00	0.00	44.70	38.06
TOTAL			**10540**				**13**	**13**	**46**	**39**

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City of Los Angeles
Venice Auxiliary Pumping Plant

Project: T.O.#41
By: N.Pailma
Date: March 2015
Checked By: R. Vargus

System Head Curve

DETERMINE SYSTEM HEAD CURVE FROM THE AVPP THROUGH BOTH FORCE MAINS SIMULTANEOUSLY.

SCENARIO:

Two pump operation with one pump operating from the existing pump station. The flow split between the 48-inch and 54-inch FM is 42.8% to 57.2%, respectively. All pumps discharge equal flow.

LWL at AVPP	-14.1 *at manifold connection*	**Total Headloss (ft) =**	58.30	51.50
HWL at AVPP	-6.1	+ 10% safety factor	5.83	5.15
Low discharge El.	40.5		64.13	56.65
High discharge El.	44.5			
		Max TDH (ft) =	**122.70**	
Max Static Head =	58.6 ft	**Min TDH (ft) =**		**103.22**
Min Static Head =	46.6 ft			

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City of Los Angeles
Venice Auxiliary Pumping Plant

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Fitting Loss Coefficients Lookup Table

Fitting	K	
bell entrance	0.04	
exit	1.00	*worst case is submerged*
90 ell-LR	0.20	
90 ell-SR	0.30	
45 ° Ell.	0.30	
22.5 ° Ell.	0.15	
tee thru	0.24	
tee side	0.72	
reducer	use eqn/table	*Use Di*
increaser	use eqn/table	*Use Di*
gate valve	0.10	
check valve	1.20	*swing check type*
bfv	0.30	
rotovalve	0.04	
tee as elbow thru	1.00	
tee as elbow side	1.00	
Mag Meter	0.19	
ball valve	1.00	

Data Table - What 1 pump sees on 1-pump operation

1-Pump (gpm)	TDH Low (ft)	TDH High (ft)
	103	121.89
0	46.57	58.57
1,000	47.05	59.11
2,000	48.34	60.57
3,000	50.36	62.86
4,000	53.10	65.95
5,000	56.53	69.81
6,000	60.62	74.42
7,000	65.37	79.77
8,000	70.77	85.84
9,000	76.81	92.63
10,000	83.49	100.12
11,000	90.78	108.31
12,500	102.89	121.89
13,000	107.23	126.75
14,000	116.37	137.00
15,000	126.11	147.92
16,000	136.45	159.50
17,000	147.39	171.76
18,000	158.93	184.67
19,000	171.05	198.24
20,000	183.76	212.46
21,000	197.05	227.33
22,000	210.92	242.84
23,000	225.38	259.00
24,000	240.41	275.80

Flow to generate system head curve for 2 pumps

2-Pump (gpm)	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
2,000	47.05	59.11
4,000	48.34	60.57
6,000	50.36	62.86
8,000	53.10	65.95
10,000	56.53	69.81
12,000	60.62	74.42
14,000	65.37	79.77
16,000	70.77	85.84
18,000	76.81	92.63
20,000	83.49	100.12
22,000	90.78	108.31
25,000	102.89	121.89
26,000	107.23	126.75
28,000	116.37	137.00
30,000	126.11	147.92
32,000	136.45	159.50
34,000	147.39	171.76
36,000	158.93	184.67
38,000	171.05	198.24
40,000	183.76	212.46
42,000	197.05	227.33
44,000	210.92	242.84
46,000	225.38	259.00
48,000	240.41	275.80

Flow to generate system head curve for 3

3-Pump (gpm	TDH Low (ft)	TDH High (ft)
0	46.57	58.57
3,000	47.05	59.11
6,000	48.34	60.57
9,000	50.36	62.86
12,000	53.10	65.95
15,000	56.53	69.81
18,000	60.62	74.42
21,000	65.37	79.77
24,000	70.77	85.84
27,000	76.81	92.63
30,000	83.49	100.12
33,000	90.78	108.31
37,500	102.89	121.89
39,000	107.23	126.75
42,000	116.37	137.00
45,000	126.11	147.92
48,000	136.45	159.50
51,000	147.39	171.76
54,000	158.93	184.67
57,000	171.05	198.24
60,000	183.76	212.46
63,000	197.05	227.33
66,000	210.92	242.84
69,000	225.38	259.00
72,000	240.41	275.80

DRAFT

HVAC

Air System Sizing Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:05AM

80° Setpoint

1/2

Air System Information

Air System Name	**Electrical Room**	Number of zones	**1**	
Equipment Class	**PKG ROOF**	Floor Area	**1300.0**	ft²
Air System Type	**SZCAV**	Location	**Los Angeles LAX, California**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**	
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**	

Central Cooling Coil Sizing Data

Total coil load	**17.9**	Tons	Load occurs at	**Aug 1300**	
Total coil load	**215.3**	MBH	OA DB / WB	**83.8 / 63.6**	°F
Sensible coil load	**215.3**	MBH	Entering DB / WB	**81.0 / 62.7**	°F
Coil CFM at Aug 1300	**9052**	CFM	Leaving DB / WB	**58.9 / 54.4**	°F
Max block CFM	**9052**	CFM	Coil ADP	**56.5**	°F
Sum of peak zone CFM	**9052**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**1.000**		Resulting RH	**35**	%
ft²/Ton	**72.5**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**165.6**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**25.7**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**9052**	CFM	BTU/(hr-ft²)	**19.8**	
Max coil CFM	**9052**	CFM	Ent. DB / Lvg DB	**58.7 / 61.4**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**9052**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**9018**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**6.96**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**500**	CFM	CFM/person	**0.00**	CFM/person
CFM/ft²	**0.38**	CFM/ft²			

=> Always have to remove equipment load

=> Setpoint only affects envelope load

(is it 100° outside vs Setpoint inside)

=> BTU = UA ΔT

ΔT = (100 - 80) = 20
(100 - 85) = 15
(100 - 90) = 10

Zone Design Load Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:05AM

80° Setpoint

2/2

Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1500 COOLING OA DB / WB 85.0 °F / 64.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 43.0 °F / 36.1 °F		
	OCCUPIED T-STAT 80.0 °F			OCCUPIED T-STAT 60.0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	2156 ft²	14207	-	2156 ft²	14988	-
Roof Transmission	484 ft²	4560	-	484 ft²	1870	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	484 ft²	0	-	484 ft²	427	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	1300 W	4435	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	56000 W	191068	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	-	214270	0	-	17284	0

Air System Sizing Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:07AM

85° Setpoint

1/2

Air System Information

Air System Name	**Electrical Room**		Number of zones	**1**	
Equipment Class	**PKG ROOF**		Floor Area	**1300.0**	ft²
Air System Type	**SZCAV**		Location	**Los Angeles LAX, California**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**		Calculation Months	**Jan to Dec**	
Space CFM	**Individual peak space loads**		Sizing Data	**Calculated**	

Central Cooling Coil Sizing Data

Total coil load	**17.2**	Tons	Load occurs at	**Aug 1500**	
Total coil load	**206.1**	MBH	OA DB / WB	**85.0 / 64.0**	°F
Sensible coil load	**206.1**	MBH	Entering DB / WB	**86.6 / 64.5**	°F
Coil CFM at Aug 1500	**7205**	CFM	Leaving DB / WB	**60.0 / 54.8**	°F
Max block CFM	**7205**	CFM	Coil ADP	**57.0**	°F
Sum of peak zone CFM	**7205**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**1.000**		Resulting RH	**29**	%
ft²/Ton	**75.7**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**158.6**		Zone T-stat Check	0 of 1	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.2**	°F

Central Heating Coil Sizing Data

Max coil load	**26.0**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**7205**	CFM	BTU/(hr-ft²)	**20.0**	
Max coil CFM	**7205**	CFM	Ent. DB / Lvg DB	**58.7 / 62.0**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**7205**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**7178**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**5.54**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**500**	CFM	CFM/person	**0.00**	CFM/person
CFM/ft²	**0.38**	CFM/ft²			

Zone Design Load Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:08AM

85° Setpoint

2/2

Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1500 COOLING OA DB / WB 85.0 °F / 64.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 43.0 °F / 36.1 °F		
	OCCUPIED T-STAT 85.0 °F			OCCUPIED T-STAT 60.0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	2156 ft²	9799	-	2156 ft²	14988	-
Roof Transmission	484 ft²	4010	-	484 ft²	1870	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	484 ft²	0	-	484 ft²	427	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	1300 W	4435	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	56000 W	191068	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	-	209312	0	-	17284	0

Air System Sizing Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:07AM

90° Setpoint

1/2

Air System Information

Air System Name	**Electrical Room**		Number of zones	**1**	
Equipment Class	**PKG ROOF**		Floor Area	**1300.0**	ft²
Air System Type	**SZCAV**		Location	**Los Angeles LAX, California**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**		Calculation Months	**Jan to Dec**	
Space CFM	**Individual peak space loads**		Sizing Data	**Calculated**	

Central Cooling Coil Sizing Data

Total coil load	**16.5**	Tons	Load occurs at	**Aug 1500**	
Total coil load	**198.1**	MBH	OA DB / WB	**85.0 / 64.0**	°F
Sensible coil load	**198.1**	MBH	Entering DB / WB	**91.3 / 66.1**	°F
Coil CFM at Aug 1500	**5936**	CFM	Leaving DB / WB	**60.2 / 54.9**	°F
Max block CFM	**5936**	CFM	Coil ADP	**56.8**	°F
Sum of peak zone CFM	**5936**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**1.000**		Resulting RH	**25**	%
ft²/Ton	**78.7**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**152.4**		Zone T-stat Check	0 of 1	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.3**	°F

Central Heating Coil Sizing Data

Max coil load	**26.8**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**5936**	CFM	BTU/(hr-ft²)	**20.6**	
Max coil CFM	**5936**	CFM	Ent. DB / Lvg DB	**58.8 / 63.0**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**5936**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**5913**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**4.57**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**500**	CFM	CFM/person	**0.00**	CFM/person
CFM/ft²	**0.38**	CFM/ft²			

Zone Design Load Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:07AM

90° Setpoint

2/2

Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1500 COOLING OA DB / WB 85.0 °F / 64.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 43.0 °F / 36.1 °F		
	OCCUPIED T-STAT 90.0 °F			OCCUPIED T-STAT 60.0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	2156 ft²	5391	-	2156 ft²	14988	-
Roof Transmission	484 ft²	3460	-	484 ft²	1870	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	484 ft²	0	-	484 ft²	427	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	1300 W	4435	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	56000 W	191068	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	-	204354	0	-	17284	0

Air System Sizing Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:10AM

100° Setpoint

1/3

Air System Information

Air System Name	**Electrical Room**		Number of zones	**1**	
Equipment Class	**PKG ROOF**		Floor Area	**1300.0**	ft²
Air System Type	**SZCAV**		Location	**Los Angeles LAX, California**	

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM	**Sum of space airflow rates**	Calculation Months	**Jan to Dec**
Space CFM	**Individual peak space loads**	Sizing Data	**Calculated**

Central Cooling Coil Sizing Data

Total coil load	**15.4**	Tons	Load occurs at	**Aug 1500**	
Total coil load	**185.3**	MBH	OA DB / WB	**85.0 / 64.0**	°F
Sensible coil load	**185.3**	MBH	Entering DB / WB	**99.2 / 68.6**	°F
Coil CFM at Aug 1500	**4303**	CFM	Leaving DB / WB	**59.1 / 54.4**	°F
Max block CFM	**4303**	CFM	Coil ADP	**54.7**	°F
Sum of peak zone CFM	**4303**	CFM	Bypass Factor	**0.100**	
Sensible heat ratio	**1.000**		Resulting RH	**19**	%
ft²/Ton	**84.2**		Design supply temp.	**58.0**	°F
BTU/(hr-ft²)	**142.6**		Zone T-stat Check	**1 of 1**	OK
Water flow @ 10.0 °F rise	**N/A**		Max zone temperature deviation	**0.0**	°F

Central Heating Coil Sizing Data

Max coil load	**25.4**	MBH	Load occurs at	**Des Htg**	
Coil CFM at Des Htg	**4303**	CFM	BTU/(hr-ft²)	**19.6**	
Max coil CFM	**4303**	CFM	Ent. DB / Lvg DB	**57.8 / 63.2**	°F
Water flow @ 20.0 °F drop	**N/A**				

Supply Fan Sizing Data

Actual max CFM	**4303**	CFM	Fan motor BHP	**0.00**	BHP
Standard CFM	**4287**	CFM	Fan motor kW	**0.00**	kW
Actual max CFM/ft²	**3.31**	CFM/ft²	Fan static	**0.00**	in wg

Outdoor Ventilation Air Data

Design airflow CFM	**500**	CFM	CFM/person	**0.00**	CFM/person
CFM/ft²	**0.38**	CFM/ft²			

Zone Sizing Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:10AM

100° Setpoint

2/3

Air System Information

Air System Name ..... **Electrical Room**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **SZCAV**

Number of zones **1**
Floor Area ..... **1300.0** ft²
Location ..... **Los Angeles LAX, California**

Sizing Calculation Information

Zone and Space Sizing Method:

Zone CFM ..... **Sum of space airflow rates**
Space CFM ..... **Individual peak space loads**

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone Sizing Data

Zone Name	Maximum Cooling Sensible (MBH)	Design Air Flow (CFM)	Minimum Air Flow (CFM)	Time of Peak Load	Maximum Heating Load (MBH)	Zone Floor Area (ft²)	Zone CFM/ft²
Zone 1	194.4	4303	4303	Aug 1500	17.3	1300.0	3.31

Zone Terminal Sizing Data

No Zone Terminal Sizing Data required for this system.

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (MBH)	Time of Load	Air Flow (CFM)	Heating Load (MBH)	Floor Area (ft²)	Space CFM/ft²
Zone 1							
MCC Room	1	194.4	Aug 1500	4303	17.3	1300.0	3.31

Zone Design Load Summary for Electrical Room

Project Name: Venice CA Aux Pump Plant Prelim
Prepared by: ARCADIS

09/16/2015
11:10AM

100° Setpoint

3/3

Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1500 COOLING OA DB / WB 85.0 °F / 64.0 °F			HEATING DATA AT DES HTG HEATING OA DB / WB 43.0 °F / 36.1 °F		
	OCCUPIED T-STAT 100.0 °F			OCCUPIED T-STAT 60.0 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	2156 ft²	-3426	-	2156 ft²	14988	-
Roof Transmission	484 ft²	2360	-	484 ft²	1870	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	484 ft²	0	-	484 ft²	427	-
Partitions	0 ft²	0	-	0 ft²	0	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	1300 W	4435	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	56000 W	191068	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	0%	0	0
>> Total Zone Loads	-	194437	0	-	17284	0

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Appendix **D**

Equipment Cutsheets

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Pumps

ARCADIS

Flygt

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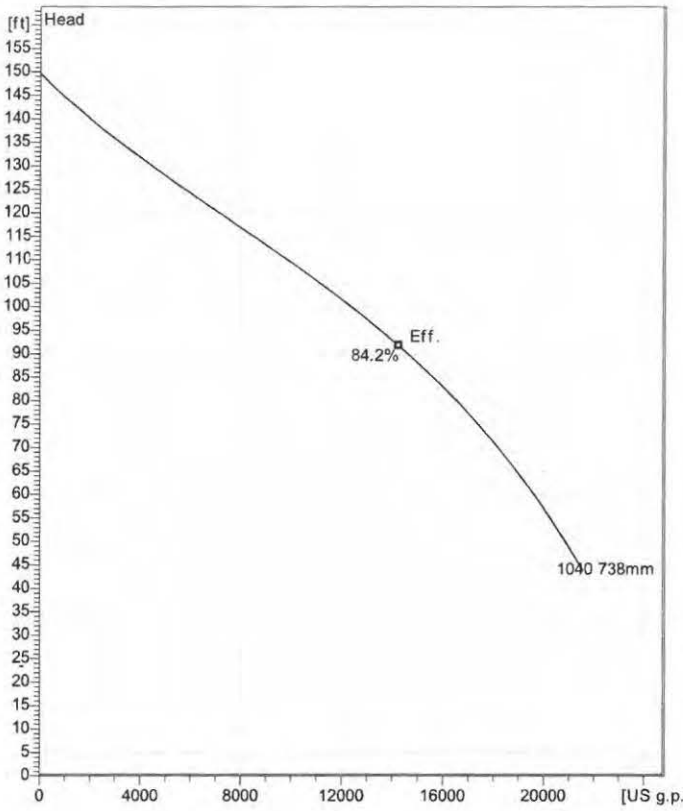
CP 3531/905 3~ 1040

Technical specification

FLYGT



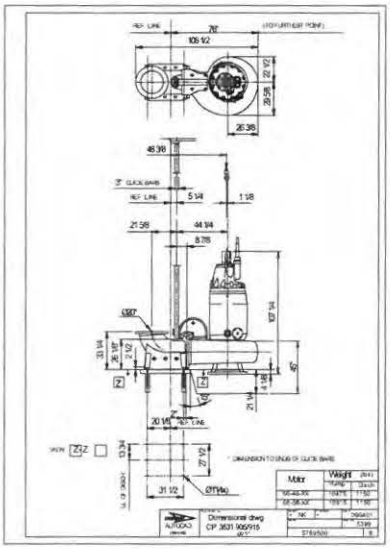
Water

Curve according to: ISO 9906 grade 2 annex 1 or 2



Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Shrouded single or multi-channel impeller pumps with large throughlets and single volute pump casing for liquids containing solids and fibres. Cast iron design with double sealing technology.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	19 11/16 inch
Suction Flange Diameter	600 mm
Impeller diameter	738 mm
Number of blades	3
Throughlet diameter	4 1/8 inch

Motor

Motor #	C0905.000 66-56-10AA-W 500hp
Stator variant	38
Frequency	60 Hz
Rated voltage	460 V
Number of poles	10
Phases	3~
Rated power	500 hp
Rated current	600 A
Starting current	3100 A
Rated speed	715 rpm
Power factor	
1/1 Load	0.82
3/4 Load	0.79
1/2 Load	0.70
Efficiency	
1/1 Load	95.0 %
3/4 Load	95.5 %
1/2 Load	95.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
NICK PAILMA	**ARCADIS US**	**Ricardo Guanio**	**2015-04-01**	**2015-04-01**

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FLYGT

Performance curve

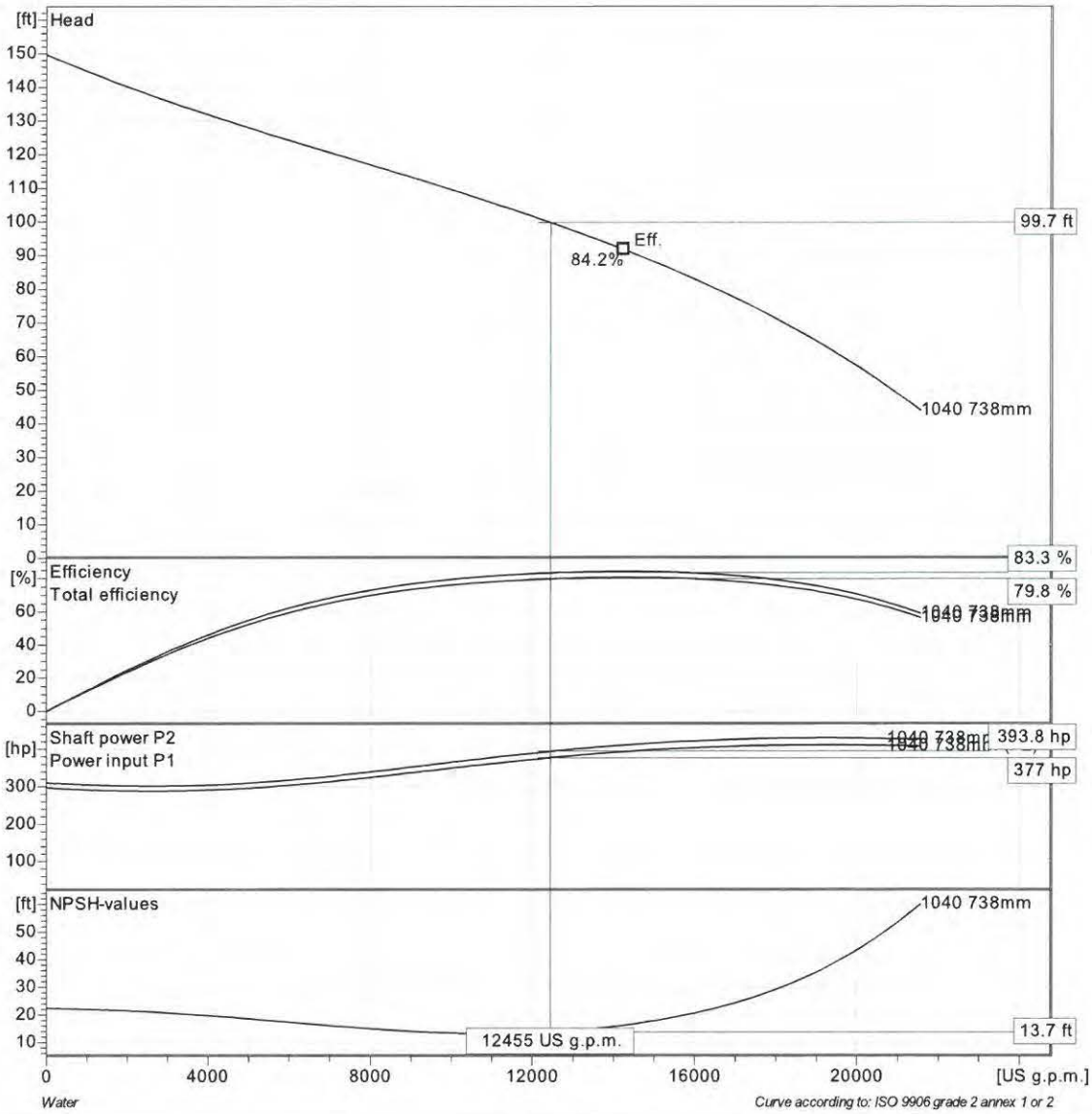
Pump

Discharge Flange Diameter	19 11/16 inch
Suction Flange Diameter	600 mm
Impeller diameter	29 1/16"
Number of blades	3
Throughlet diameter	4 1/8 inch

Motor

Motor #	C0905.000 66-56-10AA-W 500hp
Stator variant	38
Frequency	60 Hz
Rated voltage	460 V
Number of poles	10
Phases	3~
Rated power	500 hp
Rated current	600 A
Starting current	3100 A
Rated speed	715 rpm

Power factor	
1/1 Load	0.82
3/4 Load	0.79
1/2 Load	0.70
Efficiency	
1/1 Load	95.0 %
3/4 Load	95.5 %
1/2 Load	95.5 %



Project	Project ID	Created by	Created on	Last update
NICK PAILMA	**ARCADIS US**	**Ricardo Guanio**	**2015-04-01**	**2015-04-01**

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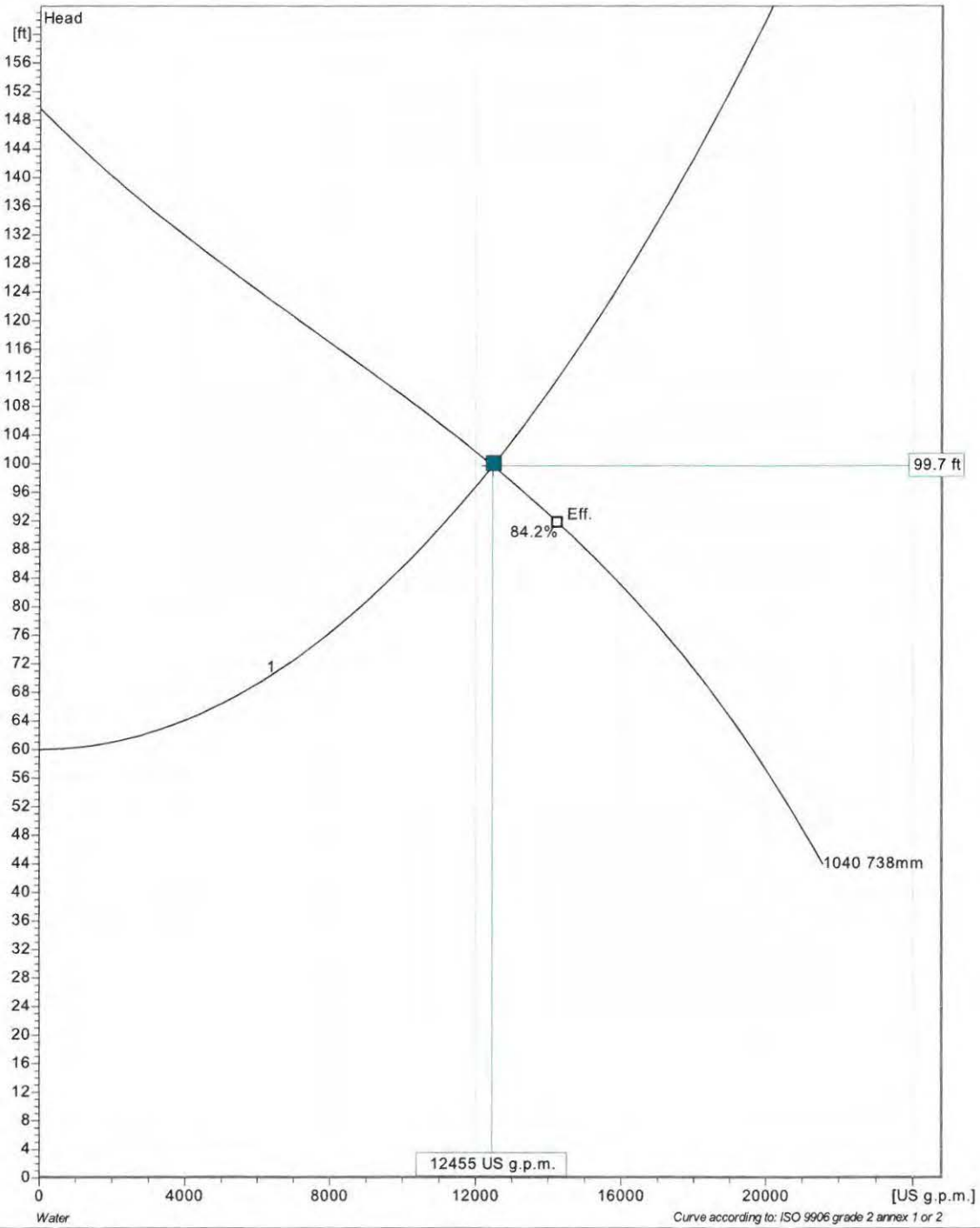
Duty Analysis



	Individual pump			Total					
Pumps running /System	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	12500 US g.p.m.	99.7 ft	377 hp	12500 US g.p.m.	99.7 ft	377 hp	83.3 %	393 kWh/US MG	13.7 ft

Project	Project ID	Created by	Created on	Last update
NICK PAILMA	**ARCADIS US**	**Ricardo Guanio**	**2015-04-01**	**2015-04-01**

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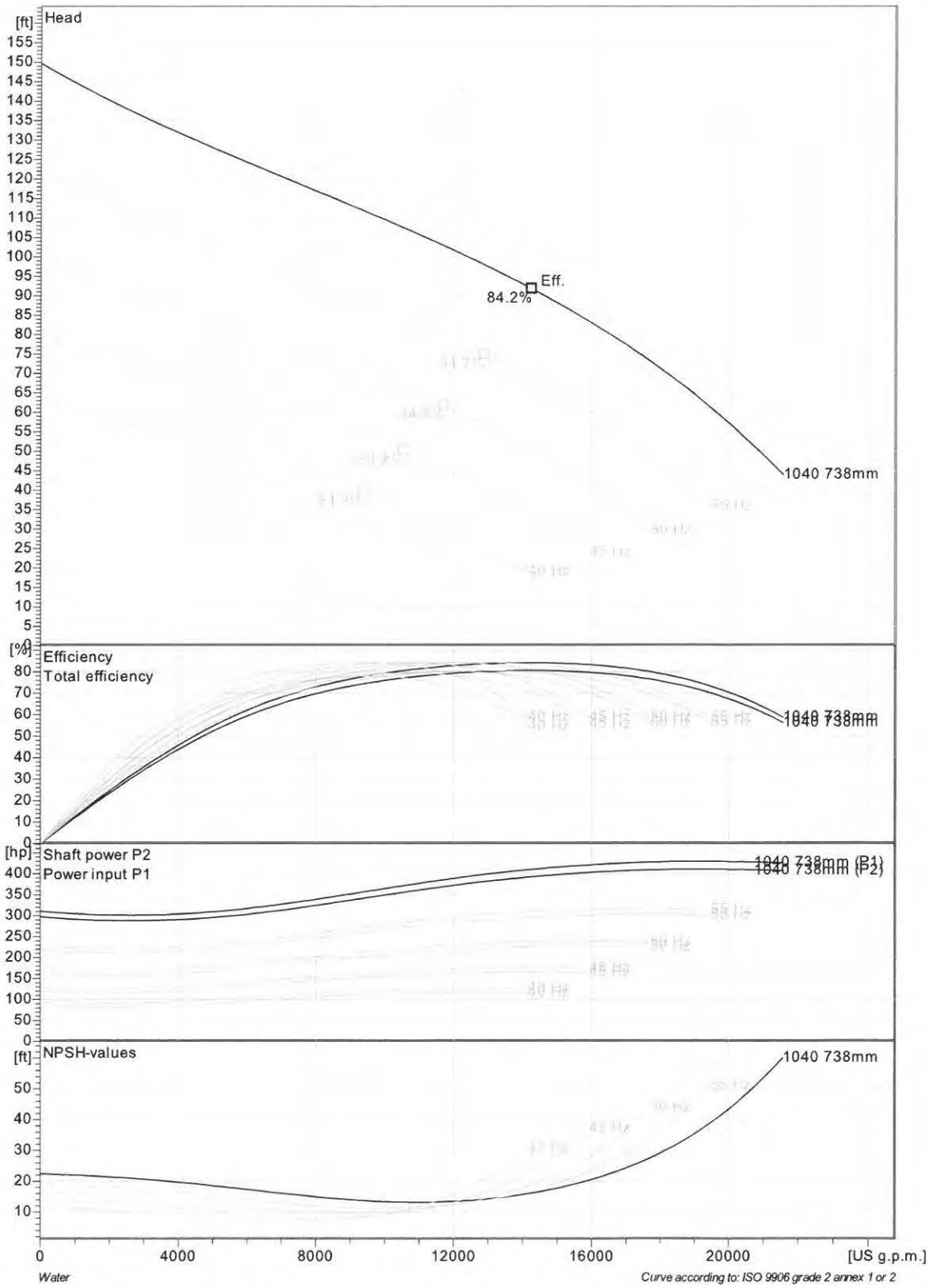
VFD Curve



Project	Project ID	Created by	Created on	Last update
NICK PAILMA	**ARCADIS US**	**Ricardo Guanio**	**2015-04-01**	**2015-04-01**

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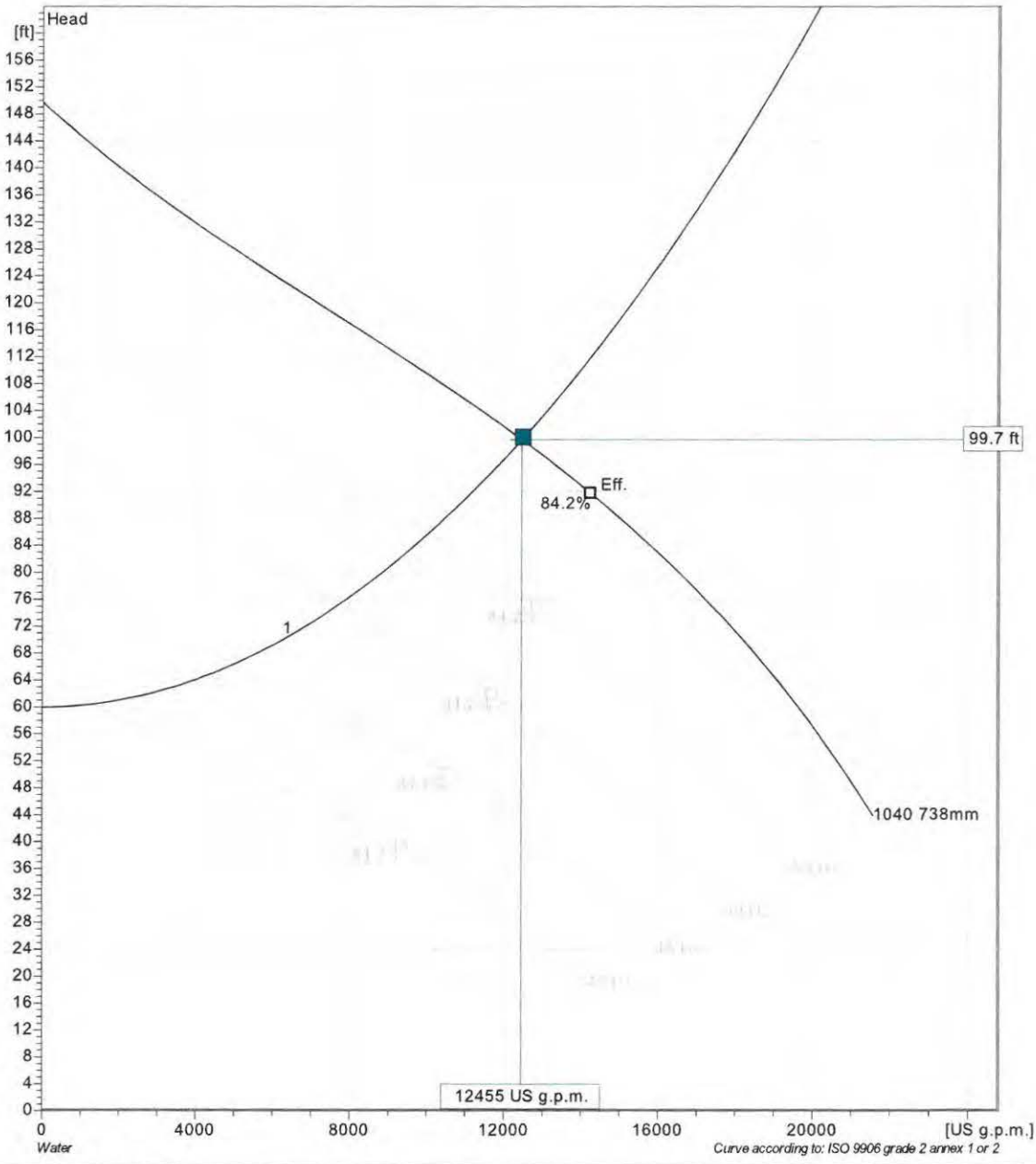
VFD Analysis



Pumps running /System	Individual pump Frequency	Flow	Head	Shaft power	Total Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	12500 US g.p.m.	99.7 ft	377 hp	12500 US g.p.m.	99.7 ft	377 hp	83.3 %	393 kWh/US MG	13.7 ft
1	55 Hz	10000 US g.p.m.	85.8 ft	267 hp	10000 US g.p.m.	85.8 ft	267 hp	81.6 %	346 kWh/US MG	11.2 ft
1	50 Hz	7740 US g.p.m.	75.3 ft	189 hp	7740 US g.p.m.	75.3 ft	189 hp	77.9 %	320 kWh/US MG	9.98 ft
1	45 Hz	4990 US g.p.m.	66.4 ft	125 hp	4990 US g.p.m.	66.4 ft	125 hp	66.8 %	335 kWh/US MG	10.1 ft
1	40 Hz	1330 US g.p.m.	60.5 ft	81.8 hp	1330 US g.p.m.	60.5 ft	81.8 hp	24.8 %	848 kWh/US MG	10.9 ft

Project	Project ID	Created by	Created on	Last update
NICK PAILMA	**ARCADIS US**	**Ricardo Guanio**	**2015-04-01**	**2015-04-01**

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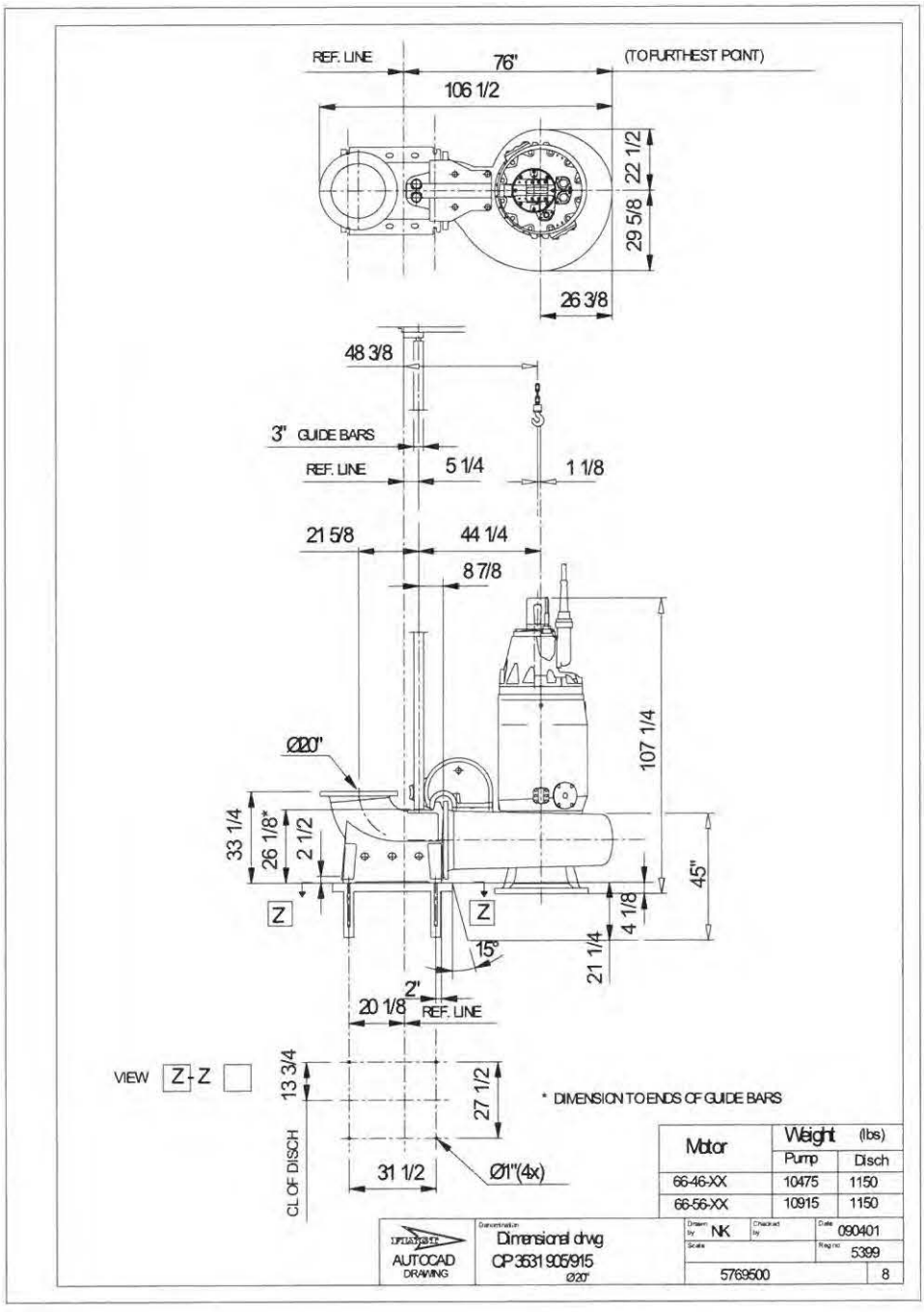
Dimensional drawing

FLYGT



Project	Project ID	Created by	Created on	Last update
NICK PAILMA	**ARCADIS US**	**Ricardo Guanio**	**2015-04-01**	**2015-04-01**

ARCADIS

KSB

Project
Customer pos.no
Project ID
Pos.no
Created by

Data sheet

Pump type KRT K 400-630/3508XNG-S

Operating data

Flow	12500	US g.p.m.	Fluid			
Head	100	ft	Density of fluid	62.3	lb/ft³	
Operating speed	895.7	rpm	Viscosity	1.08E-5	ft²/s	
Shaft power	387	hp	Temperature	68	°F	
Efficiency	81.7	%				
Required pump NPSH	15.7	ft				
Head H(Q=0)	160	ft				
Application range	Head		Flow			
From	111	ft	10000	US g.p.m.		
To	66.6	ft	19400	US g.p.m.		

Design

Make	KSB	Impeller type	Multi channel impeller		
Design	Submersible pump		Closed		
Series	KRT K	Impeller size	(611)	24 1/16	inch
Frame size	400-630		Max. (620)	24 7/16	inch
Stages	1		Min. (546)	21 1/2	inch
Curve number	K43077s	Free passage		5 3/16	inch
		Weight		10119	lb
Type of bearings	Antifriction				
Nos. of bearings	2 / 1				
Lubrication	Grease lubrication. regreasing without dismantling of pump				

Suction port	Pressure rating		--
	Flange size	DN0	---
	Flange size	DN1	20"
	Norm		--
Discharge port	Pressure rating		CLASS 125
	Flange size	DN2	16 inch
	Flange size	DN3	16 inch
	Norm		ASME/ANSI B16.1

Suction port: pump (DN1)
Discharge port: discharge elbow (DN3)

Materials

Pump casing	Grey cast iron EN-GJL-250 (A48 Class 35B)
Discharge cover	Grey cast iron EN-GJL-250 (A48 Class 35B)
Impeller	Grey cast iron EN-GJL-250 (A48 Class 35B)
Shaft	Stainless steel EN-1.4021+QT800 (A276 Type 420)
Bearing bracket	Grey cast iron EN-GJL-250 (A48 Class 35B)
Motor casing	Grey cast iron EN-GJL-250 (A48 Class 35B)
Bolts. nuts	Stainless steel A4 (EN-1.4571) (A276 Type 316)
Shaft protection sleeve	Stainless steel EN-1.4021+QT800 (A276 Type 420)
Casing wear ring	Grey cast iron EN-JL1030 (A48 Class 30B)
Impeller wear ring	---
O-Rings	Nitrile rubber (NBR)

KSB Inc., 4415 Sarellen Road, Richmond, Virginia 23231, Phone: 001-804-222-1818, Fax: 001-804-226-6961

KSB Pumps Inc, 5885 Kennedy Road, Mississauga, Ontario L4Z 2G3 (Canada), Phone: (0905) 568-9200, Fax: (0905) 568-9120

KSB Aktiengesellschaft, Turmstrasse 92, 06110 Halle (Germany), Phone +49 (345) 48260, Fax +49 (345) 4826 4699, www.ksb.com

Data sheet

Pump type

KRT K 400-630/3508XNG-S

Shaft seal

Type of seal	Double mechanical seal
Arrangement:	Tandem
Seal on medium side	with elastomer bellows
Mechanical seal. pump-side	Silicon carbide / Silicon carbide
Mechanical seal. bearing-side	Carbon / Silicon carbide

Monitoring

Thermal winding protection	By temperature sensitive switches or PTC
Explosion proof protection	---
Motor housing monitoring	By conductive moisture sensor electrode
Mechanical seal leakage detection	By float switch
Bearing temperature monitoring	By PT 100 thermistor

Coating

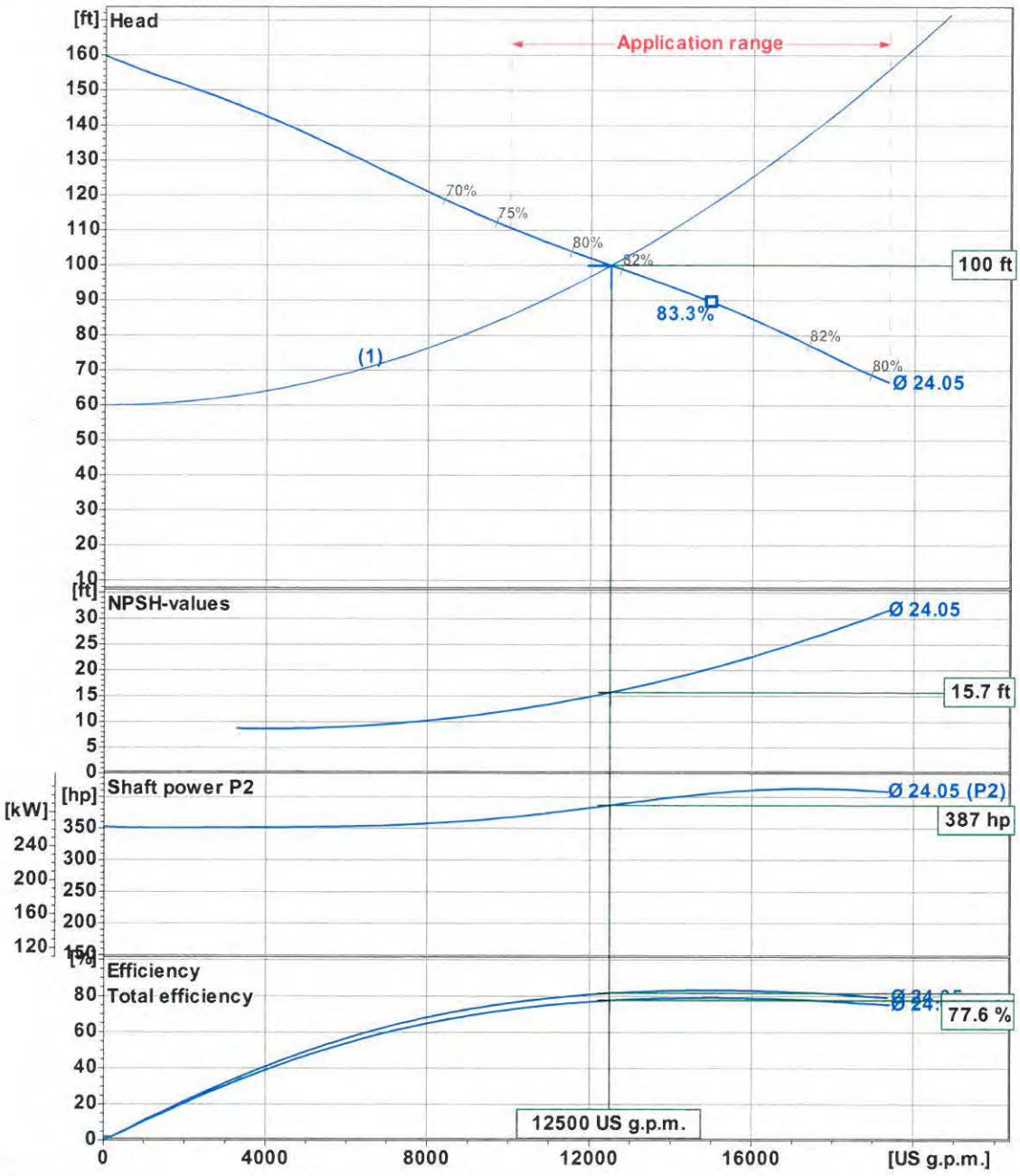
Preparatory treatment	SSPC near white SP 10
Blasting method	Steel grit blasting
Primer	Zinc phosphate or Zinc dust
Dry film thickness primer	> 1 1/2 mils (35 microns)
Top coat	2-component epoxy resin
Solids content	> 82 %
Dry film thickness top coat	> 6 mils (150 microns)
Color	Ultramarine Blue

Installation

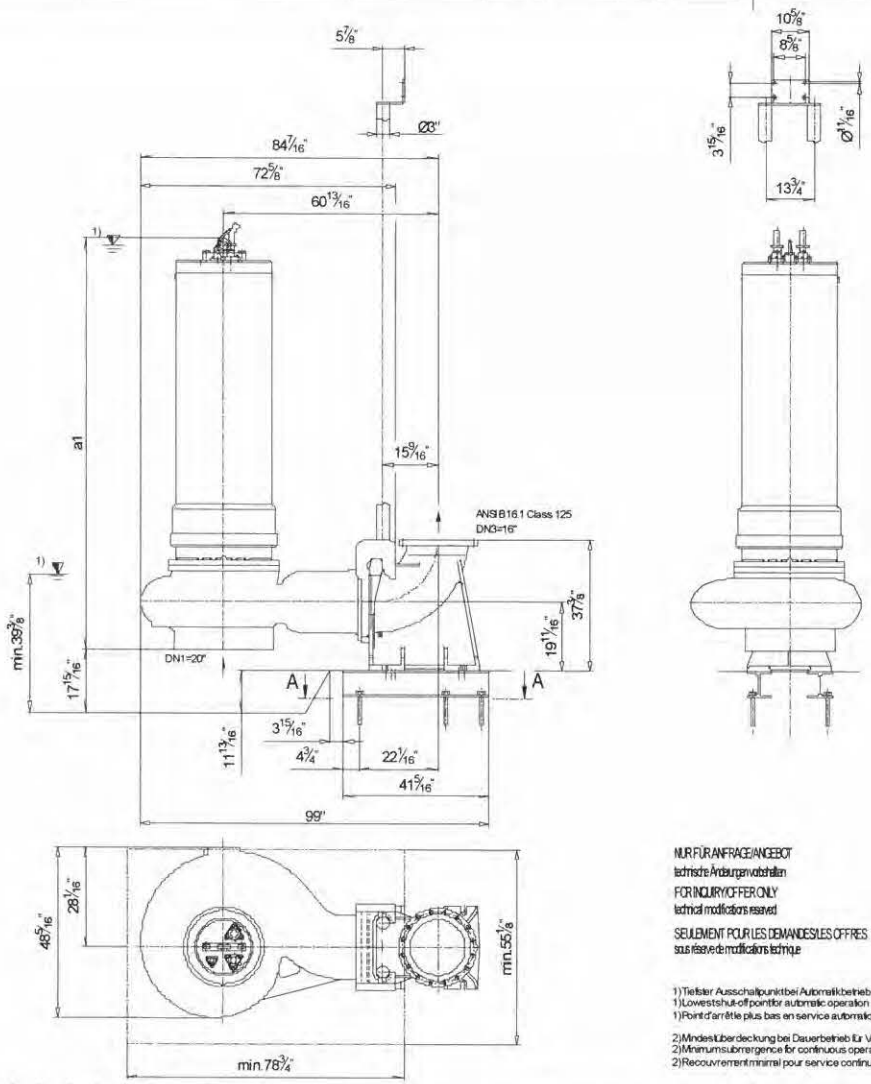
INSTALLATION	
Type of installation:	Wet well installation designed for automatic connection to a permanently installed discharge elbow
Discharge elbow size (DN2/DN3):	16 inch / 16 inch
Flange to suit:	ASME/ANSI B16.1, CLASS 125
Claw:	Bolted to the pump
Guide system:	Double guide bars, by contractor
Guide bar dimension:	3" diameter pipes
Installation depth:	15 ft (4.5 m)
Lifting device:	stainless steel lifting chain
Length of lifting device:	33 ft (10 m)
Lifting loops:	Every 8 ft (2.5 m)
Installation accessories:	Discharge elbow, 16 inch / 16 inch fasteners, claw, bracket, lifting chain, but without guide bars
Materials:	
Discharge elbow:	Grey cast iron EN-GJL-250 (A48 Class 35B)
Claw:	Grey cast iron EN-GJL-250 (A48 Class 35B)
Bracket:	Stainless steel EN-1.4571 (A276 Type 316 Ti)
Lifting device:	Stainless steel EN-1.4404 (A276 Type 316L)

Performance curve

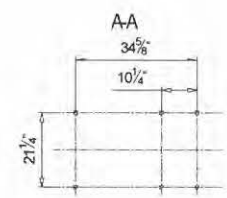
Pump type **KRT K 400-630/3508XNG-S**



Impeller type	Multi channel impellers			Curve number	K43077s
Free passage	$5^{3}/_{16}$"		Density of fluid	62.322 lb/ft³	Frequency	60 Hz
Impeller size	$24^{1}/_{16}$"	(611)	Viscosity	1.082E-5 ft²/s	Speed	895.7 1/min



Hydraulik Hydraulics Hydraulique	KSB-Motor KSB-Engine KSB-Moteur	a1 50 Hz	a1 60 Hz		Gewicht / Weight / Poids Type S Material version/variant G		Type K Material version/variant G	
		mm	mm	inch	kg	lbs	kg	lbs
K	225 6	2580	—	—	3530	7789	3670	8097
	260 6	2580	—	—	3820	8428	4000	8826
	320 6	2770	—	—	4290	9465	4480	9685
	360 6	2770	—	—	4410	9730	4630	10216
	400 6	3000	—	—	4730	10436	4950	10922
	440 6	3000	—	—	4940	10900	5150	11363
	480 6	3000	—	—	5080	11209	5300	11694
	185 8	—	2580	101 9/16	3600	7943	3760	8296
	220 8	—	2580	101 9/16	3840	8473	4000	8826
	260 8	—	2770	109 1/16	4140	9134	4340	9576
	300 8	—	2770	109 1/16	3520	7767	3720	8208
	350 8	—	3000	118 1/8	4590	10127	4810	10613
	400 8	—	3000	118 1/8	5000	11032	5220	11517



NUR FÜR ANFRAGE/ANGEBOT
technische Änderungen vorbehalten
FOR INQUIRY/OFFER ONLY
technical modifications reserved
SEULEMENT POUR LES DEMANDES/LES OFFRES
sous réserve de modifications technique

1) Tiefster Ausschaltpunkt bei Automatikbetrieb
1) Lowest shut-off point for automatic operation
1) Point d'arrêt le plus bas en service automatique

2) Mindestüberdeckung bei Dauerbetrieb für Variante S
2) Minimum submergence for continuous operation for variant S
2) Recouvrement minimal pour service continu pour variante S

mit Fundamentschienen
with foundation rails
avec glissières de fondement

120 A2

KRT 400-630/480 6

stationäre Aufstellung
stationary installation
installation stationnaire

KSB

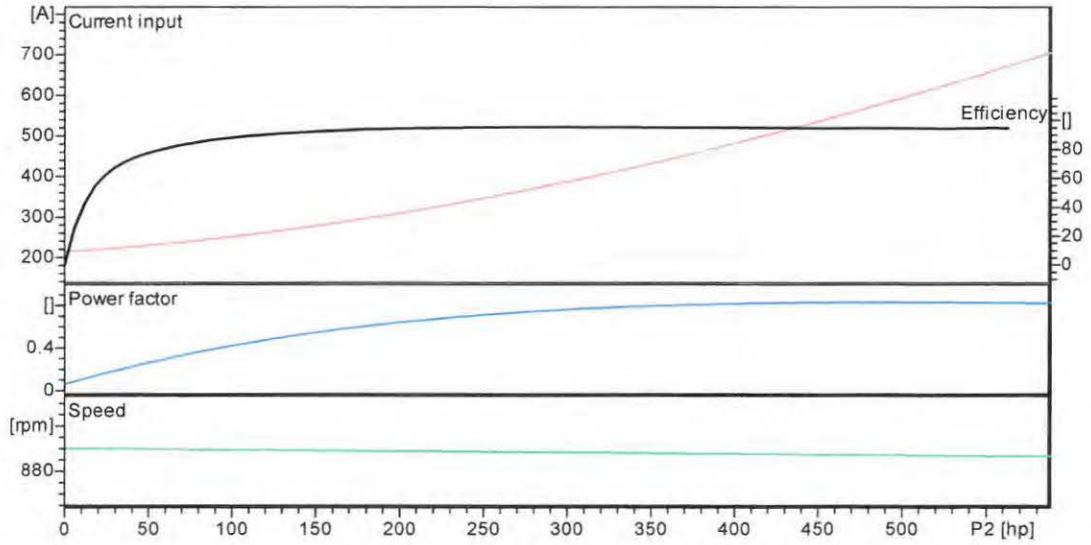
Data sheet: Motor data

Motor type 3508XNG S / P

Motor manufacturer	KSB Aktiengesellschaft	Rated voltage	460	V
Design acc. standard	-	Rated frequency	60	Hz
Service factor	1.15	Rated HP (D.O.L) or VFD	470	hp
Degree of protection	IP68	Rated current	556	A
Insulation class	H	Nominal speed	895	rpm
Starting mode	Direct	NEMA code letter	G	
No. starts / h	10	Starting to rated current	6.1	
Coolant temperature	< / = 104 °F (40 °C)	Starting current	3390	A
Motor casing	Grey cast iron EN-GJL-250 (A 48 Class 35B)			
Explosion protection	Class I, Div. 1, Groups C,D, T3			
Pump type	KRT K 400-630/3508XNG-S			

Load	P1 kW	P2 hp	eta %	cos phi	I A
4/4	368.17	470.0	95.2	0.83	556.0
3/4	276.99	352.5	94.9	0.8	435.0
2/4	186.03	235.0	94.2	0.69	338.0
1/4	95.97	117.5	91.3	0.47	256.0

Main cable	6 x AWG 1-4	Diameter	1.19..1.27 inch
Control cable	1 x AWG 15-10	Diameter	0.63..0.67 inch
Cable. outer sheath	Waterproof synthetic rubber compound		
Cable length	10 m		

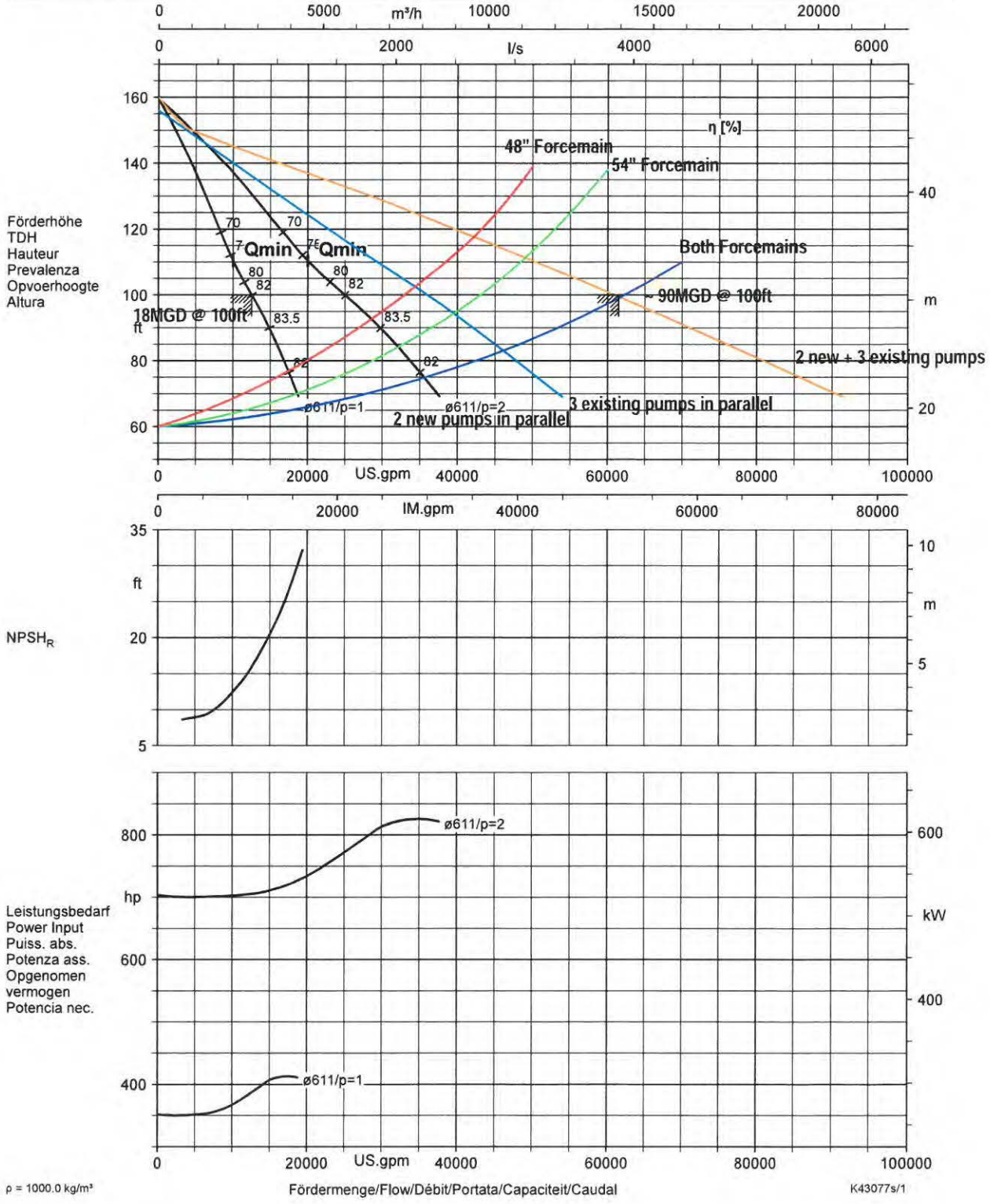


KSB Inc., 4415 Sarellen Road, Richmond, Virginia 23231, Phone: 001-804-222-1818, Fax: 001-804-226-6961

KSB Pumps Inc, 5885 Kennedy Road, Mississauga, Ontario L4Z 2G3 (Canada), Phone: (0905) 568-9200, Fax: (0905) 568-9120

KSB Aktiengesellschaft, Turmstrasse 92, 06110 Halle (Germany), Phone +49 (345) 48260, Fax +49 (345) 4826 4699, www.ksb.com

Baureihe-Größe / Type-Size / Modèle / Tipo	Nenndrehzahl / Nom. speed / Vitesse nom. / Velocità di rotazione nom / Nominaal toerental / Revolutiones nom.	Laufrad-Ø / Impeller Dia. / Diamètre de roue / Ø Girante / Ø Waaier / Ø Rodete	
KRT K 400-630/3508XNG-S (470HP)	895 1/min	611.3 mm	KSB
Projekt / Project / Projet / Progetto / Projekt / Proyecto: Venice Pumping Plant	Angebots-Nr. / Project No. / No. de l'offre / Offerta-No. / Offertenr. / Offerta-No.	Pos.-Nr. / Item No. / No. de pos. / Pos.Nr. / Positienr. / Pos.-Nr.	KSB Inc. 4415 Sarellen Road Richmond, VA 23231 Phone: (804) 222-1818 Fax: (804) 226-6961



ρ = 1000.0 kg/m³

Fördermenge/Flow/Débit/Portata/Capaciteit/Caudal

K43077s/1

Evaristo, Sergio
US-Rm
2015-04-02

ARCADIS

ABS

SULZER

AFP 5002

Dimension sheet M8/M9 WET-WELL Installation

Maßblatt M8/M9 Naßinstallation

Plan d'encombrement M8/M9 installation submersible

No: M-02.0387 - 07

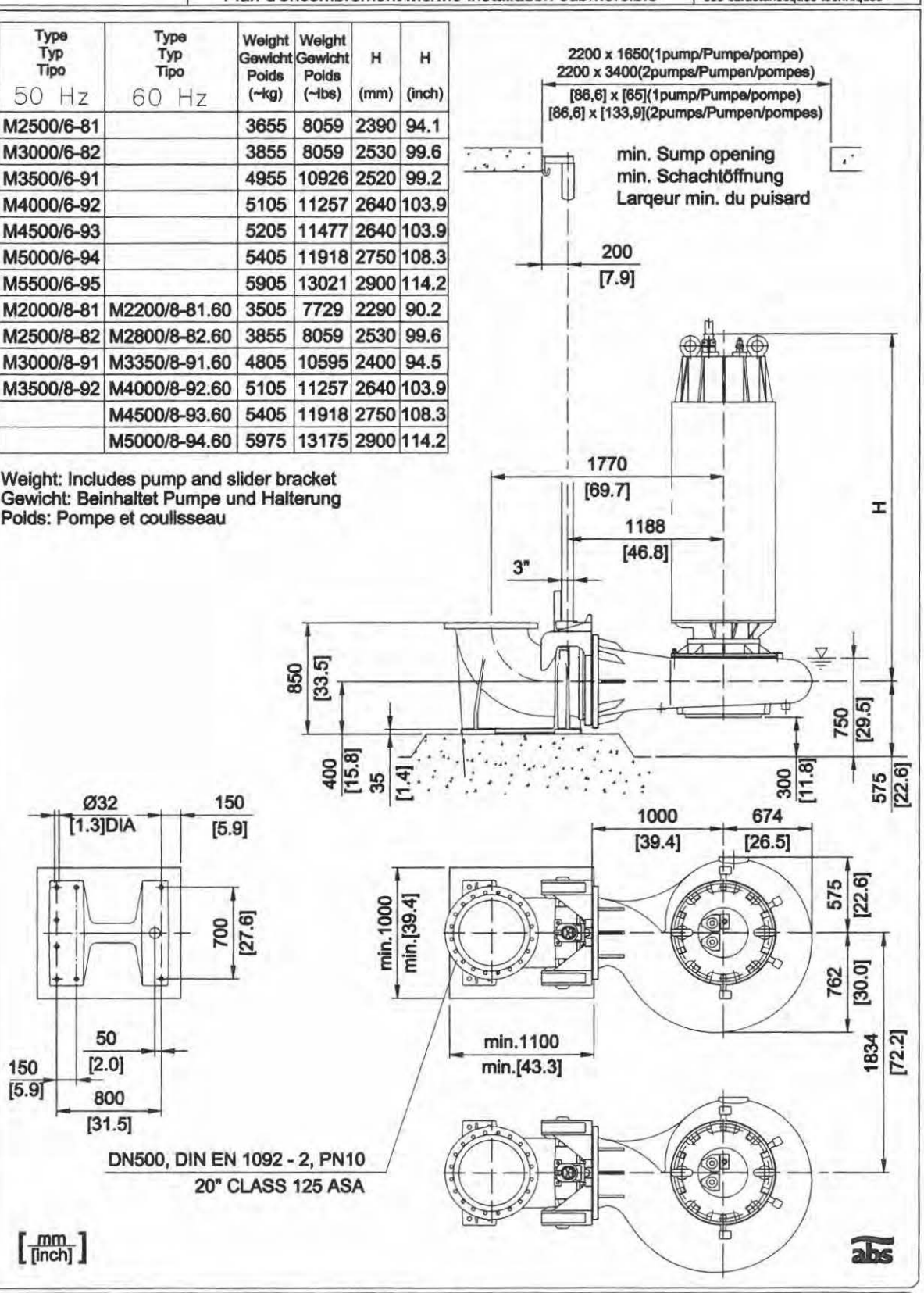
Dat/Nam.: 18.02.2008/ B.Schiffbauer

Cad Code: M_020387

Technical changes reserved
Änderungen vorbehalten
ABS se réserve le droit de changer ses caractéristiques techniques

Type Typ Tipo 50 Hz	Type Typ Tipo 60 Hz	Weight Gewicht Poids (~kg)	Weight Gewicht Poids (~lbs)	H (mm)	H (inch)
M2500/6-81		3655	8059	2390	94.1
M3000/6-82		3855	8059	2530	99.6
M3500/6-91		4955	10926	2520	99.2
M4000/6-92		5105	11257	2640	103.9
M4500/6-93		5205	11477	2640	103.9
M5000/6-94		5405	11918	2750	108.3
M5500/6-95		5905	13021	2900	114.2
M2000/8-81	M2200/8-81.60	3505	7729	2290	90.2
M2500/8-82	M2800/8-82.60	3855	8059	2530	99.6
M3000/8-91	M3350/8-91.60	4805	10595	2400	94.5
M3500/8-92	M4000/8-92.60	5105	11257	2640	103.9
	M4500/8-93.60	5405	11918	2750	108.3
	M5000/8-94.60	5975	13175	2900	114.2

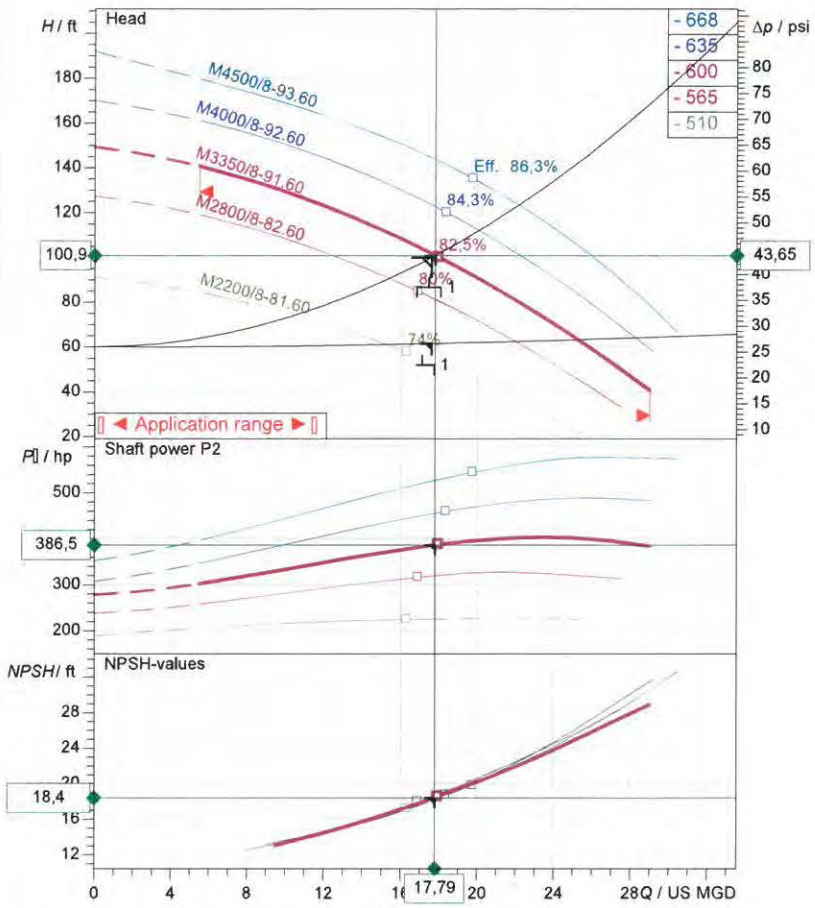
Weight: Includes pump and slider bracket
Gewicht: Beinhaltet Pumpe und Halterung
Poids: Pompe et coulisseau



Foundation in acc. to drawing AN-20.033 (only for stone bolts)
Fundament nach Plan AN-20.033 (nur für Steinschrauben)
Fondation selon schéma AN-20.033 (pour Tige filetées à scellement à queue de carpe)

SULZER

AFP 5002 60 Hz



Testnorm
ISO 9906 Gr 2

2015-03-28

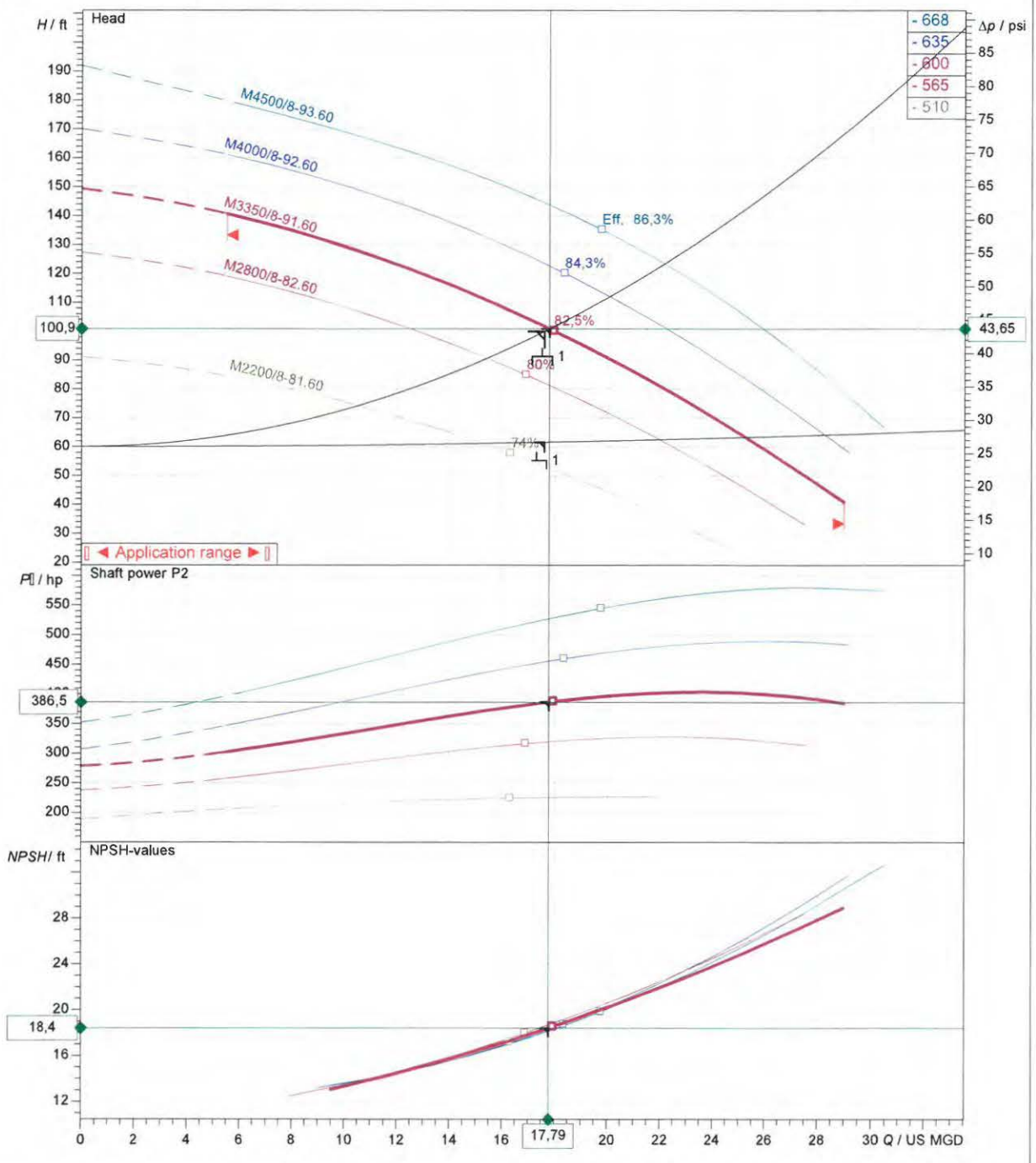
Operating data specification			
Flow	17,8 US MGD	Head	101 ft
Efficiency	82,5 %	Shaft power	386 hp
NPSH	18,4 ft	Fluid	Wastewater
Temperature	68 °F	Nature of system	Single pumps as parallel circuit
No. of pumps	5		
Pump data			
Type	AFP 5002 60 Hz	Make	SULZER
Series	AFP M8-M9	Impeller	3-vane channel impeller
N° of vanes	3	Impeller size	23,6 inch
Free passage	7,87 x 4,92 inch	Suction port	DN500
Discharge port	DN500		
Motor data			
Rated voltage	460 V	Frequency	60,0 Hz
Rated power P2	449 hp	Nominal Speed	891 rpm
Number of poles	8	Efficiency	94,8 %
Power factor	80,9	Rated current	549 A
Starting current	2960 A	Rated torque	2650 lbf ft
Starting torque	3130 lbf ft	Degree of protection	IP 68
Insulation class	F		

Sulzer reserves the right to change any data and dimensions without prior notice
and can not be held responsible for the use of information contained in this software.

Spaix® 4, Version 4.1.4 - 2015/01/27 (Build 856
Data version Dec-2014

Curve number	Pump performance curves	SULZER
Reference curve AFP 5002 60 HZ	AFP 5002 60 Hz	

			Discharge DN500	Frequency 60 Hz
Density 62,31 lb/ft³	Viscosity 1,077E-5 ft²/s	Testnorm ISO 9906 Gr 2	Rated speed 892,4 rpm	Date 2015-03-28
Flow 17,8 US MGD	Head 101 ft	Rated power 386 hp	Hydraulic efficiency 82,5 %	NPSH 18,4 ft



Impeller size	N° of vanes	Impeller	Solid size	Revision
23,6 inch	3	3-vane channel impeller	7,87 x 4,92 inch	

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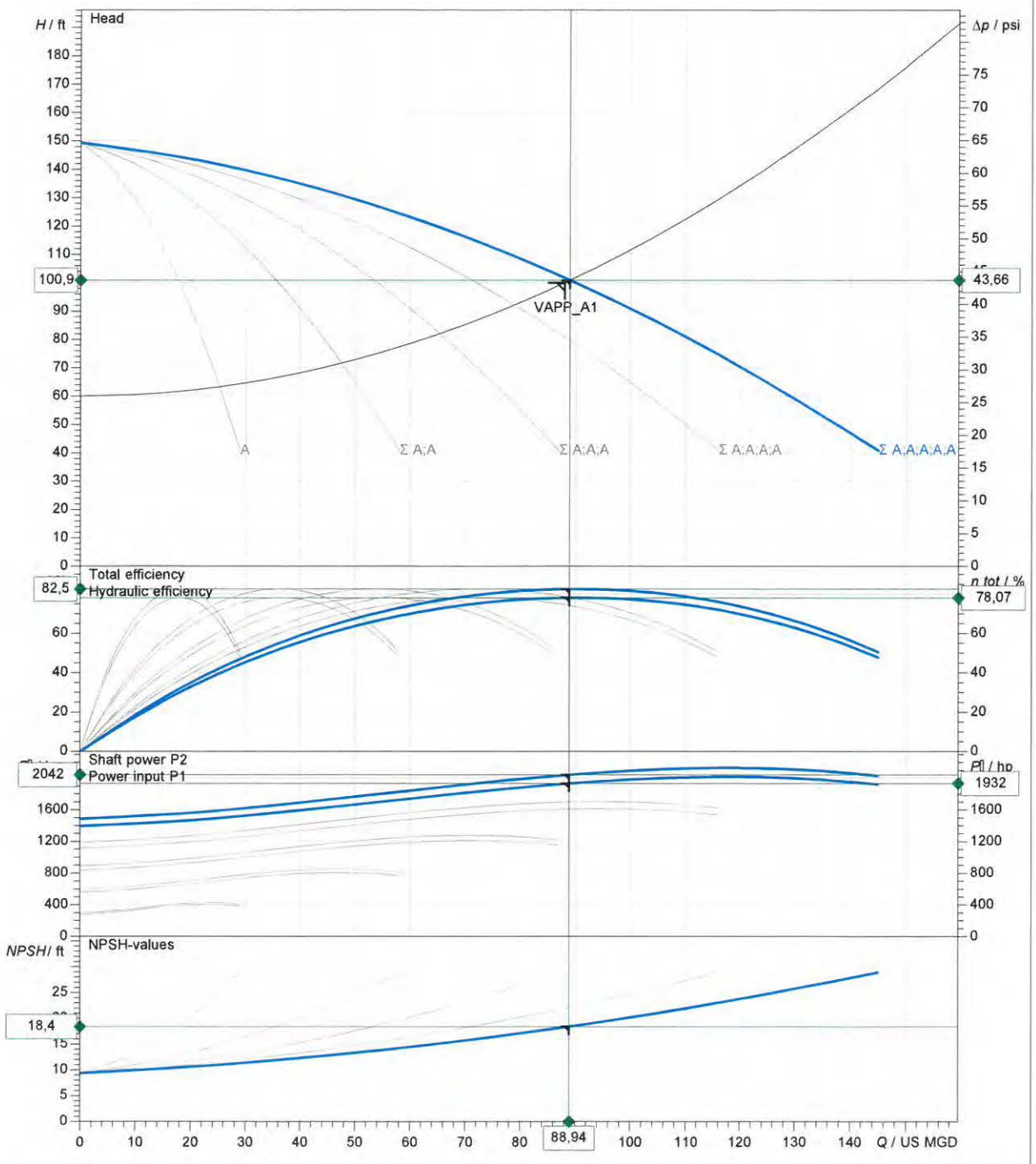
and can not be held responsible for the use of information contained in this software.

Spaix® 4, Version 4.1.4 - 2015/01/27 (Build 856
Data version Dec-2014

Curve number	Pump performance curves	SULZER
Reference curve AFP 5002 60 HZ	**AFP 5002 60 Hz**	

			Discharge DN500	Frequency 60 Hz
Density 62,31 lb/ft³	Viscosity 1,077E-5 ft²/s	Testnorm ISO 9906 Gr 2	Rated speed 892,4 rpm	Date 2015-03-28
Flow 88,9 US MGD	Head 101 ft	Rated power 386 hp	Hydraulic efficiency 82,5 %	NPSH 18,4 ft



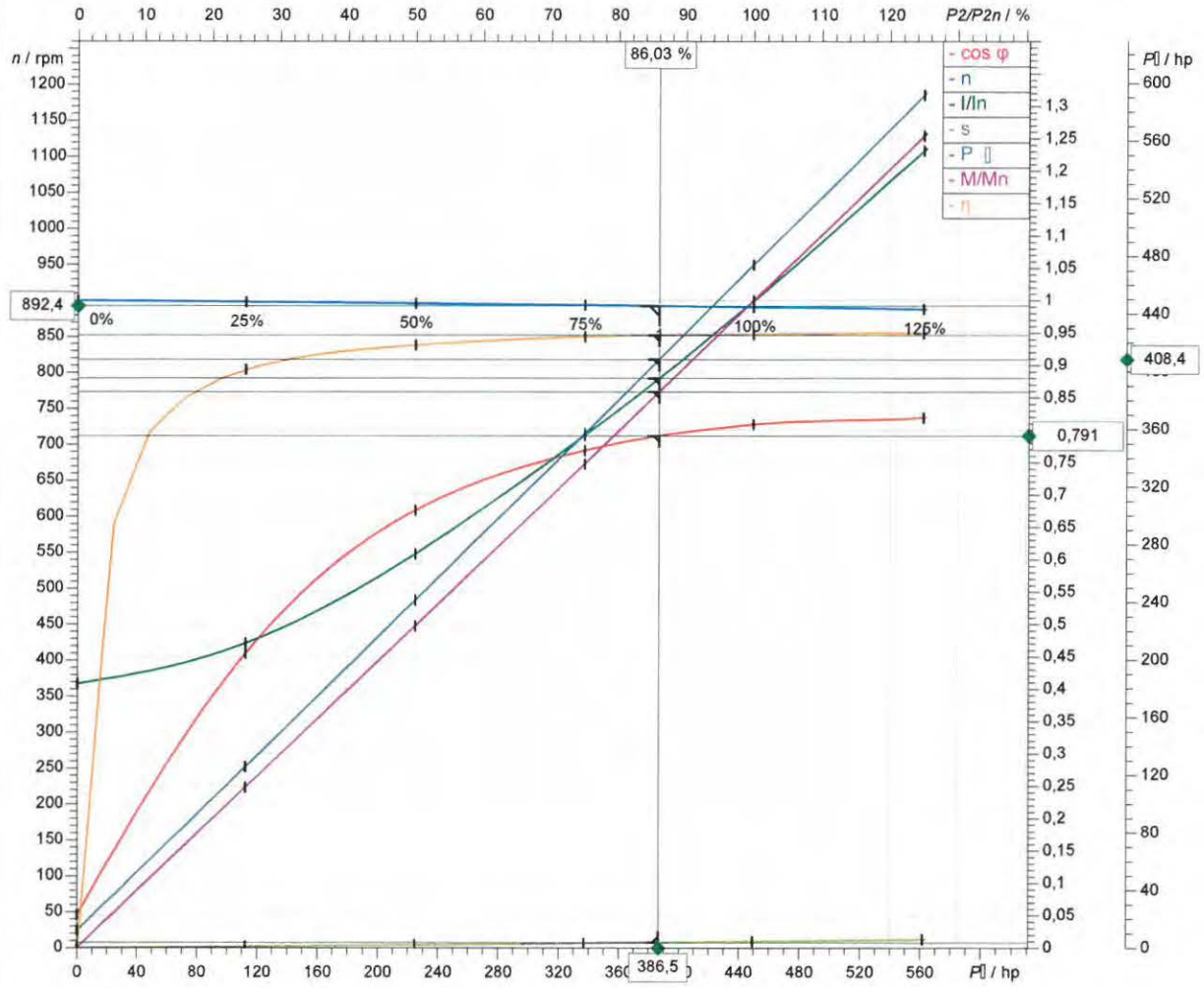
Impeller size	N° of vanes	Impeller	Solid size	Revision
23,6 inch	3	3-vane channel impeller	7,87 x 4,92 inch	

Sulzer reserves the right to change any data and dimensions without prior notice
and can not be held responsible for the use of information contained in this software.

Spaix® 4, Version 4.1.4 - 2015/01/27 (Build 856
Data version Dec-2014

Frequency	Motor performance curve	SULZER
60 Hz	M3350/8-91.60	

Rated power	Service factor	Nominal Speed	Number of poles	Rated voltage	Date
449 hp	1	891 rpm	8	460 V	2015-03-28



Symbol	No load	25 %	50 %	75 %	100 %	125 %
P / hp	0	112,3	224,6	336,9	449,2	561,6
P / hp	12,32	125,7	241,3	356,9	474,1	591,7
I / A	224,2	258,4	334,1	434,7	548,7	675,9
cos φ	0,05145	0,4553	0,676	0,7685	0,8088	0,8192
n / rpm	900	898	896	893,6	891	888
s / %	0	0,2194	0,4492	0,7151	1,003	1,329
M / lbf ft	0	656,9	1317	1980	2648	3321
η / %	0	8933	9310	9440	9475	9492

Tolerance according to VDE 0530 T1 12.84 for rated power

Starting current	Starting torque	Moment of inertia
2960 A	3130 lbf ft	390 lb ft²

Sulzer reserves the right to change any data and dimensions without prior notice
and can not be held responsible for the use of information contained in this software.

Spaix® 4, Version 4.1.4 - 2015/01/27 (Build 856
Data version Dec-2014

ARCADIS

Fire Protection

TECHNICAL DATA

CLEAN AGENT FIRE EXTINGUISHING SYSTEM

MX 200 Extinguishing Agent

Minimax Fire Products Technical Services: (480) 553-5670 Email: mxtechsupport@minimaxfp.com

The technical data described herein is for components of the Minimax Fire Products MX 200 Clean Agent System. For design, installation, and operation instructions, refer to the latest edition of the original source documents: Installation and Service Manual (Part No. 889331), Design Manual (Part No. 889336), and Operation Manual (Part No. 889329).

1. DESCRIPTION



The Minimax Fire Products MX 200 Fire Extinguishing System uses HFC-227ea agent, which is a zero ozone depleting replacement for Halon 1301 for use as a gaseous fire suppression agent. It generally finds use in Data Processing, Clean Rooms, Museums, and Telecommunication Facilities, protecting expensive equipment or contents. HFC-227ea agent is a colorless, odorless, non-toxic fire suppression agent, which has zero ozone depletion, low global warming, and a short atmospheric lifetime. Extinguishment is by a combination of chemical and physical mechanisms, causing an interruption in the fire chemistry.

2. LISTINGS AND APPROVALS

UL Listed: For the Clean Agent Fire Extinguishing System

FM Approved: For the Clean Agent Fire Extinguishing System

3. TECHNICAL DATA

Specifications

Minimum and Maximum Agent Storage Temperatures: 0 °F to 122 °F (-18 °C to 50 °C)

Minimum and Maximum Temperatures of Protected Spaces per UL and FM: 60 °F to 80 °F (15.6 °C to 26.7 °C)

Chemical Formula: C_3HF_7

Chemical Name: 1,1,1,2,3,3,3-Heptafluoropropane

Molecular Weight: 170.03

ISO Designation: HFC-227ea

Density, Liquid @ 77 °F (25 °C): 86.53 lb/ft^3 (1.386 g / cm^3)

Melting Point: -204 °F (-131 °C)

Boiling Point: 2.5 °F (-16.4 °C)

Viscosity, Liquid @ 77 °F (25 °C): 0.443 lb/ft/hr (0.184 centipoise)

Heat of Vaporization @ BP: 57.0 BTU / lb (132.6 kJ / kg)

Vapor Pressure @ 77 °F (25 °C): 65.7 psi (4.53 bar)

Environmental Properties: No ozone depletion potential (ODP 0)
Low global warming potential (GWP 3500)
Atmospheric Lifetime 31-42 years

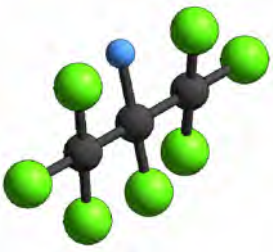


Figure 1: HFC-227ea Agent Molecule

Ordering Information

DuPont HFC-227ea agent Part Number: 88 7745

Waysmos HFC-227ea agent Part Number: 18878

Minimax Technical Data may be found on Minimax Fire Products' Web site at http://www.minimaxfp.com/. The Web site may include a more recent edition of this Technical Data Page.

TECHNICAL DATA

CLEAN AGENT FIRE EXTINGUISHING SYSTEM

MX 200 Extinguishing Agent Cylinders

Minimax Fire Products Technical Services: (480) 553-5670 Email: mxtechsupport@minimaxfp.com

The technical data described herein is for components of the Minimax Fire Products MX 200 Clean Agent System. For design, installation, and operation instructions, refer to the latest edition of the original source documents: Installation and Service Manual (Part No. 889331), Design Manual (Part No. 889336), and Operation Manual (Part No. 889329).

1. DESCRIPTION



The Minimax Fire Products MX 200 Fire Extinguishing System uses HFC-227ea extinguishing agent that is stored in the system's extinguishing agent container(s) until system activation. The container assembly includes a welded or seamless steel cylinder filled with HFC-227ea fluid, assembled with the following components:

- Cylinder valve with burst disc, pressure gauge, protective neck ring, protective cylinder cap and valve cap.
- Five cylinder sizes are available for 360 psi (25 bar): 55, 130, 270, 370, and 450 lbs. (22, 52, 106, 147, and 180 l).
- Three cylinder sizes are available for 725 psi (50 bar): 200, 350, and 450 lbs (80, 140, and 180 l)
- Cylinders are designed, manufactured, and labeled in accordance with the US Dept. of Transportation Standard DOT 4BW-500, DOT 3AA-910, and TC (Transportation Canada - 360 psi (25 bar) systems only).
- Cylinders can only be installed in the upright position.
- To create the pressure necessary for the agent to be released, the extinguishing agent container is superpressurized with nitrogen at a pressure of 360 psi (25 bar) or 725 psi (50 bar).
- Cylinder fill density is dependent on the area of protection size. Agent concentration varies due to the expected class of fire (A, B, or C).

Each cylinder is equipped with a special high-speed opening cylinder valve:

- Operates according to the differential pressure principle and has a piston and a brass housing.
- Includes a burst disc to protect from excessive pressure.
- Includes a pressure gauge for indication of the filling pressure.
- The valve is appropriate for high discharge rates and makes the extinguishant discharge possible within 10 seconds.
- Available in the nominal sizes 1-1/2 inch for the 55 and 130 lb. cylinders, and 2 inch for 200, 270, 350, 370, and 450 lb. cylinders.

An optional manual release assembly with pneumatic discharge pressure switch can be ordered separately for installation in the piping:

- The pneumatic discharge pressure switch is required with manual release installation per NFPA 2001.
- The status of the pressure switch can be monitored by the fire agent release control panel.

A cylinder nameplate label is attached to the extinguishing agent container:

- Contains maintenance and filling information, as well as information about the filling quantity.
- A UL Listing label and FM Approval label are also attached to the cylinder.

Protective caps are used to protect sensitive components (e.g. valves) of the extinguishing agent containers:

- Protects the valves from damage during transport.

NOTE: The protective valve caps must be attached before each transport.

An installation clamp is required to be ordered with each container assembly (available separately):

- The cylinder must be attached to a wall using the designated installation clamp.

NOTE: System detection is controlled by an approved system release control panel with compatible detection.

Minimax Technical Data may be found on Minimax Fire Products' Web site at http://www.minimaxfp.com/. The Web site may include a more recent edition of this Technical Data Page.

2. LISTINGS AND APPROVALS

UL Listed: Clean Agent Extinguishing System Unit

FM Approved: Clean Agent Fire Extinguishing System

CLEAN AGENT FIRE EXTINGUISHING SYSTEM

MX 200 Extinguishing Agent Cylinders

Minimax Fire Products Technical Services: (480) 553-5670 Email: mxtechsupport@minimaxfp.com

3. TECHNICAL DATA

- Minimum and Maximum Agent Storage Temperatures: 0 °F to 122 °F (-18 °C to 50 °C)
- Minimum and Maximum Temperatures of Protected Spaces per UL and FM: 60 °F to 80 °F (15.6 °C to 26.7 °C)

Cylinder Specifications

- Fill Density: Min. 31.2 lb/ft^3 (500 kg/m^3), Max. 71.1 lb/ft^3 (1140 kg/m^3) at 69.8 °F (21 °C)

NOTE: The accurate filling quantity depends on the necessary extinguishant quantity and the layout of the piping.

Valve Specifications

- Working Pressure: 360 psi (25 bar) or 725 psi (50 bar) at 70 °F (21 °C)
- Max. Working Pressure: 508 psi (35 bar) or 870 psi (60 bar) at 122 °F (50 °C)
- Response Pressure at Bursting Disc for 360 psi (25 bar) System: 900 psi (62 bar) at 68 °F (20 °C)
- Response Pressure at Bursting Disc for 725 psi (50 bar) System: 1276 psi (88 bar) for 2” valves, 1291 psi (89 bar) for 1-1/2” valves at 68 °F (20 °C)

Gauge Specifications

- Agent: HFC-227ea
- 360 psi (25 bar) system:
  - Maximum Pressure: 725 psi (50 bar)
  - Indicating Range: 0 to 508 psi (35 bar)
- 725 psi (50 bar) system:
  - Maximum Pressure: 1160 psi (80 bar)
  - Indicating Range: 0 to 870 psi (60 bar)
- Gauge Nominal Size: 2” (50 mm)
- Accuracy Class: 1.6

Material Standards

Cylinder: Welded Steel, Powder Coated Red, DOT Standard 4BW-500 or Seamless Steel, Powder Coated Red, DOT Standard 3AA-910/TPED
Protective Neck Ring: AISI 1015 Hot Rolled Steel, Powder Coated Black
Cylinder Valve:

- Housing, Adapter, Screws: Brass
- Seal Retainer: Brass
- O-ring/Seal of Seat: NBR
- Bursting Disk: Nickel
- Spring: Steel

Gauge: Aluminum
Liquid Level Indicator

- Stem: Brass
- O-Ring: Buna N
- Float: Ceramic
- Protective Cap: PVC
- Tape: Painted Steel

Protective Cylinder Cap: AISI 1026, Hot Rolled Steel, Powder Coated Black
Installation Clamp: Steel

Ordering Information

The cylinders are filled according to the ordering designations. Extinguishant cylinders are completely assembled and filled. For a complete Single Container System, the following must be ordered separately: release devices, optional manual release assembly with pneumatic discharge pressure switch, discharge nozzles, hose or NPT connections, installation clamp, and warning signs. An approved release control panel with compatible detection system is also required.



Figure 1: Pressure Gauge Markings

Gauge Indicating Range:

I. Pressure at minimum temperature 0 °F (-18 °C)
II-III. Pressure from 90% to 110% from charging pressure at 70 °F (21 °C)
IV. Pressure at max. temperature 122 °F (50 °C)

Gauge Color Marked:

0 to I.....Recharge
I to II.....Red
II to III.....Green
III to IV.....Red
IV to max....Overcharge

CLEAN AGENT FIRE EXTINGUISHING SYSTEM

MX 200 Extinguishing Agent Cylinders

Minimax Fire Products Technical Services: (480) 553-5670 Email: mxtechsupport@minimaxfp.com

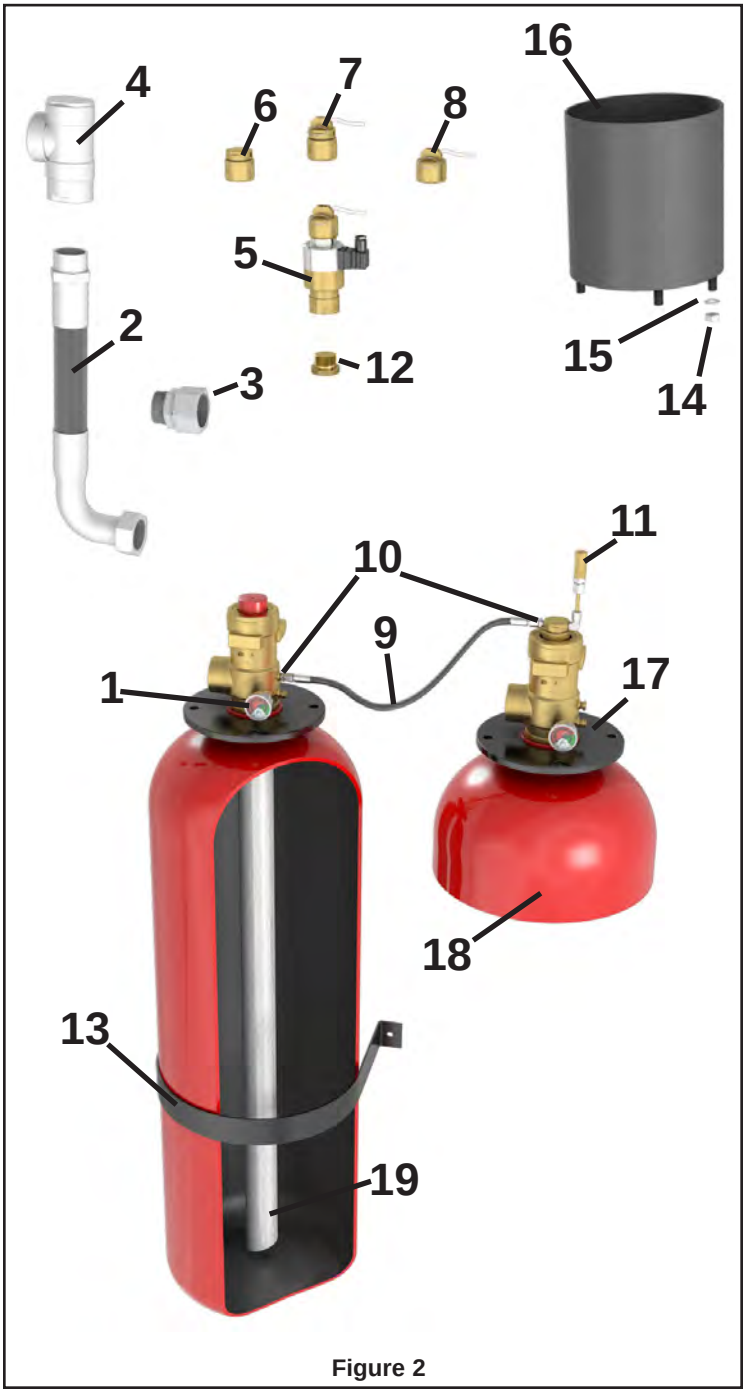


Figure 2

TABLE 1: MX Fire Extinguishing System Components

Item No.	Description			Part No.
1	Pressure Gauge	360psi (25 bar)		91 2100
		725psi (50 bar)		91 2102
	Contact Pressure Gauge / Low pressure Switch (Optional)	360psi (25 bar)	NO	88 9306
		725psi (50 bar)	NO	88 9309
2	Hose	1-1/2” 90º Bend		91 2075
		2” 90º Bend		91 2076
3	Swivel Adaptor	1-1/2” NPT		91 4154
		2” NPT		91 4155
4	Check Valve	2”		91 2071
5	Electric Release Device			88 9323
6	Pneumatic Release Device			88 7669
7	Pneumatic/Manual Release Device			88 7670
8	Manual Release Device			88 7668
9	Pilot Hose	24”		88 7834
		39”		88 7835
		59”		88 7836
10	Pilot Hose Adaptor			88 7644
11	Pressure Malfunction Safety Assembly			88 9320
12	Screw Reset Tool			17096
13	Clamp for Extinguishing Agent Cylinder	60lb / 140lb		19368
		280lb / 390lb / 220lb / 500lb		88 7639
14	Hex. Nut DIN934-M12-B-GAL ZN/B			81 1386
15	Washer DIN125-B13ST GAL ZN/B			10 9886
16	Protection Cap			
17	Ring-Protection Cap			
18	Extinguishing Agent Cylinder			
19	Siphon Tube			

CLEAN AGENT FIRE EXTINGUISHING SYSTEM

MX 200 Extinguishing Agent Cylinders

Minimax Fire Products Technical Services: (480) 553-5670 Email: mxtechsupport@minimaxfp.com

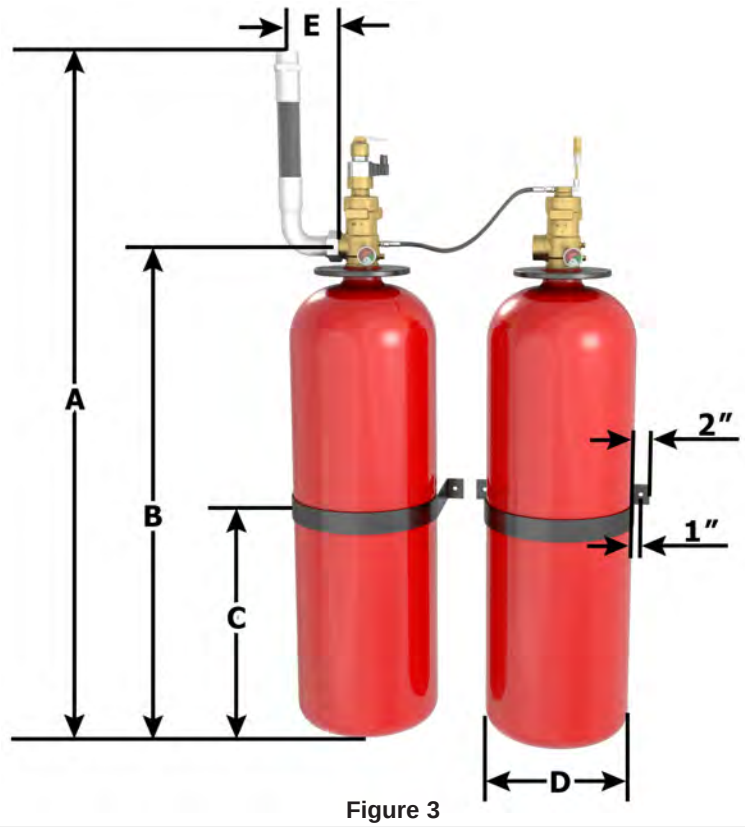


Figure 3

TABLE 2: MX 200 Cylinder Part Numbers and Dimensions[1][2]

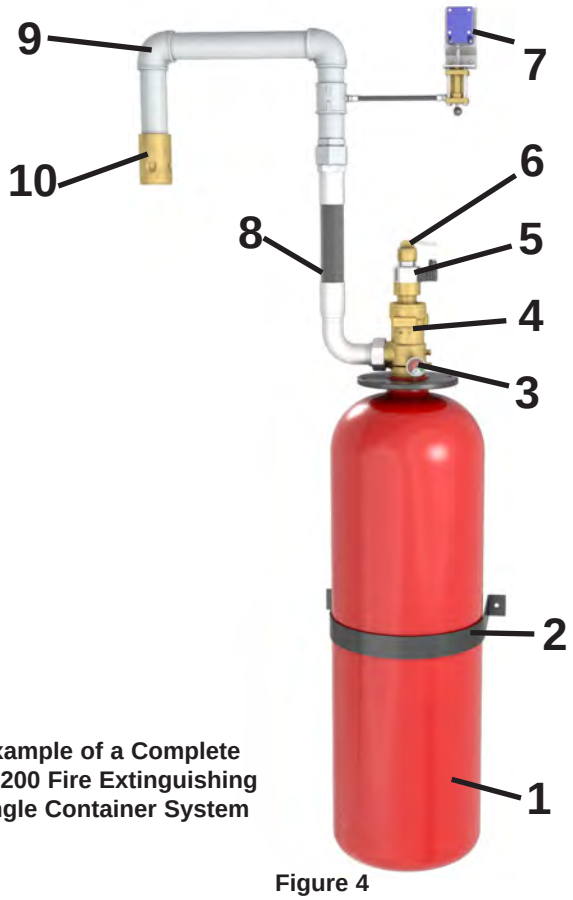
PRESSURE AT 70° F (20° C)	Nominal Volume	Part No. Valve Type A / A25	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	Amount Filled		Empty Weight
								Min.	Max.	
360 PSI (25 bar)	55 lb	91 4146	40.8	23.2	15.8	10	4.75	25 lbs	55 lbs	88 lbs
	130 lb	88 9098	65.4	47.8	27.5	10	4.75	58 lbs	130 lbs	108 lbs
	270 lb	88 9100	61.4	40.9	27.5	16	6	117 lbs	266 lbs	190 lbs
	370 lb	88 9103	74.5	54.0	41.1	16	6	163 lbs	369 lbs	229 lbs
	450 lb	91 0508	86.0	65.5	51.2	16	6	199 lbs	452 lbs	313 lbs
725 PSI (50 bar)	200 lb	88 8571	55.4	34.9	23.6	16	6	89 lbs	185 lbs	218 lbs
	350 lb	88 8574	74.3	53.8	41.4	16	6	155 lbs	324 lbs	289 lbs
	450 lb	88 8576	88.0	67.5	51.2	16	6	199 lbs	416 lbs	395 lbs
With Liquid Level Indicator										
360 PSI (25 bar)	270 lb	91 4148	61.4	40.9	27.5	16	6	116 lbs	266 lbs	210 lbs
	370 lb	91 4149	74.5	54.0	41.4	16	6	162 lbs	369 lbs	251 lbs
	450 lb	91 4150	86.0	65.5	51.2	16	6	199 lbs	452 lbs	286 lbs

[1] Extinguishing agent cylinder complete with valve, ciphon tube, ring and protection cap, without extinguishing agent.
[2] All dimensions are appoximate, variations due to manufacturing tolerances are possible.

CLEAN AGENT FIRE EXTINGUISHING SYSTEM

MX 200 Extinguishing Agent Cylinders

Minimax Fire Products Technical Services: (480) 553-5670 Email: mxtechsupport@minimaxfp.com



Example of a Complete MX 200 Fire Extinguishing Single Container System

Figure 4

TABLE 3: SYSTEM COMPONENTS FOR A COMPLETE MX 200 SINGLE CONTAINER SYSTEM WITH ELECTRIC RELEASE DEVICE

Item No.	Description
1	Extinguishing Agent Container
2	Installation Clamp**
3	Pressure Gauge
4	Cylinder Valve with Burst Disc
5	Release Device, Electric**
6	Release Device, Manual (optional, also see Item 9)**
7	Pneumatic Discharge Pressure Switch (optional)**†
8	Hose (90° Shown)**
9	Pipeline**
10	Discharge Nozzle**

**Ordered separately.

† Required if manual release device is installed (available as part of the manual release assembly).

NOTE: Additional components are required for a Multi Container System.

CLEAN AGENT FIRE EXTINGUISHING SYSTEM

MX 200 Extinguishing Agent Cylinders

Minimax Fire Products Technical Services: (480) 553-5670 Email: mxtechsupport@minimaxfp.com



Figure 5: Example of a Complete MX 200 Fire Extinguishing Multi Container System

TABLE 4: ADDITIONAL SYSTEM COMPONENTS REQUIRED FOR A MX 200 MULTI CONTAINER SYSTEM***

Item No.	Description
1	Pneumatic Release Device
2	Check Valve
3	Pilot Line
4	Pilot Line Adapter (one required for connecting each pilot line end and for connecting each pilot line safety valve)
5	Pressure Malfunction Safety Assembly

***Components required in addition to the items indicated in Figure 3 for a Single Container System.

TECHNICAL DATA

CLEAN AGENT FIRE EXTINGUISHING SYSTEM

MX 200 Discharge Nozzles

Minimax Fire Products Technical Services: (480) 553-5670 Email: mxtechsupport@minimaxfp.com

The technical data described herein is for components of the Minimax Fire Products MX 200 Clean Agent System. For design, installation, and operation instructions, refer to the latest edition of the original source documents: Installation and Service Manual (Part No. 889331), Design Manual (Part No. 889336), and Operation Manual (Part No. 889329).

1. DESCRIPTION

In the MX 200 Fire Extinguishing System, discharge nozzles are used to apply the extinguishing agent within the calculated flooding time and to distribute it uniformly in the protected enclosure.

Two types of nozzles are available for the MX 200 Fire Extinguishing System:

- 180° nozzles that spray the extinguishing agent in a semicircle around the discharge nozzles
- 360° nozzles that spray the extinguishing agent in a full circle around the discharge nozzles



2. LISTINGS AND APPROVALS

UL Listed: Clean Agent Extinguishing System Unit

FM Approved: Clean Agent Fire Extinguishing System

3. TECHNICAL DATA

Specifications

- Minimum and Maximum Agent Storage Temperatures: 0 °F to 122 °F (-18 °C to 50 °C)
- Minimum and Maximum Temperatures of Protected Spaces per UL and FM: 60 °F to 80 °F (15.6 °C to 26.7 °C)
- Minimum Operating Pressure: 131 psi (9 bar)
- Maximum Operating Pressure: 870 psi (60 bar)
- Radius 180° Discharge Nozzle: 36'-8" (11.2 m)
- Radius 360° Discharge Nozzle: 23'-1" (7.1 m)
- Maximum Effective Nozzle Height: 16.4' (5.0 m)
- Maximum Extinguishing Agent Quantity per Nozzle: 407.8 lbs (725 psi) 338.4 lbs (360 psi)
- Nozzle Orifice Diameters: Refer to Table 1 for limits. NOTE: Orifice diameter gradations are in 0.001 inch increments.
- Thread sizes: 1/2", 1", and 1-1/2" NPT

  NOTE: The discharge nozzle is identified with the manufacturer, part number, and bore diameter.

Minimax Technical Data may be found on Minimax Fire Products' Web site at http://www.minimaxfp.com/. The Web site may include a more recent edition of this Technical Data Page.

Material Standards

Nozzle: Brass UNS-C36000

Ordering Information

To order the Minimax Fire Products MX 200 Fire Extinguishing System Discharge Nozzles, refer to the following part numbers:
NOTE: The nozzle base part number is followed by a three-digit number that refers to the orifice diameter.
Example: A 1/2" NPT nozzle with a 180° pattern, and orifice diameter of 0.118" = Part No. 889036-0118.

Adjustable Spanner Wrench (optional, for nozzle installation): Part number 18038

TABLE 1: DISCHARGE NOZZLE PART NUMBERS

Thread Size	Min. Orifice Diameter		Max. Orifice Diameter		Part No. 180° Spray Angle		Part No. 360° Spray Angle	
	180°	360°	180°	360°	# of Orifices	Part No.	# of Orifices	Part No.
1/2" NPT	0.138"	0.118"	0.228"	0.197"	3	889036	4	889037
1" NPT	0.220"	0.189"	0.402"	0.346"	3	889040	4	889041
1-1/2" NPT	0.327"	0.283"	0.598"	0.520"	3	889044	4	889045

NOTE: Orifice diameter gradations are in 0.001 inch increments.

MX-320(E)(C)

Intelligent Addressable Fire Alarm System

General

In stand-alone configurations, the MX-320 meets virtually every application requirement.

Designed with modularity and ease of system planning, the MX-320 can be configured with just a few devices for small building applications, or for a large campus or high-rise application. Simply add additional peripheral equipment to suit the application. For installations using MX-320C, an optional ACM Series annunciator can be mounted in the same cabinet (up to 48 zones/points, order separately).

NOTE: *Unless called out with a version-specific "C" or "E" at the end of the part number, "MX-320" refers to models MX-320, MX-320C, and MX-320E.*

Features

- Certified for seismic applications when used with the appropriate seismic mounting kit.
- One isolated intelligent Signaling Line Circuit (SLC) Style 4, 6 or 7.
- Up to 159 detectors (any mix of ion, photo, thermal, or multi-sensor) and 159 modules (Addressable pull stations, normally open contact devices, two-wire smoke, notification, or relay). 318 devices maximum.
- Standard 80-character display.
- 6.0 A power supply with four Class A/B built-in Notification Appliance Circuits (NAC). Selectable System Sensor, Wheelock, or Gentex strobe synchronization.
- Built-in Alarm, Trouble, Security, and Supervisory relays.
- VeriFire® Tools online or offline programming utility. Upload/Download, save, store, check, compare, and simulate panel databases. Upgrade panel firmware.
- Autoprogramming and Walk Test reports.
- Optional universal 318-point DACT.
- 80-character remote annunciators (up to 32).
- EIA-485 annunciators, including custom graphics.
- Printer interface (80-column and 40-column printers).
- History file with 800-event capacity in nonvolatile memory, plus separate 200-event alarm-only file.
- Alarm Verification selection per point, with tally.
- Presignal/Positive Alarm Sequence (PAS).
- Silence inhibit and Auto Silence timer options.
- NAC coding functions:
  - March time.
  - Temporal.
  - California two-stage coding.
  - Canadian two-stage.
  - Strobe synchronization.
- Field-programmable on panel or on PC, with VeriFire® Tools program check, compare, simulate.
- Full QWERTY keypad.
- Battery charger supports 18 – 200 AH batteries.
- Non-alarm points for lower priority functions.
- Remote ACK/Signal Silence/System Reset/Drill via monitor modules.



MX-320

- Automatic time control functions, with holiday exceptions.
- Extensive, built-in transient protection.
- Powerful Boolean logic equations.

FLASHSCAN® INTELLIGENT FEATURES

- Poll up to 318 devices in less than two seconds.
- Activate up to 159 outputs in less than five seconds.
- Multicolor LEDs blink device address during Walk Test.
- Fully digital, high-precision protocol (U.S. Patent 5,539,389).
- Manual sensitivity adjustment — nine levels.
- Pre-alarm intelligent sensing — nine levels.
- Day/Night automatic sensitivity adjustment.
- Sensitivity windows:
  - **Ion** – 0.5 to 2.5%/foot obscuration.
  - **Photo** – 0.5 to 2.35%/foot obscuration.
  - **Laser (VIEW®)** – 0.02 to 2.0%/foot obscuration.
  - **Acclimate®** – 0.5 to 4.0%/foot obscuration.
  - **IntelliQuad** – 1.0 to 4.0%/foot obscuration.
- Drift compensation (U.S. Patent 5,764,142).
- Degraded mode — in the unlikely event that the MX-320's primary microprocessor fails, FlashScan detectors revert to degraded operation and can activate the control panel's NAC circuits and alarm relay. Each of the four built-in panel circuits includes a Disable/Enable switch for this feature.
- Multi-detector algorithm involves nearby detectors in alarm decision (U.S. Patent 5,627,515).
- Automatic detector sensitivity testing (NFPA-72 compliant).
- Maintenance alert (two levels).
- Self-optimizing pre-alarm.

FSL-751 VIEW (VERY INTELLIGENT EARLY WARNING) SMOKE DETECTION TECHNOLOGY

- Revolutionary spot laser design.
- Advanced intelligent sensing algorithms differentiate between smoke and non-smoke signals (U.S. Patent 5,831,524).
- Addressable operation pinpoints the fire location.
- No moving parts to fail or filters to change.
- Early warning performance comparable to the best aspiration systems at a fraction of the lifetime cost.

FAPT-851 ACCLIMATE® LOW-PROFILE INTELLIGENT MULTI-SENSOR

- Detector automatically adjusts sensitivity levels without operator intervention or programming. Sensitivity increases with heat.
- Microprocessor-based technology; combination photo and thermal technology.
- FlashScan or CLIP mode compatible.
- Low-temperature warning signal at 40°F ± 5°F (4.44°C ± 2.77°C).

FSC-851 INTELLIQUAD ADVANCED MULTI-CRITERIA DETECTOR

- Detects all four major elements of a fire (smoke, heat, CO, and flame).
- Automatic drift compensation of smoke sensor and CO cell.
- High nuisance-alarm immunity.
- Six sensitivity levels.

RELEASING FEATURES

- Ten independent hazards.
- Sophisticated cross-zone (three options).
- Delay timer and Discharge timers (adjustable).
- Abort (four options).
- Low-pressure CO_2 listed.

HIGH-EFFICIENCY OFFLINE SWITCHING 3.0 A POWER SUPPLY (6.0 A IN ALARM)

- 120 VAC (MX-320/MX-320C); 240 VAC (MX-320E).
- Displays battery current/voltage on panel (with display).

FlashScan, Exclusive World-Leading Detector Protocol

At the heart of the MX-320 is a set of detection devices and device protocol — FlashScan (U.S. Patent 5,539,389). FlashScan is an all-digital protocol that gives superior precision and high noise immunity.

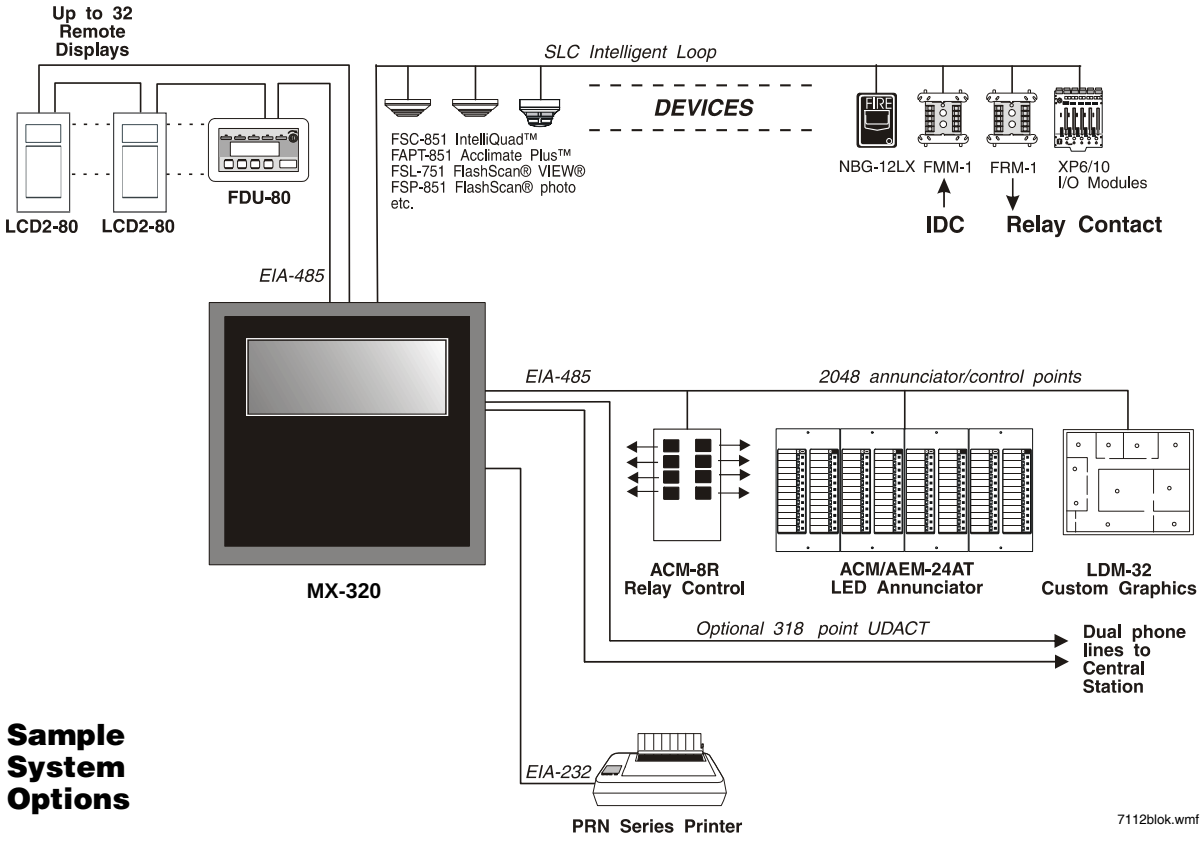
In addition to providing quick identification of an active input device, this new protocol can also activate many output devices in a fraction of the time required by competitive protocols. This high speed also allows the MX-320 to have the largest device per loop capacity in the industry — 318 points — yet every input and output device is sampled in less than two seconds. The microprocessor-based FlashScan detectors have bicolor LEDs that can be coded to provide diagnostic information, such as device address during Walk Test.

Intelligent Sensing

Intelligent sensing is a set of software algorithms that provides the MX-320 with industry-leading smoke detection capability. These complex algorithms require many calculations on each reading of each detector, and are made possible by the high-speed microcomputer used by the MX-320.

Drift Compensation and Smoothing: Drift compensation allows the detector to retain its original ability to detect actual smoke, and resist false alarms, even as dirt accumulates. It

Sample System Options



reduces maintenance requirements by allowing the system to automatically perform the periodic sensitivity measurements required by NFPA 72. Smoothing filters are also provided by software to remove transient noise signals, such as those caused by electrical interference.

Maintenance Warnings: When the drift compensation performed for a detector reaches a certain level, the performance of the detector may be compromised, and special warnings are given. There are three warning levels: (1) Low Chamber value; (2) Maintenance Alert, indicative of dust accumulation that is near but below the allowed limit; (3) Maintenance Urgent, indicative of dust accumulation above the allowed limit.

Sensitivity Adjust: Nine sensitivity levels are provided for alarm detection. These levels can be set manually, or can change automatically between day and night. Nine levels of pre-alarm sensitivity can also be selected, based on predetermined levels of alarm. Pre-alarm operation can be latching or self-restoring, and can be used to activate special control functions.

Self-Optimizing Pre-Alarm: Each detector may be set for "Self-Optimizing" pre-alarm. In this special mode, the detector "learns" its normal environment, measuring the peak analog readings over a long period of time, and setting the pre-alarm level just above these normal peaks.

Cooperating Multi-Detector Sensing: A patented feature of intelligent sensing is the ability of a smoke sensor to consider readings from nearby sensors in making alarm or pre-alarm decisions. Without statistical sacrifice in the ability to resist false alarms, it allows a sensor to increase its sensitivity to actual smoke by a factor of almost two to one.

Field Programming Options

Autoprogram. This timesaving feature is a special software routine. The FACP "learns" what devices are physically connected and automatically loads them in the program with default values for all parameters. Requiring less than one minute to run, this routine allows the user to have almost immediate fire protection in a new installation, even if only a portion of the detectors are installed.

Keypad Program Edit (with KDM-R2) The MX-320 has the exclusive feature of program creation and editing capability from the front panel keypad, while continuing to provide fire protection. The architecture of the MX-320 software is such that each point entry carries its own program, including control-by-event links to other points. This allows the program to be entered with independent per-point segments, while the MX-320 simultaneously monitors other (already installed) points for alarm conditions.

VeriFire® Tools is an offline programming and test utility that can greatly reduce installation programming time, and increase confidence in the site-specific software. It is Windows®-based and provides technologically advanced capabilities to aid the installer. The installer may create the entire program for the MX-320 in the comfort of the office, test it, store a backup file, then bring it to the site and download from a laptop into the panel.

Placement of Equipment in Chassis and Cabinet

The following guidelines outline the MX-320's flexible system design.

Wiring: When designing the cabinet layout, consider separation of power-limited and non-power-limited wiring as discussed in the *MX-320 Installation Manual.*

It is critical that all mounting holes of the MX-320 are secured with a screw or standoff to ensure continuity of Earth Ground.

KDM-R2 Controls and Indicators

Program Keypad: QWERTY type (keyboard layout).

12 LED Indicators: Power; Fire Alarm; Pre-Alarm; Security; Supervisory; System Trouble; Signals Silenced; Points Disabled; Control Active; Abort; Pre-Discharge; Discharge.

Keypad Switch Controls: Acknowledge/Scroll Display; Signal Silence; Drill; System Reset; Lamp Test.

LCD Display: 80 characters (2 x 40) with long-life LED backlight.

Ordering Information

CONFIGURATION GUIDELINES

The MX-320 system ships assembled; description and some options follow. See "Enclosures, Chassis, and Dress Plates" on page 4 for information about mounting peripherals.

MX-320: The standard, factory-assembled MX-320 system includes the following components: one control panel mounted on chassis (120 V operation — ships with grounding cable, battery interconnect cables, and document kit); includes integral power supply mounted to the main circuit board; one primary display KDM-R2 keypad/display; and one cabinet for surface or semi-flush mounting. *Purchase batteries separately. One or two option boards may be mounted inside the MX-320 cabinet; additional option boards can be used in remote cabinets.*

MX-320C: Based on MX-320 above, MX-320C adds a standard visible annunciator as required for Canadian applications. ULC listed.

MX-320E: Same as MX-320 above, but with 240 V operation.

TR-320: Trim ring for the MX-320 cabinet.

AUXILIARY POWER SUPPLIES AND BATTERIES

ACPS-610: 6.0 A or 10 A addressable charging power supply.

APS2-6R: Auxiliary Power Supply. Provides up to 6.0 amperes of power for peripheral devices. Includes battery input and transfer relay, and overcurrent protection. Mounts on two of four positions on a CHS-4L or CHS-4 chassis.

FCPS-24S6/S8: Remote 6 A and 8 A power supplies with battery charger.

BAT Series: Batteries. MX-320 uses two 12 volt, 18 to 200 AH batteries. Mounts in NFS-LBB(R).

COMPATIBLE DEVICES, EIA-232 PORTS

PRN-6: 80-column printer.

VS4095/5: Printer, 40-column, 24 V. Mounted in external backbox.

DPI-232: Direct Panel Interface, specialized modem for extending serial data links to remotely located FACPs and/or peripherals; mount on MX-320 chassis.

COMPATIBLE DEVICES, EIA-485 PORTS

ACM-24AT: ACS annunciator – up to 96 points of annunciation with Alarm or Active LED, Trouble LED, and switch per circuit. Active/Alarm LEDs can be programmed (by powered-up switch selection) by point to be red, green, or yellow; the Trouble LED is always yellow.

AEM-24AT: Same LED and switch capabilities as ACM-24AT, expands the ACM-24AT to 48, 72, or 96 points.

ACM-48A: ACS annunciator – up to 96 points of annunciation with Alarm or Active LED per circuit. Active/Alarm LEDs can be programmed (by powered-up switch selection) in groups of 24 to be red, green, or yellow. Expandable to 96 points with one AEM-48A.

AEM-48A: Same LED capabilities as ACM-48A, expands the ACM-48A to 96 points.

ACM-8R: Remote Relay Module with eight Form-C contacts. Can be located up to 6,000 ft. (1828.8 m) from panel on four wires.

LCD-80: ACS mode. 80-character, backlit LCD display. Mounts up to 6,000 ft. (1828.8 m) from panel. Up to 32 per FACP.

FDU-80G: Terminal mode. 80-character, backlit LCD display. Mounts up to 6,000 ft. (1828.8 m) from panel. Up to 32 per FACP.

LCD2-80: Terminal mode. 80-character, backlit LCD display. Mounts up to 6,000 ft. (1828.8 m) from panel. Up to 32 per FACP.

LDM: Lamp Driver Modules LDM-32, LDM-E32, and LDM-R32; remote custom driver modules.

SCS: Smoke control stations SCS-8, SCE-8, with lamp drivers SCS-8L, SCE-8L; eight (expandable to 16) circuits.

TM-4: Transmitter Module. Includes three reverse-polarity circuits and one municipal box circuit; mount on MX-320 chassis or remotely.

UDACT: Universal Digital Alarm Communicator Transmitter, 636 channel.

COMPATIBLE INTELLIGENT DEVICES

BEAMHK: Heating kit for transmitter/receiver unit of FSB-200(S) below.

BEAMHRK: Heating kit for use with the reflector of FSB-200(S) below.

BEAMLRK: Long-range accessory kit, FSB-200(S) below.

BEAMMRK: Multi-mount kit, FSB-200(S) below.

BEAMSMK: Surface-mount kit, FSB-200(S) below.

FSB-200: Intelligent beam smoke detector.

FSB-200S: Intelligent beam smoke detector with integral sensitivity test.

FSC-851: FlashScan IntelliQuad Advanced Multi-Criteria Detector.

FSI-851: Low-profile FlashScan ionization detector.

FSP-851: Low-profile FlashScan photoelectric detector.

FSP-851T: Low-profile FlashScan photoelectric detector with 135°F (57°C) thermal.

FSP-851R: Remote-test capable photoelectric detector for use with DNR(W) duct detector housings.

FST-851: FlashScan thermal detector 135°F (57°C).

FST-851R: FlashScan thermal detector 135°F (57°C) with rate-of-rise

FST-851H: FlashScan 190°F (88°C) high-temperature thermal detector.

FAPT-851: FlashScan Acclimate low-profile multi-sensor detector.

FSL-751: FlashScan VIEW laser photo detector.

DNR: InnovairFlex low-flow non-relay duct-detector housing (order separately).

DNRW: Same as above with NEMA-4 rating, watertight.

B224RB: Low-profile relay base.

B224BI: Isolator base for low-profile detectors.

B210LP: Low-profile base. Standard U.S. style. .

B501: European-style, 4" (10.16 cm) base.

B200S: Intelligent addressable sounder base, capable of producing a variety of tone patterns including ANSI Temporal 3. Compatible with sychronization protocol.

B200SR: Sounder base, Temporal 3 or Continuous tone.

FMM-1: FlashScan monitor module.

FDM-1: FlashScan dual monitor module.

FZM-1: FlashScan two-wire detector monitor module.

FMM-101: FlashScan miniature monitor module.

FCM-1: FlashScan NAC control module.

FCM-1-REL: FlashScan releasing control module.

FRM-1: FlashScan relay module.

NBG-12LX: Manual pull station, addressable.

MPS series: Manual pull stations, addressable and conventional. For use in Canada only.

ISO-X: Isolator module.

XP6-C: FlashScan six-circuit supervised control module.

XP6-MA: FlashScan six-zone interface module; connects intelligent alarm system to two-wire conventional detection zone.

XP6-R: FlashScan six-relay (Form-C) control module.

XP10-M: FlashScan ten-input monitor module.

ENCLOSURES, CHASSIS, AND DRESS PLATES

NFS-LBB: Battery Box (required for batteries larger than 26 AH).

NFS-LBBR: Same as above, but red.

SEISKIT-320/B26: Seismic mounting kit. Required for seismic-certified applications with MX-320 and BB-26. Includes battery bracket for two 26 AH batteries.

SEISKIT-BB25: Seismic mounting kit for the BB-25. Includes battery bracket for two 26 AH batteries.

SEISKIT-LBB: Seismic kit for the NFS-LBB. Includes battery bracket for two 55 AH batteries.

SEISKIT-PS/2/4: Seismic mounting kit for the FCPS-24S6/S8 and CAB-PS1. Includes battery bracket for two 7 AH or 12 AH batteries.

OTHER OPTIONS

411: Slave Digital Alarm Communicator.

411UDAC: Digital Alarm Communicator.

MINIMAX-TCD: VeriFire Tools CD-ROM. Contains programming software for the MX-320. Includes local panel connection cable.

MINIMAXUG-TCD: VeriFire Tools upgrade software.

NOTE: *For other options including compatibility with retrofit equipment, refer to the panel's installation manual, the SLC manual, and the Device Compatibility Document.*

SYSTEM SPECIFICATIONS

System Capacity

- Intelligent Signaling Line Circuits 1
- Intelligent detectors 159
- Addressable monitor/control modules 159
- Programmable internal hardware and output circuits 4
- Programmable software zones 99
- Special programming zones 14
- LCD annunciators per MX-320/MX-320E 32
- ACS annunciators per MX-320/MX-320E..... 32 addresses x 64 points

Specifications

- Primary input power
  - MX-320: 120 VAC, 50/60 Hz, 5.0 A.
  - MX-320E: 220/240 VAC, 50/60 Hz, 2.5 A.
- Total output 24 V power: 6.0 A in alarm.

NOTE: *The power supply has a total of 6.0 A of available power. This is shared by all internal circuits.*

- Standard notification circuits (4): 1.5 A each.
- Resettable regulated 24V power: 1.25 A.
- Two non-resettable regulated 24V power outputs:
  - 1.25 A.
  - 0.50 A.
- Non-resettable 5V power: 0.15 A.
- Battery charger range: 18 AH – 200 AH. Use separate cabinet for batteries over 26 AH.
- Float rate: 27.6 V.

Cabinet Specifications

MX-320/MX-320C cabinet dimensions:

- Backbox: 18.12 in. (46.025 cm) width; 18.12 in. (46.025 cm) height; 5.81 in. (14.76 cm) depth.
- Door: 18.187 in. (46.195 cm) width; 18.40 in. (46.736 cm) height; 0.75 in. (1.905 cm) depth.
- Trim ring: Molding width is 0.905 in. (2.299 cm).
- Shipping weight (without batteries):
  - MX-320: 36.15 lb. (16.4 kg).
  - MX-320C: 37 lb. (16.78 kg).

Temperature and Humidity Ranges

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

Agency Listings and Approvals

In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL Listed:** S25064
- **ULC Listed:** S25064

Standards

The MX-320 complies with the following UL Standards and NFPA 72, IBC, and CBC Fire Alarm Systems requirements:

- **UL 864** (Fire).
- **UL 1076** (Burglary).
- **LOCAL** (Automatic, Manual, Waterflow and Sprinkler Supervisory).
- **AUXILIARY** (Automatic, Manual and Waterflow) (requires TM-4).
- **REMOTE STATION** (Automatic, Manual, Waterflow and Sprinkler Supervisory) (requires TM-4).
- **PROPRIETARY** (Automatic, Manual, Waterflow and Sprinkler Supervisory). *Not applicable for FM.*
- **CENTRAL STATION** (Automatic, Manual, Waterflow and Sprinkler Supervisory) (requires UDACT).
- **EMERGENCY VOICE/ALARM**.
- **OT, PSDN** (Other Technologies, Packet-switched Data Network).
- **IBC 2000, IBC 2003, IBC 2006, IBC2009** (Seismic).
- **CBC 2007** (Seismic).

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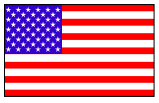
ISO 9001 CERTIFIED
ENGINEERING & MANUFACTURING
QUALITY SYSTEMS

This document is not intended to be used for installation purposes.
We try to keep our product information up-to-date and accurate.
We cannot cover all specific applications or anticipate all requirements.
All specifications are subject to change without notice.



Made in the U.S. A.

For more information, contact: Minimax, 4030 East Quenton Dr., Suite 112, Mesa, AZ 85215

HVAC

CITYMULTI® Outdoor Unit: 20-TON PUHY-P240YSKMU-* (-BS)

(Consists of Two PUHY-P120YKMU-* (-BS) and One CMY-Y100CBK3 Twinning Kit)

MITSUBISHI ELECTRIC

Job Name:

Schedule Reference: | Date:

OUTDOOR VRF HEAT PUMP SYSTEM FEATURES

- INVERTER-driven compressor
- Air-source, heat pump system
- Long line lengths - for details see Engineering Manual
- Connects to CITY MULTI® indoor units
- Controlled via CITY MULTI® Controls Network

UNIT OPTION

- □ Standard Model.....PUHY-P240YSKMU-*
- □ Seacoast (BS) Model.....PUHY-P240YSKMU-*-BS

OPTIONAL PARTS

- ■ Twinning Kit (required)..... CMY-Y100CBK3
- □ Joint Kit.....for details see Pipe Accesories Submittal
- □ Header Kit.....for details see Pipe Accesories Submittal
- □ Low Ambient Kit .....for details see Low Ambient Kit Submittal
- □ Snow/Hail Guards Kit.....for details see Snow/Hail Guards Kit Submittal

Specifications		System	Module 1	Module 2
Unit Type		PUHY-P240YSKMU-* (-BS)	PUHY-P120YKMU-* (-BS)	PUHY-P120YKMU-* (-BS)
Nominal Cooling Capacity (460V)	Btu/h	240,000	120,000	120,000
Nominal Heating Capacity (460V)	Btu/h	270,000	135,000	135,000
Operating Temperature Range *1	Cooling (Outdoor) *2	Refer to Module Data	23~115° F (-5~46° C) DB	
	Heating (Outdoor)		-4~60° F (-20~15.5° C) WB	
External Dimensions (H x W x D)	In. (mm)	Refer to Module Data	64-31/32 x 68-29/32 x 29-5/32 (1,650 x 1,750 x 740)	64-31/32 x 68-29/32 x 29-5/32 (1,650 x 1,750 x 740)
Net Weight	Lbs. (kg)	1,452 (658)	726 (329)	726 (329)
External Finish		Refer to Module Data	Pre-coated galvanized steel sheet	
Electrical Power Requirements	Voltage, Phase, Hertz	Refer to Module Data**	460V, 3-Phase, 60Hz	
Minimum Circuit Ampacity (MCA)	A	Refer to Module Data**	20	20
Maximum Fuse Size	A	Refer to Module Data**	25	25
Piping Diameter				
From Twinning Kit to First Joint or Header (Brazed) (In. / mm)	Liquid (High Pressure)	5/8 (15.88) Brazed	Refer to System Data	
	Gas (Low Pressure)	1-1/8 (28.58) Brazed		
Max. Total Refrigerant Line Length	Ft.	3,280	Refer to System Data	
Max. Refrigerant Line Length (Between ODU & IDU)	Ft.	541		
Max. Control Wiring Length	Ft.	1,650		
Indoor Unit	Total Capacity	50~130% of outdoor unit capacity	Refer to System Data	
	Model / Quantity	P06~P96/2~50	Refer to System Data	
Sound Pressure Level	dB(A)	63	Refer to System Data	
Fan				
Type x Quantity		Refer to Module Data	Propeller fan x 2	Propeller fan x 2
Airflow Rate	CFM		11,300	11,300
External Static Pressure	In. WG	Refer to Module Data	Selectable; 0, 0.12 or 0.24"WG; factory set to 0"W.G.	
Compressor Operating Range		8% to 100%	Refer to System Data	
Compressor Type x Quantity		Refer to Module Data	Inverter-driven Scroll Hermetic x 1	Inverter-driven Scroll Hermetic x 1
Refrigerant		Refer to Module Data	R410A x 26 lbs + 1 oz (11.8 kg)	R410A x 26 lbs + 1 oz (11.8 kg)
Protection Devices	High Pressure	Refer to Module Data	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)
	Inverter Circuit (Comp. / Fan)		Over-current protection	Over-current protection
	Fan Motor		Thermal switch	Thermal switch
AHRI Ratings (Ducted/Non-Ducted)	EER	12.1 / 12.0	Refer to System Data	
	IEER	18.6 / 18.1		
	COP	3.55 / 3.53		
Blue Fin Anti-corrosion Protection: Cellulose- and polyurethane-resin coating treatment applied to condenser coil that protects it from air contaminants **Standard:** ≥1µm thick; Salt Spray Test Method - no unusual rust development to 480 hours. **Seacoast (BS):** ≥1µm thick; Salt Spray Test Method - no unusual rust development to 960 hours.				

NOTES:

*1. Harsh weather environments may demand performance enhancing equipment. Ask your Mitsubishi Electric representative for more details about your region.

*2. For details on extended cooling operation range down to -10° F DB, see Low Ambient Kit Submittal.

** Each individual module requires a separate electrical connection. Refer to electrical data for each individual module.

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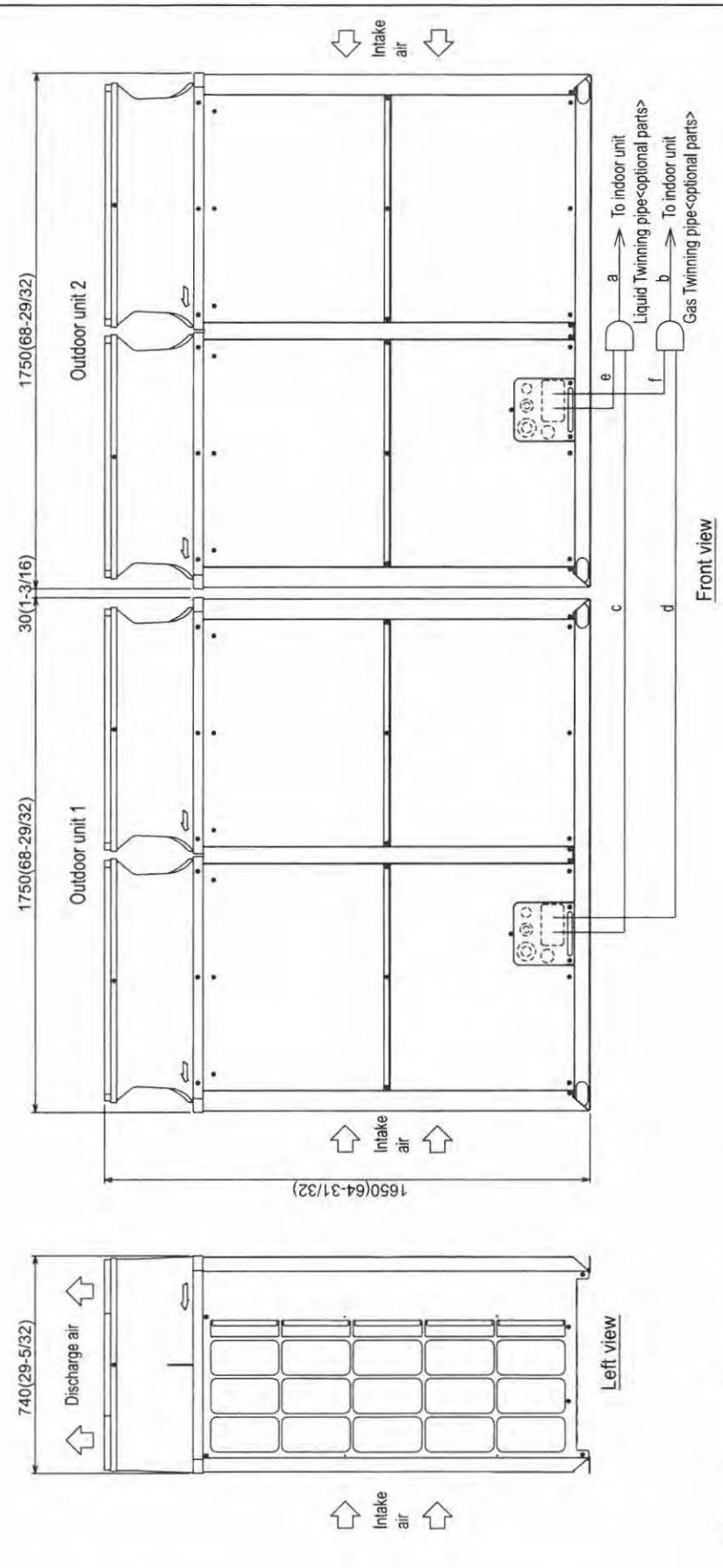
Outdoor Unit: PUHY-P240YSKMU-* (-BS) – DIMENSIONS

Unit : mm(in.)



Twinning pipe connection size

Package unit name			PUHY-P240YSKMU
Component unit name	Outdoor unit 1		PUHY-P120YKMU
	Outdoor unit 2		PUHY-P120YKMU
Outdoor Twinning Kit(optional parts)			CMY-Y100CBK3
Indoor unit–Twinning pipe	Liquid	a	ø15.88(5/8)
	Gas	b	ø28.58(1-1/8)

	Unit model	Liquid	Gas
		c or e	d or f
Twinning pipe–Outdoor unit	P120	ø12.7(1/2)	ø28.58(1-1/8)

Note 1.Connect the pipes as shown in the figure above. Refer to the table above for the pipe size.
2.Twinning pipes should not be tilted more than 15 degrees from the horizontal plane.
Be sure to see the Installation Manual for details of Twinning pipe installation.
3.The pipe section before the Twinning pipe (sections "a" and "b" in the figure) must have at least 500mm(19-11/16) of straight section ("including the straight pipe that is supplied with the Twinning pipe).
4.Only use the Twinning pipe by Mitsubishi (optional parts).

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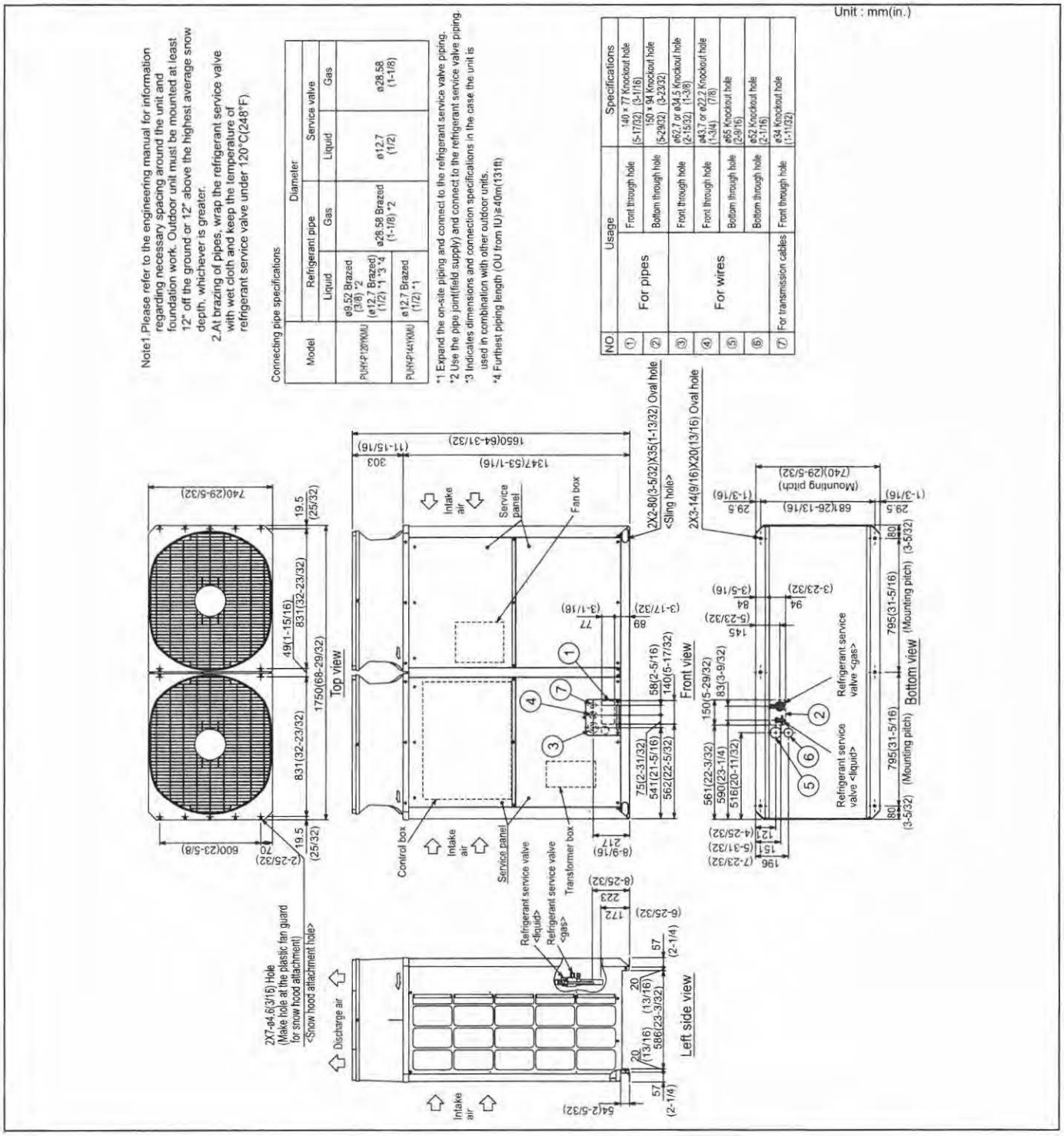
Modules 1 & 2: PUHY-P120YKMU-* (-BS) – DIMENSIONS



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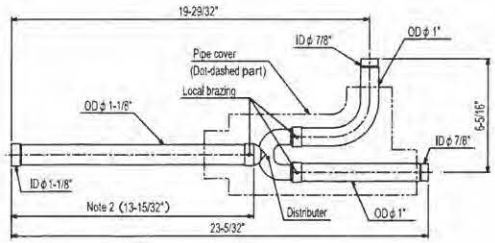
Twinning Kit: CMY-Y100CBK3

CMY-Y100CBK3

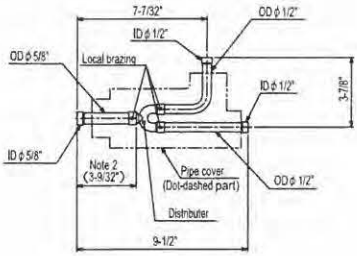
Ref.: CMY_Y100VBK2_EXD_EUDB_SI

in.

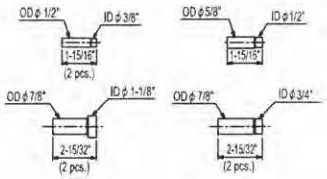
For Gas pipe:



For Liquid pipe:

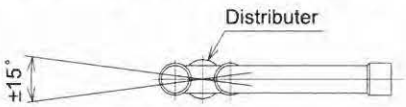


<Reducer(Accessory)>



ID: Inner Diameter OD: Outer Diameter

Note 1. Reference the attitude angle of the branch pipe below the fig.



The angle of the branch pipe for hign pressure is within ± 15 ° against the horizontal plane.

2. Use the attached pipe to braze the port-opening of the distributer.
3. Pipe diameter is indicated by inside diameter.
4. Only use the Twinning pipe by Mitsubishi (optional parts) .

Notes:

MITSUBISHI ELECTRIC
COOLING & HEATING

1340 Satellite Boulevard
Suwanee, GA 30024
Toll Free: 800-433-4822
www.mehvac.com

FORM# PUHY-P240YSKMU-* (-BS) - 201501

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ARCADIS

Electrical

Power-Zone® 4

Low Voltage, Metal-Enclosed, Drawout Switchgear with Masterpact® NW and NT Low Voltage Power Circuit Breakers

Class 6037

Catalog

05



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SQUARE D

SECTION 1 : PRODUCT DESCRIPTION

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Power-Zone® 4
Product Description

INTRODUCTION

Power-Zone® 4 low voltage, metal-enclosed, drawout switchgear is designed to provide superior electrical distribution, protection, and power quality management for the entire facility. The prime components of the switchgear are the Masterpact® NW and Masterpact NT ANSI-rated circuit breakers. Power-Zone 4 switchgear is designed to maximize the functionality of the Masterpact NW and NT circuit breakers, which, in turn, deliver maximum uptime, system selectivity, ease of maintenance and circuit protection. All of this in the smallest footprint available for low voltage drawout switchgear.

Features and Benefits

Figure 1: Power-Zone 4 Switchgear



- Power-Zone 4 is designed and built to ANSI® C37.20.1 and is listed to UL® 1558.
- Masterpact NW and NT drawout low voltage power circuit breakers are designed and built to ANSI C37.13 and C37.16., and are listed to UL1066.
- Short-circuit current rating up to 200 kA without fuses.
- High short-time withstand ratings up to 100 kA for 30 cycles.
- Family of field installable and upgradeable Micrologic® trip units with optional Powerlogic® data communications features.
- Smallest equipment footprint available in this product class.
- Front access to control and communications wire connections.
- Bolted copper bus provided as standard (up to 5000 A maximum).
- Large rear cable compartment pull area allows maximum room for power cables.
- Bus provision for future equipment expansion.
- System designed for maximum uptime with low maintenance.
- Modular circuit breaker design for easy addition of control accessories.

Figure 2: Through-the-Door Access



Figure 3: Circuit Breaker Compartment with Secondary Horizontal and Vertical Wireways



Figure 4: Powerlogic System Manager Software



Figure 5: Family of Micrologic Trip Units



Figure 6: Masterpact NT Circuit Breaker



Figure 7: Family of Masterpact NW Circuit Breakers



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Compartmentalization

Structures are compartmentalized and are built with barriers as required by ANSI C37.20.1. The structure has large conduit space within the main and feeder sections.

UL Listing

Power-Zone 4 switchgear is designed and engineered to comply with UL1558 requirements. Masterpact NW and NT circuit breakers are UL1066 listed. A UL label can be affixed where UL coverage exists for all component material, parts, and devices in a switchgear section.

Functional Capacity

High current carrying capacity frame sizes and high withstand rating make the Masterpact NW and NT circuit breakers ideal for application on today's high capacity distribution systems.

Maximum Uptime

Drawout construction allows quick and simple replacement of circuit breaker elements. If an emergency occurs, circuit breakers may be removed from low-priority circuits and re-installed to serve high-priority circuits.

Ease of Maintenance

Masterpact NW and NT circuit breakers provide disconnecting and overload protection for the circuit they control. Each is contained in an individual compartment and can be easily isolated from the energized circuit and withdrawn from the compartment for quick inspection, maintenance, or replacement. The entire switchgear or any other feeder circuits need not be shut down during this operation, thus minimizing production downtime.

Auxiliary Instrument Compartments

Optional control power transformers, meters, and other control devices can be mounted in the auxiliary instrument compartments. These compartments are furnished with hinged doors for easy access.

Secondary Horizontal and Vertical Wireways

The secondary wiring design allows for front access to circuit breaker control and communications wiring without removing the circuit breaker from its compartment. The vertical wireway is located on the right side of the circuit breaker for easy access and wiring installation. The horizontal wireway is located directly above the circuit breaker, providing direct access to control and communication terminations.

ANSI Interrupting and Short-Time (Withstand)

Power-Zone 4 switchgear with Masterpact NW and NT circuit breakers has the highest interrupting and short-time (withstand) ratings for low voltage switchgear in the smallest physical size. The elimination of limiter fuses for high interrupting Masterpact NW circuit breakers reduces space and cost. The ANSI rated circuit breaker's improved coordination with downstream devices increase system uptime.

Through-the-Door Construction

Masterpact NW and NT circuit breakers provide clear access to all circuit breaker controls, indicators, and trip unit functionality without opening the compartment door. Circuit breaker racking is also achieved with the compartment door closed.

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Disconnecting Contacts

The main disconnecting contacts (power plug-on fingers) on the rear of the circuit breaker are spring loaded and self-aligning to ensure positive electrical contact when the circuit breaker is in the connected position. The secondary disconnecting contacts are located on the top front of the circuit breaker element and are used for connecting the accessories to the control power source, other control circuits, or communication circuits.

Micrologic® Enhanced Functionality

A new family of Micrologic electronic and programmable trip units provide a choice of expanded information, power quality readings, and communication capabilities. Micrologic trip units can be integrated into the optional Powerlogic system.

Powerlogic® Monitoring System

Power-Zone 4 switchgear is available with the Powerlogic metering, data acquisition, and control system. The optional Powerlogic system is used in addition to, or in lieu of, the Type A, Type P, and Type H Micrologic® trip units for the Masterpact NW and NT circuit breakers. Powerlogic functions are included in Micrologic high-end trip units. Several highly accurate circuit monitors are available to work in conjunction with the Powerlogic System Manager Software to manage and control the electrical distribution system.

Equipment Standards

All Power-Zone® 4 switchgear are 100% rated and are assembled and tested in an ISO 9001 facility to applicable standards including:

Standard	Description
ANSI C37.20.1	Metal-enclosed low voltage circuit breaker switchgear
ANSI C.37.51	Testing of metal-enclosed low voltage ac circuit breaker switchgear
NEMA SG-5	Power switchgear assemblies
CAN/CSA C22.2 No. 31-M89	Switchgear assemblies
UBC and CBC	Zone 4 seismic applications
UL 1558	Switchgear assemblies

All Masterpact NW and NT circuit breakers are 100% rated and are assembled and tested in an ISO 9001 facility to applicable standards including:

Standard	Description
ANSI C37.13	Low voltage ac power circuit breakers used in equipment
ANSI C37.16	Preferred rating, related requirement and application recommendations for low voltage power circuit breakers and ac power circuit breakers
ANSI C37.17	Trip devices for ac and general-purpose dc low voltage power circuit breakers
ANSI C37.50	Testing of low voltage ac circuit breakers
NEMA SG-3	Low voltage circuit breakers
UL 1066	Low voltage circuit breakers

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Equipment Ratings

Application Voltage Systems	Ampacities
600 Vac Maximum	1600 A–5000 A (main circuit breaker or main lugs only)
1Ø3W, 3Ø3W, 3Ø4W	
50/60 Hz	

Short-Circuit Current Ratings			Short-Time Withstand Ratings
240 V	480 V	600 V	
42 kA	42 kA	42 kA	42 kA
65 kA	65 kA	65 kA	65 kA
85 kA	85 kA	85 kA	85 kA
200 kA	200 kA	130 kA	100 kA (maximum)

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Model 6 Motor Control Centers

Catalog
8998CT9701R07/09

2009

Class 8998



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SQUARE D

by Schneider Electric

Product Description

Introduction



Motor control centers (MCCs) provide the most suitable method for grouping electrical motor control, automation, and power distribution in a compact and economical package. Motor control centers consist of totally enclosed, dead front, free-standing structures bolted together. These sections support and house control units, a common bus bar for distributing power to the control units, and a network of wire trough and conductor entrance areas for accommodating incoming and outgoing load and control wires.

The control units consist of components such as combination motor starters, branch feeder devices, AC drives, soft starts, or lighting panelboards. Each unit is mounted in an individual, isolated compartment having its own door. Standard MCC dimensions are 20 in. wide (including a 4 in. vertical wireway trough) by 90 in. high (add 1.5 in. base channel and a 3 in. removable top lifting channel) by 15 or 20 in. deep. Larger sections are often required for mounting larger equipment or for providing space for customer-mounted devices.

Two package styles are available: standard and industrial. These Model 6 feature packages allow you to custom design the MCC to fit your specific requirements. The standard package lets you tailor the MCC by selecting only those options that you need for an individual project, guaranteeing the optimal cost/value balance. The industrial package includes options most often requested and specified by industrial customers. Offering the options as part of a package reduces the possibility of leaving out common industrial features. See the following table for a comparison of the two packages.

Option	Standard Package	Industrial Package
Structure Features		
Vertical ground bus material	Steel	Copper
Horizontal bus material	Tin-plated aluminum[1]	Tin-plated copper
Fishtape barriers	Optional	Included
Unit Features		
Interior color	Gray	White
Nameplates	Optional	Included
X1 and X2 wired to terminal blocks	Optional	Included

[1] Exceptions: 1600–2500 A are tin plated copper.

All features of the industrial package can be added individually to the standard version.

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Features



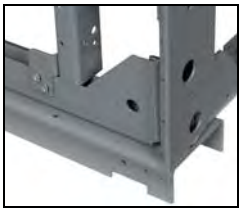
Sliding Bus Barriers

- Horizontal power bus is located at the top of the structure for easy installation, inspection, and maintenance without the need to remove units.
- Non-conductive, two-piece, sliding, horizontal bus barrier provides convenient access for splicing and maintenance without the need to remove the panels.
- Captive, four-bolt, horizontal splice bars with self-contained nuts and hardware make installation easy and reduce the possibility of splice bar loss.



Full Depth Vertical Wireway (Right-Side View)

- A full-depth vertical wireway maximizes the wire pulling area. The Model 6 MCC has the largest vertical wireway in the industry.
- Vertical bus barriers and wireway openings, when supplied, are built in 3 in. increments. This feature allows more mounting flexibility for the units and reduces wasted space in the enclosure.
- Vertical ground bus is located in each section. This bus mates with ground stabs on the rear of each plug-on unit to create a positive ground connection, with first make/last break operation.



Structural Integrity

- Frame is constructed with 12-gauge steel, and features welded corner channels for exceptional structural rigidity.
- Leveling notches in the base channel provide a means of aligning the section during installation.



Innovative

- Cast metal handle, an industry-exclusive feature, is more rugged than composites, and clearly indicates disconnect status, including a ‘tripped’ circuit breaker, for added safety.
- Quarter-turn fasteners on unit and wireway doors expedite closing and opening.
- L-shaped unit door hinge pins are easily removed with a screwdriver for general maintenance.



Shrouded Power Stabs

- Each unit is fully compartmentalized, with solid side, back, and bottom plates. This feature allows more mounting space for components and confines any potential faults within the individual unit.
- A hinged, or fold-down, unit bottom plate allows additional space for wiring and maintenance.
- Shrouded power stabs protect stabs against damage during unit maintenance, and provide a self-aligning system for installation of units and connection to the vertical bus.

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Codes and Standards

Model 6 Motor Control Centers are manufactured to National Electrical Manufacturers Association (NEMA) Standard ICS 18-2001 and Electrical Equipment Manufacturers Association of Canada (EEMAC) standards. Model 6 MCCs are also manufactured to Underwriters Laboratories (UL) Standard 845 and bear the “UL Listed” label, where applicable. The “UL Listed” mark is applied to vertical sections and units that are installed within those sections. It should be noted that sections and installed units are independently listed devices. Thus, it is possible to have non-UL Listed units installed in UL Listed vertical sections.

All sections and units listed in this catalog are UL Listed, unless otherwise noted. The Model 6 MCC meets Canadian Standards Association (CSA) specification standards and can carry the CSA label.

Certification

Model 6 Motor Control Centers are certified by the American Bureau of Shipping (ABS) for use in power distribution, control, and protection of motor and non-motor loads for multiple applications on board ABS Classed Vessels, Offshore Rigs and Platforms, and Marine applications. ABS develops and verifies conformance with standards for design, construction, and operational maintenance of marine-related facilities. Many customers require ABS certification for products used by and for marine facilities. The certification granted by ABS includes classification of use of the motor control center for both Essential and/or Non-Essential Services.

NEMA/EEMAC Wiring Classes and Enclosure Types

Wiring Classes

Class 1—Independent Units

Class 1 motor control centers consist of mechanical groupings of combination motor control units, branch feeders, other units, and electrical devices arranged in a convenient assembly. The manufacturer completes wiring between components within each unit. Wiring between units is not required.

Class 2—Interconnected Units

Class 2 MCCs are the same as Class 1 MCCs with the addition of manufacturer-furnished electrical interlocking and wiring between units as specifically described in the overall control system diagrams supplied by the purchaser.

Type A

User (field) wiring connects directly to device terminals internal to the unit. Type A wiring is provided only on Class 1 MCCs.


Control Terminal Block

Type B

User (field) control wiring connects to unit terminal block(s) in or adjacent to each motor control unit. User load (power) wiring for Size 3 or smaller combination motor control units connects as follows:

Type B-D

User load (power) wiring connects directly to the device terminals, which are located immediately adjacent to, and are readily accessible from, the vertical wireway.

Type B-T

User load (power) wiring connects to factory-wired power terminal blocks located in or adjacent to each unit.

User load (power) wiring for Size 4 or larger combination motor control units and branch feeder units connects directly to the unit device terminals.

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Type C

User (field) control wiring and load wiring on Size 3 or smaller motor control units connects to master terminal blocks mounted at the top or bottom of those vertical sections containing control units. Unit control wiring and load wiring on Size 3 or smaller units are factory-wired from unit-located terminal blocks to the master terminal blocks.

User load (power) wiring for Size 4 or larger units connects directly to the device terminals. As an option, user load (power) wiring for all sizes of motor control units may connect directly to the device terminals within the MCC units. See page 85 for load wiring options.

Enclosure Types

Type 1

Intended for indoor use only. Type 1 enclosures are designed primarily to provide protection against contact with energized equipment inside. They are to be used in locations where normal service conditions exist.

Type 1A (Gasketed)

Intended to restrict the entrance of dust and falling dirt into Type 1 enclosures. Type 1A enclosures are **not** dust-tight. Neoprene gasketing is the standard material used.

Type 3R

Intended for outdoor use only. Type 3R enclosures are designed primarily to provide protection against falling rain and sleet and remain undamaged by the formation of ice on the enclosure. They are **not** intended to provide protection against conditions such as dust, internal condensation, internal icing, or extreme heat or cold. The Model 6 Type 3R enclosure is built with galvannealed steel, which provides a high level of resistance to corrosion when compared to standard hot or cold rolled steel with the same paint finish.

Type 12

Intended for indoor use only. Type 12 enclosures are designed primarily to protect against dust, falling dirt, light splashing, and dripping of non-corrosive liquid. They are not intended to provide protection against conditions such as internal condensation.

Shipping Weights

One, two, or three vertical sections can be shipped together on a pallet. Larger MCCs are split into shipping blocks of three sections maximum. The following table lists typical approximate shipping weights for a normal mix of MCC equipment. Some sections, based on installed devices and width of the section, may vary from values shown in the table.

Approximate MCC Shipping Weights

NEMA/EEMAC Enclosure Type	Depth (inches)	1 Section (lbs)	2 Sections (lbs)	3 Sections (lbs)
1, 1A, 12	15	600	1200	1800
3R Non-Walk-In	15[1] (27.2 in. overall)	900	1800	2700
1, 1A, 12	20	750	1500	2250
3R Non-Walk-In	20[1] (32.2 in. overall)	1050	2100	3150

[1] See the NEMA/EEMAC 3R dimensions drawing on page 108.

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Altitude Ratings

The following table lists the MCC derating factors necessary at altitudes of 6,600 ft (2,000 m) and higher.

Altitude	Altitude Rating Correction Factors[1]		
	Full Load Current	System Voltage	Ambient Temperature
6,600 ft (2,000 m)	1.0	1.0	1.0
8,500 ft (2,600 m)	0.99	0.95	1.0
13,000 ft (3,900 m)	0.96	0.80	0.95
14,000 ft (4,300 m)	0.95	0.80	0.90
15,000 ft (4,600 m)	0.93	0.80	0.85

1 For variable frequency drives above 3,300 ft (1,000 m), derate the output current rating by 1% for each additional 330 ft (100 m) up to a maximum of 9,900 ft (3000 m).

For solid state reduced voltage starters above 3,300 ft (1,000 m), derate the nominal output current by 2.2% for each additional 330 ft (100 m) up to a maximum of 6,600 ft (2,000 m).

Motor Control Center Heat Dissipation

The following table lists the approximate heat dissipation of various MCC units. This information is often requested by engineers who are sizing HVAC equipment to cool and ventilate equipment rooms. Values include an estimate of heat dissipated by the MCC Power Bus. To use, add the values for each of the units in the MCC. Values are given in BTUs per hour and watts.

The values given are for “typical” applications, and include an adjustment for power bus contribution. Make the following adjustments for special situations:

- Add 10–20 percent to the total heat dissipation for MCCs that make extensive use of relays, timers, and other control devices.
- Add 10 percent to the total heat dissipation for MCCs with 1200–1600 A main bus.
- Add 20 percent to the total heat dissipation for MCCs with 2000–2500 A main bus.

Typical Heat Dissipation Values[1]

Description	Size/Rating	Heat Dissipation	
		BTUs/hr	Watts
Combination Starters (Circuit Breaker or Fusible Disconnect)	1	270	79
	2	360	106
	3	720	210
	4	1440	420
	5	2400	700
Main and Branch Feeder Breakers	15–150 A	270	79
	175–250 A	720	210
	300–400 A	780	230
	500–600 A	1320	390
	700–800 A	2220	650
	900–1200	5802	1700
	1600 A	8020	2350
	2000 A	12,628	3700
	2500 A	27,815	8150
Main and Branch Feeder Switches	30 A	126	37
	60 A	156	46
	100 A	282	85
	200 A	780	230
	400 A	1020	300
	600 A	2047	600
	800 A	3242	950
	1200 A	8874	2600
	1600 A	15,529	4550
	2000 A	24,232	7100

1 For programmable logic controllers, unit heat dissipation can be significant. Contact the MCC Technical Assistance Group (TAG) for the heat dissipation of these devices.

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Typical Heat Dissipation Values (Continued)

Description	Motor Rated HP @ 480V	Heat Dissipation					
		BTUs/hr			Watts		
		Drive	Line Reactor 3% / 5%	Load Reactor or Filter	Drive	Line Reactor 3% / 5%	Load Reactor or Filter
Combination Altivar 61 AC drives (variable torque rated)	1	150	27 / 41	255	44	8 / 12	75
	2	150	48 / 48	255	45	14 / 14	75
	3	218	68 / 68	273	64	20 / 20	80
	5	389	99 / 89	307	119	29 / 26	90
	7.5	491	106 / 140	324	144	31 / 41	95
	10	608	147 / 147	324	178	43 / 43	95
	15	741	177 / 208	375	217	52 / 61	110
	20	1092	180 / 180	444	320	53 / 53	130
	25	1338	184 / 184	444	392	54 / 54	130
	30	1662	212 / 222	461	487	62 / 65	135
	40	2447	229 / 242	495	717	67 / 71	145
	50	3331	246 / 276	870	976	72 / 81	255
	60	4301 [1]	— / 328	870	1260 [1]	— / 96	255
	75	4928 [1]	— / 369	836	1444 [1]	— / 108	245
	100	5690 [1]	— / 614	921	1667 [1]	— / 180	270
	125	8447 [1]	— / 470	887	2475 [1]	— / 138	260
	150	11002 [1]	— / 498	904	3224 [1]	— / 146	265
	200	13016 [1]	— / 747	990	3814 [1]	— / 219	290
	250	14676 [1]	— / 1197	1109	4300 [1]	— / 351	325
	300	17450 [1]	— / 2682	1024	5113 [1]	— / 786	300
	350	19717 [1]	— / 2560	1535	5777 [1]	— / 750	450
	400	22931 [1]	— / 2491	1621	6719 [1]	— / 730	475
	450	24665 [1]	— / 2642	—	7227 [1]	— / 774	—
	500	52927 [1]	— / 2379	—	8281 [1]	— / 697	—
Combination Altivar 71 AC drives (constant torque rated)	1	150	27 / 41	255	44	8 / 12	75
	2	218	48 / 48	255	64	14 / 14	75
	3	297	68 / 68	273	87	20 / 20	80
	5	492	99 / 89	307	144	29 / 26	90
	7.5	608	106 / 140	324	178	31 / 41	95
	10	741	147 / 147	324	217	43 / 43	95
	15	1092	177 / 208	375	320	52 / 61	110
	20	1338	180 / 180	444	392	53 / 53	130
	25	1659	184 / 184	444	486	54 / 54	130
	30	2447	212 / 222	461	717	62 / 65	135
	40	3331	229 / 242	495	976	67 / 71	145
	50	4253 [1]	— / 276	870	1246 [1]	— / 81	255
	60	4936 [1]	— / 328	870	1446 [1]	— / 96	255
	75	5607 [1]	— / 369	836	1643 [1]	— / 108	245
	100	5446 [1]	— / 470	921	2475 [1]	— / 138	270
	125	8774 [1]	— / 498	887	2571 [1]	— / 146	260
	150	9638 [1]	— / 747	904	2824 [1]	— / 219	265
	200	10205 [1]	— / 1197	990	2990 [1]	— / 351	290
	250	14146 [1]	— / 2242	1109	4145 [1]	— / 657	325
	300	17877 [1]	— / 2229	1024	5238 [1]	— / 653	300
	350	18556 [1]	— / 2160	1535	5437 [1]	— / 633	450
	400	21279 [1]	— / 2449	1621	6235 [1]	— / 716	475
	450	24719 [1]	— / 2058	—	7243 [1]	— / 603	—

Description	Soft Start Frame	Heat Dissipation	
		BTUs/hr	Watts
Combination Altistart 48 Soft Start (includes shorting contactor as standard)	10	51	15
	15	51	15
	20	85	25
	25	85	25
	30	85	25
	40	85	25
	50	85	25
	60	85	25
	75	85	25
	100	85	25
	125	85	25
	150	171	50
	200	171	50
	250	171	50
	300	273	80
	350	273	80
	400	273	80
	500	273	80

[1] A 3% line reactor is standard in these drive sizes.

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Structure Steel Gauge Information

Model 6 MCCs are totally enclosed, dead front, free standing assemblies. All steel is in compliance with UL 845/CSA requirements:

Part Description	Thickness (Gauge)
Corner Channels	12
Back Plates: 20–30 in. wide	16
35 in. wide	14
End Closing Plates	16 (NEMA/EEMAC Type 3R: 12 gauge)
Unit Doors	14 and 16 (NEMA/EEMAC Type 3R: 12 gauge on outer door)
Side Channels	11
Top and Bottom Frame	12
Top and Bottom Plates	14
Base Channels	10
Lifting Angle	7

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PowerGard™ Series C 18-Pulse Enclosed Drive Controllers

Combining adjustable speed drive and power quality solutions



a brand of Schneider Electric

SQUARE D

PowerGard™ Series C 18-Pulse Enclosed Drive Controllers

Combining adjustable speed drive and power quality solutions

For municipal and industrial pumping applications, the Square D® brand PowerGard™ Series C 18-Pulse enclosed drive controller features the new Telemecanique® brand Altivar® 61 or 71 adjustable frequency drives/power converters. Schneider Electric's experience and expertise in power distribution and power quality measurement are combined with solid state motor control. **The result: a robust, packaged, adjustable speed drive with a clean power solution.**

PowerGard 18-Pulse drives are ideal for installations specifying "clean power" low harmonic content in compliance with IEEE 519 guidelines for harmonic mitigation. PowerGard 18-Pulse drives are UL 508C listed and are available in Type 1 general purpose or with fan filter options. PowerGard 18-Pulse drives are low voltage products available in the following ratings:

Constant torque (heavy duty ratings – 150% current limit)

- Altivar 71 power converter
- 40 HP to 450 HP, 460 V

Variable torque (normal duty ratings – 110% current limit)

- Altivar 61 power converter
- 50 HP to 500 HP, 460 V



18-Pulse enclosed drive controller

Technology makes a difference

Schneider Electric uses a patented 18-Pulse technology designed to meet IEEE 519 guidelines for harmonic control in electrical power systems. Using this technology enables PowerGard 18-Pulse drives to achieve in excess of 95% cancellation of characteristic harmonic currents. Other multi-pulse technologies vary greatly in design and the effectivity of their cancellation techniques. Many multi-pulse drives do not provide balanced cancellation of harmonic currents, which can result in only marginal harmonic mitigation.



18-Pulse assembly (bottom compartment)

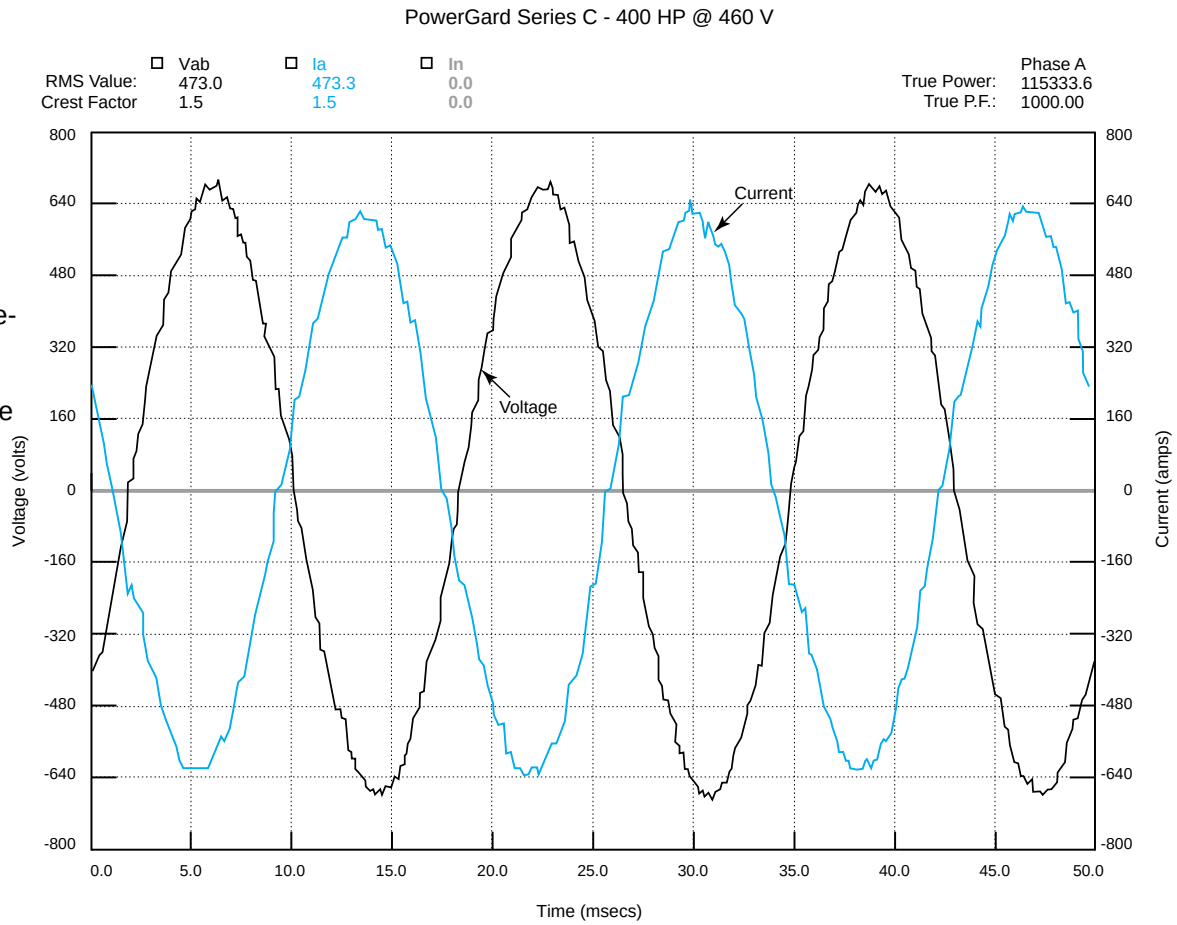
One of many harmonic mitigation strategies

With extensive power management and motor control experience, Schneider Electric provides an array of harmonic solutions using a true cost vs. benefit approach to harmonic mitigation. This proactive approach helps users tailor the correct solution ranging from "C-less" technology to active harmonic filtering for an entire system. The result is a cost-effective balance of:

- Input (RMS) current reduction
- Branch circuit conductor sizing
- Equipment size
- Installation cost
- IEEE 519 compliance

Power quality counts when you have to measure it

The voltage and current waveforms, including the harmonic spectrum shown right, is an actual field measurement taken at the input terminals of a PowerGard 18-Pulse drive rated 400 HP @ 460 V. The harmonic profile is based on power distribution with 37,000 A RMS available.



RMS Voltage = 473.0 Fundamental = 60.0 Hz
RMS Current = 437.3 True Power = 115333.56

Voltage THD = 2.17% K-Factor = 1.26
Current THD = 3.69% True P.F. = 0.97

Vab RMS Voltage			Ia RMS Current		Vab RMS Voltage			Ia RMS Current	
Hrm	Mag	Phase	Mag	Phase	Hrm	Mag	Phase	Mag	Phase
1	473.10	0.0	436.849	68.1	2	0.60	0.0	2.434	134.8
3	1.06	-171.0	7.934	-93.3	4	0.09	0.0	0.410	0.0
5	5.62	75.3	8.007	70.5	6	0.44	0.0	0.369	0.0
7	1.34	70.3	2.421	-163.4	8	0.83	0.0	0.675	0.0
9	0.58	0.0	1.294	83.9	10	1.69	159.8	1.071	84.2
11	1.71	-110.3	2.349	66.3	12	0.57	0.0	1.166	12.4
13	1.23	157.9	3.395	-88.4	14	0.24	0.0	0.648	0.0
15	0.22	0.0	0.606	0.0	16	0.48	0.0	0.674	0.0
17	3.93	11.5	6.401	162.9	18	0.19	0.0	0.408	0.0
19	4.23	-75.3	5.792	7.8	20	0.42	0.0	0.243	0.0
21	0.35	0.0	1.039	127.3	22	0.20	0.0	0.960	-96.6
23	1.51	-151.7	1.825	9.0	24	0.79	0.0	0.417	0.0
25	1.63	170.4	1.346	-163.0	26	0.87	0.0	0.671	0.0
27	0.66	0.0	0.197	0.0	28	1.17	-112.0	0.801	0.0
29	0.80	0.0	0.353	0.0	30	0.47	0.0	0.852	0.0
31	1.45	-137.7	1.215	167.4	32	0.22	0.0	0.584	0.0
33	0.47	0.0	0.201	0.0	34	0.35	0.0	0.612	0.0
35	0.96	92.7	1.573	91.9	36	0.33	0.0	0.540	0.0
37	1.45	31.1	0.834	0.0	38	0.88	0.0	0.358	0.0
39	0.47	0.0	0.791	0.0	40	0.71	0.0	0.224	0.0
41	0.36	0.0	1.398	-134.4	42	0.27	0.0	0.222	0.0
43	1.29	-65.5	0.747	0.0	44	1.06	105.7	0.338	0.0
45	0.18	0.0	0.285	0.0	46	0.91	0.0	0.505	0.0
47	0.64	0.0	0.159	0.0	48	1.00	-112.5	0.393	0.0
49	1.19	-75.5	0.756	0.0	50	0.37	0.0	0.307	0.0
51	0.32	0.0	0.399	0.0	52	0.74	0.0	0.406	0.0
53	0.48	0.0	0.280	0.0	54	0.60	0.0	0.554	0.0
55	0.78	0.0	0.800	0.0	56	0.55	0.0	0.581	0.0
57	0.45	0.0	0.349	0.0	58	0.51	0.0	0.623	0.0
59	0.17	0.0	0.268	0.0	60	0.70	0.0	0.305	0.0
61	1.07	-37.3	0.392	0.0	62	0.19	0.0	0.364	0.0
63	0.55	0.0	0.197	0.0	64	0.42	0.0	0.038	0.0
65	0.19	0.0	0.152	0.0	66	0.00	0.0	0.000	0.0

What Can the PowerGard 18-Pulse Enclosed Drive Controller Do For You?



Altivar 61/71 power converter



Expandable network cards



Intuitive graphic display terminal



High and optimized power converter performance

The Altivar 61 and 71 power converter offers evolutionary performance to meet even the most demanding applications. The power converter is optimized for motor control applications and is reliable, expandable and easy to control.

Custom performance

- Clean power (low harmonic content) for high-horsepower ratings
- Customized for specific applications
- Advanced technology platform increases reliability and uptime
- Dedicated 18-Pulse transformer/reactor and bridge rectifiers
- Altivar 61 and 71 power converters for peak performance

Ease of use

- Intuitive door-mounted graphic display screen in plain text
- Programming is clear, precise, and illustrated; diagnostics are intuitive
- Operators mounted on enclosure doors are pre-programmed to save set-up time and expense

Fully protected

- Patented 18-Pulse converter technology with premium harmonic mitigation
- 100,000 A SCCR coordinated, UL 508 listed and NEC article 409 rated
- Meets 2003 IBC and ASCE 7 standards for seismic qualification (optional)

Expandable network capabilities

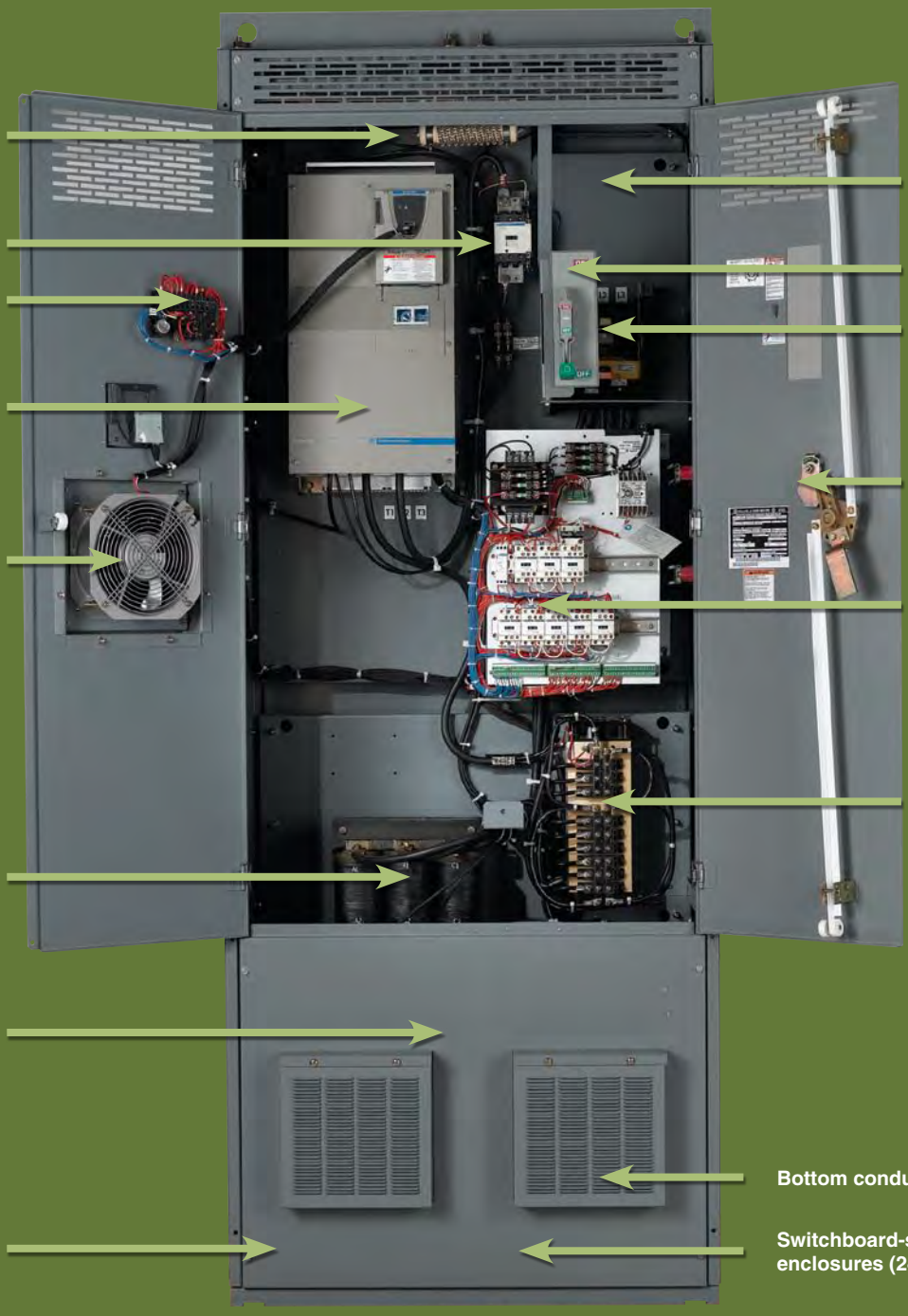
- For building automation, add Lonworks, BACNet, MetaSYS N2 or APOGEE P1 communications cards
- For industrial applications, add DeviceNet, Ethernet TCP/IP, FIPIO®, Interbus-S, Modbus® Plus, Modbus Uni-Telway or Profibus DP communication cards

Seismic qualification for new generation of building codes

1st Drive manufacturer to meet this criteria!

All PowerGard Series C 18-Pulse enclosed drive controllers meet IBC and ASCE 7 seismic qualification requirements in accordance with the ICC ES AC156 shaker table testing protocol. Many states and jurisdictions are beginning enforcement of the seismic guidelines for installed equipment contained in the IBC. The PowerGard Series C 18-Pulse enclosed drive controllers were subjected to actual shaker table tests, not just theoretical calculations for seismic ratings or obsolete requirements of the UBC. This enclosed drive controller meets the structural integrity requirements when installed to our published guidelines, and can be specified for use in applications that require an Ip = 1.5, which means operational status can be restored after a seismic event.

A Platform Engineered to Your Specifications



125 HP unit shown

Construction methodology

- Assembled in the USA
- 100,000 A symmetrical SCCR
- ANSI #49 powder-coat steel enclosures
- Seismic qualification option

Specifications for Drive Controllers

Input voltage	460 V ±10%
Displacement power factor	98% through speed range
Input frequency	50/60 Hz ± 5%
Output voltage	Three-phase output Maximum voltage equal to input voltage
Galvanic isolation	Galvanic isolation between power and control (inputs, outputs, and power supplies)
Frequency range of power converter	0.1 Hz to 500 Hz (factory setting of 60 Hz)
Torque/overtorque	VT: 110% of nominal motor torque for 60 s CT: 150% of nominal motor torque for 60 s
Current (transient)	VT: 110% of controller rated current for 60 s CT: 150% of controller rated current for 60 s
Switching frequency	Selectable from 0.5 kHz to 16 kHz. [1] Factory setting: CT: 2 kHz for 40 HP–450 HP @460 V VT: 2 kHz for 50 HP–500 HP @460 V The drive reduces the switching frequency automatically in the event of excessive heat sink temperature.
Speed reference	AI1: 0 to +10 V, Impedance = 30 kΩ. Can be used for speed potentiometer, 1 to 10 kΩ AI2: Factory setting: 4 mA to 20 mA. Impedance = 242 Ω (reassignable, X–Y range with graphic display terminal) Factory modification J10 allows 0–10 Vdc reference signal to AI2, Z = 30 kW
Frequency resolution in analog reference	0.1 for 100 Hz (11 bits)
Speed regulation	V/f control: equal to the motor's rated slip. SFVC: 10% of the motor's rate slip from 20% to 100% of nominal motor torque
Efficiency	95% at full load typical
Reference sample time	2 ms ±0.5 ms
Acceleration and deceleration ramps	0.1 to 999.9 s (definition in 0.1 s increments)
Drive controller protection	• Thermal protection of power converter • Phase loss of AC mains • Circuit breaker protected
Motor protection	• Class 10 electronic overload protection (power converter) • Class 20 bypass overload protection (with various factory engineered bypass circuits)
Graphic display terminal	Self diagnostics with fault messages in three languages; also refer to the programming manual supplied on CD with the power converter
Temperature	**Storage for all enclosures:** -13 to +149 °F (-25 to +65 °C). **Operation:** +14 to +104 °F (-10 to 40 °C). For 40 HP to 75 HP, CT and 50 HP to 100 HP, VT drives operating between 104 and 122 °F (40 and 50 °C), derate the current 2% per °C above 40 °C. For 100 HP to 450 HP, CT and 125 HP to 500 HP, VT drives operating between 104 and 122 °F (40 and 50 °C), derate the current 3.3% per °C above 40 °C
Humidity	95% with no condensation or dripping water, conforming to IEC 60068-2-3
Altitude	3,300 ft (1000 m) maximum without derating; derating of the current by 1% for each additional 330 ft (100 m)
Enclosure	NEMA Type 1 or Type 1 with fan filters
Pollution degree	Type 1, 1B: Pollution degree 2 per NEMA ICS-1 Annex A and IEC 60664-1
Operational test vibration	Conforms to IEC 60721-3-3-3M3 amplitude • 1.5 mm peak to peak from 3 Hz to 13 Hz • 1 g from 13 Hz to 200 Hz
Transit test to shock	Conforms to National Safe Transit Association and International Safe Transit Association test for packages
Operational shock	15 g, 11 ms
Seismic qualification	2003 IBC, NFPA 5000 and ASCE 7 (optional) ICC ES AC156 acceptance criteria test protocol with an importance factor of 1.5
Codes and standards	UL listed per UL 508C under category NMMS Conforms to applicable NEMA ICS, NFPA and IEC standards Manufactured under ISO 9001 standards Factory modification G10 provides Canadian cUL certification

1. On 40 HP to 75 HP CT and 50 HP to 100 HP VT controllers, above 4 kHz CT/8 kHz VT, select the next largest size drive controller. If the duty cycle does not exceed 60% (36 s maximum for a 60 s cycle), this is not necessary.

Catalog Number Explanation

Class **8839** Type **CPD T G 4 V W** Forms **A07, etc.** Series **C**

Combination Device
8839 = Circuit breaker disconnect

Design
CPD = PowerGard 18-Pulse controller

Horsepower Rating

N = 40 HP	W= 200 HP
P = 50 HP	X = 250 HP
Q = 60 HP	Y = 300 HP
R = 75 HP	Z = 350 HP
S = 100 HP	4 = 400 HP
T = 125 HP	5 = 450 HP
U = 150 HP	6 = 500 HP

Enclosure Environmental Rating
G = Type 1 general purpose
B = Type 1 with fan filters

Series Designation
C = Altivar 61/71 Power converter platform

Modifications (120+ options are available)
A07 = Hand-Off-Auto selector switch with manual speed potentiometer

Power Circuit Type
R = Barriered bypass – RVAT
S = Barriered bypass – soft start
T = Isolation and transfer
W = Combination device (drive only)
Y = Integrated bypass (IEC)
Z = Barriered bypass – full voltage

Application Type
C = Constant torque (150% current limit)
V = Variable torque (110% current limit)

Voltage Code
4 = 460/480 V, 60 Hz



Product Information

Typical dimensions

All enclosures are configured in 94.65" height and 24.5" depth standard switchboard style construction

HP @ 480 V	PowerGard Series C Enclosure Width Dimensions								
	Combination Drive Only W	Integrated Bypass Full Voltage Y		Barriered Bypass Full Voltage/ Separate Starter Z or T		Barriered Bypass Soft Start S		Barriered Bypass RVAT R	
	Total	Extender	Total	Extender	Total	Extender	Total	Extender	Total
50 to 75	36"	-	36"	20"	56"	20"	56"	42"	78"
100	36"	-	36"	20"	56"	36"	72"	42"	78"
125	36"	20"	56"	20"	56"	36"	72"	42"	78"
150	42"	20"	62"	20"	62"	36"	78"	48"	90"
200	42"	20"	62"	20"	62"	36"	78"	48"	90"
250	42"	20"	62"	20"	62"	42"	84"	54"	90"
300	48"	25"	73"	25"	73"	42"	90"	54"	102"
350	48"	25"	73"	25"	73"	42"	90"	54"	102"
400	48"	25"	73"	25"	73"	42"	90"	54"	102"
450	48" or 54"	36"	84"	36"	84"	48"	96"	54"	102"
500	48" or 54"	36"	84"	36"	84"	48"	96"	54"	102"

Power circuit description:
R – Barriered bypass with autotransformer reduced voltage starter
S – Barriered bypass with soft start
T – Isolation and transfer (separate starter)
W – Combination: Drive with disconnect means only
Y – Integrated bypass: Drive with full voltage starter in same enclosure compartment
Z – Barriered bypass: Drive with full voltage starter in separate enclosure compartment

Typical weights and estimated heat loss

PowerGard Series C – Power Circuit W							
HP @ CT rating	Weight lbs.	Estimated Heat Loss		HP @ VT rating	Weight lbs.	Estimated Heat Loss	
		Watts Loss	BTU/Hour			Watts Loss	BTU/Hour
40	1603	2478	8457	-	-	-	-
50	1603	2674	9126	50	1603	2674	9126
60	1603	2838	9686	60	1603	2838	9686
75	1603	3027	10331	75	1603	3027	10331
100	1703	4776	16301	100	1703	3756	12819
125	2070	6333	21615	125	1703	4843	16529
150	2070	6637	22652	150	2070	6637	22652
200	2086	7074	24144	200	2086	7074	24144
250	2682	9582	32703	250	2086	9582	32703
300	2682	11216	38280	300	1682	11216	38280
350	2682	11684	39878	350	2682	11684	39878
400	2682	12894	44007	400	2682	12894	44007
450	3148	13793	47076	450	3148	13793	47076
-	-	-	-	500	3148	14691	50140

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Order Number 8839BR0502R11/06

11-06 dc

Model: 30REOZK4

KOHLER. Power Systems

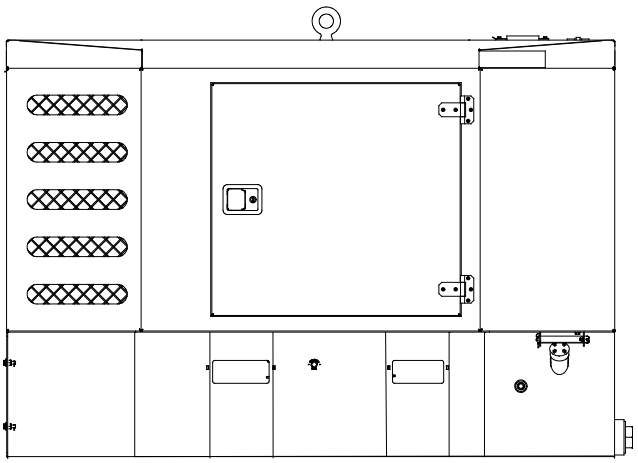
208–600 V **Diesel**

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

Tier 4 Final EPA-Certified for Stationary Emergency and Non-Emergency Applications

Ratings Range

		60 Hz
Standby:	**kW**	24–30
	kVA	24–37.5
Prime:	**kW**	22–28
	kVA	22–35



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- A one-year limited warranty covers all systems and components. Two- and five-year extended limited warranties are also available.
- Alternator features:
  - Kohler's wound field excitation system with its unique PowerBoost™ design delivers great voltage response and short-circuit capability.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Engine features:
  - Heavy-duty air cleaner with air restrictor indicator.
  - Uses cooled Exhaust Gas Regeneration (EGR) and diesel oxidation catalyst to meet Tier 4 Final without a Diesel Particulate Filter (DPF).
  - Lockable battery disconnect switch.
  - Electronic, isochronous governor.
- Other features:
  - Kohler designed controller for guaranteed system integration and remote communication. See Controller on page 3.
  - The low coolant level shutdown prevents overheating.
  - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.
  - Durable steel, sound-attenuating housing with quiet operation of 66 dB(A) @ 7 m (23 ft.) with full load at the prime rating.
  - Stainless steel hinges and lockable latches on doors.
  - 110% environmental containment basin for fuel, oil, and coolant.
  - Subbase fuel tank for 24-hour run time (minimum).
  - Customer connection panel with main circuit breaker, remote start connection, and emergency stop switch.

Generator Set Ratings

				130°C Rise Standby Rating		105°C Rise Prime Rating		105°C Rise Continuous Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
	120/208	3	60	30/37.5	104	28/35	97	28/35	97
	120/240	3	60	30/37.5	90	28/35	84	28/35	84
4D5.6	120/240	1	60	24/24	100	22/22	66	22/22	66
	277/480	3	60	30/37.5	45	28/35	42	28/35	42
	347/600	3	60	30/37.5	36	28/35	34	28/35	34

RATINGS: All three-phase units are rated at 0.8 power factor. All single-phase units are rated at 1.0 power factor. *Standby Ratings:* The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. *Prime Power Ratings:* At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. *Continuous Ratings:* At constant or nonvarying load, the number of generator set operating hours is unlimited. There is no overload capability for this rating. Ratings are in accordance with ISO-8528-1 and ISO-3046-1. For limited running time ratings, consult the factory. Obtain technical information bulletin (TIB-101) for ratings guidelines, complete ratings definitions, and site condition derates. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

Alternator Specifications

Specifications	Alternator
Manufacturer	Kohler
Type	4-Pole, Rotating-Field
Exciter type	Brushless, Wound-Field
Leads: quantity, type	12, Reconnectable 6, 600 Volt
Voltage regulator	Solid State, Volts/Hz
Insulation: Material Temperature rise	NEMA MG1 Class H 130°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Voltage regulation, no-load to full-load	Controller Dependent
One-step load acceptance	100% of Rating
Unbalanced load capability	100% of Rated Standby Current
Peak motor starting kVA: 480 V 4D5.6 (12 lead)	(35% dip for voltages below) 76

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Windings are vacuum-impregnated with epoxy varnish for dependability and long life.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.

Application Data

Engine

Engine Specifications	
Manufacturer	Kohler Diesel
Engine: model, type	KDI 1903 TCR 1.9 L, 4-Cycle Turbocharged
Cylinder arrangement	3 Inline
Displacement, L (cu. in.)	1.9 (115.9)
Bore and stroke, mm (in.)	88 x 102 (3.46 x 4.01)
Compression ratio	17:1
Piston speed, m/min. (ft./min.)	275 (905)
Main bearings: quantity, type	4, Sleeve
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	37 (49)
Cylinder head material	Cast Iron
Crankshaft material	Cast Iron
Valve material: Intake Exhaust	 Stainless Steel Stainless Steel
Governor: type, make/model	Electronic
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.5%
Frequency	Fixed
Air cleaner type, all models	Dry

Exhaust

Exhaust System	
Exhaust manifold type	Dry
Exhaust flow at rated kW, m^3/min. (cfm)	6.7 (238)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	382 (720)
Allowable back pressure, kPa (in. Hg)	Min. 7 (2.1) Max. 12 (3.5)

Engine Electrical

Engine Electrical System	
Battery charging alternator:	
Ground (negative/positive)	Negative
Volts (DC)	12
Ampere rating	80
Starter motor rated voltage (DC)	12
Battery, recommended cold cranking amps (CCA):	
Quantity, CCA rating	One, 950
Battery voltage (DC)	12

Fuel

Fuel System	
Fuel supply line, min. ID, mm (in.)	8 (0.31)
Fuel return line, min. ID, mm (in.)	6.3 (0.25)
Max. lift, fuel pump: type, m (ft.)	Mechanical, 2.5 (8.2)
Max. fuel flow, Lph (gph)	35 (9.3)
Max. return line restriction, kPa (in. Hg)	20 (5.9)
Fuel prime pump	Manual
Fuel filter	
Primary	74 Microns
Secondary	5 Microns @ 98% Efficiency
Water Separator	Yes
Recommended fuel	#2 Diesel

Lubrication

Lubricating System	
Type	Full Pressure
Oil pan capacity, L (qt.)	8.4 (8.9)
Oil pan capacity with filter, L (qt.)	8.7 (9.2)
Oil filter: quantity, type	One, Cartridge
Oil cooler	Water-Cooled

Application Data

Cooling

Radiator System	
Ambient temperature at standby rating, °C (°F)	45 (113)
Ambient temperature at prime power and continuous ratings, °C (°F)	50 (122)
Engine jacket water capacity, L (gal.)	4.2 (1.1)
Radiator system capacity, including engine, L (gal.)	17.2 (4.5)
Engine jacket water flow, Lpm (gpm)	57 (15)
Heat rejected to cooling water at rated kW, dry exhaust, certified, kW (Btu/min.)	28 (1592)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	483 (19)
Fan, kWm (HP)	2.7 (3.6)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)

Operation Requirements

Air Requirements	
Radiator-cooled cooling air, m^3/min. (scfm)‡	96.3 (3400)
Combustion air, m^3/min. (cfm)	2.4 (86.3)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	28 (1592)
Alternator, kW (Btu/min.)	6.5 (369)

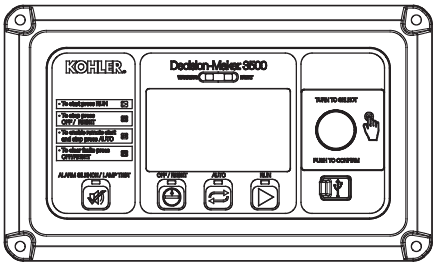
‡ Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

Fuel Consumption	
Diesel, Lph (gph) at % load	**Standby Rating**
100%	10.5 (2.8)
75%	7.8 (2.1)
50%	5.4 (1.4)
25%	3.1 (0.8)
Diesel, Lph (gph) at % load	**Prime Rating**
100%	9.8 (2.6)
75%	7.3 (1.9)
50%	5.0 (1.3)
25%	2.9 (0.8)
Diesel, Lph (gph) at % load	**Continuous Rating**
100%	9.8 (2.6)
75%	7.3 (1.9)
50%	5.0 (1.3)
25%	2.9 (0.8)

Sound Enclosure

- Durable steel, sound-attenuating housing with quiet operation of 66 dB(A) @ 7 m (23 ft.) with full load at the prime rating.
- Internal-mounted silencer and flexible exhaust connector.
- Fade-, scratch, and corrosion-resistant Kohler® Power Armor™ cream beige automotive-grade textured finish.
- Stainless steel hinges and lockable latches on doors.
- Acoustic insulation that meets UL 94 HF1 flammability classification and repels moisture absorption.
- 110% environmental containment basin for fuel, oil, and coolant.

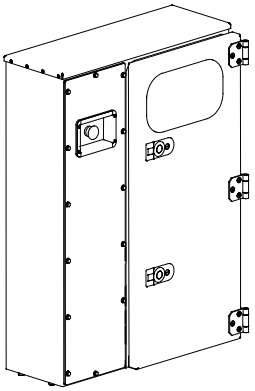
Controller



Decision-Maker® 3500 Controller
Provides advanced control, system monitoring, and system diagnostics for optimum performance and compatibility.

- Digital display with adjustable contrast and menu control provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or serial configuration
- Controller supports Modbus® protocol
- Integrated hybrid voltage regulator with ±0.5% regulation
- Potted circuitry for protection from vibration and debris
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Customer Connection Panel



- Viewable generator set controller with security cover
- Emergency stop switch
- Main line circuit breaker
  - Reconnectable models: Rating 150 amps, field adjustable based on voltage selected
  - 600 Volt models: Rating 60 amps, field adjustable
- Power connections for Available Options (battery charger and block heater)
- Remote start connection

Fuel Tank

- Subbase fuel tank for 24-hour run time (minimum).
- Fuel tank includes the fuel level gauge, fuel fill with lockable cap, and normal/emergency vents.
- Both the inner and outer tanks have emergency relief vents.
- The secondary containment tank's construction protects against fuel leaks or ruptures. The inner (primary) tank is sealed inside the outer (secondary) tank. The outer tank contains the fuel if the inner tank leaks or ruptures.

Fuel Tank Specifications	
Fuel tank capacity	293 L (77 gal.)

Modbus® is a registered trademark of Schneider Electric.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales and service outlet in the
US and Canada, phone 1-800-544-2444
KOHLERPower.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Standard Features

- Alternator Protection
- Battery, Battery Rack, and Cables
- Integral Vibration Isolation
- Local Emergency Stop Switch
- Oil Drain Extension
- Operation and Installation Literature

Available Options

Approvals and Listings

❑ CSA Approval
❑ UL 2200 Listing (requires standard skid)

Controller

❑ 15-Relay Dry Contact

Electrical System

❑ Battery Charger, Equalize/Float Type
❑ Cold Weather Package
(includes block heater and battery heater pad, wrap, and wiring)

Fuel System

❑ Two-Way Fuel Valve
(for connection of a user-supplied external fuel tank)

Skid

❑ Field Draggable Skid
(heavy gauge steel skid with integrated drains and pull bars)
❑ Load Lugs (one per phase #6–350MCM, 400 amp)

Miscellaneous

❑ Engine Fluids Added
❑ Spark Arrestor

Literature

❑ General Maintenance
❑ NFPA 110
❑ Overhaul
❑ Production

Warranty

❑ 2-Year Basic
❑ 2-Year Prime
❑ 5-Year Basic
❑ 5-Year Comprehensive

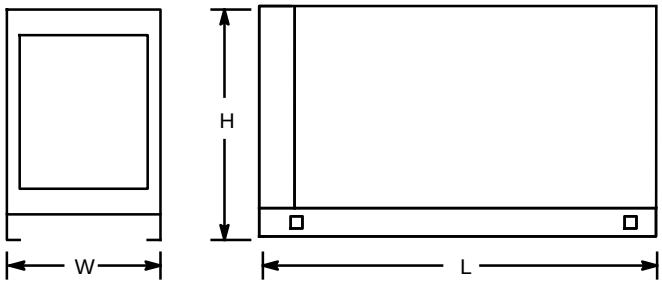
Other Options

❑ _____
❑ _____
❑ _____
❑ _____
❑ _____

Dimensions and Weights

Overall Size, L x W x H, mm (in.):	2206 x 1016 x 1622
Standard Skid	(86.9 x 40.0 x 63.9)
Weight, with engine fluids (no fuel), kg (lb.):	1397 (3080)

Overall Size, L x W x H, mm (in.):	2489 x 1016 x 1622
Field Draggable Skid	(98.0 x 40.0 x 63.9)
Weight, with engine fluids (no fuel), kg (lb.):	1461 (3220)



NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

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Appendix **E**

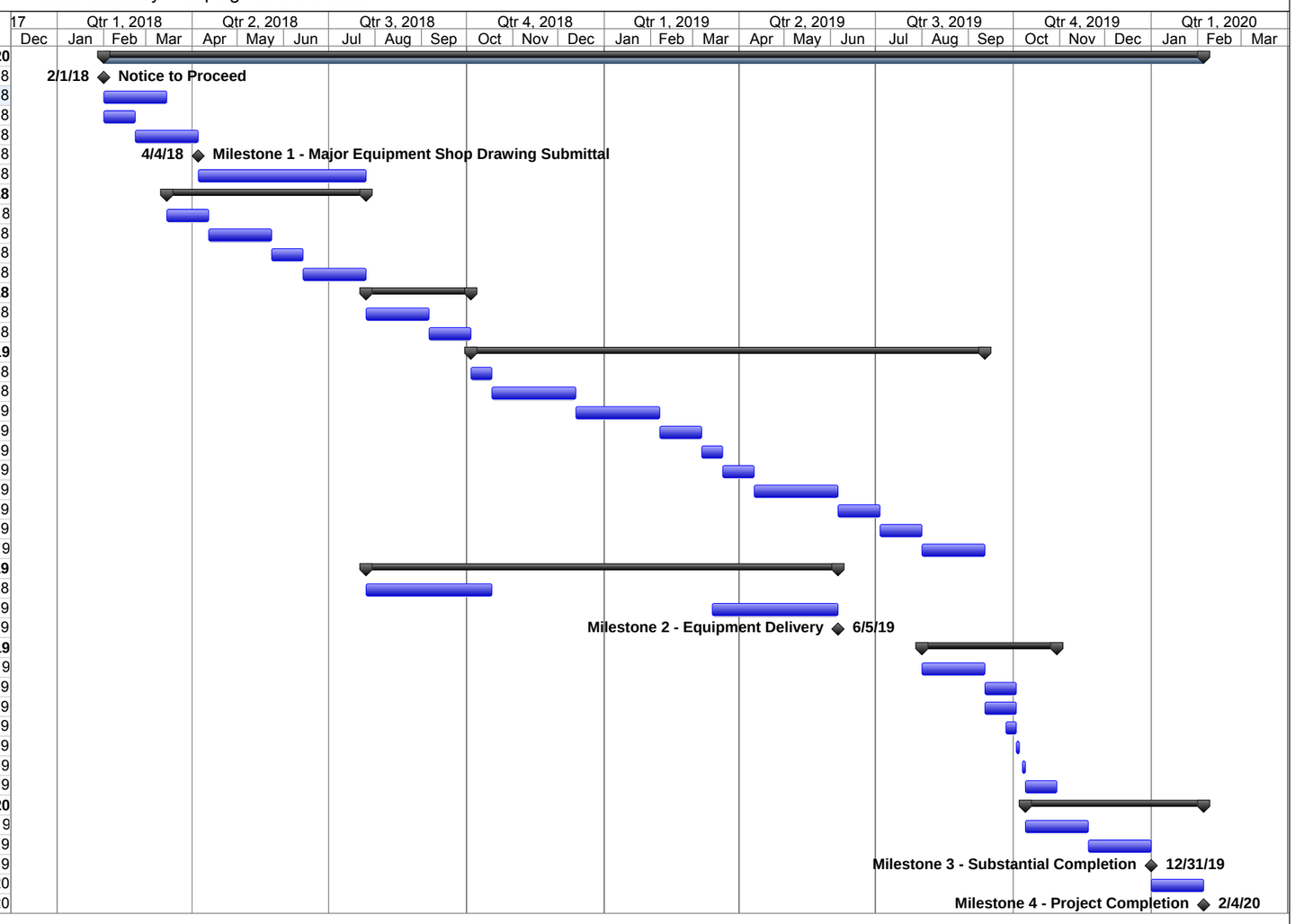
Construction Schedule

Los Angeles Department of Public Works
Bureau of Engineering

Venice Auxiliary Pumping Plant Schedule

Last Updated:Fri 11/6/15 1:28 PM

ID	Task Name	Duration	Start	Finish
1	**Construction Phase**	**524 days**	**Thu 2/1/18**	**Tue 2/4/20**
2	Notice to Proceed	0 days	Thu 2/1/18	Thu 2/1/18
3	Mobilization	30 days	Thu 2/1/18	Wed 3/14/18
4	Critical Submittals (Excavation, Shoring, Dewatering, Odor Control)	15 days	Thu 2/1/18	Wed 2/21/18
5	Review Critical Submittals	30 days	Thu 2/22/18	Wed 4/4/18
6	Milestone 1 - Major Equipment Shop Drawing Submittal	30 days	Thu 2/22/18	Wed 4/4/18
7	Shop Drawing Review/Resubmittal/Re-Review	80 days	Thu 4/5/18	Wed 7/25/18
8	**Excavation/Sheeting & Shoring**	**95 days**	**Thu 3/15/18**	**Wed 7/25/18**
9	Install Dewatering System	20 days	Thu 3/15/18	Wed 4/11/18
10	Install Shoring System & Cofferdam	30 days	Thu 4/12/18	Wed 5/23/18
11	Install Temporary Odor Control	15 days	Thu 5/24/18	Wed 6/13/18
12	Excavate	30 days	Thu 6/14/18	Wed 7/25/18
13	**Foundation Construction**	**50 days**	**Thu 7/26/18**	**Wed 10/3/18**
14	Place Pile for Foundation Support	30 days	Thu 7/26/18	Wed 9/5/18
15	Form, Seal, and Construct Foundation	20 days	Thu 9/6/18	Wed 10/3/18
16	**Construct Pump Station**	**245 days**	**Thu 10/4/18**	**Wed 9/11/19**
17	Form and Pour Base Slab	10 days	Thu 10/4/18	Wed 10/17/18
18	Form and Pour Walls	40 days	Thu 10/18/18	Wed 12/12/18
19	Form and Pour Elevated Slabs and Wet Well Contouring	40 days	Thu 12/13/18	Wed 2/6/19
20	Mechanical Equipment & Piping	20 days	Thu 2/7/19	Wed 3/6/19
21	Form and Pour Slab on Grade	10 days	Thu 3/7/19	Wed 3/20/19
22	Backfill and Temporary Pave	15 days	Thu 3/21/19	Wed 4/10/19
23	Construct Electrical Building	40 days	Thu 4/11/19	Wed 6/5/19
24	Electrical Equipment & Wiring	20 days	Thu 6/6/19	Wed 7/3/19
25	I&C/Programming	20 days	Thu 7/4/19	Wed 7/31/19
26	New Pumping Plant - Start-up/Field Testing	30 days	Thu 8/1/19	Wed 9/11/19
27	**Milestone 2 - Equipment Delivery**	**225 days**	**Thu 7/26/18**	**Wed 6/5/19**
28	Mechanical Equipment Delivery	60 days	Thu 7/26/18	Wed 10/17/18
29	Electrical Equipment Delivery	60 days	Thu 3/14/19	Wed 6/5/19
30	Milestone 2 - Equipment Delivery	0 days	Wed 6/5/19	Wed 6/5/19
31	**Install Diversion Structure**	**64 days**	**Thu 8/1/19**	**Tue 10/29/19**
32	Excavate	30 days	Thu 8/1/19	Wed 9/11/19
33	Construct Junction Structure Shell Around Influent CIS	15 days	Thu 9/12/19	Wed 10/2/19
34	Construct Modular Channel Insert For Junction Structure	15 days	Thu 9/12/19	Wed 10/2/19
35	Lay Piping	5 days	Thu 9/26/19	Wed 10/2/19
36	Cut Influent CIS Line & Place Modular Insert	2 days	Thu 10/3/19	Fri 10/4/19
37	Testing of Pipeline	2 days	Mon 10/7/19	Tue 10/8/19
38	Backfill and Final Pave	15 days	Wed 10/9/19	Tue 10/29/19
39	**Pump Station Integration**	**85 days**	**Wed 10/9/19**	**Tue 2/4/20**
40	SCADA Integration of New & Existing Pump Plants	30 days	Wed 10/9/19	Tue 11/19/19
41	Start-up/Field Testing/Commissioning	30 days	Wed 11/20/19	Tue 12/31/19
42	Milestone 3 - Substantial Completion	0 days	Tue 12/31/19	Tue 12/31/19
43	Punchlist	25 days	Wed 1/1/20	Tue 2/4/20
44	Milestone 4 - Project Completion	0 days	Tue 2/4/20	Tue 2/4/20



Project: VAPP - Preliminary Design
Date: Fri 11/6/15

Task	Summary	Inactive Summary	Manual Summary Rollup	Finish-only			
Split	Inactive Task	Manual Task	Manual Summary	Progress			
Milestone	Inactive Milestone	Duration-only	Start-only	Deadline			

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Appendix **F**

Class “C” Construction Cost Estimate

BUREAU OF ENGINEERING
WASTEWATER CONVEYANCE ENGINEERING DIVISION (WCED)
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: Venice Axiliary Pumping Plant

Scope: This project provides for design and construction of the new Venice Auxiliary Pumping Plant (VAPP) at the Venice Pumping plant (VPP). The facility will improve the reliability of the system by providing additional pumps.

Work Order: SZC12923 Client Dept.: Bureau of Sanitation

Project Manager: Abid Chowdhry Project Engineer: Hassan Masoud

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
Diversion Structure	LS	1	$653,000	$653,000
Site work	LS	1	$393,000	$393,000
Earthwork, Cofferdams, Shoring, Dewatering	LS	1	$1,740,000	$1,740,000
Site Restoration	LS	1	$108,000	$108,000
Yardpipe	LS	1	$219,000	$219,000
Wet Valve Vault - Concrete	LS	1	$811,000	$811,000
Valve Vault Concrete	LS	1	$254,000	$254,000
Submersible Pumps, Motors & VFD's	EACH	3	$930,000	$2,790,000
Wet Well /Valve Vault Mechanical	LS	1	$330,000	$330,000
Diversion Structure & Tunnel - Structural	LS	1	$650,000	$650,000
Electric Building - Structure	LS	1	$856,000	$856,000
Electric Building - Thermal & Moisture Protection	LS	1	$44,000	$44,000
Electric Building - Finishes	LS	1	$60,000	$60,000
Electric Building - MEP	LS	1	$555,000	$555,000
VPP - Electrical	LS	1	$260,000	$260,000
VPP - Emergency Generator	EACH	1	$660,000	$660,000
Subtotal (1)				**$10,383,000**

Mobilization - 0% to 7% of Subtotal (1) **Used 7%**	$727,000
Permits Allowances - 1% to 3% of Subtotal (1) **Used 2%**	$208,000
Other Allowances - 5% of Subtotal (1) **Used 5%**	$520,000
Subtotal (2)	**$11,838,000**
Estimating Contingency - 0% to 50% of Subtotal (2): **Used 15%**	$1,776,000
Subtotal (3)	**$13,614,000**
Escalation - 3% per year of Subtotal (3) **Used 12% for Construction in 2018**	$1,634,000
Subtotal (4)	**$15,248,000**
Construction Contingency - 5% to 20% of Subtotal (4) - **Used 5%**	$763,000
Total Estimated Project Construction Cost (2017 Escalated Costs)	**$16,011,000**
Right of Way Cost (Acquisition of the lot next to Venice Pumping Plant)	**$2,200,000**

Notes: Estimating contingency is reduced to 15% from 20%., construction contingency is reduced to 5% from 10% per Bureau of Sanitation instructions.

Prepared by: Dan Schottlander Date: 09/28/2015

Checked by: Abid Chowdhry Date: 09/28/2015

Approved by: Date:

Client Approval: Date:

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Appendix **G**

List of Specifications for Detailed Design

		SPECIFICATION
Division	SPEC	TITLE
01	01563	Pollution Control - Suwage Spill Prevention and Response Require
01	01571	Stormwater Pollution Control Measure for Construction Activities
01	01572	Construction and Demolition Waste Management
01	01573	Excavation shoring, Forms and Falsework
01	01711	Site Investigation
01	01712	Subsurface Data
01	01721	Mobilization
01	01722	Surveying
01	01723	Right-of-Way
01	01732	Additional Potholing
01	01740	Removal, Cleanup and Demobilization
02	02210	Clearing, Brubbing and Stripping
02	02220	Site Demolition
02	02235	Dewatering
02	02237	Sewer Bypassing
02	02240	Sheeting, Shoring, and Bracing Systems
02	02245	Permanent Earth Anchors
02	02310	Earthwork
02	2330	Soil Stabilization
02	02455	Cast-In-Place Drilled Piles
02	02460	Concrete Filled Steel Pipe Piles
02	02465	Prestressed Concrete Piles
02	02470	Structural Steel Piles
02	02475	Augered Cast-In-Place Piles
02	02510	Water Distribution
02	02515	Water Pipeline Testing and Disinfection
02	02525	Sanitary Sewer System Testing
02	02530	Natural Gas Distribution
02	02545	Storm Drain System
02	02550	Lined Reinforced Concrete Pipe
02	02560	Reinforced Concrete Pressure Pipe - Without Cylinder
02	02565	Reinforced Concrete Cylinder Pipe
02	02580	Reinforced Polymer Mortar Pipe (RPMP)
02	02585	Maintenance Hole and Precast Vault Construction
02	02590	Cleaning of Host Pipe
02	02710	Yard Work and Street Work
02	02730	Permeable Paving
02	02810	Irrigation System
02	2820	Sliding Gates and Operators
02	02821	Chain Link Fenceing and Gates
02	02840	Concrete Wheel Bumpers
02	02848	Parking Appurtenances
02	02870	Site Furnishings
02	02900	Landscaping

		SPECIFICATION
Division	SPEC	TITLE
02	02920	Lawns
02	02930	Landscape Maintenance
02	02939	Plant Protection and Pruning
03	03100	Concrete Formwork
03	03200	Reinforcing Steel
03	03250	Concrete Accessories
03	03290	Joints in Concrete
03	03300	Cast-In-Place Concrete
03	03302	Under Slab Vapor Barrier / Retarder
03	03315	Grout
03	03370	Concrete Curing
03	03400	Precast Concrete
03	03740	Concrete Repair
04	04270	Glass Unit Masonry
04	04400	Stone Masonry
05	05120	Structural Steel
05	05300	Metal Deck
05	05400	Cold Formed (Light) Metal Framing
05	05500	Miscellaneous Metalwork
05	05510	Metal Stairs
05	05520	Handrails and Railings
05	05530	Fabricated Grating
06	06100	Rough Carpentry
06	06400	Custom Casework
06	06610	Glass Fiber and Resin Fabrications
07	07110	Membrane Waterproofing
07	07120	Fluid-Applied Waterproofing
07	07160	Bituminous Dampproofing
07	07181	Above Grade Waterproofing Sealer Treatment
07	07182	Flooring/Paving Sealer Treatment
07	07183	Elastomeric Deck Coating
07	07190	Vapor Retarder
07	07210	Thermal and Acoustical Insulation and Firestopping
07	07211	Building Insulation
07	07250	Sprayed-On Fireproofing
07	07290	Waterproofing
07	07311	Asphalt Shingles Roofing
07	07321	Clay Tile Roofing
07	07500	Membrane Roofing
07	07510	Built-up Bituminous Roof
07	07521	Cap-Sheet Roofing
07	07551	Single-Ply Roofing
07	07552	Built-Up Roofing
07	07600	mf Flashing and Sheet Metal

		SPECIFICATION
Division	SPEC	TITLE
07	07600	ww Flashing and Sheet Metal
07	07610	mf Standing Seam Metal Roofing
07	07660	mf Rehabilitation of Clay Tile Roof
07	07720	ww Roof Accessories
07	07810	mf Simulated Skylight
07	07810	ww Domed Skylights
07	07820	ww Metal Framed Skylights
07	07830	mf Roof Hatches
07	07840	mf Firestopping
07	07900	ww Joint Sealants
07	07920	mf Caulking and Sealants
08	08110	mf Metal Doors and Frames
08	08110	ww Steel Doors and Frames
08	08210	mf Wood Doors
08	08213	mf Plastic Faced Wood Doors
08	08305	mf Access Panels
08	08317	mf Blast Doors and Frames
16	16010	Wastewater Facilities General Electrical Requirements
16	16020	Municipal Facilities General Electrical Requirements
16	16030	Wastewater Facilities Electrical Testing Requirements
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16	16140	Cable Trays
16	16150	Conductors, 600 Volts and Below
16	16160	Conductors
16	16170	Cabinets and Enclosures
16	16180	Wiring Devices
16	16190	Electrical Identification
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16	16270	Service and Distribution Switchboard
16	16280	Short Circuit and Coordination Report
16	16290	Municipal Facilities Grounding Systems
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16	16310	Variable Frequency Drive Units
16	16320	Transformers
16	16330	Panelboards
16	16340	Low Voltage Motor Control
16	16360	Municipal Facilities Lighting
16	16370	Wastewater Facilities Lighting
16	16400	Lightning Protection System

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16	16430	Life Safety Fire Alarm Systems
16	16440	Security Systems
16	16460	Closed Circuit Television
16	16490	Electric Motors
16	16550	Contactors, Relays and Time Switches
16	16560	Municipal Facilities Electrical Systems Commissioning
16	16570	Municipal Facilities Electrical Testing Requirements

ARCADIS

Appendix **H**

Preliminary Drawing List for Detailed Design

			DRAWING
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GENERAL		G-01	VICINITY MAP, LOCAITON MAP, BENCHMARK & BASIS OF BEARINGS
GENERAL		G-02	INDEX OF DRAWINGS, LIST OF ABBREVIATIONS AND SYMBOLS
GENERAL		G-03	GENERAL NOTES
GENERAL		G-04	FLOW DIAGRAM
DEMOLITION		D-01	DEMOLITION PLAN
CIVIL		C-01	TOPOGRAPHIC MAP, SITE LAYOUT & SURVEY DATA
CIVIL		C-02	CONSTRUCTION STAGING PLAN
CIVIL		C-03	SITE FINAL SURFACE & GRADING PLAN
CIVIL		C-04	66" SEWER JUNCTION STRUCTURE AND INFLUENT PIPE PLAN AND PROFILE
CIVIL		C-05	NEW JUNCTION STRUCTURE PLAN AND SECTION
CIVIL		C-06	42" DISCHARGE FORCE MAIN PLAN AND PROFILE
CIVIL		C-07	SITE PIPING PLAN
CIVIL		C-08	PIPE CONNECTION DETAILS
CIVIL		C-09	DRIVEWAY, SIDEWALK, CURB AND GUTTER DETAILS
CIVIL		C-10	DISCHARGE FORCE MAIN CONNECTION DETAILS & THRUST BLOCK
CIVIL		C-11	SITE FINAL SURFACE AND CURB AND GUTTER DETAILS
CIVIL		C-12	COFFERDAM OPTION 1 - SCHEMATIC
CIVIL		C-13	COFFERDAM OPTION 2 - SCHEMATIC
CIVIL		C-14	COFFERDAM OPTION 3 - SCHEMATIC
CIVIL		C-15	COFFERDAM OPTION 4 - SCHEMATIC
CIVIL		C-16	MISCELLANEOUS CIVIL DETAILS/METHANE CAPTURE
CIVIL		C-17	MISCELLANEOUS CIVIL DETAILS
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LANDSCAPE		L-02	CONSTRUCTION PLAN
LANDSCAPE		L-03	CONSTRUCTION DETAILS 1
LANDSCAPE		L-04	CONSTRUCTION DETAILS 2
LANDSCAPE		L-05	CONSTRUCTION DETAILS 3
LANDSCAPE		L-06	IRRIGATION PLAN
LANDSCAPE		L-07	IRRIGATION DETAILS
LANDSCAPE		L-08	PLANTING PLAN
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ARCHITECTURAL		A-03	ELECTRICAL ROOM LOWER FLOOR PLAN
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ARCHITECTURAL		A-12	ELECTRICAL BUILDING FINISH SCHEDULE
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STRUCTURAL		S-02	STRUCTURAL TYPICAL DETAILS 1
STRUCTURAL		S-03	STRUCTURAL TYPICAL DETAILS 2
STRUCTURAL		S-04	PUMPING FACILITY AND VALVE VAULT - BOTTOM PLAN
STRUCTURAL		S-05	PUMPING FACILITY AND VALVE VAULT - TOP PLAN
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STRUCTURAL		S-15	DIVERSION STRUCTURE BOTTOM AND TOP PLAN
STRUCTURAL		S-16	DIVERSION STRUCTURE SECTIONS AND DETAILS 1
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STRUCTURAL		S-18	METERING VAULT PLAN AND SECTIONS
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MECHANICAL		M-02	PUMP STATION FLOOR PLAN AND SECTIONS
MECHANICAL		M-03	PUMP STATION MISCELLANEOUS SECTIONS 1
MECHANICAL		M-04	PUMP STATION MISCELLANEOUS SECTIONS 2
MECHANICAL		M-05	MECHANICAL TYPICAL DETAILS 1
MECHANICAL		M-06	MECHANICAL TYPICAL DETAILS 2
HVAC		H-01	HVAC GENERAL NOTES, LEGEND AND SYMBOLS
HVAC		H-02	PUMP STATION WET WELL HVAC PLAN
HVAC		H-03	ELECTRICAL ROOM HVAC PLAN
HVAC		H-04	HVAC SECTIONS 1
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PLUMBING		P-01	PLUMBING GENERAL NOTES, LEGEND, SYMBOLS AND SCHEDULES
PLUMBING		P-02	ELECTRICAL ROOM PLUMBING PLAN
PLUMBING		P-03	PLUMBING DETAILS 1
ELECTRICAL		E-01	ELECTRICAL LEGEND 1
ELECTRICAL		E-02	ELECTRICAL LEGEND 2
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ELECTRICAL		E-08	EXISTING PLANT POWER PLAN
ELECTRICAL		E-09	AUX PLANT POWER PLAN 1
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ELECTRICAL		E-11	AUX PLANT LIGHTING AND GROUNDING PLAN
ELECTRICAL		E-12	PANELBOARD SCHEDULES
ELECTRICAL		E-13	MOTOR CONTROL SCHEMATICS
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INSTRUMENTATION		I-02	PUMP STATION P&ID
INSTRUMENTATION		I-03	SUMP PUMP P&ID
INSTRUMENTATION		I-04	EXHAUST AND SUPPLY FANS P&ID
INSTRUMENTATION		I-05	SYSTEM BLOCK DIAGRAM
INSTRUMENTATION		I-06	CONTROL PANEL LAYOUT
INSTRUMENTATION		I-07	CONTROL PANEL SCHEMATICS
INSTRUMENTATION		I-08	CONTROL ROOM LAYOUT

APPENDIX F
VENICE DUAL FORCE MAIN EXHIBIT

SS#10
SS#11
Marquesas
SS#9
Venice Pumping Plant
SS#8
Via Marine
SS#7
Marina Del Rey
Portion in County of LA
SS#6
SS#5
Least Tern Nesting Area
Marina Del Rey Entrance Channel
SS#4
Pacific Avenue
SS#3
SS#2
SS#1
Dockweiler State Beach
Vista Del Mar
Diversion Structure

- Air Relief Valve
- Air Vacuum Valve/Maintenance Vault
- Pumping Plant
- Diversion Structure
- Shaft Location
- NOS
- OpenTrench
- Jacking
- Other Surface Activities
- Microtunneling
- Water

0 0.025 0.05 0.1 0.15
Miles

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PREPARED BY GIS MAPPING DIVISION

ERIC GARCETTI
MAYOR

PROJECT: VENICE DUAL FORCE MAIN
W.O. SZC11631

CITY OF LOS ANGELES

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APPENDIX G
GRAND CANAL CONCEPTUAL PLAN-HYDROLOGY PLAN

GRAND CANAL CONCEPTUAL PLAN - HYDROLOGY MODELING

Prepared for

Psomas Ltd

Prepared by

Philip Williams & Associates, Ltd.

October 2007

PWA REF. # 1898

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1. INTRODUCTION

This appendix describes the numerical modeling to evaluate the hydrologic alternatives for the Grand Canal Conceptual Plan. The Environmental Fluid Dynamics Code (EFDC) model (Hamrick 1992, Tetra Tech 2002) was configured to evaluate different system configurations and hydrologic scenarios. The results of the modeling were used to determine how well the alternatives met the project objectives and how well they compared with existing conditions.

The hydrologic objectives of the project are:

- To maximize tidal range within Grand Canal;
- To reduce residence time within Grand Canal;
- To maintain the existing level of flood protection along Grand Canal and Ballona Lagoon.

The system configuration termed 'Existing Conditions' in this study is not the actual configuration present today. The City of Los Angeles stipulated that the proposed Marina del Rey Tide Gates Rehabilitation (LADPW 2007) be treated as existing conditions since this project is being implemented.

2. CONCLUSIONS

- Under Existing Conditions, the average tide range in Grand Canal varies between -1.3 ft MSL and 1.9 ft MSL from mid-April to mid-October and between -1.3 ft MSL and 0.3 ft MSL from mid-October to mid-April. The minimum water level is determined by the bed elevation as Grand Canal dries out at the lowest tides. The maximum water level is determined by the Marina del Rey tide gates' operational setting.

- The proposed Operational Alternative, which dictates reduced water levels only when rainfall is predicted, decreases the total duration of the reduced tidal range within Grand Canal from 50% annually to less than 20%. It also reduces the total duration of periods when high tide water levels vary from one tide to the next.

- Planned rehabilitation of the Marina del Rey tide gates has sufficient conveyance capacity that water levels in the Grand Canal closely follow oceanic tides, except when limited by bed elevation or tide gate closures. Therefore, improvements in tidal range resulting from any Structural Alternative would be minimal.

- To flush the Venice Canals, the Washington St. culverts are opened for 2-6 hours approximately twice a week. When these culverts are open, high tide and low tide in the Grand Canal are each damped by 0.3 to 0.6 ft.

- During the 50-year flood event, predicted water levels in the Grand Canal peak at 2.2 ft MSL and drain completely on the subsequent low tide.

- During Existing Conditions Dry Mode gate operations, average residence time in Ballona Lagoon and Grand Canal is just longer than one tidal cycle. Mean residence time increases by a factor of three during Wet Mode gate operations.

- By reducing the duration of restricted tidal range and residence time, the Operational Alternative would reduce the duration of freshwater inundation following flood events.

3. MODELING SETUP

3.1 HYDROLOGIC SCENARIOS

The Grand Canal is exposed to oceanic tides via tide gates at the mouth of Ballona Lagoon that connects to Marina del Rey and Santa Monica Bay. As such, the configuration of the Marina del Rey tide gates is the primary determinant of the water levels in the Grand Canal. Observations have indicated that water levels within the Grand Canal and Ballona Lagoon, the waterway seaward of the Canal, change nearly uniformly throughout the Canal and Lagoon with minimal spatial variation. Observed water levels from NOAA (Station ID 9410660) for the two-week spring-neap period from July 7 to July 21, 2006 were used as the open boundary condition forcing the model in Santa Monica Bay.

Two hydrologic scenarios were considered for each alternative:

1. no stormwater discharge; and
2. the extreme flood corresponding to the 50-year, 96-hour event.

These two scenarios bound the range of conditions for which the system is designed. The discharge for the flood scenario was estimated according to the County of Los Angeles Hydrology Manual (LADPW 2006) and stormwater sewer data provided by the City of Los Angles staff.

3.2 SYSTEM CONFIGURATION

3.2.1 Existing Conditions

The system configuration termed ‘Existing Conditions’ is not the actual configuration on the ground today. Rather, the City of Los Angeles stipulated that the proposed Marina del Rey Tide Gates Rehabilitation be treated as existing conditions for this study since this project is already being implemented. The physical specifications and operational plan for this rehabilitation plan were determined from the design drawings (LADPW 2007) and incorporated into the model. The operational plan calls for changing the cutoff water level for the automatic closure of the Marina del Rey tide gates twice a year to provide greater tide range during the summer and smaller tide range and increased flood protection during the winter. The maximum design water level is 2.7 feet Mean Sea Level (MSL). The specifications for the two modes are:

- **Dry Mode** – From mid-April to mid-October, the gates are closed when the Marina water level exceeds 2.25 feet MSL and the Marina water level is more than 0.25 feet higher than the Ballona Lagoon water level.

- **Wet Mode** –From mid-October to mid-April, the gates are closed when the Marina water level exceeds 0.0 feet MSL and the Marina water level is more than 0.25 feet higher than the Ballona Lagoon water level.

In both modes, the gates re-open when Marina water levels drop below Lagoon water levels.

3.2.2 Operational Alternative

The proposed Operational Alternative altered the Marina del Rey tide gate operations so that the Wet Mode is only implemented in response to storm forecasts. An analysis of 13 years of daily rainfall in Santa Monica[1] provided a hindcast estimate of the annual frequency at which the gates would be operated in Wet Mode. These estimates can be compared to Existing Conditions, which would be in Wet Mode for 50% of the time (six months out of the year). If the Wet Mode was implemented for two days on either side of any rainfall 0.25 inches or greater, the gates would have been set to Wet Mode for an average of 13% of the 13-year precipitation record. For the driest (2002) and wettest (2005) water years of this record, Wet Mode would have been in effect 7% and 20% of the time, respectively.

3.2.3 Structural Alternative

Initial modeling demonstrates that the Existing Conditions of the Marina del Rey tide gates provided sufficient conveyance capacity to enable water levels landward of the culvert to nearly match the oceanic tidal range, excepting water levels above the cutoff elevation. A structural alternative to further expand the capacity of the gates would likely incur significant costs for minimal gain in tidal range. Therefore, no further modeling of the structural alternative was undertaken and structural changes to the Marina del Rey tide gates are not recommended.

3.3 WASHINGTON ST. CULVERTS AND VENICE CANALS

For all results presented in section 5, the Washington Street culverts, which connect Grand Canal to the Venice Canals, were closed. Personal communication with Mariposa Landscaping, the company that operates the culverts, indicates that that they are only open between 2 to 6 hours for 1 to 3 times a week. To test the effect of having these gates open, a sensitivity analysis was conducted to compare water levels between cases when the culverts were either open or closed throughout the entire simulation period. When the culverts were open, high tide water levels

[1] CIMIS Station #99 (Santa Monica) daily precipitation data for water year 1994 to water year 2006.

decrease and low tide water levels increase by a similar magnitude of 0.3 to 0.6 feet. Even if the culverts were opened for a maximum of three 6-hour periods per week (10% of the time), the impacts on the integrated water level statistics (MHHW, MLLW, annual inundation frequency, etc.) should be small.

4. MODELING RESULTS

4.1 TIME SERIES OF WATER LEVELS – NO STORMWATER DISCHARGE

4.1.1 Dry Mode

Time series of water levels under the Dry Mode configuration of the Marina del Rey tide gates are shown in
. Both Ballona Lagoon and Grand Canal exhibited muted tidal range as compared to the oceanic tides in Marina del Rey. The deeper sections of Ballona Lagoon experience nearly the same low tide as the Marina.

For most of the spring-neap cycle, high tide water levels within the Canal were below 2.0 feet MSL. During two neap high tides (day 14), water levels peaked at 2.1 feet MSL because peak Marina water levels occured close to the gates' controlling water level of 2.25 feet MSL. Overall, the spring-neap variability in tide range, nearly a factor of two in the Marina tides, was significantly diminished within the Canal.

4.1.2 Wet Mode

Time series of water levels under the Wet Mode configuration of the tide gates are depicted in
Figure 2. During Dry Mode, the peak water levels within Grand Canal were reduced to approximately 0.5 feet MSL and minimum water levels occur when the channel bed dried out at -1.3 feet MSL. Because peak allowable water levels are reached more quickly, water levels in Grand Canal remained constant for a longer period of time as compared with Dry Mode operations. In Wet Mode, the discharge through the tide gates was more sensitive to the rate of change of Marina water levels. This produced more variability in water levels over the spring-neap cycle than during Dry Mode operations.

4.2 TIME SERIES OF WATER LEVELS – EXTREME FLOOD CONDITIONS

While greater tidal range in Grand Canal is a primary objective of the project, this range cannot be expanded at the cost of greater flood risk. To evaluate potential changes to the flood risk as a result of the alternatives, the 50-year stormwater discharge event during Wet Mode operations was evaluated with the model. Figure 3 presents the time series of water levels under these extreme flood conditions. Even during the maximum flood discharge at 10.8 days, water levels in the project area peaked at 1.8 feet MSL, 0.9 feet less than the maximum design water level of 2.7 feet MSL

The extreme flood conditions depicted in Figure 3 did not include flows from the Venice Canals through the Washington St. culverts. The culverts are unlikely to be opened during peak water levels of a flood event since this would expose the property adjacent to the Venice Canals to potential flooding from the Grand Canal. Instead, the culverts would only be opened for periods during which the Grand Canal water levels are less than the Venice Canals' water levels (P. comm., Mariposa Landscaping). As a conservative scenario, a model simulation was conducted with the Washington St. culverts open throughout the extreme flood. For this case, model predictions indicated that peak water levels in Grand Canal would be approximately 0.3 feet higher than when the culverts are closed. This maximum water level of 2.1 feet MSL was still below the maximum design water level of 2.7 feet MSL.

The Operational Alternative relies on the switching between Dry Mode and Wet Mode when storms are forecasted. To test how the system would respond if this switch did not occur, the 50-year stormwater discharge event during Dry Mode operations was evaluated with the model. 4 presents the time series of water levels under these extreme flood conditions. During the maximum flood discharge at 10.8 days, water levels in the project area peaked at 2.6 feet MSL, 0.1 feet less than the maximum design water level of 2.7 feet MSL.

4.3 TIDAL DATUMS

The tidal datums of Mean Higher High Water (MHHW), Mean Sea Level (MSL), and Mean Lower Low Water (MLLW) characterize a time-varying water level record into a few key values. Table 1 summarizes these values for Marina del Rey and the Grand Canal under different system configurations and hydrologic scenarios. The largest difference between Dry Mode and Wet Mode occurs for high tide (maximum water level and MHHW) whereas low tide (MLLW) is relatively unchanged. The maximum water level predicted for the extreme flood event during Wet Mode operations falls below the maximum water level during Dry Mode operations.

Table 1 Tidal datums and tide range from two weeks of EFDC model predictions (tidal datums in ft MSL)

		Grand Canal		
Tidal Datum, feet MSL	Marina del Rey	Dry Mode	Wet Mode	Wet Mode, Extreme flood
Maximum water level	4.2	2.1	0.7	1.8
MHHW	3.4	1.9	0.3	0.6
MSL	0.3	0.3	-0.4	-0.4
MLLW	-3.1	-1.3	-1.2	-1.3
Minimum water level	-4.2	-1.3	-1.3	-1.3

Tide range, feet (MHHW-MLLW)	6.5	3.2	1.5	1.9

4.4 ANNUAL INUNDATION FREQUENCY

An integrated summary of water levels which can be correlated with habitat is inundation frequency, presented as the relationship between water level and the percentage of time that this water level is exceeded. To extend from the two weeks of simulation time to annual frequency, the weighted average of the Dry Mode and Wet Mode inundation frequencies was calculated. For Existing Conditions, both Dry and Wet Mode were weighted equally to represent their equal implementation for six months of the year. For the Operational Alternative, the weights are based on the rainfall frequency analysis discussed above. The Wet Mode inundation frequency is weighted as 13% of the year and Dry Mode inundation frequency as the remaining 87%.

The resulting inundation frequency relationships are shown in Figure 5. Compared to an entire year of water level observations in Santa Monica Bay, the inundation frequencies within Grand Canal are compressed into a smaller tidal range. The Operational Alternative demonstrates a consistent increase of 0.5 feet in water level exceeded from 0% to 70% of the time as compared to the Existing Conditions.

4.5 TIDAL PRISM AND RESIDENCE TIME

The tidal prism was calculated by summing the discharge through the Marina del Rey tide gates to determine the volume of water exchanged between the Marina and Ballona Lagoon and Grand Canal on each tide. The residence time, calculated as the total volume in the Lagoon and Canal divided by the tidal prism, provides an estimate of how long it takes for all the water in the Lagoon and Canal to be replaced with water from the ocean.

Results of these calculations, presented in Table 2, indicate that tidal prism decreases by a factor of three between Wet Mode and Dry Mode. Residence time correspondingly increases by a factor of three. By reducing the amount of time which Wet Mode operations are in effect, the Operational Alternative would reduce the amount of time that the tidal prism is reduced and residence time increases. Additionally, by returning to Dry Mode soon after a flood event, the Operational Alternative would more quickly purge fresh and potentially polluted stormwater runoff from the Lagoon and Canal, replacing it with clean, salty ocean water.

Table 2 Average tidal prism and residence time over a spring-neap cycle for Ballona Lagoon and Grand Canal.

	Dry Mode	Wet Mode
Tidal prism (acre-ft per tide)	25	9.7
Residence time (# tidal cycles)	1.1	3.2

5. LIST OF FIGURES

6. REFERENCES

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7. LIST OF PREPARERS

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Jeremy Lowe – Project Manager

Matt Brenann - Modeler

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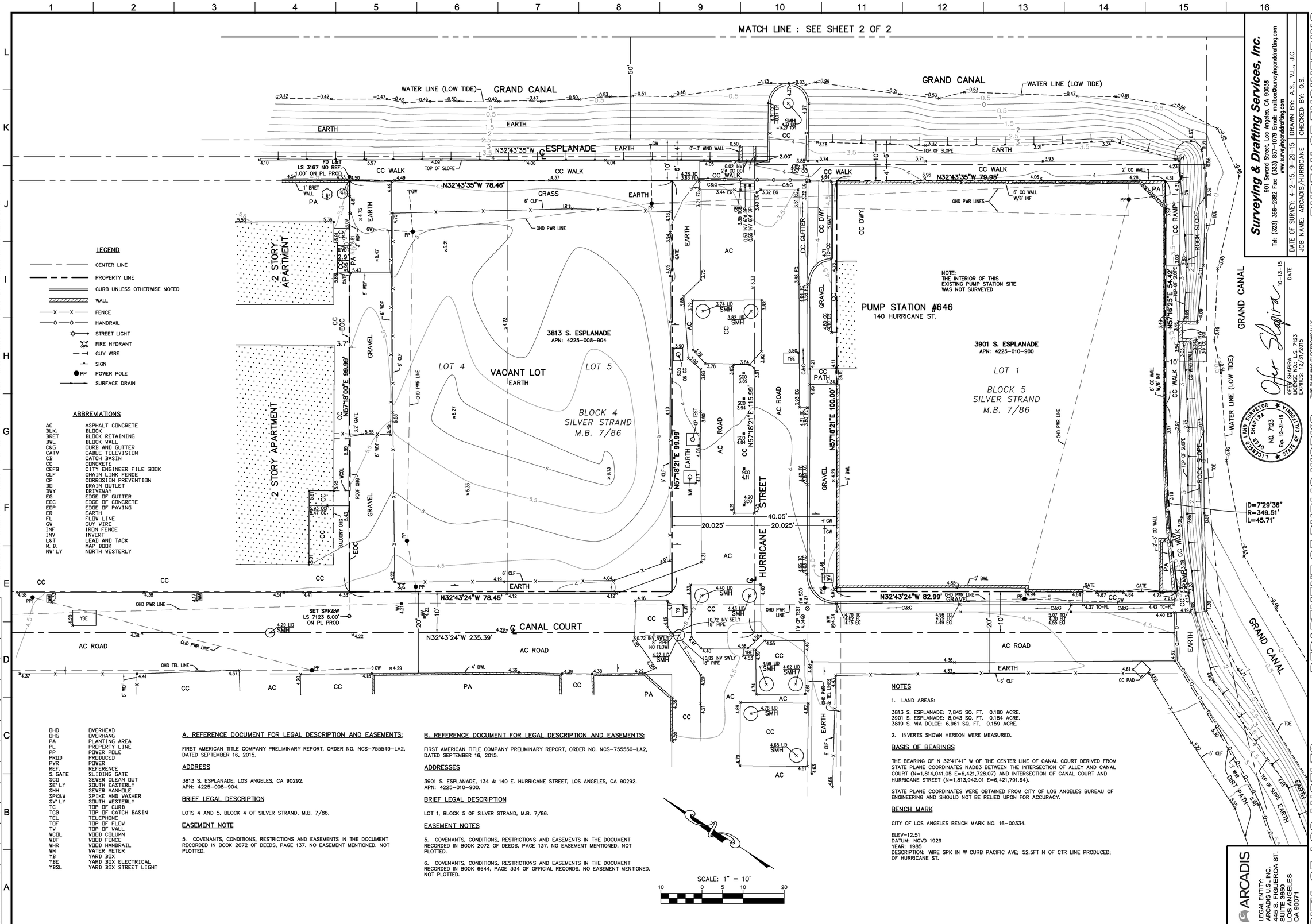
APPENDIX H
SURVEY OF VENICE AUXILIARY PUMPING PLANT SITE

MATCH LINE : SEE SHEET 2 OF 2



LEGEND

- CENTER LINE
- PROPERTY LINE
- CURB UNLESS OTHERWISE NOTED
- WALL
- FENCE
- HANDRAIL
- STREET LIGHT
- FIRE HYDRANT
- GUY WIRE
- SIGN
- PP POWER POLE
- SURFACE DRAIN

ABBREVIATIONS

AC	ASPHALT CONCRETE
BLK.	BLOCK
BRET	BLOCK RETAINING
BWL	BLOCK WALL
C&G	CURB AND GUTTER
CATV	CABLE TELEVISION
CB	CATCH BASIN
CC	CONCRETE
CEFB	CITY ENGINEER FILE BOOK
CLF	CHAIN LINK FENCE
CP	CORROSION PREVENTION
DD	DRAIN OUTLET
DWY	DRIVEWAY
EG	EDGE OF GUTTER
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVING
ER	EARTH
FL	FLOW LINE
GW	GUY WIRE
INF	IRON FENCE
INV	INVERT
L&T	LEAD AND TACK
M. B.	MAP BOOK
NW'LY	NORTH WESTERLY
OHD	OVERHEAD
OHG	OVERHANG
PA	PLANTING AREA
PL	PROPERTY LINE
PP	POWER POLE
PROD	PRODUCED
PWR	POWER
REF.	REFERENCE
S. GATE	SLIDING GATE
SCD	SEWER CLEAN OUT
SE'LY	SOUTH EASTERLY
SMH	SEWER MANHOLE
SPK&W	SPIKE AND WASHER
SW'LY	SOUTH WESTERLY
TC	TOP OF CURB
TCB	TOP OF CATCH BASIN
TEL	TELEPHONE
TOF	TOP OF FLOW
TW	TOP OF WALL
WCOL	WOOD COLUMN
WDF	WOOD FENCE
WHR	WOOD HANDRAIL
WM	WATER METER
YB	YARD BOX
YBE	YARD BOX ELECTRICAL
YBSL	YARD BOX STREET LIGHT

A. REFERENCE DOCUMENT FOR LEGAL DESCRIPTION AND EASEMENTS:

FIRST AMERICAN TITLE COMPANY PRELIMINARY REPORT, ORDER NO. NCS-755549-LA2, DATED SEPTEMBER 16, 2015.

ADDRESS

3813 S. ESPLANADE, LOS ANGELES, CA 90292.
APN: 4225-008-904.

BRIEF LEGAL DESCRIPTION

LOTS 4 AND 5, BLOCK 4 OF SILVER STRAND, M.B. 7/86.

EASEMENT NOTE

5. COVENANTS, CONDITIONS, RESTRICTIONS AND EASEMENTS IN THE DOCUMENT RECORDED IN BOOK 2072 OF DEEDS, PAGE 137. NO EASEMENT MENTIONED. NOT PLOTTED.

B. REFERENCE DOCUMENT FOR LEGAL DESCRIPTION AND EASEMENTS:

FIRST AMERICAN TITLE COMPANY PRELIMINARY REPORT, ORDER NO. NCS-755550-LA2, DATED SEPTEMBER 16, 2015.

ADDRESSES

3901 S. ESPLANADE, 134 & 140 E. HURRICANE STREET, LOS ANGELES, CA 90292.
APN: 4225-010-900.

BRIEF LEGAL DESCRIPTION

LOT 1, BLOCK 5 OF SILVER STRAND, M.B. 7/86.

EASEMENT NOTES

5. COVENANTS, CONDITIONS, RESTRICTIONS AND EASEMENTS IN THE DOCUMENT RECORDED IN BOOK 2072 OF DEEDS, PAGE 137. NO EASEMENT MENTIONED. NOT PLOTTED.

6. COVENANTS, CONDITIONS, RESTRICTIONS AND EASEMENTS IN THE DOCUMENT RECORDED IN BOOK 6644, PAGE 334 OF OFFICIAL RECORDS. NO EASEMENT MENTIONED. NOT PLOTTED.

SCALE: 1" = 10'

10 0 5 10 20

NOTES

1. LAND AREAS:

3813 S. ESPLANADE: 7,845 SQ. FT. 0.180 ACRE.
3901 S. ESPLANADE: 8,043 SQ. FT. 0.184 ACRE.
3819 S. VIA DOLCE: 6,961 SQ. FT. 0.159 ACRE.

2. INVERTS SHOWN HEREON WERE MEASURED.

BASIS OF BEARINGS

THE BEARING OF N 32°41'41" W OF THE CENTER LINE OF CANAL COURT DERIVED FROM STATE PLANE COORDINATES NAD83 BETWEEN THE INTERSECTION OF ALLEY AND CANAL COURT (N=1,814,041.05 E=6,421,728.07) AND INTERSECTION OF CANAL COURT AND HURRICANE STREET (N=1,813,942.01 E=6,421,791.64).

STATE PLANE COORDINATES WERE OBTAINED FROM CITY OF LOS ANGELES BUREAU OF ENGINEERING AND SHOULD NOT BE RELIED UPON FOR ACCURACY.

BENCH MARK

CITY OF LOS ANGELES BENCH MARK NO. 16-00334.

ELEV=12.51
DATUM: NGVD 1929
YEAR: 1985
DESCRIPTION: WIRE SPK IN W CURB PACIFIC AVE; 52.5FT N OF CTR LINE PRODUCED; OF HURRICANE ST.

Surveying & Drafting Services, Inc.
901 Seward Street, Los Angeles, CA 90038
Tel: (323) 366-2882 Fax: (323) 857-1079 E-mail: mailbox@surveyinganddrafting.com
www.surveyingandrafting.com

DATE OF SURVEY: 4-2-15, 9-29-15 | DRAWN BY: A.S., V.L., J.C.
JOB NAME: ARCADIS/HURRICANE | CHECKED BY: O.S.

OFER SHAPIRA
LICENSE NO.: L.S. 7123
EXPIRES: 12/31/2015

10-13-15
DATE

LICENSED LAND SURVEYOR * OFER SHAPIRA * NO. 7123 * Exp. 12-31-15 * STATE OF CALIFORNIA

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3650
LOS ANGELES
CA 90071

CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

GARY LEE MOORE, P.E.
CITY ENGINEER

ENGINEER: DATE:
DESIGN GROUP LIC. NO.
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:

NO. REVISIONS: DATE: BY:

STRUCTURE NO. SPB0000X
INDEX NO. D-31898

PRELIMINARY
NOT FOR
CONSTRUCTION

THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED.

SHEET TITLE: TOPOGRAPHIC SURVEY
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST
MARINA DEL REY, CALIFORNIA

VERTICAL CONTROL: NGVD 1929 (1985)
HORIZONTAL CONTROL: NAD83

WORK ORDER NO.
E6000591
DRAWING NO.

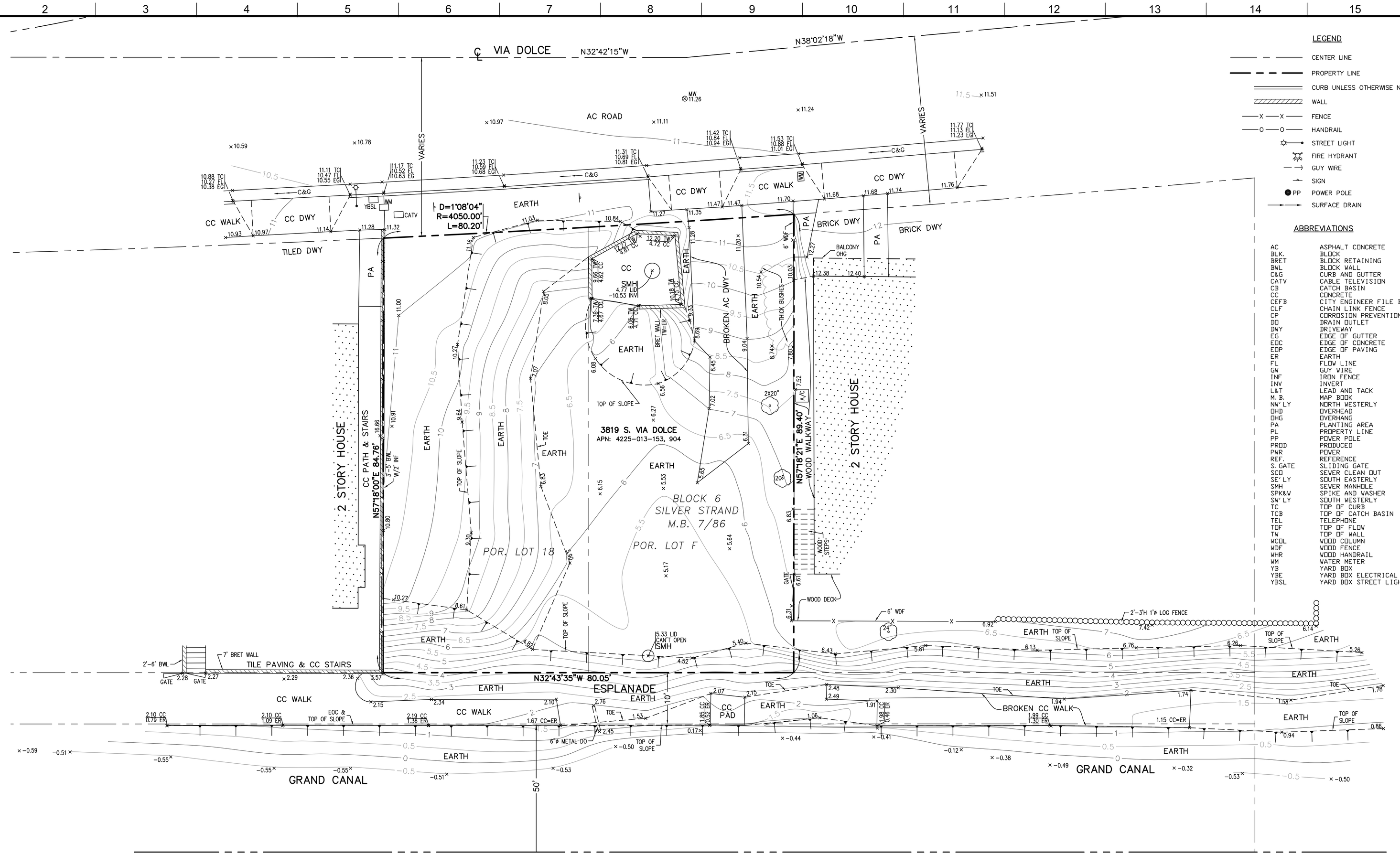
SHEET 1 OF 2 SHEETS

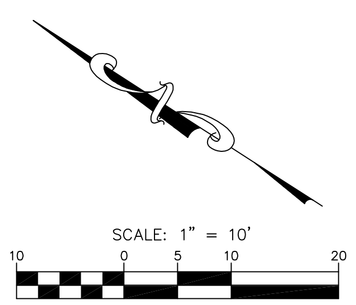
REVISION DATES (DESIGN STAGE ONLY)

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

Sheet Version 3.0

PRELIMINARY DESIGN





LEGEND

- CENTER LINE
- PROPERTY LINE
- CURB UNLESS OTHERWISE NOTED
- WALL
- FENCE
- HANDRAIL
- STREET LIGHT
- FIRE HYDRANT
- GUY WIRE
- SIGN
- POWER POLE
- SURFACE DRAIN

ABBREVIATIONS

AC	ASPHALT CONCRETE
BLK.	BLOCK
BRET	BLOCK RETAINING
BWL	BLOCK WALL
C&G	CURB AND GUTTER
CATV	CABLE TELEVISION
CB	CATCH BASIN
CC	CONCRETE
CFFB	CITY ENGINEER FILE BOOK
CLF	CHAIN LINK FENCE
CP	CORROSION PREVENTION
DD	DRAIN OUTLET
DWY	DRIVEWAY
EG	EDGE OF GUTTER
EDC	EDGE OF CONCRETE
EDP	EDGE OF PAVING
ER	EARTH
FL	FLOW LINE
GW	GUY WIRE
INF	IRON FENCE
INV	INVERT
L&T	LEAD AND TACK
M.B.	MAP BOOK
NW'LY	NORTH WESTERLY
OHD	OVERHEAD
OHG	OVERHANG
PA	PLANTING AREA
PL.	PROPERTY LINE
PP	POWER POLE
PROD	PRODUCED
PWR	POWER
REF.	REFERENCE
S. GATE	SLIDING GATE
SCO	SEWER CLEAN OUT
SE'LY	SOUTH EASTERLY
SMH	SEWER MANHOLE
SPK&W	SPIKE AND WASHER
SW'LY	SOUTH WESTERLY
TC	TOP OF CURB
TCB	TOP OF CATCH BASIN
TEL	TELEPHONE
TOF	TOP OF FLOW
TW	TOP OF WALL
WCOL	WOOD COLUMN
WDF	WOOD FENCE
WHR	WOOD HANDRAIL
WM	WATER METER
YB	YARD BOX
YBE	YARD BOX ELECTRICAL
YBSL	YARD BOX STREET LIGHT

C. PRELIMINARY TITLE REPORT WAS NOT PROVIDED

ADDRESS

3819 S. VIA DOLCE, LOS ANGELES, CA 90292.
APN: 4225-013-153, 904.

BRIEF LEGAL DESCRIPTION

POR. LOTS 18 AND F, BLOCK 6 OF SILVER STRAND, M.B. 7/86.

EASEMENT NOTE

EASEMENTS, IF ANY, ARE NOT SHOWN HEREON. PRELIMINARY TITLE REPORT WAS NOT PROVIDED.

Surveying & Drafting Services, Inc.
901 Seward Street, Los Angeles, CA 90038
Tel: (323) 366-2882 Fax: (323) 857-1079 Email: mailbox@surveyingandrafting.com

DATE OF SURVEY: 4-2-15, 9-29-15 | DRAWN BY: A.S., V.L., J.C.
JOB NAME: ARCADIS/HURRICANE | CHECKED BY: O.S.

BUREAU OF ENGINEERING

NO.	REVISIONS:	DATE:	BY:

STRUCTURE NO. SPB0000X

INDEX NO. D-31898

PRELIMINARY NOT FOR CONSTRUCTION

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED

CITY ENGINEER | DATE:
GARY LEE MOORE, P.E.
DESIGN GROUP | LIC. NO.
ENGINEER:
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:

SHEET TITLE: TOPOGRAPHIC SURVEY
VERTICAL CONTROL: NGVD 1929 (1985)
HORIZONTAL CONTROL: NAD83
PROJECT: VENICE AUXILIARY PUMPING PLANT
ADDRESS: 140 HURRICANE ST. MARINA DEL REY, CALIFORNIA

WORK ORDER NO. E6000591
DRAWING NO.
SHEET 2 OF 2 SHEETS

ARCADIS
LEGAL ENTITY:
ARCADIS U.S., INC.
445 S. FIGUEROA ST.
SUITE 3600
LOS ANGELES
CA 90071

REVISION DATES (DESIGN STAGE ONLY)

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

Sheet Version 3.0

PRELIMINARY DESIGN

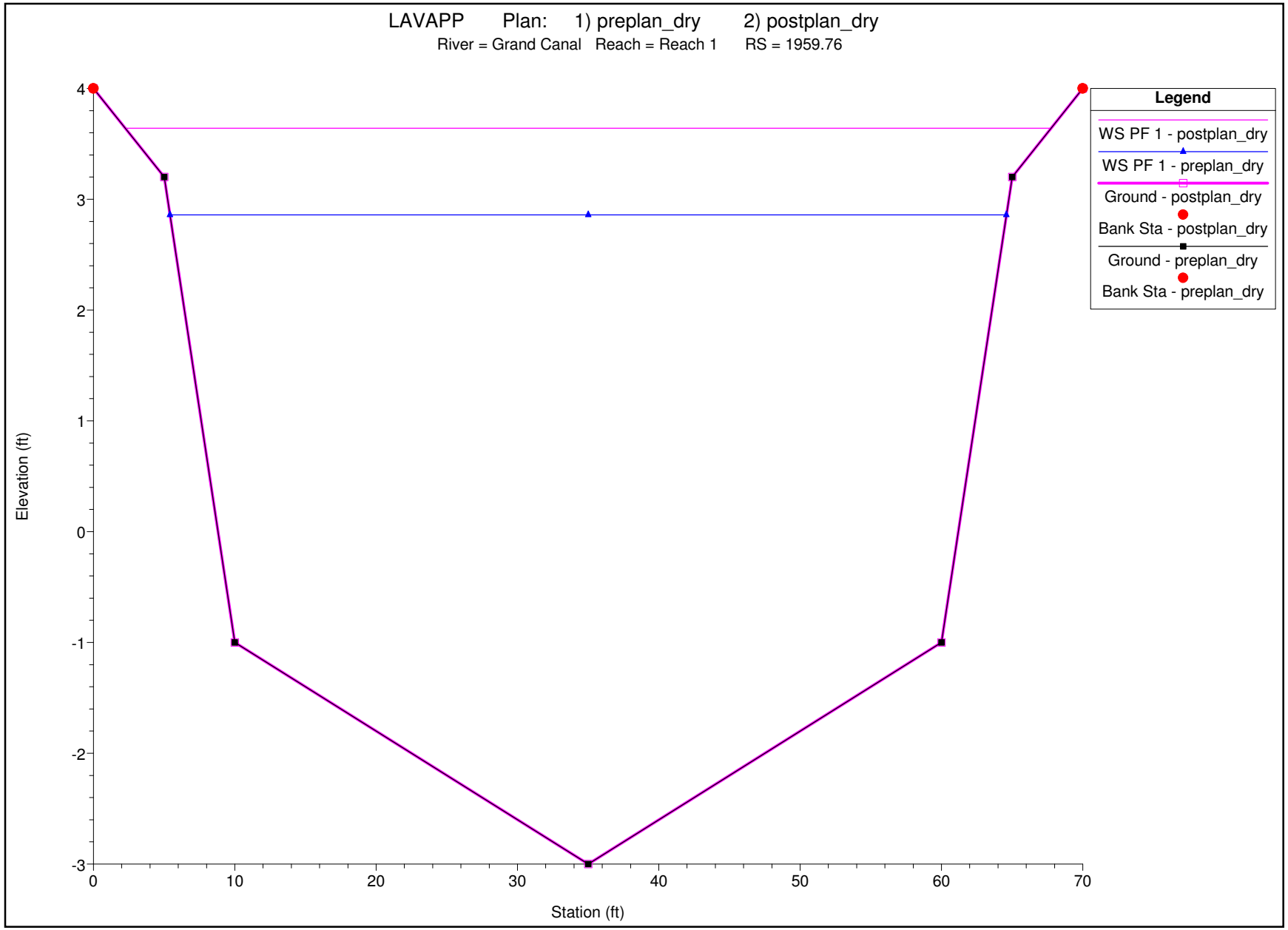
Watearth™
Water Resources + Green Infrastructure

APPENDIX I
HYDRAULIC RESULTS

HEC-RAS River: Grand Canal Reach: Reach 1 Profile: PF 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1959.76	PF 1	preplan_extreme	263.80	-0.50	3.39		3.43	0.000442	1.62	162.92	52.62	0.16
Reach 1	1959.76	PF 1	postplan_extreme	263.80	-3.00	3.63		3.64	0.000072	0.86	307.86	65.36	0.07
Reach 1	1959.76	PF 1	postplan_ex_wet	263.80	-3.00	3.65		3.66	0.000071	0.85	309.14	65.60	0.07
Reach 1	1959.76	PF 1	postplan_ex_dry	263.80	-3.00	3.64		3.65	0.000072	0.85	308.61	65.50	0.07
Reach 1	1959.76	PF 1	preplan_wet	263.80	-0.50	3.35		3.40	0.000457	1.64	161.05	52.46	0.16
Reach 1	1959.76	PF 1	preplan_dry	263.80	-0.50	3.43		3.47	0.000424	1.60	165.23	52.81	0.16
Reach 1	1959.76	PF 1	pre_dry_no_flows	0.01	-0.50	2.10		2.10	0.000000	0.00	98.62	47.02	0.00
Reach 1	1959.76	PF 1	post_dry_no_flow	0.01	-3.00	2.10		2.10	0.000000	0.00	216.44	57.38	0.00
Reach 1	241.75	PF 1	preplan_extreme	263.80	-0.50	2.24		2.34	0.001631	2.50	105.44	47.65	0.30
Reach 1	241.75	PF 1	postplan_extreme	263.80	-0.50	3.39		3.43	0.000443	1.62	162.83	52.61	0.16
Reach 1	241.75	PF 1	postplan_ex_wet	263.80	-0.50	3.41		3.45	0.000433	1.61	164.03	52.71	0.16
Reach 1	241.75	PF 1	postplan_ex_dry	263.80	-0.50	3.40		3.44	0.000437	1.61	163.54	52.67	0.16
Reach 1	241.75	PF 1	preplan_wet	263.80	-0.50	2.08		2.19	0.002057	2.70	97.70	46.94	0.33
Reach 1	241.75	PF 1	preplan_dry	263.80	-0.50	2.41		2.49	0.001307	2.33	113.42	48.37	0.27
Reach 1	241.75	PF 1	pre_dry_no_flows	0.01	-0.50	2.10		2.10	0.000000	0.00	98.62	47.02	0.00
Reach 1	241.75	PF 1	post_dry_no_flow	0.01	-0.50	2.10		2.10	0.000000	0.00	98.62	47.02	0.00
Reach 1	214.79	PF 1	preplan_extreme	263.80	-0.50	2.20		2.30	0.001637	2.47	106.94	49.43	0.30
Reach 1	214.79	PF 1	postplan_extreme	263.80	-0.50	2.88		3.36	0.007862	5.52	47.77	17.48	0.59
Reach 1	214.79	PF 1	postplan_ex_wet	263.80	-0.50	2.92		3.38	0.007574	5.45	48.41	17.56	0.58
Reach 1	214.79	PF 1	postplan_ex_dry	263.80	-0.50	2.90		3.37	0.007690	5.48	48.14	17.53	0.58
Reach 1	214.79	PF 1	preplan_wet	263.80	-0.50	2.02		2.14	0.002114	2.68	98.27	48.53	0.33
Reach 1	214.79	PF 1	preplan_dry	263.80	-0.50	2.38		2.46	0.001291	2.28	115.70	50.32	0.27
Reach 1	214.79	PF 1	pre_dry_no_flows	0.01	-0.50	2.10		2.10	0.000000	0.00	101.93	48.91	0.00
Reach 1	214.79	PF 1	post_dry_no_flow	0.01	-0.50	2.10		2.10	0.000000	0.00	34.71	15.92	0.00
Reach 1	166.66	PF 1	preplan_extreme	263.80	-0.50	2.12		2.22	0.001722	2.50	105.50	50.23	0.30
Reach 1	166.66	PF 1	postplan_extreme	263.80	-0.50	2.63		2.92	0.007939	4.32	61.07	33.76	0.57
Reach 1	166.66	PF 1	postplan_ex_wet	263.80	-0.50	2.70		2.97	0.007153	4.16	63.41	34.25	0.54
Reach 1	166.66	PF 1	postplan_ex_dry	263.80	-0.50	2.67		2.95	0.007454	4.22	62.47	34.05	0.55
Reach 1	166.66	PF 1	preplan_wet	263.80	-0.50	1.91		2.03	0.002265	2.76	95.45	48.07	0.35
Reach 1	166.66	PF 1	preplan_dry	263.80	-0.50	2.31		2.39	0.001368	2.28	115.58	53.10	0.27
Reach 1	166.66	PF 1	pre_dry_no_flows	0.01	-0.50	2.10		2.10	0.000000	0.00	104.58	49.96	0.00
Reach 1	166.66	PF 1	post_dry_no_flow	0.01	-0.50	2.10		2.10	0.000000	0.00	44.78	26.96	0.00
Reach 1	127.09	PF 1	preplan_extreme	263.80	-1.00	2.06		2.15	0.001500	2.33	113.39	53.84	0.28
Reach 1	127.09	PF 1	postplan_extreme	263.80	-1.00	2.16		2.54	0.011427	4.94	53.35	31.43	0.67
Reach 1	127.09	PF 1	postplan_ex_wet	263.80	-1.00	2.36	1.60	2.66	0.008302	4.41	59.76	32.70	0.58
Reach 1	127.09	PF 1	postplan_ex_dry	263.80	-1.00	2.29		2.62	0.009197	4.58	57.63	32.28	0.60
Reach 1	127.09	PF 1	preplan_wet	263.80	-1.00	1.84		1.94	0.002028	2.60	101.46	51.11	0.33
Reach 1	127.09	PF 1	preplan_dry	263.80	-1.00	2.27		2.34	0.001128	2.11	124.74	55.16	0.25
Reach 1	127.09	PF 1	pre_dry_no_flows	0.01	-1.00	2.10		2.10	0.000000	0.00	115.32	54.07	0.00
Reach 1	127.09	PF 1	post_dry_no_flow	0.01	-1.00	2.10		2.10	0.000000	0.00	51.57	31.07	0.00
Reach 1	37.75	PF 1	preplan_extreme	263.80	-0.50	1.80	0.93	1.95	0.003525	3.06	86.09	52.00	0.42
Reach 1	37.75	PF 1	postplan_extreme	263.80	-0.50	1.80	0.93	1.95	0.003525	3.06	86.09	52.00	0.42
Reach 1	37.75	PF 1	postplan_ex_wet	263.80	-0.50	0.93	0.93	1.47	0.023641	5.88	44.83	42.51	1.01
Reach 1	37.75	PF 1	postplan_ex_dry	263.80	-0.50	2.10	0.93	2.20	0.002123	2.58	102.10	54.38	0.33
Reach 1	37.75	PF 1	preplan_wet	263.80	-0.50	0.93	0.93	1.47	0.023641	5.88	44.83	42.51	1.01
Reach 1	37.75	PF 1	preplan_dry	263.80	-0.50	2.10	0.93	2.20	0.002123	2.58	102.10	54.38	0.33
Reach 1	37.75	PF 1	pre_dry_no_flows	0.01	-0.50	2.10	-0.48	2.10	0.000000	0.00	102.10	54.38	0.00
Reach 1	37.75	PF 1	post_dry_no_flow	0.01	-0.50	2.10	-0.48	2.10	0.000000	0.00	102.10	54.38	0.00

APPENDIX J
HEC-RAS CROSS SECTIONS OF GRAND CANAL


LAVAPP Plan: 1) preplan_dry 2) postplan_dry
River = Grand Canal Reach = Reach 1 RS = 1959.76
Legend
WS PF 1 - postplan_dry
WS PF 1 - preplan_dry
Ground - postplan_dry
Bank Sta - postplan_dry
Ground - preplan_dry
Bank Sta - preplan_dry
Elevation (ft)
Station (ft)
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3
2
1
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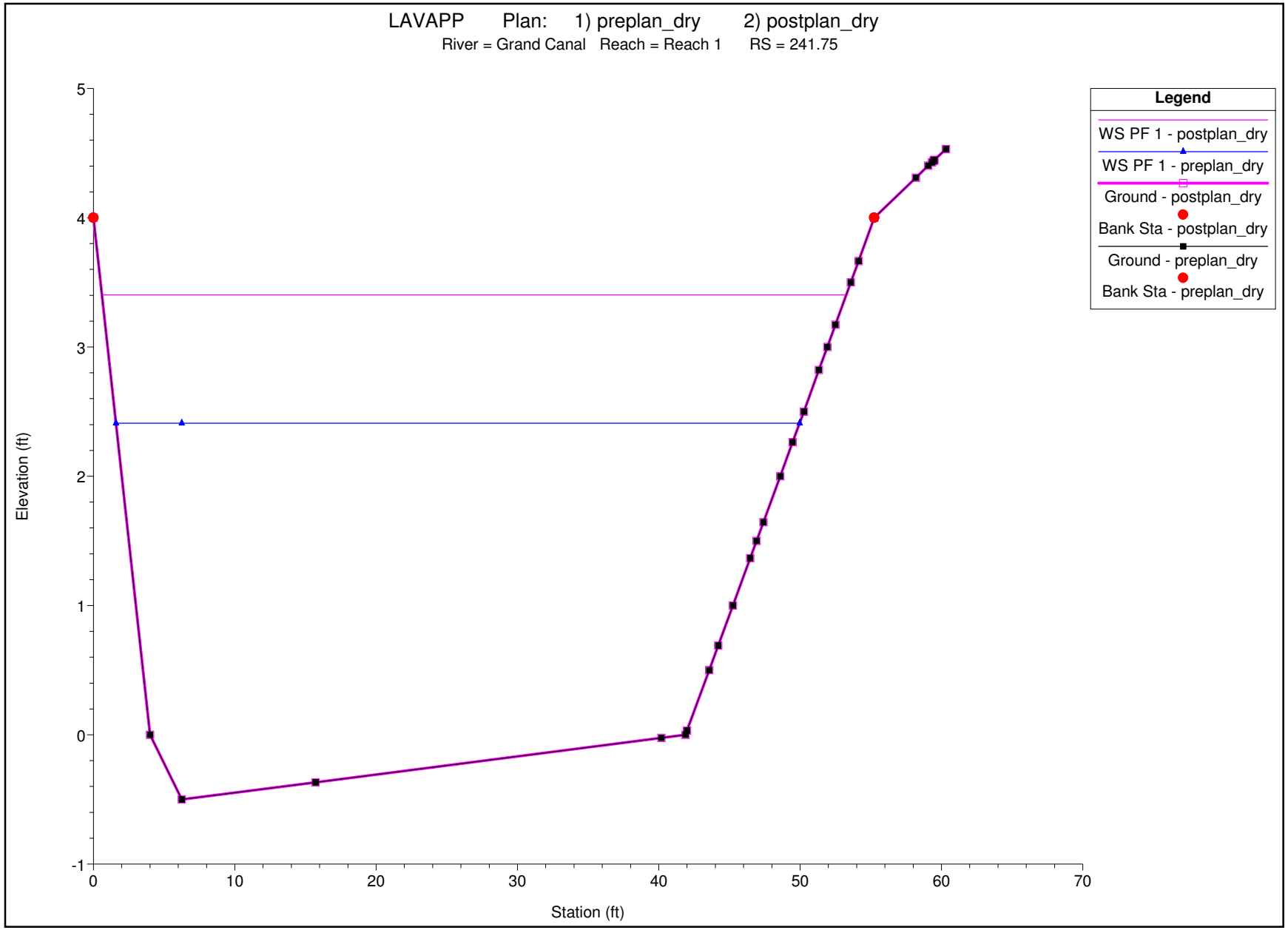
-1
-2
-3
0
10
20
30
40
50
60
70


LAVAPP Plan: 1) preplan_dry 2) postplan_dry
River = Grand Canal Reach = Reach 1 RS = 241.75
Legend
WS PF 1 - postplan_dry
WS PF 1 - preplan_dry
Ground - postplan_dry
Bank Sta - postplan_dry
Ground - preplan_dry
Bank Sta - preplan_dry
Elevation (ft)
Station (ft)
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4
3
2
1
0
-1
0
10
20
30
40
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60
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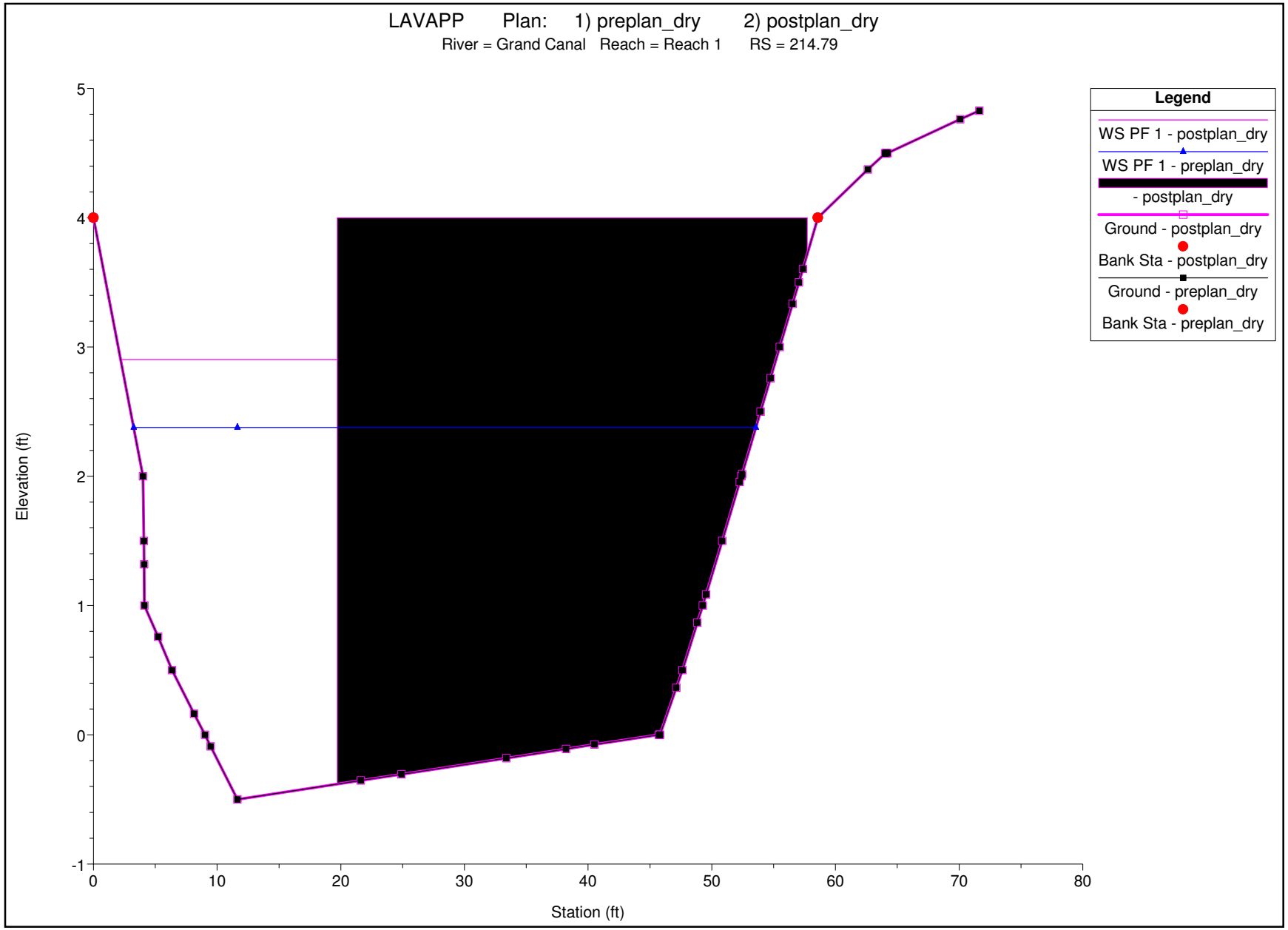
LAVAPP Plan: 1) preplan_dry 2) postplan_dry
River = Grand Canal Reach = Reach 1 RS = 214.79
Legend
WS PF 1 - postplan_dry
WS PF 1 - preplan_dry
- postplan_dry
Ground - postplan_dry
Bank Sta - postplan_dry
Ground - preplan_dry
Bank Sta - preplan_dry
Elevation (ft)
Station (ft)
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-1
0
10
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40
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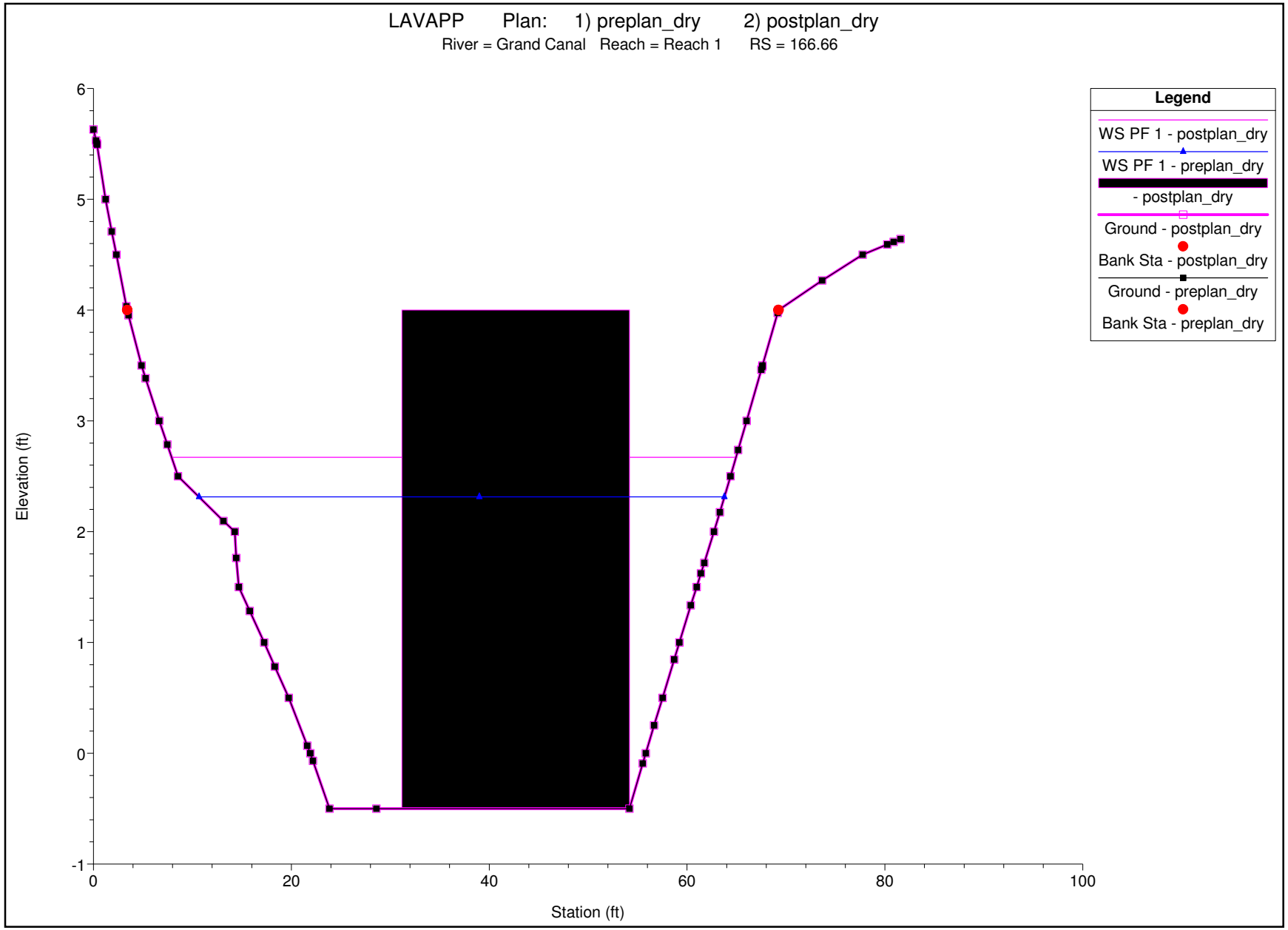
60
70
80


LAVAPP Plan: 1) preplan_dry 2) postplan_dry
River = Grand Canal Reach = Reach 1 RS = 166.66
Legend
WS PF 1 - postplan_dry
WS PF 1 - preplan_dry
- postplan_dry
Ground - postplan_dry
Bank Sta - postplan_dry
Ground - preplan_dry
Bank Sta - preplan_dry
Elevation (ft)
Station (ft)
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5
4
3
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-1
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20
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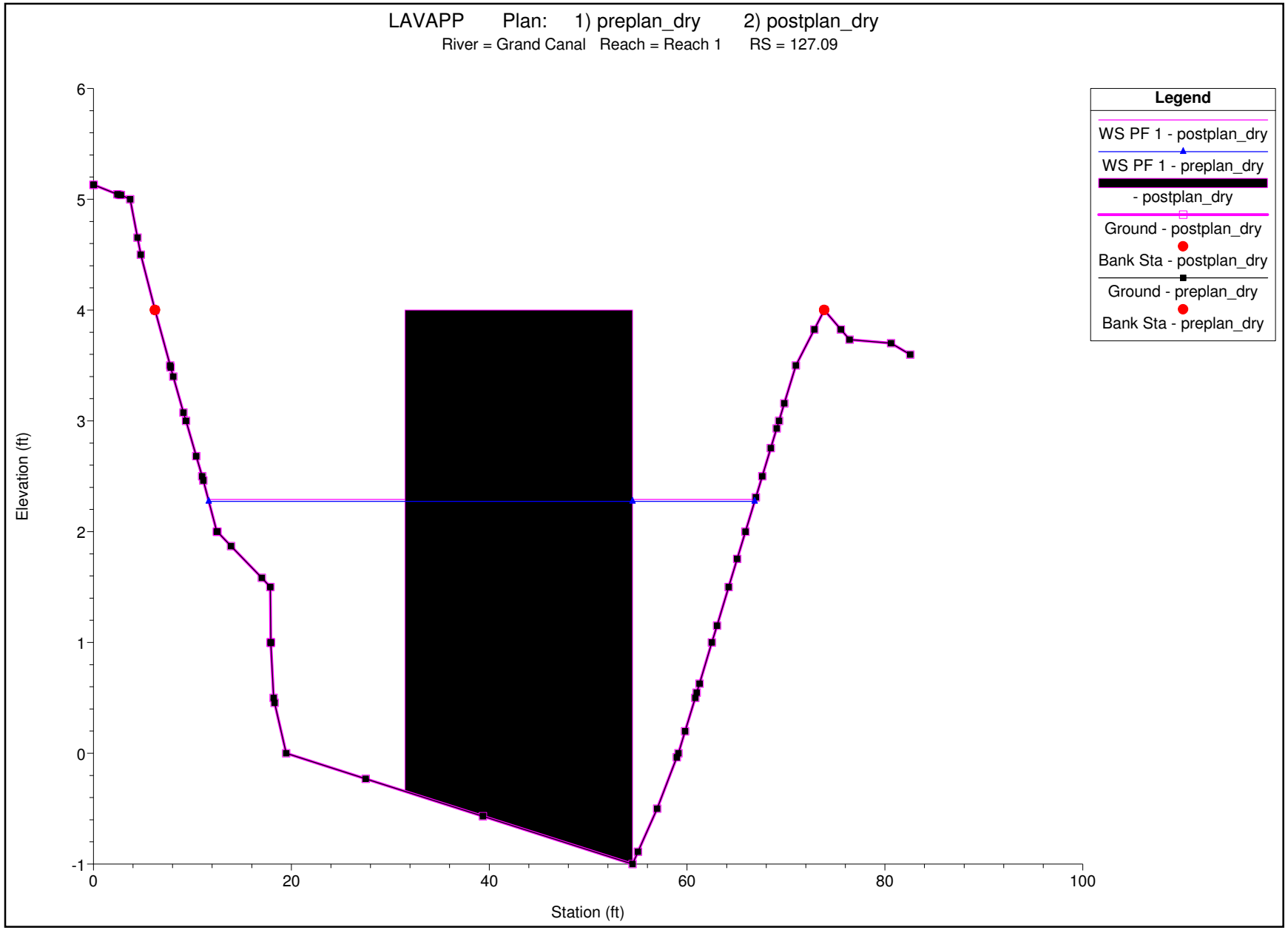
60
80
100


LAVAPP Plan: 1) preplan_dry 2) postplan_dry
River = Grand Canal Reach = Reach 1 RS = 127.09
Legend
WS PF 1 - postplan_dry
WS PF 1 - preplan_dry
- postplan_dry
Ground - postplan_dry
Bank Sta - postplan_dry
Ground - preplan_dry
Bank Sta - preplan_dry
Elevation (ft)
Station (ft)
6
5
4
3
2
1
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-1
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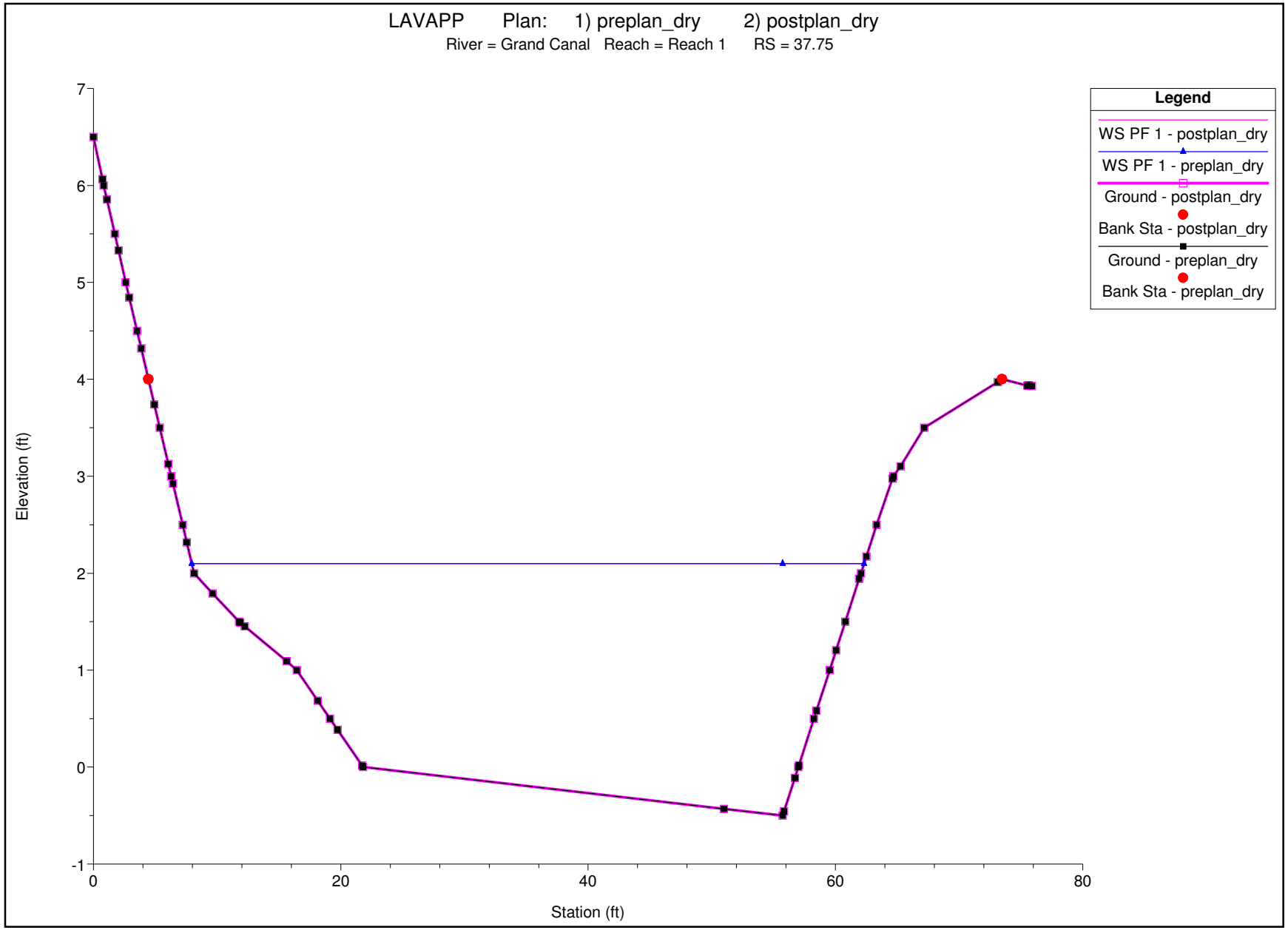
100


LAVAPP Plan: 1) preplan_dry 2) postplan_dry
River = Grand Canal Reach = Reach 1 RS = 37.75
Legend
WS PF 1 - postplan_dry
WS PF 1 - preplan_dry
Ground - postplan_dry
Bank Sta - postplan_dry
Ground - preplan_dry
Bank Sta - preplan_dry
Elevation (ft)
Station (ft)
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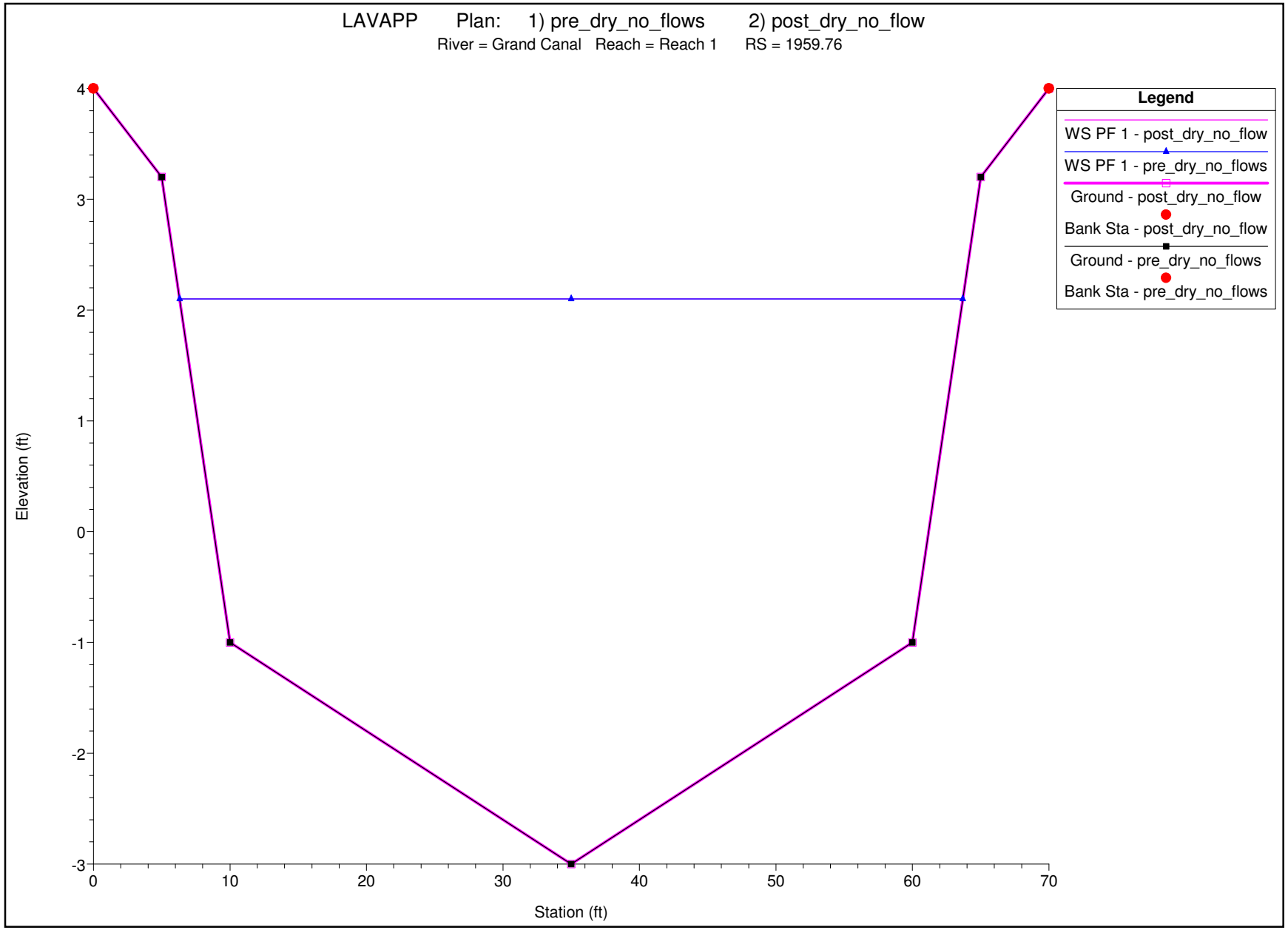
6
5
4
3
2
1
0
-1
0
20
40
60
80


LAVAPP Plan: 1) pre_dry_no_flows 2) post_dry_no_flow
River = Grand Canal Reach = Reach 1 RS = 1959.76
Legend
WS PF 1 - post_dry_no_flow
WS PF 1 - pre_dry_no_flows
Ground - post_dry_no_flow
Bank Sta - post_dry_no_flow
Ground - pre_dry_no_flows
Bank Sta - pre_dry_no_flows
Elevation (ft)
Station (ft)
4
3
2
1
0
-1
-2
-3
0
10
20
30
40
50
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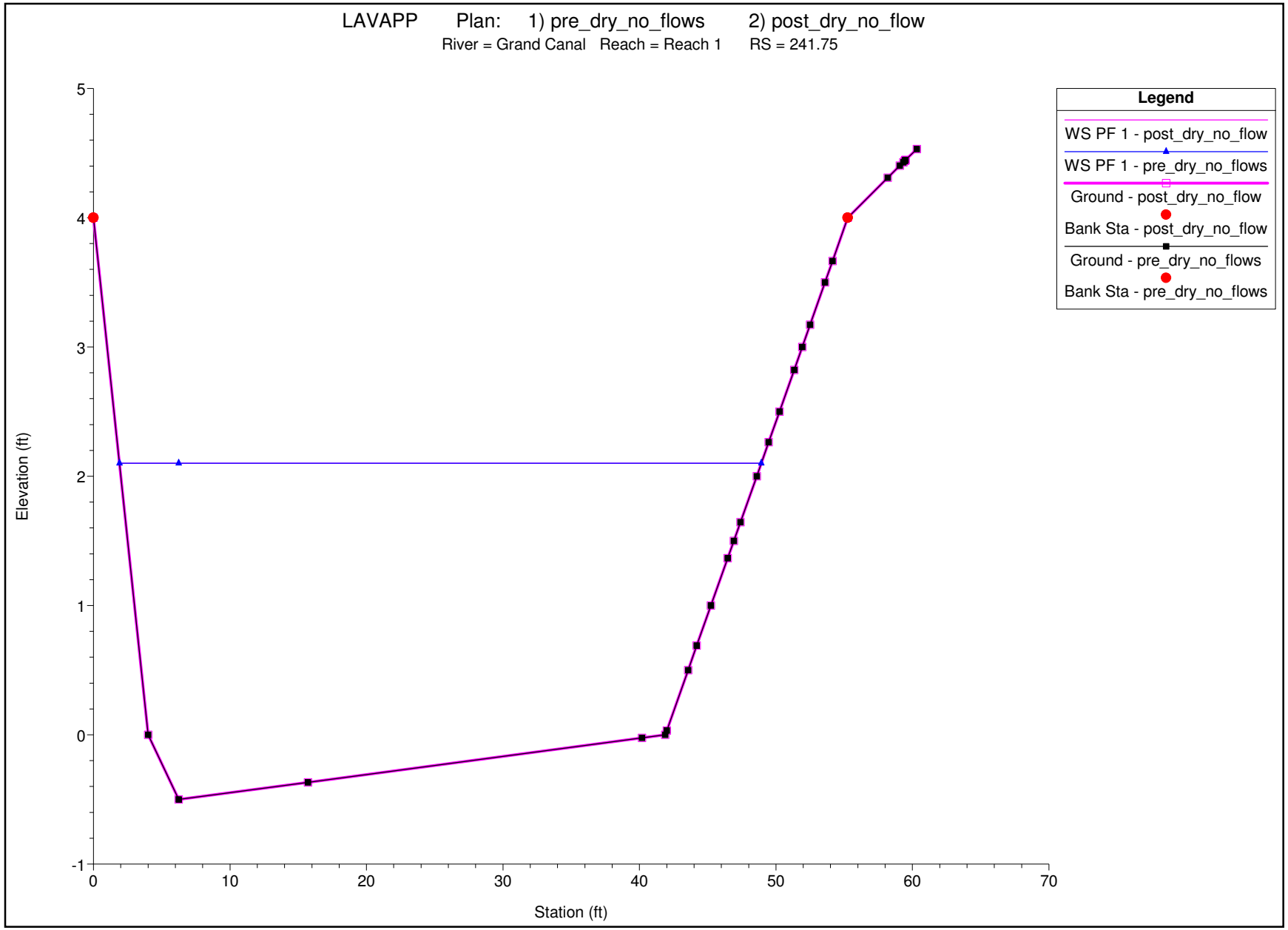
LAVAPP Plan: 1) pre_dry_no_flows 2) post_dry_no_flow
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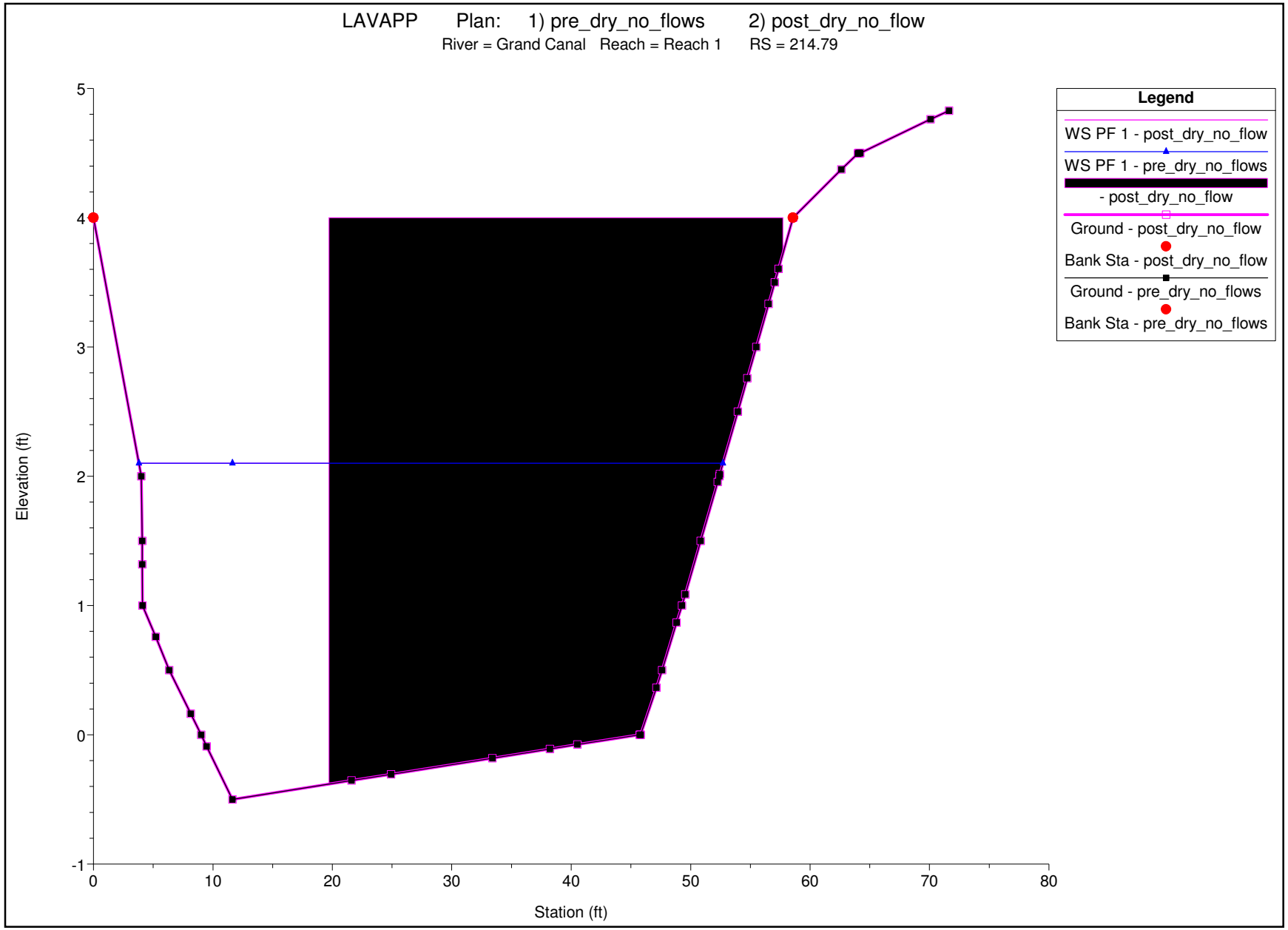
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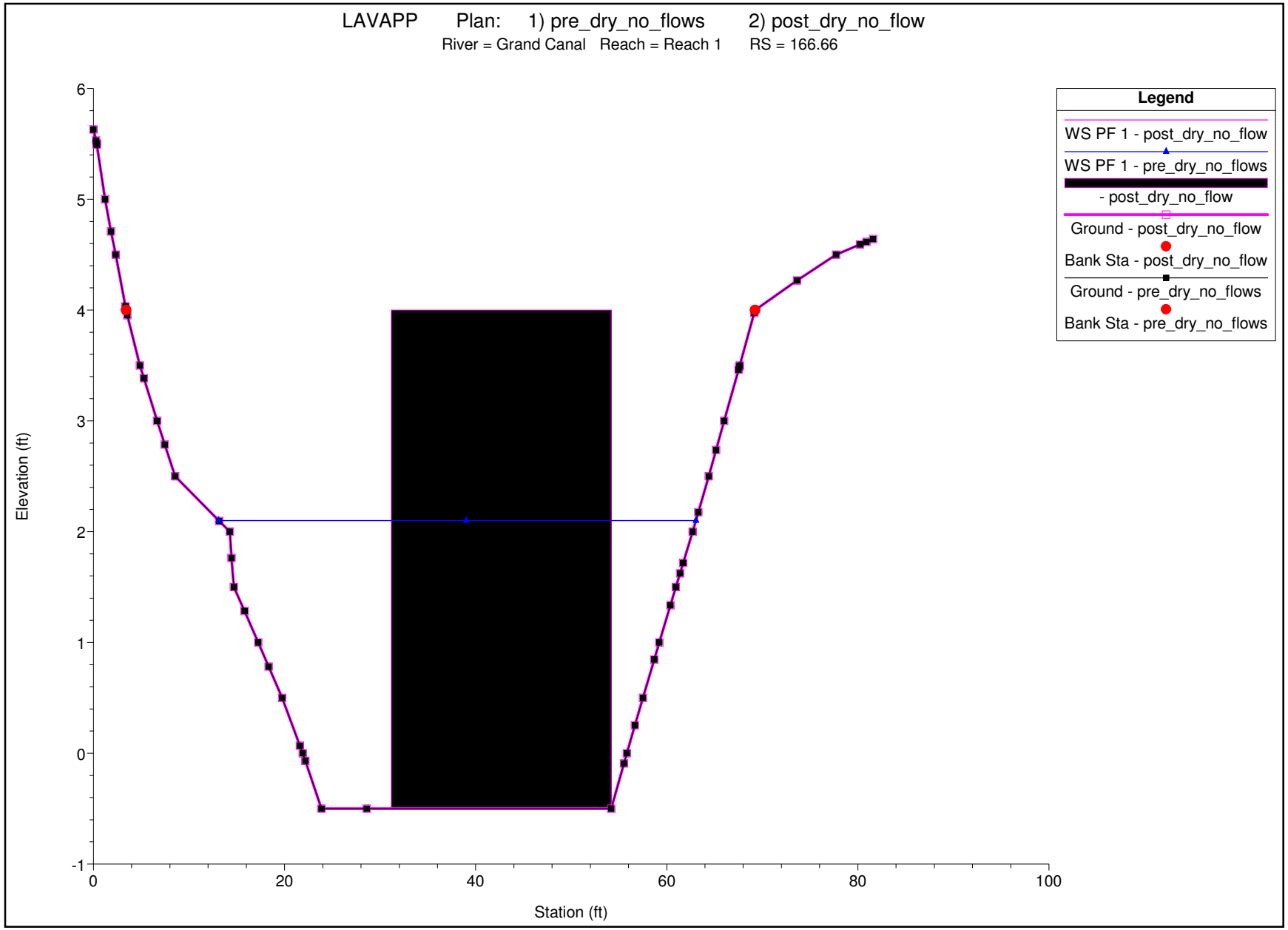
LAVAPP Plan: 1) pre_dry_no_flows 2) post_dry_no_flow
River = Grand Canal Reach = Reach 1 RS = 166.66
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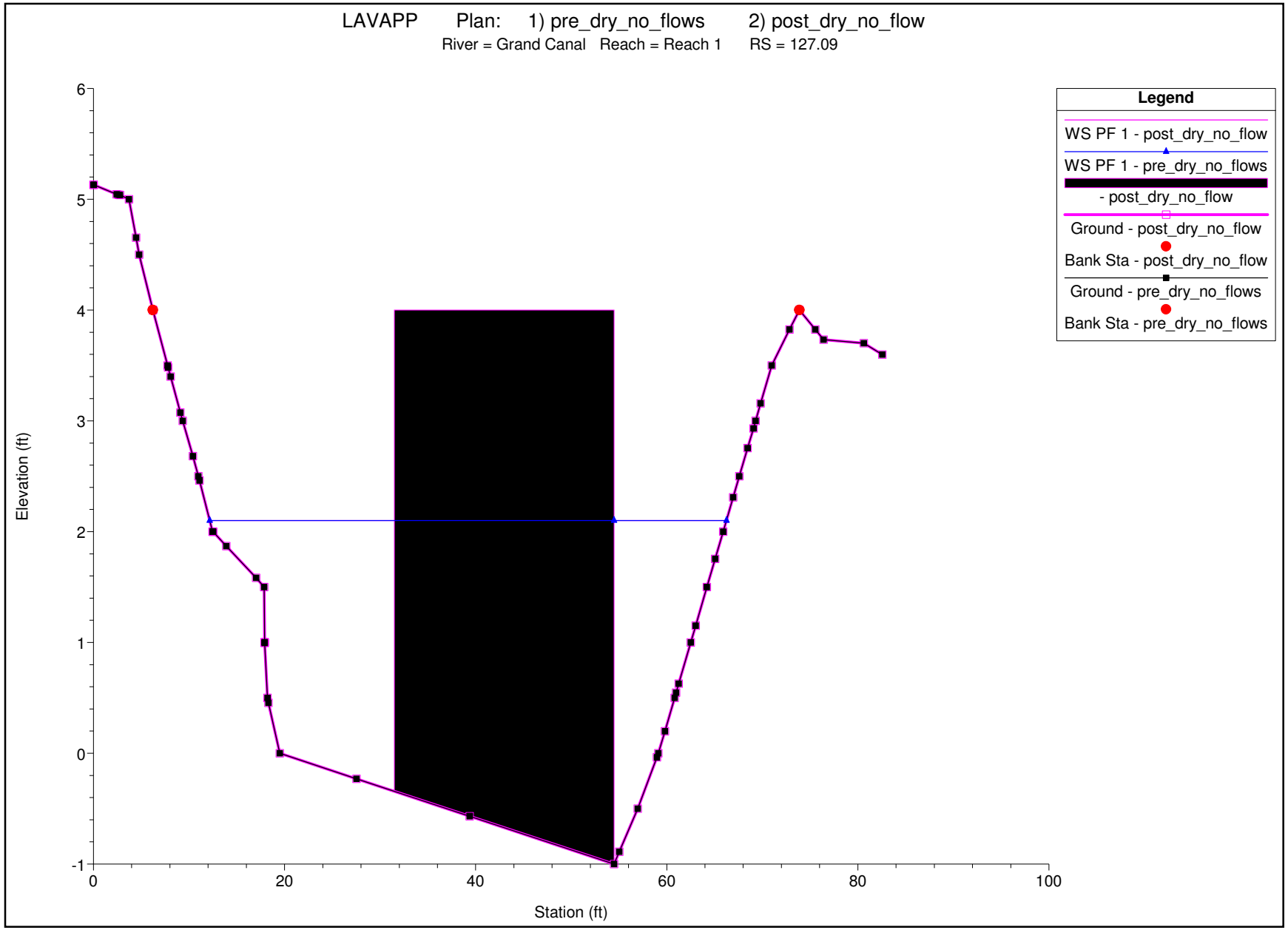
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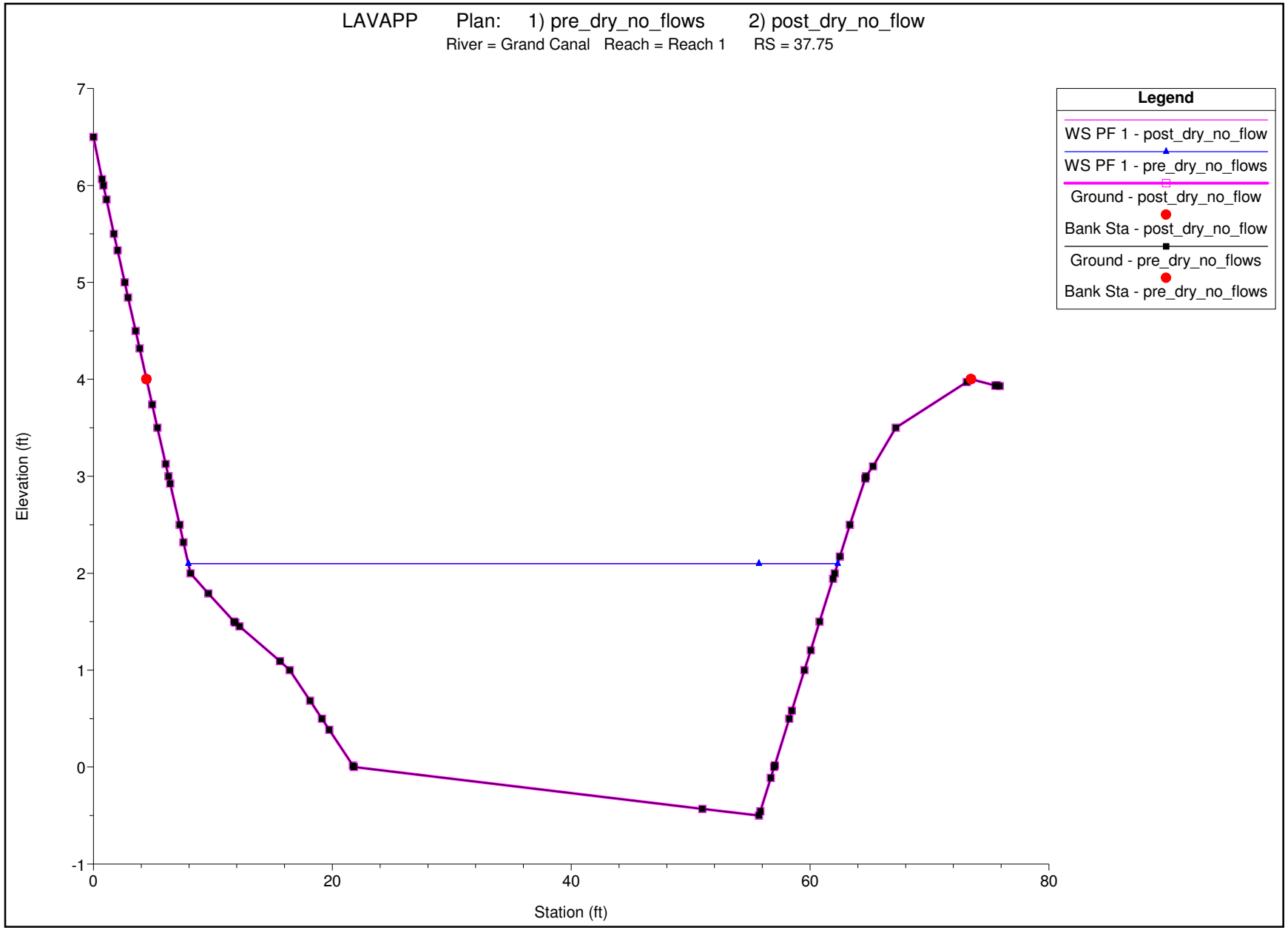
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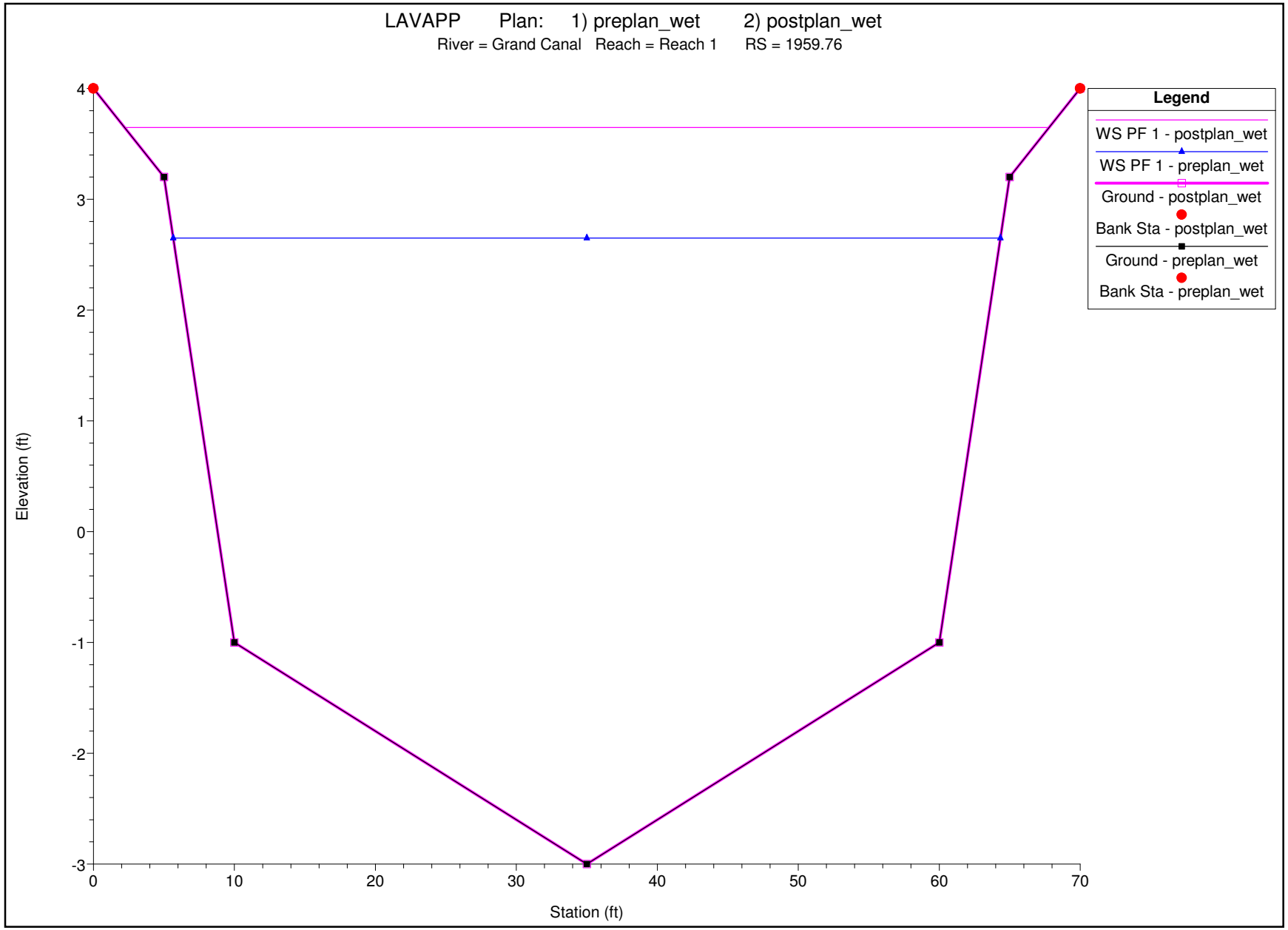
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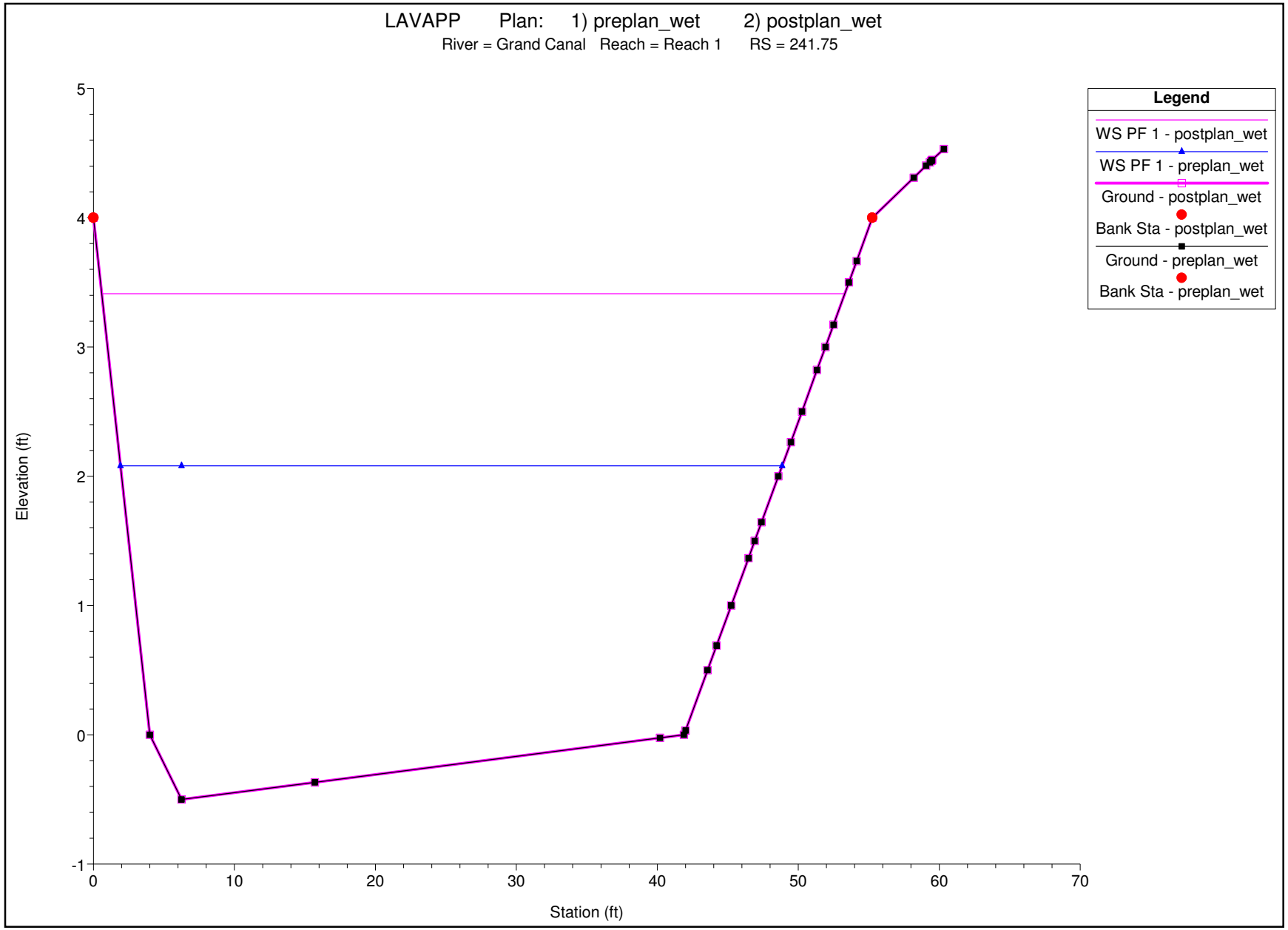
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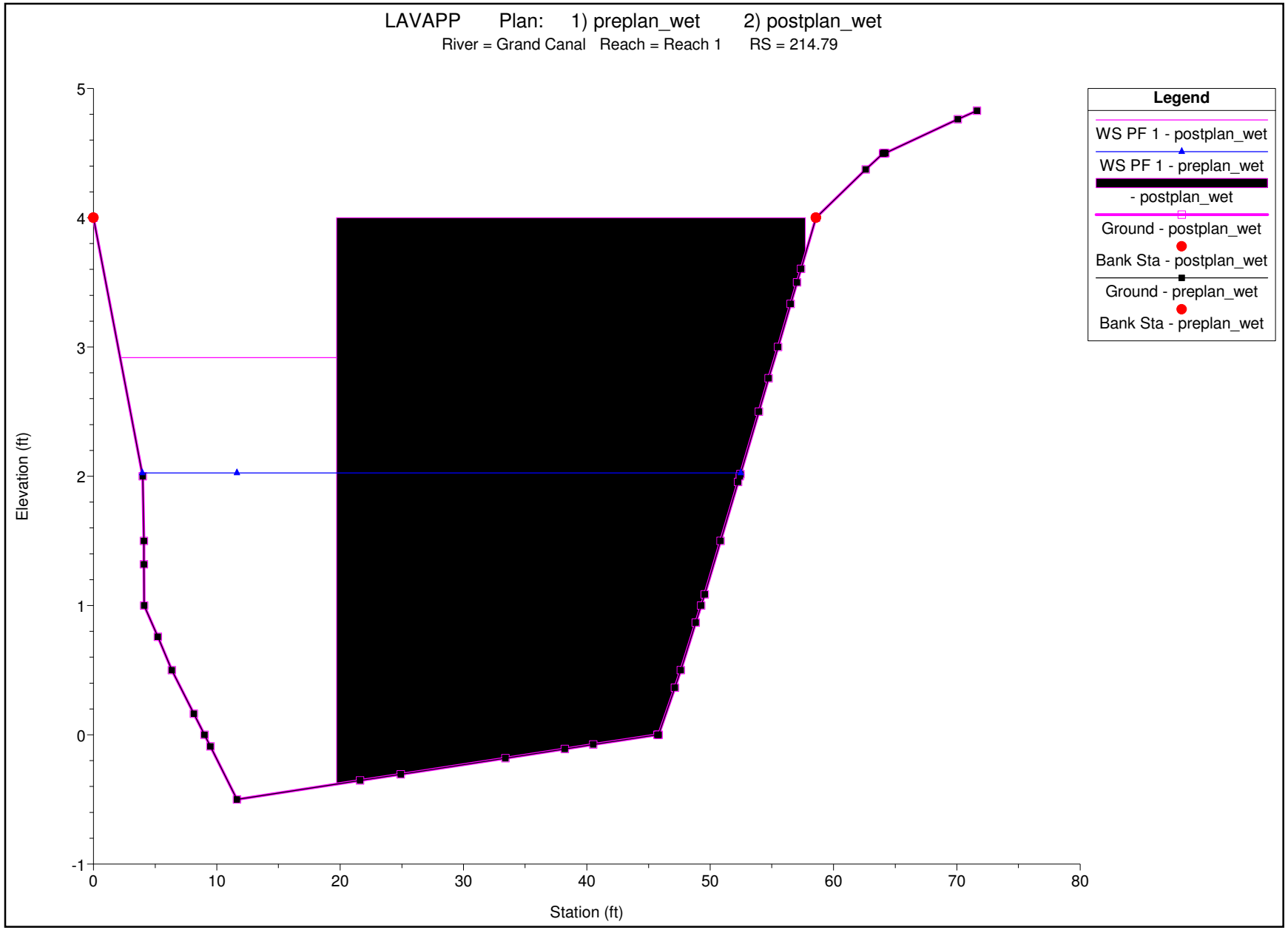
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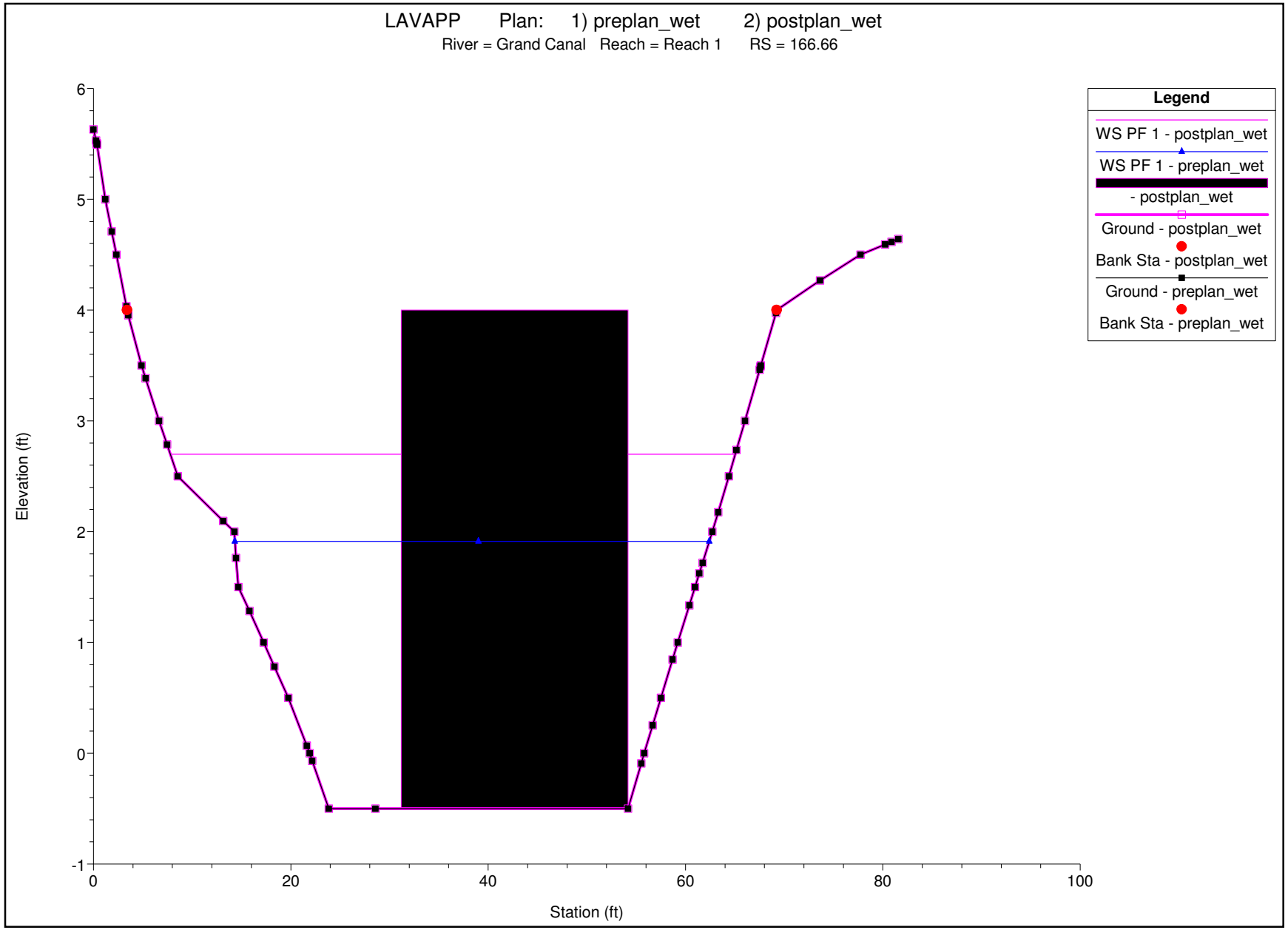
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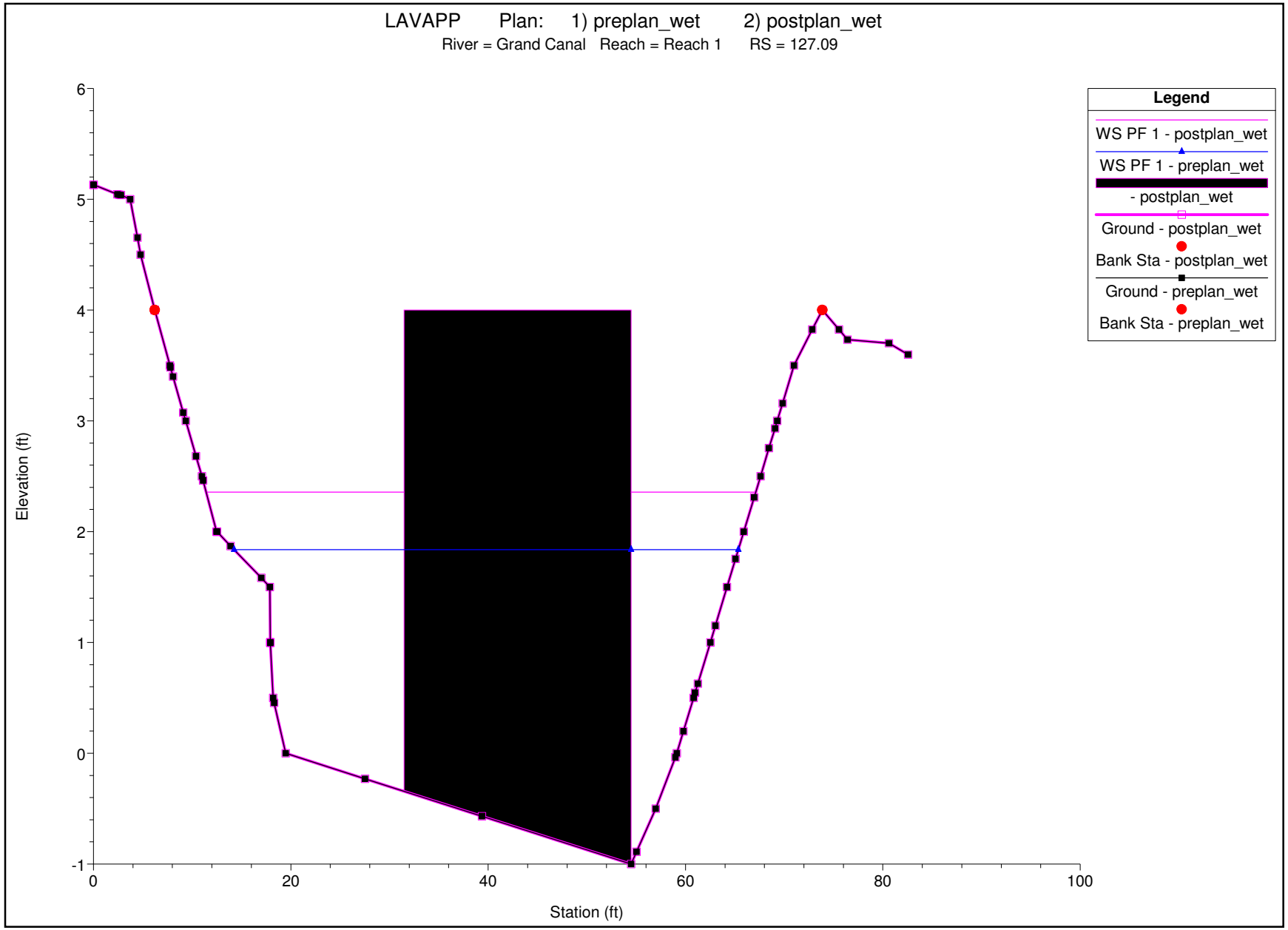
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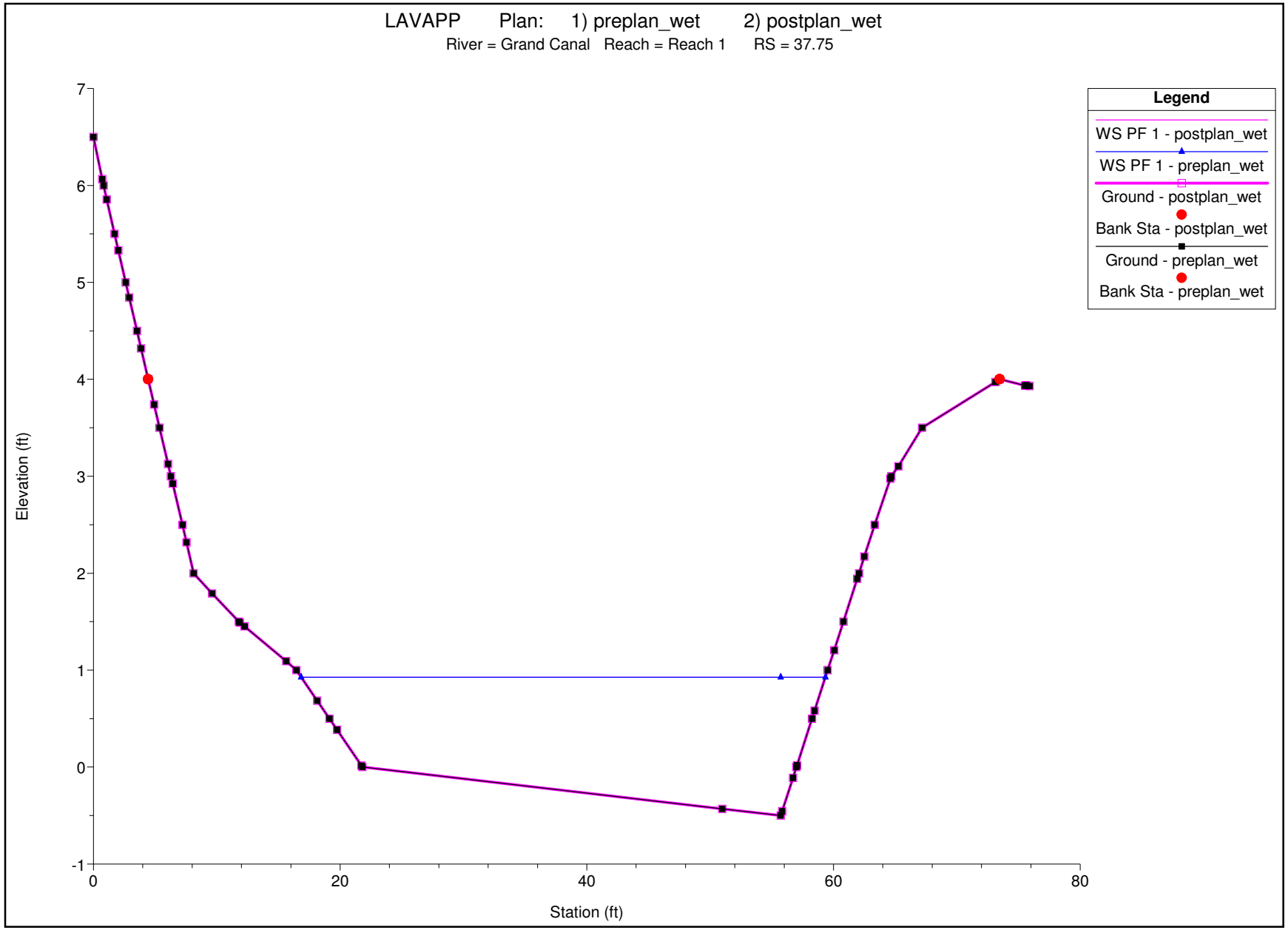
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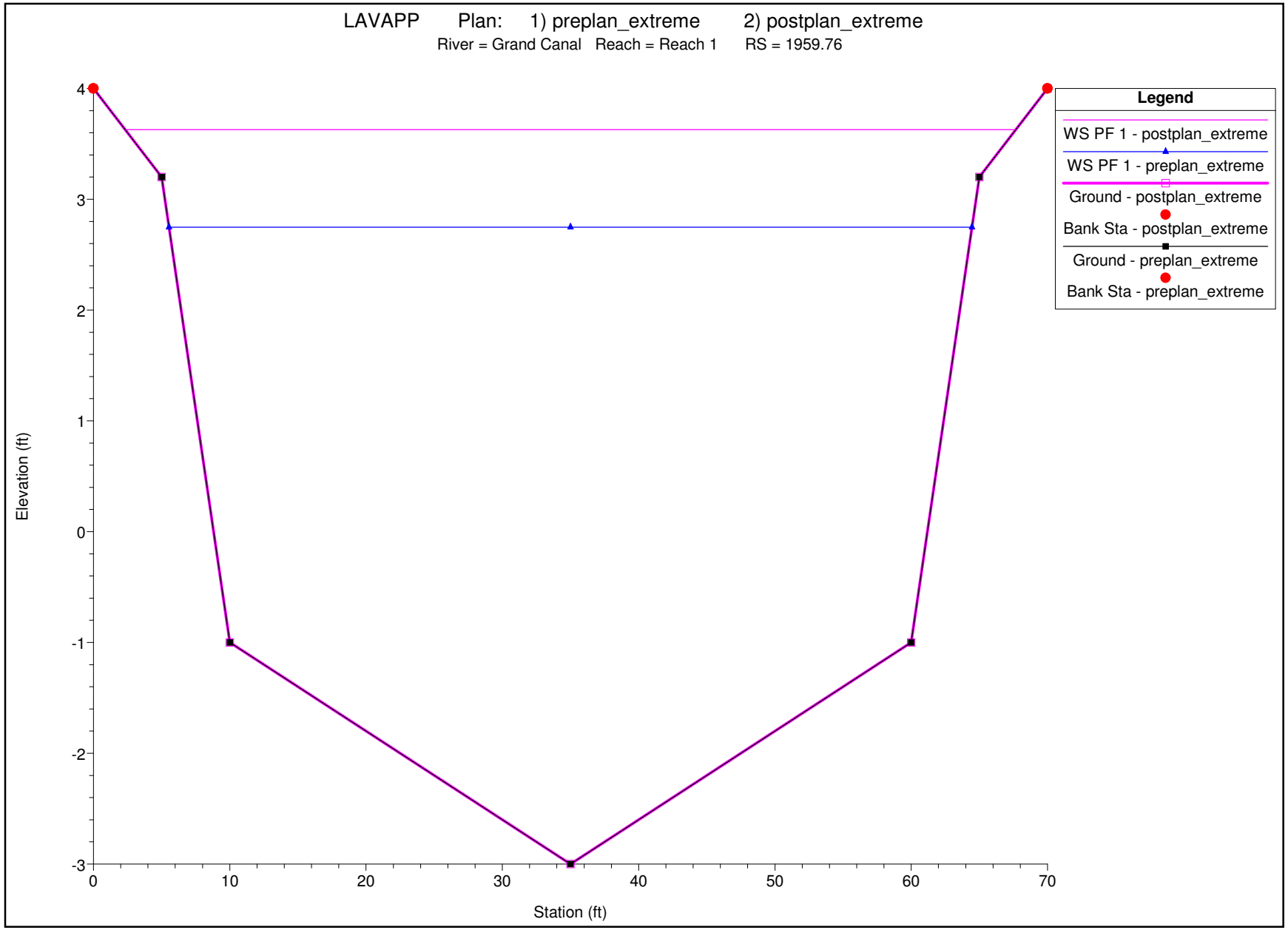
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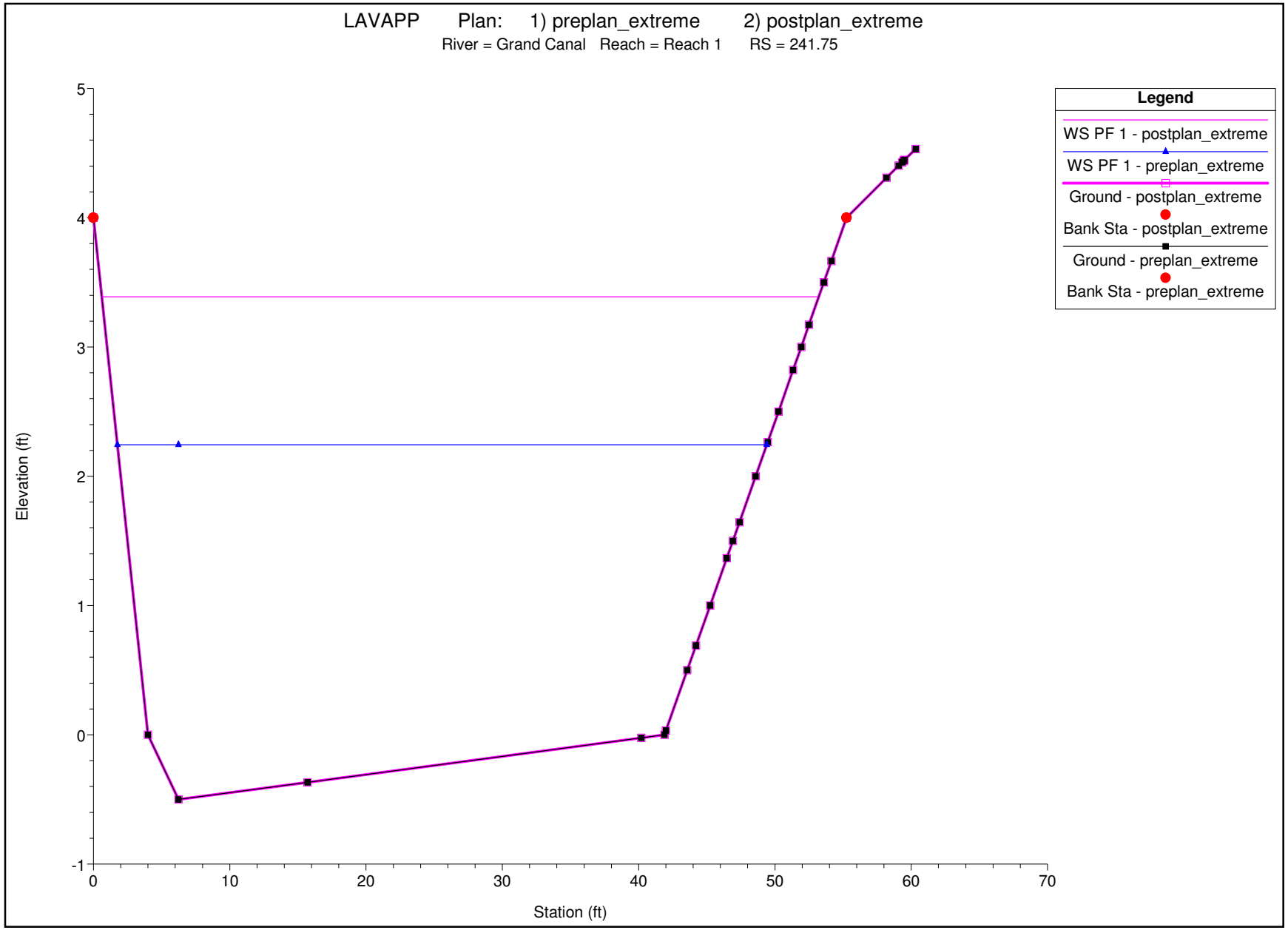
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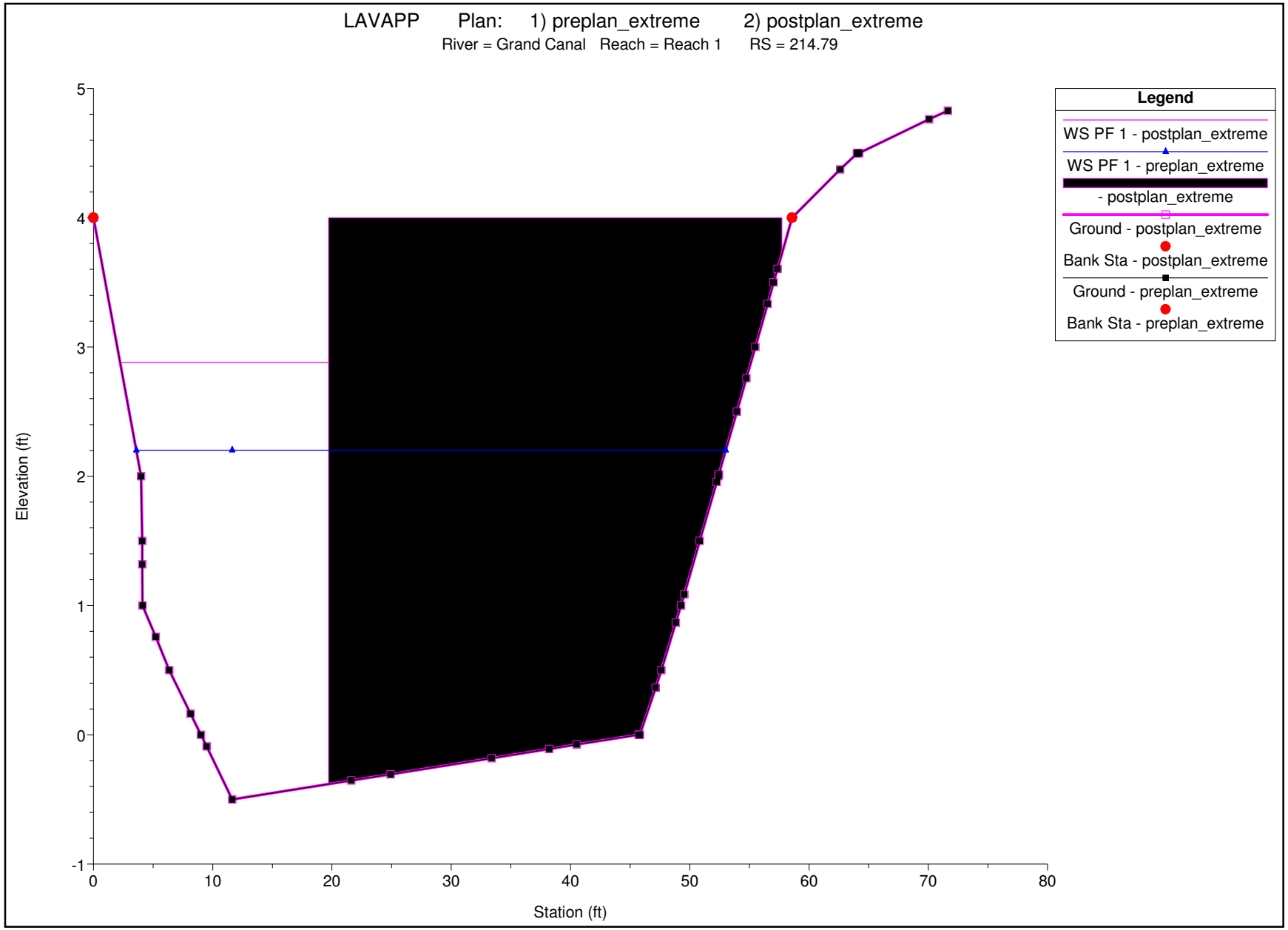
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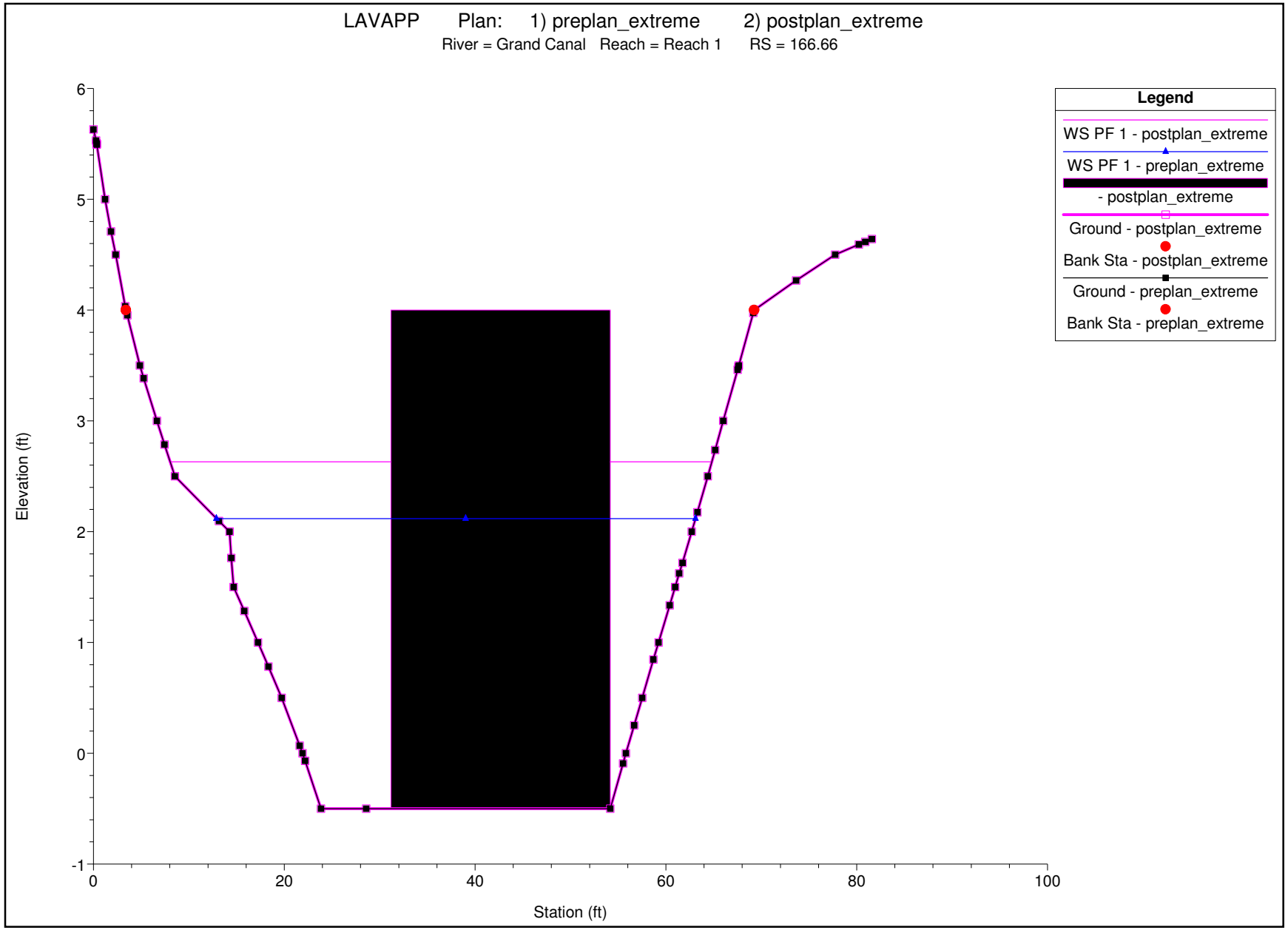
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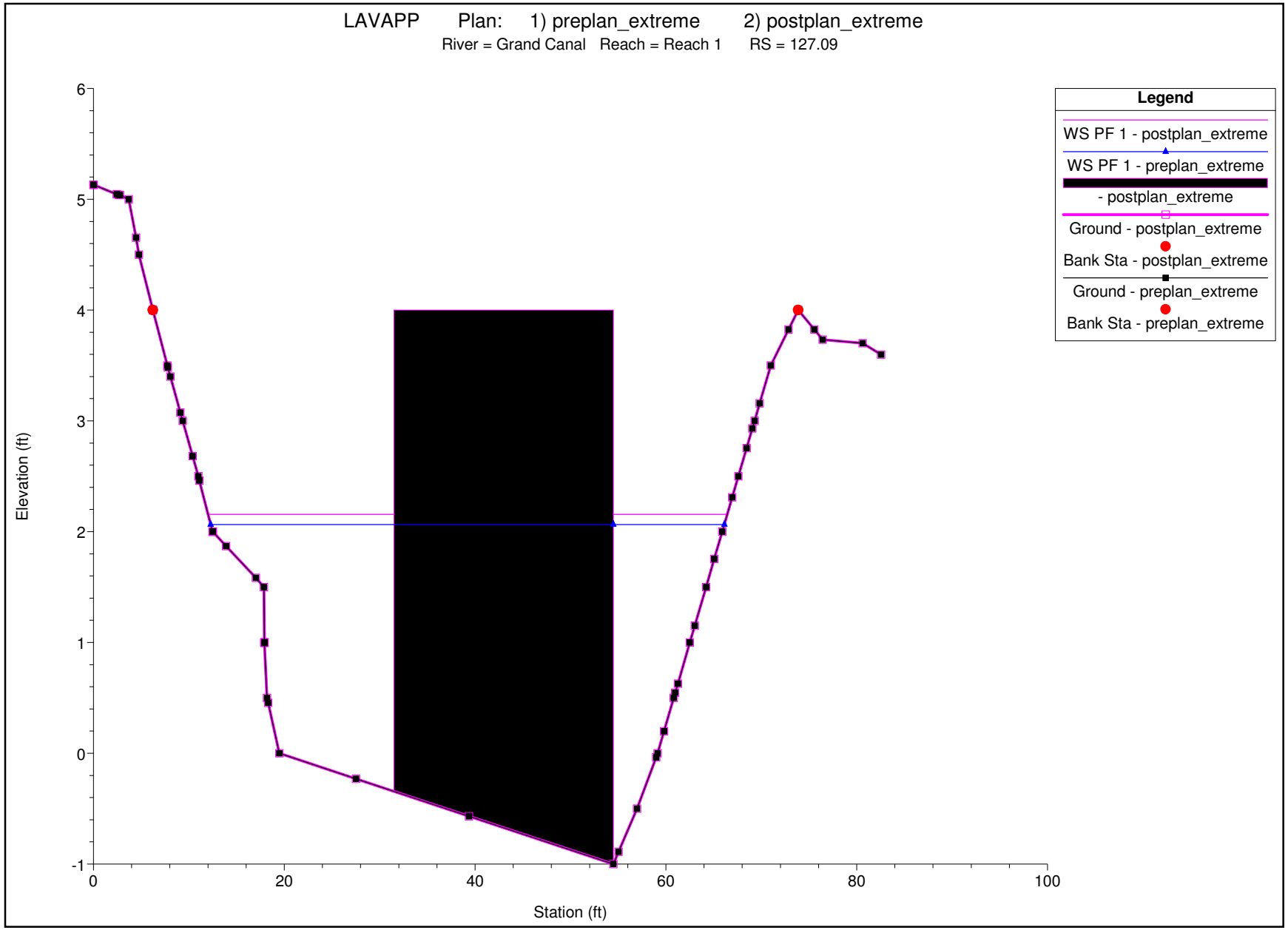
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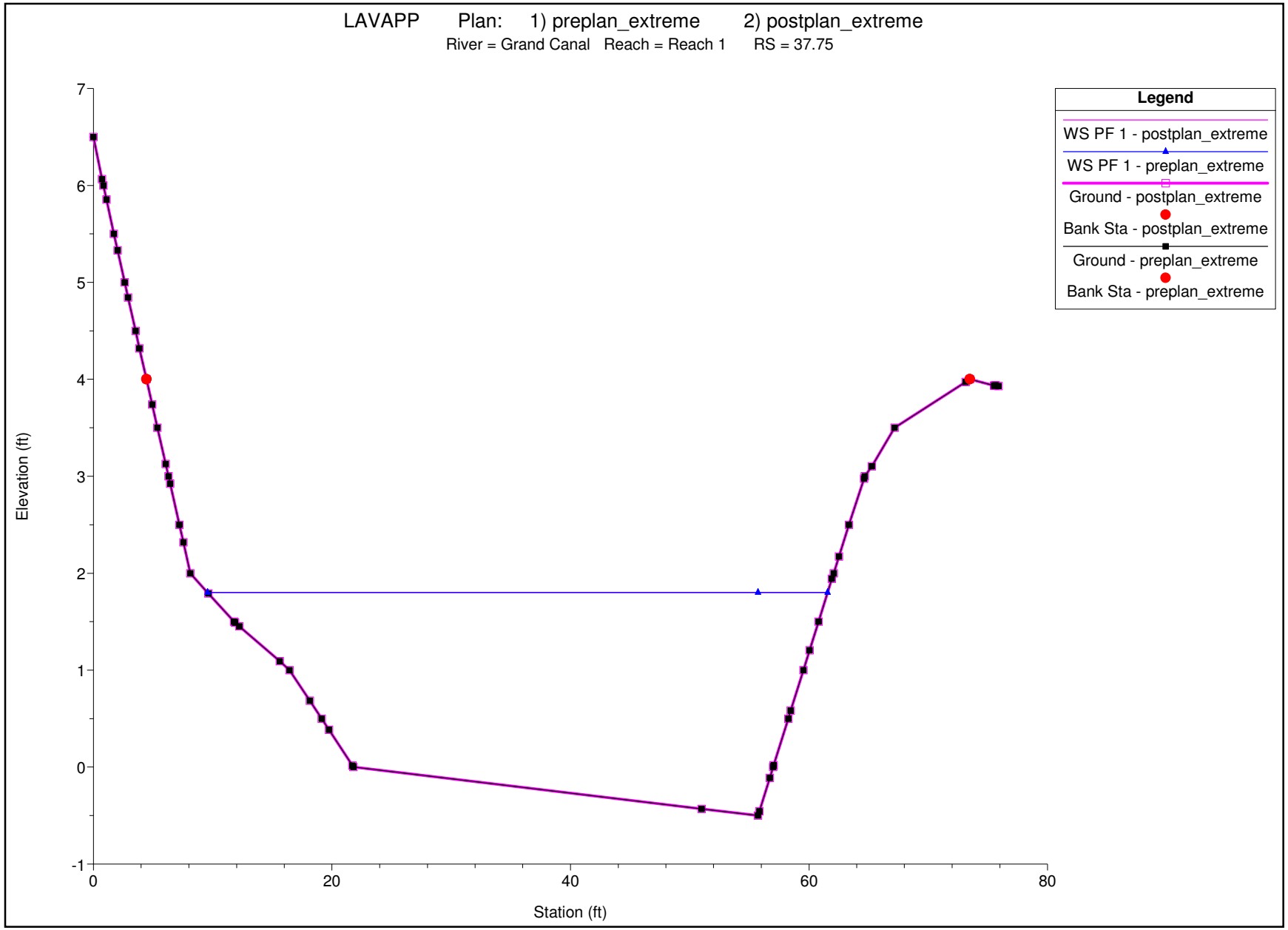
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APPENDIX K
VENICE AUXILIARY PUMPING PLANT (VAPP) WATER QUALITY SAMPLING REPORT

Venice Auxiliary Pumping Plant (VAPP)
Water Quality Sampling Report

July 8th, 2015

Prepared by

CITY OF LOS ANGELES
Department of Public Works
LA Sanitation
Environmental Monitoring Division

Prepared for

City of Los Angeles
Department of Public Works
Bureau of Engineering
Environmental Management Group

Subject: Venice Auxiliary Pumping Plant (VAPP) Water Quality Sampling

Overview

On June 5th, 2015, the Department of Public Works, Bureau of Engineering, Environmental Management Group requested baseline testing of the water quality in the Grand Canal near a construction project at the Venice Auxiliary Pumping Plant (VAPP) in Venice, California, between Hurricane Street and Galleon Street (see copy of memo at the end of this document). The canal is within a coastal intertidal wetland and covered under the *California Environmental Quality Act*. Baseline data for the following water quality parameters were requested: pH, temperature, dissolved oxygen (DO), turbidity, and total suspended solids (TSS). A visual assessment for any floating particles, including hydrocarbons, was also requested.

Materials and Methods

- Project area photographs were captured during two field reconnaissance visits; June 10 and June 26, 2015.
- The construction project was already underway prior to reconnaissance visits.
- Construction had already begun when samples were collected the morning and early afternoon of July 1st, 2015.
- YSI Sonde 6600 v2 was used to measure temperature, salinity, turbidity, and dissolved oxygen (DO). A separate handheld pH probe was used due to malfunction of the YSI pH probe.
- Salinity, DO, turbidity, and pH were all calibrated in the lab the morning of the field sampling.
- Total suspended solids (TSS) samples were collected in conjunction with YSI Sonde measurements.
- A field duplicate TSS sample was collected at the 'downstream, outgoing tide' station. Duplicate reading of TSS were made on the 'upstream, incoming tide' sample
- Sampling site (station) coordinates were captured using an iPhone.
- TSS samples were analyzed at the Environmental Monitoring Division Laboratory, Conventional Chemistry Section, Process Control Unit, in Playa del Rey, California.
- A laboratory duplicate TSS sample was analyzed with the 'upstream, incoming tide' sample.
- YSI Sonde turbidity values were verified in the lab using the samples collected for TSS.

Site photographs:



Construction site reconnaissance, June 10, 2015. Grand Canal looking southeast toward Hurricane Street with culvert indicated with arrow.



Construction site reconnaissance, June 26, 2015. Cement piles near drain that flows into canal, but no contamination was apparent

Station Locations:



Sampling Day Conditions (July 1, 2015):

- High tide: 10:21 AM (3.9 ft), Low tide 3:58 PM (-0.9 ft)
- Sampled upstream at Station 2 at 10:04 AM
- Sampled downstream at Station 3 at 1:35 PM



Cement piles near drain were absent on sampling day.

Results

Station	Date	Time	Lat	Lon	Temp (°C)	Sal (ppt)	pH	In situ Turbidity (ntu)	Discrete Turbidity (ntu)	DO (mg/)L	DO (% sat)	TSS (mg/L)
2	1-Jul-15	10:04AM	33.976263	-118.461190	23.49	33.65	8.30	1.5	6.79	6.23	88.8	40
Lab Dup												44
3	1-Jul-15	1:35PM	33.975952	-118.460886	24.93	34.17	8.38	1.4	2.82	6.91	101.3	51.2
Field Dup												43.6

Note: No anthropogenic particles or hydrocarbons were observed at any of the stations. YSI Sonde data files available upon request.
Station 2 = upstream, incoming tide
Station 3 = downstream, outgoing tide
File name: VeniceAuxPumpingPlant.xlsx

Memo request from Bureau of Engineering:

FORM GEN. 160 (Rev. 11-02)

CITY OF LOS ANGELES
INTERDEPARTMENTAL CORRESPONDENCE

Date: June 5, 2015

To: Mas Dojiri,
Wastewater Treatment Lab Manager III
Environmental Monitoring Division, MS 535
Department of Public Works, Bureau of Sanitation

From: Dr. Jan Green Rebstock
Environmental Supervisor II
Environmental Management Group, MS 939
Department of Public Works, Bureau of Engineering

Subject: VENICE AUXILARY PUMPING PLANT (VAAP) PROJECT
(W.O. SZC12923)

We are in need of baseline water quality data for the vicinity of the Grand Canal and Ballona Lagoon. The proposed project referenced above involves construction of a diversion structure within the banks of the Grand Canal, adjacent to the currently vacant lot east of the existing Venice Pumping Plant in the community of Venice, between Hurricane Street and Galleon Street. The canal is within an intertidal coastal wetland. EMG is initiating its review under the *California Environmental Quality Act* and preparing a Mitigated Negative Declaration. Anticipated required permits include Section 404 from the Army Corp of Engineers and a Section 401 water quality certification (WQC) under the *Clean Water Act*. Because water quality impacts from construction activities in the Grand Canal are likely, baseline water quality data is needed. The WQC requires water quality testing, pre and post construction.

Please provide two discrete water quality samples, one at low tide and one at high tide, using the following variables:

- pH
- temperature
- dissolved oxygen
- turbidity
- total suspended solids (TSS)
- visual assessment for floating particulates, including hydrocarbons if visible

If you have any questions or need additional information, please call me at (213) 485-5761. Thank you for your prompt attention.

CC: Curtis Cash, Bureau of Sanitation, EMD
Stan Asato, Bureau of Sanitation, EMD

APPENDIX L
CALIFORNIA COASTAL COMISSION SEA LEVEL RISE POLICY GUIDANCE

California Coastal Commission
Sea Level Rise Policy Guidance

Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits


Sunset Beach, Photo by Mario Fernandez



Chula Vista, Photo by Lisa Cox


San Francisco, Photo by Mike Baird


Arcata, Photo by Humboldt Baykeeper

Unanimously Adopted – August 12, 2015

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CALIFORNIA COASTAL COMMISSION
45 FREMONT, SUITE 2000
SAN FRANCISCO, CA 94105- 2219
VOICE (415) 904- 5200
FAX (415) 904- 5400
TDD (415) 597-5885

The ***California Coastal Commission Sea Level Rise Policy Guidance: Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits*** was **unanimously adopted** by the California Coastal Commission on August 12, 2015.

CALIFORNIA COASTAL COMMISSION

Commissioners

Steve Kinsey, *Chair*
Dayna Bochco, *Vice Chair*
Gregory Cox
Carole Groom
Erik Howell
Martha McClure
Wendy Mitchell
Mary K. Shallenberger
Effie Turnbull-Sanders
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Mark Vargas

Alternate Commissioners

Olga Diaz
Belinda Faustinos
Sarah Glade Gurney
Steve Kram
Marciela Morales
Randy Pestor
Dr. Paul Song

Ex Officio Members

John Laird/Janelle Beland
Lt. Gov. Gavin Newsom/Jennifer Lucchesi/Kevin Schmidt
Brian P. Kelly/Dale Jones

This report was prepared with financial assistance from the National Oceanic and Atmospheric Administration under the Coastal Zone Management Act Section 309 Enhancement Grant Program

SUMMARY OF DOCUMENT REVISIONS

A Draft version of this Guidance was released for public review on October 14, 2013. The public comment period was open for 120 days, until February 14, 2014. During that time, the Commission received over 100 comment letters that broke down into over 800 distinct comments. After the close of the public comment period, Commission staff responded to each comment and incorporated the feedback into a Revised Draft. A document containing all comments and responses is available on the Commission's website. Many alterations were made to the Draft Guidance, and the most significant include:

- *A new section on using scenario-based analysis to approach sea level rise planning*
- *A new section on storms, extreme events, abrupt change, and sea level rise*
- *A new section on sea level rise adaptation planning and environmental justice*
- *A revised chapter on sea level rise adaptation strategies, including additional strategies*
- *A new chapter on the legal context of adaptation planning*

The Revised Draft was released on May 27, 2015. This document was presented at the June 2015 Coastal Commission hearing in Newport Beach, and a presentation focusing specifically on Chapter 7 was given at the July 2015 hearing in Ventura. Written comments were requested by July 10, 2015, and 28 comment letters were submitted. Staff responded to each comment, and these responses are posted on the Coastal Commission website. The most significant revisions to the Recommended Final Draft include:

- *New text in Chapter 8, the Legal Context of Adaptation Planning, expanding the discussion of seawalls in the context of existing development versus new development, and addressing the planning considerations of highly urbanized areas*
- *New text clarifying the intent of this Guidance to focus on LCPs and CDPs, but that much of the content of the document is potentially applicable to other planning documents*
- *Additional text clarifying the unique challenges faced by low-income communities and the need to include low-income persons and communities in planning efforts*
- *Additional text recognizing the increasing demand for funding for sea level rise adaptation planning*
- *Additional Adaptation Strategies*
- *Additional Next Steps*

All revisions were coordinated with other California state efforts related to climate change and adaptation, including the 2014 *Safeguarding California* document (CNRA 2014). The Final Draft reflects the broad concepts and strategies in *Safeguarding California* — particularly the Coast and Oceans chapter — and complements it by providing information more specific to the Coastal Act, including Local Coastal Programs and Coastal Development Permits.

On August 12, 2015 the Commission adopted the Recommended Final Draft (dated July 31, 2015 and updated with addenda August 10, 2015) as interpretive guidelines pursuant to Public Resources Code section 30620.

How to Use this Document

This document is:	This document is NOT:
Guidance	**Regulations**
This Guidance is advisory and not a regulatory document or legal standard of review for the actions that the Commission or local governments may take under the Coastal Act. Such actions are subject to the applicable requirements of the Coastal Act, the federal Coastal Zone Management Act, certified Local Coastal Programs, and other applicable laws and regulations as applied in the context of the evidence in the record for that action.	
Dynamic	**Static**
This Guidance will be updated periodically to address new sea level rise science, information, and approaches regarding sea level rise adaptation, and new legal precedent. The Commission will also continue working on sea level rise through other projects and in a collaborative manner, as outlined in Chapter 9: Next Steps.	
Multi-purpose for multiple audiences	**Meant to be read cover-to-cover**
This Guidance is a comprehensive, multi-purpose resource and it is intended to be useful for many audiences. As such, it includes a high level of detail on many subjects. However, chapters were written as stand-alone documents to provide usable tools for readers.	
A menu of options	**A checklist**
*Since this document is intended for use statewide, it is not specific to a particular geographic location or development intensity (*e.g.*, urban or rural locations).Therefore, not all of the content will be applicable to all users, and readers should view the content as a menu of options to use only if relevant, rather than a checklist of required actions.*	

Reading Tips

- Look carefully at the Table of Contents and identify sections of interest.
- Do not expect all of the content to apply to your particular situation. As a statewide document, a wide variety of information is included to address the concerns of various users.
- Navigate to your desired level of detail: The *Executive Summary* provides a basic summary of the content; the body of the document provides a detailed discussion; and the *Appendices* provide more scientific and technical detail and a variety of useful resources.

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Commonly Used Acronyms and Agency Names

Terms:

CCT – California Coastal Trail

CDP – Coastal Development Permit

CoSMoS – Coastal Storm Modeling System

ENSO – El Niño Southern Oscillation

ESHA – Environmentally Sensitive Habitat Area

GHG – Greenhouse gas

IPCC – Intergovernmental Panel on Climate Change

LCP – Local Coastal Program

LUP – Land Use Plan

NRC Report – National Research Council Report "*Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*"

PDO – Pacific Decadal Oscillation

SLR – Sea level rise

TNC – The Nature Conservancy

Agency Names:

BCDC – San Francisco Bay Conservation and Development Commission

BOEM – Bureau of Ocean Energy Management

BSEE – Bureau of Safety and Environmental Enforcement

Cal OES – California Governor's Office of Emergency Services

Caltrans – California Department of Transportation

CCC/Commission – California Coastal Commission

CDFW – California Department of Fish and Wildlife

CNRA – California Natural Resources Agency

CO-CAT – Coast and Oceans Climate Action Team

Conservancy – California State Coastal Conservancy

EPA – Environmental Protection Agency

FEMA – Federal Emergency Management Agency

NERR – National Estuarine Research Reserve

NMS – National Marine Sanctuary

NOAA – National Oceanic and Atmospheric Administration

NPS – National Park Service

OPC – California Ocean Protection Council

OPR – California Governor's Office of Planning and Research

State Lands – California State Lands Commission

State Parks – California Department of Parks and Recreation

SWRCB – State Water Resources Control Board

USACE – United States Army Corps of Engineers

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Survey



Executive Summary

Climate change is upon us, affecting almost every facet of California's natural and built environment. Increasing global temperatures are causing significant effects at global, regional, and local scales. In the past century, average global temperature has increased by about 0.8°C (1.4°F), and average global sea level has increased by 7 to 8 in (17 to 21 cm) (IPCC 2013). Sea level at the San Francisco tide gauge has risen 8 in (20 cm) over the past century, and the National Research Council (NRC) projects that by Year 2100, sea level in California may rise by 4 to 56 in (10 to 143 cm) for areas north of Cape Mendocino and 17 to 66 in (42 to 167 cm) for areas south of Cape Mendocino (NRC 2012). While the California coast regularly experiences erosion, flooding, and significant storm events, sea level rise will exacerbate these natural forces, leading to significant social, environmental, and economic impacts. The third National Climate Assessment notes that there is strong evidence showing that the cost of doing nothing to prepare for the impacts of sea level rise exceeds the costs associated with adapting to them by about 4 to 10 times (Moser *et al*. 2014). Therefore, it is critically important that California plan and prepare for the impacts of sea level rise to ensure a resilient California coast for present and future generations.

The California Coastal Act is one of the state's primary coastal management laws for addressing land use, public access and recreation, and the protection of coast and ocean resources in the coastal zone. It is also the primary coastal hazards law governing development along the coast. Using the Coastal Act, the Coastal Commission and local governments have more than four decades of experience managing coastal development, including addressing the challenges presented by coastal hazards like storms, flooding, and erosion as well as responses to these hazards such as armoring. However, sea level rise and the changing climate present management challenges of a new magnitude, with the potential to significantly threaten many coastal resources, including shoreline development, coastal beach access and recreation, habitats, agricultural lands, cultural resources, and scenic resources, all of which are subject to specific protections and regulations in the Coastal Act. Therefore, effective implementation of the Coastal Act and the protection of California's coast must address global sea level rise and the greater management challenges it will bring.

This document focuses specifically on how to apply the Coastal Act to the challenges presented by sea level rise through Local Coastal Program (LCP) certifications and updates and Coastal Development Permit (CDP) decisions. It organizes current science, technical, and other information and practices into a single resource to facilitate implementation of the Coastal Act by coastal managers at the state and local level. While the document is intended to guide LCP planning and development decisions to ensure effective coastal management actions, it is advisory and does not alter or supersede existing legal requirements, such as the policies of the Coastal Act and certified LCPs. However, one of the Commission's priority goals is to coordinate with local governments to complete and update LCPs in a manner that adequately addresses sea level rise and reflects the recommendations in this Guidance.

This Guidance document is also part of a larger statewide strategy to respond to climate change that includes both emissions reductions and adaption planning to address the impacts of a changing climate. In 2008, Governor Schwarzenegger issued an Executive Order (S-13-08) directing state agencies to consider sea level rise as part of planning projects and to support the preparation of the National Research Council report on sea level rise. Additionally, on April 29,

2015, Governor Brown issued an Executive Order (B-30-15) to establish a new greenhouse gas emission reduction target and called for further action on adaptation. This Guidance is also being coordinated with many statewide initiatives to address climate change and sea level rise, including the 2014 *Safeguarding California* plan (an update to the 2009 *California Adaptation Strategy*; CNRA 2009, 2014), the ongoing update to the *General Plan Guidelines* (Cal OPR 2015), the 2013 update to the California Governor's Office of Emergency Services' (Cal OES) *State Hazard Mitigation Plan*, and others.[1] Commission staff has also been and will continue to participate in multi-agency partnerships, including the Coast and Ocean Workgroup of the multi-state agency Climate Action Team and the *State Coastal Leadership Group on Sea-Level Rise*. For more detail on these efforts, see the Introduction.

PRINCIPLES FOR ADDRESSING SEA LEVEL RISE IN THE COASTAL ZONE

This Guidance is rooted in certain fundamental guiding principles, many of which derive directly from the requirements of the Coastal Act. These Principles broadly lay out the common ideas and a framework by which sea level rise planning and permitting actions can be assessed, and as such represent the goals to which actions should aspire. Individual actions and outcomes may vary based on a variety of factors, including applicable policies and location- or project-specific factors that may affect feasibility. The Guiding Principles are summarized below and discussed in greater detail in Chapter 2.

Use Science to Guide Decisions [Coastal Act Sections 30006.5; 30335.5]

1. Acknowledge and address sea level rise as necessary in planning and permitting decisions.
2. Use the best available science to determine locally relevant and context-specific sea level rise projections for all stages of planning, project design, and permitting reviews.
3. Recognize scientific uncertainty by using scenario planning and adaptive management techniques.
4. Use a precautionary approach by planning and providing adaptive capacity for the highest amounts of possible sea level rise.
5. Design adaptation strategies according to local conditions and existing development patterns, in accordance with the Coastal Act.

Minimize Coastal Hazards through Planning and Development Standards [Coastal Act Sections 30253, 30235; 30001, 30001.5]

6. Avoid significant coastal hazard risks to new development where feasible.
7. Minimize hazard risks to new development over the life of authorized structures.
8. Minimize coastal hazard risks and resource impacts when making redevelopment decisions.

[1] See the Governor's Office of Planning and Research's webpage for the California Climate Change Document, which includes a matrix of additional efforts. Available at: http://opr.ca.gov/s_publications.php

9. Account for the social and economic needs of the people of the state; assure priority for coastal-dependent and coastal-related development over other development.
10. Ensure that property owners understand and assume the risks, and mitigate the coastal resource impacts, of new development in hazardous areas.

Maximize Protection of Public Access, Recreation, and Sensitive Coastal Resources [Coastal Act Chapter 3 policies]

11. Provide for maximum protection of coastal resources in all coastal planning and regulatory decisions.
12. Maximize natural shoreline values and processes; avoid expansion and minimize the perpetuation of shoreline armoring.
13. Recognize that sea level rise will cause the public trust boundary to move inland. Protect public trust lands and resources, including as sea level rises. New shoreline protective devices should not result in the loss of public trust lands.
14. Address other potential coastal resource impacts (wetlands, habitat, agriculture, scenic, *etc.*) from hazard management decisions, consistent with the Coastal Act.
15. Address the cumulative impacts and regional contexts of planning and permitting decisions.
16. Require mitigation of unavoidable coastal resource impacts related to permitting and shoreline management decisions.
17. Consider best available information on resource valuation when mitigating coastal resource impacts.

Maximize Agency Coordination and Public Participation [Coastal Act Chapter 5 policies; Sections 30006; 30320; 30339; 30500; 30503; 30711]

18. Coordinate planning and regulatory decision making with other appropriate local, state, and federal agencies; support research and monitoring efforts.
19. Consider conducting vulnerability assessments and adaptation planning at the regional level.
20. Provide for maximum public participation in planning and regulatory processes.

BEST AVAILABLE SCIENCE AND CONSEQUENCES OF SEA LEVEL RISE

The Coastal Act directs the Coastal Commission and local governments to use the best available science in coastal land use planning and development. This Guidance recommends using the best available science on sea level rise projections to inform planning decisions and project design. The State of California supported the preparation of the 2012 National Research Council's Report, *Sea-Level Rise for the Coasts of California, Oregon and Washington: Past, Present, and Future*, which is currently considered the best available science on sea level rise for California. The report contains sea level rise projections for three time periods over the coming century for north and south of Cape Mendocino (Table 1).[2,3] The Coastal Commission will re-examine best available science periodically and as needed with the release of new information.

In addition to these sea level rise projections, the 2012 NRC report provides information on the impacts of sea level rise in California. According to the report, sea level rise will cause flooding and inundation, increased coastal erosion, changes in sediment supply and movement, and saltwater intrusion to varying degrees along the California coast. These effects in turn could have a significant impact on the coastal economy and could put important coastal resources and coastal development at risk, including ports, marine terminals, commercial fishing infrastructure, public access, recreation, wetlands and other coastal habitats, water quality, biological productivity in coastal waters, coastal agriculture, and archaeological and paleontological resources.

Table 1. Sea Level Rise Projections for California (NRC 2012)

TIME PERIOD*	NORTH OF CAPE MENDOCINO	SOUTH OF CAPE MENDOCINO	
by 2030	-2 – 9 in (-4 – +23 cm)	2 – 12 in (4 – 30 cm)	
by 2050	-1 – 19 in (-3 – + 48 cm)	5 – 24 in (12 – 61 cm)	
by 2100	4 – 56 in (10 – 143 cm)	17 – 66 in (42 – 167 cm)	

*with Year 2000 as a baseline

[2] The NRC Committee divided the Pacific coast for California, Oregon and Washington into two regions, north and south of Cape Mendocino, due to differences in tectonics that occur at this point. North of Cape Mendocino, land is rising by 1.5 to 3.0 mm/yr as ocean plates descend below the North American plate at the Cascadia Subduction Zone. South of Cape Mendocino, the coast is sinking at an average rate of about 1 mm/yr, although local rates vary widely (NRC 2012, p. 3). Humboldt Bay has not experienced the regional uplift that characterizes most of the coast north of Cape Mendocino, and instead has shown the highest subsidence recorded for the California coast. As a result, the projections for north of Cape Mendocino may not be appropriate for use in or near Humboldt Bay and the Eel River Estuary. Please see *Humboldt Bay: Sea Level Rise Hydrodynamic Modeling, and Inundation Vulnerability Mapping* (Northern Hydrology and Engineering 2015) for additional information on sea level rise projections for the Humboldt Bay region.

[3] Any future updates to the state guidance document will be available at http://www.opc.ca.gov/2009/12/climate-change/.

ADDRESSING SEA LEVEL RISE IN LOCAL COASTAL PROGRAMS

This document provides a step-by-step process for addressing sea level rise and adaptation planning in new and updated Local Coastal Programs. These Steps, summarized below in text and in Figure 1, can be tailored to fit the needs of individual communities and to address the specific coastal resource and development issues of a community, such as dealing with bluff erosion or providing for effective redevelopment, urban infill, and concentration of development in already developed areas. Ideally, Commission and local government staff will establish regular coordination and work together in the early steps of any LCP planning process. For a detailed explanation of these LCP planning Steps, see Chapter 5. Communities in areas where sea level rise vulnerability assessment work is already underway can start later in the process, at Step 4, or other relevant Step(s).

Step 1. **Determine a range of sea level rise projections relevant to LCP planning area/segment** using best-available science, which is currently the 2012 NRC Report.

Step 2. **Identify potential physical sea level rise impacts in the LCP planning area/segment**, including inundation, storm flooding, wave impacts, erosion, and/or saltwater intrusion into freshwater resources.

Step 3. **Assess potential risks from sea level rise to coastal resources and development in the LCP planning area/segment,** including those resources addressed in Chapter 3 of the Coastal Act.

Step 4. **Identify adaptation measures and LCP policy options** to include in the new or updated LCP, including both general policies and ordinances that apply to all development exposed to sea level rise, and more targeted policies and land use changes to address specific risks in particular portions of the planning area.

Step 5. **Draft updated or new LCP for certification with California Coastal Commission**, including the Land Use Plan and Implementing Ordinances.

Step 6. **Implement the LCP and monitor and re-evaluate strategies as needed** to address new circumstances relevant to the area.

Planning Process for Local Coastal Programs and Other Plans



Figure 1. Flowchart for addressing sea level rise in Local Coastal Programs and other plans

ADDRESSING SEA LEVEL RISE IN COASTAL DEVELOPMENT PERMITS

New development within the coastal zone generally requires a Coastal Development Permit (CDP). Many projects reviewed through the CDP application process already examine sea level rise impacts as part of the hazards analysis, though not every CDP application will need to consider sea level rise. In general, sea level rise is only likely to affect those projects that are on low-lying land, on eroding coastal bluffs, are in close proximity to water, or rely upon a shallow aquifer for water supply. This document offers a step-by-step outline, summarized below in text and in Figure 2, for how to conduct such an analysis as a standard part of the CDP application process. The goal of these Steps is to ensure careful attention to minimizing risk to development and avoiding impacts to coastal resources over the life of the project. Early coordination with the Coastal Commission staff is highly recommended, and staff will be available to consult with applicants during this process. Adopting or updating LCPs as recommended in this Guidance should facilitate subsequent review of CDPs. LCPs can identify areas where a closer review of sea level rise concerns is necessary. If kept up to date, they can also provide information for evaluation at the permit stage and specify appropriate mitigation measures for CDPs to incorporate. For a detailed explanation of these steps, see Chapter 6 of this Guidance.

Step 1. **Establish the projected sea level rise range for the proposed project**'s planning horizon using the best available science, which is currently the 2012 NRC Report.

Step 2. **Determine how physical impacts from sea level rise may constrain the project site,** including erosion, structural and geologic stability, flooding, and inundation.

Step 3. **Determine how the project may impact coastal resources, considering the influence of future sea level rise upon the landscape** as well as potential impacts of sea level rise adaptation strategies that may be used over the lifetime of the project.

Step 4. **Identify alternatives to avoid resource impacts and minimize risks** throughout the expected life of the development.

Step 5. **Finalize project design and submit CDP application.**

Planning Process for Coastal Development Permits

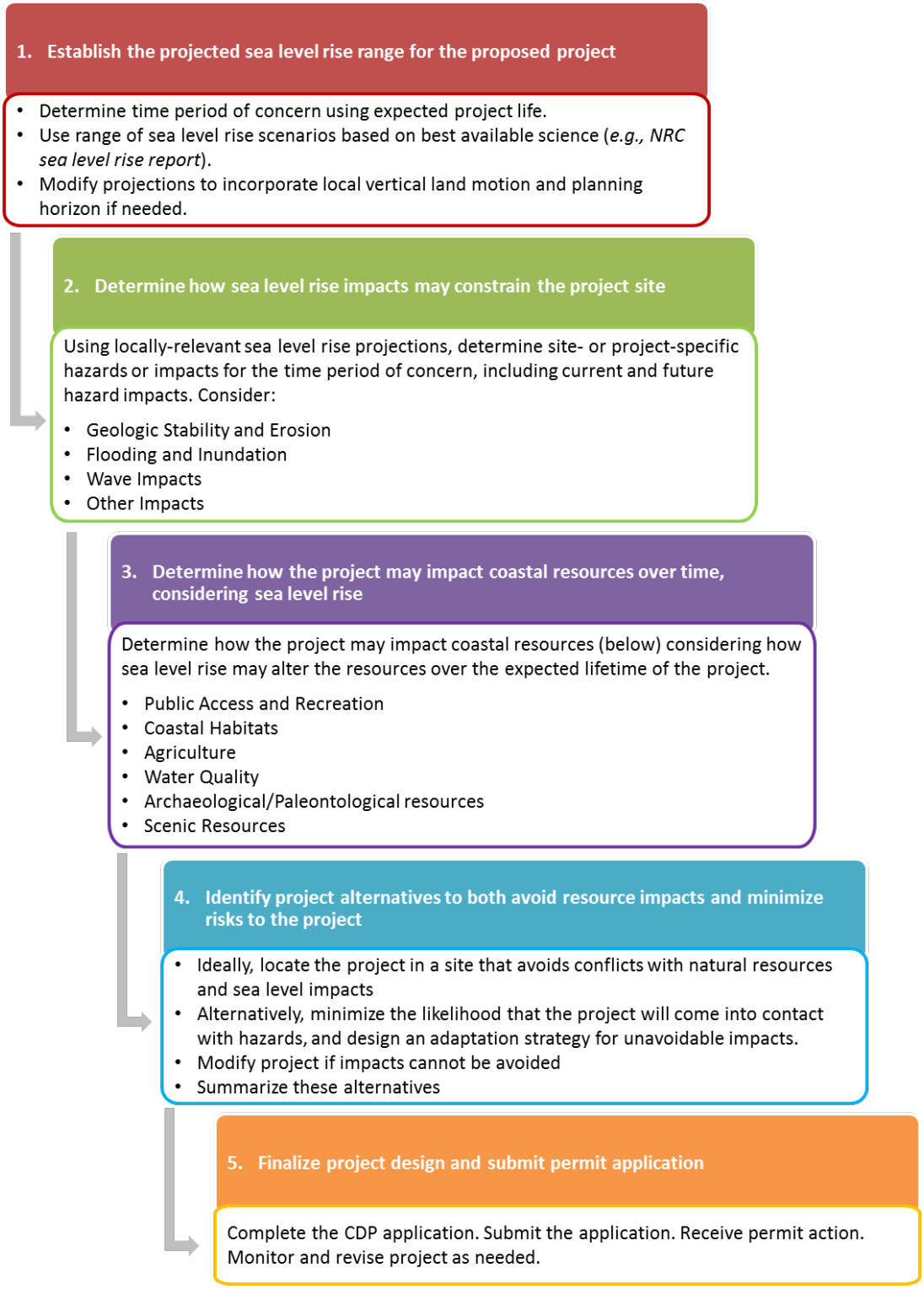

Figure 2. Flowchart for addressing sea level rise in Coastal Development Permits

ADAPTATION STRATEGIES

Steps 1 through 3 of the processes for addressing sea level rise in LCPs and CDPs will help planners and project applicants identify particular vulnerabilities to the planning region and specific project sites. Such vulnerabilities may include impacts to a number of resources identified in the Coastal Act, including development and infrastructure; public access and recreational opportunities; beaches, wetlands, environmentally sensitive habitat areas (ESHA), and other coastal habitats; agricultural resources; water quality; archaeological and paleontological resources; and scenic and visual resources. Planners and project applicants will need to identify, develop, and implement various adaptation strategies designed to protect coastal resources. These strategies should fulfill the hazard minimization and resource impact avoidance policies of the Coastal Act and should account for local conditions. In many cases, strategies will need to be implemented incrementally as conditions change, and planners, project applicants, and partners will need to think creatively and adaptively to ensure that coastal resources and development are protected over time. Chapter 7 of this Guidance summarizes a number of strategies to protect different coastal resources and meet the goals and requirements of the Coastal Act.

ADDITIONAL INFORMATION

In addition to providing a summary of best available science on sea level rise, step-by-step approaches for addressing sea level rise in LCPs and CDPs, and a discussion of numerous adaptation strategies, the Guidance includes the following supplemental information:

- A brief discussion of the legal context of adaptation
- Next steps for Commission staff in coordination with other relevant partners and research institutions, based on objectives and actions from the Commission adopted *California Coastal Commission Strategic Plan 2013-2018* (2013a)
- Additional research needs directed toward research institutions at academic, state, federal, and local levels to help communities understand and prepare for sea level rise
- Detailed information on the drivers of sea level rise and sea level rise projections
- A step-by-step methodology for assessing local hazard conditions based on regional sea level rise projections, which is applicable to both LCPs and CDPs
- Lists of useful resources and references, including examples of sea level rise adaptation documents from other state agencies
- Key Coastal Act policies relevant to sea level rise and coastal hazards

CONTEXT OF THIS DOCUMENT

This Guidance is part of a larger body of work on climate change by State agencies, regional collaborations, local leadership, academic research, and other organizations. Many of these efforts are included as resources in Appendix C. Users of the document should take advantage of these existing resources, collaborate with others, and share best practices as much as possible.

Finally, this document is intended to function as interpretive guidance for effective implementation of the Coastal Act and LCPs in light of sea level rise. It is not a regulatory document and does not contain any new regulations. Further, it does not amend or supersede existing legal authorities or the standard of review for Local Coastal Programs and coastal development permit decisions pursuant to the Coastal Act. Those actions are subject to the applicable requirements of the Coastal Act, the Coastal Zone Management Act, certified LCPs, and other applicable laws and regulations as applied in the context of the evidence in the records for those actions. The Commission is adopting this Guidance as interpretive guidelines pursuant to its authority under Public Resources Code Sections 30620.

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Chapter 1

Introduction

Climate change is happening now. Rapidly melting ice caps, rising sea levels, floods, extreme heat waves, droughts, and fires are just a few of the effects of climate change. These effects are having profound impacts on our coast and are changing coastal management planning and decision making at global, national, state, regional, local, and individual scales.

Given current trends in greenhouse gas emissions, sea levels are expected to rise at an accelerating rate in the future, and scientists project an increase in California's sea level in coming decades. Until mid-century, the most damaging events for the California coast will likely be dominated by large El Niño-driven storm events in combination with high tides and large waves. Eventually, sea level will rise enough that even small storms will cause significant damage, and large events will have unprecedented consequences (Caldwell *et al*. 2013).

This Guidance provides a framework for addressing sea level rise in Local Coastal Programs (LCPs) and Coastal Development Permits (CDPs). The intended audience for this document includes the Commission and Commission staff, local governments, other public agencies, permit applicants, members of the public, and others who are interested in how to implement and comply with the California Coastal Act (Coastal Act) while taking steps to address sea level rise.

ENVIRONMENTAL, ECONOMIC, AND SOCIAL IMPACTS OF SEA LEVEL RISE

The potential environmental, economic, and social impacts of sea level rise in California underscore the importance of addressing the issue in land use planning and regulatory work. Just over 21 million people lived in California's coastal counties as of July 2014 (CDF 2014), and the state supports a $40 billion coastal and ocean economy (NOEP 2010).

Many aspects of the coastal economy, as well as California's broader economy, are at risk from sea level rise, including coastal-related tourism, beach and ocean recreational activities, transfer of goods and services through ports and transportation networks, coastal agriculture, and commercial fishing and aquaculture facilities.

In addition to potential losses in revenue, Heberger *et al.* (2009) estimate that $100 billion worth of property is at risk of flooding during a 100-year coastal flood with 4.6 ft (1.4 m) of sea level rise (the amount projected to occur by the year 2100 in their Pacific Institute study). This property includes seven wastewater treatment plants, commercial fishery facilities, marine terminals, Coastal Highway One, 14 power plants, residential homes, and other important development and infrastructure.

Sea level rise also poses environmental and social justice challenges. This is particularly true for communities that may be dependent upon at-risk industries, are already suffering from economic hardship, or which have limited capacity to adapt, including lower-income, linguistically isolated, elderly, and other vulnerable populations.

Proactive steps are needed to prepare for sea level rise and to protect the coastal economy, California livelihoods, and coastal resources and the ecosystem services they provide. The

magnitude of the challenge is clear – not only might the impacts of sea level rise be severe, the costs and time associated with planning for them can be daunting. The third National Climate Assessment, released in May 2014, notes that there is strong evidence to suggest that the costs of inaction are 4 to 10 times greater than the costs associated with proactive adaptation and hazard mitigation (Moser *et al*. 2014). It is critical for California to take proactive steps to address the impacts sea level rise may have on the state's economy, natural systems, built environment, human health, and ultimately, its way of life.

SEA LEVEL RISE AND THE CALIFORNIA COASTAL ACT

The potential impacts of sea level rise fall directly within the Coastal Commission's (and coastal zone local governments') planning and regulatory responsibilities under the Coastal Act. Sea level rise increases the risk of flooding, coastal erosion, and saltwater intrusion into freshwater supplies, which have the potential to threaten many of the resources[4] that are integral to the California coast, including coastal development, coastal access and recreation, habitats (*e.g.*, wetlands, coastal bluffs, dunes, and beaches), coastal agricultural lands, water quality and supply, cultural resources, community character, and scenic quality. In addition, many possible responses to sea level rise, such as construction of barriers or armoring, can have adverse impacts on coastal resources. For example, beaches, wetlands, and other habitat backed by fixed or permanent development will not be able to migrate inland as sea level rises, and will become permanently inundated over time, which in turn presents serious concerns for future public access and habitat protection.

The Coastal Act mandates the protection of public access and recreation along the coast, coastal habitats, and other sensitive resources, as well as providing priority visitor-serving and coastal-dependent or coastal-related development while simultaneously minimizing risks from coastal hazards. This Guidance document has been created to help planners, project applicants, and other interested parties continue to achieve these goals in the face of sea level rise by addressing its effects in Local Coastal Programs and Coastal Development Permits. Although the focus of the Guidance is on LCPs and CDPS, much of the information contained herein can be useful for other planning documents such as Port Master Plans[5], Long Range Development Plans, and Public Works Plans. For example, the science applies regardless of the planning documents, and the discussions of how to analyze sea level rise impacts as well as a number of adaptation options may be applicable. In all cases, specific analyses performed and actions implemented will vary based on relevant policies, local conditions, feasibility, and other factors as described throughout the rest of this document.

[4] The term "coastal resources" is used throughout this Guidance and is meant to be a general term for those resources addressed in Chapter 3 of the California Coastal Act including but not limited to beaches, wetlands, agricultural lands, and other coastal habitats; coastal development; public access and recreation opportunities; cultural, archaeological, and paleontological resources; and scenic and visual qualities.

[5] Ports are generally subject to Chapter 8 of the Coastal Act. The policies of Chapter 8 acknowledge the special role and needs of ports and differ in significant ways from the Chapter 3 policies of the Act. Significant categories of development in ports, however, remain subject to Chapter 3, including categories of development listed as appealable pursuant to Section 30715 and development located within specified wetlands, estuaries, and recreation areas.

Coastal Commission reports and briefings on sea level rise: Sea level rise is not a new concern for the Commission. The Coastal Act policies on hazard avoidance and coastal resource protection provide the basis for the Commission to consider the impacts of sea level rise (see *Appendix F: Coastal Act Policies Relevant to Sea Level Rise and Coastal Hazards*), and the Commission has long considered sea level rise, erosion rates, and other effects of a dynamic climate in its analysis of permits and LCPs, staff recommendations, and Commission decisions. In 1992, Section 30006.5 was added to the Coastal Act which, among other things, directs the Commission to both develop its own expertise and interact with the scientific community on various technical issues, including coastal erosion and sea level rise. The Commission's staff also coordinates its work on sea level rise with other state and federal agencies, local governments, academic institutions, non-profit organizations, citizen groups, permit applicants, property owners, and others.

The Commission has documented its sea level rise adaptation and climate change efforts in numerous papers and briefings, including:

- 1989 Report: *Planning for Accelerated Sea Level Rise along the California Coast*
- 2001 Report: *Overview of Sea Level Rise and Some Implications for Coastal California*
- 2006 Briefing: *Discussion Draft: Global Warming and the California Coastal Commission*
- 2008 Briefing: *A Summary of the Coastal Commission's Involvement in Climate Change and Global Warming Issues for a Briefing to the Coastal Commission*
- 2008 White paper: *Climate Change and Research Considerations*
- 2010 Briefing: *A Summary of the Coastal Commission's Involvement in Sea Level Rise Issues for a Briefing to the Coastal Commission*[6]

THE IMPORTANCE OF ADDRESSING SEA LEVEL RISE IN LOCAL COASTAL PROGRAMS

The impacts of sea level rise will be felt at the local level, and therefore local responses will necessarily be part of effective management of these impacts. Fortunately, the California Coastal Act lays out a legal and planning framework for community climate preparedness and resiliency planning. LCPs, in combination with Coastal Development Permits (CDPs), provide the implementing mechanisms for addressing many aspects of climate change within coastal communities at the local level.

The goal of updating or developing a new LCP to prepare for sea level rise is to ensure that adaptation occurs in a way that protects both coastal resources and public safety and allows for sustainable economic growth. This process includes identifying how and where to apply different adaptation mechanisms based on Coastal Act requirements, other relevant laws and policies, acceptable levels of risk, and community priorities. LCP and Coastal Act policies are also reflected in CDPs, which implement sea level rise management measures and adaptation

[6] Verbal presentation to the Coastal Commission on December 17, 2010 by Susan Hansch (Item 4.5). This presentation can be viewed at the Cal-Span website (<http://www.cal-span.org/media.php?folder[]=CCC>) from approximately minute 22.00 to 24:30.

strategies through individual development decisions. By planning ahead, communities can reduce the risk of costly damage from coastal hazards, can ensure the coastal economy continues to thrive, and can protect coastal habitats, public access and recreation, and other coastal resources for current and future generations.

The Coastal Commission has made it a priority to support the update of LCPs to address climate change, as demonstrated by Goal 3 of the Commission's *Strategic Plan* (CCC 2013a), which is to "address climate change through LCP planning, coastal permitting, inter-agency collaboration, and public education." Specifically, Objective 3.1.1 directs the Commission to "adopt general sea level rise (SLR) policy guidance for use in coastal permitting and LCP planning and amendment based on best available science, including the final report from the National Research Council (NRC) of the National Academy of Science entitled, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* (released June 2012)." This Guidance document fulfills Objective 3.1.1 and is one of multiple ongoing Commission efforts to support local governments in updating LCPs to address sea level rise.

Funding for LCP updates: Both the *California Climate Adaptation Strategy* (CNRA 2009) and the *Safeguarding California* plan (CNRA 2014) identified amendments to LCPs as a key strategy for addressing sea level rise in California. However, there are significant funding constraints at both the Commission and local government levels that limit the capacity to update LCPs. Fortunately, three grant programs have recently been funded to support California local governments in updating LCPs to address sea level rise. These grant programs have partially overlapping objectives, as described below. Grant-related information as of the publication of this Guidance is summarized below. For up-to-date information regarding grants, please visit the Local Assistance Grant Program page on the Coastal Commission website.

- **Coastal Commission LCP Local Assistance Grant Program:** For fiscal years 2013/2014 and 2014/2015, the Coastal Commission received $1 million per year ($2 million total) in grant funds through a budget augmentation approved by Governor Brown and the California Legislature. The grant program provides funding to local governments to complete the certification of new and updated LCPs, with an emphasis on addressing impacts from sea level rise and climate change. In January 2014, the Coastal Commission awarded $1 million in LCP Grant funds to 11 jurisdictions throughout the state, with awards ranging from $29,000 to $130,000. In November 2014, the Coastal Commission awarded $1 million to 12 jurisdictions, with awards ranging from $13,000 to $250,000. This second round of funding was coordinated through a joint application and review process with the OPC LCP Sea Level Rise Grant program (below) in order to maximize funding opportunities.

- **Ocean Protection Council LCP Sea Level Rise Grant Program:** The OPC grant program includes $2.5 million to support local governments in updating LCPs to address sea level rise, including support of sea level rise modeling, vulnerability assessments, and adaptation planning and policy development. The OPC is administering the program in partnership with the Coastal Commission and the Coastal Conservancy. In November 2013, the OPC awarded $1,305,000 to seven jurisdictions based on recommendations from the three coordinating agencies. The remaining funds were awarded in the second

round of the grant program in December 2014. Seven jurisdictions received funding ranging from $90,000 to $200,000. This second round of funding was coordinated through a joint application and review process with the Coastal Commission Grant Program, as described above.

- **State Coastal Conservancy Climate Ready Grant Program:** The Climate Ready Grant Program provides funding for climate change-related projects including projects to update LCPs to address sea level rise. The Conservancy awarded $3 million in January 2014, and awarded an additional $2.4 million for a second round of grants in January 2015. The second round focuses on implementation of coastal climate change adaptation projects. A third round of grant applications is currently being reviewed. These grant funds are available to both local governments and non-governmental organizations.

Coastal Commission Staffing Increase to Support LCP planning: Governor Brown and the California Legislature also approved an augmentation to the Coastal Commission's FY 2013/2014 budget of $4 million ($3 million for state operations and $1 million for grants to local governments) for local governments and the Coastal Commission to prepare, update, amend, and review LCPs with an emphasis on including climate change issues.

The Governor's Budget for FY 2015/2016 implements the Spring Finance Letter issued April 1, 2014 that was approved as part of the FY 2014/2015 Enacted Budget. The Spring Finance Letter (April 1, 2014), added two additional years (FY 14/15 and FY 15/16) of state operations funding of $3 million for 25 limited term positions and operating expenses to the Coastal Commission's enacted budget for FY 14/15. For FY 14/15, the approved LCP staff funding is coming from $1 million in carryover General Fund and $2 million from the Coastal Act Services Fund (CASF 3123). For FY 15/16 the Governor's Budget proposes the LCP staff funding to come from $1 million in Environmental License Plate Funds (ELPF) and $2 million from the Coastal Act Services Fund.

The Coastal Act Services Fund holds the filing and permit fees that the Coastal Commission receives from applicants for regulatory actions (*e.g.*, development application fees). Because of the current reserve in the Coastal Act Services Fund, there are adequate resources to fund appropriation of $2 million for FY 14/15 and FY 15/16.

To extend the augmented LCP staff funding after FY 15/16, the Commission will need to submit a Budget Change Proposal in September 2015 for requested funding for FY 16/17 and thereafter.

COASTAL RESILIENCY AND PREPARING FOR SEA LEVEL RISE: THE FEDERAL AND STATE CONTEXT

Sea level rise planning efforts are currently taking place at the local, regional, state, and national levels. Framing the efforts in California is a federal strategy to address climate change by both reducing greenhouse gas emissions and adapting to climate change impacts. Recent efforts promoted by the White House include President Obama's January 2015 Executive Order 13960, which modifies Executive Order 11988, Floodplain Management, by expanding the federal approach for establishing flood risk to include the consideration of climate change. Specifically, it recommends using a new flood standard that accounts for climate change in establishing flood

elevation and hazard areas when federal funds are used to build, significantly retrofit, or repair structures.

Additionally, Governor Brown, Supervisor Carbajal (Santa Barbara County), Mayor Garcetti (Los Angeles), and Mayor Johnson (Sacramento) are on the President's State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience, which recently released recommendations for how to modernize programs and policies to incorporate climate change.[7] The Coastal Commission's Guidance document implements many of the Task Force's recommendations by providing tools and assistance to support sea level rise decision making, by establishing a framework for state, local, and federal partnership and coordination on sea level rise, and by providing guidance on how to improve the resilience of California's coastal infrastructure, natural resources, human communities, and coastal industries.

The State of California has long been a leader in preparing for sea level rise, and in 2008, Governor Schwarzenegger issued an Executive Order (S-13-08) directing state agencies to prepare guidance on sea level rise and to address sea level rise in any state projects located in vulnerable areas. Since then, state agencies have worked collaboratively to accomplish a variety of different actions related to sea level rise adaptation, many of which are listed below. Ten state and federal agencies[8] also commissioned the National Research Council's report, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* (2012), to improve understanding of sea level rise projections for California.

More recently, Governor Brown's April 2015 Executive Order B-30-15 addresses climate change and sea level rise adaptation, stating that state agencies shall take climate change into account in their planning and investment decisions. The order requires agencies to ensure that priority is given to actions that build climate preparedness and reduce greenhouse gas emissions, provide flexible and adaptive approaches, protect the state's most vulnerable populations, and promote natural infrastructure solutions. Additionally, AB2516, authored by Assemblymember Gordon and approved in September 2014, established a Planning for Sea Level Rise Database that is anticipated to be available online in early 2016. The database will provide the public with an educational tool from which to learn about the actions taken by cities, counties, regions, and various public and private entities to address sea level rise.

Much of the state's climate change adaptation work has been coordinated with the *Coast and Ocean Workgroup* of the *Climate Action Team* (CO-CAT), of which the Commission is a member. In addition, Commission staff has been involved in the *State Coastal Leadership Group on Sea-Level Rise*, which was established in early 2014 to develop and implement coordinated approaches to address sea level rise across state agencies. The partnership includes senior management from the Coastal Zone Management Agencies (Coastal Commission, San Francisco Bay Conservation and Development Commission, and State Coastal Conservancy) and land

[7] http://www.whitehouse.gov/administration/eop/ceq/initiatives/resilience/taskforce

[8] The assessment of sea level rise was commissioned by California Department of Water Resources, California Energy Commission, California Department of Transportation, California State Water Resources Control Board, California Ocean Protection Council, Oregon Watershed Enhancement Board, Washington Department of Ecology, National Oceanic and Atmospheric Administration (NOAA), US Army Corps of Engineers (USACE), and US Geological Survey (USGS).

management agencies (State Lands Commission and State Parks) along with the Ocean Protection Council and Natural Resources Agency. This Guidance is being coordinated closely with this work[9] to ensure that various initiatives do not conflict and to assure an effective response to challenges such as sea level rise.

To that end, the content of this Guidance is aligned with several key concepts in the *Safeguarding California* plan, including hazard avoidance for new development, encouraging innovative designs and adaptation strategies for structures in areas vulnerable to sea level rise hazards, and addressing climate impacts in Local Coastal Programs and General Plan updates, among many others. *Safeguarding California* also calls out the need for state agencies to produce guidance documents addressing climate adaptation, and this sea level rise Guidance is part of the statewide effort to fulfill that mandate. As *Safeguarding California* promotes, this Guidance will be a living document that will be updated and revised as sea level rise science advances and new insights are gained regarding adaptation.

State agency policies and guidance on climate change and sea level rise: As a result of the Executive Order S-13-08 and agency needs for guidance, many state agencies have developed climate change and sea level rise policies and guidance documents. For example:

- The California Natural Resources Agency (CNRA) developed the 2009 *California Climate Adaptation Strategy* and the 2014 update, *Safeguarding California*
- CNRA and the Governor's Office of Emergency Services (Cal OES) collaboratively developed the *California Climate Adaptation Planning Guide* (2012)
- The Governor's Office of Planning and Research is updating its *General Plan Guidelines* to address climate change (a draft update is anticipated in 2015)
- The Ocean Protection Council established *State Sea-Level Rise Guidance* (interim, 2010, and update, 2013) and passed a *State Sea-Level Rise Resolution* (March 11, 2011)
- The San Francisco Bay Conservation and Development Commission (BCDC) amended the *San Francisco Bay Plan* (1968) to update its policies regarding sea level rise (2011) and has been working on actions to reduce vulnerability to sea level rise throughout the San Francisco Bay through the Adapting to Rising Tides (ART) project
- The California State Coastal Conservancy (Conservancy) established climate change policies, application guidelines for sea level rise, and climate ready principles (2011)
- Cal OES updated the State Multi-Hazard Mitigation Plan in 2013
- The California Department of Transportation (Caltrans) developed guidance on incorporating sea level rise into the planning and development of Project Initiation Documents (2011), and how to address adaptation in Regional Transportation Plans (2013), and has completed numerous other climate change related activities

Other agencies including the California Department of Parks and Recreation and the California State Lands Commission are in the process of developing guidance. The California Department

[9] See the Governor's Office of Planning and Research's webpage for the California Climate Change Document which includes a matrix of additional efforts. Available at: http://opr.ca.gov/s_publications.php

of Fish and Wildlife, the Division of Boating and Waterways, and the Department of Water Resources are all actively addressing sea level rise and have taken steps to conduct research on sea level rise impacts, integrate sea level rise into planning documents, and educate staff on climate change impacts (see Appendix C for a description of these efforts).

Other efforts: Sea level rise planning efforts taking place at all levels of government and across numerous sectors helped inform this Guidance. Commission staff reviewed scientific publications on sea level rise and climate change, adaptation guidebooks, and existing adaptation principles and best practices described in documents such as *Indicators of Climate Change in California* (Cal EPA 2013), *Adapting to Sea Level Rise: A Guide for California's Coastal Communities* (Russell and Griggs 2012), *Climate Smart Conservation: Putting Adaptation Principles into Practice* (Stein *et al.* 2014), *Ecosystem Adaptation to Climate Change in California: Nine Guiding Principles* (RLF 2012), and *Climate Smart Principles* (PRBO 2013), and applied relevant information to the Guidance where applicable and consistent with the Coastal Act.

LOOKING AHEAD: PLANNING AND PROJECT DESIGN WITH SEA LEVEL RISE

The coast has always been a place of change due to land modifications such as erosion and vertical land motion, and to water variability such as tides, waves, and storms. Despite this dynamic nature, many areas of the California coast have been developed with an expectation that there will be some permanence to the land area and site safety. Development efforts have used such techniques as setbacks, avoidance of existing floodplain areas, elevation above some base flood level, and compliance with design standards to reduce or minimize coastal risks and to ensure an acceptable level of safety.

However, hazards are rarely eliminated or avoided completely. Sea level rise will exacerbate existing hazards and reduce the period of time over which some existing development can remain relatively safe. As noted in *Governing California through Climate Change*, "The notion of stable, predictable geography in which to live, work and build permanent buildings will be off the table in decades ahead" (Little Hoover Commission 2014, p. 2). Locations that might have seemed relatively safe from erosion or flooding 20 or 30 years ago may now be shown to have greater vulnerability due to sea level rise. Sites that might have seemed safe for 80 or 100 years might now only be safe for 40 or 50 years.

As coastal change accelerates, it will become more apparent that development close to the coast cannot be treated in the same way as more inland development, where hazardous conditions may be less dynamic. Coastal dynamics have long been part of land use planning considerations and project design; however, the focus on this change will grow in importance with rising sea level. This may mean that as properties are evaluated for proposed development, the type and intensity of the proposed development may need to change to address the dynamic nature of the property and changing nature of the hazards. As coastal areas erode, the carrying capacity of the area may need to be revised. The trend of redeveloping with additions and larger structures may need to change to one of maintaining what is there or redeveloping with smaller structures that better suit site constraints. The changing expectations are an important aspect of sea level rise adaptation

and are an important part of the following discussions on how to include sea level rise in Local Coastal Programs, applications for Coastal Development Permits, and adaptation planning.

Sea level rise is one of many climate change effects that will have impacts on coastal resources and development along the California coast. Accelerated coastal erosion, changing precipitation patterns, increasing temperatures, and more extreme storms will pose planning challenges in concert with sea level rise. There are other climate change impacts in the coastal zone, such as changes in water supply, terrestrial habitats, and fire hazards, that are also important to consider in decision making, and the Commission intends to provide guidance on a range of anticipated climate change impacts in the future.



Chapter 2

Principles for Addressing Sea Level Rise in the Coastal Zone

This chapter summarizes the Coastal Commission's framing principles for addressing sea level rise, many of which derive directly from the requirements of the Coastal Act. These principles broadly lay out the common ideas and a framework by which sea level rise planning and permitting actions can be assessed, and as such, represent the goals to which actions should aspire. Individual actions and outcomes may vary based on a variety of factors, including applicable policies and location- or project-specific factors that may affect feasibility. There are four categories of principles: using science to guide decisions; minimizing coastal hazards through planning and development standards; maximizing protection of public access, recreation, and sensitive coastal resources; and maximizing agency coordination and public participation. Each category groups important and related concepts that are central to addressing the challenge of rising sea levels. Building on the cumulative knowledge and experience of the Commission, subsequent chapters of this Guidance use these principles to frame practical guidance for addressing sea level rise through planning and permitting decisions in the coastal zone, consistent with the statewide policies of the California Coastal Act as well as the statewide vision of climate resilience outlined in the 2014 *Safeguarding California* plan.

USE SCIENCE TO GUIDE DECISIONS [Coastal Act Sections 30006.5; 30335.5]

1. **Recognize and address sea level rise as necessary in planning and permitting decisions.** Address sea level rise science in all applicable coastal management and decision-making processes, including Local Coastal Programs (LCPs), Port Master Plans (PMPs), Public Works Plans (PWPs), Long Range Development Plans (LRDPs), Coastal Development Permits (CDPs), federal consistency reviews, and other Coastal Act decision processes. Sea level rise should be addressed in both hazard analyses and identification of adaptation strategies/alternative analyses, consistent with the policies of the Coastal Act and LCPs as applicable[10].

2. **Use the best available science to determine locally relevant (context-specific) sea level rise projections and potential impacts for all Coastal Act planning processes, project design, and permitting reviews.** Sea level rise science continues to evolve, and some processes that are not fully understood (*e.g.*, ice sheet dynamics) could potentially have large effects on future sea level rise. At the time of this report's publication, the best available science on sea level rise in California is the 2012 National Research Council (NRC) Report, *Sea-Level Rise for the Coasts of California, Oregon and Washington: Past, Present, and Future* (NRC 2012) (See Table 2), as stated in the 2014 *Safeguarding California* document

[10] This Guidance document is intended to help implement the Coastal Act and LCPs in the context of sea level rise concerns. However, the standard of review for Commission actions remains the California Coastal Act or applicable certified LCPs. In particular, the recommendations of this Guidance do not constitute "enforceable policies" for purposes of CZMA federal consistency reviews. The enforceable policies for conducting federal consistency reviews will remain the policies of Chapter 3 of the Coastal Act. Also, for federal agency activities, the standard is consistency "to the maximum extent practicable," with Chapter 3, *i.e.*, federal agency activities must be fully consistent unless existing law applicable to the federal agency prohibits full consistency. See 15 CFR. §§ 930.32 and 930.43(d). However, the Commission looks at sea level rise as one part of determining the coastal effects from an activity through CZMA federal consistency reviews and the use of this Guidance by all parties should help determine what those coastal effects may be or how effects from sea level rise may be mitigated. Pursuant to 15 CFR § 930.11(h), implementation of this guidance would not be grounds for an objection (because it is not an "enforceable policy") but it might be one means that "would allow the activity to be conducted consistent with the enforceable policies of the program" in order to avoid an objection.

and the Ocean Protection Council's 2013 State of California Sea-level Rise Guidance Document. As discussed in greater detail in Chapter 3 of this Guidance, these projections should be used in a scenario-based analysis to identify potential local impacts from sea level rise, incorporating storms, extreme water levels, and shoreline change. Other authoritative sea level science and projections may also be used, in part or in full, provided they are peer-reviewed, widely accepted within the scientific community, and locally relevant.

The Commission will re-examine the best available science periodically and as needed with the release of new information on sea level rise.[11] In addition, Commission staff intends to submit a periodic status report to the Commission describing updates on the best available science and adaptation practices, and any potential recommended changes to the Guidance document.

Table 2. Sea Level Rise Projections for California[12] (NRC 2012)

TIME PERIOD*	NORTH OF CAPE MENDOCINO	SOUTH OF CAPE MENDOCINO	
by 2030	-2 – 9 in (-4 – +23 cm)	2 – 12 in (4 – 30 cm)	
by 2050	-1 – 19 in (-3 – + 48 cm)	5 – 24 in (12 – 61 cm)	
by 2100	4 – 56 in (10 – 143 cm)	17 – 66 in (42 – 167 cm)	

*with Year 2000 as a baseline

3. **Recognize and address scientific uncertainty using scenario planning and adaptive management techniques.** Given the uncertainty in the magnitude and timing of future sea level rise, particularly over longer time periods, planners and project designers should use scenario-based analysis to examine a range of possible shoreline changes and sea level rise risks to shape LCPs and other plans and project development designs. As appropriate, development projects, resource management plans, and LCP and other planning updates should incorporate an adaptive management framework with regular monitoring, reassessments, and dynamic adjustment in order to account for uncertainty.

[11] Major scientific reports include the release of the 2014 National Climate Assessment (Melillo *et al*.) and the 2013 IPCC 5th Assessment Report.

[12] The NRC Committee divided the Pacific coast for California, Oregon and Washington into two regions, north and south of Cape Mendocino, due to differences in tectonics that occur at this location. North of Cape Mendocino, land is rising as ocean plates descend below the North American plate at the Cascadia Subduction Zone. South of Cape Mendocino, the coast is subsiding (NRC 2012, p. 3). Humboldt Bay has not experienced the regional uplift that characterizes most of the coast north of Cape Mendocino, and instead has shown the highest subsidence recorded for the California coast. As a result, the projections for north of Cape Mendocino may not be appropriate for use in or near Humboldt Bay and the Eel River Estuary. Please see *Humboldt Bay: Sea Level Rise Hydrodynamic Modeling, and Inundation Vulnerability Mapping* (Northern Hydrology and Engineering 2015) for additional information on sea level rise projections for the Humboldt Bay region.

4. **Use a precautionary approach by planning and providing adaptive capacity for the highest amounts of possible sea level rise.** LCPs and CDPs should analyze the highest projections of sea level rise in order to understand the implications of a worst case scenario. In some cases, it may be appropriate to *design* for the local hazard conditions that will result from more moderate sea level rise scenarios, as long as decision makers and project applicants *plan* to implement additional adaptation strategies if conditions change more than anticipated in the initial design. Similar to the recommendation in the Ocean Protection Council's 2011 *State Sea-Level Rise Resolution*, the Commission does not recommend using values solely in the lower third of the NRC's projections as this does not give a full picture of the risks. Looking instead at both the high and low projections allows users to build an understanding of the overall risk sea level rise poses to the region or site.

5. **Design adaptation strategies according to local conditions and existing development patterns, in accordance with the Coastal Act.** Design adaptation strategies using best management practices for adaptation, and tailor the design to the specific conditions and development patterns of the area, in accordance with the Coastal Act and certified LCPs. LCPs should continue to serve as a key implementing mechanism for these adaptation strategies. Adaptation strategies should be evaluated for their ability to both minimize hazards and protect coastal resources.

MINIMIZE COASTAL HAZARDS THROUGH PLANNING AND DEVELOPMENT STANDARDS

[Coastal Act Sections 30253; 30235; 30001, 30001.5]

6. **Avoid significant coastal hazard risks to new development where feasible.** Section 30253 of the Coastal Act requires new development to minimize risks to life and property in areas of high geologic and flood hazard. The strongest approach for minimizing hazards is to avoid siting new development within areas vulnerable to flooding, inundation, and erosion, thus ensuring stable site conditions without the need for long-term financial and resource commitments for protective devices. Methods to direct new development away from hazardous locations are included in Chapter 7 of this Guidance.

7. **Minimize hazard risks to new development over the life of the authorized development.** Coastal Act Section 30253 requires that new development minimize coastal hazard risks without the use of bluff retaining or shoreline protection devices that would substantially alter natural landforms. When hazards from sea level rise cannot be avoided, new development should include provisions to ensure that hazard risks are minimized for the life of the development without shoreline protection, including through future modification, relocation, or removal when they become threatened by natural hazards, including sea level rise.

8. **Minimize coastal hazard risks and resource impacts when making redevelopment decisions.** LCPs should encourage and require, as applicable, existing at-risk structures to be brought into conformance with current standards when redeveloped. Improvements to existing at-risk structures should be limited to basic repair and maintenance activities and not extend the life of such structures or expand at-risk elements of the development, consistent with the Coastal Act.

9. **Account for the social and economic needs of the people of the state, including environmental justice; assure priority for coastal-dependent and coastal-related development over other development.** In planning and project development concerning sea level rise, assure that the social and economic needs of the people of the state are accounted for in accordance with Coastal Act Section 30001.5(b), with special consideration for working persons employed within the coastal zone (Coastal Act Section 30001(d)). Recognize that low-income communities are less equipped to prepare for and respond to the impacts of sea level rise and ensure that LCP and CDP decisions account for environmental justice concerns and include low-income persons and communities in planning efforts.

10. **Ensure that property owners understand and assume the risks, and mitigate the coastal resource impacts, of new development in hazardous areas.** Property owners should assume the risks of developing in a hazardous location (often referred to as internalizing risk). They should be responsible for modifying, relocating or removing new development if it is threatened in the future. Any actions to minimize risks to new development should not result in current and/or future encroachment onto public lands or in impacts to coastal resources inconsistent with the Coastal Act. LCPs and Coastal Development Permits should require recorded assumptions of risk, "no future seawall" conditions, and/or other appropriate mitigation measures to internalize risk decisions with the private land owner.

MAXIMIZE PROTECTION OF PUBLIC ACCESS, RECREATION, AND SENSITIVE COASTAL RESOURCES [Coastal Act Chapter 3 policies]

11. **Provide for maximum protection of coastal resources in all coastal planning and regulatory decisions.** New and existing development, redevelopment, and repair and maintenance activities as well as associated sea level rise adaptation strategies should avoid or minimize impacts to coastal resources, including public access, recreation, marine resources, agricultural areas, sensitive habitats, archaeological resources, and scenic and visual resources in conformity with Coastal Act requirements. Impacts from development and related activities should be avoided or minimized; unavoidable impacts should be mitigated as necessary.

12. **Maximize natural shoreline values and processes; avoid expansion and minimize the perpetuation of shoreline armoring.** If existing development (both private and public) is threatened by sea level rise hazards, it should employ the least environmentally damaging feasible alternatives and minimize hard shoreline protection. Priority should be given to options that enhance and maximize coastal resources and access, including innovative nature-based approaches such as living shoreline techniques or managed/planned retreat. If traditional hard shoreline protection is necessary and allowable under the Coastal Act, use the least-environmentally damaging feasible alternative, incorporate projections of sea level rise into the design of protection, and limit the time-period of approval, for example, to the life of the structure the device is protecting. Major renovations, redevelopment, or other new development should not rely upon existing shore protective devices for site stability or hazard protection. Where feasible, existing shoreline protection that is no longer being relied upon in this way, or no longer needed otherwise, should be phased out.

13. **Recognize that sea level rise will cause the public trust boundary to move inland. Protect public trust lands and resources, including as sea level rises. New shoreline protective devices should not result in the loss of public trust lands.** Where allowed under the Coastal Act or the relevant LCP, shoreline protective devices should be sited, designed, and conditioned to ensure that they do not result in the loss of public trust lands[13] or encroach onto public trust lands without the permission of the appropriate trustee agency. When sea level rise causes the public trust boundary to move inland such that a protective device that was located on uplands becomes subject to the public trust, the permittee should either obtain permission from the appropriate trustee agency for the encroachment or apply for a permit to remove any encroachments.

14. **Address potential secondary coastal resource impacts (to wetlands, habitat, agriculture, scenic and visual resources, *etc.*) from hazard management decisions, consistent with the Coastal Act.** Actions to address sea level rise in LCPs or permits should not exacerbate other climate-related vulnerabilities or undermine conservation/protection goals and broader ecosystem sustainability. For example, siting and design of new development should not only avoid sea level rise hazards, but also ensure that the development does not have unintended adverse consequences that impact sensitive habitats or species in the area.

15. **Address the cumulative impacts and regional contexts of planning and permitting decisions.** Sea level rise will have impacts at both the site-specific and regional scales. In addition to the evaluation of site-specific sea level rise impacts, LCPs and projects should include an evaluation of the broader region-wide impacts, in two different contexts. First, the LCP or project should consider how sea level rise impacts throughout an entire littoral cell or watershed could affect the LCP jurisdiction or project. Second, the LCP or project should consider how options to adapt to sea level rise could result in cumulative impacts to other areas in the littoral cell or watershed. Actions should be taken to minimize any identified impacts.

16. **Require mitigation of unavoidable coastal resource impacts related to permitting and shoreline management decisions.** Require mitigation for unavoidable public resource impacts over the life of the structure as a condition of approval for the Coastal Development Permit. For example, for impacts to sand supply or public recreation due to armoring and the loss of sandy beach from erosion in front of shoreline protection devices, require commensurate in-kind mitigations, a sand mitigation fee, and other necessary mitigation fees (for example, public access and recreation mitigation). Because the longer term effects can be difficult to quantify, especially given uncertainty about the exact rate of future sea level rise, consider requiring periodic re-evaluation of the project authorization and mitigation for longer term impacts.

[13] The State holds and manages all tidelands, submerged lands, and beds of navigable waterways for the benefit of all people of the State for statewide purposes consistent with the common law Public Trust Doctrine ("public trust"). In coastal areas, the landward location and extent of the State's trust lands are generally defined by reference to the ordinary high water mark, as measured by the mean high tide line. Public trust uses include such uses as maritime commerce, navigation, fishing, boating, water-oriented recreation, and environmental preservation and restoration.

17. **Consider best available information on resource valuation when planning for, managing, and mitigating coastal resource impacts.** Planning, project development, and mitigation planning should evaluate the societal and ecosystem service benefits of coastal resources at risk from sea level rise or actions to prepare for sea level rise. These benefits can include flood protection, carbon sequestration, water purification, tourism and recreation opportunities, and community character. Resource values can be quantified through restoration costs or various economic valuation models.

MAXIMIZE AGENCY COORDINATION AND PUBLIC PARTICIPATION [Coastal Act Chapter 5; Sections 30006; 30320; 30339; 30500; 30503; 30711]

18. **Coordinate planning and regulatory decision making with other appropriate local, state, and federal agencies; support research and monitoring efforts.** Given the multitude of sea level rise planning, research, and guidance efforts occurring in California, it is critical for agencies and organizations to share information, coordinate efforts, and collaborate where feasible to leverage existing work efforts and improve consistency. Additionally, since many sea level rise hazards affect multiple jurisdictions, their management may also need to be coordinated through multi-agency reviews and coordinated decision making. The Commission will continue to meet this goal through coordination, engagement with stakeholders, and trainings. However, ongoing financial support for these Commission efforts is critical.

19. **Consider conducting vulnerability assessments and adaptation planning at the regional level**. Where feasible, local governments should coordinate vulnerability assessments and adaptation planning with other jurisdictions in the region that face common threats from sea level rise. A regional vulnerability assessment provides an opportunity to evaluate impacts that span multiple jurisdictions, assess and implement regional adaptation strategies, coordinate responses, and leverage research and planning funds.

20. **Provide for maximum public participation in planning and regulatory processes.** The Coastal Commission will continue to provide avenues for maximum public participation in planning and regulatory processes, and will continue to establish and/or expand non-traditional alliances (*e.g.*, between/among public and private resource managers, tribal groups, scientists, decision makers), share knowledge openly and actively, and regularly and clearly communicate to the public on the science as well as on a range of solutions to prepare for sea level rise.

This document and its guiding principles both reflect and complement the priorities outlined in the State of California's climate adaptation strategy, the 2014 *Safeguarding California* plan. While this Guidance specifically focuses on the California Coastal Act and the regulatory work of the Coastal Commission, it also echoes key concepts in *Safeguarding California* that apply statewide. For example, a central theme in *Safeguarding California* is to provide risk reduction measures for California's most vulnerable populations, something that is addressed here in Guiding Principle #9. Similarly, this Guidance and *Safeguarding California* both emphasize the use of best available science (Guiding Principle #2) and the need for communication, outreach,

and public participation to increase understanding of climate risks and adaptation options (Guiding Principle #20).

Safeguarding California's Coast and Oceans chapter also states that "new development and communities must be planned and designed for long-term sustainability in the face of climate change," which captures a central purpose and focus of this Guidance. It goes on to specify that "California must ensure public access to coastal areas and protect beaches, natural shoreline, and park and recreational resources" and "the state should not build or plan to build, lease, fund, or permit any significant new structures or infrastructure that will require new protection from sea level rise, storm surges or coastal erosion during the expected life of the structure, beyond routine maintenance of existing levees or other protective measures, unless there is a compelling need." Again, these values are reflected here, as Guiding Principles #6 and #12. In these ways, and through the shared goal of ensuring planning for and resilience against climate change impacts, the two documents are readily consistent and complementary.

Chapter 3

Sea Level Rise Science

This chapter provides information on sea level rise science and covers the following subjects:

- The best available science on sea level rise
- Using scenario-based analysis in response to sea level rise projection ranges
- The physical impacts of sea level rise
- Storms, extreme events, and abrupt change

Sea level rise science continues to evolve, and the discussion below reflects the best available science at the time this document was published.

BEST AVAILABLE SCIENCE ON SEA LEVEL RISE

Scientists widely agree that the climate is changing and that it has led to global increases in temperature and sea level. In the past century, global mean sea level (MSL) has increased by 7 to 8 in (17 to 21 cm; IPCC 2013). It is extremely likely (>95% probability of occurrence) that human influence has been the dominant cause of the observed warming of the atmosphere and the ocean since the mid-20th century (IPCC 2013).

There are a number of methods for projecting future changes in global sea level, including using extrapolations from historical trends and observations, estimations from physical models, and combinations of observations and modeling, known as semi-empirical methods. For a detailed description of these techniques, see Appendix A.

Scientists also measure sea level change at a variety of scales, from the global down to the local level. For example, the sea level rise projections in Intergovernmental Panel on Climate Change (IPCC) reports are based on large scale models that give global projections. But sea level does not change uniformly around the globe, so modifications for local conditions are necessary for adaptation planning.

In particular, global average sea level rise is driven by the expansion of ocean waters as they warm, the addition of freshwater to the ocean from melting land-based ice sheets and glaciers, and from extractions in groundwater (Figure 3). However, regional and local factors such as tectonics and ocean and atmospheric circulation patterns result in relative sea level rise rates that may be higher or lower than the global average. As such, global-scale models are often "downscaled" through a variety of methods to provide locally relevant data.

For California, the National Research Council (NRC) 2012 report, described below, provides sea level rise projections that have been refined for the regions North and South of Cape Mendocino. Except for Humboldt Bay and the Eel River Estuary, more detailed refinement of sea level rise projections is not considered necessary at this time. While some, more localized refinements are possible, these local refinements are highly technical and data-intensive, and local variation from the regional projections will often be quite small. It is important to note, though, that while the sea level rise projections are fairly similar throughout the state, the physical impacts may be quite different, and locally-specific analysis of impacts will be very important. Detail on physical impacts and how to assess them is provided in Section C of this chapter and in Appendix B.

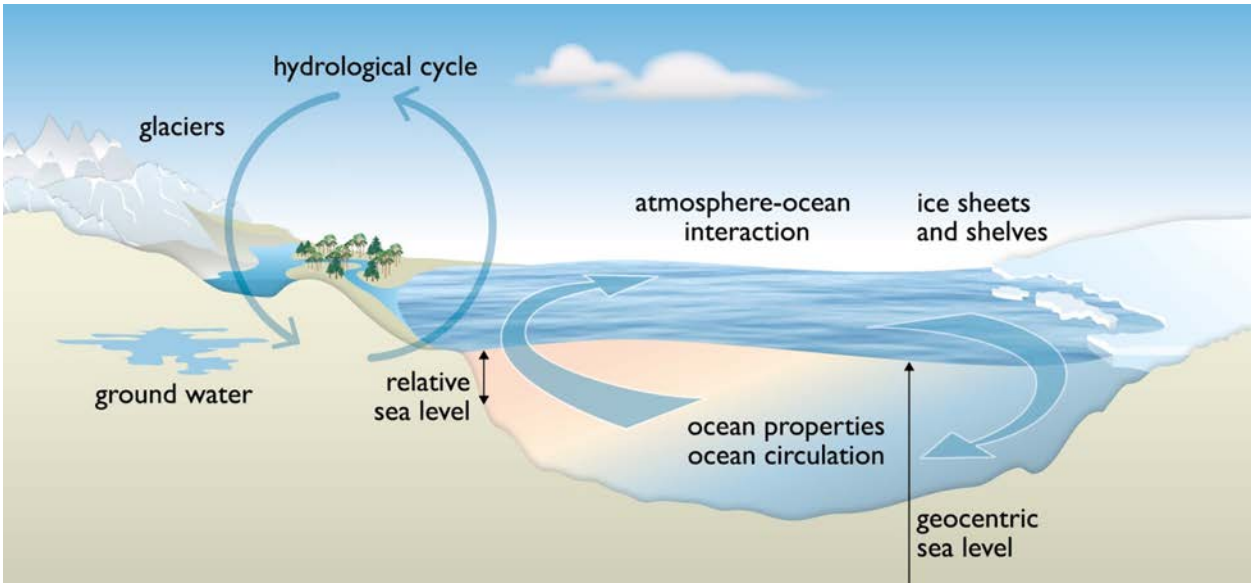

Figure 3. Climate-sensitive processes and components that can influence global and regional sea level. Changes in any one of the components or processes shown will result in a sea level change. The term "ocean properties" refers to aspects such as temperature, salinity, and density, which influence and are dependent on ocean circulation. (*Source*: IPCC 2013, Figure 13.1)

Global Sea Level Rise Projections

The IPCC 5th Assessment Report (AR5), which was released in September 2013, is the most recent global scale assessment of sea level rise. The report projects a rise in *global* average sea level by 10-39 in (26 to 98 cm) by the year 2100 (relative to mean sea level from 1985 to 2005) depending on the emissions scenario[14] (Figure 4). These projections are about 50% higher than the projections from the IPCC 4th Assessment Report (AR4, released in 2007). This is because the IPCC changed the climate model inputs between AR4 and AR5. In particular, much of the increase in the amount of sea level rise projected in the AR5 is due to the inclusion of sea level rise resulting from the loss of ice sheets. Ice sheet dynamics were not included in the AR4, but enhancements in physical models that account for such ice sheet dynamics have allowed for a better understanding and greater confidence in this input, and as such were included in the AR5[15].

[14] See Appendix A for more detail on emissions scenarios and the IPCC reports.

[15] Many of the other reports and studies cited in this Guidance used the AR4 as a reference (and for this reason detail on the AR4 is included in Appendix A). It is important to note, though, that while these other reports relied on the AR4 scenarios and model outputs for some climatic changes, many (*e.g.*, the *National Climate Assessment* (Melillo *et al*. 2014) and the NRC (2012) reports highlighted below) accounted for the loss of ice sheets through the use of semi-empirical models or other methods, further honing their results.

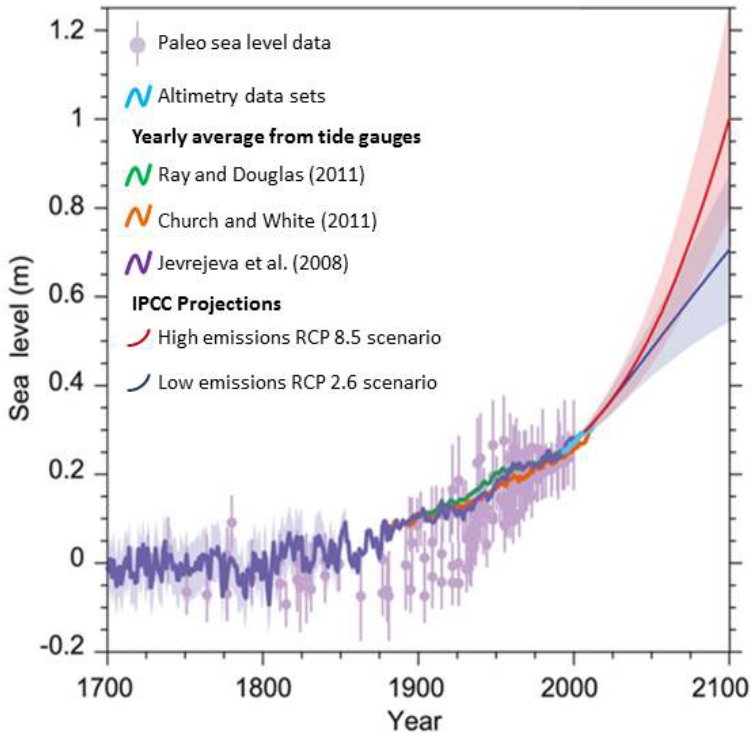

Figure 4. Past and projected future sea level trends (IPCC). Compilation of paleo sea level data, tide gauge data, altimeter data, and central estimates and likely ranges for projections of global mean sea level rise for low emissions RCP2.6 (blue) and high emissions RCP8.5 (red) scenarios, all relative to pre-industrial values. (*Source*: IPCC 2013, Figure 13.27)

National Sea Level Rise Projections

The third National Climate Assessment (NCA; Melillo *et al*.) was released in May 2014, and includes the current best-available science on climate change and sea level rise at the *national* scale. The sea level rise projections in the NCA were informed by the 2012 NOAA report titled *Global Sea Level Rise Scenarios for the United States National Climate Assessment* (Parris *et al.* 2012). This report provides a set of four global sea level rise scenarios ranging from 8 in to 7 ft (0.2 to 2.0 m) by the year 2100 (using mean sea level in 1992 as a baseline) reflecting different amounts of future greenhouse gas emissions, ocean warming and ice sheet loss (Figure 5). The low and intermediate-low scenarios assume very significant reductions in greenhouse gas emissions, and limited changes in ocean warming and ice sheet loss. The intermediate-high scenario is based on the average of the high projections from semi-empirical models, which are based on the highest IPCC 4th Assessment Report (AR4; 2007) emissions scenario (A1FI).[16] The highest scenario (2.0 m) combines the IPCC AR4 projections with the maximum possible ice sheet melt that could occur by 2100. Given the recent studies that suggest that glacier and ice

[16] The IPCC emissions scenarios make assumptions about future changes in population growth, future economic growth and the introduction of clean and efficient technology. The A1FI scenario assumes continued intensive use of fossil fuels, high economic growth, and low population growth that peaks mid-century. The B1 scenario assumes significant reduction in fossil fuel use, an increase in clean technologies, and the same low population growth that peaks mid-century. The A1F1 yields the highest CO_2 emissions by 2100 and the B1 scenario yields the lowest.

sheet loss could contribute significantly to rising sea levels (*e.g.*, Rahmstorf 2007; Vermeer and Rahmstorf 2009; IPCC 2013; McMillan *et al*. 2014; Morlighem *et al*. 2014) and evidence that current greenhouse gas emissions are tracking with intermediate IPCC AR4 scenarios (Rahmstorf *et al*. 2012), the low and intermediate-low scenarios likely underrepresent future sea level rise unless demonstrable reductions in global greenhouse gas emissions occur soon.

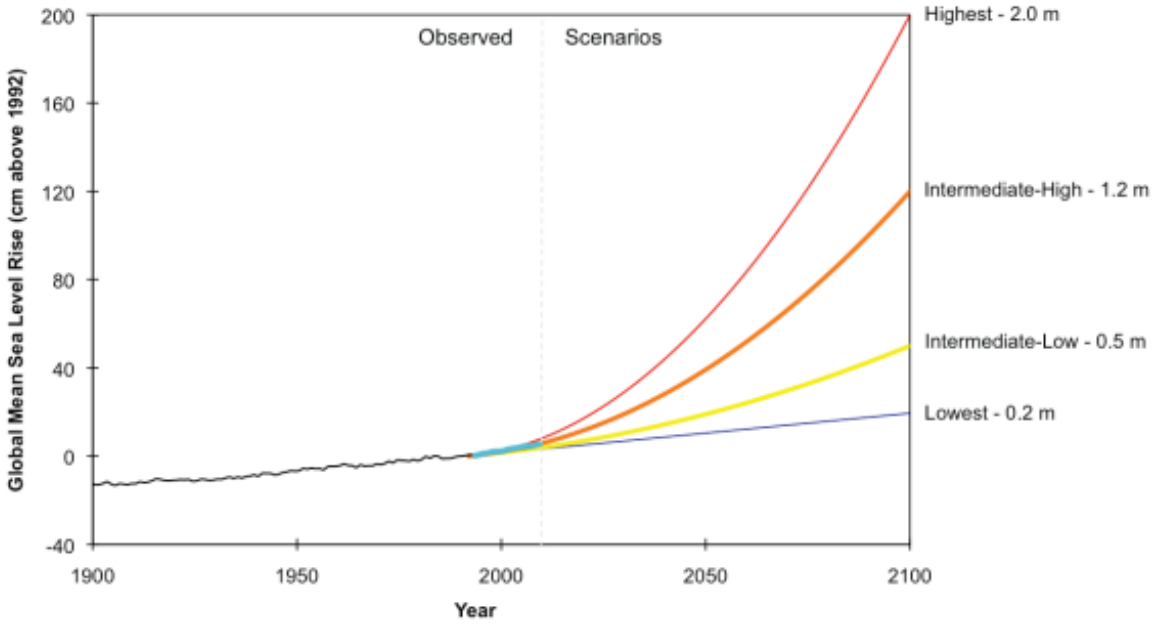

Figure 5. Observed and projected future sea level rise scenarios (Melillo *et al.* 2014). Global mean sea level rise scenarios used in the *US National Climate Assessment*. The Intermediate High Scenario is an average of the high end of ranges of global mean SLR reported by several studies using semi-empirical approaches. The Intermediate Low Scenario is the global mean SLR projection from the IPCC AR4 at 95% confidence interval. (*Source: Global Sea Level Rise Scenarios for the United States National Climate Assessment (*Parris *et al*. 2012))

Sea Level Rise Projections for California

Tide gauges and satellite observations show that in the past century, mean sea level in California has risen 8 in (20 cm), keeping pace with global rise. In the past 15 years or so, mean sea level in California has remained relatively constant, and may have been suppressed due to factors such as offshore winds and other oceanographic complexities. Bromirski *et al*. (2011, 2012) postulate that persistent alongshore winds have caused an extended period of offshore upwelling that has both drawn coastal waters offshore and replaced warm surface waters with cooler deep ocean water. Both of these factors could offset the global sea level rise trend in this region. However, localized sea level suppression will not continue indefinitely. As the Pacific Decadal Oscillation, wind, and other conditions shift, California sea level will continue rising, likely at an accelerated rate (NRC 2012; Bromirski *et al.* 2011, 2012).

Over the coming decades, sea level is projected to increase by 17 to 66 in (42 to 167 cm) along much of the California coast by Year 2100, according to the 2012 National Research Council *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* report. In March 2013, the Ocean Protection Council adopted a revised *State of California Sea-*

Level Rise Guidance Document that established the NRC 2012 report as the best available science on sea level rise for California (OPC 2013).[17]

The Commission will periodically re-examine and update sea level rise projections as they evolve with the release of new scientific reports and information on local and regional sea level trends. For now, however, the Commission recommends that local governments and applicants use the 2012 NRC report for the best available projections of regional sea level rise in California, though equivalent resources may be used by local governments and applicants provided the sources are peer-reviewed, widely accepted within the scientific community, and locally relevant.

The full range of sea level rise projections from the NRC report is provided below in Table 3. The range of sea level rise projections reflects uncertainties in future greenhouse gas emissions, future changes in the rate of ice sheet melt, and uncertainties related to the data. The low end of the range is based on the lowest IPCC 4th Assessment Report (AR4) future CO_2 emissions scenario (B1) and the high end is based on the highest IPCC AR4 emissions scenario (A1FI) (2007). Note that these amounts are what the NRC report refers to as "ranges." The report also includes "projections" that are based on the A1B emissions scenario. Please refer to Appendix A for a greater description of the "ranges" and "projections"[18]. Again, given current greenhouse gas emission levels and projections of future ice sheet loss, the lowest range of the sea level rise projections likely underrepresents future sea level rise (Rahmstorf *et al*. 2012; Horton *et al*. 2014).

Table 3. Sea Level Rise Projections for California (NRC, 2012)

TIME PERIOD*	NORTH OF CAPE MENDOCINO[19]	SOUTH OF CAPE MENDOCINO	
by 2030	-2 – 9 in (-4 – +23 cm)	2 – 12 in (4 – 30 cm)	
by 2050	-1 – 19 in (-3 – + 48 cm)	5 – 24 in (12 – 61 cm)	
by 2100	4 – 56 in (10 – 143 cm)	17 – 66 in (42 – 167 cm)	

*with Year 2000 as a baseline

The NRC report breaks the California coast into two regions – South of Cape Mendocino and North of Cape Mendocino. South of Cape Mendocino, much of the land is experiencing

[17] Visit www.opc.ca.gov/climate-change/ for the *State Sea-Level Rise Guidance Document.*

[18] Table 5.3 from the NRC 2012 report uses the term "projections" to refer to sea level rise amounts for the A1B emission scenario (herein referred to as the NRC A1B projection). However, unless otherwise noted, this Guidance uses the term "projections" to refer more generally to sea level rise amounts from the broad set of emission scenarios.

[19] Since portions of Humboldt Bay are experiencing subsidence, and thus differ from the regional uplift conditions, the projections for north of Cape Mendocino may not be appropriate for use within parts of Humboldt Bay. See Appendix B for additional discussion about vertical land movement and relative sea level rise.

subsidence, which will augment the consequences of rising sea level. For much of the area north of Cape Mendocino, the consequences of rising sea level are being reduced by the vertical land uplift along much of the Cascadia Subduction Zone. However, much of this vertical uplift could change rapidly during the next large Cascadian earthquake. During such an earthquake, areas north of Cape Mendocino could experience rapid subsidence of up to about 6 ft (2 m), which means relative sea level in the area would correspondingly rise (NRC 2012).

In contrast to the vertical uplift occurring throughout the majority of the area north of Cape Mendocino, Humboldt Bay's North Spit and the Eel River Estuary are subsiding and experiencing the highest rate of sea level rise in the state: a rate of 18.6 in over the last century (NOAA 2013). As a result, the projections for north of Cape Mendocino will not be appropriate for use in or near Humboldt Bay and the Eel River Estuary and will instead need to be modified to account for local vertical land movement. Please see *Humboldt Bay: Sea Level Rise Hydrodynamic Modeling, and Inundation Vulnerability Mapping* (Northern Hydrology and Engineering 2015) for additional information on sea level rise projections for the Humboldt Bay region.

The NRC report (2012) only provides estimated sea level rise ranges through the year 2100, though sea level will continue to rise, possibly at an accelerating rate, beyond the end of the century (IPCC 2013; Horton *et al*. 2014). Additionally, sea level rise in a particular location along the coast will likely vary from these regional projections due to changes in vertical land motion and ocean circulation, though such variation may be insignificant in places other than Humboldt Bay and the Eel River regions. Regardless, local governments, applicants, and staff may choose to modify these projections to account for local conditions and/or specific time periods, using the steps provided in Appendix B.

The Coastal Commission will be using and recommends that local governments and applicants use best available science, currently identified as the projections provided in the NRC 2012 report (Table 3), in all relevant local coastal planning and coastal development permitting decisions.

USING SCENARIO-BASED ANALYSIS IN RESPONSE TO SEA LEVEL RISE PROJECTION RANGES

Despite the recent advances in sea level rise science, sea level rise projections, including those in the 2012 NRC Report (Table 3) and the 2013 IPCC AR5, are typically presented in ranges due to several sources of significant uncertainty.

The two primary sources of uncertainty in *global* sea level projections include:

1) Uncertainty about future greenhouse gas emissions and concentrations of sulfate aerosols, which will depend on future human behavior and decision making, and
2) Uncertainty about future rates of land ice loss (NRC 2012; McMillan *et al*. 2014; Morlighem *et al*. 2014).

The NRC report (2012) also notes additional sources of uncertainty when projecting *regional* sea level for California, Oregon, and Washington, including:

1) Uncertainty in the influence of thermal expansion on local sea level, and
2) Uncertainty in future vertical land motion.

Additionally, the further into the future sea level rise is projected, the greater the uncertainty becomes. This occurs because the longer the projection period, the greater the likelihood that models will deviate from the actual impacts of climate change (NRC 2012).

This Guidance recommends using scenario-based analysis to address the uncertainty in sea level projections. Scenario-based analysis (or planning) refers to the idea of developing multiple scenarios from which to analyze vulnerabilities, generate new ideas and adaptation options, and/or test strategies. In the context of this Guidance, scenario-based analysis includes choosing several possible sea level rise amounts as a starting point to evaluate impacts to coastal resources and potential risks to development over time. This type of scenario-based approach is useful because it reveals the full range of possible consequences of sea level rise that can be reasonably expected for particular regions or sites according to the best available science. Additionally, a scenario-based analysis helps to reveal the tipping points indicating if or when sea level rise will become a serious issue in a particular location. In many cases, using multiple sea level rise scenarios will help to hone in on the types of hazards for which to prepare.

In general, the Coastal Commission recommends using best available science (currently the 2012 NRC report) to identify a range of sea level rise scenarios including the high projection, low projection, and one or more intermediate projections[20]. An even higher value than the NRC range might also be considered if there is the potential for severe impacts to coastal resources and human health and safety from sea level rise impacts. In practice, the process for choosing scenarios and performing scenario-based analysis will be slightly different for LCP planning and CDP applications due to the different planning goals and levels of technical detail required for each.

For a Local Coastal Program (LCP), the general goal is to assess the potential impacts from sea level rise over the entire planning area and over a range of time horizons so that both short and long term adaptation strategies can be identified and implemented. Another important facet of LCP planning is identifying locations that are particularly vulnerable so that additional, more detailed studies can be performed if necessary, and adaption options and actions can be prioritized. Scenario-based analysis in the context of LCP planning includes choosing a range of sea level rise projections to analyze so as to understand the best and worst case scenarios and to identify amounts of sea level rise and related conditions that would trigger severe impacts and the associated time period for when such impacts might occur. Choosing sea level rise scenarios in the context of LCP planning is described in greater detail in Chapter 5.

[20] Similar to the recommendation in the OPC's 2011 *State Sea-Level Rise Resolution*, the Commission does not recommend using values solely in the lower third of the NRC's projections as this does not give a full picture of the risks. Looking instead at both the high and low projections allows users to build an understanding of the overall risk sea level rise poses to the region or site.

In the context of a Coastal Development Permit (CDP) application, the goal is to understand how sea level rise will impact a specific site and a specific project over its expected lifetime so as to ensure that the proposed development is safe from hazards and avoids impacts to coastal resources. Thus, in the context of a CDP, it is important to identify the amounts of sea level rise that could result in effects to a particular site as well as the time period(s) over which those effects could occur so that the proposed development can be safely sited and designed to avoid resource and development impacts. However, some sites will be completely safe from sea level rise under even the highest projection scenarios, while others will depend on the timing and magnitude of sea level rise to determine safety. Therefore, scenario-based planning analysis can be used as a screening process to identify if and when sea level rise might become a problem. Identifying sea level rise scenarios in the context of CDPs is described in greater detail in Chapter 6.

Overall, scenario-based planning should help planners make reasonable and informed decisions about whether their projects or plans are compatible with the local hazards influenced by sea level rise, and identify the types of adaptation measures that might be appropriate given the local circumstances and requirements of the Coastal Act. By exploring the range of future scenarios based on the best available science, users of this document can make decisions based on full understanding of possible future hazards, ultimately achieve outcomes that are safer for both development and coastal resources, and avoid costly damages to projects.

For more information on scenario-based planning in the context of LCPs and CDPs see Chapters 5 and 6, respectively. A number of additional resources related to scenario-based planning are available, including a handbook from the National Park Service (2013) and guidance from Point Blue Conservation Science and the California Coastal Conservancy (Moore *et al*. 2013). See Appendix C for these and other resources related to scenario-based analysis and adaptation planning.

PHYSICAL EFFECTS OF SEA LEVEL RISE

Continued and accelerated sea level rise will have widespread adverse consequences for California's coastal resources (See summary in Figure 8). The main physical effects of sea level rise include increased flooding, inundation, wave impacts, coastal erosion, changes in sediment dynamics, and saltwater intrusion. These impacts are interrelated and often occur together. Absent any preparatory action, an increase in sea level may have serious implications for coastal resources and development, as described in Chapter 4. In addition, these physical effects could have disproportionate impacts on vulnerable communities that have lower capacity to adapt.

Physical effects from sea level rise to the coastal zone include the following:

- **Flooding and inundation:** Low lying coastal areas may experience more frequent flooding (temporary wetting) or inundation (permanent wetting), and the inland extents of 100-year floods may increase. Riverine and coastal waters come together at river mouths, coastal lagoons, and estuaries, and higher water levels at the coast may cause water to back up and increase upstream flooding (Heberger *et al*. 2009). Drainage systems that discharge close to sea level could have similar problems, and inland areas may become flooded if outfall pipes back up with salt water. In addition, other climate change impacts

such as increases in the amount of precipitation falling as rain rather than snow will add to river flooding in some areas.

- **Wave impacts:** Wave impacts can cause some of the more long-lasting consequences of coastal storms, resulting in high amounts of erosion and damage or destruction of structures. The increase in the extent and elevation of flood waters from sea level rise will also increase wave impacts and move the wave impacts farther inland. Erosion rates of coastal cliffs, beaches, and dunes will increase with rising sea level and are likely to further increase if waves become larger or more frequent (NRC 2012).
- **Erosion:** Large sections of the California coast consist of oceanfront bluffs that are often highly susceptible to erosion. With higher sea levels, the amount of time that bluffs are pounded by waves would increase, causing greater erosion (NRC 2012). This erosion could lead to landslides and loss of structural and geologic stability of bluff top development such as homes, infrastructure, the California Coastal Trail, Highway 1, and other roads and public utilities. The Pacific Institute (Heberger *et al*. 2009) estimated that 41 square miles (106 square km) of coastal land from the California-Oregon border through Santa Barbara County could be lost due to increased erosion with 4.6 ft (1.4 m) of sea level rise by the year 2100, and approximately 14,000 people now live in those vulnerable areas. Increased erosion will not occur uniformly throughout the state. Mendocino and Humboldt Counties have the greatest areas projected to be lost by erosion. For example, dunes in Humboldt County could erode a distance of approximately 2000 ft (nearly 600 m) by the year 2100 (Heberger *et al*. 2009; Revell *et al*. 2011). Man-made structures like dikes and levees may also be impacted by erosion, increasing flooding risk of the areas protected by those structures, such as low-lying agricultural land. Over the long term, rising sea levels will also cause landward migration of beaches due to the combined effects inundation and loss of sediment due to erosion (NRC 2012).



Figure 6. Photo of Esplanade Apartments threatened by cliff erosion in 2013 in Pacifica, CA. (*Source: California Coastal Records Project*)

- **Changes in sediment supply and movement:** Sediment is important to coastal systems in, for example, forming beaches and mudflats and as the substrate for wetlands. Sea level rise will result in changes to sediment availability. Higher water levels and changing precipitation patterns could change erosion and deposition patterns. Loss of sediment could worsen beach erosion and possibly increase the need for beach nourishment projects (adding sand to a beach or other coastal area), as well as decrease the effectiveness and long-term viability of beach nourishment if sand is quickly washed away after being placed on a beach (Griggs 2010). Sediment supplies in wetland areas will also be important for long-term marsh survival. Higher water levels due to sea level rise, however, may outpace the ability of wetlands to trap sediment and grow vertically (Titus 1988; Ranasinghe *et al*. 2012; Van Dyke 2012).
- **Saltwater intrusion:** An increase in sea level could cause saltwater to enter into groundwater resources, or aquifers. Existing research suggests that rising sea level is likely to degrade fresh groundwater resources in certain areas, but the degree of impact will vary greatly due to local hydrogeological conditions. Generally, the most vulnerable hydrogeological systems are unconfined aquifers along low-lying coasts, or aquifers that have already experienced overdraft and saline intrusion. In California, saline intrusion into groundwater resources is a problem in multiple areas, including but not limited to the Pajaro Valley (Hanson 2003), Salinas Valley (Hanson *et al*. 2002a; MCWRA 2012), Oxnard Plain (Izbicki 1996; Hanson *et al*. 2002b), and the heavily urbanized coastal plains of Los Angeles and Orange Counties (Edwards and Evans 2002; Ponti *et al*. 2007; Nishikawa *et al*. 2009; Barlow and Reichard 2010). Groundwater sources for coastal agricultural lands may also be susceptible to saltwater intrusion. Additional research is needed to understand the site-specific consequences of sea level rise and saltwater intrusion to these and other coastal aquifers in California.

STORMS, EXTREME EVENTS, AND ABRUPT CHANGE

Much of the California coast is currently vulnerable to flooding and wave damage during large storm events, and even more of the coast is vulnerable to storm impacts when they occur during times of heightened water levels, such as high tides, El Niño events, a warm phase of the Pacific Decadal Oscillation, or a combination of these factors. Sea level rise will increase coastal vulnerability to storms even more because rising water levels will result in more areas being impacted.

Climate change will likely modify or change much more than just sea level. One potential climate change-related impact that will interact most directly with sea level rise hazards is a change in frequency or intensity of coastal storms (storminess) and extreme events. The extremes associated with high-intensity events may be particularly devastating since they have the potential to cause broad-scale damage, as seen from recent events such as Hurricanes Katrina and Rita, Superstorm Sandy, and the Tohoku tsunami. Abrupt change in sea levels is another potential impact of climate change. Both potential impacts are described below.

Extreme Events and Storms

There are several ways to describe extreme events, and most definitions tend to frame these events in terms of consequences or past observations. Kruk *et al*. 2013 define extreme events as "the floods that displace us from our homes, the high waves that wash out coastal roads, or the toppling of trees and power poles from a passing storm." The IPCC defines climate extremes as "the occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variables" (IPCC 2012, p. 5). In general, extreme events, by their very nature, are those beyond the normal events that are considered in most shoreline studies. For example, for storm waves and flood conditions, an extreme event will normally be anything worse than the 100-year event.

Extreme events are of particular concern to the examination of coastal vulnerability and damage because they tend to cause the greatest community upheaval and can result in irreversible changes to the coastal landscape. In the El Niño winter of 1982-1983, for example, a series of storms, several of which coincided with high tide, caused more than $200 million in damage (in 2010 dollars) to coastal California (OPC 2013). The 2012 NRC report notes that "waves riding on these higher water levels will cause increased coastal damage and erosion—more than that expected by sea level rise alone" (NRC 2012, p.107). These impacts result because a rise in sea level will mean that flooding and damage will likely reach further inland. The IPCC *Fifth Assessment Report* (2013) states that it is very likely[21] that there will be a significant increase in the occurrence of future sea level extremes primarily as a result of an increase in mean sea level, with the frequency of a particular sea level extreme increasing by an order of magnitude or more in some regions by the end of the 21st century.

According to the 2012 NRC report, if the frequency or intensity of storms changes, then so will the frequency and intensity of extreme sea level events. However, the evidence that storminess will change in the North Pacific Ocean is conflicting and inconclusive (Cayan *et al*. 2009; Lowe *et al*. 2010; Dettinger 2011). Still, even if storminess does not change, sea level rise will exacerbate storm surge and high waves, magnifying their impact on the coastline. For this reason, it is important to include these factors in the analysis of sea level rise hazards. Methodologies for these analyses are included in Appendix B.

Abrupt change

Currently, the best available science is inconclusive as to whether sea level could change abruptly. Thermal expansion and direct melting of land ice is expected to be gradual, leading to slow and steady sea level rise. However, rapid collapse of land-based ice sheets could lead to sudden acceleration of sea level rise. Still, the likelihood of such collapses is uncertain (but probably low) and remains an area in need of future research (NRC 2013).

[21] The IPCC has assigned quantitative levels to various terms of confidence and likelihood. High confidence means there is about an 8 out of 10 chance of being correct. Very likely has a greater than 90% probability of occurrence. Other terms that will be used later in this discussion are likely (> 66% probability of occurrence), medium confidence (about a 5 out of 10 chance), low confidence (about a 2 out of 10 chance). *Source of terms*: http://www.ipcc.ch/pdf/supporting-material/uncertainty-guidance-note_ar4.pdf

Rapid change in land elevation during an earthquake is another potential cause of an abrupt sea level change in a localized area. A large earthquake in the Cascadia Subduction Zone could cause land in northern California, Oregon, and Washington to suddenly subside relative to sea level, causing a sudden rise in relative sea level by 3-6.5 ft (1-2 m; NRC 2012). Large earthquakes in this zone are expected to occur about every several hundred to one thousand years, and the most recent such earthquake occurred in 1700. The sudden rise or drop in land elevation would occur in a matter of minutes. If the land were to subside, the relative rise in sea level would be rapid and it would add to sea level rise already occurring from climate-related forcing.

There is also potential for oceanographic conditions to lead to a relatively rapid rate of sea level rise in California. Examination of the tidal gauge records indicate that there was no significant interannual rise in California's sea level from 1983 to 2011, despite a rise in global sea level over the same time period. One explanation, presented by Bromirski *et al*. (2011, 2012), links this suppression of sea level rise with persistent alongshore winds and an extended period of offshore upwelling that has both drawn coastal waters offshore and replaced warm surface waters with cooler deep ocean water. However, this suppression will not continue indefinitely and as the Pacific Decadal Oscillation, wind, and other conditions shift, California sea level will continue rising, likely at an accelerated rate (NRC 2012; Bromirski *et al.* 2011, 2012).

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Chapter 4

Consequences of Sea Level Rise for Communities, Coastal Resources, and Development

The physical effects of sea level rise described in the previous chapter could have significant consequences for California's citizens, coastal communities and the resources protected by the Coastal Act. This chapter describes some of these consequences and notes the relevant Coastal Act policies for convenience. It is important to consider both the direct impacts of sea level rise on coastal resources and what these impacts mean for the people and communities who use and enjoy these coastal resources. It is also important to consider environmental justice when analyzing sea level rise impacts, as described in greater detail in the section below.

SEA LEVEL RISE ADAPTATION PLANNING AND ENVIRONMENTAL JUSTICE

Sea level rise and how we respond to it may result in significant changes in the distribution of environmental benefits, or environmental justice, in California. General planning law in California specifically recognizes and defines environmental justice as "the fair treatment of people of all races, culture and income with respect to the development, adoption, implementation and enforcement of environmental laws, regulations, and policies" (Government Code Section 65040.12; and see Public Resources Code Section 71110-71116). Environmental justice demands that all people, regardless of their race, ethnicity, or level of income, are able to enjoy the benefits of our environmental protection programs and our environment generally. *Safeguarding California* (CNRA 2014) identifies environmental justice as an important cross-sector theme in the state's climate adaptation and resilience planning efforts.

The California Coastal Act also recognizes the fundamental importance of the fair distribution of environmental benefits in Section 30001:

> *The Legislature hereby finds and declares: (a) That the California coastal zone is a distinct and valuable natural resource of vital and enduring interest to all the people and exists as a delicately balanced ecosystem. (b) That the permanent protection of the state's natural and scenic resources is a paramount concern to present and future residents of the state and nation. (c) That to promote the public safety, health, and welfare, and to protect public and private property, wildlife, marine fisheries, and other ocean resources, and the natural environment, it is necessary to protect the ecological balance of the coastal zone and prevent its deterioration and destruction. (d) That existing developed uses, and future developments that are carefully planned and developed consistent with the policies of this division, are essential to the economic and social well-being of the people of this state and especially to working persons employed within the coastal zone.*

The Act thus declares that the protection of the coast is of vital interest to *all* the people, of paramount concern *to present and future residents* of the state and nation, and that careful planning and development is essential to *the economic and social well-being* of the people. This broad direction to protect the coast for everyone is underscored in Section 30006, which declares:

> *. . . the public has a right to fully participate in decisions affecting coastal planning, conservation and development; that achievement of sound coastal conservation and development is dependent upon public understanding and support; and that the continuing planning and implementation of programs for coastal conservation and development should include the widest opportunity for public participation.*

Hence, everyone is entitled to participate in the management decisions that determine how the benefits and burdens of managing California's coast will be distributed. Ensuring low-income and underserved communities are included in environmental decisions is a key tenet of environmental justice and will minimize disproportionate environmental and public health impacts.

The Coastal Act's broad concern for all the people is best borne out in its public access policies, which require the maximum provision and protection of the public's rights of access to and along the shoreline (Sections 30210-214). These policies reflect the judgement of the people of California in passing Proposition 20 in 1972 that public access and recreation along our coast is a fundamental environmental benefit to be protected for and enjoyed by all, not just by those with the good fortune or means to live along the shoreline. Public access to the coast is important to the health and well-being of the public, and promoting public access for all citizens provides low-cost, outdoor recreation that can improve the overall quality of life of the public, including low-income and underserved communities.

Unfortunately, public access is also one of the coastal resources most at risk from accelerating sea level rise. As discussed elsewhere in this Guidance, beaches, accessways, recreational amenities, and even surfing resources may be dramatically impacted by rising seas. Where development already exists, and particularly where there is substantial shoreline armoring to protect this development, California stands to lose significant recreational beach areas. These places that are at increased risk provide environmental benefits for everyone, generally at very low cost, or even free. Thus, the potential loss of beach and shoreline recreation areas represents a significant potential impact to a resource that both is especially important to those with fewer economic resources and one that we endeavor to provide for everyone without discrimination, no matter their income levels, ethnicities or cultures; no matter if they are from coastal or inland areas or from outside the state.

The exacerbation of environmental injustices by anticipated sea level rise may be particularly concerning when the Commission and local governments need to make decisions about shoreline protection and hazard mitigation. As discussed elsewhere in this Guidance, the Coastal Act provides for the protection and mitigation of coastal hazards for existing and new development. But some hazard mitigation, such as seawall development or elevated development on beaches, may have significant impacts to public trust shoreline resources. Thus, we face a situation where widely available public beach resources may be diminished in order to protect private or public development along the shoreline – potentially a significant environmental justice concern. Because of this, it will be important for decision makers to proactively consider all aspects of this Guidance in an effort to avoid and mitigate the potential impacts to coastal resources from hazard response. This is particularly true for recommendations to consider alternatives to shoreline structure development and, where shoreline structures must be approved, for recommendations to fully mitigate the impacts of such structures on public shoreline resources.

A May 2015 decision made by the Coastal Commission emphasizes the importance of analyzing low-cost recreational opportunities in addition to other coastal resource impacts when evaluating shoreline protection and other responses to sea level rise and coastal hazards. The Coastal Commission approved a revetment at the west end of the Goleta Beach County Park to provide

protection against erosion. This park is an important public resource in Santa Barbara County and receives up to 1.5 million visitors each year, a large fraction of which are low-income visitors. Park facilities include picnic areas, open parkland, and access to the ocean and a recreational beach for no or low cost. The revetment was approved contingent upon specific conditions, including continued free public access and vehicle parking for the term of the permit. This decision highlights the importance of protecting wide accessibility to shoreline resources even as sea level rises.

The potential impacts of adaptation responses on public shoreline resources, and thus the potential environmental justice impacts of such actions, will need to be considered for all resources protected under the Coastal Act. It is also true that due to current development patterns along the coast, sea level rise hazards may affect various sections of the population differently, as could the implementation and effectiveness of various adaptation measures. The number of people living along the open coast in areas exposed to flooding from a 100-year flood would increase to 210,000 with a 4.6 ft (1.4 m) increase in sea level; approximately 27% or 56,000 of these are lower income people (those earning less than $30,000 annually); 45,000 are renters; and 4,700 are linguistically isolated and less likely to understand flood warnings (Heberger *et al*. 2009). According to Heberger *et al*. (2009), the greatest increases in the number of people vulnerable to flooding will occur in Los Angeles, San Diego, Ventura, Humboldt, and San Luis Obispo counties. Sea level rise will likely result in the loss of key infrastructure, intrusion of saltwater into water sources, and the creation of additional coastal hazards. Hazards in vulnerable areas will have disproportionate impacts on communities with the least capacity to adapt, which could deepen and expand existing environmental injustice if adaptation responses are not managed appropriately.

For example, lower-income communities and those who live in rental units are more likely to be displaced by flooding or related impacts as compared to property owners because they lack the funds and/or abilities to rebuild, have less control over their safety, and often have limited access to insurance. Relatedly, these same populations are less likely to be able to take proactive steps to adapt to sea level rise. Additionally, loss of local public beaches or a reduction in public access and recreation opportunities would disproportionately affect low-income communities that have few alternative lower cost recreational opportunities. Tribal communities are also vulnerable to sea level rise because they are often tied to specific locations, and therefore can’t easily relocate.

Overall, it will be important for planners and decision makers to not only consider the direct impacts and consequences of sea level rise on coastal resources, but to also consider what those consequences mean for the distribution of environmental benefits along the coast, and the communities that use and rely on those resources. Low-income and underserved communities are less equipped to prepare for and respond to sea level rise, but community engagement and social cohesion can improve coastal resilience. Planners and decision makers should consider environmental justice concerns in the analysis of alternative project designs and adaptation measures and ensure low-income and underserved communities are involved in decision-making and planning efforts. This will better ensure that adaptation efforts benefit all Californians, fairly, and that they do not increase vulnerability to sea level rise among any particular group or demographic, and do not have any unintended consequences that lead to social or environmental

injustices. In particular, it will be important to consider the potential impacts of hazard mitigation actions to protect development that may only benefit a few, on the public access and shoreline resources that are available for all Californians to enjoy.

CONSEQUENCES OF SEA LEVEL RISE FOR COASTAL ACT RESOURCES

- **Coastal development (Coastal Act Sections 30235, 30236, 30250, 30253):** Sea level rise will increase the likelihood of property damage from flooding, inundation, or extreme waves, and will increase the number of people living in areas exposed to significant flooding. Increased erosion and loss or movement of beach sand will lead to an increase in the spatial extent of eroding bluffs and shorelines, and could increase instability of coastal structures and recreation areas. Levee systems could also experience damage and overtopping from an increase in water levels, extreme wave conditions, or a loss of wetlands, which buffer impacts from high water. The replacement value of property at risk from sea level rise for the California coast is approximately $36.5 billion (in 2000 dollars, not including San Francisco Bay) (Heberger *et al*. 2009).

  Impacts to public infrastructure, ports, and industrial development include:

  - **Public infrastructure:** Low-lying roads, wastewater treatment facilities, energy facilities, stormwater infrastructure, and utility infrastructure such as potable water systems and electricity transfer systems are at risk of impaired function due to erosion, flooding, and inundation. Heberger *et al*. (2009) estimated that 7 wastewater treatment plants, 14 power plants, including one in Humboldt County and 13 in Southern California, and 250 miles (402 km) of highways, 1500 miles (2414 km) of roads, and 110 miles (177 km) of railways could be at risk from a 100-year flood with 1.4-m rise in sea level (Heberger *et al*. 2009). Facilities and highways located on coastal bluffs subject to erosion will become more susceptible in the future. Sections of Highway 1 have already had to be realigned due to erosion or are in the planning stages for realignment projects, including areas in San Luis Obispo County, Monterey Bay, Half Moon Bay, and Marin County and the sections at risk in the future will likely increase.



Figure 7. Photo of infrastructure at risk near Rincon Beach, Ventura, CA, during the King Tide in December 2012. (Photo courtesy of David Powdrell, California King Tides Initiative)

- **Ports (Coastal Act Sections 30703 – 30708):** Sea level rise could cause a variety of impacts to ports, including flooding and inundation of port infrastructure and damage to piers and marina facilities from wave action and higher water levels. A possible benefit could be a decreased need for dredging. But, unless facilities have already included accommodations for larger ships than they currently service, higher water levels could increase the difficulty for cargo handling facilities due to the higher vessel position (CCC 2001; CNRA 2014). Increased water heights could reduce bridge clearance, reducing the size of ships that can access ports or restricting movement of ships to low tides, and potentially increasing throughput times for cargo delivered to ports. Heberger *et al*. (2009) found that significant flooding from sea level rise is possible at the Ports of Los Angeles and Long Beach. Given that these two ports handle 45-50% of the containers shipped into the United States, and 77% of goods that leave the state, sea level rise could affect the efficiency of goods movement, and have serious economic implications for California and the nation (Heberger *et al*. 2009).
- **Industrial development, refineries, and petrochemical facilities (Coastal Act Sections 30260-30266.5):** Sea level rise could reduce areas available for siting or expansion of industrial development. Inundation of contaminated lands near industrial development could lead to problems with water quality and polluted runoff. Sea level rise could lead to an increase in flooding damage of refineries or petrochemical facilities, and impacts from sea level rise could be an issue when locating or expanding refineries or petrochemical facilities, or when mitigating any adverse environmental effects.
- **Construction altering natural shorelines (Coastal Act Section 30235):** Sea level rise may lead to an increase in demand for construction of shoreline protection for existing development, public access, and coastal-dependent uses in danger of erosion. Shoreline protection devices alter natural shorelines and also generally have negative impacts on beaches, near-shore marine habitat, and scenic and visual qualities of coastal areas.

- **Public access and recreation (Coastal Act Sections 30210, 30211, 30213, 30220, 30221):** One of the highest priorities in the Coastal Act is the mandate to protect and maximize public access to the coast. Sea level rise could lead to a loss of public access and recreational opportunities due to permanent inundation, episodic flooding, or erosion of beaches, recreational areas, or trails. In areas where beaches cannot migrate inland due to development or more resistant landforms, beaches will become narrower or will disappear completely. Access and functionality of water-oriented activities may also be affected. For instance, sea level rise, by increasing water levels and altering sediment patterns, could lead to a change in surfing conditions or affect the safety of harbors and marinas (Kornell 2012).
- **Coastal habitats (Coastal Act Sections 30230, 30231, 30233, 30240):** Coastal habitat areas likely to be affected by sea level rise include bluffs and cliffs, rocky intertidal areas, beaches, dunes, wetlands, estuaries, lagoons and tidal marshes, tidal flats, eelgrass beds, and tidally-influenced streams and rivers.

Importantly, there are many endemic and endangered species in California that are dependent on these coastal environments. For example, grunion need a sandy beach environment in order to reproduce and survive, the California clapper rail is dependent on marshes and wetlands, and the black abalone requires rocky intertidal habitat. Nesting habitat, nursery areas, and haul-out sites important for birds, fish, marine mammals and other animals could also disappear as sea levels rise (Funayama *et al*. 2012).

Impacts to wetlands, intertidal areas, beaches, and dunes include:

- **Beaches, dunes, and intertidal areas:** Inundation and increased erosion from sea level rise could convert habitats from one type to another and generally reduce the amount of nearshore habitat, such as sandy beaches and rocky intertidal areas. Sea level rise will cause landward migration of beaches over the long term, and could lead to a rapid increase in the retreat rate of dunes. Beaches with seawalls or other barriers will not be able to migrate landward and the sandy beach areas will gradually become inundated (NRC 2012). A loss of beach and dune areas will have significant consequences for beach and adjacent inland ecosystems. Beaches and dunes provide critical habitat for species and act as buffers to interior agricultural lands and habitat during storms (CNRA 2009).
- **Wetlands:** Sea level rise will lead to wetland habitat conversion and loss as the intertidal zone shifts inland. Of particular concern is the loss of saltwater marshes from sea level rise, which have already decreased by about 90% from their historical levels in California (CNRA 2010). California's 550 square miles (885 km) of critical coastal wetland habitat (Heberger *et al*. 2009, including wetlands in San Francisco Bay) could be converted to open water by 4.6 ft (1.4 m) rise of sea level if they are not able accrete upward or to migrate inland due to natural or anthropogenic barriers. Although barriers are plentiful, inland migration of these wetlands is possible for over 50% of the potentially inundated wetland area based on land use compatibility alone (Heberger *et al*. 2009). Consideration of adequate sediment supply and additional barriers to inland migration would further constrain wetland migration potential. A 4.6 ft (1.4 m) increase in sea level would flood 150 square miles (241 km) of land immediately adjacent to wetlands, which could become future wetlands if that land remains undeveloped. Loss or reduction of wetland habitat would impact many plant and animal species, including migratory birds that depend on these habitats as part of the Pacific Flyway. Species that are salt-tolerant may have an advantage as sea level rise occurs and exposes new areas to salt water, while species that have narrow salinity and temperature tolerances may have difficulty adapting to changing conditions.

o **Biological productivity of coastal waters (Coastal Act Sections 30230, 30231):** Sea level rise could affect biological productivity of coastal waters by changing the types of habitats that are available. This change could alter species composition, and could potentially result in cascading effects through the coastal food chain. Changes in water quality can have differing impacts on biological productivity. For instance, decreased water quality due to increased nutrient pollution has been found to increase biological productivity at the base of the food chain to undesirable levels, and has been linked to harmful algal blooms which result in hypoxic conditions for other marine species (Kudela *et al*. 2010; Ryan *et al.* 2010; Caldwell *et al*. 2013).

- **Water quality (Coastal Act Section 30231):** Sea level rise could lead to declines in coastal water quality in several ways. First, coastal water quality could be degraded due to inundation of toxic soils and an increase in nonpoint source pollution from flooding. In particular, the presence of facilities or land containing hazardous materials in coastal areas susceptible to flooding or permanent inundation presents toxic exposure risks for human communities and ecosystems. Second, rising seas could impact wastewater facility infrastructure and other methods and structures designed to protect water quality near the coast. In addition to damaging equipment and blocking discharge from coastal outfall structures, floods could force facilities to release untreated wastewater, threatening nearby water quality (Heberger *et al*. 2009). Salt water draining into sewer lines as part of extreme weather flooding might also damage biological systems at wastewater facilities if the organisms present in these systems are not salt-tolerant. Third, sea level rise could lead to saltwater intrusion into valuable groundwater aquifers, potentially rendering some existing wells unusable and decreasing the total groundwater supply in coastal areas. The extent of saltwater intrusion will likely vary based upon local hydrological conditions, with the worst impacts occurring in unconfined aquifers along low-lying coasts that have already experienced overdraft and saline intrusion. This change could force affected communities to turn to more costly water sources such as surface water transfers or desalination. Finally, loss of wetlands could decrease water quality given that wetlands act to improve water quality by slowing and filtering water that flows through them.
- **Coastal agriculture (Coastal Act Sections 30241- 30243):** Sea level rise could lead to an increase in flooding and inundation of low-lying agricultural land, saltwater intrusion into agricultural water supplies, and a decrease in the amount of freshwater available for agricultural uses. Flooding of agricultural lands can cause major impacts on local businesses, national food supplies, and the state's economy.
- **Archaeological and paleontological resources (Coastal Act Section 30244):** Archaeological or paleontological resources could be put at risk by inundation, flooding, or by an increase in erosion due to sea level rise. Areas of traditional cultural significance to California Native American tribes, including villages, religious and ceremonial locations, middens, burial sites, and other areas, could be at risk from sea level rise. For example, the Santa Barbara Channel area has thousands of archaeological sites dating over 13,000 years that are at risk of being destroyed or altered from small amounts of sea level rise (Reeder *et al*. 2010).

For a summary of some of the sea level rise impacts and potential consequences for the coast, see Figure 8. Many of these consequences are conditions that coastal managers already deal with on a regular basis, and strategies already exist for minimizing impacts from flooding, erosion, saltwater intrusion, and changing sediment patterns. Preparing for sea level rise involves integrating future projections of sea levels into existing hazard analyses, siting, design, and construction processes, ecosystem management, and community planning practices. Processes for integrating sea level rise in Local Coastal Programs and Coastal Development Permit applications are described in the following chapters.

Drivers of Global SLR

Expansion of ocean water as temperature increases

Addition of freshwater to the ocean from melting glaciers and ice sheets

Addition of freshwater to the ocean from groundwater extraction, use, and discharge

Drivers of Local/Regional SLR Variability

Vertical land movement

Oceanographic phenomena including El Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO)

Physical Impacts of SLR

Inundation (permanent wetting)

Flooding (temporary wetting)

Increased erosion and bluff collapse

Increased tidal prism

Increased wave heights and force

Increased saltwater intrusion

Change in sediment movement patterns

Summary of Consequences of SLR for Coastal Resources & Development

Coastal Development: Greater likelihood of tidal damage, flooding, inundation, and extreme waves, which could lead to loss of property or physical injury; instability from increased erosion and loss/movement of beach sand; increased areas exposed to a 100-year flood.

Public infrastructure: Low-lying roads, wastewater treatment facilities, energy facilities, stormwater infrastructure, potable water systems, and electricity transfer systems are at risk of inundation and flooding, and impaired function. Infrastructure located on eroding bluffs is also subject to increased geologic hazards.

Coastal Agriculture: Increase in flooding and inundation of low-lying agricultural lands; saltwater intrusion into agricultural water supplies; potential decrease in amount of freshwater available for agricultural uses.

Public Access & Recreation: Loss of beach areas where beaches cannot migrate inland due to development; inaccessibility of public accessways and recreation sites due to flooding and erosion.

Coastal Habitats: Transformation of habitats as intertidal zone shifts inland; loss of wetlands and other habitats where areas cannot migrate up or inland due to inland barriers such as coastal development.

Water Quality: Coastal water quality could decline due to inundation of toxic soils and an increase in nonpoint source pollution from flooding. Rising seas could also impact wastewater facilities and cause saltwater intrusion into groundwater supplies.

Biological productivity of coastal waters: Sea level rise could affect biological productivity of coastal waters by changing the types of habitats that are available. This change could alter species compositions, and could potentially result in cascading effects through the coastal food chain.

Cultural Resources: Archeological and paleontological sites, including many Native American villages, religious and ceremonial locations, burial sites, and other areas could be at risk from sea level rise.

Figure 8. Summary of sea level rise impacts and consequences

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Chapter 5

Addressing Sea Level Rise in Local Coastal Programs

The Coastal Act requires that the 61 cities and 15 counties in coastal California prepare Local Coastal Programs (LCPs) to govern land use and development in the coastal zone inland of the mean high tide. LCPs become effective only after the Commission certifies their conformity with the policies of Chapter 3 of the Coastal Act.

LCPs contain the ground rules for future development and protection of resources in the coastal zone. Each LCP includes a Land Use Plan (LUP) and an Implementation Plan (IP). The LUP specifies the kinds, locations, and intensity of uses, and contains a required Public Access Component to ensure that maximum recreational opportunities and public access to the coast is provided. The IP includes measures to implement the LUP, such as zoning ordinances. LCPs are prepared by local governments and submitted to the Coastal Commission for review for consistency with Coastal Act requirements.[22]

Once an LCP's certification becomes effective, the local government becomes responsible for reviewing most Coastal Development Permit (CDP) applications. However, the Commission retains continuing permit authority over some lands (for example, over tidelands, submerged lands, and public trust lands) and authority to act on appeals for certain categories of local CDP decisions.

To be consistent with the Coastal Act hazard avoidance and resource protection policies, it is critical that local governments with coastal resources at risk from sea level rise certify or update Local Coastal Programs that provide a means to prepare for and mitigate these impacts. The overall LCP update and certification process has not changed. Now, however, the impacts of accelerated sea level rise should be addressed in the hazard and coastal resource analyses, alternatives analyses, community outreach, public involvement, and regional coordination. This Guidance is designed to complement and enhance the existing LCP certification and update steps. Although the existing LCP certification and update processes are still the same, sea level rise calls for new regional planning approaches, new strategies, and enhanced community participation.

LCPs are essential tools to fully implementing sea level rise adaptation efforts. Since many existing LCPs were certified in the 1980s and 1990s, it is important that future amendments of the LCPs consider sea level rise and adaptation planning at the project and community level, as appropriate. The *California Climate Adaptation Strategy* (CNRA 2009) and *Safeguarding California* (CNRA 2014) specifically identify LCPs as a mechanism for adaptation planning along the California coast. For general guidance on updating LCPs, see the LCP Update Guide, available here: http://www.coastal.ca.gov/la/lcp.html.

[22] In addition there are other areas of the coast where other plans may be certified by the Commission, including Port Master Plans for ports governed by Chapter 8 of the Coastal Act, Long Range Development Plans for state universities or colleges, and Public Works Plans for public infrastructure and facilities. Following certification of these types of plans by the Commission, some permitting may be delegated pursuant to the Coastal Act provisions governing the specific type of plan.

Steps for Addressing Sea Level Rise in Local Coastal Programs and Other Plans

The Commission recommends the following six steps to address sea level rise as part of the development of an LCP, LCP Amendment, or other plan.[23] These steps can be modified and adapted to fit the needs of individual planning efforts and communities and to address the specific coastal resource and development issues of a community, such as addressing bluff erosion or providing for effective redevelopment, infill, and concentration of development in already developed areas. At the start of an LCP update to address sea level rise or a new LCP project, local government planners should contact their local Coastal Commission district office to discuss the LCP goals and to establish a plan for Coastal Commission staff coordination and public involvement throughout the entire process. A key element of any LCP project is public involvement. This can include establishing technical and community stakeholder advisory committees, establishing an interdepartmental sea level rise team of City and County staff representatives, and planning a series of public workshops to gather feedback, in addition to the required public hearings on the LCP.

The steps of this process are illustrated in Figure 9 and described below. They are similar to the standard steps of a long-range planning process and should be familiar to local planners. Steps 1-3 are often referred to as a "sea level rise vulnerability assessment" in other sea level rise planning contexts and therefore are similar to other sea level rise-related resources.

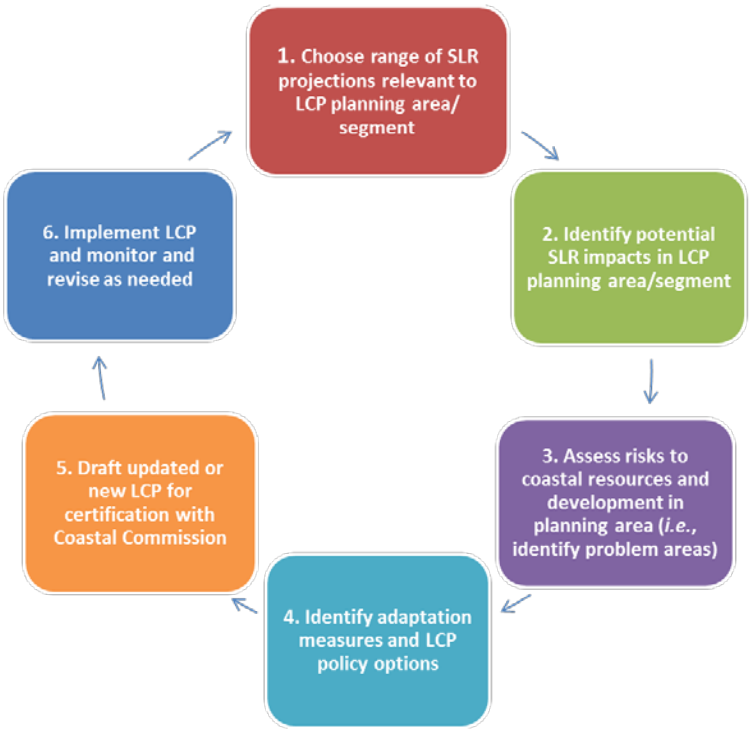


Figure 9. Sea level rise adaptation planning process for new and updated Local Coastal Programs

[23] This Guidance uses the term 'LCP process' to refer to the LCP process, but many of the concepts included here are applicable to other planning processes, including Long Range Development Plans, Public Works Plans, and Port Master Plans. For example, recommendations for how to analyze sea level rise impacts and perform a vulnerability assessment are broadly applicable. Many adaptation strategies may also be applicable, though in all cases, individual actions taken will vary based on relevant policies, local conditions, feasibility, and other factors.

The Coastal Commission also offers a *Local Coastal Program (LCP) Update Guide* (2013b) that outlines the broad process for amending or certifying an LCP, and there is naturally some overlap between the content of that document and this Sea Level Rise Policy Guidance document. The general LCP amendment steps are outlined below, in a flow chart (see Appendix D), and in the LCP Tips/Best Practices document (2013c), which is available in the *Resources for Local Governments* section of the Commission's website. Local governments should contact the Coastal Commission planner for their area when pursuing a new LCP or LCP amendment.

1. **Initial Amendment scoping and development:** Conduct issues assessment, identify need for amendment, prepare preliminary draft, coordinate with Commission staff, and share early drafts
2. **Local Amendment process:** Notify public, conduct local outreach and hearings, meet with Commission staff to discuss any issues, and adopt LCP at the local level
3. **Prepare Submittal:** assemble LCP materials, discuss with Commission staff prior to submittal, transmit to Coastal Commission, and make available to public
4. **Process Amendment at Coastal Commission:** Commission staff will review submittal within 10 working days for completeness; will address outstanding information needs; will prepare and write staff report; hold public hearing and vote; and transmit action to local government
5. **Effectuate Amendment:** Local acceptance of any modifications or resubmittal within 6 months, finalize local approval, and complete Coastal Commission Executive Director check-off
6. **Implement LCP Amendment, monitor and revise as necessary.**

The step-by-step process for incorporating sea level rise into LCPs outlined in the rest of this chapter fits into these broader LCP amendment steps. Local government planners should use the LCP Update Guide in conjunction with the Sea Level Rise Policy Guidance to inform the LCP.

Use scenario-based analysis

The Guidance recommends using a method called "scenario-based analysis" (described in Chapter 3 of this Guidance). Since sea level rise projections are not exact, but rather presented in ranges, scenario-based planning includes examining the consequences of multiple sea level rise amounts, plus extreme water levels from storms and El Niño events. The goal of scenario-based analysis for sea level rise is to understand where and at what point sea level rise, and the combination of sea level rise and storms, pose risks to coastal resources or threaten the health and safety of a developed area. This approach allows planners to understand the full range of possible impacts that can be reasonably expected based on the best available science, and build an understanding of the overall risk posed by potential future sea level rise. For example, if there are large changes in the hazard zones between two sea level rise amounts, additional analyses may help determine the tipping points when viable land uses will change. In general, scenario-based analyses can help determine the long-term compatibility of certain areas with certain land uses. For further description of this method, see Chapter 3.

Include other topics as applicable or desired

This Guidance recommends a number of analyses that will generate useful information related to sea level rise and other environmental vulnerabilities. Performing these analyses (and the overall planning process) may provide a useful opportunity to include other studies that will complement the goals of Local Coastal Programs and provide valuable insights for community concerns. For example, planners should expand the Coastal Act consideration of lower cost visitor serving facilities to include considerations of social equity and environmental justice in the analyses by determining how climate hazards or the adaptation measures might differentially impact various demographics. Additionally, planners may want to incorporate analysis of the economic implications of various options for adaptation. Important topics such as these should be incorporated into the analyses already underway for the sake of efficiency.

Leverage analyses and share information with other planning-related processes and documents

Sea level rise is addressed in many other planning-related documents and by many other agencies and organizations. Planners should be aware of these documents and the on-going work of state and federal agencies and make an effort to share information in cases where analyses required for some of these documents may overlap with the studies appropriate for sea level rise planning in LCPs. Additionally, these agencies, organizations, and planning efforts may be good resources from which to gather information when performing these analyses for LCP updates.

For example, there is overlap between the required elements of a Local Hazard Mitigation Plan (LHMP) and Local Coastal Programs, and the Commission recommends coordinating an LHMP update with an LCP update if possible. As part of an LHMP, local governments identify the natural hazards that impact their community, identify actions to reduce the losses from those hazards, and establish a coordinated process to implement the plan.[24] In order to be eligible for certain types of non-emergency disaster assistance, including funding for hazard mitigation projects, local governments are required by FEMA to complete an LHMP[25] and to update the plan every 5 years. Any sea level rise hazard avoidance strategies included in an LCP certification or update, such as relocation of critical facilities must be included in the LHMP narrative to be eligible for funding from FEMA to implement future projects. If a local government has recently updated their LHMP, the city or county can add narrative information on sea level rise strategies through an addendum to the plan, referred to by FEMA as an annex.[26]

In many cases, the analyses and adaptation options identified in this Guidance could be used for hazard mitigation plans or vice versa, as the goal of each of these planning processes is to

[24] http://www.fema.gov/media-library-data/20130726-1524-20490-5927/67fr8844.pdf

[25] Note that recent revisions to the State Mitigation Plan Review Guide, set to go into effect in March 2016, will require states to analyze the probability and possible impacts due to future hazard events in a way that includes the projected changes in natural hazards resulting from climate change. Failure to include such considerations may result in a state's ineligibility for certain non-emergency mitigation grants.

[26] For more information on how to complete or update an LHMP, visit http://hazardmitigation.calema.ca.gov/ or contact the Cal OES office and a hazard mitigation technical expert can assist local governments with the planning process. For contact information, visit http://hazardmitigation.calema.ca.gov/contact.

minimize or avoid impacts from coastal hazards. As a result, there may be opportunities to leverage funding and share work efforts.

A number of other similar planning processes, projects, and documents are listed in Figure 10, and planners may be able to use these studies in the LCP planning process, or, alternatively, share analyses and information performed for LCP planning with the groups working on related projects. Additionally, the forthcoming State of California Planning for Sea Level Rise Database (established by Assembly Bill 2516 and pursuant to Public Resources Code Sections 30961-30968) may become an important tool for identifying past and/or ongoing actions that stakeholders have implemented to address sea level rise. In any case, information sharing is highly recommended to promote efficiency.

Coordinate regionally as appropriate

Many impacts of sea level rise will transcend jurisdictional boundaries. Similarly, the adaptation decisions made by coastal communities could themselves have consequences that affect areas outside the local jurisdiction. For these reasons, regional coordination will often enhance the effectiveness of local adaptation decisions. Indeed, many of the projects identified in Figure 10 have taken this regional approach. Planners should keep this concept in mind as they work through these steps and coordinate regionally where appropriate and possible.

Representative Adaptation Planning Stakeholders

Agencies

Local/Regional:

- City/county governments
- League of Cities
- Association of Counties
- Regional entities (e.g., air districts, water boards, metropolitan planning organizations, regional transportation planning agencies)

State:

- Natural Resources Agency
- Ocean Protection Council
- CA Coastal Commission
- State Coastal Conservancy
- State Lands Commission
- SF Bay Conservation & Development Commission
- Office of Planning & Research
- Caltrans
- Office of Emergency Services
- CA Geologic Survey
- Dept. of Parks and Rec.
- Dept. of Fish and Wildlife
- Dept. of Water Resources
- State Water Resources Control Board
- Air Resources Board
- Dept. of Conservation

Federal:

- FEMA
- EPA
- US Fish and Wildlife Service
- NOAA
- Gulf of the Farallones NMS
- Monterey Bay NMS
- SF Bay NERR
- Elkhorn Slough NERR
- Tijuana River NERR
- US Geologic Survey
- US Army Corps of Engineers
- BOEM, BSEE
- National Park Service
- Sea Grant

Partner Organizations

- Non-Government Organizations (e.g., environmental, social)
- Professional organizations (e.g., agricultural, fisheries, communications)
- Science organizations
- Universities
- Private consultants/industry

Examples include:

- The Nature Conservancy
- Surfrider Foundation
- Coastkeeper Alliance
- Center for Ocean Solutions
- Point Blue Conservation Science
- Pacific Institute
- Natural Capital Project
- American Society of Adaptation Professionals

Coordinated Planning Efforts

Regional Environmental Efforts

- Our Coast Our Future (CoSMoS)
- So. CA Coastal Impacts Project (CoSMoS)
- Humboldt Bay SLR Adaptation Working Group
- Monterey Bay Adaptation Group
- LA Regional Adaptation Group
- Coastal Resilience Ventura
- San Diego Regional Climate Collaborative
- Santa Barbara and Ventura Co. resilience planning

Local/Regional Plans

- Local Hazard Mitigation Plans
- General Plans
- Climate Action Plans
- Capital Improvement Plans/Programs
- Climate Change Adaptation Plans
- Integrated Regional Water Management Plans
- Regional Sediment Management Plans
- Sustainable Community Plans
- Regional Transportation Plans

Figure 10. Agencies, organizations, and planning efforts related to sea level rise adaptation

Step 1 – Determine range of sea level rise projections relevant to LCP planning area/segment

The first step in incorporating sea level rise into the LCP planning process is to identify locally relevant sea level rise scenarios that may occur at given time steps into the future. These scenarios will be carried through the rest of the steps in the sea level rise LCP planning process. Follow these steps to determine the locally relevant sea level rise projections to use in the subsequent steps:

- **Determine planning horizons of concern:** The National Research Council (NRC) report for California uses the time periods of 2030, 2050, and 2100 to project future sea levels. These time periods may be used, or local governments may identify other relevant planning horizons for their plans and development scenarios, as long as the projections for those time frames are based on the best available and relevant scientific projections.

- **Determine the full range of sea level rise projections from the best available science:** Using best available science, currently the NRC report (or other comparable study, provided that it is peer reviewed, widely accepted within the scientific community, and locally relevant), determine the range of sea level rise for the planning horizons of concern. The sea level rise projections from the NRC 2012 report are presented in Table 4 below. If the planning horizon of concern extends past Year 2100, extrapolate from the NRC projections (See Appendix B for more details on this step). See below for a discussion of scenario-based planning in the LCP context. The LCP should include a policy to use the best available science about sea level rise.

  For parts of the Humboldt Bay region and Eel River Estuary, modify projections for vertical land motion:[27] For project locations in the vicinity of Humboldt Bay and the Eel River Estuary, the regional NRC sea level rise projections will need to be modified to adjust for local vertical land motion (VLM).[28] Areas other than Humboldt Bay and Eel River Estuary may choose to undertake an adjustment for vertical land motion. However, since local trends generally follow the regional land trend for most coastal areas, this VLM adjustment is not necessary.[29] Since actual VLM is the combination of several

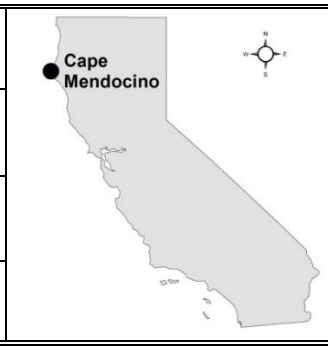
[27] Vertical land motion describes the subsidence or uplift of land and is caused by different processes, including tectonic activity, sediment compaction, groundwater or other fluid withdrawal and recharge, and glacial isostatic rebound. Land North of Cape Mendocino is generally found to be rising at a rate of 1.5- 3.0mm/year, with the exception of parts of Humboldt Bay and the Eel River Estuary, which is subsiding. Land South of Cape Mendocino is subsiding at a rate of ~1mm/year, with variation in areas South of Cape Mendocino from -3.7 mm to 0.6 mm/year (NRC 2012, p. 78).

[28] See Appendix B and *Humboldt Bay: Sea Level Rise Hydrodynamic Modeling, and Inundation Vulnerability Mapping* (Northern Hydrology and Engineering 2015) for additional information on VLM and sea level rise projections for the Humboldt Bay region.

[29] A three-member subcommittee of the OPC Science Advisory Team (OPC-SAT) advised using the NRC projections, without modification, for all California locations except between Humboldt Bay and Crescent City. The OPC-SAT subcommittee stated, "We do not believe that there is enough certainty in the sea level rise projections nor is there a strong scientific rationale for specifying specific sea level rise values at individual locations along California's coastline" (OPC 2013, p. 10).

unrelated factors, such as seismic events, water withdrawals, and glacial isostatic rebound, historic trends may not be a good indicator of future change. Thus, if sea level rise projections are modified for areas other than the Humboldt Bay region and the modified projections are lower than the unmodified NRC projections, at least one scenario for the analysis of impacts should use the high value from the unmodified NRC projections in order to assess a potential worst-case scenario possibility.

Table 4. Sea Level Rise Projections for California (NRC 2012)

TIME PERIOD*	NORTH OF CAPE MENDOCINO	SOUTH OF CAPE MENDOCINO	
by 2030	-2 – 9 in (-4 – +23 cm)	2 – 12 in (4 – 30 cm)	
by 2050	-1 – 19 in (-3 – + 48 cm)	5 – 24 in (12 – 61 cm)	
by 2100	4 – 56 in (10 – 143 cm)	17 – 66 in (42 – 167 cm)	

*with Year 2000 as a baseline

- **Choose multiple sea level rise scenarios based on range of sea level rise projections.** The Coastal Commission recommends all communities evaluate the impacts of the highest water level conditions that are projected to occur in the planning area. Local governments may also consider including higher scenarios (such as a 6.6 ft (2 m) scenario[30]) where severe impacts to Coastal Act resources and development could occur from sea level rise. In addition to evaluating the worst-case scenario, planners need to understand the minimum amount of sea level rise that will cause impacts for their community, and how these impacts will change over time, with different amounts of sea level rise. Planners should evaluate enough scenarios to be able to answer the following:
    - What are the impacts from the worst-case scenario of the highest possible sea level rise plus elevated water levels from high tide, El Niño and a 100-year storm?
    - What is the minimum amount of sea level rise that causes inundation, flooding, or erosion concerns?
    - How do inundation, flooding, and erosion concerns change with different amounts of sea level rise?
    - Are there any tipping points where sea level rise impacts become more severe? (For example, is there a point at which seawalls or levees are overtopped?)

  There are two main ways to choose scenarios from which to evaluate sea level rise: by sea level rise amount or by time-period. Tools that provide maps by sea level rise amount can then be linked to the relevant time period, as shown below in the *Our Coast Our Future* example. There is no single accepted sea level rise mapping methodology for the

[30] The *Global Sea Level Rise Scenarios for the United States National Climate Assessment* (Parris *et* al. 2012) establishes 6.6 ft (2 m) as the highest global sea level rise scenario for Year 2100.

state of California. Local governments can choose whether to use existing sea level rise tools or to develop their own scenarios and maps. See below for information on scenarios and modeling outputs generated by existing sea level rise modeling tools.

Examples of Choosing Scenarios with Existing Sea Level Rise Modeling Tools

For California, there are two primary methods for identifying sea level rise scenarios, based on two of the currently available SLR mapping tools: CoSMoS (Our Coast Our Future) and Coastal Resilience Ventura (The Nature Conservancy). The type of tool available for sea level rise mapping in a planning area can be a deciding factor for which scenarios to use in the analysis. The Coastal Commission recommends using as many scenarios as necessary to fully analyze the potential impacts to coastal resources, human health, and safety rather than a specific tool or number of scenarios. Examples for choosing scenarios based on the tools available are described below.

Example 1: Identify SLR amounts, then relate to likely time period(s) of occurrence

This method involves first examining different amounts of sea level rise and storm events, and second, looking at the NRC projections to determine the range of years during which those impacts could potentially occur. For example, the Our Coast Our Future CoSMoS-based tool provides sea level rise maps for 9 different amounts in 25 cm (0.8 ft) intervals, three different storm scenarios (annual, 20-year, and 100-year), and a king tide scenario. With this tool, users can first evaluate different amounts of sea level rise and storms, determine how different amounts of sea level rise and storm situations affect the planning area, and then determine when the increased water level is likely to occur based on the NRC report projections. The CosMoS tool is currently available for Marin, Sonoma, and San Mateo Counties, and preliminary data will be available from Point Conception to the Mexico Border in Fall of 2015. The NOAA Sea Level Rise and Coastal Flooding Impacts viewer similarly provides maps for different amounts of sea level rise (in this case, in 1-ft increments), but does not include impacts from storms, erosion or waves. A methodology for adding in these additional impacts is described in Appendix B.

Example 2: Choose applicable years, then identify high, intermediate, and low scenarios

For this method, planners pick specific years, determine the range of sea level rise amounts that could occur by that year, and examine the consequences of three or more sea level rise amounts within that range. For example, the Coastal Resilience Ventura Tool (The Nature Conservancy) provides maps showing inundation, flooding, wave impact zone, and erosion risk zones with low, medium, and high sea level rise scenarios for the years 2030, 2060, and 2100. For local governments within Ventura County, planners may choose to evaluate scenarios according to the 2030, 2060, and 2100 time periods. The model provides maps for both flooding and erosion.

Expected outcomes from Step 1: *Upon completing this step, a range of regionally- or locally-relevant sea level rise projections for the time periods of concern should be established. Based on the range of projections, planners will have identified a low, high, and one or more intermediate projections. These projections are the sea level rise scenarios that will be carried through the rest of the planning process.*

Step 2 – Identify potential physical sea level rise impacts in LCP planning area/segment

The next step is to identify the physical hazards and impacts (referred to comprehensively as sea level rise impacts) associated with current and future sea level. As described in Section C of Chapter 3 of this Guidance, broad categories of sea level rise impacts may include inundation, flooding, wave impacts, erosion, and saltwater intrusion. In this step, planners should analyze these physical impacts and their various sub-components in order to understand current and future local hazard conditions. The analysis should answer the following basic questions:

- What are the existing hazard conditions that threaten the planning area?
- What is the projected change in hazard conditions due to locally appropriate sea level rise projections and planning horizons of concern?

This analysis should include the following topics, as applicable:

- Local Water Conditions (See Appendix B for a detailed methodology)
  - Current tidal datum[31] and future inundation
  - Water level changes from storm surge, atmospheric pressure, the Pacific Decadal Oscillation (PDO), the El Niño Southern Oscillation (ENSO), and/or other basin-wide phenomena
  - Wave impacts and wave runup, including wave runup from a 100-year storm, and based on tides, other water level changes, and future beach and bluff erosion
  - Flooding from extreme events such as storms with intervals greater than 100 years, tsunamis, *etc.*
- Shoreline change (See Appendix B for more information)
  - Current shoreline erosion rates. For future cliff and dune erosion rates, modify historic erosion rates, to account for the influence of sea level rise (*e.g.*, work by the Pacific Institute – Heberger *et al*. 2009; Revell *et al*. 2011). If possible, modify long-term beach erosion rates to account for changes in El Niño frequency, storm intensity, sediment supply or changing transport conditions. Analyzing wetland responses to sea level rise may require site-specific analyses of various physical and biological factors as described in Heberger *et al.* 2009.
  - Sedimentation rates
- Water quality
  - Current and future saltwater intrusion areas

[31] Tidal datums are based on the latest National Tidal Datum Epoch (NTDE) published by NOAA and are the mean of the observed sea levels over a 19-year period. The latest published epoch is 1983-2001. This tidal epoch can be considered equivalent to the year 2000 baseline for the NRC projections.

- Current and potential future coastal water pollution issues due to inundation of toxic soils, rising water tables, and increases in nonpoint source pollution

Use existing models, tools, reports, historic records, and other materials (Table 5) to develop or double check the identified hazard areas. Document the current and future hazard areas in the Land Use Plan using maps, GIS products, graphics, tables, charts, figures, descriptions, or other means. This process should be repeated for each planning horizon and/or sea level rise scenario defined in Step 1.

Expected outcomes from Step 2: *Upon completing this step, the potential current and future impacts to the planning area from sea level rise hazards should be identified based on sea level rise projections. These should include impacts from the high, low, and intermediate sea level rise scenarios for the planning horizon(s) of concern. Maps, GIS layers, graphics, figures, charts, tables, descriptions, or another system should be developed to communicate the impacts of current and future hazards.*

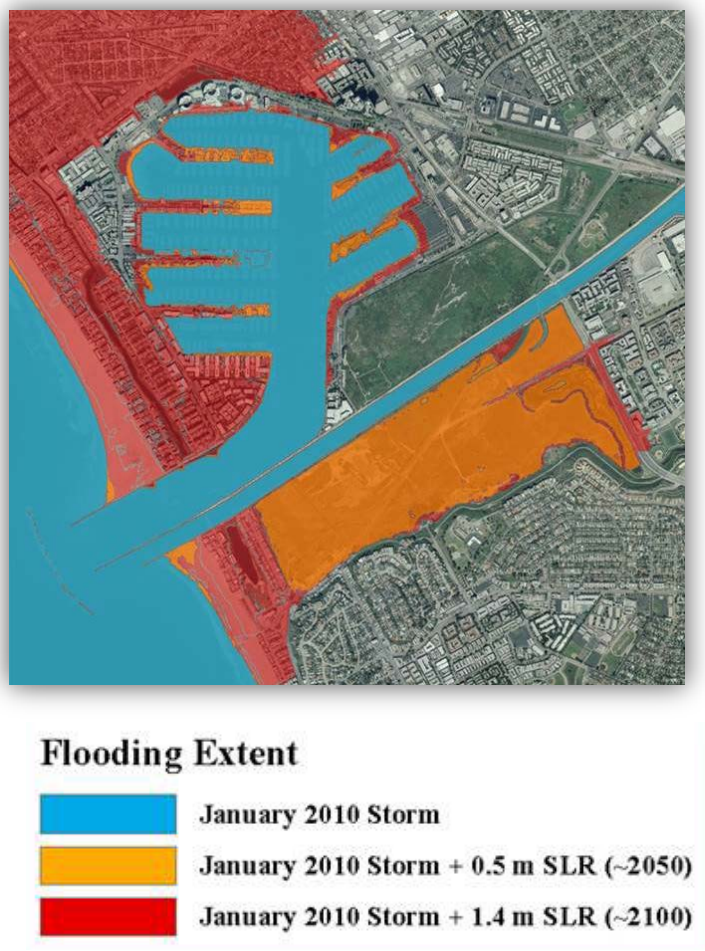


Figure 11. Example of analysis of SLR impacts. Flooding hazards predicted from the CoSMoS hindcast of the January 2010 storm, with and without sea level rise (SLR) scenarios, in the region of Venice and Marina del Rey, CA. (*Source*: Barnard *et al.* 2014).

Resources for Sea Level Rise Mapping

Table 5 includes a list of sea level rise mapping tools. The tools vary in their complexity: some are considered "bathtub models," because they show future inundation with simple rise in sea level (and no changes to the shoreline caused by other forces). Others include factors like erosion, storms, and fluvial inputs. These tools provide a useful first look at possible sea level rise impacts, but may need to be supplemented with additional, site- or topic-specific analyses, depending on the region. See Appendix B for additional information on determining hazard impacts and tools for mapping sea level rise.

Table 5. Sea Level Rise Mapping Tools

Tool	Description	Link
Statewide		
NOAA Sea Level Rise and Coastal Flooding Impacts Viewer	Displays potential future sea levels with a slider bar. Communicates spatial uncertainty of mapped sea level rise, overlays social and economic data onto sea level rise maps, and models potential marsh migration due to sea level rise. Maps do not include any influence of beach or dune erosion.	NOAA Office for Coastal Management, http://coast.noaa.gov/digitalcoast/tools/slr
Cal-Adapt – Exploring California's Climate	Shows coastal areas that may be threatened by flooding from a 4.6 ft (1.4 m) rise in sea level and a 100-year flood event. Maps were developed using the Pacific Institute SLR Maps (see below) and do not currently include any influence of beach or dune erosion or existing protective structures.	http://cal-adapt.org/sealevel/
Pacific Institute Sea Level Rise Maps	Downloadable PDF maps showing the coastal flood and erosion hazard zones from the 2009 study. Data are overlaid on aerial photographs and show major roads. Also available are an interactive online map and downloadable maps showing sea level rise, population and property at risk, miles of vulnerable roads and railroads, vulnerable power plants and wastewater treatment plants, and wetland migration potential.	http://www.pacinst.org/reports/sea_level_rise/maps/ For the 2009 report *The Impacts of Sea-Level Rise on the California Coast* visit: http://pacinst.org/publication/the-impacts-of-sea-level-rise-on-the-california-coast/

Climate Central Surging Seas	Overlays sea level rise data with socio-economic information and ability to analyze property values, population, socio-economic status, ethnicity, and income or areas at risk. Can compare exposure across the state or a county.	http://sealevel.climatecentral.org/ssrf/california
North Coast		
Humboldt Bay Sea Level Rise Adaptation Project	This project is a multi-phased, regional collaboration. Phase I produced the *Humboldt Bay Shoreline Inventory, Mapping, and Sea Level Rise Vulnerability Assessment* which describes current shoreline conditions and vulnerabilities under the current tidal regime. Phase II included hydrodynamic modeling to develop vulnerability maps of areas surrounding Humboldt Bay vulnerable to inundation from existing and future sea levels. Phase II produced the *Humboldt Bay Sea Level Rise Modeling Inundation Mapping Report* and the *Humboldt Bay Sea Level Rise Conceptual Groundwater Model*.	All reports are available at: http://humboldtbay.org/humboldt-bay-sea-level-rise-adaptation-planning-project
North Central Coast		
Our Coast Our Future Project (Bodega Head to Half Moon Bay), including the Coastal Storm Modeling System (CoSMoS)	Provides online maps and tools to help understand, visualize, and anticipate vulnerabilities to sea level rise and storms, including seamless Digital Elevation Model (DEM) at 6.6 ft (2 m) horizontal resolution; 9.8 in (25 cm) increment sea level rise projections between 0-6.6 ft (0-2 m) with a 16.4 ft (5 m) extreme; storm scenarios using the Coastal Storm Modeling System (CoSMoS); and interactive maps overlaying infrastructure and ecosystem vulnerabilities.	http://data.prbo.org/apps/ocof/

Southern Coast		
Coastal Resilience Ventura	A partnership to provide science and decision-support tools to aid conservation and planning projects and policymaking to address conditions brought about by climate change within the County of Ventura. The primary goals of Coastal Resilience Ventura are assessing the vulnerabilities of human and natural resources, and identifying nature-based solutions.	http://coastalresilience.org/geographies/ventura-county
Southern California Coastal Impacts Project, including the Coastal Storm Modeling System (CoSMoS)	A numerical modeling system to predict coastal flooding due to both sea level rise and storms driven by climate change; conditions will be specifically selected for and downscaled to the southern California region (from Point Conception to the US-Mexico border, including the Channel Islands and coastal embayments). This version will take into account shoreline change and fluvial inputs; additionally, even more robust modeling of coastal erosion and shoreline change will be provided for the Los Angeles region.	http://walrus.wr.usgs.gov/coastal_processes/cosmos/

Step 3 – Assess potential risks from sea level rise to coastal resources and development in LCP planning area/segment

After sea level rise impacts are identified and mapped in Step 2, the next Step is to determine whether sea level rise poses any risks, or potential problems, for coastal resources and development in the LCP planning area (refer to Chapter 4 for a description of the potential consequences of sea level rise for coastal resources). Next, assess whether the LCP planning area's current and planned land uses are appropriate or consistent with Coastal Act or LCP policies given those impacts, or if those land uses should be revised. This step requires an understanding of several characteristics of the coastal resources and development typically found within various land use types. (Much of this information can be produced in a vulnerability assessment, an analysis that is commonly conducted in the planning and climate change adaptation field. See Appendix C for a list of recent sea level rise vulnerability assessments.) Account for potential impacts to vulnerable, low-income communities and consider coastal development and resources, including but not limited to:

- Existing and planned development
- Coastal-dependent development and uses such as harbors, wharfs, ports, marinas, and commercial and recreational fishing areas and facilities
- Critical infrastructure[32] such as wastewater treatment plants, transportation infrastructure, and some power plants and energy transmission infrastructure
- Public accessways, beaches and other recreation areas, and the California Coastal Trail
- State Highway 1, 101, and other state and local roads that provide access to the coast
- Wetlands, environmentally sensitive habitat area (ESHA), and other coastal habitats and sensitive species
- Agricultural areas
- Cultural sites and archaeological or paleontological resources
- Visitor-serving development and uses

Conduct the following tasks for each planning horizon (*e.g.*, the years 2030, 2050, and 2100, or other planning horizons):

1. For the planning horizon of interest, determine what development and coastal resources may be subjected to the sea level rise impacts expected for that time period. Map the coastal resources and development that lie within the sea level rise impact areas for the given time period. (Remember to address the wide range of resources listed above, including both natural resources and development.)

[32] Critical infrastructure can vary widely from community to community. For planning purposes, a jurisdiction should determine criticality based on the relative importance of its various assets for the delivery of vital services, the protection of special populations, and other important functions.

2. Determine if sea level rise impacts are a problem or benefit for each resource, and if so, when and to what degree the resource will be impacted. In some instances, sea level rise may result in the creation of new habitat areas that could help to alleviate impacts from the loss of similar habitat in other locations. However, it is more likely, especially in heavily urbanized areas, that sea level rise will result in a net loss of habitat unless steps are taken to preserve these systems.

   To accomplish this, consider a wide range of characteristics of each resource, including the following. The questions listed under each characteristic might help guide the consideration of each of these characteristics. These questions are meant to be suggestions rather than a standardized approach, and planners may use scientific literature, best professional judgment, or a variety of other resources to gain a conceptual understanding of the important resources and vulnerabilities in their jurisdictions.

   a. **Exposure.** Will sea level rise impacts affect the resource/development at all?
      i. Are coastal resources and community assets exposed to sea level rise impacts?
      ii. Is the resource already exposed to hazards such as waves, flooding, erosion, or saltwater intrusion? If it is, will sea level rise increase hazard exposure?

   b. **Sensitivity.** If resources are exposed, to what degree will coastal resources/development be affected by sea level rise impacts? A simple way to think about this concept is to consider *how easily affected* the resource or development is in regard to sea level rise impacts.
      i. How quickly will the resource respond to the impact from sea level rise?
      ii. Will the resource/development be harmed if environmental conditions change just a small amount? What are the physical characteristics of resource/asset (*e.g.*, geology, soil characteristics, hydrology, coastal geomorphology, topography, bathymetry, land cover, land use)? Do any of those characteristics make the resource especially sensitive?
      iii. Are there thresholds or tipping points beyond which sensitivity to sea level rise increases?

   c. **Adaptive Capacity.** How easily can the resource successfully adapt to sea level rise impacts?
      i. How well can the resource/development accommodate changes in sea level?
      ii. Is rate of change faster than the ability of the resource/development to adapt?
      iii. How easily can development be modified to cope with flooding, inundation, and/or erosion? Can structures be elevated or relocated?

iv. Are there adaptation efforts already underway? Are there any factors that limit the success of adaptation efforts?

v. Do beaches, wetlands and other coastal habitats have room to migrate inland? What is the overall health of existing wetlands and coastal habitats?

vi. Are there any other climate change-related impacts to consider? Are there any non-climate stressors that could impair ability to adapt to sea level rise?

vii. Is there potential for habitat creation as a result of sea level rise?

viii. What are the options to protect, redesign (*e.g.*, elevate), or relocate inland any existing public accessways, recreational beaches, and segments of the Coastal Trail to cope with rising sea levels? Is lateral access compromised with sea level rise?

d. **Consequences.** When sea level rise and/or sea level rise adaptation measures have impact(s) upon a resource, what are the economic, ecological, social, cultural, and legal consequences?

i. How severely could each resource be affected? At what scale?

ii. Are there cumulative consequences?

iii. Are there ripple effects, or secondary consequences to consider?

iv. Will human responses cause further adverse impacts?

e. **Land Use Constraints.** Given the location of sea level rise impacts and the resources currently located in those areas, should the types and intensities of land use be altered to minimize hazards and protect coastal resources?

i. What is the current pattern of development? Is the area largely developed or does it have significant areas of undeveloped land?

ii. Is the area served by infrastructure that is vulnerable to sea level rise impacts?

iii. Are large areas of land under common ownership or is land mostly subdivided into smaller lots in separate ownership?

iv. What conditions does the land use type, development, or resource require to either exist or fulfill its intended purpose?

v. Is it a coastal-dependent use? What is its ideal proximity to the coast?

vi. For new development, what is the expected lifespan? Is it economically feasible to locate it in a sea level rise impact area for a certain period of time before it is removed or relocated?

vii. For existing development, what are the options available to minimize hazards to the development and protect coastal resources? Note that in

certain situations, the Coastal Act allows existing structures to be protected (Coastal Act Section 30235). What are the coastal resource impacts of such protection, and are there feasible alternatives that avoid shoreline armoring, such as options to provide incentives to property owners to relocate or remove at-risk structures?

viii. For a natural resource or habitat, what conditions does it require to persist?

ix. Where would resources/development ideally be located after sea level rise causes environmental conditions to shift?

x. What changes to existing LCP requirements or other land use restrictions are necessary to maximize opportunities for avoiding hazards or relocating threatened existing development?

After going through the questions listed above, and others that may be relevant to the planning exercise, synthesize the information and determine where sea level rise impacts currently pose problems for coastal resources, what problems may develop over time as sea level rises, and how urgent the problems are. Create maps illustrating the location and extent of vulnerable land uses, such as critical facilities, wastewater infrastructure, and State Highway 1 and other coastal access roadways. This information can also be summarized in narrative form. The analysis should identify resources and development likely to be impacted by sea level rise at various periods in the future, and thus the issues that need to be resolved in the LCP planning process.

Remember that these assessments are not static; existing risks will change and new risks will arise with changes in a community, the emergence of new threats, new information, and the implementation of adaptation actions. For this reason, the analysis should be updated as needed to reflect changes in sea level rise projections, changes in land use patterns, or new threats.

Expected outcomes from Step 3*: Descriptions of the characteristics that influence risk, including exposure, sensitivity, and adaptive capacity of each coastal resource to sea level rise impacts under each sea level rise scenario identified in Step 1 at the selected planning horizons, along with the expected consequences of those impacts for the resource and broader community. Maps of resources and/or land uses at risk could be produced.*

Example for Step 3

To illustrate the process described in Step 3, consider a hypothetical planning area that includes multiple coastal resources and land use types, including a coastal wetland, bluff-top residential development with a fronting beach, and a wastewater treatment facility, that need to be addressed in the planning process. After Steps 1 and 2, portions of the planning area are found to be subject to current and future sea level rise impacts.

Step 3.1: Map the coastal resources (in this case the wetland, development, and wastewater treatment facility) for the range of time periods and sea level rise projections.

Step 3.2

a. **Exposure**

- *Wetland:* The wetland is highly exposed to flooding and inundation from sea level rise. By the year 2030, portions of the wetland will trap sediment at a rate such that the elevation keeps pace with sea level rise. By 2050, a portion of the wetland will become inundated and converted to open water, and by 2100 the entire area will be converted to open water. The wetland will be completely lost by this time period if it is not able to move inland.
- *Bluff-top Residential Development:* Houses in the residential development are not exposed to sea level rise impacts in 2030. However, a high rate of retreat along the fronting beach and bluff will put front-line houses in danger of being undermined by the year 2050, and the entire development may be lost by 2100.
- *Wastewater Treatment Facility:* Given that the wastewater treatment plant is set back somewhat from the water, it will not be exposed to impacts from sea level rise until 2050. By 2050, however, portions of the infrastructure will be exposed to impacts from elevated water levels due to 100-year storm events and El Niño occurrences. By 2100, significant portions of the facility will be exposed to flooding as the surrounding area is eroded and inundated.

b. **Sensitivity**

- *Wetland:* The wetland has high sensitivity to changes in sea level because its functioning is highly-dependent on local physical parameters such as water flow, tidal fluctuation, sediment supply, and water quality. Although it currently has good sediment supply, good water quality, and a number of other characteristics, small changes in sea level rise by 2050 may alter the function of the wetland. In addition, there are concerns that beyond 2050 the wetland will not be able to keep up with accelerated sea level rise, thus increasing sensitivity to further changes in sea level.
- *Bluff-top Residential Development:* The residential development has moderate to high sensitivity to longer-term sea level rise changes. By 2050, the front-line houses will no longer be safe enough for occupancy. Moreover, infrastructure such as roads, sewage systems, and power networks may be damaged as the bluff-face erodes.
- *Wastewater Treatment Facility:* The facility is moderately sensitive to sea level rise. Flooding and erosion from sea level rise could cause damage of the facility, pumps and

other equipment, but the facility was initially built to withstand a high degree of storm and related impacts.

c. **Adaptive Capacity**

- *Wetland:* Unlike many wetlands in the State of California, this particular wetland has a moderate-high adaptive capacity because it has the ability to both accumulate sediment and grow upwards, and, given that the land upland of the wetland is preserved as open space, it can migrate inland. However, by 2050, a part or all of the existing wetland area could be converted to open water if the wetland is not able to migrate inland or accumulate sediment at a rate that keeps pace with sea level rise. In this case, for example, a public trail will need to be relocated to allow inland migration of the new intertidal zone. Additionally, adaptive capacity may be reduced if pollution increases (*e.g.*, as a result of damage to adjacent development) and disrupts the normal functioning of the wetland.
- *Bluff-top Residential Development:* The residential development has a moderate adaptive capacity. As houses become threatened over time, a scenario of managed retreat would allow houses to be removed incrementally and eventually be relocated to safer areas. The feasibility of managed retreat can depend upon lot sizes, ownership patterns, land use restrictions in the safer areas, and the availability of public or private financing. In addition, a protective structure such as a seawall would minimize threats to the residence due to erosion, though if the development is protected by shoreline structures, the fronting beach will eventually be lost.
- *Wastewater Treatment Facility:* The wastewater treatment facility has a very low adaptive capacity. It is large and has expensive infrastructure so it cannot be elevated, and relocation is costly and difficult. In order to be protected in its current location, new structures will need to be built.

d. **Consequences**

- *Wetland:* In many situations, the loss of wetland area is a high risk since wetlands provide flood protection, water quality enhancement, and essential habitat for fish and bird species. However, in this case, wetland migration is not restricted by inland development, so the risks for this wetland are slight to moderate, depending upon the suitability of the inland area for establishment of wetland plants and potential changes in water temperature and water quality. In the short term, the wetland will likely continue to function at normal levels. However, if it eventually can't keep up with sea level rise or if there are barriers to migration, loss of the habitat will result in a loss of important ecosystem services.
- *Bluff-top Residential Development:* The housing development has medium to high risk through 2100. The option to either relocate houses or protect them with a seawall means that they could continue to exist. Importantly, a system of managed retreat will allow for the continued existence of the fronting beach and all of its social, economic, and environmental benefits, whereas the construction of a seawall will result in the loss of the beach and these benefits.

- *Wastewater Treatment Facility:* Given its low adaptive capacity and high sensitivity to higher levels of sea level rise, the wastewater treatment facility is at high risk. Loss or damage to the facility could result in serious social, economic, and environmental consequences. Flooding of the facility and surrounding areas will cause damage to infrastructure and loss of facility function. This could lead to discharge of untreated sewage, which would have adverse impacts to water quality and could impair the health of nearshore ecosystems. Sea level rise could also cause outflow pipes to back up with seawater, leading to inland flooding and additional water quality problems. However, efforts to protect the structure may have unintended consequences including loss of surrounding habitat areas.

e. **Land Use Constraints (discussed further in Step 4)**

- *Wetland:* The high adaptive capacity of the wetland means that minimizing risk to this resource may be accomplished by ensuring that there is space available for it to move into. Land use policies designed to protect areas inland of the current wetland area will be necessary.
- *Bluff-top Residential Development:* The area in question will eventually become incompatible with the current use. Development will not begin to be exposed to sea level rise impacts until 2050, but it is important to start planning now about how best to address the risks to the houses. Managed retreat would necessitate identifying feasible locations into which houses could be moved or a plan to abandon and remove houses. Such a plan might include a Transfer of Development Rights program in which homes are encouraged in less hazardous areas. If a managed retreat strategy is not in place, existing structures may qualify for shoreline protection. Shoreline protection would likely exacerbate beach erosion, degrade public access, impair shoreline habitat, and alter visual character.
- *Wastewater Treatment Facility:* The biggest risk in this scenario is to the wastewater treatment facility. It should be determined how likely it is that the facility will be able to be protected throughout the rest of its expected lifespan under even the highest sea level rise scenarios. It may be that the wastewater treatment facility becomes an incompatible use under future conditions. If so, plans should be made to relocate at-risk portions of the facility, as feasible, or to phase out the facility.

Note that this is a simplified example used to demonstrate the process described in Step 3. Decisions about how to address various challenges presented by sea level rise will be more complex than those illustrated above and may require prioritizing the different resources based on Coastal Act requirements taking into account the goals and circumstances of the community and the various characteristics of each resource. An understanding of the exposure, sensitivity, adaptive capacity, consequences, and land use constraints for the particular resources and scenarios will need to be kept in mind as planners move into Step 4 to identify possible adaptation strategies. Updated LCP policies and ordinances should be considered to support strategy implementation over the long term.

Step 4 – Identify LCP adaptation strategies to minimize risks

Whether as part of a new LCP or as part of an amendment to update an existing LCP, coastal planners should work with the Coastal Commission and relevant stakeholders at all steps, but particularly to evaluate potential options and adaptation strategies to address the sea level rise impacts identified in Step 2 and the risks to coastal resources identified in Step 3. Planners will then develop new or revised land use designations, policies, standards, or ordinances to implement the adaptation strategies in the LCP.

An LCP as certified by the Commission should already have land use policies, standards, and ordinances to implement Coastal Act Chapter 3 policies, including policies to avoid and mitigate hazards, and to protect coastal resources. However, in older LCPs, many of these policies may not address changing conditions adequately enough to protect coastal resources over time as sea level rises. Similarly, policies to protect resources and address coastal hazards may not reflect new techniques that can be utilized to adaptively manage coastal resources in a dynamic environment. As such, the LCP should be evaluated to identify the land use designations, policies, or ordinances that need to be amended. An LCP update may need to include a variety of adaptation measures depending on the nature and location of the vulnerability. In addition, local governments may need to add new "programmatic" changes to address sea level rise, such as transfer of development credit programs, regional sediment management programs, or a land acquisition program.

In Steps 1-3, planners will have analyzed several possible sea level rise scenarios, and this analysis will have revealed valuable information about areas and specific coastal resources that are especially vulnerable to sea level rise hazards under possible scenarios. The results should show areas that are particularly resilient to future change and trigger points at which sea level hazards will become particularly relevant to certain areas. Step 3d (identifying the *Consequences* of sea level rise impacts) and Step 3e (considering the *Land use constraints*) will be particularly useful in thinking through what resources are particularly vulnerable and what the local priorities may be.

In Step 4, planners should weigh information from the previous steps, keeping in mind the hazard avoidance and resource protection policies of the Coastal Act, and begin identifying, choosing, and/or developing adaptation strategies to be included in a new or updated LCP. The options available to minimize risks from sea level rise are dependent upon the specifics of the local community, and will vary widely depending on whether the area is an urban, fully-developed waterfront, or a rural, undeveloped coastline. In undeveloped areas, the options may be clear: strictly limit new development in sea level rise hazard zones.

However, in urban areas, sea level rise can present unprecedented challenges, and the options are less clear. The Coastal Act allows for protection of certain existing structures. However, armoring can pose significant impacts to coastal resources. To minimize impacts, innovative, cutting-edge solutions will be needed, such as the use of living shorelines to protect existing infrastructure, restrictions on redevelopment of properties in hazardous areas, managed retreat, partnerships with land trust organizations to convert at risk areas to open space, or transfer of development rights programs. Strategies will need to be tailored to the specific needs of each

community based on the resources at risk, should be evaluated for resulting impacts to coastal resources, and should be developed through a public process, in close consultation with the Coastal Commission and in line with the Coastal Act.

Adaptation strategies should be selected based upon the local conditions, the results of the scenario-based analysis, and Coastal Act requirements, taking into account the particular goals of the local community. If certain adaptation strategies should be implemented when conditions reach pre-identified trigger points, those caveats should be included in the LCP. Similarly, LCP adaptation policies should be developed and implemented in such a way as to be flexible and adaptive enough that they can be changed or updated as conditions change or if sea level rise impacts are significantly different than anticipated. Additionally, many adaptation strategies should be implemented in a coordinated way through both the LCP and individual CDPs. For example, current land uses that will conflict with future conditions may be amended through updated zoning designations in an LCP. In turn, zoning designations could carry out specific policies or requirements regarding new development or redevelopment that need to be addressed in a CDP to ensure that projects are resilient over time. Planners are encouraged to work with Coastal Commission staff to ensure compliance with the Coastal Act and to coordinate and share information with other local partners including those in charge of emergency management, law enforcement, and related services, and those identified in Figure 10 as applicable and feasible.

A key issue that should be addressed in the LCP is the evaluation of strategies to minimize hazards related to existing development. Under the Coastal Act, certain improvements and repairs to existing development are exempt from CDP requirements. Non-exempt improvements and any repairs that involve the replacement of 50% or more of a structure, however, generally require a CDP and must conform to the standards of the relevant Local Coastal Program or Coastal Act.[33] Redevelopment, therefore, should minimize hazards from sea level rise. For existing structures currently sited in at-risk locations, the process of redeveloping the structure may require the structure to be moved or modified to ensure that the structure and coastal resources are not at risk due to impacts from sea level rise. As described in Guiding Principle 6, sequential renovation or replacement of small portions of existing development should be considered in total. LCPs should include policies that specify that multiple smaller renovations that amount to alteration of 50% or more of the original structure should require a Coastal Development Permit, and require that the entire structure to be brought into conformance with the standards of the Local Coastal Program or Coastal Act.[34]

[33] Section **§** 13252(b) of the Commission's regulations states that "unless destroyed by natural disaster, the replacement of 50 percent or more of a single family residence, seawall, revetment, bluff retaining wall, breakwater, groin or any other structure is not repair and maintenance under Coastal Act Section 30610(d) but instead constitutes a replacement structure requiring a Coastal Development Permit."

[34] In addition, for existing structures located between the first public road and the sea or within 300 feet of the inland extent of a beach, improvements that increase the height or internal floor area by more than 10% normally require a CDP. (Cal. Code Regs., tit. 14, §§13250(b)(4), 13253(b)(4).) Depending upon the location of the structure, smaller improvements may also require a CDP. (Cal. Code Regs., tit. 14, §§ 13250(b), 13253(b).)

General Adaptation Strategies:

Chapter 7 describes a number of adaptation policies and strategies and is organized by resource type to allow users to easily identify the types of policies that may be relevant to local resource vulnerabilities. However, there are a number of adaption strategies or related actions that apply to a variety of resources or that may be generally useful when adopting or updating an LCP. Some of these adaptation strategies and actions are broadly described below.

- **Update resource inventory and maps**: An important first step for addressing sea level rise hazards and vulnerabilities in a new or updated LCP will be to compile a set of maps that clearly show the current locations of the range of coastal resources present in an LCP jurisdiction (*e.g.*, beaches and public accessways; agricultural land, wetlands, ESHA, and other coastal habitats; energy, wastewater, transportation, and other critical infrastructure; and archaeological and paleontological resources), as well as existing land use designations, and hazard areas. It may also be helpful to map possible future conditions based on the analysis done in Steps 1-3. Doing so will help planners begin to identify possible land use and zoning changes and other adaptation strategies that will be necessary to meet hazard avoidance and resource protection goals.
- **Update land use designations and zoning ordinances**: One of the most common methods of regulating land use is through zoning designations and ordinances, and updating these policies is one of the most fundamental ways of responding to sea level rise impacts. Planners may address particular vulnerabilities and local priorities by updating land use designations and zoning ordinances to protect specific areas and/or resources. For example, areas that are particularly vulnerable to sea level rise impacts can be designated as hazard zones and specific regulations can be used to limit new development and/or to encourage removal of existing development in such zones. Similarly, open areas can be designated as conservation zones in order to protect and provide upland areas for wetland and habitat migration or for additional agricultural land.
- **Update siting and design standards**: Updated siting and design standards may go hand in hand with updated land use designations and zoning ordinances in that specific standards may be required for development or projects in certain zones. For example, development in hazard zones may require additional setbacks, limits for first floor habitable space, innovative stormwater management systems, special flood protection measures, mitigation measures for unavoidable impacts, relocation and removal triggers and methodologies, and so on.
- **Establish methods to monitor local changes from sea level rise**: Add policies that establish actions to conduct long-term sea level rise monitoring and research on areas of key uncertainties, areas sensitive to small changes in sea level rise, or areas with high sea level rise risk.
- **Research and data collection**: Support research to address key data gaps and better utilize existing information. Local governments may find it useful to collaborate with local, regional, and state partners to pursue new research to better understand the factors controlling sea level rise, baseline shoreline conditions, ecosystem responses to sea level rise, potential impacts and vulnerabilities, and the efficacy of adaptation tools. Related efforts may include monitoring programs designed to track trends in local shoreline

change, flooding extent and frequency, or water quality. Monitoring of the results of various adaptation strategies and protective structures could be included as part of a Coastal Development Permit for projects in hazard zones.

- **Outreach and education**: Education and outreach efforts involve formal instruction and provision of information to stakeholders, and can help generate support for planning and action implementation. It is important to coordinate with partners and include all relevant stakeholders in these processes, particularly those that are typically isolated, such as low-income or underserved communities. For many people, sea level rise is a new issue. Information on sea level rise science and potential consequences may motivate stakeholders to take an active role in updating the LCP for sea level rise issues, or in the vulnerability and risk assessment efforts. Additionally, education efforts regarding the risks of sea level rise as well as possible adaptation strategies may encourage people to take proactive steps to retrofit their homes to be more resilient or to choose to build in less hazardous areas.

As stated above, a more extensive and detailed list of possible adaptation strategies can be found in Chapter 7. The list should neither be considered a checklist from which all options need to be added to an LCP, nor is it an exhaustive list of all possible adaptation strategies. Sea level rise adaptation is still an evolving field and decision makers will need to be innovative and flexible to respond to changing conditions, new science, and new adaptation opportunities. The important point is to analyze current and future risks from sea level rise, determine local priorities and goals for protection of coastal resources and development, and identify what land use designations, zoning ordinances, and other adaptation strategies can be used to meet those goals within the context of the Coastal Act.

***Expected outcomes from Step 4**: Identified sections of the LCP that need to be updated, a list of adaptation measures applicable to the LCP, and new policies and ordinances to implement the adaptation measures.*

Step 5 – Draft updated or new LCP for certification with the Coastal Commission

Once potential adaptation strategies have been identified, LCP policies that address sea level rise should be incorporated into a new LCP or LCP amendment. For jurisdictions with a certified LCP, adaptation measures will be implemented through development of amendments to the certified LCPs. For jurisdictions that currently do not have a certified LCP, the sea level rise policies will be part of the development of a new LCP. In areas without a certified LCP, the Coastal Commission generally retains permitting authority, and the standard of review for development is generally Chapter 3 of the California Coastal Act.

As noted in Step 4, sea level rise has the potential to affect many types of coastal resources in an LCP planning area/segment, and it is likely that policies throughout the LCP will need to be revised or developed to address impacts from sea level rise. Two major types of updates to the LCP will likely be needed to address sea level rise:

1. New or revised policies/ordinances that apply to all development in the planning area. For example, policies such as "All new development shall be sited and designed to minimize risks from sea level rise over the life of the structure."
2. Updated land use and zoning designations, as well as programs to facilitate adaptive community responses, to reduce risks to specific coastal resources. For example, the LCP could modify the zoning of undeveloped land located upland of wetlands from residential to open space in order to provide the opportunity for wetlands to migrate inland, and protect wetlands for the future.

Local government staff should work closely with Coastal Commission staff and relevant stakeholders, including ensuring there is opportunity for public input, to develop the new LCP or LCP amendments. Once the updates and plans are complete, local governments will submit to the Commission for certification. The Commission may either certify or deny the LCP or LCP amendment as submitted, or it may suggest modifications. If the Commission adopts suggested modifications, the local government may adopt the modifications for certification or refuse the modifications and resubmit a revised LCP for additional Commission review. For more information on updating LCPs, see http://www.coastal.ca.gov/la/lcp.html.

Expected outcomes from Step 5*: Certified/updated LCP with policies and land use designations that address sea level rise and related hazards and ensure protection of coastal resources to the maximum extent feasible.*

Step 6 – Implement LCP and monitor and revise as needed

Upon certification of the updated LCP, sea level rise adaptation strategies will be implemented through the certified implementing ordinances and related processes and actions (*e.g.*, local review of CDPs, proactive action plans). Additionally, an important component of successful adaptation is to secure funds for implementation, regularly monitor progress and results, and update any policies and approaches as needed. Sea level rise projections should be re-evaluated and updated as necessary.

- **Secure resources for implementation:** There are a number of different sources of funds available to help local governments implement adaptation strategies. For example, the Coastal Commission, the Ocean Protection Council, and the Coastal Conservancy have grant programs designed to support local adaptation efforts (see Chapter 1 for additional details on each of these programs).

  As described previously there may also be overlap between LCP planning and Local Hazard Mitigation planning. FEMA's Hazard Mitigation Assistance (HMA) grant programs provide significant opportunities to reduce or eliminate potential losses to State, Indian Tribal government, and local assets through hazard mitigation planning and project grant funding. Currently, there are three programs: the Hazard Mitigation Grant Program (HMGP); Pre-Disaster Mitigation (PDM); and Flood Mitigation Assistance

(FMA)[35]. Cal OES administers the HMA and FMA programs. More information can be found at http://hazardmitigation.calema.ca.gov/grants or the FEMA HMA Web site at https://www.fema.gov/hazard-mitigation-assistance.

A list compiled by Cal OES of additional funding options for hazard mitigation can be found in Appendix E. The Commission recognizes that funding opportunities are constantly evolving, that demand for funding is increasing, and that there is a significant need for the development of additional funding opportunities.

- **Identify key resources to monitor:** Certain species can be indicators of whether sea level rise is affecting an ecosystem. For instance, the presence of certain plant species can indicate the salinity of soils. Also, monitoring plans should reflect the outcome of the scenario-based analysis of sea level rise. Some adaptation measures might be earmarked for implementation when a certain amount of sea level rise (or a particular sea level rise impact) occurs. Monitoring programs should ensure that these triggers are recognized and responded to at the appropriate time.

- **Periodically Update LCPs:** Local governments should try to review their vulnerability and risk assessments on a regular basis as significant new scientific information becomes available and propose amendments as appropriate. Given the evolving nature of sea level rise science, policies may need to be updated as major scientific advancements are made, changing what is considered the best available science. Modify the current and future hazard areas on a five to ten year basis or as necessary to allow for the incorporation of new sea level rise science, monitoring results, and information on coastal conditions. Regular evaluation of LCPs is important to make sure policies and adaptation strategies are effective in reducing impacts from sea level rise.

***Expected outcomes from Step 6**: Plan to monitor the LCP planning area for sea level rise and other impacts and for effectiveness of various adaptation strategies that are implemented; plan to revise the LCP when conditions change or science is updated.*

This six-step process discussed in this chapter is illustrated in the flowchart below (Figure 12). Notice that the process is circular. Because sea level rise science will be refined and updated in the future, planners should periodically repeat this six-step process to update and improve their LCPs.

For additional resources and examples of ways to incorporate sea level rise into the LCP, see Appendix C.

[35] Each HMA program was authorized by separate legislative action, and as such, each program differs slightly in scope and intent.

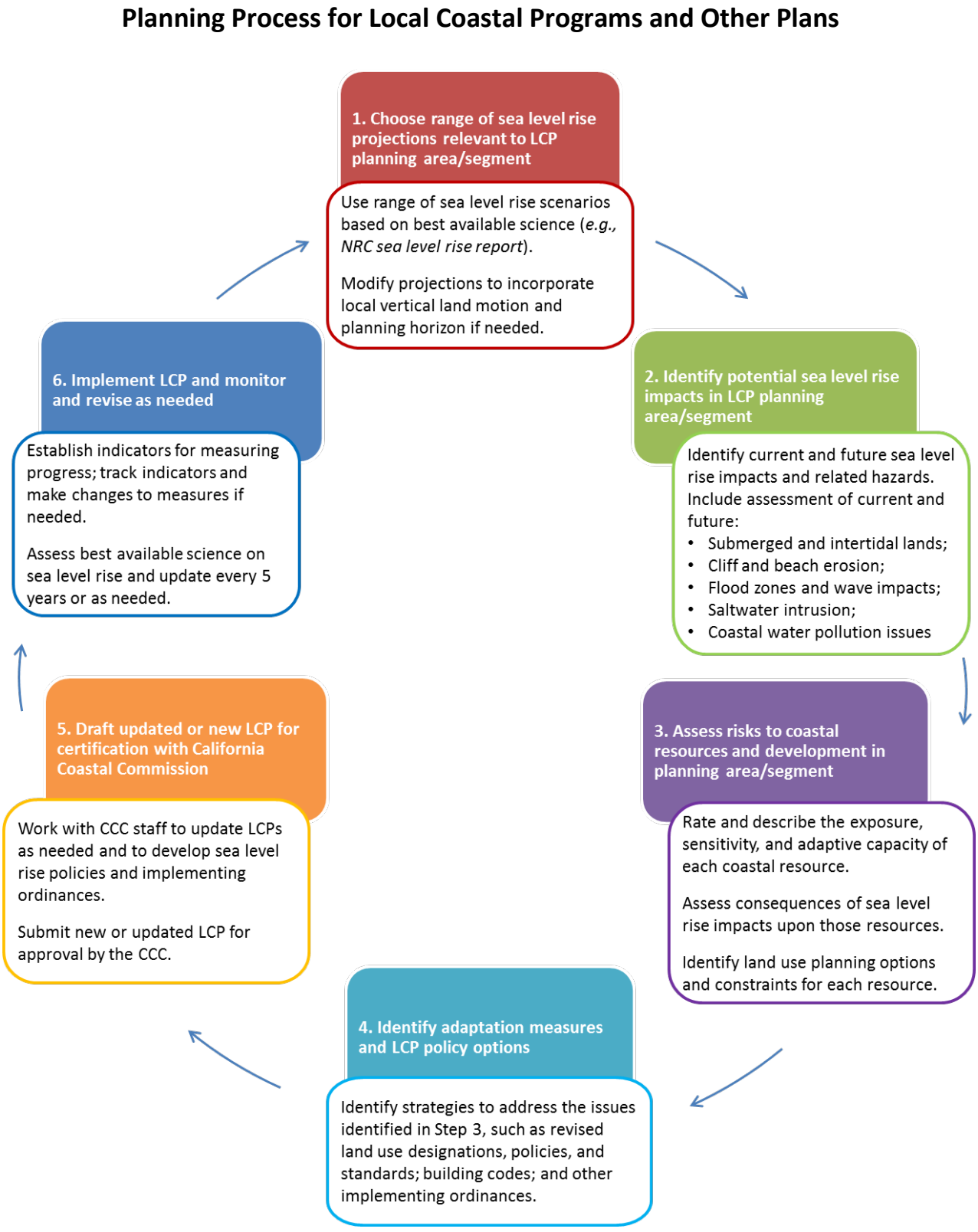


Figure 12. Flowchart for addressing sea level rise in Local Coastal Programs and other plans

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Chapter 6

Addressing Sea Level Rise in Coastal Development Permits

Development in the coastal zone generally requires a Coastal Development Permit (CDP).[36] In areas of retained jurisdiction and areas without a certified Local Coastal Program (LCP), the Commission is generally responsible for reviewing the consistency of CDP applications with the policies of Chapter 3 of the Coastal Act (Public Resources Code Sections 30200-30265.5).[37] In areas with a certified LCP, the local government is responsible for reviewing the compliance of CDP applications with the requirements of the certified LCP and, where applicable, the public access and recreation policies of the Coastal Act. Certain local government actions on CDP applications are appealable to the Commission. On appeal, the Commission also applies the policies of the certified LCP and applicable public access and recreation policies of the Coastal Act.[38] The Commission and local governments may require changes to the project or other mitigation measures in order to assure compliance with Coastal Act policies or LCP requirements by both minimizing risks to the development from coastal hazards and avoiding impacts to coastal resources.

The Coastal Act, the LCP, and the CDP Application cover the broad range of information and analyses that must be addressed in a CDP application. This CDP guidance focuses only on sea level rise and those conditions or circumstances that might change as a result of changing sea level. It does not address other Coastal Act or LCP requirements.

Adopting or updating LCPs as recommended in this Guidance should facilitate subsequent review of CDPs. LCPs can identify areas where close review of sea level rise concerns is necessary and where it is not. If kept up to date, they can also provide information for evaluation at the permit stage and specify appropriate mitigation measures for CDPs to incorporate.

Sea level rise will be important for some, but not all, of the projects reviewed through the CDP process. Locations currently subject to inundation, flooding, wave impacts, erosion, or saltwater intrusion will be exposed to increased risks from these coastal hazards with rising sea level and will require review for sea level rise effects. Locations close to or hydraulically connected to these at-risk locations, will themselves be at risk as sea level rises and increases the inland extent

[36] Coastal Act Section 30106 defines "Development" to be, “on land, in or under water, the placement or erection of any solid material or structure; discharge or disposal of any dredged material or of any gaseous, liquid, solid, or thermal waste; grading, removing, dredging, mining, or extraction of any materials; change in the density or intensity of use of land, including, but not limited to, subdivision pursuant to the Subdivision Map Act (commencing with Section 66410 of the Government Code), and any other division of land, including lot splits, except where the land division is brought about in connection with the purchase of such land by a public agency for public recreational use; change in the intensity of use of water, or of access thereto; construction, reconstruction, demolition, or alteration of the size of any structure, including any facility of any private, public, or municipal utility; and the removal or harvesting of major vegetation other than for agricultural purposes, kelp harvesting, and timber operations which are in accordance with a timber harvesting plan submitted pursuant to the provisions of the Z'berg-Nejedly Forest Practice Act of 1973 (commencing with Section 4511).”

[37] The Commission retains CDP jurisdiction below mean high tide and on public trust lands.

[38] Local governments may assume permitting authority even without a fully certified LCP (*see* Public Resources Code, §§ 30600(b), 30600.5), but only the City of Los Angeles has done so. Any action on a CDP application by a local government without a fully certified LCP may be appealed to the Commission. (Public Resources Code, § 30602.)

of these hazards. The following box provides some of the general situations for which sea level rise will need to be included in the project analysis.

General Situations when sea level rise should be considered in the project analysis include when the project or planning site is:

- Currently in or adjacent to an identified floodplain
- Currently or has been exposed to flooding or erosion from waves or tides
- Currently in a location protected by constructed dikes, levees, bulkheads, or other flood-control or protective structures
- On or close to a beach, estuary, lagoon, or wetland
- On a coastal bluff with historic evidence of erosion
- Reliant upon shallow wells for water supply

Many of the projects reviewed through the CDP application process already examine sea level rise as part of the hazards analysis. Such examination will need to continue, and these guidelines offer direction and support for a thorough examination of sea level rise and its associated impacts based on current climate science, coastal responses to changing sea level, and consequences of future changes.

To comply with Coastal Act Section 30253 or the equivalent LCP section, projects will need to be planned, located, designed, and engineered for the changing water levels and associated impacts that might occur over the life of the development. In addition, project planning should anticipate the migration and natural adaptation of coastal resources (beaches, access, wetlands, *etc.*) due to future sea level rise conditions in order to avoid future impacts to those resources from the new development. As LCPs are updated to reflect changing conditions and to implement sea level rise adaptation strategies, it will be important that CDPs are also conditioned and approved in ways that similarly emphasize an adaptive approach to addressing sea level rise hazards. Such coordination between LCP and CDP adaptation policies and strategies will help ensure that coastal development and resources are resilient over time.

Steps for Addressing Sea Level Rise in Coastal Development Permits

The steps presented in Figure 13 and described in more detail below, provide general guidance for addressing sea level rise in the project design and permitting process for those projects where sea level rise may be contribute to or exacerbate hazards or impact coastal resources.

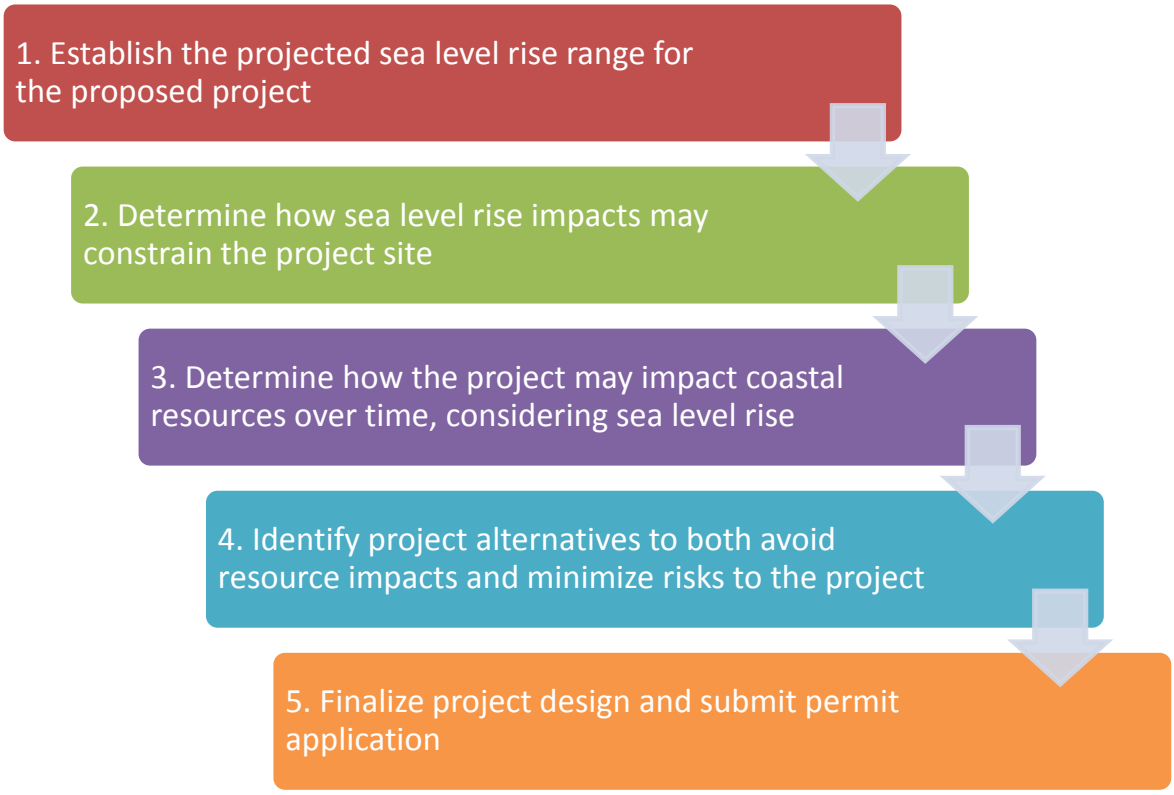

Figure 13. Process for addressing sea level rise in Coastal Development Permits

The goal of these steps is to ensure that projects are designed and built in a way that minimizes risks to the development and avoids impacts to coastal resources in light of current conditions and the changes that may arise over the life of the project. Many project sites and proposed projects may raise issues not specifically contemplated by the following guidance steps or the permit filing checklist at the end of this section. It remains the responsibility of the project applicant to adequately address these situations so that consistency with the Coastal Act and/or LCP may be fully evaluated. There are many ways to evaluate and minimize the risks associated with sea level rise, and the Commission understands that different types of analyses and actions will be appropriate depending on the type of project or planning effort.

Throughout the CDP analysis, applicants are advised to contact planning staff (either at the Commission or the local government, whichever is appropriate) to discuss the proposed project, project site, and possible resource or hazard concerns. The extent and frequency of staff coordination may vary with the scale of the proposed project and the constraints of the proposed project site. Larger projects and more constrained sites will likely necessitate greater coordination with local government and Commission staff.

Use scenario-based analysis

This process recommends using various sea level rise scenarios for the analysis of possible resource changes and site risks associated with sea level rise. Given the uncertainty about the magnitude and timing of future sea level rise, a scenario-based analysis will examine the consequences of a range of situations rather than basing project planning and design upon one sea level rise projection.

One approach for scenario-based analysis is to start with the highest possible sea level rise. If a developable area can be identified that has no long-term resource impacts, and is at no or low-risk from inundation, flooding, and erosion, then there may be no benefit to undertaking additional analysis for sea level rise and the project can continue with the rest of the analyses that are part of the Coastal Act or LCP (such as impacts to coastal habitats, public access, and scenic and visual qualities, and other issues unrelated to sea level rise).

If the site is constrained under a high sea level rise scenario, analysis of other, lower sea level rise amounts can help determine thresholds for varying impacts to coastal resources and types and extent of site constraints that need to be considered during project planning. The analysis of lower and intermediate sea level rise projections are used to better understand the timing and probability of the constraints. For further description of scenario-based analysis, see Chapter 3 of this Guidance.

Step 1 – Establish the projected sea level rise range for the proposed project

A projected sea level rise range should be obtained from the best available science, such as the 2012 National Research Council (NRC) report or an equivalent resource. These projections should cover the expected life of the proposed project, as the ultimate objective will be to assure that the project is safe from coastal hazards, without the need for shoreline protection or other detrimental hazard mitigation measures, as long as it exists.

- **Define Expected Project Life**: The expected project life will help determine the amount of sea level rise to which the project site could be exposed while the development is in place. Importantly, the point of this step is not to specify exactly how long a project will exist (and be permitted for), but rather to identify a project life time frame that is typical for the type of development in question so that the hazard analyses performed in subsequent steps will adequately consider the impacts that may occur over the entire life of the development.

  Some LCPs include a specified design life for new development. If no specified time frame is provided, a more general range may be chosen based on the type of development. For example, temporary structures, ancillary development, amenity structures, or moveable or expendable construction may identify a relatively short expected life such as 25 years or less. Residential or commercial structures will likely be around for some time, so a time frame of 75 to 100 may be appropriate. A longer time frame of 100 years or more should be considered for critical infrastructure like bridges or industrial facilities. Resource protection or enhancement projects such as coastal habitat

conservation or restoration projects should also consider longer time frames of 100 years or more, as these types of projects are typically meant to last in perpetuity.[39]

- **Determine Sea Level Rise Range:** Using the typical project life identified above, the project analysis should identify a range of sea level rise projections based on the best available science that may occur over the life of the project. At present, the 2012 NRC report is considered to be the best available science (Table 6)[40], though an equivalent resource may be used provided that it is peer-reviewed, widely accepted within the scientific community, and locally relevant. Appendix B provides information on how to determine sea level rise amounts for years that are not included in the NRC report and, if needed, how to modify the NRC sea level rise projections to account for local vertical land motion. At a minimum, one high sea level rise projection for the proposed life of the project should be used for project analysis and evaluation. If constraints are identified with the high sea level rise scenario, a low sea level rise scenario and/or one or more intermediate rise scenarios should also be used. For critical infrastructure, development with a very long project life, or for projects with the potential to have severe impacts to Coastal Act resources, the analysis may also consider higher scenarios (such as a 2-m (6.6-ft) scenario[41]). These values should each be carried forward through the rest of the steps in this chapter.

Table 6. Sea Level Rise Projections for California (NRC 2012)

TIME PERIOD*	NORTH OF CAPE MENDOCINO	SOUTH OF CAPE MENDOCINO	
by 2030	-2 – 9 in (-4 – +23 cm)	2 – 12 in (4 – 30 cm)	
by 2050	-1 – 19 in (-3 – + 48 cm)	5 – 24 in (12 – 61 cm)	
by 2100	4 – 56 in (10 – 143 cm)	17 – 66 in (42 – 167 cm)	

*with Year 2000 as a baseline

[39] Determining an anticipated life for restoration activities or other related projects is somewhat more complex than for typical development projects because these activities are typically meant to exist in perpetuity. As such, assessing sea level rise impacts may necessitate analyzing multiple different time frames, including the present, near future, and very long term depending on the overall goals of the project. For restoration projects that are implemented as mitigation for development projects, an expected project life that is at least as long as the expected life of the corresponding development project should be considered.

[40] The NRC Committee divided the Pacific coast for California, Oregon and Washington into two regions, north and south of Cape Mendocino, due to differences in tectonics that occur at this point. North of Cape Mendocino, land is rising as ocean plates descend below the North American plate at the Cascadia Subduction Zone. South of Cape Mendocino, the coast is sinking (NRC 2012, p. 3). Humboldt Bay has not experienced the regional uplift that characterizes most of the coast north of Cape Mendocino, and instead has shown the highest subsidence recorded for the California coast. As a result, the projections for north of Cape Mendocino may not be appropriate for use in or near Humboldt Bay and the Eel River Estuary.

[41] The Global Sea Level Rise Scenarios for the United States National Climate Assessment 2012 established 6.6 ft (2 m) as the highest global sea level rise scenario for 2100.

Note that for project locations in the vicinity of Humboldt Bay and the Eel River estuary, the regional NRC sea level rise projections will need to be modified to adjust for localized vertical land motion.[42] Adjustments for vertical land motion are not necessary for other locations, though they may be done if desired and if locally relevant data are available.[43] If sea level rise projections are modified for areas other than the Humboldt Bay region, at least one scenario for the analysis of impacts should use the high value from the unmodified NRC projections in order to assess a worst case scenario possibility.

***Expected outcomes from Step 1**: A proposed or expected project life and corresponding range of sea level projections—including the high, the low, and one or more intermediate sea level rise projections—that will be used in the following analytic steps.*

Step 2 – Determine how physical impacts from sea level rise may constrain the project site

The Coastal Act requires that development minimize risks from coastal hazards. Sea level rise can both present new hazards and exacerbate hazards that are typically analyzed in CDP applications. In this step, project applicants determine the types and extent of sea level rise impacts that may occur now and into the future.

As described in Chapter 3 of the Guidance, impacts associated with sea level rise generally include erosion, inundation, flooding, wave impacts, and saltwater intrusion. An assessment of these impacts is often required as part of a routine hazards assessment or the safety element of the LCP. Therefore, information in the local LCP can provide an initial determination of potential hazards for the project in question, if available. However, proposed development will often need a second, site-specific analysis of hazards to augment the more general LCP information.

Analyze relevant sea level rise impacts for each sea level rise scenario.

A CDP application for new development in a hazardous area should include reports analyzing the anticipated impacts to a project site associated with each sea level rise scenario identified in Step 1. Generally, the analyses pertinent to sea level rise include geologic stability, erosion, flooding/inundation, wave runup, and wave impacts, and these analyses are described in detail below. Depending on the site, however, different analyses may be required. Applicants should work with planning staff (Coastal Commission or local government staff) to perform a pre-application submittal consultation to determine what analyses are required for their particular

[42] Please see Appendix B and *Humboldt Bay: Sea Level Rise Hydrodynamic Modeling, and Inundation Vulnerability Mapping* (Northern Hydrology and Engineering 2015) for additional information on VLM and sea level rise projections for the Humboldt Bay region.

[43] A three-member subcommittee of the OPC Science Advisory Team (OPC-SAT) advised using the NRC projections, without modification, for all California locations except between Humboldt Bay and Crescent City. The OPC-SAT subcommittee stated, "We do not believe that there is enough certainty in the sea level rise projections nor is there a strong scientific rationale for specifying specific sea level rise values at individual locations along California's coastline." (OPC 2013, p. 10)

project. Analysis of those hazards that will not be altered by sea level rise (such as the location of faults, fire zones, *etc.*) should be undertaken at the same time as the assessment of sea level rise affected hazards so a complete understanding of hazard constraints can be used for identification of safe or low-hazard building areas. After the submission of the CDP application, any additional analyses that are required will be listed in an application filing status review letter.

The professionals who are responsible for technical studies of geologic stability, erosion, flooding/inundation, wave runup, and wave impacts should be familiar with the methodologies for examining the respective impacts. However, the methodologies do not always adequately examine potential impacts under rising sea level conditions, as established by best available science. Appendix B goes through the various steps for incorporating the best available science on sea level rise into the more routine analyses, which are summarized below. The analyses should be undertaken for each of the sea level rise scenarios identified in Step 1.

- **Geologic Stability:** The CDP should analyze site-specific stability and structural integrity without reliance upon existing or new protective devices (including cliff-retaining structures, seawalls, revetments, groins, buried retaining walls, and caisson foundations) that would substantially alter natural landforms along bluffs and cliffs. Geologic stability can include, among others, concerns such as landslides, slope failure, liquefiable soils, and seismic activity. In most situations, the analyses of these concerns will be combined with the erosion analysis (below) to fully establish the safe developable area.
- **Erosion:** Both bluff erosion and long-term shoreline change will increase as the time period increases. Thus, some estimate of project life is needed to determine expected bluff and shoreline change, and to fully assess the viability of a proposed site for long-term development. The CDP application should include an erosion analysis that establishes the extent of erosion that could occur from current processes, as well as future erosion hazards associated with the identified sea level rise scenarios over the life of the project. If possible, these erosion conditions should be shown on a site map, and the erosion zone, combined with the geologic stability concerns, can be used to help establish locations on the parcel or parcels that can be developed without reliance upon existing or new protective devices (including cliff-retaining structures, seawalls, revetments, groins, buried retaining walls, and caissons) that would substantially alter natural landforms along bluffs and cliffs.
- **Flooding and Inundation:** The CDP application should identify the current tidal datum and include analysis of the extent of flooding or inundation that potentially could occur from the identified sea level rise scenarios, and under a range of conditions that could include high tide, storm surge, water elevation due to El Niños, Pacific Decadal Oscillations, a 100-year storm event, and the combination of long-term erosion and seasonal beach erosion. If possible, this information and resulting flood zones should be shown on a site map.
    - **Flood Elevation Certificate**: If a site is within a FEMA-mapped 100-year flood zone, building regulations, in implementing the federal flood protection program, require new residences to have a finished floor elevation above Base Flood

Elevation (BFE; generally 1 ft).[44] The CDP application should include a flood elevation certificate prepared by a registered land surveyor, engineer, or architect, demonstrating that the finished floor foundation of the new structure will comply with the minimum FEMA guidelines and building standards. However, at this time, the Flood Certificate does not address sea level rise related flooding. In addition, designing to meet FEMA requirements may be in conflict with other resource constraints, such as protection of visual resources, community character, and public access and recreation. Thus, in general, a certificate is not adequate to address Coastal Act and LCP standards for demonstrating that future flood risk or other impacts to coastal resources have been minimized.

- **Wave Runup and Wave Impacts:** Building upon the analysis for flooding, the CDP application should include analysis of the wave runup and impacts that potentially could occur over the anticipated life of the project from a 100-year storm event, combined with the identified sea level rise scenarios, and under a range of conditions that could include high tide, storm surge, water elevation due to El Niño events, Pacific Decadal Oscillations, and the combination of long-term erosion and seasonal beach erosion. If possible, this information and resulting wave runup zones should be shown on a site map or site profile.
- **Other Impacts**: Any additional sea level rise related impacts that could be expected to occur over the life of the project, such as saltwater intrusion should be evaluated. This may be especially significant for areas with a high groundwater table such as wetlands or coastal resources that might rely upon groundwater, such as agricultural uses.

Expected outcomes from Step 2*: Detailed information about the sea level rise related impacts that can occur on the site and changes that will occur over time under various sea level rise scenarios. High risk and low risk areas of the site should be identified. The scenario-based analyses should also provide information on the potential effects of sea level rise, such as coastal erosion, that could occur over the proposed development life, without relying upon existing or new protective devices.*

[44] FEMA's proposed "Revised Guidelines for Implementing Executive Order 11988, Floodplain Management" (released for public review and comment on January 30, 2015) will modify the Federal Flood Risk Management Standard, in compliance with EO 13960, to address the need for federal agencies to include climate change considerations in floodplain management. It recommends that the elevation and flood hazard area be established by (i) using climate-informed science, (ii) adding 2 feet (for non-critical actions) or 3 feet (for critical actions) of freeboard to the Base Flood Elevation, or (iii) including the area subject to the 0.2% annual chance of flood. These Revised Guidelines could lead to future changes in the elevation required for Flood Elevation Certificates for new development.

Step 3 – Determine how the project may impact coastal resources, considering the influence of sea level rise upon the landscape over time

The Coastal Act requires that development avoid impacts to coastal resources. Sea level rise will likely cause some coastal resources to change over time, as described in Chapters 3 and 4. Therefore, in this step, applicants should analyze how sea level rise will affect coastal resources now and in the future so that alternatives can be developed in Step 4 to minimize the project's impacts to coastal resources throughout its lifetime.

This section discusses only those resources that might change due to rising sea level or possible responses to rising sea levels. As in Step 2, each sea level rise scenario (high, low, and intermediate values) should be carried through this step. A complete CDP application will need to assess possible impacts to all coastal resources – including public access and recreation, water quality, natural resources (such as ESHA and wetlands), agricultural resources, natural landforms, scenic resources, and archaeological and paleontological resources. Analysis of those resources that will not be affected by sea level rise should be undertaken at the same time as the assessment of the sea level rise affected resources so a complete map of resource constraints can be used for identification of a resource-protective building area.

3.1 Analyze coastal resource impacts and hazard risks for each sea level rise scenario

Analysis of resource impacts will require information about the type and location of the resources on or in proximity to the proposed project site and the way in which the proposed project will affect such resources initially and over time. The following discussion of each resource will help identify the key impacts to each that might result from either sea level rise or the proposed development. If coastal resources will be affected by sea level rise, such as changes to the area and extent of a wetland or riparian buffer, these changes must be considered in the analysis. Much of the following discussion recommends analysis of impacts from current and future inundation, flooding, erosion, and from the ways in which the project proposes to address such impacts. Appendix B provides guidance on how to undertake this analysis and includes lists of suggested resources that can provide data, tools, or other resources to help with these analyses. This analysis should be repeated for each sea level rise scenario identified in Step 1. Also, it may be important for local planners to coordinate and share information with other local partners – including those in charge of emergency management, law enforcement, and related services – in order to identify risks and vulnerabilities. Information on the following coastal resources is included. To skip to a section, click on the links below:

- New Development (addressed in Step 2, above)
- Public Access and Recreation
- Coastal Habitats
- Natural Landforms
- Agricultural Resources
- Water Quality and Groundwater
- Scenic Resources

Public Access and Recreation: Public access and recreation resources include lateral and vertical public accessways, public access easements, beaches, recreation areas, public trust lands,[45] and trails, including the California Coastal Trail. These areas may become hazardous or unusable during the project life due to sea level rise and/or due to the proposed project. Approaches to identify potential risks to public access and recreation include:

- Identify all public access locations on or near the proposed project site and, if possible, map these resources in relation to the location of the proposed project. The analysis should also identify existing public trust areas in relation to the proposed project
- Determine whether any access locations or public trust lands will be altered or impacted by sea level rise and/or the proposed project for the identified sea level rise scenarios. Such impacts could result from flooding, inundation, or shoreline erosion, or from proposed project elements. At a minimum, establish the extent of likely and/or possible changes to public access and recreation and to public trust lands.
- If any access locations will be altered by sea level rise and/or the proposed project, map or otherwise identify the potential changes to the location of these access resources for the identified sea level rise scenarios.
- Identify whether there are locations on the proposed project site that can support development without encroachment onto the existing or future locations of these access locations, and without impacts otherwise to public access and recreation. Overlay with development constraints (fault zones, landslides, steep slopes, property line setbacks, *etc.*) and with other coastal resource constraints.

Coastal Habitats (ESHA, wetlands, *etc.*): Coastal habitats, especially those that have a connection to water, such as beaches, intertidal areas, and wetlands, can be highly sensitive to changes in sea level. Ways to identify potential resource impacts associated with the project include:

- Identify all coastal habitats and species of special biological or economic significance on or near the proposed project site and, if possible, map these resources in relation to the location of the proposed project.
- Determine whether any coastal habitats will be altered or affected by sea level rise and/or the proposed project over the proposed life of the project. Such impacts could result from flooding, inundation, shoreline erosion, or changes to surface or groundwater conditions (see discussion below on water quality). At a minimum, use the identified sea level rise scenarios to establish the extent of likely and/or possible changes to coastal habitats.
- If any coastal habitats will be altered by sea level rise and/or the proposed project, map or otherwise identify potential changes to the location of these coastal resources for the identified sea level rise scenarios.
- Identify locations of the proposed project site that can support development without encroachment onto the existing or future locations of these coastal habitats, and without

[45] The State Lands Commission has oversight of all public trust lands and many local governments are trustees of granted tidelands. The State Lands Commission or other appropriate trustee should be contacted if there is any possibility that public trust lands might be involved in the proposed project. As a general guide, public trust lands include tide and submerged lands as well as artificially filled tide and submerged lands.

other impacts to coastal habitats. Overlay with development constraints (fault zones, landslides, steep slopes, property line setbacks, *etc.*) and with other coastal resource constraints.

Natural Landforms: Natural landforms can include coastal caves, rock formations, bluffs, terraces, ridges, and cliffs. Steps to identify natural landforms at risk include:

- Identify all natural landforms on or near the proposed project site and, if possible map these resources in relation to the location of the proposed project.
- Determine whether any natural landforms will be altered or impacted by sea level rise and/or the proposed project for the identified sea level rise scenarios. Such impacts could result from flooding, inundation or shoreline erosion. At a minimum, use the identified sea level rise scenarios to establish the zone of likely and/or possible changes to natural landforms.
- If any natural landforms will be altered by sea level rise and/or the proposed project, map or otherwise identify the likely changes to location of these coastal resources for the identified sea level rise scenarios.
- Identify locations of the proposed project site that can support development without encroachment onto the existing or future locations of these natural landforms and without other impacts to such landforms. Bluffs and cliffs can often require additional analysis for slope stability to determine the setback from the eroded bluff face that can safely support development. Overlay with development constraints (fault zones, landslides, steep slopes, property line setbacks, *etc.*) and with other coastal resource constraints.

Agricultural Resources: Agricultural resources may be affected by sea level rise through changes to surface drainage and the groundwater table. Other changes can result from flooding, inundation or saltwater intrusion. If agricultural lands are protected by levees or dikes, they can be affected by changes to the stability or effectiveness of these structures. Steps to identify risks to agricultural resources include:

- Identify whether the proposed project site is used for or zoned for agricultural uses, contains agricultural soils, or is in the vicinity of or upstream of lands in agricultural use.
- Identify surface water drainage patterns across the site or from the site to the agricultural use site.
- If any drainage patterns are closely linked to and potentially influenced by the elevation of sea level, examine changes in drainage patterns with rising sea level on the proposed site or the agricultural use site.

Water Quality and Groundwater: Sea level rise may cause drainages with a low elevation discharge to have water back-ups. It may also cause a rise in the groundwater table. Both of these changes could alter on-site drainage and limit future drainage options. If the proposed site must support an on-site wastewater treatment system, or if drainage and on-site water retention will be a concern, consider the following, as appropriate:

- Identify surface water drainage patterns across the site.

- Examine changes with rising sea level of any drainage patterns that are closely linked to and likely influenced by the elevation of sea level. At a minimum, use the identified sea level rise scenarios to establish the zone of likely changes to drainage patterns.
- Identify the elevation of the groundwater table. Since groundwater can fluctuate during periods of rain and drought, attempt to identify the groundwater zone.
- Estimate the likely future elevation of the groundwater zone, due to sea level rise. At a minimum, use the identified sea level rise scenarios to establish the zone of likely changes to groundwater.
- Evaluate whether changes in groundwater will alter the proposed site conditions.

Scenic Resources: Visual and scenic resources include views to and along the ocean and scenic coastal areas. Development modifications to minimize risks from sea level rise could have negative consequences for scenic resources, including creating a structure that is out of character with the surrounding area, blocks a scenic view, or alters natural landforms. Steps to identify impacts to scenic resources, including any impacts from possible adaptation measures, include:

- Identify all scenic views to and through the proposed project site from public vantage points such as overlooks, access locations, beaches, trails, the Coastal Trail, public roads, parks, and if possible, map these views and view lines in relation to the location and maximum allowable elevation of the proposed project.
- Identify locations of the proposed project site that can support development and avoid or minimize impacts to scenic views from current and future vantage points. Overlay with development constraints (fault zones, landslides, steep slopes, property line setbacks, *etc.*) and with other coastal resource constraints.

3.2 Synthesize and assess development and resource constraints

After completing the detailed analysis of each coastal resource, the applicant should summarize the potential resource impacts under each sea level rise scenario identified in Step 1. This set of results, when combined with potential impacts to those coastal resources not affected by sea level rise, should give the applicant valuable information about the degree of risk posed to each coastal resource and to the development itself. If practical, for each sea level rise scenario, applicants should produce a constraints map illustrating the location and the extent of resource impacts that could occur over the life of the development. Based on the analysis of resource impacts and potential hazard risks over the life of the development, the applicant should develop an overlay identifying the development and resource constraints.

3.3 Identify areas suitable for development

The final part of this step is to identify the locations of the project site that could support some level of development without impacts to coastal resources and without putting the development at risk.

Expected outcomes from Step 3*: Upon completing this step, the applicant should have detailed information about the types of coastal resources on the project site and the level of risk that sea level rise poses to each resource under each sea level rise scenario, including resource locations and the extent of resource impacts that could occur over the life of the proposed project. This step should also provide an overlay of all development and resource constraints, and clearly identify the locations on the proposed project site that could support some level of development without impacts to coastal resources and without putting the development at risk.*

Step 4 – Identify project alternatives that avoid resource impacts and minimize risks to the project

By this step, applicants should have developed a set of factors based on the sea level rise hazards identified in Step 2, potential resource impacts identified in Step 3, and other site conditions (such as archaeological resources or fault lines) to identify the buildable areas that avoid both risk from coastal hazards and impacts to coastal resources. Hazard and resource avoidance is usually the preferred option, and, in many cases, applicants may find that the site is safe from sea level rise hazards for all the identified sea level rise scenarios and no further identification of project alternatives would be necessary in order to address sea level rise concerns.

For some cases, the site constraints may require consideration of project alternatives that fit with the available buildable area, without the use of protective structures. In these cases, one of the alternatives may be to replace what was initially being considered for the site. In other cases, development that is safe from hazards and is resource protective may be possible if certain adaptation strategies are used to modify the project over time and as the potential hazard areas increase or move closer to the project. For these cases, the possible adaptation measures would be included as part of the proposed project, along with necessary monitoring and triggers for implementing the adaptation options. In still other cases, hazard minimization may be the only feasible option for development on hazard constrained-sites. In all cases, projects must be sited and designed to address all applicable Coastal Act and LCP requirements, including any new requirements within LCPs that have been updated to adapt to sea level rise.

The results from the analysis of sea level rise scenarios should factor into the decisions made in this step. In particular, after looking at the results from Steps 2 and 3 as a whole, applicants can better decide the project changes, types of adaptation strategies, and design alternatives that would be most appropriate given the degree of risk posed by possible sea level rise and how long the development might be free from risk. The applicant also might identify triggers (*e.g.*, a certain amount of sea level rise) when certain adaptation measures should be implemented to reduce risk and/or impacts to coastal resources.

Importantly, land divisions and lot line adjustments in high hazard areas can change hazard exposure and should therefore be undertaken only when they can be shown to not worsen or create new vulnerability. In particular, no new lots or reconfigured lots with new development potential should be created if they cannot be developed without additional shoreline hazard risks.

Strategies to Avoid Resource Impacts and Minimize Risks

The best way to minimize risks to development and coastal resources is to avoid areas that are or will become hazardous as identified by the sea level rise scenarios analysis in the previous steps. Such avoidance often includes changes to the proposed project to bring the size and scale of the proposed development in line with the capacity of the project site. However, if it is not feasible to site or design a structure to completely avoid sea level rise impacts, the applicant may need to modify or relocate the development to prevent risks to the development or to coastal resources. Some changes, such as the use of setbacks, may be necessary at the outset of the project. Other changes, such as managed retreat or added floodproofing, may be useful as adaptive strategies that can be used after the initial project completion. Considerations involved in choosing and designing an appropriate adaptation strategy may include those listed below. See Chapter 7 for more information on specific adaptation measures. For a list of guidebooks, online clearinghouses, and other sea level rise adaptation resources, see Appendix C.

- **Assess Design Constraints:** Determine whether there are any significant site or design constraints that might prevent future implementation of possible sea level rise adaptation measures. Some project locations may be constrained due to lot size, sea level related hazards, steep slopes, fault lines, the presence of wetlands or other ESHA, or other constraints such that no safe development area exists on the parcel. Ideally, such parcels would be identified during the LCP vulnerability analysis, and the land use and zoning designations would appropriately reflect the constraints of the site. However, in some cases development may need to be permitted even if it cannot avoid all potential hazards. As stated above, care should be taken in these cases to avoid resource impacts and minimize risks as much as possible by developing and implementing a sea level rise adaptation plan for the proposed development. In creating this plan, it is important to identify any design constraints that will limit the ability to implement adaptation strategies in the future, as described below.

- **Identify Adaptation Options:** Identify possible adaptation strategies (such as those found in Chapter 7) for the proposed project, and evaluate each adaptation option for efficacy in protecting the development. Also, evaluate the consequences from each proposed adaptation measure to ensure it will not have adverse impacts on coastal and sensitive environmental resources, including visual impacts and public access.

  For example, an option that is often considered for sea level rise is to elevate the development or the structures that are providing flood protection. However, elevated structures will change the scenic quality and visual character of the area. Also, elevation of the main development may be of little long-term utility to the property owner if the supporting infrastructure, such as the driveways, roads, utilities or septic systems are not also elevated or otherwise protected. Elevation of existing levees or dikes can provide flood protection for an area of land and all the development therein. However, the foundation of the levee or dike must have been designed to support the additional height or else it may have to be expanded and the increased footprint of the foundation could have impacts on intertidal area, wetlands, or other natural resources. Thus, the long-term options for adaptation should be considered as part of any permit action, to ensure that current development decisions are not predetermining resource impacts in the future.

- **Ensure Sea Level Rise Design Flexibility:** If the likelihood of impacts is expected to increase with rising sea level, it may be necessary to design the initial project for some amount of sea level rise but to also include design flexibility that will allow future project changes or modifications to prevent impacts if the amount of sea level rise is more than anticipated in the initial design. Changes and modifications could include the use of foundation elements that will allow for building relocations or removal of portions of a building as it is threatened or reserving space to move on-site waste treatment systems away from eroding areas or areas that will be susceptible to a rising water table or increased flooding.

- **Develop Project Modifications**: Highly constrained sites may not be able to support the amount of development that an applicant initially plans for the site. Even a small building footprint may be at risk from flooding or erosion under high sea level rise scenarios. In such cases, it will be important to work closely with the appropriate planning staff to develop a project option that can minimize hazards from the identified sea level rise scenarios for as long as possible, and then incrementally retreat once certain triggers are met. Some examples of triggers could be that erosion is within some distance of the foundation, or monthly high tides are within some distance of the finished floor elevation. The time period for relocation or removing the structure would be determined by changing site conditions but relocation would most likely occur prior to the time period used in Step 1 to determine long-term site constraints.

- **Plan for Monitoring:** Develop a monitoring program or links to other monitoring efforts to ensure that the proposed adaptation measures will be implemented in a timely manner. Following a monitoring protocol and requirements for evaluating sea level rise impacts to coastal habitats over time can help to identify the triggers that would lead to revising project life, other project modifications or additional adaptation efforts.

Expected outcomes from Step 4*: This step may involve an iterative process of project modifications and reexamination of impacts, leading to one or more alternatives for the project site. The alternative that will minimize risks from coastal hazards and avoid or minimize impacts to coastal resources should be identified. Possible adaptation options could be identified and analyzed, if appropriate. If the site is very constrained, modifications to the expected project life might be suggested.*

Step 5 – Finalize project design and submit CDP application

After Step 4, the applicant should have developed one or more project alternatives and identified a preferred alternative. The alternatives should include adaptation strategies to minimize impacts if hazards cannot be avoided entirely. The CDP application step involves the following:

1. **Work with the planning staff to complete the CDP application**. Depending upon the proposed project and extent of prior interactions with the planning staff, the initial submittal may be the first time the planner has been provided with information about the general project or the preferred alternative. Once a proposed project is submitted, the coastal planner will need to become familiar with the project location, area around the project site, the proposed actions and the studies and analyses that have been undertaken in support of the application. The planner will review the application for completeness to ensure that there is sufficient information to analyze the project for all appropriate LCP or Coastal Act Chapter 3 policies. If analysis for sea level rise concerns is needed, the planner will also check that analyses for sea level rise risks have been included in the submittal. Much of the information developed in Steps 1-4 will be useful for the application process. The Suggested Filing Checklist for CDP Applications (located at the end of this chapter) covers the typical information that might be included in a CDP application necessary for planning review of the sea level rise aspects of the proposed project. Applicants who are unfamiliar with the permit process should consult the local government website, Coastal Commission website, or contact the appropriate district office for instructions on how to complete a CDP application.

   The review of an application might involve an iterative process, wherein planning staff requests more information about the proposed project, project alternatives, analysis of the hazards or identification of potential resource impacts to help in the review for compliance with the LCP or the Coastal Act. At the same time, planning staff may request that some of the technical staff review the submitted material to ensure that there is sufficient information in all technical information and analyses to support a decision on the proposed project. This process may be repeated until the application provides the studies, analysis and project review necessary for planning review.

2. **Submit a complete CDP application.** Once a complete application has been accepted, the planning staff will do a more thorough review and analysis of the potential hazards and resource impacts associated with the proposed project. Ideally, the planner will have requested all necessary project information at the filing stage. In some instances, additional information may be needed after the application has been accepted. This is normally limited to clarifications of some of the information or further details about some of the possible, but not preferred alternatives. During this stage in the CDP application process, the planner may identify necessary project modifications that were not part of the initial application, or identify various conditions that will be needed if the project is to be approved. Chapter 7 includes many of the possible project modifications and permit conditions that might be used to address sea level rise concerns and potential resource impacts.

   During the project analysis, the planning staff will review all submitted material, discussing the proposed project with other staff members, and obtaining further technical

review. Working with their supervisors and managers, they will also develop a staff recommendation and prepare a staff report that supports the proposed recommendation. Please consult the Coastal Commission website (http://www.coastal.ca.gov/cdp/cdp-forms.html) or contact your district office for instructions on how to complete a CDP application.

3. **Permit action.** Once the proposed project has been through planning review and a staff recommendation has been prepared, the proposed project will be brought to hearing before either the local planning commission or the California Coastal Commission. The outcome of the hearing process will be project approval, approval with conditions, or denial. Based on the regulatory decision, the project may be constructed, or additional modifications and condition requirements may have to be met.
4. **Monitor and revise.** CDP approvals may include conditions that require monitoring. Applicants should monitor the physical impacts of sea level rise on the project site, provide reports and updates to planning staff and introduce adaptive changes to the project in accordance with the permit and permit conditions.

Expected outcomes from Step 5*: This step, combined with supporting documentation from the previous steps, should provide a basis for evaluating the proposed project's hazard risks and impacts that can result from sea level rise. Such an analysis will provide one of the bases for project evaluation and complements the other resource evaluations and analyses that are part of a complete CDP application.*

Planning Process for Coastal Development Permits

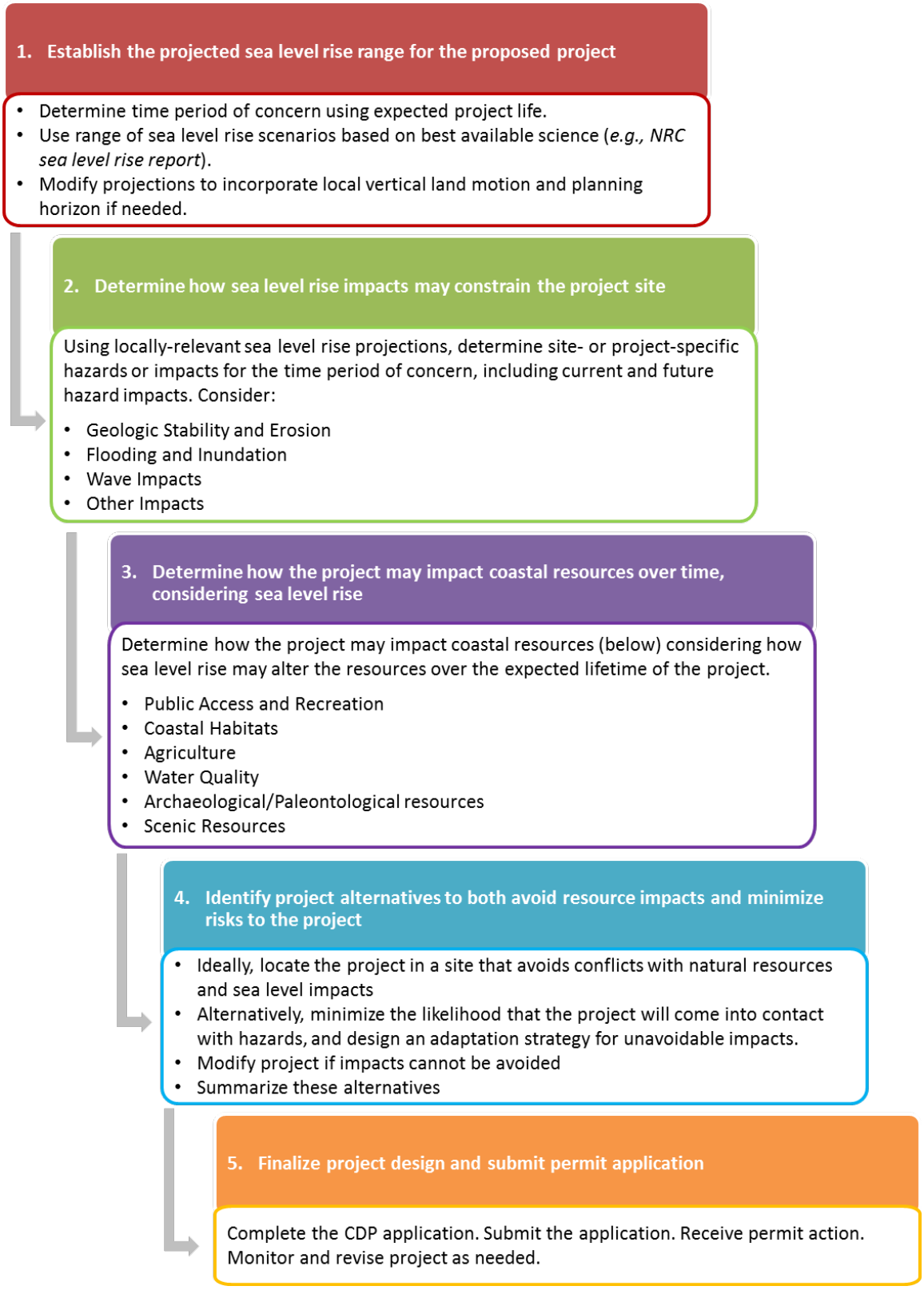

Figure 14. Flowchart for steps to address sea level rise in Coastal Development Permits

Suggested Filing Checklist for Sea Level Rise Analysis

- Proposed/Expected Project Life
- Sea Level Rise Projections used in Impacts Analyses
- Impacts Analyses (possibly from Vulnerability Assessment)
    - Structural and Geologic Stability
        - Identify current tidal datum
        - Perform Geotechnical Report and Erosion Analysis
        - Identify blufftop setback and safe building area
        - Show setback, safe building area and proposed project footprint (site maps)
    - Erosion Amount over Expected Project Life
        - Perform Coastal Processes Study and Erosion Analysis
        - Quantify total erosion amount for proposed project site
        - Show retreat along with proposed project footprint (site maps)
    - Flooding and Inundation Risks
        - Perform Coastal Processes Study and Wave Runup Analysis
        - Quantify flood elevation and flooding extent
        - Show flood extent with proposed project footprint (site map)
        - Show flood elevation on site profile, with proposed project elevation
        - Provide Flood Certificate if in FEMA designated 100-year Flood Zone
    - Tipping points for sea level rise impacts, specific to proposed project site
- Impacts to coastal resources (possibly from Environmental Assessment) for current conditions and changes due to sea level rise and related impacts
    - Public Access and Recreation
        - Show access resources and future changes (site maps)
    - Water Quality, surface and groundwater
        - Provide surface drainage patterns and runoff and future changes (site maps)
        - Provide zone of groundwater elevation
    - Coastal Habitats
        - Provide wetland delineation, ESHA determination, if appropriate
        - Provide boundary determinations or State Lands review, if appropriate
        - Show all coastal habitats and future changes (site maps)
    - Agricultural Resources
        - Show agricultural resources and future changes (site maps)
    - Natural Landforms
        - Show all natural landforms and future changes (site maps)
    - Scenic Resources
        - Show views from public access and future changes due to access changes
    - Overlay all coastal resources to establish areas suitable for development (site maps)
- Analysis of Proposed Project and Alternatives
    - Provide amount(s) of sea level rise used in project planning and design
    - Provide analysis of the proposed project and alternatives
    - Identify proposed current and future adaptation strategies
    - Show avoidance efforts (site map)
    - Identify hazard minimization efforts that avoid resource impacts (site maps)

Example for Addressing Sea Level Rise in Coastal Development Permits

To illustrate the process described in this chapter for how to address sea level rise in the CDP process, consider three example projects: a wetland restoration project, a new bluff-top residential development with a fronting beach, and a new wastewater treatment facility. These three examples will follow each of the recommended CDP steps, showing how the guidance could be applied in specific situations. Note that these are simplified examples used to demonstrate the process described in this chapter. Decisions about how to address various challenges presented by sea level rise will be more complex than those illustrated below, and the Coastal Commission encourages applicants to coordinate with staff as necessary and feasible throughout the process.

Step 1: Establish the projected sea level rise range for the proposed project

- *Wetland Restoration Project:* Sea level rise projection ranges should be chosen based on the goals of the project. For example, if wetland restoration efforts are intended as mitigation for a development project, the lifetime for the wetland restoration should be, at a minimum, the lifetime of the development project. For wetland restoration projects in which the desired outcome is the protection of the wetland in perpetuity, sea level rise ranges should be projected over a minimum of 100 years, with consideration of the intervening years as well as the even longer term for ongoing adaptive management.
- *Bluff-top Residential Development:* The lifetime of the project is assumed to be at least 75 years, unless the LCP specifies a different time period. High, low, and intermediate sea level rise projection ranges are established, appropriate for the proposed area over the assumed 75-year project life.
- *Wastewater Treatment Facility:* Wastewater treatment facilities are normally critical infrastructure. For this example, a minimum life of 100 years is assumed, unless the LCP specifies a different time period. High, low, and intermediate sea level rise projections ranges are established, appropriate for the proposed area over the assumed 100-year or longer project life.

Step 2: Determine how impacts from sea level rise may constrain the project site

- *Wetland Restoration Project:* Current topography of the wetland area is mapped, current barriers to inland migration are identified, and an analysis of erosion and flooding potential (and subsequent effects to wetland extent) is performed for various sea level rise scenarios. Potential changes to groundwater are evaluated. Potential changes in sediment flows or other physical properties as a result of changing conditions are examined. It is determined that in this case, open space exists behind the wetland to allow for inland migration over time.
- *Bluff-top Residential Development:* The average long-term beach and bluff retreat rate, erosion rate due to various sea level rise scenarios, and erosion potential from 100-year storms and other extreme events are determined. Beach and bluff erosion will vary with sea level rise rates. The geologic stability of the bluff over the life of the development is analyzed assuming that no protective structure (such as a seawall) either exists or will be built.

- *Wastewater Treatment Facility:* Erosion and flooding potential over the lifetime of the facility under both a low and a worst-case scenario sea level rise projection are analyzed, as are current and future wave runup and storm impacts for 100-year storms. The geologic stability of the site over the life of the facility is analyzed assuming that no protective structure either exists or will be built. Potential damage to infrastructure (for example corrosion due to saltwater intrusion) is examined.

Step 3: Determine how the project may impact coastal resources, considering the influence of sea level rise upon the landscape over time

- *Wetland Restoration Project:* Coastal resources present in the proposed project site are mapped and sea level rise impacts to these resources are analyzed over the lifetime of the project. It is unlikely that the project will have any adverse impacts on coastal resources. Barriers to wetland migration are examined and it is determined in this case that enough open space currently exists to allow for the wetland to migrate inland over time. The few barriers that exist can be modified in the future, if necessary. This will allow for continued maintenance of habitat area and ecosystem services.
- *Bluff-top Residential Development:* Maps are developed that identify scenic viewsheds, the bluff extent, and adjacent coastal habitats including the fronting beach, and descriptions of each are provided. Opportunities for public access are identified. Impacts to each of these resources as a result of sea level rise are analyzed, as are impacts that would result from the development project. It is determined that the development has the potential to result in the loss of a fronting beach if a protective structure is installed. However, development setbacks are designed to ensure that no such structure is planned over the lifetime of the development under any sea level rise scenario.
- *Wastewater Treatment Facility:* Maps are developed that identify coastal resources in the area and impacts to these resources resulting from sea level rise are analyzed. As with the bluff-top development, any protective structure would have detrimental effects to the fronting beach, but no such structure is determined to be necessary. Any potential impacts to adjacent habitat areas or to water quality as a result of damage to infrastructure (for example sewage outflow or backup of seawater into the system) are examined under the range of sea level rise projections for the life of the facility.

Step 4: Identify project design alternatives that avoid resource impacts and minimize risks to the project

- *Wetland Restoration Project:* In this example, there are no concerns related to detrimental impacts to coastal resources as a result of this project. Natural barriers will be removed through grading and contouring of the land to ensure that the wetland has the ability to migrate inland with sea level rise and that hydrologic function will be maintained. Inland areas are protected into the future to ensure the space will be open for migration. Additionally, a plan is included to monitor changes in sea level, sediment dynamics, and overall health of the wetland so that adaptive management options can be applied as needed.

- *Bluff-top Residential Development:* The optimal site for a bluff-top residential development is one that avoids the hazards identified in Step 2 and impacts to coastal resources identified in Step 3 over the life-time of the project. If the proposed site does not avoid risks, alternative locations on the project sites should be identified and examined. If no such location exists, efforts should be made to minimize hazards and impacts to resources, or the project should be denied. Minimization efforts may include: building with an extra setback from the bluff-face, developing a managed retreat plan, and designing buildings to be easily relocated. If the safe building envelope will not be sufficient for a reasonable-sized building, local governments could consider allowing reduced setbacks on portions of the site located away from the bluff face (*e.g.*, side or front yard setbacks), reduced off-street parking, additional height on safe portions of the site, or other development that doesn't require shore protection. No seawall is planned as such a device would result in the loss of the fronting beach. A plan to monitor rates of erosion at various places along the bluff as well as any impacts to adjacent resources is developed, and erosion rates/scenarios that would trigger the need for retreat are identified.
- *Wastewater Treatment Facility:* The optimal site for a wastewater treatment facility is one that avoids the hazards identified in Step 2 and impacts to coastal resources identified in Step 3 over the life-time of the project. If the proposed site does not avoid risks, alternative sites should be identified and examined. If no such site exists, efforts should be made to minimize hazards and impacts to resources. Minimization efforts may include: building the facility further back from the beach, elevating outflow pipes, and adding one-way valves to prevent backflow of sea-water into the system. A plan to monitor erosion rates along the beach as well as wave and storm impacts and any impacts to coastal resources caused by the facility is developed.

Step 5: Finalize project design and submit CDP application

- *Wetland Restoration Project:* The best site and design option is chosen and presented to the Commission or local government for the permit process. Application includes likely options for adaptive management to maintain wetlands and key monitoring needed to examine ongoing wetland function.
- *Bluff-top Residential Development:* The best site and design option is chosen and presented to the Commission or local government for the permit process. Application includes analyses of hazard and resource risks and any plans for adaptive project designs and proposed monitoring.
- *Wastewater Treatment Facility:* The best site and design option is chosen and presented to the Commission or local government for the permit process. Application includes analyses of hazards and resource risk and plans for site monitoring.

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Chapter 7

Adaptation Strategies

Chapters 5 and 6 provide guidance on the sequential processes for addressing sea level rise in Local Coastal Programs (LCPs) and Coastal Development Permits (CDPs). This chapter describes some of the specific adaptation strategies to consider in these planning and development review processes. Given the range of impacts that could occur as a result of sea level rise, and the uncertainties surrounding projections of sea level rise over the lifetimes of many coastal projects, communities, planners, coastal managers and project applicants will need to use adaptation strategies to effectively address coastal hazard risks, and protect coastal resources over time.

As described in Chapters 5 and 6, adaptation strategies should be chosen based on the specific risks and vulnerabilities of a region or project site and the applicable Coastal Act and LCP requirements, with due consideration of local priorities and goals. Adaptation strategies may involve modifications to land use plans, regulatory changes, project modifications, or permit conditions that focus on avoidance or minimization of risks and the protection of coastal resources.

Some adaptation strategies may require land use plans or proposed projects to anticipate longer-run impacts now, such as assuring that critical infrastructure is built to last a long time without being put in danger, or rezoning hazardous areas as open space. Other adaptation strategies may build adaptive capacity into the plan or project itself, so that future changes in hazard risks can be effectively addressed while ensuring long-term resource protection. In most cases, especially for LCP land use and implementation plans, multiple adaptation strategies will need to be employed. For projects, adaptation strategies may be addressed through initial siting and design and through conditions that provide for specific adaptation over time.

The next sections provide an overview of the general categories of adaptation options, followed by a description of various specific adaptation strategies organized by type of coastal resource, as outlined in Chapter 3 of the California Coastal Act.

The adaptation options described in this chapter are intended to provide guidance for potential LCP and permitting strategies. Not all strategies listed here will be appropriate for every jurisdiction, nor is this an exhaustive list of options. However, as described in Chapters 5 and 6, all local governments and all project applicants should analyze the possible effects of sea level rise and evaluate how the strategies in this chapter, or additional supplemental strategies, could be implemented in LCPs or CDPs to minimize the adverse effects of sea level rise.

GENERAL ADAPTATION CATEGORIES

There are a number of options for how to address the risks and impacts associated with sea level rise. Choosing to “do nothing” or following a policy of “non-intervention” may be considered an adaptive response, but in most cases, the strategies for addressing sea level rise hazards will require proactive planning to ensure protection of coastal resources and development. Such proactive adaptation strategies generally fall into three main categories: protect, accommodate, and retreat.

For purposes of implementing the Coastal Act, no single category or even specific strategy should be considered the “best” option as a rule. Different types of strategies will be appropriate in different locations and for different hazard management and resource protection goals. The effectiveness of different adaptation strategies will vary across both spatial and temporal scales. In many cases, a hybrid approach that uses strategies from multiple categories will be necessary,

and the suite of strategies chosen may need to change over time. As discussed later in the document, the legal context of various options will also need to be considered in each situation and ultimately, adaptive responses will need to be consistent with the Coastal Act. Nonetheless, it is useful to think about the general categories of adaptation strategies to help frame the consideration of land use planning and regulatory options in specific communities and places along the coast.

Protect: Protection strategies refer to those strategies that employ some sort of engineered structure or other measure to defend development (or other resources) in its current location without changes to the development itself. Protection strategies can be further divided into "hard" and "soft" defensive measures or armoring. "Hard" armoring refers to engineered structures such as seawalls, revetments, and bulkheads that defend against coastal hazards like wave impacts, erosion, and flooding. Such armoring is a fairly common response to coastal hazards, but it can result in serious negative impacts to coastal resources, particularly as sea level rises. Most significantly, hard structures form barriers that impede the ability of natural beaches and habitats to migrate inland over time. If they are unable to move inland, public recreational beaches, wetlands, and other habitats will be lost as sea level continues to rise. This process is commonly referred to as "passive erosion," which is the narrowing of beaches due to the fact that the back of the beach on an eroding shoreline has been fixed in place (Flick *et al*. 2012). Other detrimental impacts may include negative visual impacts or interference with other ecosystem services.

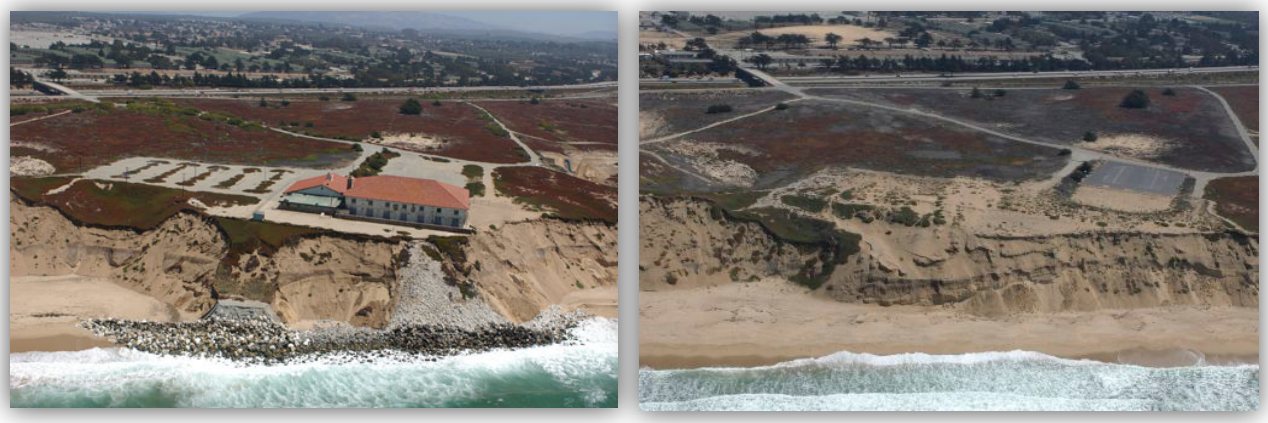

Figure 15. Photo depicting passive erosion. (*Left*) Passive erosion in front of a revetment at Fort Ord, illustrating the loss of beach where the development prevents the shoreline from migrating landward. The beach continues to migrate inland on either side of the revetment. (*Right*) Recovery of the beach following removal of the revetment and blufftop structure. (*Source: California Coastal Records Project*).

"Soft" armoring refers to the use of natural or "green" infrastructure like beaches, dune systems, wetlands, and other systems to buffer coastal areas. Strategies like beach nourishment, dune management, or the construction of "living shorelines" capitalize on the natural ability of these systems to protect coastlines from coastal hazards while also providing benefits such as habitat, recreation area, more pleasing visual impacts, and the continuation or enhancement of ecosystem services. The engineering of green infrastructure is a somewhat newer concept in some cases, and because of this, the effectiveness of different strategies in different types of environments is not necessarily well-known or tested. In cases in which natural infrastructure might not be

completely effective or may not be preferred, a hybrid approach using both hard and natural infrastructure could be considered. As described in Principle 10 of this Guidance and in the *Safeguarding California* plan (CNRA 2014), priority should be given to options that protect, enhance, and maximize coastal resources and access, including giving full consideration to innovative nature-based approaches such as living shoreline techniques or managed/planned retreat. Although the Coastal Act clearly provides for potential protection strategies for "existing development", it also directs that new development be sited and designed to not require future protection that may alter a natural shoreline.

Accommodate: Accommodation strategies refer to those strategies that employ methods that modify existing developments or design new developments to decrease hazard risks and thus increase the resiliency of development to the impacts of sea level rise. On an individual project scale, these accommodation strategies include actions such as elevating structures, retrofits and/or the use of materials meant to increase the strength of development, building structures that can easily be moved and relocated, or using extra setbacks. On a community-scale, accommodation strategies include any of the land use designations, zoning ordinances, or other measures that require the above types of actions, as well as strategies such as clustering development in less vulnerable areas or requiring mitigation actions to provide for protection of natural areas even as development is protected. As with protection strategies, some accommodation strategies could result in negative impacts to coastal resources. Elevated structures may block coastal views or detract from community character; pile-supported structures may, through erosion, develop into a form of shore protection that interferes with coastal processes, blocks access, and, at the extreme, results in structures looming over or directly on top of the beach.



Figure 16. Photo depicting "managed retreat" and restoration. Surfers' Point Managed Shoreline Retreat project in which the parking lot was moved back and beach area was restored. (*Aerial composite by Rick Wilborne (February 28, 2013); photo courtesy of Surfrider Foundation*)

Retreat: Retreat strategies are those strategies that relocate or remove existing development out of hazard areas and limit the construction of new development in vulnerable areas. These strategies include land use designations and zoning ordinances that encourage building in more resilient areas or gradually removing and relocating existing development. Acquisition and buy-out programs, transfer of development rights programs, and removal of structures where the right to protection was waived (*i.e.*, via permit condition) are examples of strategies designed to encourage managed retreat.

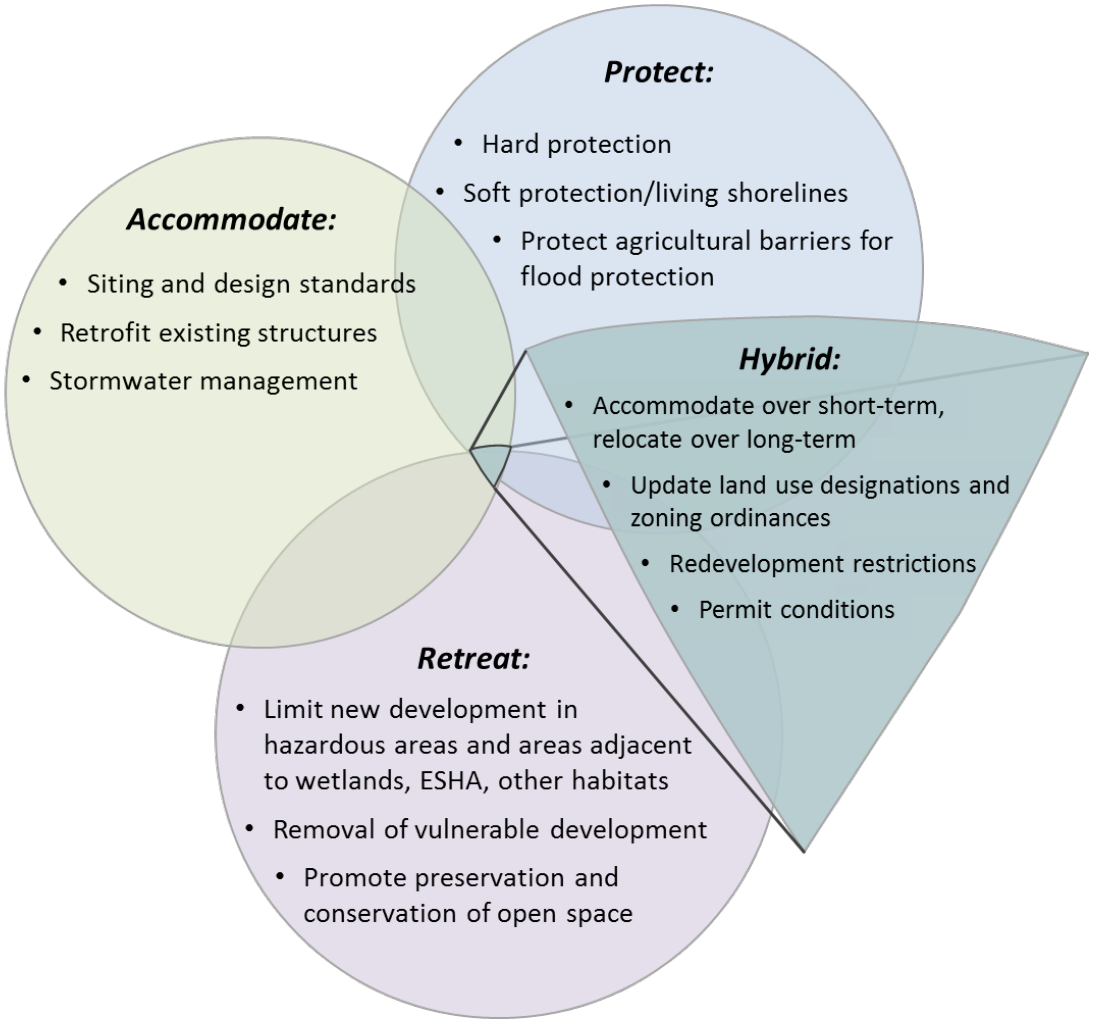

Figure 17. Examples of general adaptation strategies

SPECIFIC ADAPTATION STRATEGIES

The following sections, organized by category of coastal resource, present measures that local governments and coastal planners should consider including in their LCPs or individual CDPs. The purpose of this organization is to allow coastal managers and project applicants to easily find strategies that will help address the specific resource vulnerabilities identified in Steps 1-3 of the LCP and CDP processes laid out in Chapters 5 and 6. In the development of LCP policies, local governments should use adaptation measures that best implement the statewide resource protection and hazard policies of the Coastal Act at the local level given the diverse geography and conditions of different areas.

As part of identifying adaptation strategies, local governments should carefully examine the potential impacts to coastal resources that could occur from various adaptation strategies. Some adaptation strategies will need to be implemented incrementally over time as conditions change, and many strategies will need to be implemented through both the LCP and CDP to be effective. For each issue area, there is a description of potential impacts that could occur due to sea level rise and a list of adaptation tools or actions to minimize impacts. To skip to a topic, click on the links below.

A. Coastal Development and Hazards
B. Public Access and Recreation
C. Coastal Habitats, ESHA, and Wetlands
D. Agricultural Resources
E. Water Quality and Supply
F. Archaeological and Paleontological Resources
G. Scenic and Visual Resources

The lists in these sections should be considered neither checklists from which all options need to be used, nor exhaustive lists of all possible adaptation strategies. Sea level rise adaptation is an evolving field, and policy language, cost considerations, effectiveness of various strategies, and other topics are continuing to be developed. Planners, applicants, and partners will need to think creatively and adaptively respond to changing conditions, new science, and new adaptation opportunities, and the Coastal Commission will continue to support and collaborate on these efforts.

Additionally, sea level rise planning may involve a number of trade-offs among various competing interests, and no single adaptation strategy will be able to accomplish all planning objectives. Economic and social implications of various adaptation options will likely play into the planning process at the local level. The important point is to analyze current and future risks from sea level rise, determine local priorities and goals for protection of coastal resources and development in light of Coastal Act requirements, and identify what land use designations, zoning ordinances, and other adaptation strategies can be used to meet those goals.

A. Coastal Development and Hazards

The Coastal Act requires that new development be sited and designed to be safe from hazards and to not adversely impact coastal resources (Coastal Act Sections 30235 and 30253). The main goals that relate to hazards and coastal development are:

- Update land use designations, zoning maps, and ordinances to account for changing hazard zones
- Include sea level rise in hazard analyses and policies
- Plan and locate new development to be safe from hazards, not require protection over its entire lifespan, and be protective of coastal resources
- Incorporate sea level rise adaptation into redevelopment policies
- Encourage the removal of development that is threatened by sea level rise
- Use "soft" or "natural" solutions as a preferred alternative for protection of existing endangered structures
- Limit bluff and shoreline protective devices to protect existing endangered structures
- Require special considerations for critical infrastructure and facilities
- Protect transportation infrastructure

Chapter 3 of the Guidance covers the impacts to coastal development that might result from sea level rise. Certified LCPs should already have policies and standards to assure that coastal development is safe over its anticipated lifetime and that it does not adversely impact other coastal resources. However, LCP policies and standards may need to be updated in light of new knowledge and to consider sea level rise hazards. Adaptation options have been developed to support the development goals of the Coastal Act through both LCP policies and CDP conditions, and the following strategies cover a range of options for addressing the identified goals of the Coastal Act.

Goal: Update land use designations, zoning maps, and ordinances to account for changing hazard zones

A.1 **Establish mapped hazard zones or overlays:** Update land uses and zoning requirements to minimize risks from sea level rise in identified hazard zones or overlay areas. For example, limit new development in current and future sea level hazard zones and encourage removal of existing development when threatened.

A.1a **Identify zones that require a more rigorous sea level rise hazards analysis**: Specify areas where a closer analysis of sea level rise is necessary at the permit application stage to avoid or minimize coastal hazards and impacts to coastal

resources. Ensure that the most up-to-date information on sea level rise is incorporated in such analyses.

Goal: Include sea level rise in hazard analyses and policies

A.2 **Update policies to require sea level rise to be included in hazard analyses and management plans**: LCP policies should include requirements to analyze projected sea level rise. Consider specific projection scenarios to be analyzed. (See Chapter 3 of the Guidance for a description of scenario planning.) LCPs could also specify which analyses are required for various types of projects/development (see Step 2 of Chapters 5 and 6 or Appendix B for suggested analyses).

A.2a **Site-specific evaluation of sea level rise**: Update policies, ordinances, and permit application requirements to include a required site-specific evaluation of coastal hazards due to sea level rise over the full projected life of any proposed development. Analyses should be conducted by a certified Civil Engineer or Engineering Geologist with expertise in coastal processes.

A.2b **Incorporate wave runup zones and sea level rise in coastal flood hazard maps:** Develop coastal flood maps that include areas that will be subject to wave action and flooding due to sea level rise. These maps may be able to rely upon existing flood maps, such as the FEMA Flood Insurance Rate Maps, for current flood areas and base conditions, but should be augmented to include future conditions, including sea level rise, likely to occur through the life of proposed new development.

A.2c **Incorporate sea level rise into calculations of the Geologic Setback Line**: Update geotechnical report requirements for establishing the Geologic Setback Line (bluff setback) to include consideration of bluff retreat due to sea level rise in addition to historic bluff retreat data, future increase in storm or El Niño events, and any known site-specific conditions. The report should be completed by a licensed Geotechnical Engineer or an Engineering Geologist.

A.2d **Include sea level rise in wave runup, storm surge, and tsunami hazard assessments**[46]: Sea level rise should be included in wave runup analyses, including storm event and tsunami hazard assessments. This should include evaluating tsunami loads/currents on maritime facilities and coastal structures. Since tsunami wave runup can be quite large, sea level rise projections of only a few inches may not have a large impact on these assessments. However, for time periods or scenarios where sea level rise projections are large (perhaps 1 ft or more), it would be appropriate to include sea level rise because it could change the results to a significant degree.

[46] Tsunami evacuation maps are based upon current sea level conditions and they will need to be updated with changes in sea level.

A.3 Establish shoreline management plans to address long-term shoreline change due to sea level rise: Create policies that require a management plan for priority areas that are subject to sea level rise hazards, and incorporate the plan into the larger LCP if applicable. Similar to an LCP, shoreline management plans generally include the short and long term goals for the specified area, the management actions and policies necessary for reaching those goals, and any necessary monitoring to ensure effectiveness and success. Incorporate strategies necessary to manage and adapt to changes in wave, flooding, and erosion hazards due to sea level rise.

Goal: Plan and locate new development to be safe from hazards, not require protection over its entire lifespan, and be protective of coastal resources

A.4 Limit new development in hazardous areas: Restrict or limit construction of new development in zones or overlay areas that have been identified or designated as hazardous areas to avoid or minimize impacts to coastal resources and property from sea level rise impacts.

A.5 Cluster development away from hazard areas: Concentrate development away from hazardous areas. Update any existing policies that cluster development to reflect additional hazard zones due to sea level rise.

A.5a **Concentration of development/smart growth**: Require development to concentrate in areas that can accommodate it without significant adverse effects on coastal resources. This strategy is applicable for community wide planning through an LCP, but may also apply to CDPs for subdivisions or for larger developments involving large or multiple lots.

A.5b **Transfer of Development Rights programs (TDR)**: Restrict development in one area ("sending area") and allow for the transfer of development rights to another area more appropriate for intense use ("receiving area"). LCPs can establish policies to implement a TDR program to restrict development in areas vulnerable to sea level rise and allow for transfer of development rights to parcels with less vulnerability to hazards. A TDR program can encourage the relocation of development away from at-risk locations, and may be used in combination with a buy-out program.

A.6 Develop adequate setbacks for new development: Ensure structures are set back far enough inland from the beach or bluff edge such that they will not be endangered by erosion (including sea level rise induced erosion) over the life of the structure, *without the use of a shoreline protective device*. When used to address future risk, setbacks are normally defined by a measurable distance from an identifiable location such as a bluff edge, line of vegetation, dune crest, or roadway. Establish general guidance and criteria for setbacks in LCPs that consider changes in retreat due to sea level rise. Require detailed, site-specific analyses through LCPs and CDPs to determine the size of the setback, taking into consideration sea level rise and establish the expected life of the

structure (for example, the time period over which the setback should be effective).



Figure 18. Photo depicting a development setback in Pismo Beach. (*Source:* California Coastal Records Project)

A.7 **Limit subdivisions in areas vulnerable to sea level rise**: Prohibit any new land divisions, including subdivisions, lot splits, lot line adjustments, and/or certificates of compliance that create new beachfront or blufftop lots unless the lots can meet specific criteria that ensure that when the lots are developed, the development will not be exposed to hazards or pose any risks to protection of coastal resources.

A.8 **Update development siting, code, and design standards to avoid, minimize, or reduce risks from coastal hazards and extreme events**: Establish and implement building codes and standards for building siting and construction that avoid or minimize risks from flooding and erosion and increase resilience to extreme events within sea level rise hazard zones. Such standards and applicable building code provisions should be included in LCPs as additional development controls in areas that are identified in the LCP as hazard areas, and applied in specific projects through a CDP.

A.8a **Update flood protection measures to incorporate both FEMA and Coastal Act requirements:** Require new development located in areas subject to current or future flood/wave action to be sited and designed to be capable of withstanding such impacts in compliance with both FEMA and Coastal Act requirements. For example, ensure that implementation of adaptation measures such as elevation of habitable areas, break-away walls, *etc*. will be consistent with both LCP and FEMA provisions.

A.8b **Limit basements and first floor habitable space**: Where applicable, in areas likely to be subject to current or future flood/wave action, revise residential building standards to prohibit habitable space at elevations subject to wave/flood risk. Specifically address potential impacts of basements on long-range adaptation options such as landward relocation or removal.

A.8c **Evaluate impacts from flood protection measures:** Require new development that must be located in areas likely subject to current or future flood/wave action or elevated groundwater to evaluate potential impacts to adjacent or nearby properties from all proposed structural flood protection measures to ensure that these measures will not create adverse direct and/or cumulative impacts either on-site or off-site.

A.9 Analyze options for removal when planning and designing new development: Design options should not place an undue burden on future property owners or coastal resources. For new development in high hazard areas or resource-constrained areas where managed retreat might be an appropriate option at some time in the future, ensure that foundation designs or other aspects of the development will not preclude future incremental relocation or managed retreat. Foundation and building elements, such as deepened perimeter foundations, caissons or basements, may be difficult to remove in the future, or their removal may put adjacent properties at risk. Alternative design options should be considered, and employed if site conditions allow.

A.9a **Develop a plan to remove or relocate structures that become threatened:** Require new development authorized through a CDP that is subject to wave action, erosion, or other hazards to be removed or relocated if it becomes threatened in the future.

A.9b **Identify triggers for incremental removal of structures on constrained lots**: When a lot is not large enough to accommodate development that avoids coastal hazards for the expected life of the development, develop a project option that minimizes hazards from the identified sea level rise scenarios for as long as possible, and then requires incremental retreat once certain triggers are met.

Triggers for relocation or removal of the structure would be determined by changing site conditions such as when erosion is within a certain distance of the foundation; when monthly high tides are within a certain distance of the finished floor elevation; when building officials prohibit occupancy; or when the wetland buffer area decreases to a certain width.

A.9c **Avoid shoreline protection for new development:** Require CDPs for new development in hazardous locations to include as a condition of approval a waiver of rights to future shoreline protection that would substantially alter natural landforms or cause other adverse coastal resource impacts.

A.9d **Limit the use of foundations or basements that can interfere with coastal processes:** In locations where foundation or building elements, such as deepened perimeter foundations, caissons or basements may be exposed to wave action through rising sea level or erosion, require analysis of less extensive foundation or building options.

A.9e **Develop triggers for foundation and structure removal:** If no less damaging foundation alternatives are possible, ensure that the foundation design allows for incremental removal as the foundation elements become exposed, and develop pre-established triggers, for example when the bluff edge or shoreline comes within a certain distance of the foundation, for incremental or complete removal that will avoid future resource impacts.



Figure 19. Photo depicting eroding bluff and exposed caissons in Encinitas, CA. (*Photograph by Lesley Ewing*)

A.10 Ensure that current and future risks are assumed by the property owner: New development should be undertaken in such a way that the consequences from development in high hazard areas will not be passed on to public or coastal resources. Recognize that over time, sea level rise will cause the public trust boundary to move inland. Establish standards, permit conditions, and deed restrictions that ensure that current and future risks are assumed by the property owner. Consider policies that would encourage or require property owners to set aside money, such as in the form of a bond, as a contingency if it becomes necessary to modify, relocate, or remove development that becomes threatened in the future.

A.11 Real estate disclosure: Require sellers of real estate to disclose permit conditions related to coastal hazards, or property defects or vulnerabilities, including information about known current and potential future vulnerabilities to sea level rise, to prospective buyers prior to closing escrow.

Goal: Incorporate sea level rise adaptation into redevelopment policies

A.12 Avoid the expansion or perpetuation of existing structures in at-risk locations: On an eroding shoreline, the seaward portions of an existing structure may become threatened as the setback or buffer zone between the structure and the mean high tide line or bluff edge is reduced due to erosion of the beach or bluff. When the seaward portion of the structure no longer meets the standards or setback that would be required for new development, it becomes a "non-conforming" structure for purposes of redevelopment policies and regulations. The following should be considered, as consistent with the Coastal Act, FEMA policies, and other relevant standards, to address existing non-conforming development to avoid the need for shoreline or bluff protective devices and associated impacts to coastal resources.

A.12a **Update non-conforming structure policies and definitions**: Develop policies and regulations to define non-conforming development in the area between the sea and the first coastal roadway or other known hazard zones to avoid perpetuating development that may become at risk and require a new protective device or extend the need for an existing protective device.

A.12b **Limit redevelopment or upgrades to existing structures in at risk locations**: Use redevelopment policies or regulations to limit expansions, additions, or substantial renovations of existing structures in danger from erosion. Require removal of non-conforming portions of the existing structure, when possible, when a remodel or renovation is proposed.

A.12c **Limit foundation work within the geologic setback area:** To facilitate removal of non-conforming portions of an existing structure, use LCP regulations and CDPs to limit new or replacement foundations or substantial improvements, other than repair and maintenance, to the existing foundation when located seaward of the Geologic Setback line. Approve significant new foundation work only when it is located inland of the setback line for new development and when it will not interfere with coastal processes in the future.

A.12d **Limit increases to existing non-conformities:** Use LCP regulations and CDPs to allow non-exempt repair and maintenance and modifications only if they do not increase the size or degree of non-conformity of the existing structure. For shoreline or blufftop development, any decrease in the existing non-conforming setback would increase the degree of non-conformity.

A.12e **Limit additions to non-conforming structures:** Use LCP regulations and CDPs to acknowledge that additions to existing structures should be considered new development that must conform to the standards for new development including but not limited to avoiding future protective devices. Consider limitations on the size of additions unless non-conforming portions of the structure are removed.

A.12f **Address existing protection of non-conforming structures:** Use LCP regulations and CDP conditions to put current and future property owners on notice that if there is currently shoreline or bluff protection for an existing structure, the structure is likely at-risk and improvements to that structure in its current location may be limited. Also, consider acknowledging that any rights to

retain the existing protective device(s) apply only to the structure that existed at the time the protective device was constructed or permitted.

A.13 Redevelopment of existing structures: Define "redevelopment" as, at a minimum, replacement of 50% or more of an existing structure. Other options that may be used to define what constitutes redevelopment or a replacement structure could include 1) limits on the extent of replacement of major structural components such as the foundation or exterior walls, or 2) improvements costing more than 50% of the assessed or appraised value of the existing structure. The redevelopment definition should take into consideration existing conditions and pattern of development, potential impacts to coastal resources, and the need for bluff or shoreline protective devices if the structure remains in its current, non-conforming location.

A.13a **Require redevelopment to meet the standards for new development:** Use LCPs and CDPs to require that renovations meeting the threshold for redevelopment should not be approved unless the entire structure meets the standards for new development, including but not limited to a waiver of right to protection. Specify that if any existing non-conforming elements are permitted to remain, those non-conforming elements are not subject to rights to protection pursuant to Coastal Act Section 30235.

A.13b **Include cumulative improvement or additions to existing structures in the definition of redevelopment:** Use LCP regulations to acknowledge that demolition, renovation, or replacement of less than 50% (or less) of an existing structure constitutes redevelopment when the proposed improvements would result cumulatively in replacement of more than 50% of the existing structure from an established date, such as certification of the LUP.

A.14 Remove existing shoreline protective devices: On properties with existing shoreline protective devices, use regulations to require removal of the protective device when the structure requiring protection is redeveloped or removed. If removal is not possible, require a waiver of any rights to retain the protective device to protect any structure other than the one that existed at the time the protective device was constructed or permitted.

Goal: Encourage the removal of development that is threatened by sea level rise

A.15 Use Rolling Easements: The term "rolling easement" refers to the policy or policies intended to allow coastal lands and habitats including beaches and wetlands to migrate landward over time as the mean high tide line and public trust boundary moves inland with sea level rise. Such policies often restrict the use of shoreline protective structures (such as the "no future seawall" limitation sometimes used by the Commission), limit new development, and encourage the removal of structures that are seaward (or become seaward over time) of a designated boundary. This boundary may be designated based on such variables as the mean high tide line, dune vegetation line, or other dynamic line or legal requirement. Despite the term "rolling easements," not all of the strategies related to rolling easements actually involve the use of recorded easements.

A.16 **Develop an incentive program to relocate existing development at risk**: Provide incentives to relocate development out of hazardous areas and to acquire oceanfront properties damaged by storms, where relocation is not feasible. Consider creating a relocation fund through increased development fees, *in lieu* fees, or other funding mechanisms.

A.17 **Transfer of Development Rights programs (TDR)**: See Strategy A.5b above.

A.18 **Acquisition and buyout programs**: Acquisition includes the acquiring of land from the individual landowner(s). Structures are typically demolished or relocated, the property is restored, and future development on the land is restricted. Such a program is often used in combination with a TDR program that can provide incentives for relocation. Undeveloped lands are conserved as open space or public parks. LCPs can include policies to encourage the local government to establish an acquisition plan or buyout program to acquire property at risk from flooding or other hazards.

Goal: Use "soft" or "natural" solutions as a preferred alternative for protection of existing endangered structures

A.19 **Require the use of green infrastructure as a preferred alternative**: Under appropriate shoreline conditions, require or encourage development to use "soft" or "natural" solutions or "living shorelines" as an alternative to the placement of hard shoreline protection in order to protect development or other resources and to enhance natural resource areas. Examples of soft solutions include vegetative planting, dune restoration, and sand nourishment.

A.19a **Establish a beach nourishment program and protocols**: New policies may be needed to address increased demand or need for beach nourishment with sea level rise. Policies within an LCP may identify locations where nourishment may be appropriate; establish a beach nourishment program and protocols for conducting beach nourishment; establish criteria for the design, construction, and management of the nourishment area; and/or establish measures to minimize adverse biological resource impacts from deposition of material, such as sand compatibility specifications, timing or seasonal restrictions, and identification of environmentally preferred locations for deposits. Beach nourishment programs should also consider how nourishment options may need to change over time as sea level rises.

A.19b **Dune management**: Establish management actions to maintain and restore dunes and natural dune processes. Dunes provide buffers against erosion and flooding by trapping windblown sand, storing excess beach sand, and protecting inland areas, and they also provide habitat. This is likely most effective for areas with some existing dune habitat and where there is sufficient space to expand a foredune beach for sand exchange between the more active (beach) and stable (dune) parts of the ecosystem. LCPs can identify existing dune systems and develop or encourage management plans to enhance and restore these areas,

including consideration of ways that the system will change with rising sea level. CDPs for dune management plans may need to include periodic reviews so the permitted plans can be updated to address increased erosion from sea level rise, and the need for increased sand retention and replenishment.



Figure 20. Photo depicting dune restoration at Surfer's Point, Ventura. (*Photograph courtesy of Surfrider Foundation*)

A.19c **Regional Sediment Management (RSM) programs**: Develop a Regional Sediment Management (RSM) program including strategies designed to allow the use of natural processes to solve engineering problems. To be most effective, RSM programs include the entire watershed, account for effects of human activities on sediment, protect and enhance coastal ecosystems, and maintain safe access to beaches for recreational purposes. LCPs can support development of an RSM program and its implementation, and the program should be periodically updated to address on-going changes from sea level rise. Natural boundaries for RSM may overlap within several LCPs, so regional cooperation may be needed for best implementation. Individual actions such as a beach nourishment project would be accomplished through a CDP. Many coastal RSM programs have already been developed and can be used as a resource. See the *Coastal Sediment Management Workgroup* website (and Appendix C) for more information.

A.19d **Maintenance or restoration of natural sand supply**: Adjustment of the sediment supply has been one of the ways natural systems have accommodated

changes from sea level. Maintenance or restoration of sediment involves identifying natural sediment supplies and removing and/or modifying existing structures or actions that impair natural sand supply, such as dams or sand mining. LCPs could include policies and implementing standards that support nature-based responses to sea level rise by maintaining and restoring natural sand supply. Where applicable, develop policies and standards to prohibit sand mining, regulate sand replenishment, and promote removal of dams or the by-passing of sand around dams. Plans should take into consideration changes in sand supply due to sea level rise and may identify and designate high priority areas for restoring natural processes. These actions and policies can also be implemented through a Regional Sediment Management (RSM) program.

A.19e **Beneficial reuse of sediment through dredging management**: Dredging involves the removal of sediment from harbor areas to facilitate boat and ship traffic or from wetland areas for restoration. Dredging management actions and plans may need to be updated to account for elevated water levels. Policies can be developed with an LCP and/or carried out through a CDP to facilitate delivery of clean sediment extracted from dredging to nearby beaches or wetland areas where needed. Beneficial reuse of sediment in this way can be coordinated through a Regional Sediment Management (RSM) program and/or through coordination with other jurisdictions.

Goal: Allow bluff and shoreline protective devices only to protect existing endangered structures

A.20 Use hard protection only if allowable and if no feasible less damaging alternative exists: "Hard" coastal protection is a broad term for most engineered features such as seawalls, revetments, cave fills, and bulkheads that block the landward retreat of the shoreline. In some cases, caissons and pilings may also be considered hard shoreline protective devices. Due to adverse effects on shoreline sand supply and beach area available for public use, such protective devices should be avoided when feasible. Under current law, shoreline protection for existing structures in danger from erosion may be allowed if coastal resource impacts are avoided or minimized and fully mitigated where unavoidable.

A.20a **Retention of existing shoreline protection**: On intensely developed, urbanized shorelines, if the removal of armoring would put existing development at risk and not otherwise result in significant protection or enhancement of coastal resources, it may be appropriate to allow properly designed shoreline armoring to remain for the foreseeable future, subject to conditions that provide for potential future removal in coordination with surrounding development. However, the proper short term responses, longer term adaptation measures, and mitigation of on-going resource impacts should be determined through updated context-specific LCP planning and consideration of the existing rights and responsibilities of development in the area (see strategies A.21 – A.25).

A.21 Require monitoring of the structure: Require periodic monitoring of the shoreline protective device to examine for structural damage, excessive scour, or other impacts from coastal hazards and sea level rise. Ensure that the structures remain within the initial footprint and that they retain functional stability.

A.22 Conditional approval of shoreline protective device: Use LCP regulations and permit conditions to require monitoring of impacts to shoreline processes and beach width both at the project site and the broader area and/or littoral cell as feasible, and provide for such actions as removal or modification of armoring in the future if it is no longer needed for protection or if site conditions change.

A.22a **Limit the authorization of shoreline protective devices to the development being protected:** Use LCP regulations and CDP conditions to require permits for bluff and shoreline protective devices to expire when the currently existing structure requiring protection is redeveloped, is no longer present, or no longer requires a protective device, whichever occurs first. Prior to expiration of the permit, the property owner should apply for a Coastal Development Permit to remove the protective device, or to modify or retain it if removal is not feasible at that time.

A.22b **Require assessment of impacts from existing pre-Coastal Act or permitted shoreline armoring:** Use LCP regulations and permit conditions to specify that expansion and/or alteration of a pre-Coastal Act or legally permitted bluff or shoreline protective device requires a new CDP and the review should include an assessment of changes to geologic site and beach conditions including but not limited to, changes in beach width relative to sea level rise, implementation of any long-term, large scale sand replenishment or shoreline restoration programs, and any ongoing impacts to public access and recreation from the existing device.

A.22c **Reassess impacts and need for existing armoring over time:** Use LCP regulations and CDPs to provide for reassessment of the impacts from protective devices at specific trigger points, including when substantial improvement or redevelopment of the structure requiring protection is proposed, or when existing armoring is being modified or expanded. Reassessment should consider the effect any significant improvement to a structure requiring protection will have on the length of time the protective device will remain, and if the existing armoring is still required, acknowledge that it is authorized to protect the existing structure only. The CDP review should assess existing site conditions and evaluate options to modify, replace, or remove the existing device in a manner that would eliminate or mitigate any identified impacts that may be occurring on public access and recreation, scenic views, sand supply, and other coastal resources, if feasible.

A.23 Require mitigation for impacts of shoreline protective devices: For unavoidable public resource impacts from shoreline structures permitted under the Coastal Act, require mitigation of resource impacts over the life of the structure as a condition of approval for the development permit. For example, require landowners to pay mitigation fees and/or complete other mitigation actions for the loss of sandy beach and other

adverse impacts on public access and recreation due to shoreline protection devices. Importantly, mitigation measures should be planned in such a way that sea level rise will not impair their efficacy over time. Other mitigation measures could include acquisition of other shoreline property for public recreational purposes, construction of public access and recreational improvements along the shoreline, and/or easements to protect lateral access along the shoreline in areas where seawalls eliminate sandy beach.

A.23a **Reassess mitigation over time as necessary:** Impacts of shoreline structures, including to shoreline and sand supply, public access and recreation, ecosystem values, and other relevant coastal resources, should be fully mitigated. Where reassessment of an approved structure is authorized, phasing of necessary mitigation may be appropriate.

A.24 Limit retention of existing shore protection: On lots with existing pre-Coastal Act or permitted armoring, consider requiring a waiver of rights to retain such protection for any structures other than the structure that existed at the time the armoring was constructed or permitted.

A.25 Removal of shoreline protection structures: The removal of shoreline protection structures can open beach or wetland areas to natural processes and provide for natural responses to sea level rise. LCPs can specify priority areas where shoreline protection structures should be removed if they are no longer needed or in a state of great disrepair, including areas where structures threaten the survival of wetlands and other habitats, beaches, trails, and other recreational areas. Once these priority areas have been identified, assessment of potential re-siting of structures and removal of armoring could be required by a CDP as redevelopment occurs.



Figure 21. Photo depicting removal of shoreline protective structure. Removal of rock revetment restores access and allows natural bluff erosion at the Ritz Carlton in Half Moon Bay. (*Source:* California Coastal Records Project)

A.25a **Remove shoreline protective structures located on public lands:** Over time, sea level rise will cause the public trust boundary to move inland. If the structures

as originally approved were located on uplands but that land becomes subject to the public trust in the future, the State Lands Commission or any local government or other entity acting as trustee for public trust lands could require the structures to be removed. The Commission or local governments could approve permit conditions to ensure permittees obtain authorization to retain or remove structures if they ever become located on public trust lands. Removal might also be accomplished through non-regulatory means such as offering incentives for removal to property owners or by incorporating removal of public structures into Capital Improvement Plans.

Goal: Require special considerations for critical infrastructure and facilities

A.26 Plan ahead to preserve function of critical facilities: Addressing sea level rise impacts to critical facilities and infrastructure will likely be more complex than for other resources and may require greater amounts of planning time, impacts analyses, public input, and funding. To address these complexities, establish measures that ensure continued function of critical infrastructure, or the basic facilities, service, networks, and systems needed for the functioning of a community. Programs and measures within an LCP could include identification of critical infrastructure that is vulnerable to SLR hazards, establishment of a plan for managed relocation of at-risk facilities, and/or other measures to ensure functional continuity of the critical services provided by infrastructure at risk from sea level rise and extreme storms. Repair and maintenance, elevation or spot-repair of key components, or fortification of structures where consistent with the Coastal Act may be implemented through CDPs.

A.26a **Develop or update a long-term public works plan for critical facilities to address sea level rise**: Develop a long-term management plan to address the complexities of planning for sea level rise that incorporates any potential maintenance, relocation, or retrofits and structural changes to critical facilities to accommodate changes in sea level, and obtain Coastal Commission certification.

A.27 Apply high sea level rise projections for siting and design of critical facilities: Given the planning complexities, high costs, and potential impacts resulting from damage, there is reason to be particularly cautious when planning and designing new critical facilities and/or retrofitting existing facilities. Ensure that critical facilities are designed to function even if the highest projected amounts of sea level rise occur and that sites with hazardous materials are protected from worst-case scenario sea level rise impacts.

A.27a **Design coastal-dependent infrastructure to accommodate worst case scenario sea level rise**: Include policies that would require proposals and/or expansion plans to address sea level rise for coastal dependent infrastructure that must necessarily be sited in potentially hazardous areas, such as industrial, energy, and port facilities. Such facilities should be designed to withstand worst case future impacts while minimizing risks to other coastal resources through initial siting, design, and/or inclusion of features that will allow for future adaptation.

A.28 Site and design wastewater disposal systems to avoid risks from sea level rise: Wastewater treatment and disposal systems are particularly challenging in that they are often located in areas that will be impacted by sea level rise. Ensure that these systems are not adversely affected by the impacts of sea level rise over the full life of the structure and ensure that damage to these facilities would not result in impacts to water quality or other coastal resources. Avoid locating new facilities in hazardous areas if possible. If complete avoidance is not possible, minimize elements of the system that are in hazardous areas (for example, locate the main facility on higher ground and only place pump stations in potentially hazardous areas), and design any facilities in hazardous areas to withstand worst-case scenario sea level rise impacts.

Goal: Protect transportation infrastructure

A.29 Identify priorities for adaptation planning and response: Carry out vulnerability analyses to identify chronic problem areas that are highly subject to erosion, wave impacts, flooding, or other coastal hazards or that maybe become so in the near future. Coordinate with Caltrans and local public works/transportation agencies to address high priority areas and increase monitoring efforts of chronic problem areas.

A.30 Add policies to address impacts to transportation routes: If transportation facilities are at risk from sea level rise, coordinate with Caltrans and local public works/transportation agencies to establish new alternative transportation routes or a plan to ensure continued alternative transportation and parking is available that allows for continued access to beaches and other recreation areas.

A.30a **Integrate LCP/land use planning processes with transportation planning processes:** Updates and changes to LCPs and other land use planning efforts should be jointly planned, evaluated, and implemented with Coordinated System Management Plans, Regional Transportation Plans, and other transportation planning efforts to ensure that long-term land use and access goals and needs are aligned.

A.31 Allow for phased implementation of realignment and relocation projects: In some cases it may be necessary to make incremental changes in transportation networks so that access to and along the coast can be maintained while also addressing coastal hazards over the long-term. For example, a phased approach may allow for interim shoreline protection to maintain an existing road alignment while future realignment plans are evaluated and pursued. Such phased approaches should be coordinated with Caltrans and local public works/transportation agencies and aligned with long-term LCP planning and adaptation goals. Individual projects will be implemented through CDPs.



Figure 22. Photo depicting planned retreat for major public infrastructure. The Piedras Blancas Highway 1 Realignment will move nearly 3 miles (5km) of Highway 1 500 ft (152 m) inland. (*Source:* California Coastal Records Project)

A.32 Plan and design transportation systems to accommodate anticipated sea level rise impacts: Ensure that transportation networks are designed to function even if the highest projected sea level rise amounts occur. Efforts to realign, retrofit, and/or protect infrastructure should be coordinated with Caltrans, local public works/transportation agencies, and LCP planning efforts, and individual projects will be implemented through CDPs.

A.32a **Retrofit existing transportation infrastructure as necessary:** In instances where relocation is not an option, repair damage and/or retrofit existing structures to better withstand sea level rise impacts. For example, use stronger materials, elevate bridges or sections of roadways, and build larger or additional drainage systems to address flooding concerns.

A.32b **Build redundancy into the system:** Provide alternate routes, as possible, to allow for access to and along the coast in instances in which sections of roadways may become temporarily impassible as a result of coastal hazards. Ensure that alternate route information is provided to residents and visitors to coastal areas.

A.33 Incorporate sea level rise considerations into Port Master Plans and other port activities: Ensure that ports and related infrastructure are designed to function given anticipated sea level rise. In some cases, this may mean initially designing structures to accommodate projected sea level rise impacts. Other options may include planning for and ensuring capacity for future adaptive actions.

A.33a **Retrofit existing port infrastructure as necessary**: Given the coastal-dependent nature of many port structures, it may not be feasible to site or relocate development to avoid hazards. In these instances it may be more appropriate to include efforts to accommodate and withstand sea level rise during actions to

repair or retrofit existing structures. Options may include using more robust designs or materials or elevating structures.

A.33b **Minimize resource impacts that may result from future use of shoreline protective structures**: If existing, coastal-dependent port structures require shoreline protective structures, minimize resource impacts as feasible and consistent with Chapter 3 and/or Chapter 8 of the Coastal Act, as applicable, by encouraging inland expansion of protective devices rather than further fill of coastal waters.

A.33c **Ensure that linkages to overland transportation networks are able to adapt to sea level rise impacts**: Coordinate with relevant stakeholders to ensure that linkages between port infrastructure and overland transportation networks will be resilient to future sea level rise impacts.

A.33d **Ensure that lessees and other parties understand sea level rise risks and vulnerabilities**: Coordinate with lessees and other stakeholders to ensure that they understand the risks associated with development in hazard areas as well as the responsibilities that come with such development.

B. Public Access and Recreation

One of the highest priorities in the Coastal Act is the mandate to maximize public access and recreational opportunities to and along the coast. The main goals and Coastal Act policies (Sections 30210, 30220, 30221, 30213) that relate to public access and recreation are to:

- Maximize public access and recreational use by protecting beaches and other coastal areas suitable for such use
- Protect lower cost visitor and recreational facilities and accessways

Chapter 3 of the Guidance covers the impacts to public access and recreation that might result from sea level rise or the interaction of sea level rise with development patterns. Certified LCPs should already have policies and standards to assure that existing public access and visitor serving amenities are protected and that maximum public access is both planned for and provided with new development when warranted. However, LCP policies and standards may need to be updated to consider sea level rise hazards. Adaptation options have been developed to support the access goals of the Coastal Act through both LCP policies and CDP conditions, and the following strategies cover a range of options for addressing the identified goals of the Coastal Act.

Goal: Maximize public access and recreational use by protecting beaches and other coastal areas

B.1 **Incorporate sea level rise into a comprehensive beach management strategy**: Update or develop a new comprehensive beach management strategy to address loss of beach areas, including loss of lateral access, or changes in beach management due to sea level rise. Establish a program to minimize loss of beach area through, as may be appropriate, a beach nourishment program; restoring sand and sediment supply to the littoral cell; removal, adjustments, or maintenance to shoreline protection structures; use of man-made structures such as terminal groins or artificial reefs to retain sediment; or other actions.

B.1a **Develop a sediment management and sand replenishment strategy**: Identify natural sediment supplies and remove and/or modify existing structures or actions that impair natural sand supply, such as dams or sand mining. LCPs could include policies and implementing standards that support nature-based responses to sea level rise by maintaining and restoring natural sand supply. Where applicable, develop policies and standards to prohibit sand mining, regulate sand replenishment, and promote removal of dams or the by-passing of sand around dams. Plans should take into consideration changes in sand supply due to sea level rise. These actions and policies can also be implemented through a Regional Sediment Management (RSM) program.

B.2 **Plan ahead to replace loss of access and recreation areas:** Identify replacement opportunities or otherwise plan ahead for how to replace recreation areas and accessways that will be lost due to inundation or damage associated with sea level rise. An LCP could designate and zone lands for this through, for example, a phased overlay or other regulatory measures that ensure that access and recreational areas are available in the future. Local governments may choose to provide additional incentives to encourage creation of new recreation areas or opportunities. Such incentives could include grant for protection new recreation areas or tax breaks for recreation related businesses.

B.2a **Protect existing open space adjacent to the coast**: Plan for future coastal recreational space and parkland by protecting open space adjacent to coastal habitats so that beaches and other habitats can migrate or so that there is open space available as parkland or other areas are lost.

B.2b **Plan for removal of structures that limit inland migration of beaches**: Seawalls and other development adjacent to beaches and other coastal habitats will impede the ability of these habitats to migrate inland and will therefore result in the inundation and eventual loss of these areas. Consideration should be given to removing and relocating these structures to ensure that beaches and other habitats are able to persist over time. Additional detail on removal of structures can be found above in the "Coastal Development and Hazards" section of this chapter.

Goal: Protect lower cost visitor and recreational facilities and accessways

B.3 **Site and design access sites and facilities to minimize impacts**: Add policies that require public access sites, segments of the CCT, and recreation and visitor-serving facilities to be sited and designed to avoid impacts from sea level rise, while maximizing public access and recreation opportunities. Examples of siting and design standards for development can be found in section A. Where facilities can be safely sited for the near term but future impacts are likely, require an adaptive management plan detailing steps for maintenance, retrofitting, and/or relocation.

B.3a **Require mitigation of any unavoidable impacts**: For unavoidable impacts to public access or recreation from shoreline armoring or other development, require mitigation of impacts through the addition of new public access, recreation opportunities, visitor-serving accommodations, or Coastal Trail segments, or payment of fees to fund such improvements. Importantly, mitigation measures should be planned in such a way that, if possible, sea level rise will not impair their efficacy over time.

B.4 **Plan ahead to replace loss of visitor-serving and recreational facilities**: Develop a plan to replace any visitor-serving facilities that are lost due to impacts from sea level rise, maximizing continued provision of affordable options and an appropriate mix of accommodations over time. For example, an LCP could include standards to re-site existing visitor-serving and recreational facilities when they become impacted by sea

level rise and/or could identify and zone for future areas to be reserved for these functions.

B.5 **Add requirements for retrofit/relocation of public access and recreation sites at risk**: The LCP can add policies that require all new public access and recreation areas, sections of the CCT, visitor- serving accommodations, or related recreation facilities to be retrofitted or relocated if they become threatened from erosion, flooding, or inundation. For new facilities and public access sites, the CDP conditions of approval can specify how maintenance, retrofit, or relocation will take place. Policies and plans should be designed to be adaptive so that retrofits and or/relocations are implemented as sea level rise impacts occur.

B.5a **Retrofit or relocate recreation and visitor-serving facilities**: Consider options to retrofit existing recreation and visitor-serving facilities to better accommodate sea level rise impacts. Such retrofits could include use of different building materials and/or relocating facilities.

B.5b **Retrofit or relocate vertical accessways**: Consider options to retrofit existing accessways to reduce impacts from sea level rise. Such retrofits could include using different materials that can better withstand impacts, or re-orienting the layout or other features of accessways to lessen damage and other impacts. Also begin to plan for and identify triggers and options for relocating accessways over time as conditions change.

B.5c **Retrofit or relocate sections of the Coastal Trail**: Use boardwalks, bridges, and/or other design features to ensure continuity of the CCT in sections that are vulnerable to SLR hazards. Some sections may need to be relocated over time. An LCP could identify vulnerable sections of the CCT and establish a phased approach to relocate sections of the trail in such a way that is consistent with provisions of the Coastal Act and ensures that the CCT remains within sight, sound, or smell of the sea.

Goal: Foster efforts to better understand impacts of sea level rise

B.6 **Support research on impacts to recreation and public access**: Changes in sea level will affect wave conditions and sediment transport, but additional research is needed to understand how these changes will affect specific conditions for surfing and other recreation activities. While such research programs may be outside the scope of individual local jurisdictions, statements of support for the local issues that need to be addressed can help guide research agendas at the regional state or federal level. Or, such needs can serve to guide grant applications to undertake the needed projects within a jurisdiction. To the extent possible, add policies to promote research on sea level rise impacts to recreational activities like surfing or other coastal recreational uses in the LCP jurisdiction.

C. Coastal Habitats, ESHA, and Wetlands

The Coastal Act provides for the protection of both land and marine habitats. It mandates that ESHA and marine resources shall be protected against significant disruption of habitat value and shall be maintained, enhanced, and restored as feasible (Sections 30230, 30233, 30240, 30240(a), 30240(b)). The main goals and Coastal Act policies that relate to coastal habitats are to:

- Protect, enhance, and restore sensitive habitats
- Avoid significant disruption to sensitive habitats
- Avoid significant impacts to habitats from adjacent development
- Manage sediment in ways that benefit habitats

Chapter 3 of the Guidance covers the impacts to coastal habitats and resources that might result from sea level rise or the interaction of sea level rise with development patterns. Certified LCPs should already have policies and standards to ensure that ESHA, wetlands, and other coastal habitats and resources are protected to the maximum extent feasible. However, LCP policies and standards may need to be updated to consider sea level rise hazards. Adaptation options have been developed to support the habitat protection goals of the Coastal Act through both LCP policies and CDP conditions, and the following strategies cover a range of options for addressing the identified goals of the Coastal Act.

Goal: Protect, enhance, and restore sensitive habitats

C.1 **Open space preservation and conservation**: Preserve land for its ecological or recreational value. This may involve limiting or prohibiting development and any uses that conflict with ecological preservation goals. LCPs can establish transfer of development rights programs to offset reduced development potential and can develop open space management plans that evaluate and consider the impacts of sea level rise, extreme events, and other climate change impacts. LCPs can establish open space and conservation areas through land use designations and zoning, redevelopment restrictions, acquisition and easement programs, and setback and buffer requirements.

C.1a **Update policies to provide for new or restored coastal habitat**: Update policies to require new coastal habitat to be provided or for degraded areas to be restored to account for the expected loss of existing habitat that will occur when development blocks the necessary upland migration due to sea level rise. Use an adaptive management approach where applicable. Encourage policies that provide for conservation or restoration of multiple habitat types.

C.1b **Identify areas for public acquisition**: New or updated LCPs can establish a program to partner with state, federal, and non-profit organizations to acquire and protect natural resource areas for public use, including areas that could serve as

refugia for species impacted by sea level rise, or areas that could be appropriate sites for coastal habitat creation or restoration.

C.1c **Establish conservation easements or other development restrictions to protect habitat**: Establish a formalized program to identify, acquire, and manage areas appropriate for some form of conservation protection. Easements or other strategies may be used to limit or restrict development on portions of a lot parcel that are most vulnerable to SLR impacts. The program might develop standard agreements to be used for easements and identify the entities that could hold the easements. A conservation easement program could be established on a community wide basis through an LCP and implemented on a parcel by parcel basis through individual CDPs.

C.1d **Require open space protection as a component of new development located adjacent to coastal habitats**: The LCP can require permit conditions for new development in certain areas that buffers around natural resource areas be protected through a conservation easement, deed restrictions, or other comparable mechanism.

C.1e **Use Rolling Easements**: See Strategy A.15 above.

C.1f **Transfer of Development Rights programs (TDR)**: See Strategy A.5b above.

Goal: Avoid significant disruption to habitats

C.2 Use ecological buffer zones and/or increase the size of buffers: Buffer zones are intended to protect sensitive habitats from the adverse impacts of development and human disturbance. An important aspect of buffers is that they are distinct ecologically from the habitat they are designed to protect. LCPs can establish requirements for ecological buffers and provide guidance on how to establish or adjust these buffers to accommodate sea level rise. CDPs should require buffers to be designed, where applicable, to provide "habitat migration corridors" that allow sensitive habitats and species to migrate inland or upland as sea level rises.

C.2a **Consider sea level rise buffer zones**: Update buffer zone policies to allow room for coastal habitats to migrate with changes in sea level. The size of the buffer needed to allow for migration will vary depending on the individual wetland or habitat type, as well as site-specific features such as natural or artificial topography and existing development. For instance, in flat areas, a larger buffer may be needed, but in steep areas, a smaller buffer may be acceptable.

C.3 Avoid impacts to Marine Protected Areas: Recognize the importance of the State's network of marine protected areas (MPAs) in protecting the diversity and abundance of marine life. Understand that planning and permitting decisions made on land could have impacts on these areas, particularly as conditions change with sea level rise, and avoid disruptions to these habitats as feasible and applicable.

C.4 Protect specific ESHA functions: Environmentally Sensitive Habitat Areas (ESHA) are areas that are critically important for the survival of species or valuable for maintaining

biodiversity. These areas can include nursery grounds, spawning areas, or highly diverse areas. Where at risk from sea level rise, the LCP should establish measures to ensure the continued viability of the habitat areas, such as protection of migration zones, habitat corridors, and other applicable adaptation strategies, as listed below. ESHA that is not at risk from sea level rise should also be afforded special protection in the LCP to serve as refugia.

C.4a **Protect wildlife corridors, habitat linkages, and land upland of wetlands to allow habitat migration**: Preserve open areas that are adjacent to wetlands to allow for migration of these habitats as sea levels rise.

C.4b **Protect refugia areas**: Protect refugia, or areas that may be relatively unaltered by global climate change and thus can serve as a refuge for coastal species displaced from their native habitat due to sea level rise or other climate change impacts.

C.4c **Promote increased habitat connectivity to allow species movement**: Connectivity refers to the degree to which the landscape facilitates animal movement and other ecological flows. Roads, highways, median barriers, fences, walls, culverts, and other structures can inhibit movement of animals. Develop LCP policies that will enable identification of important animal movement corridors. Develop regulations to protect these corridors for present and future conditions, taking into account habitat shifts from climate change. In LCPs and through CDPs, require that new structures such as highways, medians, bridges, culverts, and other development are designed to facilitate movement of animals.

C.4d **Facilitate wetland and other habitat migration**: Reserve space for a "habitat migration corridor" or areas into which wetlands and other habitats could migrate as sea level rise induced inundation of existing wetland areas occurs. In the LCP, identify potential habitat migration corridors. These areas could be reserved for this purpose in an LCP through land acquisition, use designations, zoning buffers, setbacks, conservation easement requirements, and clustering development. LCPs should also consider developing a plan for acquisition of important habitat migration corridors.

Goal: Avoid significant impacts to habitats from adjacent development

C.5 Limit new development in areas adjacent to wetlands, ESHA, and other coastal habitats: Restrict the construction of new development in areas that are adjacent to wetlands, ESHA, and other coastal habitats in order to preserve buffers and open areas to allow for habitat migration.

C.5a **Cluster development away from coastal habitats**: Existing LCPs will likely have policies that already require clustering of development. To address sea level rise, these policies might need to be updated to include clustering development away from land where wetlands and other coastal habitats could migrate with sea level rise.

C.5b **Limit subdivisions**: Update subdivision requirements to require provision for inland migration of natural resource areas or to require lots to be configured in a way that allows such migration. Lot line adjustments may sometimes be appropriate if they facilitate locating physical development further away from hazards or sensitive resources.



Figure 23. Photo depicting the preservation and conservation of open space along an urban-rural boundary. North end of Pismo Beach from 1972 (*left*) to 2002 (*right*). (*Source:* California Coastal Records Project)

Goal: Manage sediment in ways that benefit habitats

C.6 **Identify opportunities for Regional Sediment Management**: Sediment supplies will be important for the long-term sustainability of many beaches and wetland areas. Strategies to maintain or restore natural sediment supplies and to coordinate sediment removal efforts with opportunities for reuse can provide multiple benefits to coastal ecosystems. See Strategy A.19c above for more detail on RSM programs.

C.6a **Restore natural sediment sources to wetlands**: Restoration of natural hydrodynamic systems will help to ensure the ability of wetlands to persist with sea level rise by ensuring that sediment is available for wetland accretion. Such actions may include restoring natural channels in streams and waterways that have been armored or channelized. Organizing and coordinating such efforts may be accomplished through a Regional Sediment Management Plan.

C.6b **Identify opportunities for beneficial reuse of sediment to support wetland restoration**: Consider facilitating the delivery of clean, dredged sediment to areas where former wetlands have subsided or to areas where existing wetlands are or may become sediment-limited as sea levels rise.

Goal: Incorporate sea level rise into habitat management actions

C.7 **Include sea level rise in site-specific evaluations**: Update policies to require site-specific biological evaluations and field observations of coastal habitat to include an evaluation of vulnerability to sea level rise where appropriate. Such an evaluation should consider both topographic features as well as habitat and species sensitivities (for example, sensitivity to inundation and saltwater intrusion).

C.8 Incorporate sea level rise in restoration, creation, or enhancement of coastal habitats: Update policies to require site-specific biological evaluations and field observations of coastal habitat to include an evaluation of vulnerability to sea level rise. Such an evaluation should consider both topographic features as well as habitat and species sensitivities (for example, sensitivity to inundation and saltwater intrusion). Habitat restoration, creation, or enhancement projects should be designed to withstand impacts of sea level rise and adapt to future conditions. As applicable, the LCP should contain policies to ensure restoration and management techniques account for future changes in conditions. CDPs for restoration projects should incorporate sea level rise and provisions to ensure habitats can adapt with changing future conditions.

C.9 Update habitat management plans to address sea level rise: Add policies stating that the effects of sea level rise should be addressed in management plans for coastal habitats. For example, plans should evaluate the full range of sea level rise impacts to coastal habitats, and develop a strategy for managing coastal habitats given changing sea level rise conditions. Existing management plans may need to be updated to add new monitoring and restoration requirements to address sea level rise. The strategies listed below are examples of strategies that could be included in habitat management plans.

C.9a **Use an adaptive management approach in ecosystem management, restoration, or design**: Habitat management plans and/or other habitat projects should establish an adaptive management approach, with clearly defined triggers for adaptive actions. Such an approach would allow for and ensure that coastal habitats are able to migrate and transition with changes in sea level.



Figure 24. Photo depicting habitat protection at Salinas River State Beach. Dunes are roped off to protect Snowy Plover nesting habitat. (*Source:* California Coastal Records Project)

C.10 Pursue strategies to protect ecosystem function under a range of future sea level rise or climate change scenarios: The LCP and/or habitat management plans can recommend coastal habitat management strategies that strive to protect ecosystem function in the future. Strategies include protecting a wide range of ecosystem types, protecting refugia, protecting wildlife and habitat corridors, and establishing methods to monitor ecosystem change over time.

C.10a **Update monitoring requirements for coastal habitats**: As part of the LCP and/or habitat management plans, consider establishing a monitoring protocol and requirements for evaluating sea level rise impacts to coastal habitats over time. Such a protocol would also help identify triggers at which additional adaptation options are necessary.

D. Agricultural Resources

Agriculture is a priority use within the Coastal Act, which mandates that the maximum amount of prime agricultural land shall be protected and maintained (Sections 30231, 30241, 30242). The main goals and Coastal Act policies that relate to agriculture are to:

- Protect the maximum amount of prime agricultural land
- Limit conversion of lands suitable for agriculture to non-agricultural uses
- Minimize impacts to water quality that could result from agricultural practices
- Promote water conservation efforts

Chapter 3 of the Guidance describes the impacts to agricultural resources that may result from sea level rise. Certified LCPs should already have policies and standards to ensure that agricultural resources are protected to the maximum extent feasible. However, LCP policies and standards may need to be updated to address sea level rise hazards. Adaptation options have been developed to support the agricultural protection goals of the Coastal Act through both LCP policies and CDP conditions, and the following strategies cover a range of options for addressing the identified goals of the Coastal Act.

Goal: Protect the maximum amount of prime agricultural land

D.1 **Identify and designate areas suitable for agricultural production to replace agricultural production areas that could be lost to sea level rise:** Identify any non-sensitive open or developed areas, both within and outside of the Coastal Zone, which could potentially be used to replace agricultural land that is lost to sea level rise. Update LCP designations and/or policies to protect these identified areas for agricultural production and, as applicable, to provide for their conversion to agricultural use. Encourage and support regional coordination as feasible and applicable.

D.1a **Establish SLR-specific agricultural protection program:** Establish a formal program to identify, acquire, incentivize, and manage areas appropriate for new/renewed agricultural use and/or for protection of current and/or future agricultural uses. Such program should target key areas and properties where agricultural conversion threats are highest, and should dovetail with existing agricultural protection programs. Easements and other legal restrictions may be used as part of such program to help limit or restrict development in areas where agricultural land and production are most vulnerable to sea level rise impacts. The program might develop standard language and/or legal documents that can be used for easements or other property restrictions. The program should be flexible enough to be able to be implemented on both a large scale (*e.g.*, though LCP policies and programs) as well as on a smaller scale (*e.g.*, through the CDP process).

D.2 **Protection, maintenance, and adaptation of dikes and levees**: Repairing and maintaining existing flood barriers such as dikes and levees may be a cost-effective way to continue to protect agricultural areas. While some repair and maintenance activities are exempt from the need for a CDP, the repair and maintenance exemption does not apply to repair and maintenance work that is located within an ESHA, within any sand area, within 50 feet of the edge of a coastal bluff or ESHA, or within 20 feet of coastal waters. LCPs could identify opportunities for these kinds of actions and ensure that they are appropriately permitted, with consideration to the environmental protection and restoration goals of the Coastal Act. While landowners have the right to repair and maintain existing legal levees in their current configurations, the Commission and local governments administering LCPs have the authority to regulate, via the CDP process, the proposed methods of repair and maintenance. To raise, reconfigure, enlarge, or widen levees is not repair and maintenance and requires a Coastal Development Permit. Such activities may not be consistent with the Coastal Act or certified LCP, such as in cases involving wetland fill impacts. However, where there are opportunities to restore marine resources and the biological productivity of wetlands and estuaries, it may be possible to permit a dike/levee reconstruction project that provides for substantial restoration.

Goal: Limit conversion of lands suitable for agriculture to non-agricultural uses

D.3 **Limit conversion of agricultural land to other developed land uses**: Develop policies to assure maximum environmentally feasible protection of rural agricultural land, open space, and other coastal resources, including areas that may be considered non-prime agricultural land at this time. Anticipate areas that could become more difficult to farm and identify strategies to avoid or mitigate the potential impacts.

Goal: Minimize impacts to water quality that could result from agricultural practices

D.4 **Include sea level rise in water quality protection policies**: Where needed, coordinate with regional water quality control boards to add policies to reduce water pollution from runoff should agricultural lands become flooded or inundated due to sea level rise.

D.4a **Minimize water quality impacts from flooding of agricultural lands**: Agricultural practices that are designed to minimize water quality impacts, such as those designed to minimize runoff, may need to be updated or enhanced to ensure water quality protection if sea level rise results in more frequent flooding of agricultural lands.

D.4b **Add policies to address saltwater intrusion**: Add policies to protect water supply for priority coastal agriculture, including policies to address saltwater intrusion, such as limits on groundwater withdrawal or diversification of water supplies. Strategies to pump freshwater and/or highly treated wastewater into aquifers to reduce saltwater intrusion should be minimized in areas with limited freshwater resources.

Goal: Promote water conservation efforts

D.5 **Maximize water conservation to protect priority agricultural water supplies**: Saltwater intrusion and other climate change impacts may result in reduced water availability. LCP policies should be updated to establish or enhance standards related to water conservation and/or to identify opportunities for water recycling, dual plumbing systems, and the like. For more information on options such as relocating wells and reducing pumping in sensitive aquifers, see the following section on Water Quality and Water Control Management.

D.6 **Identify alternate water sources for agriculture**: Establish a program to identify alternate water sources for agriculture.

E. Water Quality and Supply

The main water quality protection policy of the Coastal Act requires minimizing the adverse effects of wastewater discharges, runoff, and groundwater depletion in order to protect the biological productivity and quality of coastal waters, as described in Section 30231. The main goals related to water quality include:

- Control runoff and stormwater pollution
- Minimize adverse effects of wastewater discharges and entrainment
- Prevent depletion of groundwater supplies from saltwater intrusion
- Improve long-term water quality through research

Chapter 3 of the Guidance covers the impacts to coastal waters from increased runoff, wastewater discharge and saltwater intrusion into groundwater sources from sea level rise. Adaptation options have been developed to limit the amount of pollutants that enter coastal waters through runoff or discharges.

Goal: Control runoff and stormwater pollution

E.1 **Update water quality Best Management Practices (BMPs)**: Evaluate and update BMPs to account for changes in water quality and supply issues due to sea level rise, as applicable. Updates could include practices to provide greater infiltration/inflow of rainwater, increased stormwater capture and/or water recycling programs, the use of low impact development, improved maintenance procedures for public sewer mains, policies to address impaired private sewer laterals, and other proactive measures.

E.2 **Include sea level rise in stormwater management plans and actions**: Control the amount of pollutants, sediments, and nutrients entering water bodies through precipitation-generated runoff. LCPs should include sea level rise and extreme storms in stormwater management plans and actions. CDPs for stormwater infrastructure should consider sea level rise.

E.2a **Increase capacity of stormwater infrastructure**: Actions to reduce impacts from higher water levels could include widening drainage ditches, improving carrying and storage capacity of tidally-influenced streams, installing larger pipes and culverts, adding pumps, converting culverts to bridges, creating retention and detention basins, and developing contingency plans for extreme events. Encouraging and supporting these types of efforts upstream may also be important.

E.2b **Use green stormwater infrastructure to the maximum extent feasible**: Employ natural, on-site drainage strategies to minimize the amount of stormwater that flows into pipes or conveyance systems. These strategies include low impact development, green roofs, permeable pavements, bioretention (*e.g.*, vegetated

swales, rain gardens) and cisterns. LCPs can include policies that require green infrastructure be used whenever possible *in lieu* of hard structures. Incorporate sea level rise and extreme storms into the design.

E.2c **Retrofit existing development with inadequate stormwater infrastructure**: Identify and prioritize development in low-lying or other at-risk areas with inadequate stormwater infrastructure and take steps to retrofit these systems to better accommodate sea level rise driven changes. Retrofits should incorporate the green infrastructure options detailed in strategy E.2c above as applicable.

Goal: Minimize adverse effects of wastewater discharges and entrainment

E.3 Add policies to address water quality risks from wastewater treatment plants, septic systems, and ocean outfalls: Consider establishing a program to retrofit, relocate, or eliminate ocean outfalls and other wastewater infrastructure deemed at risk. Alternatives include modifications to outfall lines, the use of green infrastructure, and redesign of waste and stormwater systems.

E.3a **Update siting and design policies**: Add policies to ensure that new ocean outfalls, wastewater treatment facilities, and other facilities that could negatively impact water quality if flooded or inundated, are sited and designed to minimize impacts from sea level rise. Avoid construction of new stormwater outfalls and direct stormwater to existing facilities with appropriate treatment and filtration where feasible. Where new outfalls cannot be avoided, plan, site, and design stormwater outfalls to minimize adverse impacts on coastal resources, including consolidation of existing and new outfalls where appropriate. Consolidate new and existing outfalls where appropriate.

E.3b **Retrofit, relocate, or eliminate outfalls deemed "at risk"**: An ocean outfall is a pipeline or tunnel that discharges municipal or industrial wastewater, stormwater, combined sewer overflows, cooling water, or brine effluents from desalination plants to the sea. LCPs should identify areas where sea level rise could affect flow of wastewater from outfalls and lead to backup and inland flooding, and plans should be made to retrofit, relocate, or eliminate these outfalls to prevent damage and impacts to water quality. Additionally, CDPs for new ocean outfalls should consider sea level rise in the design.

E.3c **Reduce or find alternatives for septic systems in hazardous areas**: Flooding, inundation, and changing groundwater dynamics may result in impacts to septic systems, which rely on leach fields for dispersal of wastewater, that could cause water quality impairments. Options to reduce the potential for these impacts by redesigning or eliminating septic systems in hazardous areas should be identified. New development that will rely on septic systems should be limited in hazardous areas.

Goal: Prevent depletion of groundwater supplies from saltwater intrusion

E.4 **Groundwater Management**: Plan and coordinate monitoring, operation, and administration of a groundwater basin or portion of a groundwater basin with the goal of fostering long-term sustainability of the resource. The LCP can add policies that specify limits or establish other standards for the use of groundwater and sensitive aquifers. These policies should be made in accordance with other regional water planning efforts, such as Integrated Regional Water Plans as well as relevant state water policies. CDPs involving the use of groundwater should address groundwater management issues.

E.4a **Add policies to address saltwater intrusion into aquifers**: Consider adding policies that establish a long-term strategy for addressing saltwater intrusion in aquifers, including limiting development that would use sensitive aquifers as applicable. For some areas of the state, additional information is needed on the site-specific impacts of sea level rise on aquifers. For these areas, the LCP could identify the local information needs and promote the establishment of a research program to increase understanding of the vulnerability of coastal aquifers.

E.4b **Limit groundwater extraction from shallow aquifers**: Groundwater extraction from shallow aquifers can increase susceptibility to saltwater intrusion. Regulating development to limit or prevent extraction and avoid overdraft from vulnerable aquifers can reduce the impacts of saltwater intrusion and preserve fresh groundwater supplies. LCPs or CDPs can add restrictions to the use of aquifers susceptible to saltwater intrusion and can encourage measures to recharge shallow aquifers that are depleted.

E.4c **Relocate wells and water intake facilities**: Identify opportunities to relocate wells and water intake facilities away from hazards and/or areas where saltwater intrusion may be a problem.

E.4d **Restrict development of new wells in sensitive areas**: Require new water wells to be sited away from areas where saltwater intrusion could occur.

E.4e **Limit development that relies on vulnerable water supplies**: Limit or restrict new development in areas that are dependent on water supplies that are or will become susceptible to saltwater intrusion.

E.4f **Ensure adequate long term water supplies:** When siting and designing new development, ensure that adequate and sustainable water sources are available for the lifetime of the development and suitable for the intended use of the development, considering potential impacts of sea level rise and saltwater intrusion upon groundwater supplies.

Goal: Improve long-term water quality through research

E.5 Identify research and monitoring needs to more precisely understand local issues: Research programs may be established to analyze the particular local challenges related to water quality and supply as a result of sea level rise. Opportunities for innovative solutions to these challenges should be identified.

E.5a **Clearly define areas at risk**: The LCP should include an updated inventory of potential pollutant sources due to sea level rise, including toxic waste sites, ocean outfalls and wastewater treatment facilities at risk of inundation, as well as aquifers and wells at risk of saltwater intrusion. Policies may also be added to prioritize low-lying contaminated sites for remediation and restoration.

F. Archaeological and Paleontological Resources

The Coastal Act provides for the protection of archaeological and paleontological resources, stating in Section 30244 that:

> "Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required."

Chapter 3 of the Guidance discusses the impacts to archaeological and paleontological resources that might result from sea level rise. Certified LCPs should already have policies and standards to ensure that these resources are protected to the maximum extent feasible, however, such policies and standards may need to be updated to consider sea level rise hazards. The following strategies cover a range of options for addressing the identified goals of the Coastal Act.

Goal: Protect archaeological and paleontological resources

F.1 **Add policies to protect archeological and paleontological resources from sea level rise:** Add policies to require site-specific evaluation of potential sea level rise impacts to archeological and paleontological resources on a development site. The LCP can also add requirements that a monitoring program and plan be established as a condition of approval for development located on a site with artifacts vulnerable to sea level rise. Adaptation or protection strategies used may depend on the significance of the archaeological resources in question.

F.1a **Consult with relevant tribes for guidance:** If resources are at risk, the appropriate entity or Native American tribe(s) should be contacted to develop a coordinated management plan for artifacts. See, for example, the *California Natural Resources Agency Final Tribal Consultation Policy* for additional guidance.

F.1b **Coordinate with the State Historic Preservation Officer (SHPO):** In line with the provisions of the Coastal Act, work with the State Historic Preservation Officer to identify actions to protect archaeological and paleontological resources.

G. Scenic and Visual Resources

The scenic value of the coast is a resource of public importance. As noted in Section 30251 of the Coastal Act, development shall be sited and designed to:

> "Protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural landforms…and to restore and enhance visual quality in visually degraded areas."

As stated in Chapter 3 of the Guidance, some options to address rising sea levels, such as elevating structures or utilizing seawalls or bluff retention devices, have the potential to alter or degrade the visual character of an area. Certified LCPs should already have policies and standards to ensure scenic and visual resources are protected to the maximum extent feasible, but these may need to be updated to consider sea level rise hazards. Coastal regions with scenic overlays or designated scenic corridors, or those areas designated as scenic in the California Coastal Preservation and Recreation Plan in particular should pay close attention to actions that could be used to minimize risks to development. The following adaptation options address some of the methods for protecting the scenic qualities of the coast.

Goal: Protect views to and along the ocean and scenic coastal areas

G.1 **Establish design standards to protect visual resources**: Update and/or add design standards to ensure that adaptation measures protect visual resources while minimizing hazards. Adaptation strategies such as shoreline armoring or elevation techniques should be designed such that the visuals are subordinate to, and in character with, the surrounding visual resources of an area.

G.1a **Establish standards for the use of caissons or other means of elevating structures:** Ensure that the use of caissons or other elevation techniques do not result in negative visual impacts. Develop policies regarding where elevation of structures may be allowable, and establish standards guiding the use of these techniques. Ensure that the appearance of caissons will not detract from the scenic character of an area if or when they become visible as a result of erosion or other processes.

G.1b **Maintain height limitations in scenic areas**: Avoid modifications to height limits in scenic areas and provide for options to modify roof-lines or elevate the lowest flood elevation for flood protection in a manner that is consistent with scenic character. In some cases it may be appropriate to update height limitations to allow for elevation in response to sea level rise hazards. However, such decisions will require trade-offs and will need to strike a balance in terms of adapting to sea level rise and protecting visual resources and community character in line with the requirements of the Coastal Act.

G.1c **Develop or redevelop property to be safe from hazards without impairing scenic resources**: Emphasize the use of adaptation strategies that will not impact visual resources. Such strategies may include short-term retrofits with plans for longer term relocation or removal.

G.1d **Establish new scenic communities**: Designate areas with significant visual resources that could be negatively impacted by adaptation responses (*e.g.*, due to seawalls or "spider" homes) as scenic communities with special protections. Establish standards in LCPs to specifically protect visual resources in these areas.



Figure 25. Photo depicting protection of visual resources and public access. A seawall visually blends in with the natural bluff while surfing access is also provided at Pleasure Point, Santa Cruz (2013). (*Source:* California Coastal Records Project)

Chapter 8

Legal Context of Adaptation Planning

Land use law is dynamic and must be interpreted and applied based on case-specific factors at the time of decision. Nonetheless, sea level rise and adaptation planning raise a number of important legal issues that coastal managers should consider as they develop and apply adaptation strategies.

This section includes discussion of the legal contexts for addressing:

- Seawalls and other shoreline protective devices
- The public trust boundary
- Potential private property takings issues

SEAWALLS AND OTHER SHORELINE PROTECTIVE DEVICES

Section 30235 of the Coastal Act provides that seawalls and other forms of construction that alter natural shoreline processes "shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply." Despite other Coastal Act provisions that could often serve as the basis for denial of shoreline protective devices (for example, new development requiring shoreline protection can also conflict with Coastal Act policies requiring protection of public access and recreation, coastal waters and marine resources, natural landforms, and visual resources), the Coastal Commission has interpreted Section 30235 as a more specific overriding policy that requires the approval of Coastal Development Permits for construction intended to protect coastal-dependent uses[47] or existing structures if the other requirements of Section 30235 are also satisfied.[48] The Commission thus will generally permit a shoreline protective device if (1) there is an existing structure, public beach, or coastal-dependent use that is (2) in danger from erosion; and (3) the shoreline protection is both required to address the danger (the least environmentally-damaging, feasible alternative) and (4) designed to eliminate or mitigate impacts on sand supply.

In contrast to Section 30235, Coastal Act Section 30253 requires that "new development…assure stability and structural integrity, and neither create nor contribute significantly to erosion…or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs." The Commission has long applied this policy to implement appropriate bluff-top and shoreline setbacks for new development. Such setbacks are based on an assessment of projected erosion and related hazards at the site for the life of the proposed development and help ensure that seawalls and other protective devices that could lead to adverse impacts would not be necessary in the future.

[47] Coastal-dependent uses are those that require a site on, or adjacent to, the sea to be able to function at all. (Public Resources Code, § 30101.)

[48] Some commenters argue that because shoreline armoring often conflicts with Coastal Act policies other than Section 30235, the Commission should evaluate proposed armoring under the conflict resolution provisions of the Act. (See Public Resources Code, § 30007.5, 30200(b).) Because the conflict resolution provisions require the Commission to resolve the conflict in a manner which on balance is the most protective of significant coastal resources, this approach could result in the more frequent denial of shoreline armoring, especially when it is intended to protect residential development or other uses that the Coastal Act does not identify as priority uses.

Additionally, from its earliest days, the Commission has also required that landowners "assume the risks" of developing along shoreline and coastal bluffs where risks of coastal hazards are present. Since at least the late 1990s, the Commission has approved many new developments with required deed restrictions that specifically prohibit any future construction of shoreline protection for these developments. These deed restrictions require that property owners waive any rights that may exist for a shoreline structure under Section 30235 and thus internalize the risks of building in an inherently hazardous location. This, in turn, will protect shoreline areas with natural resources or other access, recreational, or scenic value, including as required by Section 30253. If and when the approved development is threatened by erosion and becomes uninhabitable, these deed restrictions prevent the construction of a shoreline protective device and require property owners to remove the development, as well as clean up any debris that may result from erosion undermining the development.[49]

Read together, the most reasonable and straight-forward interpretation of Coastal Act Sections 30235 and 30253 is that they evince a broad legislative intent to allow shoreline protection for development that was in existence when the Coastal Act was passed, but avoid such protective structures for new development now subject to the Act. In this way, the Coastal Act's broad purpose to protect natural shoreline resources and public access and recreation would be implemented to the maximum extent when new, yet-to-be-entitled development was being considered, while shoreline development that was already entitled in 1976 would be "grandfathered" and allowed to protect itself from shoreline hazards if it otherwise met Coastal Act tests even if this resulted in adverse resource impacts. Such grandfathering of existing conditions is common when new land use and resource protection policies are put in place, and the existing development becomes "non-conforming."

Even still, in the case of Coastal Act Section 30235, existing development is only entitled to shoreline protection if it is in fact in danger, and the proposed shoreline protection is the least environmentally-damaging alternative to abate such danger. It may be that in certain circumstances existing development can be modified or feasibly relocated, or that other non-structural alternatives such as reducing blufftop irrigation or pursuing beach replenishment, may effectively address the risk to the development without the need for a shoreline protective device.

In practice, implementing Sections 30235 and 30253 has been challenging because many urban areas are made up of both developed and undeveloped lots. In addition, many developments in existence in 1976 have since been "redeveloped" through renovations, remodeling, additions, and complete demolition and rebuild. The reality of effective shoreline management is that the Coastal Act and LCPs must address and be applied to a wide variety of physical and legal circumstances that may not be addressed by a simple application of the clean Coastal Act distinction between existing development that may be entitled to shoreline protection and new development that is not. In some urban areas, for example, one may find intermingled shoreline developments that pre-date the Coastal Act, both with and without shoreline protection, post-Coastal Act developments approved by the Coastal Commission or local governments pursuant to an LCP that theoretically won't need shoreline protection (though some may have it), and

[49] This legal instrument is not an easement but it does provide for "planned retreat" into the future as a site erodes. Once a development is removed, a site may have potential for new development if it is once again set back and restricted against future shoreline protection device construction.

developments that may have pre-dated the Coastal Act but that were redeveloped pursuant to a coastal development permit. Moreover, some of the post-Coastal Act developments may have conditions that prohibit shoreline protection while adjacent properties may be eligible for or have a protective device because they pre-date the Act.

For purposes of implementing this Guidance, it is important that local governments, property owners, development applicants, and others take full advantage of available legal tools to mitigate hazards and protect resources, but to do so in way that considers the specific legal context and circumstances of LCP updates and individual development decisions in context and on a case-by-case basis. For example, although the Coastal Act does not explicitly define what qualifies as an "existing structure" for the purposes of Section 30235, how this term is interpreted in specific cases and through LCPs may be critical to the success of an adaptation strategy over the long-run.

The Commission has relatively infrequently evaluated whether structures built after 1976 should be treated as "existing" and thus entitled to shoreline protection pursuant to Section 30235. When it has, the shoreline protection being proposed to protect the structure has often also been identified as necessary to protect adjacent pre-Coastal Act structures.[50] In a few instances, however, the Commission has treated structures built after 1976 as existing structures entitled to shoreline protection even if no adjacent pre-Coastal Act structure also needed protection. Nonetheless, going forward, the Commission recommends the rebuttable presumption that structures built after 1976 pursuant to a coastal development permit are not "existing" as that term was originally intended relative to applications for shoreline protective devices, and that the details of any prior coastal development approvals should be fully understood before concluding that a development is entitled to shoreline protection under Section 30235.

As mentioned, in order to find new development consistent with Section 30253 or related LCP requirements and to limit the potential proliferation of armoring to protect newly approved structures, the Commission has long used setbacks, assumption of risk conditions and, over the last 15-20 years, generally required that applicants proposing new development in hazardous shoreline locations waive any rights under Section 30235 (or related LCP policies) to build shoreline protection for the proposed new development. Notably, no appellate decision addresses whether the term "existing structures" in this context includes only structures built prior to the Coastal Act or instead includes structures in existence at the time the Commission acts on an application for shoreline protection, or otherwise addresses the interplay between 30235 and 30253.

LCP updates are an opportunity to clarify how the distinction between existing and new development will be applied in specific areas, and some LCP's have already done so. For example, local governments have sometimes specified a date by which a structure must have been constructed in order to qualify as an "existing structure" for the purpose of evaluating whether it may be eligible for shoreline protection. In Marin County, the Local Coastal Program

[50] For example, CDP A-3-CAP-99-023-A1, *Swan and Green Valley Corporation Seawall*. In this situation, repairs to maintain a seawall fronting the pre-coastal Swan Residence could only be undertaken by encroachment onto the adjacent property, Green Valley Corporation; however, the Green Valley Corporation development had been approved with a condition to prohibit any future shore protection.

policy that implements Section 30235 specifies that existing structures are those that existed on the date the LCP was originally adopted (May 13, 1982). LCPs can also codify the prohibition on shoreline protective devices for new development, such as the following provision from the San Luis Obispo County North Coast Area Plan standard:

> ***Seawall Prohibition***. *Shoreline and bluff protection structures shall not be permitted to protect new development. All permits for development on blufftop or shoreline lots that do not have a legally established shoreline protection structure shall be conditioned to require that prior to issuance of any grading or construction permits, the property owner record a deed restriction against the property that ensures that no shoreline protection structure shall be proposed or constructed to protect the development, and which expressly waives any future right to construct such devices that may exist pursuant to Public Resources Code Section 30235 and the San Luis Obispo County certified LCP.*[51]

The distinction between existing and new development inherent in the Coastal Act is often directly raised by proposals for redevelopment as well. This Guidance thus deals directly with potential approaches for managing shoreline hazards and protecting coastal resources as shorelines are redeveloped (see Chapter 7, Strategy A.13). Most recently, the Commission approved a Land Use Plan for the City of Solana Beach that includes many policies designed to address the existing residential development pattern along the high, eroding bluffs of the City. Although further elaboration is yet to come through the City's work on the Implementation Plan, the Solana Beach LUP is a good example of an effort to pragmatically address the need to mitigate the risks to residential development, provide for some redevelopment potential while moving the line of new development inland, avoid and minimize new bluff protection and seawalls, and perhaps remove protective devices in the future to minimize impacts to natural landforms and to protect the beach for long-term public use.

Local governments and other shoreline managers should also take into account that although a public agency may not deny a Coastal Development Permit for a shoreline protective device that meets all of the tests under Section 30235 and equivalent LCP policies, this does not limit the authority of public agencies to refuse to allow construction of shoreline protective devices pursuant to some authority other than the Coastal Act. For example, if a private property owner requests permission from a public agency to build a structure on that agency's property (such as a local or State park or public beach) to protect adjacent private property, the public agency would generally have the authority as the landowner not to agree to the encroachment. Similarly, agencies that are trustees of public trust lands (such as the State Lands Commission and Port Districts) have the authority to prohibit structures that are not consistent with public trust uses and prioritized public trust needs, values, and principles. Public trust uses include maritime commerce, navigation, fishing, boating, water-oriented recreation, and environmental preservation and restoration, but do not typically include non-water dependent uses such as residential or general commercial and office uses. Thus, trustee agencies have the authority to refuse to allow, or to require removal of, shoreline armoring located on public trust lands, including if that armoring unreasonably interferes with public trust uses.

[51] Community-wide standard 15C.

Approval of a Coastal Development Permit for shoreline armoring under Section 30235 may be unavoidable in certain circumstances. Nonetheless, the construction of shoreline armoring will often cause impacts inconsistent with other Coastal Act requirements, including Section 30235's requirement that a shoreline protective device be the least-environmentally damaging, feasible alternative for addressing shoreline hazards. For example, as discussed above, Section 30253(b) prohibits *new development* from in any way requiring the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs. Shoreline protective devices can also adversely affect a wide range of other coastal resources and uses that the Coastal Act protects. They often impede or degrade public access and recreation along the shoreline by occupying beach area or tidelands, by reducing shoreline sand supply, and by fixing the back of the beach, ultimately leading to the loss of the beach. Shoreline protection structures thus raise serious concerns regarding consistency with the public access and recreation policies of the Coastal Act. Such structures can fill coastal waters or tidelands and harm marine resources and biological productivity in conflict with Sections 30230, 30231, and 30233. They often degrade the scenic qualities of coastal areas and alter natural landforms in conflict with Section 30251. Finally, by halting shoreline erosion, they can prevent the inland migration of intertidal habitat, salt marshes, beaches, and other low-lying habitats that rising sea levels will inundate.

Even when an agency approves a Coastal Development Permit for shoreline armoring, the agency has the authority to impose conditions to mitigate impacts on shoreline sand supply and to minimize adverse impacts on other coastal resources. (See *Ocean Harbor House Homeowners Assn. v. California Coastal Comm.* (2008) 163 Cal.App.4th 215, 242; Public Resources Code, §30607.)[52] Any approved shoreline structure, therefore, must avoid or mitigate impacts that are inconsistent with Coastal Act policies.

Because of the wide range of adverse effects that shoreline protective devices typically have on coastal resources, this Guidance recommends avoidance of hard shoreline armoring whenever possible. This can entail denying development in hazardous locations, allowing only development that is easily removable as the shoreline erodes, or requiring new development to be set back far enough from wave runup zones or eroding bluff edges so that the development will not need shoreline armoring during its anticipated lifetime. The Commission's practice when reviewing proposed development in shoreline locations that are potentially vulnerable to shoreline erosion, wave runup, or inundation has been to require applicants to waive rights to shoreline protective devices in the future, and, more recently, to require relocation and/or removal should such development become endangered in the future. See Chapter 7: Adaptation Strategies for further details regarding alternatives to the use of hard armoring structures.

PUBLIC TRUST BOUNDARY

The State of California acquired sovereign ownership of all tidelands and submerged lands and beds of navigable waterways upon its admission to the United States in 1850. The State holds and manages these lands for the benefit of all people of the State for statewide purposes consistent with the common law Public Trust Doctrine ("public trust"). The public trust ensures that title to sovereign land is held by the State in trust for the people of the State. Public trust

[52] Indeed, as noted above, 30235 itself clarifies that even when approvable, such structures should be designed to eliminate or mitigate any adverse impacts on local shoreline sand supply.

uses include maritime commerce, navigation, fishing, boating, water-oriented recreation, visitor-serving facilities and environmental preservation and restoration. Non-water dependent uses such as residential and general office or commercial uses are generally inconsistent with public trust protections and do not qualify as public trust uses.

In coastal areas, the landward location and extent of the State's sovereign fee ownership of these public trust lands are generally defined by reference to the ordinary high water mark (Civil Code §670), as measured by the mean high tide line (*Borax Consolidated v. City of Los Angeles* (1935) 210 U.S. 10); these boundaries remain ambulatory, except where there has been fill or artificial accretion. More specifically, in areas unaffected by fill or artificial accretion, the ordinary high water mark and the mean high tide line will generally be the same. In areas where there has been fill or artificial accretion, the ordinary high water mark (and the state's public trust ownership) is generally defined as the location of the mean high tide line just prior to the fill or artificial influence. It is important to note that such boundaries may not be readily apparent from present day site inspections (*Carpenter v. City of Santa Monica* (1944) 63 C. A. 2nd 772, 787).

The mean high tide line is the intersection of the shoreline with the elevation of the average of all high tides calculated over an 18.6-year tidal epoch. This property line is referred to as "ambulatory" for two reasons: first, gradual changes to the shoreline due to factors such as variations in the height and width of sandy beaches, shoreline erosion or accretion, and uplift or subsidence of land can change the location of where the mean high tide line meets the shoreline. Second, the elevation of the mean high tide line itself changes over time and is likely to increase at an accelerating rate in the future due to sea level rise. Over time, sea level rise will continue to gradually cause the public trust boundary to move inland. Boundaries between publicly-owned waterways and adjoining private properties (referred to as *littoral* along lakes and seas and *riparian* along rivers and streams) have always been subject to the forces of nature and property boundary law reflects these realities.

Accelerating sea level rise will likely lead to more disputes regarding the location of property boundaries along the shoreline, since lands that were previously landward of the mean high tide line have become subject to the State's ownership and protections of the public trust. These disputes, in turn, will affect determinations regarding what kinds of structures and uses may be allowed or maintained in areas that, because of sea level rise, either are already seaward of the mean high tide line, are likely to become seaward of the mean high tide line in the future, or would be seaward of the mean high tide line if it were not for artificial alterations to the shoreline.

California case law does not explicitly address how shoreline structures such as seawalls that artificially fix the shoreline temporarily and prevent inland movement of the mean high tide line affect property boundaries, if at all. The Ninth Circuit Court of Appeals, however, has interpreted federal common law as allowing the owner of tidelands to bring a trespass action against a neighboring upland property owner who built a revetment that prevented the natural inland movement of the mean high tide line. The court ruled that the actual property boundary was where the mean high tide line would have been if the revetment were not there and that the owner of the tidelands could require the upland owners to remove the portions of the revetment

that were no longer located on the upland owners' properties. (*United States v. Milner* (9th Cir. 2009) 583 F.3d 1174, 1189-1190.)

POTENTIAL PRIVATE PROPERTY TAKINGS ISSUES

The United States and California constitutions prohibit public agencies from taking private property for public use without just compensation. Section 30010 of the Coastal Act similarly prohibits public agencies implementing the Coastal Act from granting or denying a permit in a manner that takes or damages private property for public use without payment of just compensation. The classic "takings" scenario arises when a public agency acquires title to private property in order to build a public facility or otherwise devote the property to public use. In 1922, however, the United States Supreme Court ruled that regulation of private property can constitute a taking even if the regulation does not involve acquisition of title to the property. As Justice Oliver Wendell Holmes stated, "while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking," (*Pennsylvania Coal Co. v. Mahon* (1922) 260 U.S. 393, 415.)

Courts have struggled in the 90 years since then to give agencies and property owners a more definite sense of exactly when a regulation "goes too far." The Supreme Court has identified three basic categories of takings that can occur in the context of land use regulation. Different legal standards apply depending on what kind of taking is at issue. (See, generally, *Lingle v. Chevron USA, Inc.* (2005) 544 U.S. 528).

The most straightforward test applies to what is variously called a categorical, total, *per se*, or *"Lucas"* takings, which occurs when a regulation deprives an owner of all economically beneficial use of the property. (See *Lucas v. South Carolina Coastal Council* (1992) 505 U.S. 1003). An agency that completely deprives a property owner of all economically beneficial use of the property will likely be found liable for a taking unless background principles of nuisance or property law independently restrict the owner's intended use of the property. Courts have generally been very strict about when they apply this test. If any economically beneficial use remains after application of the regulation, even if the value of that use is a very small percentage of the value of the property absent the regulatory restriction, a *Lucas* taking has not occurred.

Where a regulation significantly reduces the value of private property but does not completely deprive the owner of all economically beneficial use, the multi-factor "*Penn-Central"* test applies (*Penn Central Transportation Co. v. City of New York* (1978) 438 U.S. 104). This test has no set formula, but the primary factors include the economic impact of the regulation, the extent to which the regulation interferes with distinct, reasonable investment-backed expectations, and the character of the governmental action. When evaluating the character of the governmental action, courts consider whether the regulation amounts to a physical invasion or instead more generally affects property interests through a program that adjusts the burdens and benefits of economic life for the common good. Whether a regulation was in effect at the time an owner acquired title is also a relevant factor, but is not by itself dispositive. (See *Palazzolo v. Rhode Island* (2001) 533 U.S. 606, 632-633 (O'Connor, J., concurring)). Because this test takes such a wide range of factors into account, caselaw does not provide clear guidance about the situations in which a regulation is likely to qualify as a "*Penn-Central"* taking. A *Penn-Central*

claim is unlikely to succeed, however, unless the plaintiff can establish that the regulation very substantially reduces the value of the property.

The third category of takings claims applies to "exactions," that is, government permitting decisions that require a property owner either to convey a property interest or to pay a mitigation fee as a condition of approval. (See *Nollan v. California Coastal Comm.* (1987) 483 U.S. 825; *Dolan v. City of Tigard* (1994) 512 U.S. 374; *Koontz v. St. Johns River Water Management Dist.* (2013) 133 S.Ct. 2586). Under the *Nollan/Dolan* line of cases, the agency must establish a "nexus" between the condition requiring a property interest or payment and the effects of the project that that property interest or payment is mitigating. That property interest or payment must also be roughly proportional to the impact that it is intended to mitigate. In California, the *Ocean Harbor House* case is a good example of a shoreline structure impact mitigation requirement that was found by the courts to meet the relevant standards of nexus and proportionality.

Various recommendations of this Guidance may potentially give rise to takings concerns. Because the determination of whether a particular regulation may in some circumstances be applied in a way that constitutes a taking is so fact-intensive and context-specific, this Guidance cannot provide a simple set of parameters for when agencies should either allow exceptions to a land use regulation or consider purchasing a property interest. That said, land use restrictions that prevent all economically beneficial use of the entirety of a property[53] are vulnerable to *Lucas* takings claims unless those uses would qualify as a nuisance or are prohibited by property law principles such as the public trust doctrine. Agencies can minimize the risk of these claims by allowing economically beneficial uses on some of the property and by exploring whether legal doctrines regarding nuisance, changing shoreline property lines, or the public trust independently allow for significant limitations on the use of the property. Establishing a transferrable development rights program for properties that are subject to significant development restrictions may also minimize potential exposure to takings claims.

Where a proposed development would be safe from hazards related to sea level rise in the near future, but cannot be sited so as to avoid those risks for the expected life of the structure, agencies may consider allowing the structure, but requiring removal once it is threatened. Property owners may argue that they have a right to protect threatened structures even if they have waived rights to shoreline protection under the Coastal Act, but a recent federal court of appeal ruling casts significant doubt on the existence of any common law right to attempt to fix an ambulatory shoreline boundary through artificial structures such as seawalls (see *United States v. Milner* (9th Cir. 2009) 583 F.3d 1174, 1189-1190).

If an agency is contemplating requiring property owners to dedicate open space easements or other property interests or requiring the payment of fees to mitigate project impacts, the agency should be careful to adopt findings explaining how requiring the property interest or payment is

[53] What qualifies as the entirety of a property can also be the subject of dispute. The property will normally include all legal lots on which the proposed development would be located, but can also include other lots that are in common ownership and adjacent to, or in close proximity with, the lots that would be developed. (See *Norman v. United States* (Fed. Cir. 2005) 429 F.3d 1081, 1091; *District Intown Properties Limited Partnership v. District of Columbia* (D.C. Cir. 1999) 198 F.3d 874, 880.).

both logically related to mitigating an adverse impact of the project and roughly proportional to that impact. Legislatively adopting rules that establish the exact criteria for determining when to require these exactions and, if so, their magnitude, may also reduce an agency's exposure to takings claims.[54] With respect to mitigation fees, California cities and counties should also comply with applicable requirements of the Mitigation Fee Act (Government Code, §66000 *et seq.*).

[54] The California Supreme Court has ruled that courts should be more deferential towards agencies when reviewing fees imposed pursuant to legislatively enacted rules of general applicability than when reviewing fees imposed on an ad hoc basis. (*Ehrlich v. City of Culver City* (1996) 12 Cal.4th 854, 881.) The rationale is that fees imposed pursuant to rules of general applicability that involve little discretion are less likely to impose disproportionate burdens on property owners than fees determined on an ad hoc basis.

Chapter 9

Next Steps

CURRENT AND FUTURE COASTAL COMMISSION EFFORTS:

The Commission has a Strategic Plan for 2013-2018 (2013a) that identifies many action items that the Commission or partner organizations plan to take to address the challenges of sea level rise and climate change. The first priority in the Strategic Plan is for the Commission to adopt Sea Level Rise Policy Guidance for use in Local Coastal Program (LCP) planning and project design (Action 3.1.1), and this Guidance reflects significant progress toward accomplishing this task. The objectives and action items from the Strategic Plan related to sea level rise and climate change are presented within the following pages.

The Commission is also involved in a number of other efforts that meet the climate change planning goals laid out in its Strategic Plan. These include efforts related to the Commission's normal operating business, such as ongoing coordination with local government partners and other agencies, as well as specially funded projects designed to meet specific needs. Several of these efforts that are currently underway or that staff identified as next steps during the completion of this Guidance document are listed below. The Commission anticipates that these items will be completed over the next two to five years, in coordination with other relevant partners and research institutions, as staff capacity and funding allows.

1. **Continue an active program of public outreach on sea level rise.** The Commission will strive to provide public information about sea level rise issues through public workshops, the Commission's website, meetings, outreach, and our public education program. The Commission will work to enhance efforts to coordinate with low-income and underserved populations and communities.

2. **Develop methods for quantifying impacts to coastal resources from shoreline armoring projects.** The Coastal Commission staff has initiated a Project of Special Merit (funded by NOAA) to build upon the Commission's existing efforts to mitigate for the adverse impacts of shoreline development projects to public access and recreation by working with beach ecologists and a valuation economist to develop a method to quantify impacts to biological resources and beach ecology. The final product is anticipated to be a set of guidelines to use in assessing the impacts of proposed shoreline armoring projects and a method(s) for calculating the full value of recreational and ecological loss resulting from installation of shoreline armoring projects (where they may be approved as consistent with the Coastal Act).

3. **Adopt policy guidance and model ordinance language for resilient shoreline residential development in hazardous areas affected by sea level rise.** Under another NOAA-funded Project of Special Merit, the Coastal Commission will conduct a statewide survey to characterize physical shoreline conditions for residential areas along the coast. Informed by this assessment, staff will identify and analyze policy and legal issues for development and redevelopment in hazardous areas, factoring in sea level rise projections that will change shoreline conditions over time. Working collaboratively with local governments, staff will use the policy and legal analysis to develop policy guidance and model ordinance language. The project will build upon this Guidance and is consistent with the Coastal Commission's Strategic Plan goals.

4. **Enhance coordination and planning efforts related to developing adaptation strategies for critical infrastructure.** Addressing sea level rise impacts to critical infrastructure is particularly complex and will require greater amounts of planning time, stakeholder input, and funding. The Commission will support planning efforts in a number of ways including, for example:

    a. Providing guidance or participating in working groups that examine managed retreat of critical infrastructure, including when to consider managed retreat rather than continue with repairs and maintenance in light of sea level rise.

    b. Coordinating closely with Caltrans to address transportation issues. Planning efforts may include integrating LCP planning and regional transportation planning processes; coordinating and supporting phased approaches for realignment projects; and identifying priorities for adaption response.

    c. Coordinating with port and harbor authorities and other relevant stakeholders to address vulnerabilities specific to ports, harbors, fisheries, and navigation, and to develop and enhance adaptation strategies that are particularly applicable for coastal-dependent infrastructure and other port needs.

    d. Coordinating with the State and Regional Water Quality Control Boards to consider vulnerability issues related to water supply and wastewater capacity infrastructure in California.

5. **Consider producing additional guidance documents, including**:

    a. Broader climate change guidance addressing other climate change impacts to the coastal zone.

    b. One-page fact sheets on some adaptation measures such as green infrastructure and conservation easements.

    c. Guidance on the use of ‘living shorelines’, dune management, beach nourishment, and so on for California, including an assessment of areas or coastal situations where these strategies could be effective, what they need to succeed, monitoring requirements, and maintenance.

    d. Guidance for how to address impacts to critical infrastructure, assets and resources that cross jurisdictional boundaries, and ports, harbors and other coastal-dependent resources.

6. **Implement the Coastal Commission’s responsibilities under other state efforts and legislation.**

    a. Governor Brown’s April 2015 Executive Order B-30-15 states that state agencies shall take climate change into account in their planning and investment decisions, and employ full life-cycle cost accounting to evaluate and compare infrastructure investments and alternatives. The order requires agencies to ensure that priority is given to actions that build climate preparedness and reduce greenhouse gas emissions, provide flexible and adaptive approaches, protect the state's most vulnerable

populations, and promote natural infrastructure solutions. The Coastal Commission will continue to integrate these principles into its planning and regulatory work.

b. AB2516, authored by Assemblymember Gordon and approved in September 2014, established a *Planning for Sea Level Rise Database* that is anticipated to be available online in early 2016. The database will provide the public with an educational tool from which to learn about the actions taken by cities, counties, regions, and various public and private entities to address sea level rise. The Coastal Commission will contribute data to this effort, including information about grant-funded LCP updates.

c. The Coastal Commission will also participate in the implementation of the 2014 *Safeguarding California* plan, along with the Ocean Protection Council's 2014 Resolution on the Implementation of the Safeguarding California Plan. Key principles are and will continue to be incorporated into Coastal Commission work, including protection of California's most vulnerable populations the integration of risk reduction with emissions reductions, and the development of metrics and indicators of progress on efforts to reduce climate risk.

Coastal Commission Strategic Plan 2013-2018 Excerpts
Actions Related to Sea Level Rise and Climate Change

GOAL 1: Maximize Public Access and Recreation

Objective 1.1 – Enhance Public Access through Updated Beach Access Assessment and Constraints Analysis

Actions:

1.1.5 Identify locations where access may be limited or eliminated in the future due to sea level rise and increased storm events and begin planning for other options such as new vertical accessways to maintain maximum beach access (see also Action 3.2.1).

Objective 1.4 – Expand the California Coastal Trail System through Enhanced Planning and Implementation

Actions:

1.4.4 Identify locations of the CCT that might be at risk from rising sea level and increased storm events and begin planning for trail relocations or other alternatives to insure continued functionality of the CCT (see also Action 3.2.1).

GOAL 3: Address Climate Change through LCP Planning, Coastal Permitting, Inter-Agency Collaboration, and Public Education

Objective 3.1 – Develop Planning and Permitting Policy Guidance for Addressing the Effects of Climate Change on Coastal Resources

Actions:

3.1.1 Adopt general sea level rise (SLR) policy guidance for use in coastal permitting and LCP planning, and amendments based on best available science, including the final report

from the National Research Council of the National Academy of Science entitled *Sea-Level Rise for the Coasts of California, Oregon, and Washington* (June 2012).

3.1.2 Based on the general SLR policy guidance, identify and develop specific regulatory guidance for addressing coastal hazards, including recommendations for analytic methods for accounting for SLR and increased storm events in project analysis, standards for redevelopment and development in hazard zones (*e.g.*, bluff top and flood zones), buffers for coastal wetlands, and policies for shoreline structure design and impact mitigation.

3.1.3 Develop a work program to produce policy guidance for coastal permitting and LCPs, to account for other climate change related impacts and adaptation planning including wetland, marine and terrestrial habitat protection, habitat migration, risk of wildfires, water supply and groundwater protection.

3.1.4 Provide public information and guidance through workshops, presentations to local government, *etc.* Assist local governments with interpretation of scientific or other technical information related to climate change and sea level rise that could be of use in adaptation planning.

3.1.5 Contribute to relevant state-wide efforts on climate change and adaptation as a member of the State's Climate Action Team – Coast and Ocean Working Group.

3.1.6 Coordinate with Natural Resources Agency, Office of Planning and Research, California Governor's Office of Emergency Services (Cal OES) and others to provide consistent guidance on climate change in updating general plans, hazard mitigation plans and other planning documents used by local governments.

3.1.7 Coordinate with the State Lands Commission to address sea level rise and shoreline change and implications for the management of public trust resources.

Objective 3.2 – Assess Coastal Resource Vulnerabilities to Guide Development of Priority Coastal Adaptation Planning Strategies

Actions:

3.2.1 Conduct a broad vulnerability assessment of urban and rural areas to identify priority areas for adaptation planning, such as community development, public infrastructure, public accessways, open space or public beaches at risk from sea level rise. Identify and participate in on-going vulnerability assessments and adaptation planning efforts as feasible.

3.2.2 Work with CalTrans and other public agency partners to assess and address roadway, rail, and other transportation infrastructure vulnerabilities, particularly along Highway One and other coastal roads and highways.

3.2.3 Work with the Department of Water Resources, State Water Resources Control Board, and local agencies to assess and address water and wastewater treatment plant vulnerabilities along the coast.

3.2.4 Work with the Conservancy, California Department of Fish and Game *[sic]*, US Fish and Wildlife, and other partners to assess the vulnerability of wetlands and other sensitive habitat areas. Identify habitats that are particularly vulnerable climate change and/or

habitats that may be important for future habitat migration (*e.g.*, wetland transitional areas).

3.2.5 Work with the Coastal Observing Systems, researchers, and others to identify and develop baseline monitoring elements to better understand and monitor changes in coastal conditions related to sea level rise and other climate change impacts.

3.2.6 With the Conservancy and OPC, develop and implement a competitive grant program to provide funding to selected local governments to conduct vulnerability assessments and/or technical studies that can be used to assess a community's risks from climate change and inform updates to LCPs.

ADDITIONAL RESEARCH NEEDS

Additional research is needed to more fully understand and prepare for sea level rise. The research needs are directed toward research institutions at academic, state, federal, and local levels. The Commission will strive to collaborate with and support research related to sea level rise science and adaptation, including with the efforts and ongoing work of the California Climate Change Research Plan.

1. **Modeling.** Sea level rise science is an evolving field, and new science is expected to change and refine our understanding of the dynamics of sea level rise and its associated impacts to both natural and built environments. As such, there is a continual need for models to be developed, updated, and refined to ensure that we continue to have the best understanding of sea level rise-related impacts as possible. In some cases, the modelling capabilities already exist, but there is a need for such modelling to be applied to local areas to understand specific localized impacts. Several topics in particular that are in need of better or more refined modeling include:
    a. Fluvial dynamics as they relate to and interact with rising sea levels
    b. Habitat evolution models (*e.g.*, SLAMM) that project future locations of wetlands and other coastal habitats
    c. The interaction of other climate change-related impacts with the impacts of sea level rise (*e.g.*, changing precipitation patterns, increased frequency and/or intensity of storms)

2. **Improved estimates of local vertical land motion.** Several independent processes – glacial isostatic rebound, groundwater withdrawals, plate movements and seismic activity – influence vertical land motion. Current guidance on sea level projections adjusts for large-scale vertical land motion north and south of Cape Mendocino. These adjustments do not properly address locations that are moving differently from the region, such as Humboldt Bay. A peer-reviewed methodology is needed to determine:
    a. Instances when it will be important to modify the regional sea level rise projections for local vertical land motion
    b. Types of existing information on land motion (*e.g.*, tide gauge records, satellite data, land-based GPS stations) that provide the best estimates of local land trends

c. A procedure for adjusting state or regional sea level rise projections for sub-regional or local conditions

d. Additional data that are needed to implement this procedure

3. **Baseline data and monitoring systems**. Baseline monitoring data are needed for coastal and nearshore waters, beaches, bluffs, dune systems, nearshore reefs, tide pools, wetlands, and other habitat areas to better understand these systems, monitor trends, and detect significant deviations from historic conditions that may be related to sea level rise and other aspects of climate change. Better storm event monitoring data are also needed to support refinements and calibration of models used to project and analyze impacts.

   A system for monitoring and tracking the cumulative impacts of projects in the coastal zone, including both new development and any adaptation strategies, is needed to better understand the impacts of development in the face of sea level rise and the efficacy of various adaptation methods. Monitoring systems may be needed at a variety of scales, including at the local, regional, and state level.

4. **Methods for estimating change in erosion rates and shoreline change due to future sea level rise.** There is a need for a peer-reviewed methodology for estimating change in erosion rates due to sea level rise for bluffs, beaches, and other shorelines exposed to erosion. An improved understanding of future erosion rates is necessary to better evaluate projects affected by such erosion, including in terms of calculating an appropriate setback distance.

5. **Analysis of sea level rise impacts to coastal access and recreation.** To improve public access planning efforts, more information is needed about how sea level rise could affect public access areas and recreation throughout the state, including changes to waves and surfing, and the potential economic costs of these impacts. Additional information about how these changes will affect lower-income populations and underserved communities is particularly important.

   Many currently accessible beach areas have the potential to become inaccessible due to impacts from sea level rise. Shoreline armoring and emerging headlands could isolate connected beaches with sea level rise, which will block lateral access. Rising sea level will also tend to constrict beaches that are prevented from migrating landward by shoreline armoring and development. Some blufftop trails will become inaccessible as segments of trail are lost to erosion. In addition, changes in beach conditions and sediment dynamics due to sea level rise could affect waves and surfing, as can the rise itself by potentially 'drowning out' surf spots combined with the lack of space available for these spots to move (*e.g.*, where new 'tripping' elements can be encountered in the right depth of water to create surfable waves). Research on the specifics of these impacts will help the Commission and others understand the details of the potential impacts to coastal access and recreation.

6. **Methods to evaluate impacts to coastal resources from shoreline protection.** Research is needed to develop and improve methods to evaluate and mitigate for the adverse impacts to recreation, public access and beach ecology from shoreline armoring projects. This information will be used to determine a set of mitigation options that may be considered for use when evaluating individual permit applications to offset anticipated losses to beach

ecology and resources caused by shoreline armoring projects. The Coastal Commission staff is currently working on developing resource valuation guidelines as part of a Project of Special Merit (see Coastal Commission Effort #2).

7. **Analysis of sea level rise impacts to wetlands and strategies for preserving wetlands throughout the state.** Additional research is needed to assess the vulnerability of wetlands and other sensitive habitat areas to climate change, and to identify adjacent areas that may be important for future habitat migration (*e.g.*, wetland transitional areas). Further work is also needed to develop management strategies that are adaptable to local wetland conditions and sea level rise impacts, such as the following:
    a. Methodologies for establishing natural resource area buffer widths in light of sea level rise
    b. Approaches for identifying and protecting migration corridors
    c. Guidance for increasing wetland sediment supply and retention
    d. Techniques for developing an adaptive wetland restoration plan
    e. Monitoring criteria

8. **Assessment of coastal habitat functions in light of sea level rise and other climate change impacts.** It is necessary to develop a better understanding of the value and benefits that intact natural habitats provide, especially as they relate to increasing coastal resiliency to sea level rise. In addition, further research is needed to identify the coastal habitats that are most likely to experience adverse impacts from sea level rise and extreme storms, and what the associated loss of ecosystem services will mean for coastal populations. Research is also needed to identify strategies to ameliorate the vulnerabilities.

9. **Potential effects of sea level rise on groundwater and coastal aquifers.** Additional research is needed to quantify the potential effect of sea level rise on freshwater aquifers located along the California coast, and the degree to which sea level rise could lead to new incidences of intrusion. Research should include: (a) an evaluation of the potential incidence and severity of saltwater intrusion at the scale of individual aquifers, under various sea level rise scenarios, (b) criteria to use when deciding if saltwater intrusion requires mitigation or response and (c) identification of strategies to address the impacts rising groundwater and saltwater intrusion have on agriculture.

10. **Analysis of non-environmental factors that influence sea level rise adaptation.** As suggested in a number of places throughout this Guidance, there are factors beyond just environmental concerns that will influence sea level rise planning. Such factors include environmental justice/social equity, economic, and legal considerations, among others. Understanding how these social concerns interact with environmental vulnerabilities will be important when assessing adaptation planning opportunities and challenges.



Glossary

The following terms were collected from the 2009 *California Climate Change Adaptation Strategy*[55], the Intergovernmental Panel on Climate Change Third Assessment Report[56], the Coastal Commission's Beach Erosion and Response (BEAR) document,[57] and the California Coastal Act, unless otherwise noted. Some of these definitions are not used in the text of the report, but are included as a resource on coastal-related adaptation issues.

Adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which minimizes harm or takes advantage of beneficial opportunities.

Adaptive capacity: The ability of a system to respond to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, and to cope with the consequences.[58]

Adaptive management: Involves monitoring the results of a management decision, and updating actions as needed and as based on new information and results from the monitoring.

Ambulatory (*as used in public trust boundaries*): Moveable, subject to change, or capable of alteration.[59]

Aquifer: An underground layer of porous rock, sand, or other earth material containing water, into which wells may be sunk.

Armor: To fortify a topographical feature to protect it from erosion (*e.g.*, constructing a wall to armor the base of a sea cliff), or to construct a feature (*e.g.*, a seawall, dike, or levee) to protect other resources (*e.g.*, development or agricultural land) from flooding, erosion, or other hazards.

Atmosphere-Ocean General Circulation Models (or Atmosphere-Ocean General Climate Models; ACGOM): Three-dimensional global models that dynamically link ocean density, circulation, and sea level using wind stress, heat transfer between air and sea, and freshwater fluxes as critical variables. (See also *General Circulation Models*)

Baseline (or Reference): Any datum against which change is measured. It might be a "current baseline," in which case it represents observable, present-day conditions. It might also be a "future baseline", which is a projected future set of conditions excluding the driving factor of interest (*e.g.*, how would a sector evolve without climate warming). It is critical to be aware of what change is measured against which baseline to ensure proper interpretation. Alternative interpretations of the reference conditions can give rise to multiple baselines.[60]

[55] CNRA 2009

[56] IPCC 2001

[57] Many of these definitions were extracted from: USACE 1984, Griggs and Savoy 1985 and Flick 1994.

[58] Willows and Connell 2003

[59] *West's Encyclopedia of American Law* 2008

[60] Moser 2008

Beach: The expanse of sand, gravel, cobble or other loose material that extends landward from the low water line to the place where there is distinguishable change in physiographic form, or to the line of permanent vegetation. The seaward limit of a beach (unless specified otherwise) is the mean low water line.

Beach nourishment: Placement of sand and/or sediment (*e.g.*, beneficial re-use of dredged sediment) on a beach to provide protection from storms and erosion, to create or maintain a wide(r) beach, and/or to aid shoreline dynamics throughout the littoral cell. The project may include dunes and/or hard structures as part of the design.

Bluff (or Cliff): A scarp or steep face of rock, weathered rock, sediment and/or soil resulting from erosion, faulting, folding or excavation of the land mass. The cliff or bluff may be a simple planar or curved surface or it may be step-like in section. For purposes of (the Statewide Interpretive Guidelines), "cliff" or "bluff" is limited to those features having vertical relief of ten feet or more and "seacliff" is a cliff whose toe is or may be subject to marine erosion.

Bluff top retreat (or Cliff top retreat): The landward migration of the bluff or cliff edge, caused by marine erosion of the bluff or cliff toe and subaerial erosion of the bluff or cliff face.

Caisson: A supporting piling constructed by drilling a casing hole into a geologic formation and filling it with reinforcing bar and concrete; used for foundations. (See also *Piling*)

Climate change: Any long-term change in average climate conditions in a place or region, whether due to natural causes or as a result of human activity.

Climate variability: Variations in the mean state of the climate and other statistics (*e.g.*, standard deviations, the occurrence of extremes) on all temporal and spatial scales beyond that of individual weather events.

Coastal-dependent development or use: Any development or use which requires a site on, or adjacent to, the sea to be able to function at all.[61]

Coastal-related development: Any use that is dependent on a coastal-dependent development or use.[62]

Coastal resources: A general term used throughout the Guidance to refer to those resources addressed in Chapter 3 of the California Coastal Act, including beaches, wetlands, agricultural lands, and other coastal habitats; coastal development; public access and recreation opportunities; cultural, archaeological, and paleontological resources; and scenic and visual qualities.

Development: On land, in or under water, the placement or erection of any solid material or structure; discharge or disposal of any dredged material or of any gaseous, liquid, solid, or

[61] Public Resources Code § 30101

[62] Public Resources Code § 30101.3

thermal waste; grading, removing, dredging, mining, or extraction of any materials; change in the density or intensity of use of land, including, but not limited to, subdivision pursuant to the Subdivision Map Act (commencing with Section 66410 of the Government Code), and any other division of land, including lot splits, except where the land division is brought about in connection with the purchase of such land by a public agency for public recreational use; change in the intensity of use of water, or of access thereto; construction, reconstruction, demolition, or alteration of the size of any structure, including any facility of any private, public, or municipal utility; and the removal or harvesting of major vegetation other than for agricultural purposes, kelp harvesting, and timber operations which are in accordance with a timber harvesting plan submitted pursuant to the provisions of the Z'berg-Nejedly Forest Practice of 1973 (commencing with Section 4511).[63]

Ecosystem-Based Management (EBM): An integrated approach to resource management that considers the entire ecosystem, including humans, and the elements that are integral to ecosystem functions.[64]

Ecosystem services: Benefits that nature provides to humans. For example, plants, animals, fungi and micro-organisms produce services or goods like food, wood and other raw materials, as well as provide essential regulating services such as pollination of crops, prevention of soil erosion and water purification, and a vast array of cultural services, like recreation and a sense of place.[65]

Emissions scenarios: Scenarios representing alternative rates of global greenhouse gas emissions growth, which are dependent on rates of economic growth, the success of emission reduction strategies, and rates of clean technology development and diffusion, among other factors.[66]

Environmentally Sensitive [Habitat] Area (ESHA): Any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments.[67]

Erosion: The wearing away of land by natural forces; on a beach, the carrying away of beach material by wave action, currents, or the wind. Development and other non-natural forces (*e.g.*, water leaking from pipes or scour caused by wave action against a seawall) may create or worse erosion problems.

Eustatic: Refers to worldwide changes in sea level.

[63] Public Resources Code § 30106

[64] NOC 2011

[65] Hassan *et al.* 2005

[66] Bedsworth and Hanak 2008

[67] Public Resources Code § 30107.5

Feasible (*as used in "least environmentally damaging feasible alternative"*): Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors.[68]

Flood (or Flooding): Refers to normally dry land becoming temporarily covered in water, either periodically (*e.g.*, tidal flooding) or episodically (*e.g.*, storm or tsunami flooding).[69]

General Circulation Models (or General Climate Models; GCM): A global, three-dimensional computer model of the climate system which can be used to simulate human-induced climate change. GCMs are highly complex and they represent the effects of such factors as reflective and absorptive properties of atmospheric water vapor, greenhouse gas concentrations, clouds, annual and daily solar heating, ocean temperatures and ice boundaries. The most recent GCMs include global representations of the atmosphere, oceans, and land surface.[70] (See also *Atmospheric-Ocean General Circulation Models*)

Green infrastructure: Refers to the use of vegetative planting, dune management, beach nourishment or other methods that mimic natural systems to capitalize on the ability of these systems to provide flood and erosion protection, stormwater management, and other ecosystem services while also contributing to the enhancement or creation of natural habitat areas.

Greenhouse gases (GHGs): Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, carbon dioxide, methane, nitrous oxide, ozone, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride.[71]

Hard protection: A broad term for most engineered features such as seawalls, revetments, cave fills, and bulkheads that block the landward retreat of the shoreline. (See also *Revetment, Seawall, Shoreline protective devices*)

Impact assessment: The practice of identifying and evaluating the detrimental and beneficial consequences of climate change on natural and human systems.

Inundation: The process of dry land becoming permanently drowned or submerged, such as from dam construction or from sea level rise.[72]

Local Coastal Program (LCP): A local government's (a) land use plans, (b) zoning ordinances, (c) zoning district maps, and (d) within sensitive coastal resources areas, other implementing actions, which, when taken together, meet the requirements of, and implement the provisions and policies of, this division at the local level.[73]

[68] California Coastal Act § 30108

[69] Flick *et al.* 2012

[70] NASA Earth Observatory Glossary

[71] UNFCCC 2004

[72] Flick *et al.* 2012

[73] Public Resources Code § 30108.6

Mean sea level: The average relative sea level over a period, such as a month or a year, long enough to average out transients such as waves and tides. Relative sea level is sea level measured by a tide gauge with respect to the land upon which it is situated. (See also *Sea level change/sea level rise*)

Mitigation (*as used in climate science*): A set of policies and programs designed to reduce emissions of greenhouse gases.[74]

Mitigation (*as used in resource management*): Projects or programs intended to offset impacts to resources.

Monitoring: Systematic collection of physical, biological, chemical, or economic data, or a combination of these data on a project in order to make decisions regarding project operation or to evaluate project performance.

Passive erosion: The process whereby erosion causes the shoreline to retreat and migrate landward of any hardened structures that have fixed the location of the back beach therefore resulting in the gradual loss of beach in front of the hardened structure.

Permit: Any license, certificate, approval, or other entitlement for use granted or denied by any public agency which is subject to the provisions of this division.[75]

Piling (or Pile): A long, heavy timber or section of concrete or metal driven or drilled into the earth or seabed to serve as a support or protection. (See also *Caisson*)

Potential impacts: All impacts that may occur given a projected change in climate, including impacts that may result from adaptation measures.

Public Trust Lands: All lands subject to the Common Law Public Trust for commerce, navigation, fisheries, recreation, and other public purposes. Public Trust Lands include tidelands, submerged lands, the beds of navigable lakes and rivers, and historic tidelands and submerged lands that are presently filled or reclaimed and which were subject to the Public Trust at any time.[76] (See also *Tidelands, Submerged lands*)

Radiative forcing: Radiative forcing is a measure of the influence a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism. In [the IPCC] report radiative forcing values are for changes relative to pre-industrial conditions defined at 1750 and are expressed in Watts per square meter (W/m^2).[77]

[74] Luers and Moser 2006

[75] Public Resources Code § 30110

[76] Public Resources Code § 13577

[77] IPCC 2007

Redevelopment: At a minimum, replacement of 50% or more of an existing structure. LCPs may also consider including limits on the extent of replacement of major structural components such as the foundation or exterior walls, or improvements costing more than 50% of the assessed or appraised value of the existing structure**.**

Revetment: A sloped retaining wall; a facing of stone, concrete, blocks, rip-rap, *etc.* built to protect an embankment, bluff, or development against erosion by wave action and currents. (See also *Hard protection, Seawall, Shoreline protective devices*)

Risk: Commonly considered to be the combination of the likelihood of an event and its consequences – *i.e.*, risk equals the probability of climate hazard occurring multiplied the consequences a given system may experience.[78]

Scenario-based analysis: A tool for developing a science-based decision-making framework to address environmental uncertainty. In general, a range of plausible impacts based on multiple time scales, emissions scenarios, or other factors is developed to inform further decision-making regarding the range of impacts and vulnerabilities.[79]

Sea level: The height of the ocean relative to land; tides, wind, atmospheric pressure changes, heating, cooling, and other factors cause sea level changes.

Sea level change/sea level rise: Sea level can change, both globally and locally, due to (a) changes in the shape of the ocean basins, (b) changes in the total mass of water and (c) changes in water density. Factors leading to sea level rise under global warming include both increases in the total mass of water from the melting of land-based snow and ice, and changes in water density from an increase in ocean water temperatures and salinity changes. Relative sea level rise occurs where there is a local increase in the level of the ocean relative to the land, which might be due to ocean rise and/or land level subsidence.[80] (See also *Mean sea level*, *Thermal expansion*)

Sea level rise impact: An effect of sea level rise on the structure or function of a system.[81]

Seawall: A structure separating land and water areas, primarily designed to prevent erosion and other damage due to wave action. It is usually a vertical wood or concrete wall as opposed to a sloped revetment. (See also *Hard protection*, *Revetment*, *Shoreline protective devices*)

Sediment: Grains of soil, sand, or rock that have been transported from one location and deposited at another.

[78] Burton *et al.* 2004

[79] NOAA 2010

[80] IPCC 2007

[81] PCGCC 2007

Sediment management: The system-based approach to the management of coastal, nearshore and estuarine sediments through activities that affect the transport, removal and deposition of sediment to achieve balanced and sustainable solutions to sediment related needs.

Sensitivity: The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct (*e.g.*, a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (*e.g.*, climatic or non-climatic stressors may cause people to be more sensitive to additional extreme conditions from climate change than they would be in the absence of these stressors).

Shore protection: Structures or sand placed at or on the shore to reduce or eliminate upland damage from wave action or flooding during storms.

Shoreline protective devices: A broad term for constructed features such as seawalls, revetments, riprap, earthen berms, cave fills, and bulkheads that block the landward retreat of the shoreline and are used to protect structures or other features from erosion and other hazards. (See also *Hard protection, Revetment, Seawall*)

Still water level: The elevation that the surface of the water would assume if all wave action were absent.

Storm surge: A rise above normal water level on the open coast due to the action of wind stress on the water surface. Storm surge resulting from a hurricane also includes the rise in water level due to atmospheric pressure reduction as well as that due to wind stress.

Submerged lands: Lands which lie below the line of mean low tide.[82] (See also *Public Trust Lands*, *Tidelands*)

Subsidence: Sinking or down-warping of a part of the earth's surface; can result from seismic activity, changes in loadings on the earth's surface, fluid extraction, or soil settlement.

Tectonic: Of or relating to the structure of the earth's crust and the large-scale processes that take place within it.

Thermal expansion: An increase in water volume in response to an increase in temperature, through heat transfer.

Tidal prism: The total amount of water that flows into a harbor or estuary and out again with movement of the tide, excluding any freshwater flow.

Tidal range: The vertical difference between consecutive high and low waters. The Great Diurnal Range is the difference between mean higher high water and mean lower low water; the Mean Range of tide is the difference in height between mean high water and mean low water.[83]

[82] Public Resources Code § 13577

[83] NOAA 2013

Tidelands: Lands which are located between the lines of mean high tide and mean low tide.[84] (See also *Public Trust Lands*, *Submerged lands*)

Transfer of Development Rights (TDR): A device by which the development potential of a site is severed from its title and made available for transfer to another location. The owner of a site within a transfer area may retain property ownership, but not approval to develop. The owner of a site within a receiving area may purchase transferable development rights, allowing a receptor site to be developed at a greater density.[85]

Tsunami: A long period wave, or seismic sea wave, caused by an underwater disturbance such as an earthquake, submarine landslide, or subaerial landslide (slope failure from land into a water body). Tsunamis can cause significant flooding in low-lying coastal areas and strong currents in harbors. (Commonly misnamed a *Tidal wave*)

Vulnerability: The extent to which a species, habitat, ecosystem, or human system is susceptible to harm from climate change impacts. More specifically, the degree to which a system is exposed to, susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, as well as of non-climatic characteristics of the system, including its sensitivity, and its coping and adaptive capacity.

Vulnerability assessment: A practice that identifies who and what is exposed and sensitive to change and how able a given system is to cope with extremes and change. It considers the factors that expose and make people or the environment susceptible to harm and access to natural and financial resources available to cope and adapt, including the ability to self-protect, external coping mechanisms, support networks, and so on.[86]

Wave: A ridge, deformation, or undulation of the surface of a liquid. On the ocean, most waves are generated by wind and are often referred to as wind waves.

Wave height: The vertical distance from a wave trough to crest.

Wave length (or Wavelength): The horizontal distance between successive wave crests or between successive troughs of waves.

Wave period: The time for a wave crest to traverse a distance equal to one wavelength, which is the time for two successive wave crests to pass a fixed point.

Wave runup: The distance or extent that water from a breaking wave will extend up the shoreline, including up a beach, bluff, or structure.

[84] Public Resources Code § 13577

[85] Cal OPR 1987

[86] Tompkins *et al.* 2005

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Appendix A

Sea Level Rise Science and Projections for Future Change

DRIVERS OF SEA LEVEL RISE

The main mechanisms driving increases in *global* sea level are: 1) expansion of sea water as it gets warmer (thermal expansion) and, 2) increases in the amount of water in the ocean from melting of land-based glaciers and ice sheets as well as human-induced changes in water storage and groundwater pumping (Chao *et al.* 2008; Wada *et al.* 2010; Konikow 2011).[1] The reverse processes can cause global sea level to fall.

Sea level at the *regional and local levels* often differs from the average global sea level.[2] Regional variability in sea level results from large-scale tectonics and ocean and atmospheric circulation patterns. The primary factors influencing local sea level include tides, waves, atmospheric pressure, winds, vertical land motion and short duration changes from seismic events, storms, and tsunamis. Other determinants of local sea level include changes in the ocean floor (Smith and Sandwell 1997), confluence of fresh and saltwater, and proximity to major ice sheets (Clark *et al.* 1978; Perette *et al.* 2013).

Over the long-term, sea level trends in California have generally followed global trends (Cayan *et al.* 2009; Cayan *et al.* 2012). However, global projections do not account for California's regional water levels or land level changes. California's water levels are influenced by large-scale oceanographic phenomena such as the El Niño Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO), which can increase or decrease coastal water levels for extended periods of time. Figure A-1 shows how El Niño and La Niña events have corresponded to mean sea level in California in the past. California's land levels are also affected by plate tectonics and earthquakes. Changes to water as well as land levels are important factors in regionally down-scaled projections of future sea level. It follows that the sea level rise projections specific to California are more relevant to efforts in the coastal zone of California than projections of global mean sea level.

[1] Large movements of the tectonic plates have been a third major mechanism for changes in global sea level. The time periods for plate movements to significantly influence global sea level are beyond the time horizons used for even the most far-reaching land-use decisions. Plate dynamics will not be included in these discussions of changes to future sea level.

[2] For further discussion of regional sea level variations and regional sea level rise projections, see Yin *et al.* 2010, Slangen *et al.* 2012, and Levermann *et al.* 2013, as examples.

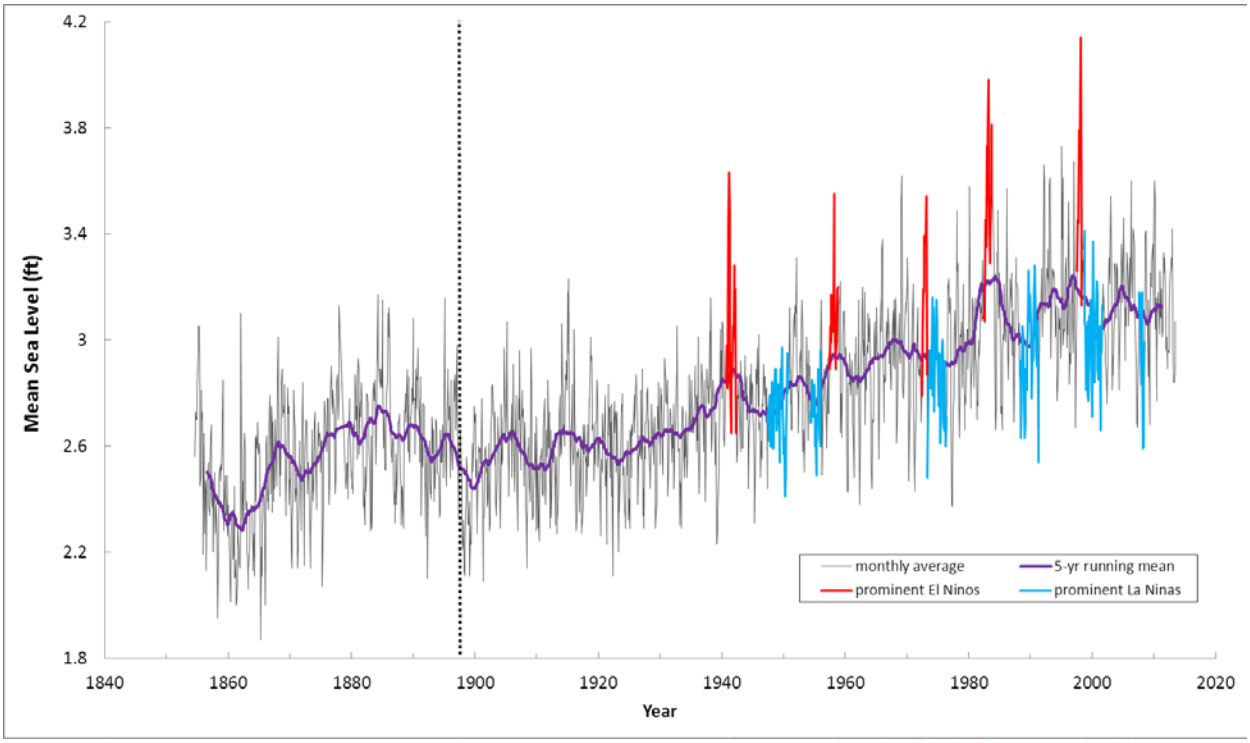

Figure A-1. Variations in monthly mean sea level at Fort Point, San Francisco, 1854 to 2013. Mean sea level heights (in ft) are relative to mean lower low water (MLLW). Purple line represents the 5-year running average. Note that the monthly mean sea level has varied greatly throughout the years and that several of the peaks occurred during strong El Niño events (red highlight). Periods of low sea level often occurred during strong La Niña events (blue highlight). The current "flat" sea level condition can also be seen in the 5-year running average. (*Sources: NOAA CO-OPS data, Station 9414290, http://tidesandcurrents.noaa.gov/ (sea level); NOAA Climate Prediction Center, http://www.elnino.noaa.gov/ (ENSO data)*)

APPROACHES FOR PROJECTING FUTURE GLOBAL SEA LEVEL RISE

This section provides an overview of some of the more well-known approaches that have been used to project sea level changes and their relevance to California. Appendix B will cover how these projections can be used to determine water conditions at the local scale.

There is no single, well-accepted technique for projecting future sea level rise. Understanding future sea level rise involves projecting future changes in glaciers, ice sheets, and ice caps, as well as future groundwater and reservoir storage. Two subjects in particular present challenges in sea level rise modeling. First, future changes to glaciers, ice sheets, and ice caps are not well understood and, due to the potential for non-linear responses from climate change, they present many difficulties for climate models (Overpeck 2006; Pfeffer *et al.* 2008; van den Broecke *et al.* 2011; Alley and Joughin 2012; Shepherd *et al.* 2012; Little *et al.* 2013). Second, the actual magnitudes of the two human-induced changes – pumping of groundwater and storage of water in reservoirs – are poorly quantified, but the effects of these activities are understood and can be modeled (Wada *et al.* 2010). Despite these challenges, sea level rise projections are needed for many coastal management efforts and scientists have employed a variety of techniques to model sea level rise, including:

1. Extrapolation of historical trends;
2. Modeling the physical conditions that cause changes in sea level;
3. Empirical or semi-empirical methods; and
4. Expert elicitations

There are strengths and weaknesses to each approach, and users of any sea level rise projections should recognize that there is no perfect approach for anticipating future conditions. This section provides users of the Guidance document with a general understanding of several of the most widely used sea level rise projection methodologies and their respective advantages and disadvantages. Figure A-2 provides a visual summary of several of the more commonly cited projections of future global and regional sea level rise.

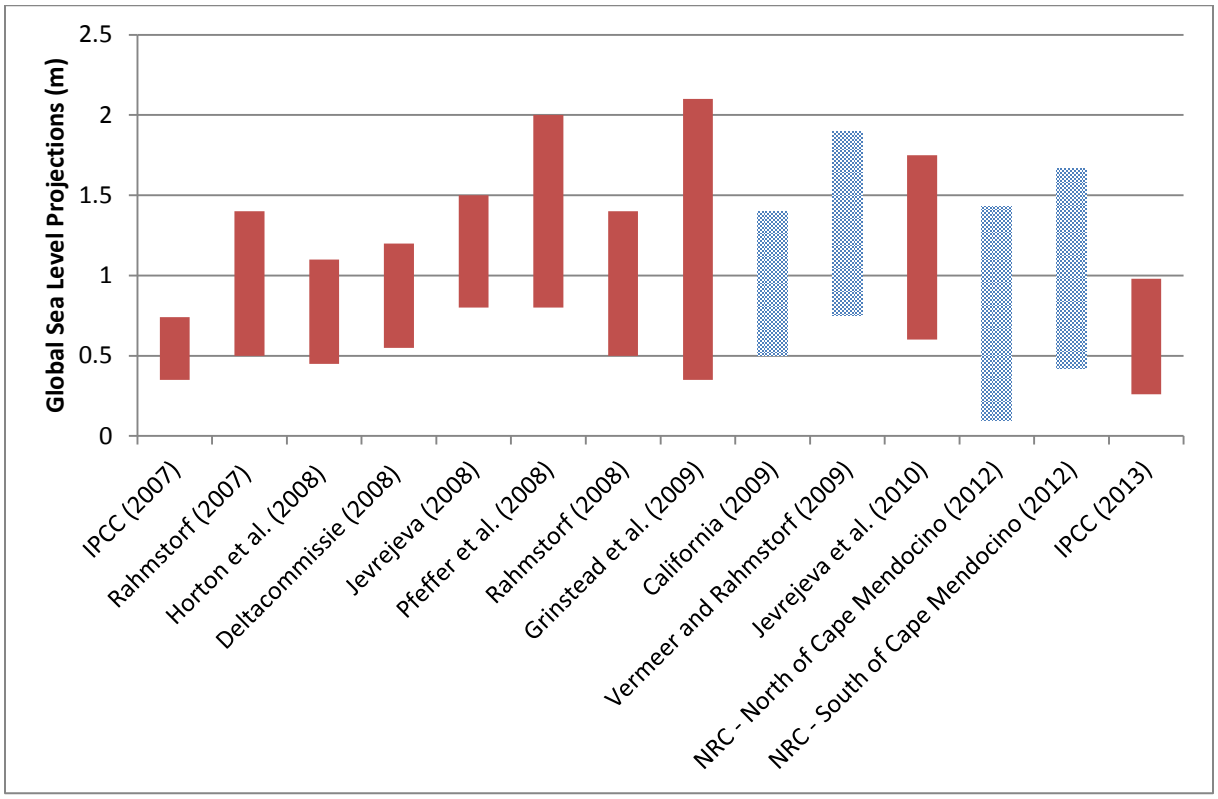

Figure A-2. Sea level rise projections for year 2100 from scientific literature. Graphic summary of the range of average sea level rise (SLR) projections by end of century (2090–2100) from the peer-reviewed literature as compared to the recent National Research Council report for California, Oregon and Washington. The light blue shaded boxes indicate projections for California. Ranges are based on the IPCC scenarios, with the low range represented by the B1 scenario (moderate growth and reliance in the future on technological innovation and low use of fossil fuels) and the high part of the range represented by the A1FI scenario (high growth and reliance in the future on fossil fuels). Details on the methods used and assumptions are provided in the original references.

Extrapolation of Historical Trends

Extrapolation of historical trends in sea level has been used for many years to project future changes in sea level. The approach assumes that there will be no abrupt changes in the processes that drive the long-term trend, and that the driving forces will not change. However, drivers of climate change and sea level rise, such as radiative forcing, are known to be changing, and this method is no longer considered appropriate or viable in climate science.

A recent modification to the historical trend method discussed above has been to estimate rates of sea level rise during the peak of the last interglacial (LIG) period (~125,000 years before present, when some drivers of sea level rise were similar to those today)[3] and use these as proxy records to project sea level rise rates to the 21st Century. For example, Katsman *et al.* (2011) and Vellinga *et al.* (2008) used the reconstructed LIG record of sea level change (from Rohling *et al.* 2008) to reconstruct sea level rise rates during rapid climate warming, and applied these rates to estimate sea level at years 2100 and 2200. Similarly, Kopp *et al.* (2009) used sea level rise rates inferred from the LIG to estimate a range of sea level rise for Year 2100 between 1-3 ft (0.3-1 m). Compared to traditional historical trend extrapolation, this modified approach has the advantage of including the dynamic responses of ice sheets and glaciers to past global climates that were significantly warmer than the present, but is limited by the large uncertainties associated with proxy reconstructions of past sea level.

Physical Models

Physical climate models use mathematical equations that integrate the basic laws of physics, thermodynamics, and fluid dynamics with chemical reactions to represent physical processes such as atmospheric circulation, transfers of heat (thermodynamics), development of precipitation patterns, ocean warming, and other aspects of climate. Some models represent only a few processes, such as the dynamics of ice sheets or cloud cover. Other models represent larger scale atmospheric or oceanic circulation, and some of the more complex General Climate Models (GCMs) include atmospheric and oceanic interactions.

Physical models of sea level changes account for the thermal expansion of the ocean and the transfer of water currently stored on land, particularly from glaciers and ice sheets (Church *et al.* 2011). Currently, coupled Atmosphere-Ocean General Circulation Models (AOGCMs) and ice sheet models are replacing energy-balance climate models as the primary techniques supporting sea level projections (IPCC 2013). Ocean density, circulation and sea level are dynamically connected in AOGCMs as critical components of the models include surface wind stress, heat transfer between air and sea, and freshwater fluxes. AOGCM climate simulations have recently been used as input for glacier models (Marzeion *et al.* 2012) which project land-water contributions to sea level.

The Intergovernmental Panel on Climate Change (IPCC) is one of the main sources of peer-reviewed, consensus-based modeling information on climate change. The IPCC does not undertake climate modeling, but uses the outputs from a group of climate models that project

[3] During the last interglacial, global mean temperature was 1-2ºC warmer than the pre-industrial era (Levermann *et al.* 2013), while global mean sea level was likely 16.4-29.5 ft (5-9 m) above present mean sea level (Kopp *et al.* 2009; Dutton and Lambeck 2012; Levermann *et al.* 2013).

future temperature, precipitation patterns, and sea level rise, based on specific emission scenarios. Early in the 1990s, the IPCC developed basic model input conditions to ensure comparable outputs from the various models. The IPCC initially developed scenarios of future emissions, based on energy development, population and economic growth, and technological innovation. Four families of scenarios (A1, A2, B1, and B2) and subgroups (A1B, A1FI, A1T) were developed and used for climate and sea level rise projections for early IPCC reports (1990, 1995, 2001, 2007). IPCC used 4 new scenarios for the *5th Assessment Report* (AR5) in 2013, based on Representative Concentration Pathways (RCPs) that are different greenhouse gas concentration trajectories. These trajectories bear similarities to, but are not directly comparable to the earlier emission scenarios. Projections in IPCC AR5 (2013) differ from the earlier IPCC projections due to improvements in climate science, changes due to the new scenarios, and changes in the models to accommodate the new inputs, with improvements in climate science and model capabilities driving the bulk of the changes.

One finding of the earlier 2007 IPCC report called for improved modeling of ice dynamics. Focused research on ice dynamics to improve the ability of climate models to address the scale and dynamics of change to glaciers, ice sheets, and ice caps was subsequently undertaken (*e.g.*, Price *et al.* 2011; Shepherd *et al.* 2012; Winkelman *et al.* 2012; Bassis and Jacobs 2013; Little *et al.* 2013). Recent modeling results presented in the AR5 (IPCC 2013) reflect the scientific community's increased understanding in, as well as advances in modeling of the impacts of glacier melting and ocean thermal expansion on sea level change. AR5 scenarios reflect a greater range of global sea level rise (28-98 cm) based on improved modelling of land-ice contributions.

Semi-Empirical Method

The semi-empirical method for projecting sea level rise is based on developing a relationship between sea level and some factor (a proxy) – often atmospheric temperature or radiative forcing – and using this relationship to project changes to sea level. An important aspect for the proxy is that there is fairly high confidence in models of its future changes; a key assumption that is made by this method is that the historical relationship between sea level and the proxy will continue into the future. One of the first projections of this kind was based on the historical relationship between global temperature changes and sea level changes (Rahmstorf 2007). This semi-empirical approach received widespread recognition for its inclusion of sea level rise projections. These projections looked at the temperature projections for two of the previous IPCC (2007) emission scenarios that span the likely future conditions within the report's framework – B1, an optimistic, low-greenhouse gas emission future, and A1FI, a more "business-as-usual" fossil fuel intensive future.[4] The Rahmstorf 2007 sea level rise projections were used in the California 2009 *Climate Change Scenarios Assessment* (Cayan 2009).

Since the initial semi-empirical projections for future sea level rise (Rahmstorf 2007), other researchers have published different projections based on the IPCC scenarios, using different

[4] When the IPCC began examining climate change, the available models used a broad range of inputs. In an attempt to evaluate the different model outputs based on the different model characteristics rather than the inputs, the IPCC developed a number of standard greenhouse gas emission scenarios. These scenarios are described in *Response Strategies Working Group III* (IPCC 1990). In general, the B1 scenario projects the lowest temperature and sea level increases and the A1FI projects the highest increases.

data sets or best-fit relationships.[5] Notably, Vermeer and Rahmstorf (2009) prepared a more detailed methodology that includes both short-term responses and longer-term responses between sea level rise and temperature. These 2009 projections of sea level rise were used in the *Interim Guidance on Sea Level Rise* (OPC 2010) and the California 2012 *Vulnerability and Assessment Report* (Cayan 2012).

There are also several new semi-empirical sea level rise projections based on scenarios other than those developed by the IPCC. For instance, Katsman *et al.* (2011) use a "hybrid" approach that is based on one of the newer radiative forcing scenarios and empirical relationships between temperature change and sea level. Future projections were then modified to include contributions from the melting of major ice sheets based on expert judgment[6]. This yields what they call "high end" SLR projections for Years 2100 and 2200 under several emissions scenarios.

Zecca and Chiari (2012) produced semi-empirical sea level rise projections based on their own scenarios of when fossil fuel resources would be economically exhausted. Though based on a different set of assumptions about human behavior/choices, in terms of global temperature and radiative forcing, the scenarios do not differ greatly from the IPCC scenarios. The results are identified as being "lower bound" sea level rise projections for high, medium, low fuel use scenarios, and "mitigation" (extreme and immediate action to replace fossil fuel use) scenarios. The report then provides projections for the 2000-2200 time period.

Expert Elicitation

Expert elicitation is one of the newer methods that have been used for projecting or narrowing ranges of future sea level rise. Using expert judgment has been an important aspect of scientific inquiry and the scientific method. The method of expert elicitation is a formalized use of experts in climate science and sea level change to help either narrow uncertainty for sea level projections, or to help with specifying extremes of a range. The elicitation method normally begins with experts refining model output information. One of the first attempts to use expert elicitation for sea level rise was a study by Titus and Narayanan (1996), when it was thought there was only 1% probability that sea level would exceed 3.3 ft (1 m) by Year 2100. In 2011, the Arctic Monitoring and Assessment Programme Report (AMAP 2011) surveyed the climate literature to construct a range of estimates of sea level rise by the year 2100, and then used a panel of experts to decide on a smaller, more plausible range. Not surprisingly, the projections supported by the AMAP experts fell right in the middle of the range shown in Figure A-2. Bamber and Aspinall (2013) used a statistical analysis of a large number of expert estimates to

[5] Semi-empirical projections of sea level rise using relationships between water level and radiative forcing such as those from Grinsted *et al.* (2009), Jevrejeva *et al.* (2010), Katsman *et al.* (2011), Meehl *et al.* (2012), Rahmstorf *et al.* (2012), Schaeffer *et al.* (2012), and Zecca and Chiari (2012) have shown general agreement with the projections by Vermeer and Rahmstorf (2009). The Grinsted *et al.* projections have a wider range than those of Vermeer and Rahmstorf, while the Jevrejeva *et al.* projections are slightly lower. All semi-empirical methods project that sea level in Year 2100 is likely to be much higher than linear projections of historical trends and the projections from the 2007 IPCC.

[6] Expert judgment has long been part of the scientific process. Expert elicitation, which is a formalized process for using expert judgment, has grown in importance and is discussed as a separate approach for projecting future sea level rise.

develop their projected range of future sea level, projecting sea level rise by 2100 ranging from 1–4.3 ft (0.33–1.32 m), under one of the intermediate AR5 scenarios (RCP 4.5).

Horton *et al.* (2014) surveyed experts in sea level science, based upon published papers, to develop a probabilistic assessment of long-term sea level rise (by the years 2100 and 2300), assuming two very different scenarios. Under one scenario, aggressive efforts would limit greenhouse gas concentrations that would cause global temperature to increase slightly until about 2050 when it would slowly drop (AR5's RCP 3 scenario). Under the other scenario, temperatures would continue to increase through to 2300 (AR5's RCP 8.5 scenario). Experts determined that it is likely that sea level rise could remain below 3.3 ft (1 m) for the low emission scenario (RCP 2.6), but that the likely range of future sea level rise for the high emission scenario (RCP 8.5) could be 6.6-9.8 ft (2-3 m).

Kopp *et al.* (2014) have combined detailed process modeling, community assessments and expert elicitation to assign probability distributions of local sea level rise through 2200 for identified communities around the world. Under the high concentration scenario, RCP 8.5, Kopp *et al.* estimate the "maximum physically possible rate of sea level rise" to be 8.2 ft (2.5 m) for the year 2100. This study also finds that sea level rise along the Pacific Coast of the US is close to the global average, and the likely range of sea level is 2-3.3 ft (0.6-1.0 m) by the year 2100 at San Francisco, under the high concentration scenario. In contrast, in areas of high subsidence such as Galveston, Texas, the likely range of sea level in by 2100 ranges from 3.3 to 5 ft (1.0-1.5 m). And, at many of the localities that were examined, including San Francisco, the current 1-in-10 year flooding event is likely to occur every other year by 2100 (five times more frequently) due to sea level rise; the frequency of the 1-in-100 year event is expected to double by the year 2100 with sea level rise.

Coastal communities cannot ignore sea level rise in long-term planning, permitting and project design. The four different approaches to projecting future sea level rise all have varying strengths and weaknesses. As noted earlier in this section, projections, like models, will not be completely accurate, but they are important tools for evaluation nonetheless[7]. The most commonly cited projections provide future sea level as a range, as a way to allow for many of the uncertainties that are part of future climate change. Often, projections of sea level rise rely upon multiple approaches. For example, the 2012 National Research Council (NRC) report, which is currently considered the best available sea level rise reference for the state of California, was developed through expert judgment that combined information from both physical models and semi-empirical projections.

[7] George E.P. Box, mathematician and statistician is quoted as saying, "Essentially all models are wrong, but some are useful."

BEST AVAILABLE SCIENCE ON SEA LEVEL RISE

Global Projections of Sea Level Rise

The best available science on *global* sea level rise projections is currently the IPCC *Fifth Assessment Report: Climate Change 2013* (AR5) released in September 2013. The new report now projects a more rapid sea level rise than the *Fourth Assessment* (AR4) released in 2007. By Year 2100, the AR5 projects global sea level to be more than 50% higher (26-98 cm) than the old projections (18-59 cm) when comparing similar emission scenarios and time periods. The increase in AR5 sea level projections results from improved modelling of land-ice contributions. Substantial progress in the assessment of extreme weather and climate events has also been made since the AR4 as models now better reproduce phenomena like the El Niño-Southern Oscillation (ENSO; IPCC 2013).

National Projections of Sea Level Rise

The third National Climate Assessment (NCA) was released in May 2014 (Melillo *et al.*), and includes the current best-available science on climate change and sea level rise *at the national scale*. The sea level rise projections in the NCA were informed by the 2012 NOAA report titled *Global Sea Level Rise Scenarios for the United States National Climate Assessment* (Parris *et al.*). This report provides a set of four scenarios of future global sea level rise, as well as a synthesis of the scientific literature on global sea level rise. The NOAA Climate Program Office produced the report in collaboration with twelve contributing authors.[8] The report includes the following description of the four scenarios of sea level rise by the year 2100:

- **Low scenario:** The lowest sea level change scenario (a rise of 8 in (20 cm)) is based on historical rates of observed sea level change.
- **Intermediate-low scenario:** The intermediate-low scenario (a rise of 1.6 ft (0.5 m) is based on projected ocean warming.
- **Intermediate- high scenario:** The intermediate-high scenario (a rise of 3.9 ft (1.2 m)) is based on projected ocean warming and recent ice sheet loss.
- **High scenario:** The highest sea level change scenario (a rise of 6.6 ft (2 m)) reflects ocean warming and the maximum plausible contribution of ice sheet loss and glacial melting.

The Parris *et al*. (2012) report recommends that the highest scenario be considered in situations where there is little tolerance for risk. It also provides steps for planners and local officials to modify these scenarios to account for local conditions. These steps are intended for areas where local sea level rise projections have not been developed. For California, the NRC report (below) provides scenarios that have been refined for use at the local level, and the Coastal Commission, along with the State of California Sea Level Rise Guidance, recommends using the NRC projections rather than the global or national scenarios.

[8] Authors include NOAA, NASA, the US Geologic Survey, the Scripps Institution of Oceanography, the US Department of Defense, the US Army Corps of Engineers, Columbia University, the University of Maryland, the University of Florida, and the South Florida Water Management District.

California-Specific Projections of Sea Level Rise and Best Available Science

In 2012, the National Research Council (NRC) Committee on Sea-Level Rise in California, Oregon and Washington (NRC Committee) released a report, *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*. This report provides an examination of global and regional sea level rise trends and projections of future sea level. It is considered the best available science on sea level rise for California.

To produce global sea level rise projections, the Committee used the basic scenarios that are the foundation of the IPCC AR4 climate projections and earlier climate studies for California. These scenarios were used to model steric changes in global sea level (thermal expansion or contraction), as well as changes in the amount of ocean water due to melting of land-based ice on Greenland, Antarctica, and other land-based glaciers and ice caps. Table A-1 shows the NRC projections for *global* sea level rise.

Table A-1. Recent Global Sea Level Rise Projections for 2000 to 2100

Time Period	NRC 2012 (English)		NRC 2012 (Metric)	
	Projection	Range	Projection	Range
2000 – 2030	5 ± 1 in	3 – 9 in	14 ± 2 cm	8 – 23 cm
2000 – 2050	11 ± 1 in	7 – 19 in	28 ± 3 cm	18 – 48 cm
2000 – 2100	33 ± 4 in	20 – 55 in	83 ± 11 cm	50 – 140 cm

Source: NRC 2012

In addition to the global sea level rise projections, the NRC Committee developed regional/West Coast projections based on the local steric and wind conditions (estimated by using down-scaled global climate models (GCMs), extrapolation of land-ice contributions, and estimates of vertical land motion. The report provides several sets of sea level rise amounts expected by the years 2030, 2050, and 2100 for several locations and regions in California. These include:

- Sea level rise "ranges" for north and south of Cape Mendocino
- Sea level rise "ranges" for San Francisco, Los Angeles, Newport, OR, and Seattle, WA
- Sea level rise "projections" for San Francisco, Los Angeles, Newport, OR, and Seattle, WA

The high and low sea level rise amounts for the "ranges" are based on the A1FI and B1 emission scenarios, respectively. The "projections" (with a standard deviation indicated) are based on the A1B emissions scenario[9]. A subset of these ranges and projections is included in Table A-2. Figure A-3 displays the A1B projections for Los Angeles and San Francisco overlaid on the "ranges" for south of Cape Mendocino. The NRC Report does not provide a California community for the North of Cape Mendocino "projection" so, in addition to the range, the "projection" for Newport, Oregon is provided as a general representation for the North of Cape Mendocino region.

[9] The IPCC A1B scenario assumes similar economic and population growth patterns but with a more balanced energy approach of both fossil-intensive and non-fossil sources.

Table A-2. Regional Sea Level Rise Ranges and Projections (NRC 2012). Ranges and projections with IPCC scenario indicated.

Time Period*	North of Cape Mendocino[10]		South of Cape Mendocino	
	Range: (B1-A1FI scenario)	Projection: Newport, OR (A1B scenario)	Range: (B1-A1FI scenario)	Projection: Los Angeles, CA (A1B scenario)
by 2030	-2 – 9 in (-4 – +23 cm)	3 ± 2 in (7 ± 6 cm)	2 – 12 in (4 – 30 cm)	6 ± 2 in (15 ± 5 cm)
by 2050	-1 – 19 in (-3 – + 48 cm)	7 ± 4 in (17 ± 10 cm)	5 – 24 in (12 – 61 cm)	11 ± 4 in (29 ± 9 cm)
by 2100	4 – 56 in (10 – 143 cm)	25 ± 11 in (63 ± 28 cm)	17 – 66 in (42 – 167 cm)	37 ± 10 in (93 ± 25 cm)

* Relative to the year 2000

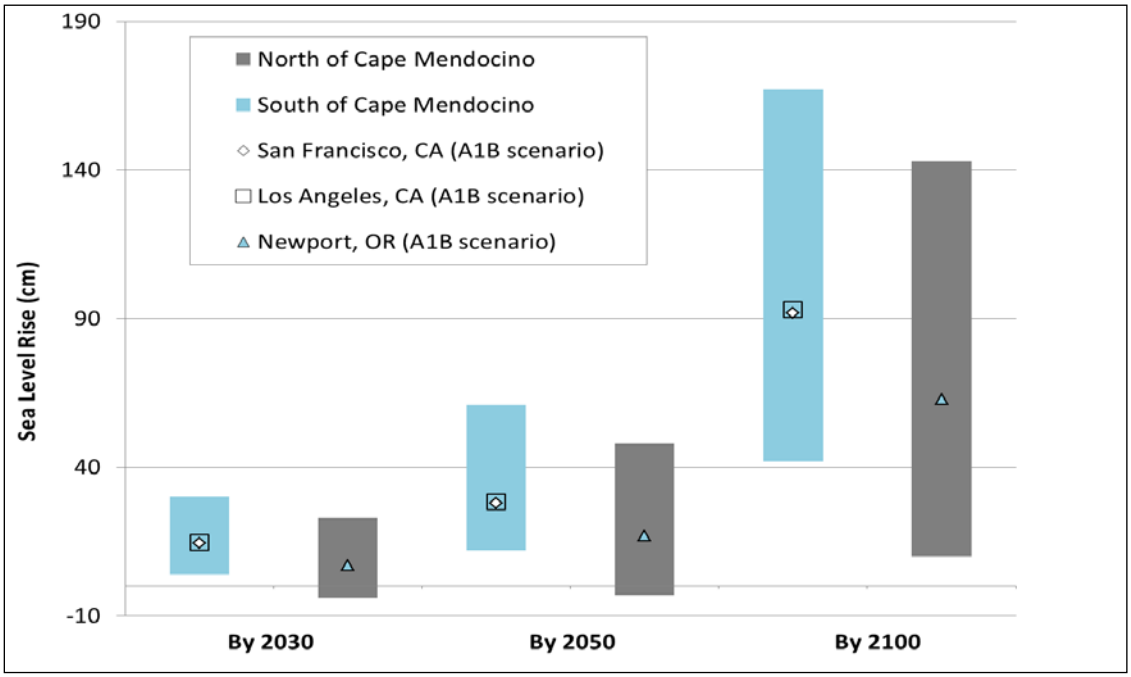

Figure A-3. NRC 2012 sea level rise ranges bounded at the low end by the B1 scenario and by the A1FI scenario at the high end. The points refer to projections based on the A1B scenario.

[10]The NRC Committee divided the Pacific into two regions, north and south of Cape Mendocino, due to differences in tectonics that occur at this point. North of Cape Mendocino, land is rising as ocean plates descend below the North American plate at the Cascadia Subduction Zone. South of Cape Mendocino, the coast is sinking (NRC 2012, p. 3). Humboldt Bay has not experienced the regional uplift that characterizes most of the coast north of Cape Mendocino, and instead has shown the highest subsidence recorded for the California coast. As a result, the projections for north of Cape Mendocino may not be appropriate for use in or near Humboldt Bay and the Eel River Estuary.



Figure A-4. Location of Cape Mendocino

The NRC Committee gave different sea level rise ranges for north and south of Cape Mendocino because it identified distinctly different land level changes in the two regions (Figure A-4). The area north of Cape Mendocino is experiencing significant uplift of about 0.059 to 0.118 in/yr (1.5 to 3 mm/yr), which the Committee attributed to plate movement along the Cascadia Subduction Zone (NRC 2012, p. 93). In contrast, the coast south of Cape Mendocino is dropping at an average rate of about 0.039 in/yr (1 mm/yr) (NRC 2012, p. 93). The measurements of land subsidence south of Cape Mendocino vary widely, from -0.146 in/yr to +0.024 in/yr (-3.7 mm/yr to +0.6 mm/yr) (NRC 2012, p. 93), with slightly greater subsidence in southern California than in Central California.[11] The NRC Committee noted that the uplift being experienced along the Cascadia Subduction Zone may reverse during a fault rupture or earthquake of magnitude 8.0 or greater along the Cascadia Subduction Zone. The NRC report notes that during such an earthquake, coastal areas could experience sudden vertical land motion, with uplift in some locations and subsidence as much as 6.6 ft (2 m) in other locations (NRC 2012). Despite the potential for rapid reversibility of much of the coastal uplift north of Cape Mendocino, the "ranges" for north of Cape Mendocino incorporate land uplift.

In contrast to the vertical uplift occurring throughout the majority of the area north of Cape Mendocino, Humboldt Bay's North Spit and the Eel River Estuary is subsiding and experiencing the highest rate of sea level rise in the state: a rate of 18.6 in (47 cm) over the last century (NOAA 2013). Therefore, the OPC Science Advisory Team recommends making modifications to NRC's sea level rise projections for North of Cape Mendocino based on tide gauge readings for Crescent City and Humboldt Bay, with intermediate values for the areas between them (OPC 2013, p. 11).[12] Please see *Humboldt Bay: Sea Level Rise Hydrodynamic Modeling, and Inundation Vulnerability Mapping* (Northern Hydrology and Engineering 2015) for additional information on sea level rise projections for the Humboldt Bay region.

For the area south of Cape Mendocino, the NRC report provides a range of future sea level rise for the entire region, and ranges and projections for both San Francisco and Los Angeles. The

[11] Personal Communication to staff from Anne Linn, NRC Study Director (August 1, 2012)

[12] A three-member subcommittee of the OPC Science Advisory Team (OPC-SAT) advised using the NRC projections, without modification, for all California locations except between Humboldt Bay and Crescent City (OPC 2013, p. 10).

ranges for both San Francisco and Los Angeles match ranges for the south of Cape Mendocino to within a few millimeters. Because of this close match, and because the NRC report does not indicate what portion of the coast would most appropriately use either the San Francisco or Los Angeles projections, using the city values instead of the regional values is not necessary. The Ocean Protection Council Science Advisory Team recommends using the sea level rise amount for south of Cape Mendocino for the entire region, stating, "we do not believe that there is enough certainty in the sea level rise projections nor is there a strong scientific rationale for specifying specific sea level rise values at individual locations along California's coastline" (OPC 2013, p. 10).

The Coastal Commission recommends that the high and low "ranges" for north and south of Cape Mendocino—along with one or more intermediate values—be considered in all relevant local coastal planning and coastal development permitting decisions. The NRC "projections" may serve as intermediate values where appropriate.

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Appendix B

Developing Local Hazard Conditions Based on Regional or Local Sea Level Rise Using Best Available Science

This Appendix provides technical information regarding how to determine local hazard conditions for sea level rise planning efforts. This process is described more broadly as Steps 1-3 in Chapters 5 and 6 in this document, and includes determining a range of sea level rise projections and analyzing the physical effects and possible resource impacts of sea level rise hazards.

Water level varies locally, so this analysis must be performed on a regional or site specific basis, and applicants and planners should prioritize obtaining data or conducting research at the correct geographical scale. The 2012 National Research Council (NRC) report is considered the best available science on California's regional sea level rise, and the Commission recommends using it when sea level rise projections are needed. Equivalent resources may be used by local governments and applicants provided that the resource is peer-reviewed, widely accepted within the scientific community, and locally relevant.[99]

Much of the research by the Intergovernmental Panel on Climate Change (IPCC) and others, and even the material in the 2012 NRC Report, has focused on global and regional changes to mean sea level. However, the coast is formed and changed by local water and land conditions. Local tidal range influences where beaches, wetlands and estuaries will establish; waves and currents are major drivers of shoreline change; and storms and storm waves are often the major factors causing damage to coastal development. It is local conditions that influence beach accretion and erosion, storm damage, bluff retreat, and wetland function.

Local water levels along the coast are affected by local land uplift or subsidence, tides, waves, storm waves, atmospheric forcing, surge, basin-wide oscillations, and tsunamis. Some of these factors, such as tides and waves, are ever-present and result in ever-changing shifts in the local water level. Other drivers, such as storms, tsunamis, or co-seismic uplift or subsidence, are episodic but can have important influences on water level when they occur. The following section discusses these factors in the context of sea level rise and how to incorporate them into planning and project analysis.

In most situations, high water will be the main project or planning concern. For wetlands, the intertidal zone between low and high tides will be of concern, while in some special situations, such as for intake structures, low water might be the main concern. In situations where low water is the concern, current low water is likely to be the low water planning condition and there may be no need to factor future sea level rise into those project or planning situations. In most other situations, hazards analyses will need to account for sea level rise. The following box identifies some of the key situations in which it may be important for coastal managers and applicants to consider sea level rise during project review.

[99] This appendix is written in such a way that it complements the materials from the 2012 NRC Report, which is currently considered the best available science on sea level rise in California. As new reports are issued in the future, Commission staff will assess whether they should be considered the best available science and update the approaches or terminology in this Appendix accordingly.

General situations needing sea level rise analysis include when the project or planning site is:

- Currently in or adjacent to an identified floodplain
- Currently or has been exposed to flooding or erosion from waves or tides
- Currently in a location protected from flooding by constructed dikes, levees, bulkheads, or other flood-control or protective structures
- On or close to a beach, estuary, lagoon, or wetland
- On a coastal bluff with historic evidence of erosion
- Reliant upon shallow wells for water supply

For situations where future sea level conditions will be important for the analyses of hazards or resource impacts, the following sections are provided as guidance for determining local hazards. Figure B-1 shows the general progression for going from global sea level projections to the possible consequences or impacts that can result from local water levels.

The following information provides details about how to develop sea level rise projections that can be used for specific time periods and geographic areas. It then provides guidance on using these temporally- and regionally-appropriate sea level rise projections to determine future tidal elevations and inundation, future still water, future shoreline change and erosion, potential flooding, wave impacts and wave runup, and flooding from extreme events.

Most of these analyses must occur sequentially. Sea level rise is used to determine changes in tidal conditions, and tidal conditions are combined with future surge, El Niño Southern Oscillation (ENSO) events, and Pacific Decadal Oscillations (PDOs) to estimate local still water. Changes in the frequencies of still water levels will in turn affect erosion rates, and the amount of erosion will affect future wave impacts, runup and flooding.

To be consistent with other sections, these different efforts are presented as Steps, with a discussion of how to accomplish each and the expected outcome. Depending upon the planning or project concerns and required analysis, it may not be necessary to proceed step-by-step and readers should use their judgment as to which items are relevant to their concerns. For example, if the concern is about runup on a non-erosive slope due to an increase in the still water level of 5.5 ft (1.7 m), the guidance on wave runup analysis may be all that is necessary.

Step 1 – Develop temporally- and spatially-appropriate sea level rise projections
Step 2 – Determine tidal range and future inundation
Step 3 – Determine still water level changes from surge, El Niño events and PDOs
Step 4 – Estimate beach, bluff, and dune change from erosion
Step 5 – Determine wave, storm wave, wave runup, and flooding conditions
Step 6 – Examine potential flooding from extreme events

A Note on Hydrodynamic Models versus "Bathtub Fill" Models

It is important to be aware of the differences between a so-called "bathtub fill" model and hydrodynamic models, and the related pros and cons of each for analysis of sea level rise impacts. In general, "bathtub fill" refers to those models that analyze flooding or inundation based solely on elevation. In other words, if sea level is projected to rise 3 ft (1 m), thereby increasing flooding/inundation from a current elevation of +10 ft (3 m) to +13 ft (4 m), these models will, in general, flood everything below the +13 ft (4m) elevation. The modeling does not take into consideration whether the new flood areas are connected to the ocean, nor does it consider how the changes to the water level will change wave propagation or overtopping of flood barriers. This is a significant oversimplification of the processes involved in flooding, but it provides value in allowing individuals to gain a broad view of the general areas that could be impacted by sea level rise without requiring a great deal of technical information.

Conversely, hydrodynamic modeling takes into account the details of local development patterns and the characteristics of waves and storms, and can therefore provide a much better understanding of local sea level rise impacts than is possible from "bathtub fill" models. In particular, hydrodynamic models take into account factors that alter flooding and inundation patterns and impacts. Such factors may include the extent and orientation of development – for example, roadways and linear features that tend to channelize water flows, and buildings or flood barriers that can block and divert flows – as well as the conditions that contribute to flooding and inundation, such as wave conditions, flow velocities, the extent of overtopping, and so on. Although the initial development of the modeling grid that is used to depict the community development patterns can be quite time-consuming to create and the model output will change with differing grid designs (Schubert and Sanders 2012), once the grid is developed, hydrodynamic modeling can be used to better characterize areas of flooding and to distinguish areas of concentrated flooding from those areas that may experience small amounts of flooding only during peak conditions (Gallien *et al.* 2011, 2012).

Significantly, many of the analyses described in this Appendix are the kinds of analyses that go beyond "bathtub fill" modeling to include the hydrodynamic factors that help to specify the more location-specific impacts for which planners should prepare.

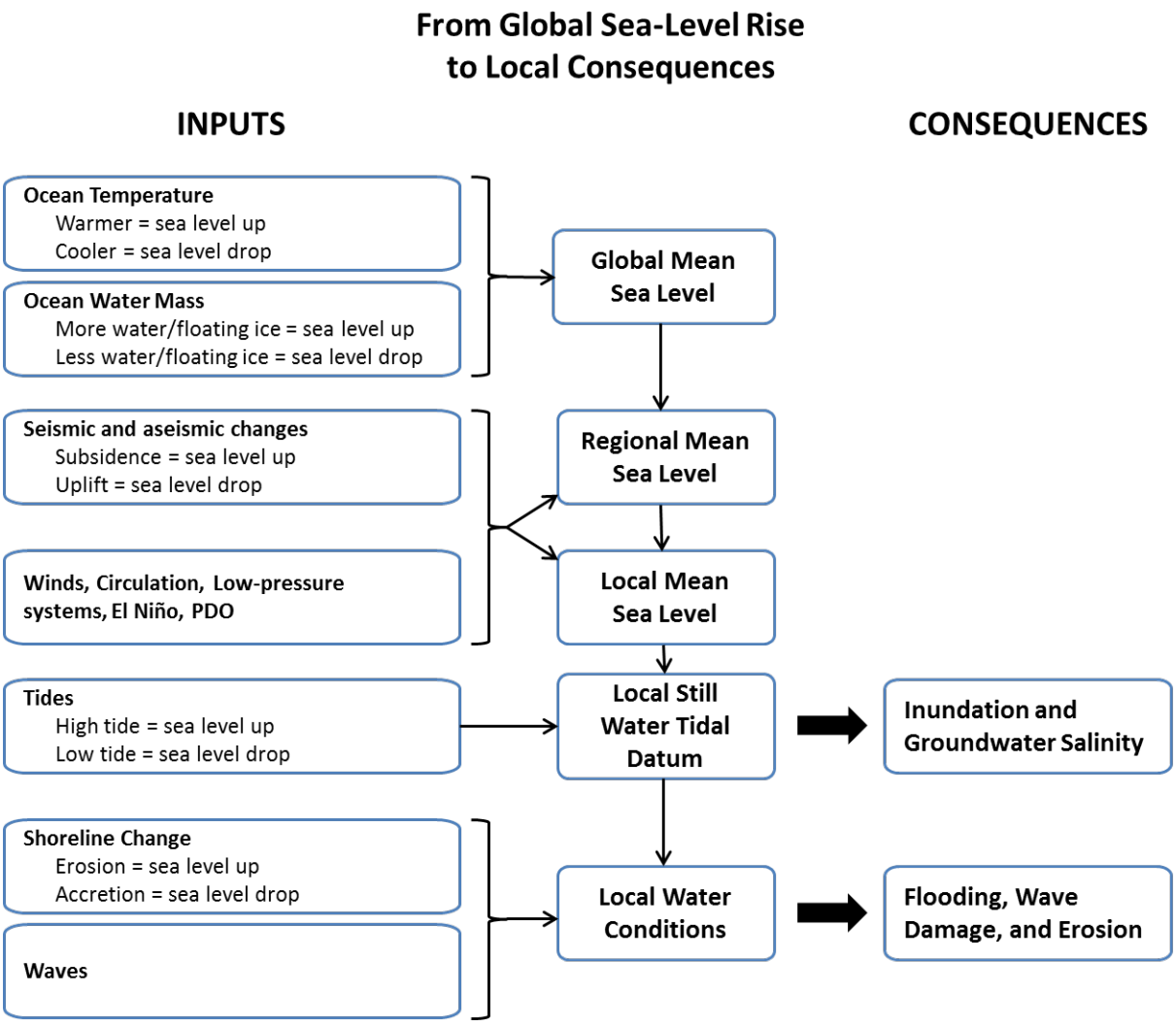

Figure B-1. General process for translating global sea level rise to local consequences

Step 1 – Develop temporally- and spatially-appropriate sea level rise projections

a. Determine appropriate planning horizon or expected project life

The first step in a sea level rise analysis is to determine the appropriate planning horizon based on the expected life of the project. The longer the life of a project or planning horizon, the greater the amount of sea level rise the project or planning area will experience.

Local governments should select their planning horizons to evaluate a broad range of planning concerns. Planning horizons could address the 20-year time period that is typical for *General Plan* updates as well as the long-range planning that is necessary for infrastructure and new development. The 20-year planning horizon may help identify areas within the coastal zone that are now or will soon be vulnerable to sea level rise related hazards as an aid for focusing adaptation planning on the areas of greatest need. Local Coastal Program (LCP) planning will likely use multiple planning horizons and undertake hazards analyses for multiple time periods, multiple sea level rise projections, or both.

At the project level, the LCP may provide insight into the time period that should be considered for the expected project life. At present, LCPs typically provide only a single standard (if any) for the expected life of a structure or development, such as 50, 75, or 100 years. Future LCPs and LCP Amendments (LCPAs) may find it useful to provide greater guidance on expected project life, with differentiations among major development or use classifications. For example, a general range may be chosen based on the type of development such that temporary structures, ancillary development, amenity structures, or moveable or expendable construction should identify a relatively short expected life of 25 years or less. Residential or commercial structures, which will be around longer, should choose a time frame of 75 to 100 years to consider. A longer time frame of 100 years or more should be considered for critical infrastructure like bridges or industrial facilities or for resource protection or enhancement projects that are typically meant to last in perpetuity.

For projects with long lead times, the analysis of impacts from sea level rise should use the projections for the time period when the development will be in use, rather than the current period because the trajectory of future sea level rise is not expected to be linear. For example, a project built today will experience less sea level rise over a 50-year lifetime (about 24 in (61 cm) using the higher projections for south of Cape Mendocino) than the same project if it were built in the year 2050 (about 40 in (101 cm), using the higher projections for south of Cape Mendocino). Thus, it is important to understand the anticipated project life of a structure and the associated planning horizon before starting an analysis for sea level rise concerns.

As explained in Chapters 5 and 6, the point of this step is not to specify exactly how long a project will exist (and be permitted for), but rather to identify a project life timeframe that is typical for the type of development in question so that the hazard analyses performed in subsequent steps will adequately consider the impacts that may occur over the entire life of the development.

b. Project sea level rise for years other than 2030, 2050, and 2100

At present, the 2012 NRC report provides the best available science for regional sea level rise projections from the year 2000 to 2030, 2050, and 2100. For sea level rise projections for years within a few of those used in the NRC projections, the 2030, 2050, and 2100 projections can be used. However, for years that are not close to these years, sea level rise projections should be interpolated from the projections. Two methods are recommended for establishing a projection value for a specific year: 1) conduct a linear interpolation[100], or 2) use the "best fit" equations that are provided below. At this time, both are acceptable for Coastal Commission purposes.

1. ***Linear Interpolation:*** One method for establishing a sea level rise projection for a specific year is linear interpolation between two known or given projections. The most immediate time periods before and after the desired time period should be used. For example, for a proposed project south of Cape Mendocino with an expected life until the year 2075, the upper range for the sea level rise projections closest to this time period are 24 in (61 cm) for Year 2050, and 66 in (167 cm) for Year 2100.

$$\mathrm{SLR}_{2075} = \mathrm{SLR}_{2050} + [\mathrm{SLR}_{2100} - \mathrm{SLR}_{2050}] * \frac{2075 - 2050}{2100 - 2050}$$

$$\mathrm{SLR}_{2075} = 24\ \mathrm{in} + [66\ \mathrm{in} - 24\ \mathrm{in}] * \frac{25\ \mathrm{years}}{50\ \mathrm{years}}$$

$$\mathrm{SLR}_{2075} = 45\ \mathrm{in} = 114\ \mathrm{cm}$$

2. ***"Best-Fit" Equation:*** Figure B-2 illustrates smoothed curve fits for the high and low ranges of expected sea level rise from 2012 NRC report, along with several local projections. As seen from these curves, a linear interpolation between any two points on the curves would be slightly higher than a projection that is represented by the curve itself. A second option that can be used to estimate sea level rise projections for years other than years 2030, 2050, and 2100 that avoids this slight discrepancy is to use one of the following quadratic equations that represent the "best fit" for each of the above sea level rise curves. These equations provide sea level rise in centimeters. If English units are desired, the projections will need to be converted using 1 cm = 0.0328 ft, or 1 cm = 0.394 in.

[100] Linear interpolation is a method for filling in gaps in data or information that assumes that two known data points that bound the unknown point can be connected with a straight line. The missing information is estimated through reference to this line. The example in the text provides an example of the mathematical steps for linear interpolation.

Equations for Sea Level Rise Projections, based on values from the 2012 NRC Report

North of Cape Mendocino

- [*Upper Range*] Sea Level Change (cm) $= 0.0094t^2 + 0.4868t$ (Equation B1)
- [*Lower Range*] Sea Level Change (cm) $= 0.0033t^2 - 0.2257t$ (Equation B2)

South of Cape Mendocino

- [*Upper Range*] Sea Level Change (cm) $= 0.0093t^2 + 0.7457t$ (Equation B3)
- [*Lower Range*] Sea Level Change (cm) $= 0.0038t^2 + 0.039t$ (Equation B4)

Where "t" is the number of years after 2000

For example, if the proposed project were south of Cape Mendocino, with an expected life of 75 years, use Equation B3, with t = 75 (*i.e.*, Year 2075):

$$\mathrm{SLR}_{2075} = (0.0093 \times 75^2) + (0.7457 \times 75)$$

$$\mathrm{SLR}_{2075} = 52 + 56 = 108 \text{ cm} = 43 \text{ in}$$

The sea level projection estimated using the "best-fit" equation is slightly less than the estimation based on linear interpolation because the NRC's sea level curves, shown in Figure B-2, are concave upward (sea level rise is expected to accelerate over the 21st Century). A line between any two points on the curve will always be slightly higher than the curve itself.

As noted previously, either of the two methods is acceptable for estimating sea level rise for a year that has not been provided in the NRC Report.

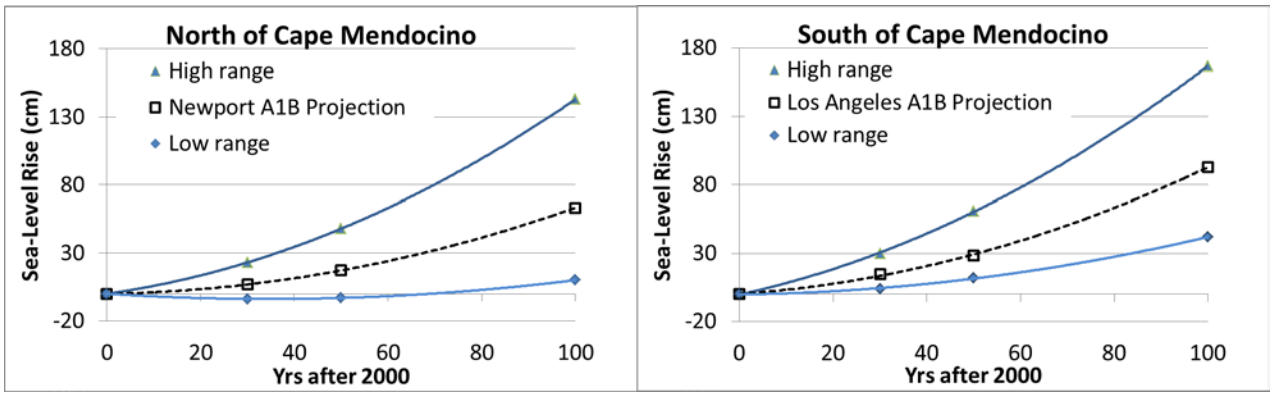

Figure B-2. Ranges of sea level rise based on 2012 NRC report. The NRC report used the IPCC (2007) A1FI scenario to represent the high range, and the B1 scenario to represent the low range. North of Cape Mendocino, Newport, OR, provides a mid-range A1B scenario projection and south of Cape Mendocino, Los Angeles, CA, provides a mid-range A1B scenario projection.

c. Ranges of sea level rise projections that do not start at the year 2000

The NRC sea level rise projections use the year 2000 as the base year. Since there has been little, if any, measureable rise in sea level since 2000 for most locations in California (Bromirski *et al.* 2011; NOAA 2013), there is little reason or justification for adjusting sea level rise projections from the year 2000 baseline to a more current date when analyzing projects with start dates prior to about Year 2015 or 2020. However, the latent sea level rise might occur quickly, providing sea level conditions consistent with the future projections. Thus, when analyzing sea level rise impacts for projects that are proposed to begin development in the near future and to exist for a limited lifetime, there is no need to adjust the 2012 NRC projections for a different project starting year or to account for the current lack of significant sea level change from the year 2000 baseline.

Conversely, if the needed sea level rise value is the range of sea level that might be experienced over a future time period, as might be used for planning a wetland restoration project, then adjustments to the starting point for sea level rise projections may be necessary. In such a case, this sea level range can be developed by interpolating the sea level projections for the starting and ending years (using the processes above for years other than 2030, 2050, and 2100), and obtaining the difference in sea level by subtracting these two. For example, if a restoration project is proposed to be designed to take into account the sea level rise that will occur from years 2040 to 2060, use Equations B1, B2, B3, or B4 to get $SLR_{t1=2040}$ and $SLR_{t2=2060}$. Then, subtract SLR_{2040} from SLR_{2060} to get the range of sea level rise that is anticipated from years 2040 to 2060.

d. Sea level rise projections beyond year 2100

Sea level rise is expected to continue well past the year 2100, despite the termination of most projections at that year in the scientific literature. However, the uncertainty associated with any projections for sea level grows significantly as the time period increases and there are large uncertainties in projections for sea level rise in the year 2100 and beyond. Despite such uncertainty, long-term planning and projects requiring long lead times or large capital expenditures need to consider conditions that might occur in the next 100 or more years in order to analyze potential hazards.

At this time, there are no studies that specifically address projections of sea level rise for California beyond the year 2100. The NRC projections stop at Year 2100 and provide no guidance for extrapolation of the range of sea level rise projections past that time. The equations provided above, while most appropriate for interpolation up to 2100, can be used to extrapolate sea level rise for a few years beyond 2100. However, for projections beyond about years 2105 or 2110, alternative methods should be considered for developing sea level rise projections. Options for developing sea level rise projections for years beyond 2100 include:

1. Use the NRC projections for 2050 and 2100 to develop a linear trend beyond Year 2100.
2. Use sea level rise rates that have been developed in recent years, some of which are provided in Table B-1.

3. Interpolate between the NRC projections, and one of the reports that provides projections of global sea level rise for years 2200 or 2300 (some of which are listed in Table B-2).

None of these options will provide sea level rise projections that have a confidence similar to the NRC projections. Eventually, there may be regionally appropriate projections for sea level into the 22nd and 23rd centuries. Until then, simplifying assumptions might be necessary for analysis that goes into these time periods. It is clear that sea level will continue to rise past 2100, and any effort to look beyond the year 2100 will be better than using projections of sea level rise for 2100 as the upper limit of what might happen beyond that time. Nonetheless, it is critical that long-range planning efforts and projects with long design lives include provisions to revisit SLR hazards periodically, and to make adjustments as new science becomes available.

Table B-1. Range of Global Sea Level Rise (*from Nicholls et al. 2011*)

Source	Methodological Approach	Sea level rise ft/century (m/century)
Rahmstorf 2007	Semi-empirical projection[a]	1.6 – 4.6 (0.5 – 1.4)
Rohling *et al.* 2008	Paleo-climate analogue	2.6 – 7.9 (0.8 – 2.4)
Vellinga *et al.* 2008	Synthesis[a]	1.8 – 3.6 (0.55 – 1.10)
Pfeffer *et al.* 2008	Physical constraints analysis[a]	2.6 – 6.6 (0.8 – 2.0)
Kopp *et al.* 2009	Paleo-climate analogue	1.8 – 3.0 (0.56 – 0.92)
Vermeer and Rahmstorf 2009	Semi-empirical projection[a]	2.5 – 6.2 (0.75 – 1.90)
Grinsted *et al.* 2009	Semi-empirical projection[a]	2.4 – 5.2 (0.72 – 1.60)[b]

[a] For the 21st Century
[b] For the best paleo-temperature record.

Table B-2. Projections of Global Sea Level Rise Beyond Year 2100

Projection Scenario[a]	Sea level rise for 2300, referenced to 2000 (Schaeffer *et al.* 2012) ft (m)	2300 Sea level rise rate (Schaeffer *et al.* 2012) in/yr (mm/yr)	Sea level rise for 2500, referenced to 2000 (Jevrejeva *et al.* 2012) ft (m)
RCP4.5	7.0 – 17.3 (2.12 – 5.27)	0.24 – 0.74 (6 - 20)	2.4 – 14.1 (0.72 – 4.3)
RCP3PD	3.9 – 10.1 (1.18 – 3.09)	0.04 – 0.35 (1 - 9)	0.4 – 5.7 (0.13 – 1.74)
RCP6			3.4 – 19.0 (1.03 – 5.79)
RCP8.5			7.4 – 37.8(2.26 – 11.51)
Stab 2°C	5.1 – 13.2 (1.56 – 4.01)	0.16 – 0.55 (4 – 14)	
Merge400	2.8 – 7.7 (0.86 – 2.36)	-0.08 – 0.12 (-2 – 3)	
Zero 2016	2.5 – 6.8 (0.76 – 2.08)	0.04 – 0.24 (1 – 6)	

[a] See referenced reports for details on projection scenarios.

Step 2 – Determine tidal range and future inundation

One of the most basic examinations of changing sea level conditions has been to determine the new intersection of mean sea level or other tidal datums[101] with the shoreline. This is a basic "bathtub" analysis since it looks only at the expansion of areas that will be inundated (*i.e.*, regularly submerged under water) or subject to tidal or wave action. For example, future subtidal levels would be the current subtidal limit plus projected regional mean sea level rise. Future intertidal zones would be bounded by the future higher high tide level (current higher high water plus projected regional sea level rise) and future lower low tide levels (current lower low water plus projected regional sea level rise).[102] For some projects, such as wetland restoration, the identification of future inundation zones may be the only sea level analysis needed for project evaluation. However, if the shoreline is eroding, the location of this elevation would need to also incorporate the rate of erosion. So, if the shoreline is expected to erode due to increased wave attack, not only will the intertidal zone move up in elevation, it will be both higher than and inland of the current zone.

Future Water *Elevation* = Current Tidal Datum + Projected Sea Level Rise

OR

Future Water *Location* = Intersection of Future Water Elevation with Future Shore Location

Future water location will extend to the new inundation elevation on the future shoreline. On beaches with a gradual slope, this can move the inundation location significantly inland, based on the geometric conditions of the beach. (This type of analysis is often called the Bruun Rule). On a stable beach with a slope of 1:X (Vertical:Horizontal), every foot of vertical sea level rise will move the inundation area horizontally X feet inland. For a typical 1:60 beach, every foot of sea level would move the inundation zone inland by 60 ft. If the beach is eroding, the loss due to erosion will add to the loss resulting from inundation.

Figure B-3 shows the influence of tides and sea level rise on low-wave energy beaches. Table B-3 provides some useful resources for inundation studies. Local Tidal Elevations are available from tide gauges maintained by NOAA. Where there are no nearby gauges, NOAA recommends the VDatum software.

[101] Tidal datums are based on the latest National Tidal Datum Epoch (NTDE) published by NOAA and are the mean of the observed sea levels over a 19-year period. The latest published epoch is 1983-2001. This tidal epoch can be considered equivalent to the year 2000 baseline for the NRC projections.

[102] Historical trends of high and low tide have changed differently than mean sea level (Flick *et al.* 2003). Based on historical trends, the changes to various tidal elements are likely to track closely with, but not identically with, changes to mean sea level. The future variability of changes to the tidal components, compared with changes to mean sea level will normally fall within the uncertainty for sea level rise projections and can be disregarded in almost all situations. As this phenomenon of tidal change is better understood and can be modeled, it may be appropriate in the future to include the changes in tidal components into the analysis of inundation and various water level projections.

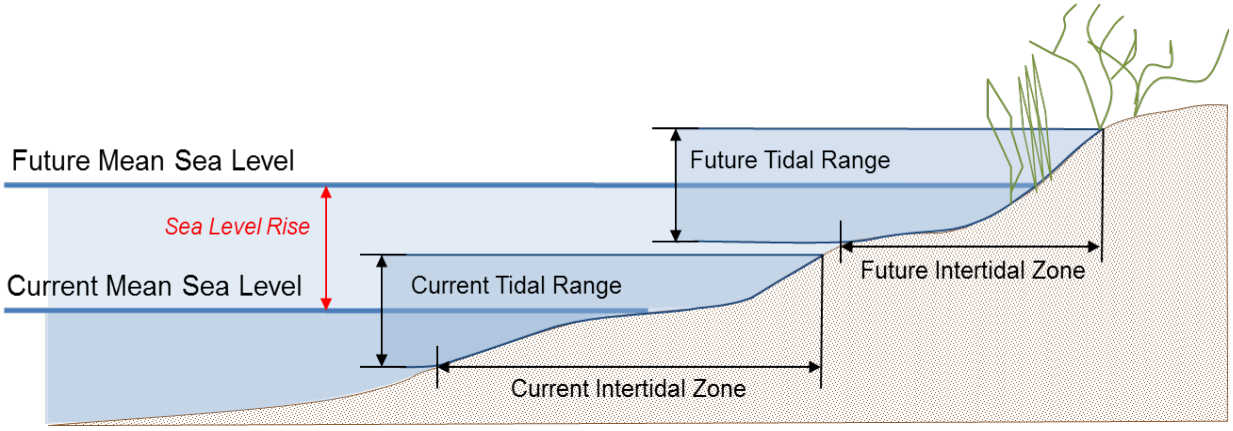

Figure B-3. Sea level rise and changes to tide range and intertidal zone. (*Source: L. Ewing, 2013*).

Table B-3. General Resources for Inundation Studies

Resource	Description	Link
Aerial Photographs	Useful for general information on shoreline trends; ortho-rectified photos can help quantify trends.	California Coastal Records Project, www.californiacoastline.org; Huntington Library; Local Libraries
LIDAR	Fairly detailed topography providing GIS layers for current conditions and comparable with LIDAR data sets for temporal changes.	NOAA Digital Coast, http://coast.noaa.gov/digitalcoast/data/coastallidar
Topographic Maps	Useful for basemaps to overlay site changes; often not at a scale to distinguish small changes in inundation or tidal action.	USGS Map Center, http://www.usgs.gov/pubprod/maps.html
NOAA Sea Level Rise and Coastal Flooding Impacts Viewer	Useful to show changes in water level location if there are no changes in the land due to erosion.	NOAA Digital Coast, http://coast.noaa.gov/digitalcoast/tools/slr/
NOAA Tidal Data	Measured and predicted tidal components for locations along the open coast and in bays.	NOAA Center for Operational Oceanographic Products and Services, http://tidesandcurrents.noaa.gov/
NOAA Technical Report NOS 2010-01: *Technical Considerations for use of Geospatial Data in Sea Level Change Mapping and Assessment*	Provides technical guidance to agencies, practitioners, and decision makers seeking to use geospatial data to assist with sea level change assessments.	NOAA National Ocean Service http://www.tidesandcurrents.noaa.gov/publications/tech_rpt_57.pdf

VDatum Software	A Vertical Datum Transformation program that allows users to transform geospatial data among various geoidal, ellipsoidal and tidal vertical datums.	NOAA National Ocean Service, http://www.nauticalcharts.noaa.gov/csdl/vdatum_enhancements.html
Cal-Adapt – Exploring California's Climate	Shows coastal areas that may be threatened by flooding from a 4.6 ft (1.4 m) rise in sea level and a 100-year flood event. Maps were developed using the Pacific Institute SLR Maps and do not now include any influence of beach or dune erosion or existing protective structures.	http://cal-adapt.org/sealevel/
Estimating Sea Level for Project Initiation Documents	Provides guidance on converting tidal datums and predicting future sea levels.	Caltrans Office of Land Surveys, http://www.dot.ca.gov/hq/row/landsurveys/SurveysManual/Estimating_Sea_Level_v1.pdf

Outcome from Step 2: *Provide information on the projected changes to the tidal range and future zones of inundation. For locations without any influence from erosion, storm surge, or wave energy, the identification of new inundation areas may be sufficient for project analysis and planning efforts. This projected new inundation area may also be useful for anticipating the likely migration of wetlands and low-energy water areas or as input for analysis of changes to groundwater salinity. For most open coast situations, this information will be used to inform further project planning and analysis that examines erosion, surge and storm wave conditions.*

Step 3 – Determine still water changes from surge, El Niño events, and PDOs

Estimates of surge, El Niño, and PDO water elevation changes are developed primarily from historical records. There are no state-wide resources for this information, although it may be included in some Regional Sediment Management Plan studies. General guidance on water level changes that can be expected from surge, El Niño events, and PDOs is provided in Table B-4.

The remaining discussion provides general information on some of these phenomena. It is provided to acquaint readers to the main issues associated with each phenomenon. Readers with a strong background in ocean-atmospheric conditions may want to skim or skip the rest of this section.

The Pacific Ocean is a complex system. Sea level in the Pacific Ocean responds to multiple oceanic and atmospheric forcing phenomena, occurring with different intensities and at different temporal and spatial scales. Some phenomena may reinforce each other, while others may act in opposition, reducing the net effect. Scientists and researchers are attempting to identify the

various signals from the multiple phenomena, but these are nascent sciences and there is still much we need to learn.

Regional water levels can be influenced by surge as well as by high and low pressure systems. Surge is a short-term change in water elevation due to high wind, low atmospheric pressure, or both. It is most often associated with East Coast and Gulf Coast hurricanes that can cause up to 15 or 20 ft (4-6 m) or more of short-term water level rise over many miles of the coast. Along the West Coast, storm surge tends to be much smaller, and is rarely a coastal hazard, except in enclosed bays. In southern California, it rarely exceeds 1 ft (0.3 m) and in central California, it rarely exceeds 2 ft (0.6 m). Surge becomes a concern as one of several cumulative factors that cause a temporary rise in sea level. Each rise may be small, but when surge occurs during high tides and/or in combination with storms, it increases the threat of coastal flooding, wave impacts, and erosion.

Two of the more recognized phenomena that affect water temperature in the Pacific are the El Niño-Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO). ENSO cycles, which occur on inter-annual timescales (approximately 2-7 years), not only involve ocean-basin-spanning changes in sea surface temperature (SST) and in the depth of the mixed layer in the Equatorial Pacific, but also drive changes in ocean conditions and atmospheric circulation at higher latitudes. El Niño events result in the transfer of warm surface waters into the normally cool eastern equatorial Pacific, resulting in elevated SST and water levels along much of the west coast of the Americas. El Niños also tend to increase the strength and frequency of winter low pressure systems in the North Pacific. These events can persist for months or years at a time, and strongly influence local and regional sea level. For example, the pulse of warm water from the large 1982-83 El Niño caused water levels along California to be elevated by approximately 0.4-0.7 ft (0.12-0.21 m) for many months, with short-term water elevation peaks up to approximately 1 ft (0.3 m; Flick 1998). The opposite phase of ENSO, characterized by unusually cool SSTs and lower water elevations along the eastern Pacific margin, are called La Niña events. Between El Niños and La Niñas are periods of neutral SST and water elevation changes.

The PDO is an ENSO-like pattern of SST and atmospheric variability occurring over multiple decades. In contrast to ENSO, the PDO is more strongly expressed in the North Pacific than in the tropics. The positive or warm phase of the PDO is associated with unusually warm surface water throughout the eastern North Pacific (along the western US coast), while the negative or cool phase PDO is associated with colder than normal waters. As with the ENSO effects, the warm phase PDO has tended to cause elevated sea levels in the eastern Pacific and along the California coast, while the cool phase of the PDO tends to lower sea level in this region.

The PDO has basin-wide influence. Elevated water levels in one part of the Pacific are often accompanied by lowered water levels elsewhere. The cool phase PDO can result in a drop of water level along the eastern Pacific (western US Coast) and a rise in water level along the western Pacific. Recently, sea level along the western Pacific has been rising about three times faster than the global mean sea level rise rate, due in part to the PDO (Bromirski *et al.* 2011; Merrifield 2011). This does not mean the eastern Pacific will experience sea level rise that is three times faster than the global mean sea level rise when there is the next shift in the PDO, but does show that the PDO can have a major influence on basin-wide and regional sea level.

The above discussion of El Niño and the PDO may suggest that they are well-understood phenomena, with easily anticipated changes in sea level. However, it is important to note that El Niños have varying strengths and intensities, resulting in different sea changes from one event to the next. Also, changes in regional mean sea level along the eastern Pacific have not always shown a strong connection to the PDO cycles. An apparent jump in regional mean sea level occurred after the mid-1970s shift to the warm phase of the PDO, yet the expected continued rise in sea level along the West Coast seems to have been suppressed by other forces. Tide gauge records for the Washington, Oregon, and California coasts have shown no significant inter-annual rise in sea level from 1983 to 2011 (Cayan *et al.* 2008; Bromirski *et al.* 2011; NOAA 2013). Bromirski *et al.* (2011, 2012) postulate that persistent alongshore winds have caused an extended period of offshore upwelling that has both drawn coastal waters offshore and replaced warm surface waters with cooler deep ocean water. Both of these factors could have caused a drop in sea level, canceling out the sea rise that would otherwise be expected from a warm phase PDO signal.

Water level changes from surge, atmospheric forcing, El Niño events and the PDO can occur in combination. The water elevation changes from each factor may be only about 1 ft (0.3 m) or less, but each can cause changes in the water level over a time period of days, months, or a few years – far more rapidly than sea level rise. In combination, they can potentially cause a significant localized increase in water level.

When high water conditions occur in combination with high tides, and with coastal storms, the threat of coastal flooding, wave impacts and erosion also increases. These conditions can be additive, as shown in Figure B-4. Also, these changes in water level will continue to be important to the overall water level conditions along the California coast and they need to be examined in conjunction with possible changes due to regional sea level rise.

As stated earlier, estimates of surge, El Niño and PDO water elevation changes are developed primarily from historical records. There are no state-wide resources for this information, although it may be included in one of the Regional Sediment Management Plans, available for many coastal areas (see http://www.dbw.ca.gov/csmw/). General guidance on water level changes, surge, and El Niño events is provided in Table B-4.

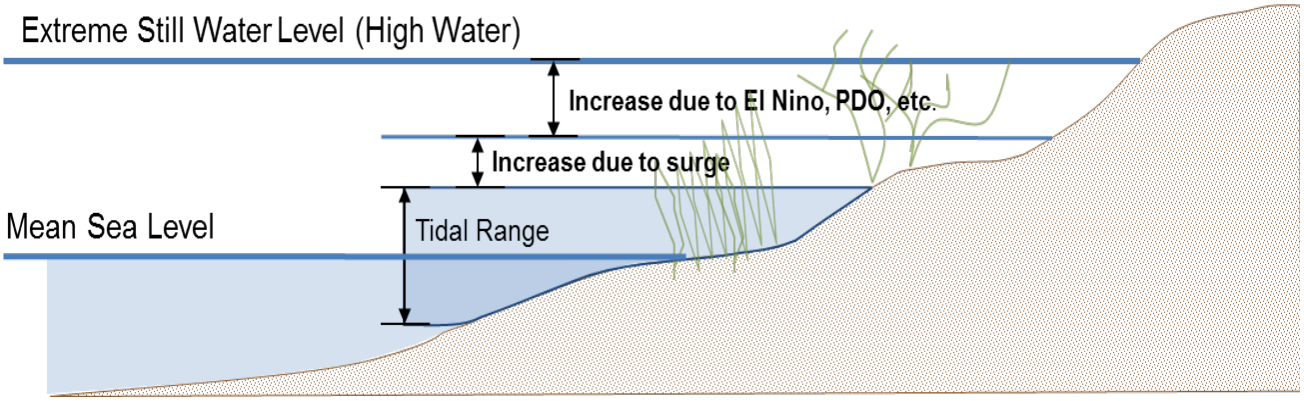

Figure B-4. Changes to extreme still water level due to surge, El Niño events, and PDOs. (*Source: L. Ewing, 2013*).

Table B-4. General Resources for Determining Still Water Elevation, Surge, El Niño events, and PDOs

Resource	Description	Link
NOAA Sea Level Rise and Coastal Flooding Impacts Viewer	Displays potential future sea levels within wetland areas, and provides visualizations for various amounts of sea level rise. For bays and estuaries, it also provides information on inland areas with the potential to flood if existing barriers to water connectivity are removed or overtopped. Communicates spatial uncertainty of mapped sea level rise, overlays social and economic data onto sea level rise maps, and models potential marsh migration due to sea level rise. Maps do not include any influence of beach or dune erosion.	NOAA Digital Coast, http://coast.noaa.gov/digitalcoast/tools/slr/
Pacific Institute Sea Level Rise Maps	Downloadable PDF maps showing the coastal flood and erosion hazard zones from the 2009 study. Data are overlaid on aerial photographs and show major roads. Also available are an interactive online map and downloadable maps showing sea level rise and population and property at risk, miles of vulnerable roads and railroads, vulnerable power plants and wastewater treatment plants, and wetland migration potential.	http://www.pacinst.org/reports/sea_level_rise/maps/ For the 2009 report "The Impacts of Sea Level Rise on the California Coast" visit: http://pacinst.org/publication/the-impacts-of-sea-level-rise-on-the-california-coast/
Cal-Adapt – Exploring California's Climate	Shows coastal areas that may be threatened by flooding from a 4.6 ft (1.4 m) rise in sea level and a 100-year flood event. Maps were developed using the Pacific Institute SLR Maps (see above) and do not now include any influence of beach or dune erosion or existing protective structures.	http://cal-adapt.org/sealevel/
Regional Sediment Management Plans	Plans for regions of the state to identify how governance, outreach and technical approaches can support beneficial reuse of sediment resources within that region without causing environmental degradation or public nuisance.	http://www.dbw.ca.gov/csmw/

***Outcome from Step 3**: Provide estimates of water elevations that can result from surge, El Niño events, and PDOs. When combined with the sea level changes to the tidal range, developed in Step 4, these can provide information on the extreme still water level. For most open coast situations, this information will be used to inform further project analysis and planning that examines erosion, surge and storm conditions.*

Step 4 – Estimate beach, bluff, and dune change from erosion

Predictions of future beach, bluff, and dune erosion are complicated by the uncertainty associated with future waves, storms and sediment supply. As a result, there is no single specific accepted method for predicting future beach erosion. At a minimum, projects should assume that there will be inundation of dry beach and that the beach will continue to experience seasonal and inter-annual changes comparable to historical amounts. When there is a range of erosion rates from historical trends, the high rate should be used to project future erosion with rising sea level conditions (unless future erosion will encounter more resistant materials, in which case lower erosion rates may be used). For beaches that have had a relatively stable long-term width, it would be prudent to also consider the potential for greater variability or even erosion as a future condition. For recent studies that provide some general guidance for including sea level rise in an evaluation of bluff and dune erosion, see, for example, Heberger *et al.* (2009) or Revell *et al.* (2011). Other approaches that recognize the influence of water levels in beach, bluff, or dune erosion can also be used. Table B-5, at the end of this section, provides some resources that can be used for projecting future erosion.

The following sections discuss specific concerns associated with beach, bluff and dune erosion and are provided to acquaint readers to the main issues associated with each system. Readers with a strong background in coastal systems may want to skim or skip the rest of this section.

Beach Erosion

Beach erosion and accretion occur on an on-going basis due to regular variability in waves, currents and sand supply. The movement of sand on and off of beaches is an ongoing process. Along the California coast, periods of gradual, on-going beach change will be punctuated by rapid and dramatic changes, often during times of large waves or high streamflow events.

The overall dynamics of beach change have been described many times.[103] Sand moves on and off shore as well as along the shore. Normal sources of sand to a beach are from rivers and streams, bluff erosion or gullies, and offshore sand sources. Sand leaves a beach by being carried downcoast by waves and currents, either into submarine canyons or to locations too far offshore for waves to move it back onto shore. Beaches are part of the larger-scale sediment dynamics of the littoral cell, and in very simple terms, beaches accrete if more sand comes onto the beach than leaves and beaches erode if more sand leaves than is added. Changes in sand supply are a major aspect of beach change.

Beach changes are often classified as being either seasonal or long-term/inter-annual changes. Seasonal changes are the shifts in beach width that tend to occur throughout the year and are usually reversible. During late fall and winter, beaches tend to become narrower as more high energy waves carry sand away from the beach and deposit it in offshore bars. This is later followed by beach widening as gentler waves again bring sand landward, building up a wider

[103] See for example, Bascom 1980, Komar 1998, and Griggs *et al.* 2005.

dry-sand summer beach. These changes are considered seasonal changes, and if the beach widths return to the same seasonal width each year, then the beach experiences seasonal changes but no long-term or inter-annual changes. If the seasonal beach widths become progressively wider or narrower, these changes become long-term or inter-annual change, and suggest a long-term beach change trend – accretion if the beach is widening and erosion if the beach is narrowing.

If development is at or near beach level, erosion of the beach can expose the development to damage from waves, flooding, and foundation scour. Additionally, waves that hit the coast bring with them vegetation, floating debris, sand, cobbles, and other material which can act like projectiles, adding to the wave forces and flood damage.

At present, approximately 66% of the California beaches have experienced erosion over the last few decades, with the main concentration of eroding beaches occurring in southern California (Hapke *et al.* 2006). This erosion has been due to a combination of diminished sand supplies and increased removal of sand by waves and currents. With rising sea level, beach erosion is likely to increase due to both increased wave energy[104] that can carry sand offshore or away from the beach, and to decreased supply of new sediments to the coast.[105]

There are several factors that will contribute to the effects of sea level rise on seasonal and inter-annual beach change. There will be the changes to the beach due to inundation by rising water levels, as shown in Figure B-5 (see the discussion on inundation earlier in this Appendix for more information on how to determine this change). If the beach cannot migrate inland to accommodate these changes, then the inundation will result in a direct loss or erosion of beach width. This will result in a narrower seasonal beach as well as inter-annual loss of beach.

Seasonal and inter-annual beach conditions will also be affected by changes to waves and sediment supply. Since waves are sensitive to bottom bathymetry, changes in sea level may change the diffraction and refraction of waves as they approach the coast, thereby changing the resulting mixture of beach-accreting and beach-eroding waves. However, the influence of climate change (not just rising sea level) on wave conditions, through changes in wave height, wave direction, storm frequency, and storm intensity, will likely be far more significant than the slight changes from bathymetric changes. In addition, changing precipitation patterns will modify the amount and timing of sediment delivery to the beach.

[104] In shallow water, wave energy is proportional to the square of the water depth. As water depths increase with sea level rise, wave energy at the same location will likewise increase.

[105] Many parts of the developed coast are already experiencing drops in sand supplies due to upstream impoundments of water and sediment, more impervious surfaces, and sand mining.

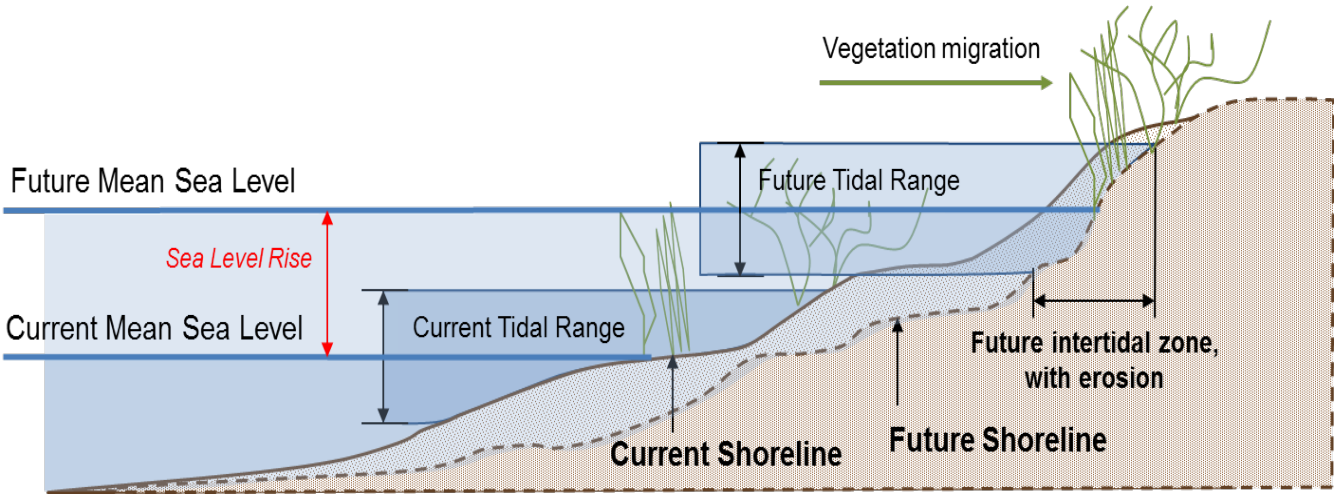

Figure B-5. Changes to the intertidal zone with sea level rise and erosion, without wave impacts. (*Source: L. Ewing, 2013*).

Bluff Erosion

A second type of erosion occurs on coastal bluffs.[106] There is no fully-accepted methodology for estimating future bluff erosion with sea level rise. Guidance for coastal analysts in Hawaii is to assume erosion will increase as a proportion of historical erosion (Hwang 2005). One approach used in the past by the Commission has been to apply one of the higher rates of historical erosion to represent average future trends. A more process-based methodology, used in the Pacific Institute study of erosion due to rising sea level, is to correlate future erosion rates of bluffs with a higher still water level that will allow waves to attack the bluff more frequently (Heberger *et al.* 2009; Revell *et al.* 2011). This approach assumes that all bluff erosion is due to wave impacts and that erosion rates will change over time as the beach or bluff experiences more frequent or more intense wave attack. Such an approach should be considered for examining bluff erosion with rising sea level. Other approaches that recognize the influence of water levels in beach, bluff, or dune erosion can also be used.

Bluff retreat occurs via many different mechanisms. Landslides, slumps, block failures, gullies, and rilling are examples of bluff retreat. At the most basic level, bluff retreat or collapse occurs when the forces leading to collapse of the bluff face are stronger than the forces holding the bluff in place. Forces causing bluff retreat can include earthquakes, wind, burrowing animals, gravity, rain, surface runoff, groundwater, and sheet flow. Coastal bluffs have the added factor of wave attack. Resistance to collapse is mainly a characteristic of the bluff material. For example, granitic bluffs like those along the Big Sur coast retreat at a much slower rate than the soft sandstone and marine terrace bluffs of Pacifica.

[106] Bluffs can be built or expanded during interglacial cycles or following seismic uplift. Many of the marine terraces that are visible along the California coast are remnants of past beach areas that have been uplifted to become bluffs and cliffs. However, natural bluff rebuilding is a millennial or multi-millennial process, and it will not occur during the time periods over which most development projects are evaluated.

Coastal bluff erosion can occur throughout the year, but it often occurs during or after storm periods, when the dry beach will be narrow or non-existent. When coastal bluffs are fronted by wide sand beaches, most waves break on the beach face and the beaches protect the bluffs from direct wave attack. When the beach is narrow, there is less buffering of the wave energy and waves can break directly against the bluffs. A general depiction of bluff retreat with rising sea level is provided in Figure B-6.

Bluff retreat is often episodic – the bluff may be stable for a number of years and then retreat by tens of feet in a few hours or a few days. If the changes to a bluff are examined through endpoint analysis (*i.e.*, looking first at the initial position of the bluff and then at the position of the bluff sometime in the future), researchers can determine the amount of retreat that has occurred during the time from the initial to final positions. This gives information on an average retreat rate that has occurred, but provides no insight about the conditions leading to the retreat, the size of retreat, frequency of retreat events, or the progression of retreat and no retreat. The average retreat rates can give some indication of likely future changes, but they provide little information about when the next retreat episode might occur or how large it might be.

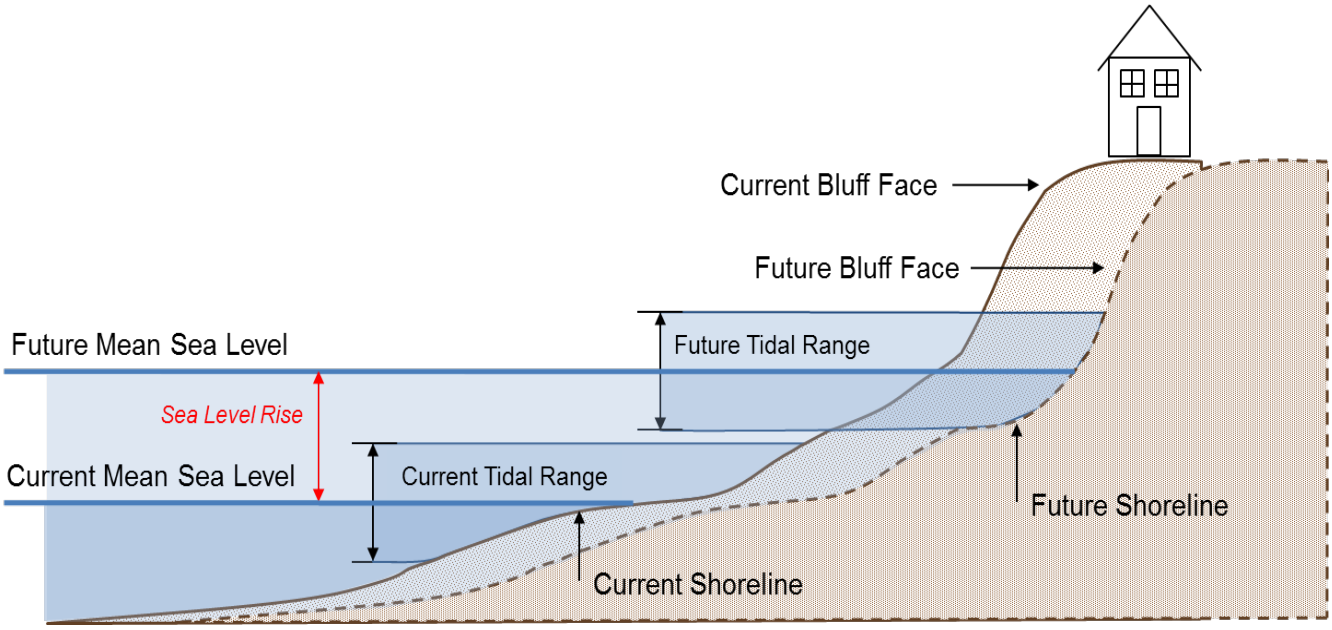

Figure B-6. Bluff erosion with changes in sea level. (*Source: L. Ewing, 2013*).

Dune Erosion

Just as there is no fully-accepted methodology for estimating changes to beach or bluff erosion with sea level rise, there is no fully-accepted methodology for dune erosion. A methodology somewhat similar to that for bluff erosion has been developed for dunes (Heberger *et al.* 2009; Revell *et al.* 2011), and such an approach should be considered for examining dune erosion with rising sea level. Other approaches that recognize the influence of water levels in beach, bluff, or dune erosion may also be used.

Dune erosion occurs when the waves break at or near the dunes, pulling sediment out of the dune. This process deposits sand onto the beach or in the nearshore area, but can result in short-term dune retreat. If sand is not returned to the dunes following these periods of short-term retreat, the sand losses will contribute to long-term dune erosion. Damage will occur to development located on dunes when the dune retreats back to the location of development, either through reversible, short-term retreat or long-term erosion.

For individual cases, determinations of future retreat risk are based on the site-specific conditions and professional analysis and judgment. However, the lack of information about the contributions of all the erosive forces to dunes and the beach-dune interactions makes it challenging to anticipate future changes to coastal dune retreat due to rising sea level and increased wave forces. As with beaches and bluffs for most situations, historical conditions provide a lower limit for future dune *retreat*, or the upper limit of dune *advance* for those sites that are now experiencing accretion or quasi-stability. Projections of future erosion should either: 1) use the high range of historical erosion; 2) develop a sea level rise influenced erosion rate, as done by Heberger *et al.* (2009) or Revell *et al.* (2011); or, 3) develop another approach that considers shoreline changes that are likely to occur under rising sea level conditions.

Table B-5. General Resources for Information on Beach, Bluff and Dune Erosion

Resource	Description	Link
Aerial Photographs	Useful for general information on shoreline trends; ortho-rectified photos can help quantify trends.	California Coastal Records Project, www.californiacoastline.org; Huntington Library; Local Libraries
LIDAR	Fairly detailed topography that can provide GIS layers for current conditions and is comparable with LIDAR data sets for temporal changes.	NOAA's Digital Coast, http://coast.noaa.gov/digitalcoast/data/coastallidar
USGS National Assessment of Shoreline Change with GIS Compilation of Vector Shorelines	Statewide inter-annual beach and bluff erosion; GIS shorelines available for sandy shorelines & cliff edge, showing historical changes for long-term (70 to 100 years) and short-term (25 to 50 years). No projections of future erosion rates available.	Sandy Shorelines – Open File Report 2006-1219, http://pubs.usgs.gov/of/2006/1219, and GIS Data in Open File 2006-1251, http://pubs.usgs.gov/of/2006/1251; Bluff Shorelines – Open File Report 2007-1133, http://pubs.usgs.gov/of/2007/1133, and GIS Data in Open File 2007-1251, http://pubs.usgs.gov/of/2007/1112

Regional Sediment Management Studies	Summaries of seasonal and long-term erosion studies	CSMW Website, http://dbw.ca.gov/csmw/default.aspx; California Beach Erosion Assessment Survey, http://dbw.ca.gov/csmw/library.aspx
US Army Corps of Engineers, Coast of California Studies	Summaries of seasonal and long-term erosion studies	Studies for many regions are available through an internet search (addresses are too numerous to list here)
Beach Profiles and Surveys	Detailed beach or bluff changes with time	NOAA's Digital Coast, http://coast.noaa.gov/digitalcoast/tools/list; US Army Corps of Engineers; Regional Beach Studies; University Studies
The Impacts of Sea Level Rise on the California Coast (Pacific Institute Report)	Expected changes to bluff position over time for sea level rise of 4.6 ft (1.4 m) from 2000 to 2100 for California coast from Oregon border through Santa Barbara County.	Pacific Institute Website, http://www.pacinst.org/reports/sea_level_rise/maps/
CoSMoS	Tool for predicting climate change impacts from storms. The *Our Coast, Our Future* effort, from Half Moon Bay to Bodega Bay, does not predict long-term erosion, but can provide general information for short-term, storm-driven beach changes. The Southern California version (from Point Conception to the US-Mexico border, including the Channel Islands and coastal embayments) does account for shoreline change and fluvial inputs.	http://walrus.wr.usgs.gov/coastal_processes/cosmos/
Coastal Resilience Ventura	A partnership to provide science and decision-support tools to aid conservation and planning projects and policymaking to address conditions brought about by climate change. The primary goals of Coastal Resilience Ventura are assessing the vulnerabilities of human and natural resources, and identifying solutions that help nature help people. The mapping tool includes flooding and inundation risk, wave impacts, and erosion risk.	http://coastalresilience.org/geographies/ventura-county

Outcome from Step 4: *Provide projections of future long-term beach, bluff or dune erosion that takes into account sea level rise. For locations without any influence from storm surge, or wave energy, the identification of the extent of beach, bluff or dune erosion may be sufficient for project analysis and planning efforts. This projected new erosion area may also be useful for anticipating the appropriate setback distance for otherwise stable land forms (If slope stability is a concern, refer to Commission guidance on setbacks (*http://www.coastal.ca.gov/W-11.5-2mm3.pdf*)). For most open coast situations, this information will be used to inform further project analysis and planning that examines erosion, surge and storm conditions.*

Step 5 – Determine wave, storm wave, wave runup, and flooding conditions

The main concerns with waves, storm waves, and runup are flooding and damage from wave impacts. Flooding is the temporary wetting of an area by waves, wave runup, surge, atmospheric forcing (such as water elevation during El Niño events) and, at river mouths, the combination of waves and river flows. Wave impacts occur when high-energy waves, often associated with storms, reach backshore areas or development. Coastal flooding and wave impacts are worst when they coincide with high water level events (high tide plus high inundation). As sea level rises, inundation will move inland, and so will flooding and wave impacts. Beach erosion will aggravate these conditions and add to the inland extent of impacts.

Flooding

In most situations, factors that result in high water conditions, such as tides, surge, El Niño events, and PDOs, should be used to determine flood levels and flood areas, as shown below. If the area is exposed to storm waves, these forces should be examined as well.

Future Flooding Level = Higher High Tide + Sea Level Rise + Surge + Forcing + Wave Runup

Flooding Areas = Flooding + Seasonal Eroded Beach + Long-Term Beach Erosion

Waves

Waves, like tides, cause constant changes to the water levels that are observed at the coast. The rhythmic lapping of waves on the beach during summer can be one of the joys of a beach visit. At other times of the year, waves can increase in size and energy and damage or destroy buildings, and cause erosion of bluffs and cliffs. Routine ocean waves are generated by wind blowing across the surface of the water and can travel far from their source, combining with waves generated from other locations to produce the rather erratic and choppy water levels that are seen in most of the ocean. As waves move into shallow water and approach land, they are strongly modified by the offshore bathymetry. They take on a more uniform appearance, aligning somewhat parallel to the shoreline through processes of refraction and diffraction. During most of the year, moderate short-period waves break once they are in water depths of approximately 1.3 times the wave height.

Wave impacts depend greatly upon storm activity – both the intensity and the duration of the storm. Normally projects have used design wave conditions comparable to the 100-year event. For critical infrastructure or development with a long life expectancy, it may be advisable to use a greater design standard, such as a 200-year or 500-year event. It may be suitable for some proposed projects to adjust design waves or the frequency of high energy waves to analyze the consequences of worsening wave impacts.

Waves also vary greatly with bathymetry; offshore reefs and sand bars can cause waves to break far from the coast and greatly reduce the energy of the waves that come onshore. Therefore, changes in offshore water depths can alter the nature of nearshore wave propagation and resultant onshore waves. For areas with complex offshore bathymetry, wave impact changes due to rising sea level may need to be examined in the context of both offshore and nearshore conditions.

Wave impacts to the coast, to coastal bluff erosion and inland development, should be analyzed under the conditions most likely to cause harm. Those conditions normally occur in winter when most of the sand has moved offshore leaving only a reduced dry sand beach to dissipate wave energy (this seasonal change in beach width is often referred to as short-term or seasonal erosion). On beaches that will experience long-term erosion, trends expected to occur over the entire expected life of the development should also be considered. Just as the beach conditions to analyze should be those least likely to protect from damage over the life of the development, the water level conditions considered should also be those most likely to contribute to damage over the life of the development. Waves that cause significant damage during high tide will be less damaging during low tide; all other things being equal, waves will cause more inland flooding and impact damage when water levels are higher. Since water levels will increase over the life of the development due to rising sea level, the development should be examined for the amount of sea level rise (or a scenario of sea level rise conditions) that is likely to occur throughout the expected life of the development. Then, the wave impact analysis should examine the consequences of a 100-year design storm event using the combined water levels that are likely to occur with high water conditions and sea level rise, as well as a long-term and seasonally eroded beach.

Eroded Beach Conditions = Seasonal Erosion + Long-Term Erosion*

High Water Conditions = High Tide + Relative Sea Level Rise* + Atmospheric Forcing

Wave Conditions = 100-year Design Storm + High Water + Eroded Beach

* The time period for both long-term erosion and relative sea level rise will be at least as long as the expected life of the development.

The remaining discussion provides general information about waves, the California wave climate, and coastal flooding. It is provided to acquaint readers to the main issues associated with waves and coastal flooding. Readers with a strong background in waves or coastal processes may want to skim or skip the rest of this section.

Storm Waves

During storm conditions, winds can transfer large amounts of energy into waves, increasing wave height, length, and period. Energy transfer to waves depends upon three conditions: the wind energy that is available to be transferred to the water (intensity); the length of time over which the wind blows (duration); and the area over which the wind blows (the fetch). As any of these conditions increases, the energy in the waves will increase, as will the energy that these waves bring to the coastline. Coastal scientists separate waves that are generated far from the coast (swell) from waves that are locally generated (seas). Storms in the mid-Pacific can cause storm-like wave conditions along the coast, even when there are no storms in the area. Likewise, a local storm can cause storm waves along one part of the coast while waves in other sections of the coast may be fairly mild.

Some of the worst storm wave conditions occur when there are intense storms along a large portion of the coast and when this large, distantly generated swell combines with local seas. The 1982/83 El Niño has been cited often as one of the more damaging storm seasons in recent times. In late January 1983, waves from a distant storm combined with locally generated waves and the highest tides of the year. This one storm caused substantial damage along much of the California Coast. The coast was not able to recover before a series of storms in February and March caused additional damage. The full 1982/83 El Niño storm season resulted in damage to approximately 3,000 homes and 900 businesses and destruction of 33 buildings. Damages exceeded $100 million to structures and $35 million to public recreational infrastructure (in 1982 dollars; Flick 1998).

Wave Runup

Wave runup, as depicted in Figure B-7, is the distance or extent to which water from a breaking wave will spread up the shoreline. Much of the wave energy will dissipate during breaking, but wave runup can also be damaging. The runup water moves quickly and can scour or erode the shoreline areas (including the beach), damage structures, and flood inland areas.

Damage from waves and wave runup may increase in the future, due both to rising sea level and to changes in storm intensity and frequency. Waves will break farther landward when water levels are higher. Therefore, increased water levels due to tides, surge, ENSO or PDO variability, or sea level rise will enable more wave energy to reach the beach, back shore, or inland development. The higher water levels do not change the waves. Rather, higher water levels change the point of impact, the extent of runup, and the frequency of wave impact. In locations where high waves now hit the coast, that frequency will increase; in locations where high waves rarely hit the coast, exposure to wave impacts will increase. Increased exposure to wave impacts or wave runup can cause a greater risk of flooding, erosion, bluff failure, and/or damage to

development. But, since the focusing of wave energy is strongly influenced by offshore bathymetry, locations of wave exposure may also change with rising sea level and modifications in wave propagation might result from future differences in water depths.

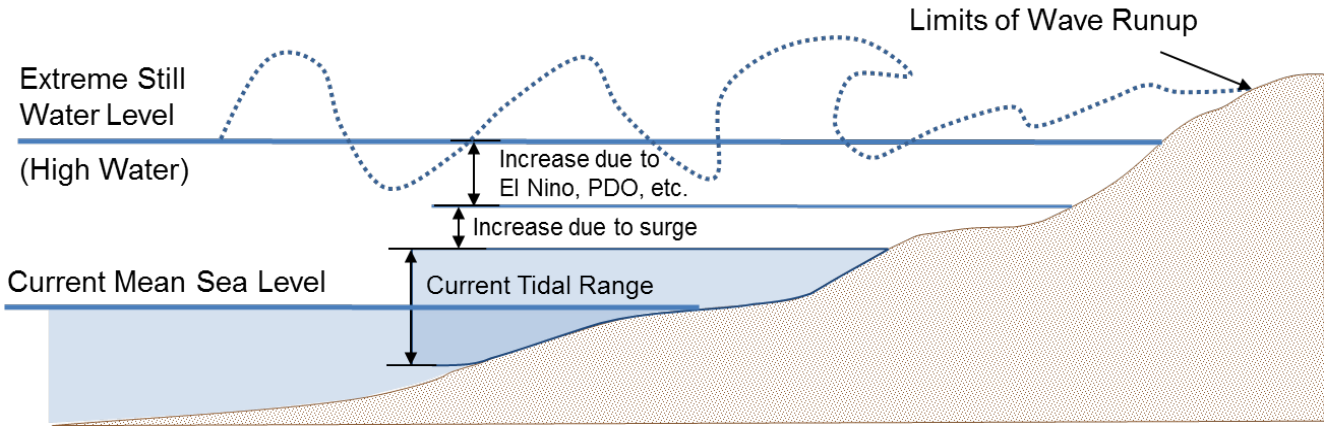

Figure B-7. Wave runup combined with extreme still water (High Water). (*Source: L. Ewing, 2013*).

Summary

Coastal flooding is a significant problem now and it will increase with rising sea level. At present, about 210,000 people in California are living in areas at risk from a 100-year flood event (Heberger *et al.* 2009). A rise in sea level of 55 in (1.4 m) with no change in development patterns or growth along the coast could put 418,000 to 480,000 people at risk from a 100-year flood (Cooley *et al.* 2012). An additional fraction of the California population that relies on critical infrastructure located in potentially hazardous areas is also vulnerable and increases in storm intensity or in the density of development in flood-prone areas will increase the number of people at risk from flooding.

The frequency and intensity of high wave events depends upon the storm conditions that generate the waves. There is less consistency in the output of climate models related to projections of future storm conditions than there has been for temperature projections. A recent report on coastal flooding from years 2000 to 2100 for the California coast has found that "storm activity is not projected to intensify or appreciably change the characteristics of winter nearshore wave activity of the twenty-first century" (Bromirski *et al.* 2012, p. 33). This continuation of current storm conditions is not, however, an indication that storms will not be a problem in the future. Storm damage is expected to continue, and, if sea level rise by the end of the twenty-first century reaches the high projections of about 55 in (1.4 m), "coastal managers can anticipate that coastal flooding events of much greater magnitude than those during the 1982-83 El Niño will occur annually." (Bromirski *et al.* 2012, p. 36)

For most situations, the 100-year storm event should be used as the design storm. This is equivalent to a storm with a 1% annual probability of occurrence. However, most development does outlast one year and this probability of occurrence grows over time such that there is a 22% probability of occurrence during a 25-year period and over 53% probability that this storm will occur at least once during a 75-year period. Even so, the 100-year storm event, like the 100-year flood event, is often used as a design standard for development. However, for structures with a

very long projected life or for which storm protection is very critical, a larger, 200-year or 500-year event might be appropriate.

Table B-6 lists many of the resources that are available for finding regional or state-wide information on waves and flooding. Local communities may have records of major erosion episodes or flood events as well.

Table B-6. General Resources for Flooding and Wave Impacts

Resource	Description	Link
CDIP (Coastal Data Information Program)	Current and historical information on wind, waves, and water temperature, wave and swell models and forecasting. As of 2013, there are 19 active stations along the California coast.	http://cdip.ucsd.edu/
Flood Insurance Rate Maps (FIRMs)	FEMA is updating coastal flood maps. Existing FIRMs are based on 1980s topography; flooding includes seasonal beach change but not long-term erosion. Maps do not include sea level rise. Inclusion of a site shows a flood hazard; but exclusion does not necessarily indicate a lack of flood hazard.	FEMA Flood Map Service Center, https://msc.fema.gov/portal
FEMA Flood Hazard Mapping Guidance	*Subsection D.2.8* provides guidance for calculating wave runup and overtopping on barriers. There are special cases for steep slopes and where runup exceeds the barrier or bluff crest.	https://www.fema.gov/media-library/assets/documents/13948
Regional Sediment Management Studies	Some studies show elements of beach flooding and wave impacts.	http://dbw.ca.gov/csmw/default.aspx
Cal-Adapt – Exploring California's Climate	Shows coastal areas that may be threatened by flooding from a 4.6 ft (1.4 m) rise in sea level and a 100-year flood event. Maps were developed using the Pacific Institute SLR Maps and do not now include any influence of beach or dune erosion, or existing protective structures.	http://cal-adapt.org/sealevel/
US Army Corps of Engineers, Coastal Engineering Manual	Detailed information on all aspects of deep-water wave transformation, shoaling, runup, and overtopping.	http://chl.erdc.usace.army.mil/cem
European Overtopping Manual	Descriptions of available methods for assessing overtopping and its consequences. Provides techniques to predict wave overtopping at seawalls, flood embankments, breakwaters and other shoreline structures facing waves. Supported by web-based programs for the calculation of overtopping discharge and design details.	http://www.overtopping-manual.com/

CoSMoS	A tool to help understand, visualize, and anticipate vulnerabilities from sea level rise and storms. It does not predict long-term erosion, but can provide general information for short-term, storm-drive beach changes. Currently available for the central coast, but expanding to southern California in 2015/2016.	http://walrus.wr.usgs.gov/coastal_processes/cosmos/
Coastal Resilience Ventura	A partnership to provide science and decision-support tools to aid conservation and planning projects and policymaking to address conditions brought about by climate change. The primary goals of Coastal Resilience Ventura are assessing the vulnerabilities of human and natural resources, and identifying solutions that help nature help people. The mapping tool includes flooding and inundation risk, wave impacts, and erosion risk.	http://coastalresilience.org/geographies/ventura-county

Outcome from Step 5: *Provide projections of future flooding and wave impacts resulting from waves, storm waves and runup, taking into account sea level rise.*

Step 6 – Examine potential flooding from extreme events

Extreme events[107], by their very nature, are those beyond the normal events that are considered in most shoreline studies. Examples of extreme events that might occur along the California coast include:

- An individual storm with an intensity at or above the 100-year event
- A series of large, long-duration storms during high tides
- A local storm that coincides with the arrival of distant swell and high tides
- Rapid subsidence, as might happen along the Northern California coast during a Cascadia Subduction Zone earthquake
- Global sea level rise greater than that projected to occur by 2100, when combined with a large storm during normal tides

Planning and project analysis need to consider and anticipate the consequences of these outlier events. In many situations, this assessment might be a qualitative consideration of consequences that could happen if an extreme event does occur. Analysis of the consequences of extreme events presents opportunities to address some of those potential impacts through design and adaptation.

[107] In its report on *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*, the IPCC defines extreme events as "a facet of climate variability under stable or changing climate conditions. They are defined as the occurrence of a value or weather or climate variable above (or below) a threshold value near the upper (or lower) ends ("tails") of the range of observed values of the variable" (IPCC 2012).

In California, there may be some worsening of extreme precipitation and inland flooding from projected changes to atmospheric rivers, narrow bands of concentrated moisture in the atmosphere. In general, however, future extremes are likely to be comparable to the extremes of today, but with the added influence of sea level rise. Extreme storm waves or floods can be addressed with the guidance provided earlier, except that the extreme storm conditions would be used. For tsunamis it is recommended that, for most situations, the appropriate projection of sea level rise be added to the currently projected inundation level from tsunamis. This will provide a close approximation for future inundation from extreme tsunamis. If a detailed analysis of future tsunami impacts is needed, the analysis should be conducted by someone experienced in modeling tsunami waves.

Tsunamis

Tsunamis are large, long-period waves that can be generated by submarine landslides, subaerial landslides (slope failures from land into a water body), large submarine earthquakes, meteors, or volcanic eruptions. They are rare events, but can be extremely destructive when they occur. The extent of tsunami damage will increase as rising water levels allow tsunami waves to extend farther inland. Thus the tsunami inundation zone will expand inland with rising sea level. There has been no research that suggests that climate change will increase the intensity or frequency of seismically-generated tsunamis. However, the number and size of coastal subaerial landslides may increase because of increased coastal erosion due to sea level rise, which in turn may increase the potential for tsunamigenic landslides along the California coast (Highland 2004; Walder *et al.* 2003).

The detailed changes to the inundation zone with rising sea level need to be determined by modeling; however, modeling of long-waves, such as tsunamis, is a specialized area of coastal engineering, and will not be covered in this general Guidance. For most situations, it will be sufficient to get information on possible inundation from the most recent tsunami inundation maps (currently on the Department of Conservation website, http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/Pages/Statewide_Maps.aspx). The California Geological Survey and California Governor's Office of Emergency Services are creating new tsunami inundation maps based on probabilistic tsunami hazard analysis (CPTHAWG 2015). As a rough approximation, the change to the tsunami inundation level can be estimated as equal to the change in water elevation due to sea level; a 1-ft rise in sea level could be assumed to result in a 1-ft rise in the inundation elevation. However, in many places, particularly shallow bays, harbors, and estuaries, the change in tsunami inundation zone is likely to scale non-linearly with sea level rise and require careful modeling. California Geological Survey is also working to evaluate the impact of sea level rise with numerical tsunami modeling to verify that an additive approach (tsunami height + SLR) is the appropriate method for integrating SLR and tsunami inundation together. In areas with high tsunami hazards, or where critical resources are at risk, a site-specific analysis of sea level rise impacts on tsunami hazards is crucial, and someone experienced in modeling tsunami waves should be consulted.

Summary

Many different factors affect the actual water levels that occur along the coast and resulting hazards. In California, waves and tides have the largest routine effect on water levels. Tsunamis may have a very large, but infrequent effect on water levels. Sea level rise will affect water levels all along the coast. Until the mid-century, tides and storms are expected to have the biggest effects on local water levels, with sea level rise being a growing concern. After Year 2050, sea level rise is expected to become increasingly influential on water levels and in contributing to damages to inland areas from flooding, erosion and wave impacts. Table B-7 provides a general characterization of all the factors that can affect local water levels, with general estimates of their range and frequency of occurrence.

Outcome from Step 6: *Projections of potential flooding from extreme events including rapid subsidence, extreme precipitation, and tsunamis.*

Table B-7. Factors that Influence Local Water Level Conditions

Factors Affecting Water Level	Typical Range for CA Coast (ft)	Typical Range for CA Coast (m)	Period of Influence	Frequency
Tides	3 – 10	1 – 3	Hours	Twice daily
Low pressure	1.5	0.5	Days	Many times a year
Storm Surge	2 – 3	0.6 – 1.0	Days	Several times a year
Storm Waves	3 – 15	1 – 5	Hours	Several times a year
El Niño events (within the ENSO cycle)	<1.5	< 0.5	Months - Years	2 – 7 years
Tsunami waves	20 – 50 (max) 3 – 10 (typical)	6 – 15 (max) 1 – 3 (typical)	Minutes, Hours, Days	Infrequent but unpredictable
Historical Sea Level, over 100 years	0.7	0.2	Ongoing	Persistent
NRC State-wide Sea Level Projections 2000 – 2050	0.7 – 1.4	0.2 – 0.4	Ongoing	Persistent
NRC State-wide Sea Level Projections 2000 – 2100	0.3 – 4.69 ft (North of Cape Mendocino) 1.38 – 5.48 ft (South of Cape Mendocino)	0.1 – 1.43 m (North of Cape Mendocino) 0.42 – 1.67 m (South of Cape Mendocino	Ongoing	Persistent

Note that all values are approximations. The conversions between feet and meters have been rounded to maintain the general ranges and they are not exact conversions. *Sources*: Flick 1998; NRC 2012; Personal communications from Dr. Robert Guza (Scripps Institution of Oceanography), Dr. William O'Reilly (Scripps Institution of Oceanography and University of California, Berkeley), and Rick Wilson, California Geological Survey; and professional judgment of staff.

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Appendix C

Resources for Addressing Sea Level Rise

This section contains lists of sea level rise viewers, guidebooks, guidance documents, and state agency-produced resources, and data clearing houses related to sea level rise. These resources will be particularly relevant for informing Steps 1-6 of the LCP planning process (Chapter 5). Tables include:

- Table C-1 – Sea Level Rise Mapping Tools.
  This may be particularly relevant for Steps 1-3.

- Table C-2 – Sea Level Rise Data and Resource Clearinghouses.
  This may be particularly relevant for Steps 1-4.

- Table C-3 – Adaptation Planning Guidebooks.
  This may be particularly relevant for Steps 1-3.

- Table C-4 – Resources for Assessing Adaptation Measures.
  This may be particularly relevant for Step 4.

- Table C-5 – Examples of Sea Level Rise Vulnerability Assessments in California.
  This may be particularly relevant for Steps 1-3.

- Table C-6 – California Climate Adaptation Plans that Address Sea Level Rise.
  This may be particularly relevant for Steps 1-4.

- Table C-7 – California State Agency Resources

Table C-1. Sea Level Rise Mapping Tools

Tool	Description	Link
Statewide		
NOAA Digital Coast Sea Level Rise and Coastal Flooding Impacts Viewer	Displays potential future sea levels with a slider bar. Communicates spatial uncertainty of mapped sea level rise, overlays social and economic data onto sea level rise maps, and models potential marsh migration due to sea level rise. Maps do not include any influence of beach or dune erosion.	http://coast.noaa.gov/digitalcoast/tools/slr/
Cal-Adapt – Exploring California's Climate	Shows coastal areas that may be threatened by flooding from a 4.6 ft (1.4 m) rise in sea level and a 100-year flood event. Maps were developed using the Pacific Institute SLR Maps (see below) and do not now include any influence of beach or dune erosion or existing protective structures.	http://cal-adapt.org/sealevel/
Climate Central Surging Seas	Overlays sea level rise data with socio-economic information and ability to analyze property values, population, socio-economic status, ethnicity, and income or areas at risk. Can compare exposure across the whole state or selected county.	http://sealevel.climatecentral.org/ssrf/california
Pacific Institute Sea Level Rise Maps (Heberger *et al*. 2009)	Downloadable PDF maps showing the coastal flood and erosion hazard zones from the 2009 study. Data are overlaid on aerial photographs and show major roads. Also available are an interactive online map and downloadable maps showing sea level rise and population and property at risk, miles of vulnerable roads and railroads, vulnerable power plants and wastewater treatment plants, and wetland migration potential.	http://www.pacinst.org/reports/sea_level_rise/maps/ For the 2009 report *The Impacts of Sea-Level Rise on the California Coast*, see: http://pacinst.org/publication/the-impacts-of-sea-level-rise-on-the-california-coast/

Sea Level Affecting Marshes Model (SLAMM)	Simulates the dominant processes involved in wetland conversions and shoreline modifications during long-term sea level rise. Map distributions of wetlands are predicted under conditions of accelerated sea level rise, and results are summarized in tabular and graphical form.	http://www.warrenpinnacle.com/prof/SLAMM
Coastal Storm Modeling System (CoSMoS)	A numerical modeling system to predict coastal flooding due to both sea level rise and storms driven by climate change. Used in the *Our Coast Our Future* project (along the Central Coast) and for the entire Southern California Bight (expected to be available in 2015).	*OCOF*: http://data.prbo.org/apps/ocof/ Southern CA: http://walrus.wr.usgs.gov/coastal_processes/cosmos/socal2.0/index.html
North Coast		
Humboldt Bay Sea Level Rise Adaptation Project	This project is a multi-phased, regional collaboration. Phase I produced the *Humboldt Bay Shoreline Inventory, Mapping, and Sea Level Rise Vulnerability Assessment* which describes current shoreline conditions and vulnerabilities under the current tidal regime. Phase II included hydrodynamic modeling to develop vulnerability maps of areas surrounding Humboldt Bay vulnerable to inundation from existing and future sea levels. Phase II produced the *Humboldt Bay Sea Level Rise Modeling Inundation Mapping Report* and the *Humboldt Bay Sea Level Rise Conceptual Groundwater Model*.	All reports are available at: http://humboldtbay.org/humboldt-bay-sea-level-rise-adaptation-planning-project

North Central Coast		
Our Coast Our Future (map available for Bodega Head to Half Moon Bay)	Provides online maps and tools to help understand, visualize, and anticipate vulnerabilities to sea level rise and storms, including seamless Digital Elevation Model (DEM) at 6.6 ft (2 m) horizontal resolution; 9.8 in (25 cm) increment sea level rise projections between 0-6.6 ft (0-2 m) with a 16.4 ft (5 m) extreme; storm scenarios using the Coastal Storm Modeling System (CoSMoS); and interactive maps overlaying infrastructure and ecosystem vulnerabilities.	http://data.prbo.org/apps/ocof/
South Coast		
Coastal Resilience Ventura	A partnership to provide science and decision-support tools to aid conservation and planning projects and policymaking to address conditions brought about by climate change. The primary goals of Coastal Resilience Ventura are assessing the vulnerabilities of human and natural resources, and identifying solutions that help nature help people.	http://maps.coastalresilience.org/california/ http://coastalresilience.org/geographies/ventura-county
Southern California Coastal Impacts Project, including the Coastal Storm Modeling System (CoSMoS)	A numerical modeling system to predict coastal flooding due to both sea level rise and storms driven by climate change; conditions will be specifically selected for and downscaled to the southern California region (from Point Conception to the US-Mexico border, including the Channel Islands and coastal embayments). This version will take into account shoreline change and fluvial inputs; additionally, even more robust modeling of coastal erosion and shoreline change will be provided for the Los Angeles region.	http://walrus.wr.usgs.gov/coastal_processes/cosmos/socal2.0/index.html

Table C-2. Sea Level Rise Data and Resource Clearinghouses

Resource	Description	Link
California Climate Commons	Offers a point of access to climate change data and related resources, information about the science that produced it, and the opportunity to communicate with others about applying climate change science to conservation in California.	http://climate.calcommons.org/
Climate Adaptation Knowledge Exchange (CAKE)	Provides an online library of climate adaptation case studies and resources, plus ways to connect with an online climate adaptation community/ network.	http://www.cakex.org/
Ecosystem Based Management Tools Network Database	Provides a searchable database of tools available for climate adaptation, conservation planning, sea level rise impact assessment, *etc.*	http://www.ebmtools.org/about_ebm_tools.html
Climate.Data.gov	Recently launched federal government data portal that includes a number of data sets on climate change, including sea level rise impacts.	http://www.data.gov/climate/
NOAA Digital Coast	This NOAA-sponsored website is focused on helping communities address coastal issues. The Digital Coast provides coastal data, tools, training, and information from reputable sources.	http://coast.noaa.gov/digitalcoast/

Table C-3. Adaptation Planning Guidebooks

Title	Description	Link
Scanning the Conservation Horizon (National Wildlife Federation 2011)	Designed to assist conservation and resource professionals to better plan, execute, and interpret climate change vulnerability assessments.	http://www.habitat.noaa.gov/pdf/scanning_the_conservation_horizon.pdf
Adapting to Sea Level Rise: A Guide for California's Coastal Communities (Russell and Griggs 2012)	Intended to assist California's coastal managers and community planners in developing adaptation plans for sea level rise that are suited to their local conditions and communities.	http://seymourcenter.ucsc.edu/OOB/Adapting%20to%20Sea%20Level%20Rise.pdf
California Adaptation Planning Guide (APG) (Cal EMA/CNRA 2012)	Provides guidance to support regional and local communities in proactively addressing the unavoidable consequences of climate change. Includes a step-by-step process for local and regional climate vulnerability assessment and adaptation strategy development.	http://resources.ca.gov/climate/safeguarding/adaptation_policy_guide/
Preparing for Climate Change: A Guidebook for Regional and State Governments (Snover *et al.* 2007)	Assists decision makers in a local, regional, or state government prepare for climate change by recommending a detailed, easy-to-understand process for climate change preparedness based on familiar resources and tools.	http://cses.washington.edu/db/pdf/snoveretalgb574.pdf
Adapting to Climate Change: a Planning Guide for State Coastal Managers (NOAA 2010)	Guide offers a framework for state coastal managers to follow as they develop and implement climate change adaptation plans in their own states.	http://coastalmanagement.noaa.gov/climate/docs/adaptationguide.pdf

Using Scenarios to Explore Climate Change: A Handbook for Practitioners (NPS 2013)	Describes the five-step process for developing multivariate climate change scenarios taught by the Global Business Network (GBN). Detailed instructions are provided on how to accomplish each step. Appendices include a hypothetical scenario exercise that demonstrates how to implement the process and some early examples of how national parks are using climate change scenarios to inform planning and decision making.	http://www.nps.gov/subjects/climatechange/upload/CCScenariosHandbookJuly2013.pdf
Scenario Planning for Climate Change Adaptation: A Guidance for Resource Managers (Moore *et al.* 2013)	Step-by-step guide to using scenarios to plan for climate change adaptation for natural resource managers, planners, scientists, and other stakeholders working at a local or regional scale to develop resource management approaches that take future climate change impacts and other important uncertainties into account.	http://scc.ca.gov/files/2013/07/Scen-planning_17july2013_FINAL-3.pdf

Table C-4. Resources for Assessing Adaptation Measures

Resource	Description	Link
General		
Georgetown Climate Center's Climate Adaptation Toolkit – Sea Level Rise and Coastal Land Use	Explores 18 different land-use tools that can be used to preemptively respond to the threats posed by sea level rise to both public and private coastal development and infrastructure, and strives to assist governments in determining which tools to employ to meet their unique socio-economic and political contexts.	http://www.georgetownclimate.org/resources/adaptation-tool-kit-sea-level-rise-and-coastal-land-use
What Will Adaptation Cost? (ERGI 2013)	"This report provides a framework that community leaders and planners can use to make more economically informed decisions about adapting to sea level rise and storm flooding. The four-step framework can be used to perform a holistic assessment of costs and benefits of different adaptation approaches across a community, or to focus in on select infrastructure. The report also discusses the expertise needed at each step in the process."	http://coast.noaa.gov/digitalcoast/publications/adaptation
Center for Ocean Solutions: Adaptation in Action: Examples from the Field	Provides case studies of various adaptation strategies including overlay zones, non-conformities, setbacks, buffers, development conditions, shoreline protection devices, managed retreat, capital improvement programs, acquisition programs, conservation easements, rolling easements, tax incentives, transfer development rights, and real estate disclosures.	http://www.centerforoceansolutions.org/sites/default/files/Application%20of%20Land%20Use%20Practices%20and%20Tools%20to%20Prepare.pdf

Combatting Sea Level Rise in Southern California: How Local Government Can Seize Adaptation Opportunities While Minimizing Legal Risk (Herzog and Hecht 2013)	Identifies how local governments can harness legal doctrines to support aggressive, innovative strategies to achieve successful sea level rise adaptation outcomes for Southern California while minimizing legal risk. Broadly outlines likely sea level rise impacts in Southern California, and evaluates the risks and opportunities of potential protection, accommodation, and retreat adaptation strategies that local governments could deploy.	http://www.law.ucla.edu/~/media/Files/UCLA/Law/Pages/Publications/CEN_EMM_PUB%20Combatting%20Sea-Level%20Rise.ashx
Strategies for Erosion-Related Impacts		
Evaluation of Erosion Mitigation Alternatives for Southern Monterey Bay	Provides a technical evaluation of various erosion mitigation measures, conducts a cost benefit analysis of some of the more promising measures, and includes recommendations for addressing coastal erosion in Southern Monterey Bay. The report is intended to be relevant for other areas of California as well.	http://montereybay.noaa.gov/new/2012/erosion.pdf
Rolling Easements		
Rolling Easements- A Primer (Titus 2011)	Examines more than a dozen different legal approaches to rolling easements. It differentiates opportunities for legislatures, regulators, land trusts, developers, and individual landowners. Considers different shoreline environments (*e.g.*, wetlands, barrier islands) and different objectives (*e.g.*, public access, wetland migration)	http://papers.risingsea.net/rolling-easements.html
No Day at the Beach: Sea Level Rise, Ecosystem Loss, and Public Access Along the California Coast (Caldwell and Segall 2007)	Provides a description of sea level rise impacts to ecosystems and public access, strategies to address these impacts, and case study examples of rolling easement strategies for the California coast.	http://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=1833&context=elq

Natural Resources		
PRBO Climate Smart Conservation	Lists science-based, climate-smart conservation planning and management tools and methods, including restoration projects designed for climate change and extremes.	http://www.pointblue.org/priorities/climate-smart-conservation/
US Forest Service System for Assessing Vulnerability of Species- Climate Change Tool	Quantifies the relative impact of expected climate change effects for terrestrial vertebrate species.	http://www.fs.fed.us/rm/grassland-shrubland-desert/products/species-vulnerability/savs-climate-change-tool/
The Nature Conservancy: Reducing Climate Risk with Natural Infrastructure report	Presents a series of nine case studies in which natural, "green" infrastructure was successfully used to mitigate climate impacts. The economic costs and benefits of the green infrastructure are compared with traditional "gray" approaches.	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/california/ca-green-vs-gray-report-2.pdf
CDFW Essential Habitat Connectivity Project	"The California Department of Fish and Wildlife and the California Department of Transportation (Caltrans) commissioned a team of consultants to produce a statewide assessment of essential habitat connectivity by February of 2010, using the best available science, datasets, spatial analyses, and modeling techniques. The goal was to identify large remaining blocks of intact habitat or natural landscape and model linkages between them that need to be maintained, particularly as corridors for wildlife."	https://www.wildlife.ca.gov/Conservation/Planning/Connectivity
CDFW Areas of Conservation Emphasis tool	Provides a mapping tool and reports on the best available statewide, spatial information on California's biological richness, including species diversity, rarity, and sensitive habitats, as well as recreational needs and opportunities throughout the state, including fishing, hunting and wildlife-viewing.	http://www.dfg.ca.gov/biogeodata/ace/

Table C-5. Examples of Sea Level Rise Vulnerability Assessments in California

Title	Description	Link
Santa Barbara Sea Level Rise Vulnerability Study (Russell and Griggs 2012)	Assesses the vulnerability of the City of Santa Barbara to future sea level rise and related coastal hazards (by Years 2050 and 2100) based upon past events, shoreline topography, and exposure to sea level rise and wave attack. It also evaluates the likely impacts of coastal hazards to specific areas of the City, analyzes their risks and the City's ability to respond, and recommends potential adaptation responses.	http://www.energy.ca.gov/2012publications/CEC-500-2012-039/CEC-500-2012-039.pdf
City of Santa Cruz Climate Change Vulnerability Assessment (Griggs and Haddad 2011)	Delineates and evaluates the likely impacts of future climate change on the city of Santa Cruz, analyzes the risks that these hazards pose for the city, and then recommends potential adaptation responses to reduce the risk and exposure from these hazards in the future.	http://seymourcenter.ucsc.edu/OOB/SCClimateChangeVulnerabilityAssessment.pdf
Developing Climate Adaptation Strategies for San Luis Obispo County: Preliminary Vulnerability Assessment for Social Systems (Moser 2012)	Describes the likely impacts of climate change on the resources and social systems of San Luis Obispo County, and assesses key areas of vulnerability. Sea level rise is identified as a major source of risk to fishing, coastal tourism, coastal development, and infrastructure.	http://www.energy.ca.gov/2012publications/CEC-500-2012-054/CEC-500-2012-054.pdf

Monterey Bay Sea Level Rise Vulnerability Study (Monterey Bay National Marine Sanctuary and PWA ESA; In progress)	Will assess potential future impacts from sea level rise for the Monterey Bay region. The project will estimate the extent of future coastal erosion in Monterey Bay due to accelerated sea level rise and evaluate areas subjected to coastal flooding by inundation from wave action and/or storm surges. The project will update and refine existing Monterey Bay coastal hazard zones maps (erosion and flooding).	Project scope and grant details: http://scc.ca.gov/webmaster/ftp/pdf/sccbb/2012/1201/20120119Board03D_Monterey_Bay_Sea_Level_Rise.pdf
Sea Level Rise Vulnerability Study for the City of LA (Adapt LA) (USC Sea Grant 2013)	This report provides a summary of the initial research on the potential impacts of sea level rise and associated flooding from storms for coastal communities in the City of L.A. The study concentrates on the City's three coastal regions: Pacific Palisades from Malibu to Santa Monica; Venice and Playa del Rey; and San Pedro, Wilmington and the Port of Los Angeles.	http://dornsife.usc.edu/uscseagrant/la-slr/

Table C-6. California Climate Adaptation Plans that Address Sea Level Rise

Title	Description	Link
Adapting to Rising Tides (ART) Project	The ART project is a collaborative planning effort led by the San Francisco Bay Conservation and Development Commission to help SF Bay Area communities adapt to rising sea levels. The project has started with a vulnerability assessment for a portion of the Alameda County shoreline.	http://www.adaptingtorisingtides.org/ Vulnerability and risk assessment report: http://www.adaptingtorisingtides.org/vulnerability-and-risk-assessment-report/
Santa Cruz Climate Adaptation Plan	An update to the 2007 Hazard Mitigation Plan, the adaptation plan includes strategies and best available science for integrating climate change impacts into City of Santa Cruz operations.	Complete plan is available: http://www.cityofsantacruz.com/home/showdocument?id=23644
San Diego Bay Sea Level Rise Adaptation Strategy	The strategy provides measures to evaluate and manage risks from sea level rise and other climate change impacts, and includes a vulnerability assessment of community assets at risk, and broad recommendations to increase resilience of these assets.	http://sdclimatecollaborative.org/wp-content/uploads/2015/08/San-Diego-Bay-SLR-Adaptation-Strategy.pdf

Table C-7. California State Agency Resources

Agency	Document	Description and Link
California Natural Resources Agency	*Safeguarding California from Climate Change* (2014)	An update to the 2009 *California Climate Adaptation Strategy*: http://resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf
	California Climate Adaptation Strategy (2009)	Summarizes climate change impacts and recommends adaptation strategies across seven sectors: Public Health, Biodiversity and Habitat, Oceans and Coastal Resources, Water, Agriculture, Forestry, and Transportation and Energy: http://resources.ca.gov/docs/climate/Statewide_Adaptation_Strategy.pdf
Office of the Governor	*Executive Order S-13-08* (2008)	This 2008 Executive Order required the CA Natural Resources Agency to develop a statewide climate adaptation strategy, and requested that the National Academy of Sciences convene an independent scientific panel to assess sea level rise in California. http://gov.ca.gov/news.php?id=11036
	Executive Order B-30-15 (2015)	This 2015 Executive Order established an interim greenhouse gas reduction target of 40 percent below 1990 levels by 2030 to expand upon the targets already included in AB32 and emphasized the need for adaptation in line with the actions identified in the *Safeguarding California* document. http://gov.ca.gov/news.php?id=18938
California Ocean Protection Council	*Resolution on Implementation of the Safeguarding California Plan for Reducing Climate Risks* (2014)	Resolves that OPC staff and the State Coastal Leadership Group on SLR will develop an action plan to implement the *Safeguarding California* plan. http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20140827/Item5_OPC_Aug2014_Exhibit_1_Safeguarding_Resolution_ADOPTED.pdf
	Resolution on Sea Level Rise (2011)	Recognizes that state agencies should address SLR through various actions such as the consideration of SLR risks in decision making, investment of public funds, stakeholder engagement, state SLR guidance updates, *etc*. http://www.opc.ca.gov/webmaster/ftp/pdf/docs/OPC_SeaLevelRise_Resolution_Adopted031111.pdf

Coasts & Oceans Climate Action Team (led by Ocean Protection Council)	*California State Sea-Level Rise Guidance Document* (2013)	Provides guidance for incorporating sea level rise projections into planning and decision making for projects in California. Updated to include NRC projections March 2013: http://www.opc.ca.gov/webmaster/ftp/pdf/docs/2013_SLR_Guidance_Update_FINAL1.pdf
California Coastal Conservancy	*Climate Change Policy* (2010)	Includes policies on 1) consideration of climate change in project evaluation, 2) consideration of sea level rise impacts in vulnerability assessments, 3) collaboration to support adaptation strategies, and 4) encouragement of adaptation strategies in project applications mitigation and adaptation: http://scc.ca.gov/2009/01/21/coastal-conservancy-climate-change-policy-and-project-selection-criteria/
	Project Selection Criteria (2011)	Adds sea level rise vulnerability to project selection criteria: http://scc.ca.gov/2009/01/21/coastal-conservancy-climate-change-policy-and-project-selection-criteria/
	Guidance for addressing climate change in CA Coastal Conservancy projects (2012)	Includes the following steps: 1) conduct initial vulnerability assessment, 2) conduct more comprehensive vulnerability assessment, 3) reduce risks and increase adaptive capacity, and 4) identify adaptation options: http://scc.ca.gov/2013/04/24/guidance-for-grantees
San Francisco Bay Conservation and Development Commission (BCDC)	*Climate Change Bay Plan Amendment* (2011)	Amends *Bay Plan* to include policies on climate change and sea level rise. Policies require: 1) a sea level rise risk assessment for shoreline planning and larger shoreline projects, and 2) if risks exist, the project must be designed to cope with flood levels by mid-century, and include a plan to address flood risks at end of century. Assessments are required to "identify all types of potential flooding, degrees of uncertainty, consequences of defense failure, and risks to existing habitat from proposed flood protection devices": http://www.bcdc.ca.gov/proposed_bay_plan/bp_amend_1-08.shtml

	Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline (2011)	Provides the background staff report identifying vulnerabilities in the Bay Area's economic and environmental systems, as well as the potential impacts of climate change on public health and safety. The report provides the basis for all versions of the proposed findings and policies concerning climate change: http://www.bcdc.ca.gov/BPA/LivingWithRisingBay.pdf
California Department of Transportation (Caltrans)	*Estimating Sea Level for Project Initiation Documents* (2012)	Provides guidance on converting tidal datums and predicting future sea levels. http://www.dot.ca.gov/hq/row/landsurveys/SurveysManual/Estimating_Sea_Level_v1.pdf
	Guidance on Incorporating Sea Level Rise (2011)	Provides guidance on how to incorporate sea level rise concerns into programming and design of Caltrans projects. Includes screening criteria for determining whether to include SLR and steps for evaluating degree of potential impacts, developing adaptation alternatives, and implementing the adaptation strategies: http://www.dot.ca.gov/ser/downloads/sealevel/guide_incorp_slr.pdf
	Addressing Climate Change in Adaptation Regional Transportation Plans: A Guide for MPOs and RTPAs (2013)	Provides a clear methodology for regional agencies to address climate change impacts through adaptation of transportation infrastructure: http://www.camsys.com/pubs/FR3_CA_Climate_Change_Adaptation_Guide_2013-02-26_.pdf

Cal OES	*California Multi-Hazard Mitigation Plan* (SHMP 2013)	"The 2013 SHMP represents the state's primary hazard mitigation guidance document, and provides an updated and comprehensive description of California's historical and current hazard analysis, mitigation strategies, goals and objectives. Innovative features of the California hazard mitigation plan include an expanded discussion of climate change and adaptation strategies, a new and expanded section on volcanic hazards in the state, as well as significant mitigation initiatives, strategies and actions completed since adoption of the 2010 SHMP." http://hazardmitigation.calema.ca.gov/plan/state_multi-hazard_mitigation_plan_shmp
State Lands Commission	Application for Lease of State Lands	Requires assessment of climate change risks, and preference is given to projects that reduce climate change risks: http://www.slc.ca.gov/Forms/LMDApplication/LeaseApp.pdf
California State Parks	Sea level rise guidance (*in development*)	Will provide guidance to Park staff on how to assess impacts to parklands.
Groups of state agencies	California Climate Change Center's 3rd Assessment	Explores local and statewide vulnerabilities to climate change, highlighting opportunities for taking concrete actions to reduce climate-change impacts: http://climatechange.ca.gov/climate_action_team/reports/third_assessment/
	California Climate Adaptation Planning Guide (APG)	Provides a decision-making framework intended for use by local and regional stakeholders to aid in the interpretation of climate science and to develop a systematic rationale for reducing risks caused, or exacerbated, by climate change (2012): http://resources.ca.gov/climate/safeguarding/adaptation_policy_guide/

Appendix D

General LCP Amendment Processing Steps and Best Practices

Sea level rise is one of many topics that should be addressed in a Local Coastal Program (LCP) or LCP amendment. The Coastal Commission offers a *Local Coastal Program (LCP) Update Guide* that outlines the broad process for amending or certifying an LCP, including guidance for both Land Use Plans and Implementation Plans. It addresses major Coastal Act concerns, including public access, recreation and visitor serving facilities, water quality protection, ESHA and natural resources, agricultural resources, new development, archaeological and cultural resources, scenic and visual resources, coastal hazards, shoreline erosion and protective devices, energy and industrial development, and timberlands. Therefore, this *Sea Level Rise Policy Guidance* should be used in conjunction with the LCP Update Guide to perform complete LCP amendments or certifications. The following figure depicts the general LCP amendment process.

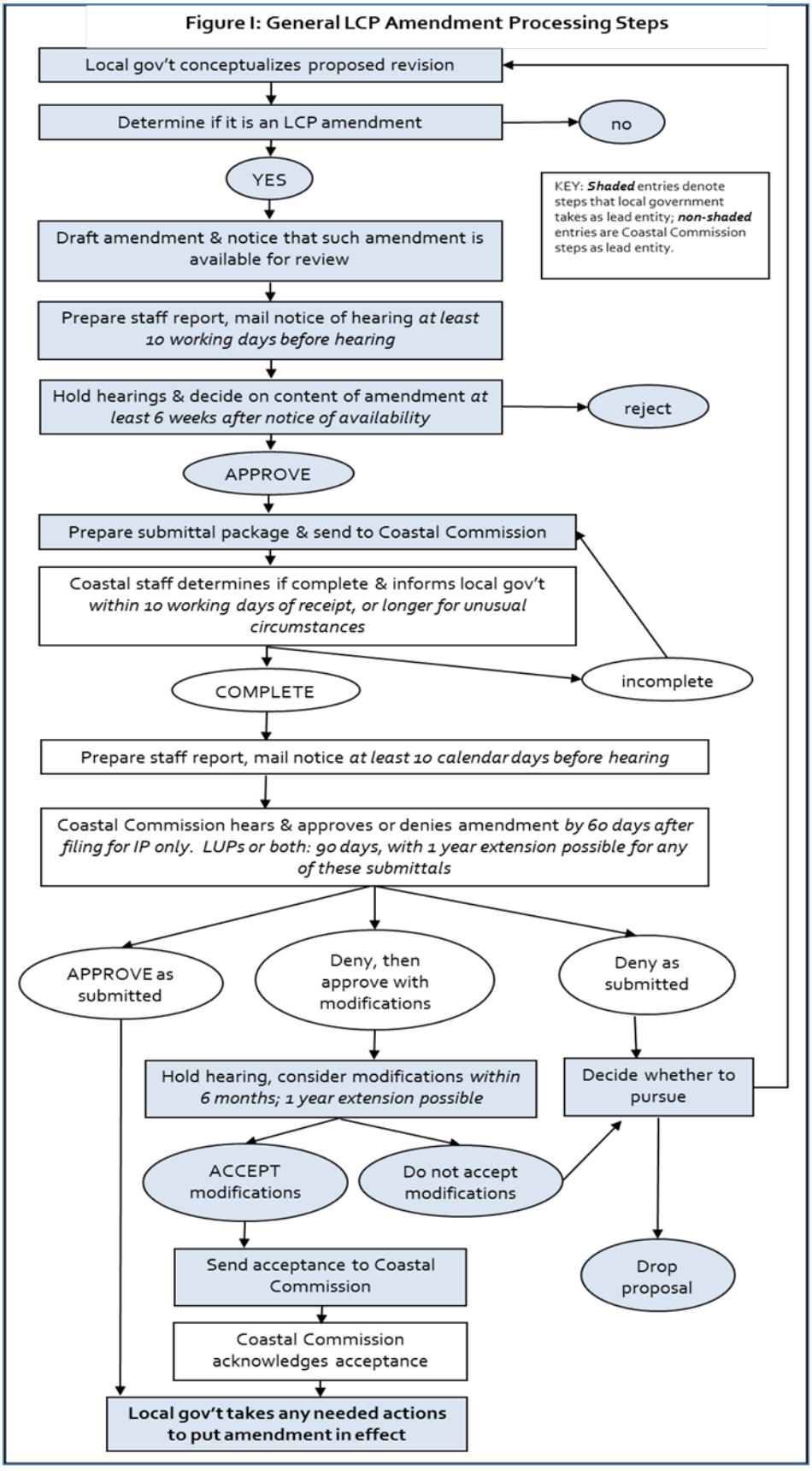
Figure I: General LCP Amendment Processing Steps
Local gov't conceptualizes proposed revision
Determine if it is an LCP amendment
no
YES
KEY: Shaded entries denote steps that local government takes as lead entity; non-shaded entries are Coastal Commission steps as lead entity.
Draft amendment & notice that such amendment is available for review
Prepare staff report, mail notice of hearing at least 10 working days before hearing
Hold hearings & decide on content of amendment at least 6 weeks after notice of availability
reject
APPROVE
Prepare submittal package & send to Coastal Commission
Coastal staff determines if complete & informs local gov't within 10 working days of receipt, or longer for unusual circumstances
incomplete
COMPLETE
Prepare staff report, mail notice at least 10 calendar days before hearing
Coastal Commission hears & approves or denies amendment by 60 days after filing for IP only. LUPs or both: 90 days, with 1 year extension possible for any of these submittals
APPROVE as submitted
Deny, then approve with modifications
Deny as submitted
Hold hearing, consider modifications within 6 months; 1 year extension possible
Decide whether to pursue
ACCEPT modifications
Do not accept modifications
Send acceptance to Coastal Commission
Drop proposal
Coastal Commission acknowledges acceptance
Local gov't takes any needed actions to put amendment in effect

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Appendix E

Funding Opportunities for LCP Planning and Implementation

Project Implementation Funds

The following table includes a list of grant funding available for implementation of sea level rise adaptation projects and programs. Much of this information was compiled by the Governor's Office of Emergency Services (Cal OES).

Grant Name	Agency	Purpose	Contact
Pre-Disaster Mitigation (PDM) Program	Administered by: Cal OES Funded by: US Department of Homeland Security, Federal Emergency Management Agency (FEMA)	Provides funds for hazard mitigation planning and projects on an annual basis. The PDM program was put in place to reduce overall risk to people and structures, while at the same time reducing reliance on federal funding if an actual disaster were to occur.	Cal OES http://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/pre-disaster-flood-mitigation FEMA https://www.fema.gov/pre-disaster-mitigation-grant-program
Hazard Mitigation Grant (HMG) Program	Administered by: Cal OES Funded by: US Department of Homeland Security, Federal Emergency Management Agency (FEMA)	Provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.	Cal OES http://www.caloes.ca.gov/cal-oes-divisions/recovery/disaster-mitigation-technical-support/404-hazard-mitigation-grant-program FEMA https://www.fema.gov/hazard-mitigation-grant-program
Flood Mitigation Assistance (FMA) Program	Administered by: Cal OES Funded by: US Department of Homeland Security, Federal Emergency Management Agency (FEMA)	Provides grants to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP.	Cal OES http://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/pre-disaster-flood-mitigation FEMA https://www.fema.gov/flood-mitigation-assistance-program

Public Assistance (PA) Program	US Department of Homeland Security, Federal Emergency Management Agency (FEMA)	To provide supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.	FEMA https://www.fema.gov/public-assistance-local-state-tribal-and-non-profit
Community Development Block Grant (CDBG) Program	US Department of Housing and Urban Development	Program works to ensure decent affordable housing, to provide services to the most vulnerable in our communities, and to create jobs through the expansion and retention of businesses.	HUD http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs
Watershed Surveys and Planning	US Department of Agriculture, Natural Resource Conservation Service	To provide planning assistance to Federal, state and local agencies for the development or coordination of water and related land resources and programs in watersheds and river basins.	NRCS http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wsp/
Watershed Protection and Flood Prevention	US Department of Agriculture, Natural Resource Conservation Service	To provide technical and financial assistance in planning and executing works of improvement to protect, develop, and use of land and water resources in small watersheds.	NRCS http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfpo/
Land and Water Conservation Fund Grants	US Department of the Interior, National Park Service	To acquire and develop outdoor recreation areas and facilities for the general public, to meet current and future needs.	NPS http://www.nps.gov/lwcf/index.htm

SBA Disaster Loan Program	US Small Business Administration	SBA provides low-interest disaster loans to businesses of all sizes, private non-profit organizations, homeowners, and renters. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets.	SBA https://www.sba.gov/content/disaster-loan-program
Clean Water Act Section 319 Grants	US Environmental Protection Agency	To implement state and tribal non-point source pollution management programs, including support for non-structural watershed resource restoration activities.	EPA http://water.epa.gov/polwaste/nps/319hfunds.cfm
Flood Control Works/ Emergency Rehabilitation	US Department of Defense, Army Corps of Engineers	To assist in the repairs and restoration of public works damaged by flood, extraordinary wind, wave or water action.	USACE http://www.usace.army.mil/Missions/EmergencyOperations/NationalResponseFramework/FloodControl.aspx
Emergency Streambank and Shoreline Protection	US Department of Defense, Army Corps of Engineers	To prevent erosion damages to public facilities by the emergency construction or repair of streambank and shoreline protection works (33 CFR 263.25)	USACE http://www.mvr.usace.army.mil/BusinessWithUs/OutreachCustomerService/FloodRiskManagement/Section14.aspx
Small Flood Control Projects	US Department of Defense, Army Corps of Engineers	To reduce flood damages through small flood control projects not specifically authorized by Congress.	USACE www.usace.army.mil See also: https://www.cfda.gov/index?s=program&mode=form&tab=core&id=2216ee03c69db437c431036a5585ede6

Appendix F

Primary Coastal Act Policies Related to Sea Level Rise and Coastal Hazards

Legislative Findings Relating to Sea Level Rise

Section 30006.5 of the Coastal Act states (Legislative findings and declarations; technical advice and recommendations) states (emphasis added):

> *The Legislature further finds and declares that sound and timely scientific recommendations are necessary for many coastal planning, conservation, and development decisions and that the commission should, in addition to developing its own expertise in significant applicable fields of science, interact with members of the scientific and academic communities in the social, physical, and natural sciences so that the commission may receive technical advice and recommendations with regard to its decisionmaking, especially with regard to issues such as coastal erosion and geology, marine biodiversity, wetland restoration, the question of sea level rise, desalination plants, and the cumulative impact of coastal zone developments.*

Public Access and Recreation

Section 30210 of the Coastal Act (Access; recreational opportunities; posting) states:

> *In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.*

Section 30211 of the Coastal Act (Development not to interfere with access) states:

> *Development shall not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.*

Section 30212 of the Coastal Act (New development projects) states:

> *(a) Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where: (1) it is inconsistent with public safety, military security needs, or the protection of fragile coastal resources, (2) adequate access exists nearby, or (3) agriculture would be adversely affected. Dedicated accessway shall not be required to be opened to public use until a public agency or private association agrees to accept responsibility for maintenance and liability of the accessway.*

Section 30214 of the Coastal Act (Implementation of public access policies; legislative intent) states:

> (*a) The public access policies of this article shall be implemented in a manner that takes into account the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case including, but not limited to, the following:*
>
> *(1) Topographic and geologic site characteristics.*
>
> *(2) The capacity of the site to sustain use and at what level of intensity.*

(3) The appropriateness of limiting public access to the right to pass and repass depending on such factors as the fragility of the natural resources in the area and the proximity of the access area to adjacent residential uses.

(4) The need to provide for the management of access areas so as to protect the privacy of adjacent property owners and to protect the aesthetic values of the area by providing for the collection of litter.

(b) It is the intent of the Legislature that the public access policies of this article be carried out in a reasonable manner that considers the equities and that balances the rights of the individual property owner with the public's constitutional right of access pursuant to Section 4 of Article X of the California Constitution. Nothing in this section or any amendment thereto shall be construed as a limitation on the rights guaranteed to the public under Section 4 of Article X of the California Constitution.

(c) In carrying out the public access policies of this article, the commission and any other responsible public agency shall consider and encourage the utilization of innovative access management techniques, including, but not limited to, agreements with private organizations which would minimize management costs and encourage the use of volunteer programs.

Section 30220 of the Coastal Act (Protection of certain water-oriented activities) states:

Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.

Section 30221 of the Coastal Act (Oceanfront land; protection for recreational use and development**)** states:

Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and foreseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.

Section 30223 of the Coastal Act (Upland areas) states:

Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible.

Wetlands and Environmentally Sensitive Resources

Section 30231 of the Coastal Act (Biological productivity; water quality) states in part:

The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored…

Section 30233 of the Coastal Act (Diking, filling or dredging; continued movement of sediment and nutrients) states:

> *(a) The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:*

Section 30240 of the Coastal Act (Environmentally sensitive habitat areas; adjacent developments) states:

> *(a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.*
>
> *(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

Coastal Act Section 30121 defines “Wetland” as follows:

> *"Wetland" means lands within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens.*

The California Code of Regulations Section 13577(b) of Title 14, Division 5.5, Article 18 defines “Wetland” as follows:

> *(1) Measure 100 feet landward from the upland limit of the wetland. Wetland shall be defined as land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent and drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salts or other substances in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to, vegetated wetlands or deep-water habitats. For purposes of this section, the upland limit of a wetland shall be defined as:*
>
> > *(A) the boundary between land with predominantly hydrophytic cover and land with predominantly mesophytic or xerophytic cover;*
> >
> > *(B) the boundary between soil that is predominantly hydric and soil that is predominantly nonhydric; or*
> >
> > *(C) in the case of wetlands without vegetation or soils, the boundary between land that is flooded or saturated at some time during years of normal precipitation, and land that is not.*
>
> *(2) For the purposes of this section, the term “wetland” shall not include wetland habitat created by the presence of and associated with agricultural ponds and reservoirs where:*

> *(A) the pond or reservoir was in fact constructed by a farmer or rancher for agricultural purposes; and*
>
> *(B) there is no evidence (e.g., aerial photographs, historical survey, etc.) showing that wetland habitat pre-dated the existence of the pond or reservoir. Areas with drained hydric soils that are no longer capable of supporting hydrophytes shall not be considered wetlands.*

In addition, Coastal Act Section 30107.5 defines “Environmentally sensitive area" as follows:

> *"Environmentally sensitive area" means any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments.*

Agricultural and Timber Lands

Section 30241 of the Coastal Act (Prime agricultural land; maintenance in agricultural production) states:

> *The maximum amount of prime agricultural land shall be maintained in agricultural production to assure the protection of the areas’ agricultural economy, and conflicts shall be minimized between agricultural and urban land uses…*

Section 30242 of the Coastal Act (Lands suitable for agricultural use; conversion) states:

> *All other lands suitable for agricultural use shall not be converted to nonagricultural uses unless (1) continued or renewed agriculture use is not feasible, or (2) such conversion would preserve prime agricultural land or concentrate development consistent with Section 30250. Any such permitted conversion shall be compatible with continue agricultural use on surrounding lands.*

Section 30243 of the Coastal Act (Productivity of soils and timberlands; conversions) states:

> *The long-term productivity of soils and timberlands shall be protected, and conversions of coastal commercial timberlands in units of commercial size to other uses or their division into units of noncommercial size shall be limited to providing for necessary timber processing and related facilities.*

Archaeological and Paleontological Resources

Section 30244 of the Coastal Act (Archaeological or paleontological resources) states:

> *Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required.*

Marine Resources

Section 30230 of the Coastal Act (Marine resources; maintenance) states:

> *Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.*

Section 30231 of the Coastal Act (Biological productivity; water quality) states:

> *The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface waterflow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.*

Section 30233 of the Coastal Act (Diking, filling or dredging; continued movement of sediment and nutrients) states:

> *(a) The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects…*
>
> *(d) Erosion control and flood control facilities constructed on watercourses can impede the movement of sediment and nutrients that would otherwise be carried by storm runoff into coastal waters. To facilitate the continued delivery of these sediments to the littoral zone, whenever feasible, the material removed from these facilities may be placed at appropriate points on the shoreline in accordance with other applicable provisions of this division, where feasible mitigation measures have been provided to minimize adverse environmental effects. Aspects that shall be considered before issuing a Coastal Development Permit for these purposes are the method of placement, time of year of placement, and sensitivity of the placement area.*

Section 30234 of the Coastal Act (Commercial fishing and recreational boating facilities**)** states:

> *Facilities serving the commercial fishing and recreational boating industries shall be protected and, where feasible, upgraded. Existing commercial fishing and recreational boating harbor space shall not be reduced unless the demand for those facilities no longer exists or adequate substitute space has been provided. Proposed recreational boating facilities shall, where feasible, be designed and located in such a fashion as not to interfere with the needs of the commercial fishing industry.*

Section 30234.5 of the Coastal Act (Economic, commercial, and recreational importance of fishing) states:

> *The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.*

Coastal Development

Section 30250 of the Coastal Act (Location; existing developed area) states:

> *(a) New residential, commercial, or industrial development, except as otherwise provided in this division, shall be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects, either individually or cumulatively, on coastal resources. In addition, land divisions, other than leases for agricultural uses, outside existing developed areas shall be permitted only where 50 percent of the usable parcels in the area have been developed and the created parcels would be no smaller than the average size of surrounding parcels.*
>
> *(b) Where feasible, new hazardous industrial development shall be located away from existing developed areas.*
>
> *(c) Visitor-serving facilities that cannot feasibly be located in existing developed areas shall be located in existing isolated developments or at selected points of attraction for visitors.*

Section 30251 of the Coastal Act (Scenic and visual qualities) states:

> *The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas...*

Section 30253 the Coastal Act (Minimization of adverse impacts) states in part:

> *New development shall do all of the following:*
>
> *(a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.*
>
> *(b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs...*

Section 30235 of the Coastal Act (Construction altering natural shoreline) states:

> *Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public*

beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fishkills should be phased out or upgraded where feasible.

Section 30236 of the Coastal Act (Water supply and flood control) states:

Channelizations, dams, or other substantial alterations of rivers and streams shall incorporate the best mitigation measures feasible, and be limited to (l) necessary water supply projects, (2) flood control projects where no other method for protecting existing structures in the flood plain is feasible and where such protection is necessary for public safety or to protect existing development, or (3) developments where the primary function is the improvement of fish and wildlife habitat.

Ports

Section 30705 of the Coastal Act (Diking, filling or dredging water areas) states:

(a) Water areas may be diked, filled, or dredged when consistent with a certified port master plan only for the following: …

(b) The design and location of new or expanded facilities shall, to the extent practicable, take advantage of existing water depths, water circulation, siltation patterns, and means available to reduce controllable sedimentation so as to diminish the need for future dredging.

(c) Dredging shall be planned, scheduled, and carried out to minimize disruption to fish and bird breeding and migrations, marine habitats, and water circulation. Bottom sediments or sediment elutriate shall be analyzed for toxicants prior to dredging or mining, and where water quality standards are met, dredge spoils may be deposited in open coastal water sites designated to minimize potential adverse impacts on marine organisms, or in confined coastal waters designated as fill sites by the master plan where such spoil can be isolated and contained, or in fill basins on upland sites. Dredge material shall not be transported from coastal waters into estuarine or fresh water areas for disposal.

Section 30706 of the Coastal Act (Fill) states:

In addition to the other provisions of this chapter, the policies contained in this section shall govern filling seaward of the mean high tide line within the jurisdiction of ports:

(a) The water area to be filled shall be the minimum necessary to achieve the purpose of the fill.

(b) The nature, location, and extent of any fill, including the disposal of dredge spoils within an area designated for fill, shall minimize harmful effects to coastal resources, such as water quality, fish or wildlife resources, recreational resources, or sand transport systems, and shall minimize reductions of the volume, surface area, or circulation of water.

(c) The fill is constructed in accordance with sound safety standards which will afford reasonable protection to persons and property against the hazards of unstable geologic or soil conditions or of flood or storm waters.

(d) The fill is consistent with navigational safety.

Section 30708 of the Coastal Act (Location, design and construction of port related developments) states:

All port-related developments shall be located, designed, and constructed so as to:

(a) Minimize substantial adverse environmental impacts.

(b) Minimize potential traffic conflicts between vessels.

(c) Give highest priority to the use of existing land space within harbors for port purposes, including, but not limited to, navigational facilities, shipping industries, and necessary support and access facilities.

(d) Provide for other beneficial uses consistent with the public trust, including, but not limited to, recreation and wildlife habitat uses, to the extent feasible.

(e) Encourage rail service to port areas and multicompany use of facilities.

Public Works Facilities

According to Coastal Act Section 30114, public works facilities include:

(a) All production, storage, transmission, and recovery facilities for water, sewerage, telephone, and other similar utilities owned or operated by any public agency or by any utility subject to the jurisdiction of the Public Utilities Commission, except for energy facilities.

(b) All public transportation facilities, including streets, roads, highways, public parking lots and structures, ports, harbors, airports, railroads, and mass transit facilities and stations, bridges, trolley wires, and other related facilities. For purposes of this division, neither the Ports of Hueneme, Long Beach, Los Angeles, nor San Diego Unified Port District nor any of the developments within these ports shall be considered public works.

(c) All publicly financed recreational facilities, all projects of the State Coastal Conservancy, and any development by a special district.

(d) All community college facilities.

Greenhouse Gas Emissions Reduction

Section 30250(a) of the Coastal Act (Location, existing developed areas states) in part:

(a) New residential, commercial, or industrial development, except as otherwise provided in this division, shall be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have

significant adverse effects, either individually or cumulatively, on coastal resources. In addition, land divisions, other than leases for agricultural uses, outside existing developed areas shall be permitted only where 50 percent of the usable parcels in the area have been developed and the created parcels would be no smaller than the average size of surrounding parcels.

Section 30252 of the Coastal Act (Maintenance and enhancement of public access) states:

The location and amount of new development should maintain and enhance public access to the coast by (1) facilitating the provision or extension of transit service, (2) providing commercial facilities within or adjoining residential development or in other areas that will minimize the use of coastal access roads, (3) providing nonautomobile circulation within the development, (4) providing adequate parking facilities or providing substitute means of serving the development with public transportation, (5) assuring the potential for public transit for high intensity uses such as high-rise office buildings, and by (6) assuring that the recreational needs of new residents will not overload nearby coastal recreation areas by correlating the amount of development with local park acquisition and development plans with the provision of onsite recreational facilities to serve the new development.

Section 30253(d) of the Coastal Act (Minimization of adverse impacts) states in part:

New Development shall:

(d) Minimize energy consumption and vehicle miles traveled….

Appendix G

Coastal Commission Contact Information

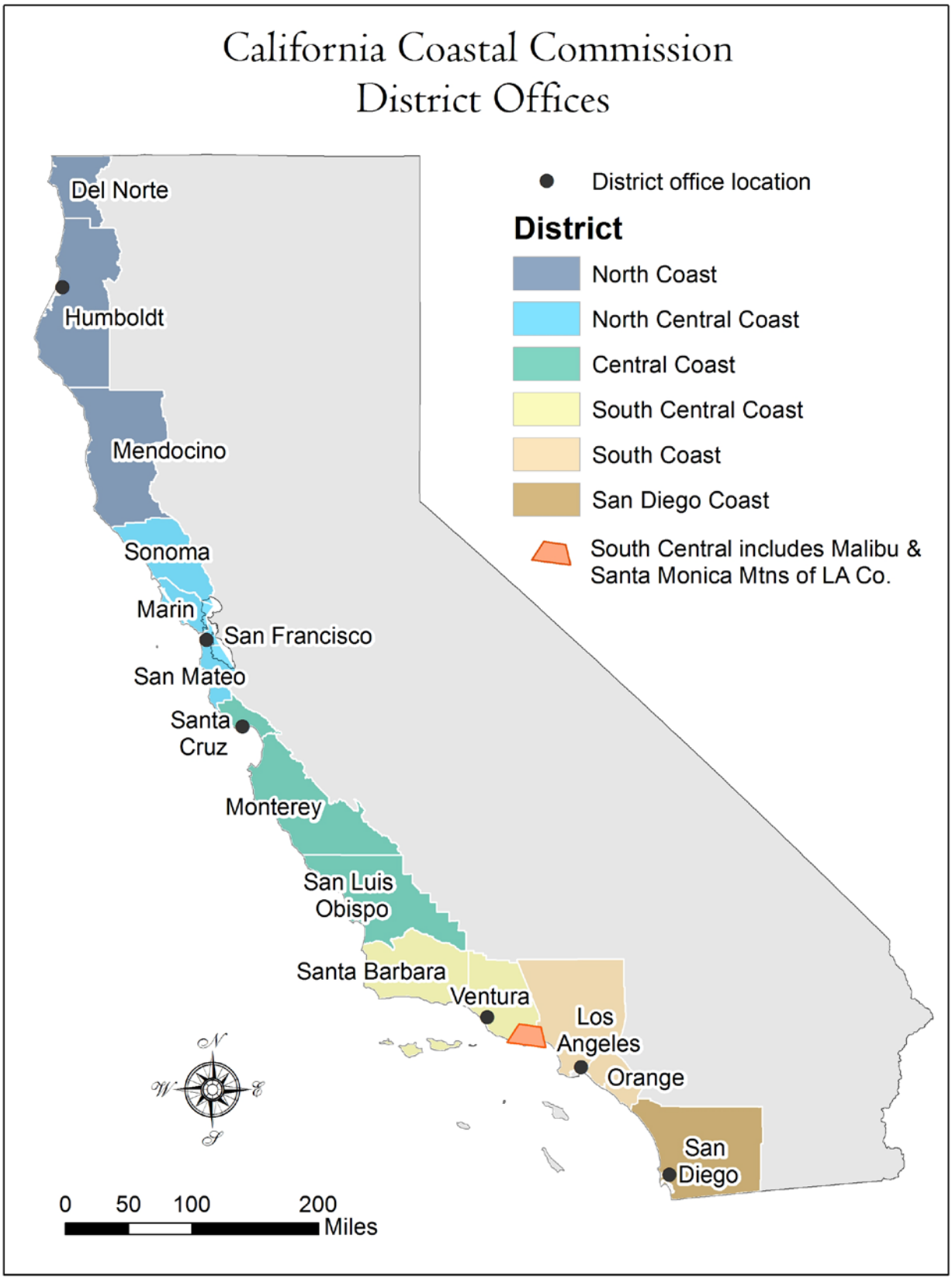

Figure G-1. Location of Coastal Commission offices

COASTAL COMMISSION DISTRICT OFFICE CONTACT INFORMATION

North Coast (Del Norte, Humboldt, Mendocino Counties)
(707) 826-8950

Headquarters and North Central Coast (Sonoma, Marin, San Francisco, San Mateo Counties)
(415)-904-5200

Central Coast (Santa Cruz, Monterey, San Luis Obispo Counties)
(831) 427-4863

South Central Coast (Santa Barbara and Ventura Counties, and the Malibu portion of Los Angeles County)
(805) 585-1800

South Coast (Los Angeles (except Malibu) and Orange Counties)
(562) 590-5071

San Diego (San Diego County)
(619) 767-2370

COASTAL COMMISSION STAFF SEA LEVEL RISE TEAM

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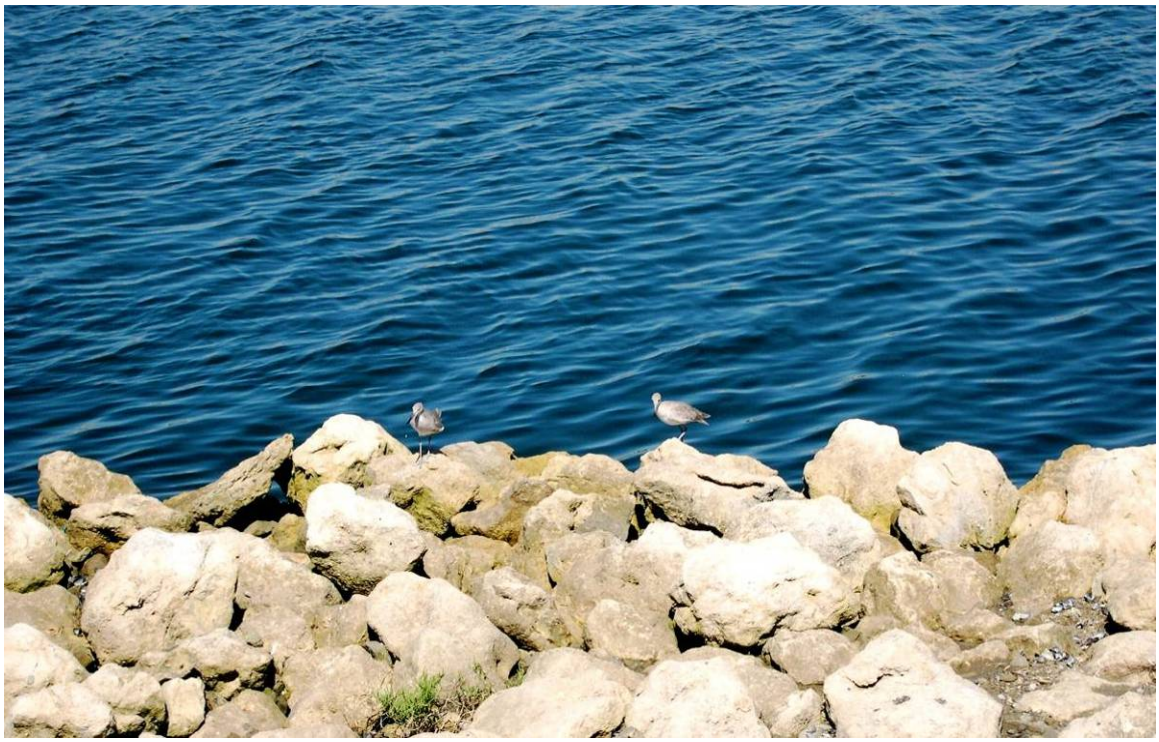
APPENDIX M
BALLONA ESTUARY & SEPELVEDA CHANNEL BACTERIA TMDL, COORDINATED MONITORING PLAN

BALLONA CREEK, BALLONA ESTUARY, & SEPULVEDA CHANNEL BACTERIA TMDL

COORDINATED MONITORING PLAN



PREPARED BY THE MONITORING PLAN SUB-COMMITTEE
CITY OF LOS ANGELES, CHAIR

SUBMITTED
April 23, 2008

ACKNOWLEDGEMENT

The Coordinated Monitoring Plan (CMP) was developed by the City of Los Angeles (Primary Jurisdiction), County of Los Angeles (represented by Department of Public Works – Watershed Management Division), Cities of Culver City, Beverly Hills, West Hollywood, Inglewood, Santa Monica and California Department of Transportation (Caltrans).

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LIST OF ACRONYMS

ALERT	Automatic Local Evaluation in Real-Time
APHA	American Public Health Association
AWWA	American Water Works Association
BCB	Ballona Creek Bacteria
CA DOHS	California Department of Health Services
Cal/OSHA	California Office of Occupational Safety and Health Administration
CalTrans	California Department of Transportation
CA DOHS	California Department of Health Services
CFU	Colony Forming Unit
CHP	Chemical Hygiene Plan
CMP	Coordinated Monitoring Plan
COC	Chain of Custody
CSV	Comma Separated Value
CWA	Clean Water Act
DMR	Discharge Monitoring Report
ELAP	Environmental Laboratory Accreditation Program
EMD	Environmental Monitoring Division (LA City)
EPA	Environmental Protection Agency
GIS	Geographic Information System
ICSD	Information and Control System Division (LA City)
LREC-1	Limited Water Contact Recreation
LACDPW	Los Angeles County Department of Public Works
LACSD	Los Angeles County Sanitation Districts
LARWQCB	Los Angeles Regional Water Quality Control Board
LIMS	Laboratory Information Management System
MPN	Most Probable Number
NIST	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
PE	Performance Evaluation
QA/QC	Quality Assurance/Quality Control
REC-1	Water Contact Recreation
REC-2	Non Contact Recreation
RPD	Relative Percentage Difference
SOP	Standard Operating Procedure
S & T	Status and Trends Monitoring Program (LA City)
TMDL	Total Maximum Daily Loads
WLA	Waste Load Allocations
WP	Water Pollution
WPCF	Water Pollution Control Federation
WPD	Watershed Protection Division (LA City)

1.0 EXECUTIVE SUMMARY

The Ballona Creek, Sepulveda Channel, and Ballona Estuary were listed on the State's 1998 303(d) list as impaired due to exceedance of total and/or fecal coliform water quality standards. To address the high bacteria concentrations in the Creek and its tributaries, the Los Angeles Regional Water Quality Control Board (Regional Board) on June 8, 2006, adopted the Total Maximum Daily Loads for Bacterial Indicator Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel (Bacteria TMDL). The Bacteria TMDL subsequently became effective on April 27, 2007 after approval by the U.S. Environmental Protection Agency (USEPA). This TMDL has multi-part numeric targets based on the updated bacteria objectives for marine and fresh waters designated for contact recreation (REC-1), and fresh waters with Limited REC-1 and non-contact water recreation (REC-2) beneficial use designations.

The Bacteria TMDL identifies the Responsible Jurisdictions and Agencies as the Cities of Los Angeles, Culver City, Beverly Hills, Inglewood, West Hollywood, Santa Monica, County of Los Angeles, and California Department of Transportation (Caltrans). The City of Los Angeles is the Primary Jurisdiction as it controls the majority of the land area in the watershed.

The Responsible Jurisdictions and Responsible Agencies are required to submit a comprehensive bacteria water quality monitoring plan for the Ballona Creek Watershed (Coordinated Monitoring Plan or CMP) to the Regional Board for approval by April 27, 2008, 12 months after the effective date of the Bacteria TMDL. Development and submittal of this document is to satisfy this requirement of the Bacteria TMDL.

Coordinated Monitoring Plan (CMP) Development

The CMP was developed by the Bacteria TMDL Monitoring Plan Sub-Committee. The Sub-Committee is chaired by the City of Los Angeles, the Primary Jurisdiction. The other members are the Responsible Jurisdictions and Responsible Agencies as designated in the Bacteria TMDL.

The CMP has three objectives:

1. To characterize existing water quality based on applicable bacteria water quality objectives and;
2. To assess compliance with the waste load allocations in the Bacteria TMDL and;
3. To provide data to support re-evaluations that will be made when the Bacteria TMDL is scheduled for reconsideration on April 27, 2011, four years after the effective date of the Bacteria TMDL.

Requirements of the Bacteria TMDL Coordinated Monitoring Plan

a) Ambient Monitoring

Ambient monitoring of water quality conditions will begin six months after the Regional Board's formal approval of the CMP and conclude at the first compliance deadline in

each impaired reach and at the confluences of each tributary. As stated in the TMDL, on-going monitoring efforts by the City of Los Angeles and County of Los Angeles within the Ballona Creek watershed may fulfill this requirement; however, all responsible jurisdictions and responsible agencies are ultimately accountable for ensuring that these monitoring requirements are met. Prior to the first compliance deadline weekly ambient monitoring will be conducted at the CMP-specified effectiveness monitoring locations found in **Table 3.1** and *Section 3.2*.

b) TMDL Effectiveness Monitoring

The TMDL effectiveness monitoring program shall be conducted to assess attainment of the allowable exceedances for Ballona Creek, Ballona Estuary, Sepulveda Channel, and the Waste Load Allocations (WLAs) for the tributaries. As stated in the TMDL:

If the number of exceedance days is greater than the allowable number of exceedance days in the REC-1 and LREC-1 waters, and/or the frequency of exceedance is greater than 10% in the REC-2 waters, the responsible jurisdictions and/or responsible agencies shall be considered not attaining the TMDLs and/or assigned allocations (non-attaining). Responsible jurisdictions or agencies will be considered attaining TMDLs and/or assigned allocations based upon the results of an investigation that at minimum shows single sample events meet bacteria water quality objectives through daily sampling results at the existing monitoring location.

Sampling Locations and Schedule

The implementation of the CMP will begin six months following its formal approval by the Regional Board with monitoring at eight (8) sites identified in the CMP. Detailed descriptions of each site can be found in **Section 3.2**.

Accelerated Sampling following Elevated Bacterial Levels (Exceedances)

For the summer dry-weather period and the winter dry-weather periods during effectiveness monitoring, accelerated sampling will be conducted as a result of single-sample exceedances. Locations monitored weekly will be subject to accelerated monitoring, at 48 hours after the initial bacterial exceedance and, if the 48-hour sample exceeds, sampling also will occur at 96 hours following the initial bacterial exceedance. All location-required indicator bacteria, not just the exceeding indicator, will be analyzed during accelerated testing.

Analytical Methodology

Samples will be tested for specific indicator bacteria (i.e., total coliforms, fecal coliforms and/or *E. coli*, and enterococcus) whose presence indicates that enteric pathogenic microorganisms also may also be present. Approved sampling and analytical procedures will be used as described in *Appendices D and G*. Sampling and analytical procedures are to be followed as specified in "Standard Methods for the Examination of Water and Wastewater", 18th – 20^{th}edition, 1992, 1998 respectively, APHA, AWWA, WPCF, Washington, DC, and "Microbiological Methods for Monitoring the Environment, Water, and Wastes", EPA-600/8-78-017.

Data Management and Reporting

Electronically-formatted data will be archived and submitted to the responsible agencies and the Regional Board promptly after the data become available, and electronic copies of the monthly reports will be distributed to the responsible agencies.

2.0 INTRODUCTION

This monitoring proposal is submitted to fulfill the 12-month requirement for developing a Coordinated Monitoring Plan for the Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria Total Maximum Daily Loads (BC Bacteria TMDL). For reference, the TMDL Regional Water Quality Control Plan (Basin Plan) amendments can be found in *Appendix K* of this document. All BC Bacteria TMDL documents, including the staff report, can be found on the Los Angeles Regional Water Quality Control Board's (LARWQCB) website at http://www.waterboards.ca.gov/losangeles/.

2.1 Background

Federal Regulations under the Clean Water Act (CWA) require states to develop a list of impaired waters and pollutants for which they are impaired, also known as the 303(d) List. The States must then establish the capacity of the water body to assimilate the impairing pollutants. These criteria are done in the form of the pollutant TMDL, which defines that the water body can still receive pollutant loads up to the water quality objectives necessary to protect beneficial uses (e.g., REC-1, REC-2, and LREC-1). Waste Load Allocations from point sources and load allocations from non-point sources must be reduced as needed according to the schedule set in the TMDL to meet TMDL compliance for the water body. The TMDL is incorporated as an amendment to the regional Basin Plan.

Ballona Creek, Ballona Estuary, and Sepulveda Channel were designated as impaired by the State of California and included on California's 2002 and 1998 CWA §303(d) List of Impaired Waters. Segments of the Ballona Creek, Ballona Estuary, and Sepulveda Channel are listed for high coliform counts. High bacterial loading of these water bodies may result in impairments of the water contact recreation (REC-1) beneficial use of Ballona Estuary[1] and Sepulveda Channel, limited water contact recreation (LREC-1) beneficial use of Ballona Creek Reach 2[2], and non-contact recreation (REC-2) beneficial use of Ballona Creek Reach 1[3] (**Table 2.1**). Recreating in waters with elevated bacterial indicator densities has long been associated with adverse human health effects.

[1] Ballona Estuary is from Centinela Avenue to the Pacific Ocean for 3.5 miles and its lower portion runs parallel to the main channel of Marina del Rey.
[2] Ballona Creek Reach 2 (Ballona Creek to Estuary) is approximately 4 miles from National Boulevard to Centinela Avenue.
[3] Ballona Creek Reach 1 is a 2-mile stretch from Cochran Avenue to National Boulevard.

Table 2.1 Ballona Creek Beneficial Uses

Water Body	Beneficial Use
Ballona Estuary	REC-1 Marine Water
Sepulveda Channel	REC-1 Fresh Water
Ballona Creek Reach 2	LREC-1 Fresh Water
Ballona Creek Reach 1	REC-2 Fresh Water

There are several historical or existing sites monitored by the Los Angeles County Department of Public Works (LACDPW), City of Los Angeles Watershed Protection Division (WPD), and City of Los Angeles Environmental Monitoring Division (EMD) in Ballona Creek, Ballona Estuary, and its tributaries.

Beginning in early 2001, the City of Los Angeles, Department of Public Works, Bureau of Sanitation, WPD, under its Status and Trends Monitoring Program (S&T), began monitoring at four (4) locations along the main channel of Ballona Creek for bacteria, metals, and other pollutants. In 2002 the Status and Trends Program was extended to include four (4) tributary monitoring locations. In addition, LACDPW, as part of the Los Angeles County Municipal Stormwater Permit, under its Core Monitoring Program, conducts sampling within the Ballona Creek watershed. The County's Core Monitoring Program is comprised of one permanent mass emission station (S01) within the main channel, six tributary locations, five estuary locations, and one bioassessment location. During the period of 2005-2006, LACDPW ended the monitoring activities for the six mass emission sites located on tributaries to the main channel of Ballona Creek. Currently, only station S01 is monitored for three storm and two dry-weather events.

2.2 Ballona Creek Watershed Setting

The Ballona Creek watershed is the largest sub-watershed within the Santa Monica Bay Watershed Management Area, and is comprised of West Los Angeles, Westwood Village, Culver City, Hollywood, Cienega, and Windsow Hills sub-watersheds as defined by the LARWQCB. The combined size of the six sub-watersheds is approximately 82,878 acres[4]; however, 13 acres of National Park Service land and 414 acres of miscellaneous State and Federal lands are currently excluded from the LARWQCB-defined jurisdictional group. The LARWQCB recommended that these areas be excluded at this time since they will be covered by separate NDPES permits issued by the LARWQCB. This leaves 82,451 acres as the effective watershed area[5]. The effective watershed area falls under the jurisdiction of eight agencies. (**Table 2.2**)

[4] Area breakdown was generated with GIS using data from LARWQCB.
[5] The overall effective watershed area may change depending on how the Regional Board decides to enforce National Parks Service and miscellaneous State and Federal areas to comply with the TMDLs.

Table 2.2 Ballona Creek Jurisdictional Group

Responsible Agencies	Land area	
City of Los Angeles (lead)	67,053	acres
County of Los Angeles	3,928	acres
City of Beverly Hills	3,630	acres
City of Culver City	3,234	acres
City of Inglewood	1,934	acres
City of West Hollywood	1,201	acres
City of Santa Monica	265	acres
Caltrans	1,206	acres
Total	82,451	acres

Ballona Creek flows as an open channel for approximately 10 miles from Los Angeles (South of Hancock Park) through Culver City, reaching the Santa Monica Bay just south of Marina del Rey. Tributaries of the Creek and Estuary include Centinela Creek, Sepulveda Channel, Benedict Canyon Channel, and numerous other storm drains. The transition between the Creek and Estuary is considered to occur at Centinela Boulevard; Ballona Creek above Centinela Boulevard is concrete-lined and Ballona Creek below Centinela Boulevard is soft bottom.

2.3 Waste Load Allocation Targets

The TMDL has a multi-part numeric target based on four bacteriological parameters: total coliform density, enterococcus density, fecal coliform density, and *Escherichia coli* (*E. coli)* density. All bacteria densities shall be reported as the number of bacteria counted in 100 milliliters of water sampled. These numerical targets and the corresponding waste load allocations have been set based on the Los Angeles Basin Plan objectives for water contact recreation (REC-1), limited water contact recreation (LREC-1), and water non-contact recreation (REC-2) uses.

The BC Bacteria TMDL specifies three separate periods for compliance purposes, each with specific requirements. The periods are summer dry-weather (April 1 to October 31), winter dry-weather (November 1 to March 31), and wet-weather days (defined as days of $\geq$ 0.1 inches of precipitation and the three days following the end of the rain event).

Waste load allocations in the Ballona Creek TMDLs are expressed as an allowed number of exceedance days. The number of allowable exceedance days at a given location is determined by the number of projected exceedance days during the 90th percentile year at either the designated reference site or historically at the location in question, whichever is lower. Allowable exceedance days, as determined by the reference site method, relative to a weekly monitoring schedule are shown in **Table 2.3 and Table 2.4.**

Table 2.3 Summary of waste load allocations in Ballona Creek, Ballona Estuary, and Sepulveda Channel by Reach.

Time Period	Ballona Estuary, Ballona Creek Reach 2, and Sepulveda Channel [1]	Ballona Creek Reach 1 [2]
Summer Dry-Weather (April 1 to October 31)	Zero (0) exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives
	Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives
Winter Dry-Weather (November 1-March 31)	Three (3) exceedance days based on the applicable Single Sample Bacteria Water Quality Objective[4]	No more than 10% of the Single Sample Bacteria Water Quality Objectives
	Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives
Wet-Weather (days with ≥0.1 inch of rain + 3 days following the rain event)	Seventeen (17)[3] exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives[4]	No more than 10% of the Single Sample Bacteria Water Quality Objectives
	Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives.	Zero (0) exceedance days based on the Rolling 30-Days Geometric Mean Bacteria Water Quality Objectives

[1] Exceedance days for Ballona Estuary based on REC-1 marine water numeric targets; for Ballona Creek Reach 2 based on LREC-1 freshwater numeric targets; and for Sepulveda Channel, based on fresh water REC-1 numeric targets

[2] Exceedance frequency for Ballona Creek Reach 1 based on freshwater REC-2 numeric targets

[3] In Reach 2, the greater of the allowable exceedance days under the reference system approach or high flow suspension shall apply

[4] As set forth by the SMBB CMP the maximum allowable number of exceedance days per year based on the reference system during dry weather is scaled back to one (1) day per year based on weekly sampling and the maximum allowable number of exceedance days based on the reference system during year-round wet weather is scaled back accordingly to three (3) exceedance days per year based on weekly sampling.

Table 2.4 Summary of waste load allocations and load allocations for Ballona Creek Tributaries

Tributary	**Point of Application**	**Water Quality Objectives**	**Waste Load Allocation** (No. exceedance days)
Ballona Creek Reach 1	At confluence with Reach 2	LREC-1 Freshwater	For single sample objectives: *(0) summer dry-weather,* *(3) winter dry-weather,* *(17*) wet-weather* For geometric mean objectives: *(0) for all periods*
Benedict Canyon Channel	At confluence with Reach 2	LREC-1 Freshwater	For single sample objectives: *(0) summer dry-weather,* *(3) winter dry-weather,* *(17*) wet-weather* For geometric mean objectives: *(0) for all periods*
Ballona Creek Reach 2	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry-weather,* *(3) winter dry-weather,* *(17) wet-weather* For geometric mean objectives: *(0) for all periods*
Centinela Creek	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry-weather,* *(3) winter dry-weather,* *(17) wet-weather* For geometric mean objectives: *(0) for all periods*
Del Rey Lagoon	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry-weather,* *(3)winter dry-weather,* *(17) wet-weather* For geometric mean objectives: *(0) for all periods*

*At the confluence with Reach 2, the greater of the allowable exceedance days under the reference system approach or high flow suspension shall apply. Sepulveda Channel was not assigned a waste load allocation at its confluence with Reach 2 since the TMDL requires the more stringent REC-1 objectives to be met in this water body, which should lead to the attainment of the less stringent LREC-1 objectives of the downstream reach.

2.3.1 Single Sample Limits

The Single Sample Limits apply throughout the year, and are shown in **Table 2.5**

Table 2.5 Single Sample Limits

Marine Waters Designated for Water Contact Recreation (REC-1)	
Indicator	**Number of bacteria/100mL**
Total Coliform	10,000
Fecal Coliform	400
Enterococcus	104
Total Coliform density*	Fecal-to-Total Coliform ratio*
Fresh Waters Designated for Water Contact Recreation (REC-1)	
Indicator	**Number of bacteria/100mL**
E. coli	235
Fecal Coliform	400
Fresh Waters Designated for Limited Water Contact Recreation (LREC-1)	
Indicator	**Number of bacteria/100mL**
E. coli	576
Fecal Coliform	not assigned
Fresh Waters Designated for Water Non-Contact Recreation (REC-2)	
Indicator	**Number of bacteria/100mL**
E. coli	-
Fecal Coliform	4000

* Total coliform density shall not exceed 1,000/100mL, if the ratio of fecal-to-total coliform exceeds 0.1

There are a certain number of exceedance days allowed for single sample targets for summer dry-weather, winter dry-weather, and wet-weather days. The number of allowable exceedance days is established using a "reference system/anti-degradation approach," which is based on historical exceedance levels at existing monitoring locations, including a local reference beach within the Santa Monica Bay coastal watershed (Leo Carrillo State Beach). The maximum number of allowable exceedance days for REC-1, LREC-1 and REC-2 waters are shown in Table 2.3 and Table 2.4 (pages 8-9).

2.3.2 Rolling 30-day Geometric Mean Limits

The Rolling 30-day Geometric Mean Limits apply through the year, and are shown in **Table 2.6**

Table 2.6 Geometric Mean Limits

Marine Waters Designated for Water Contact Recreation (REC-1)	
Indicator	**Number of bacteria/100mL**
Total Coliform	1,000
Fecal Coliform	200
Enterococcus	35
Fresh Waters Designated for Water Contact Recreation (REC-1)	
Indicator	**Number of bacteria/100mL**
E. coli	126
Fecal Coliform	200
Fresh Waters Designated for Limited Water Contact Recreation (LREC-1)	
Indicator	**Number of bacteria/100mL**
E. coli	126
Fecal Coliform	200
Fresh Waters Designated for Water Non-Contact Recreation(REC-2)	
Indicator	**Number of bacteria/100mL**
E. coli	-
Fecal Coliform	2000

The Rolling 30-Day Geometric Mean is calculated as the 30th root of the product of 30 numbers using the bacterial densities over the most recent 30 days.

The Geometric Mean Limits may not be exceeded at any time. The rolling 30-day geometric means will be calculated on each day, regardless of whether a weekly or daily schedule is selected. If weekly sampling is conducted each test result will supersede the previous result and be assigned to the remaining days of the week until the next sample is collected. Only dry-weather data are to be used to calculate geometric means; wet-weather data will be excluded from this calculation until single sample limits for wet-weather become effective.

The Rolling 30-Day Geometric Mean calculation may change. Based on recent communication with the Regional Board, we understand the method of calculating the daily Rolling 30-Day Geometric Mean proposed above has been deemed inappropriate and may be revised.

The TMDL will be implemented in two phases over a ten-year period. For the first phase, within six years of the effective date of the TMDL, the allowable number of summer dry-weather, winter dry-weather exceedance days, and the rolling 30-day

geometric mean targets must be achieved. For the second phase, within 10 years of the effective date of the TMDL (or by July 15, 2021 if the Integrated Water Resource Approach is implemented), the allowable number of wet-weather exceedance days and rolling 30-day geometric mean targets must be achieved.

2.4 Coordinated Monitoring Plan Development

This monitoring plan was developed by the Ballona Creek Monitoring Plan Sub-Committee, which was chaired by the City of Los Angeles (*Appendix M*).

In early 2007 the Ballona Jurisdictional Group began gathering information and meeting with representatives of the various agencies that had historically conducted monitoring within Ballona Creek watershed; namely the City of Los Angeles Bureau of Sanitation and the Los Angeles County Department of Public Works. During development of the CMP, input from the Regional Board, Santa Monica Bay Keeper, and Heal the Bay was sought and incorporated in this document. The first draft of the CMP was completed in January 2008 and presented to the Regional Board and non-governmental organizations. The final draft was submitted to the Regional Board in April 2008.

2.5 Requirements of Coordinated Monitoring Plan

As stated in the Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL:

"Responsible jurisdictions and responsible agencies must submit, for Regional Board approval, a comprehensive bacteria water quality monitoring plan for the Ballona Creek Watershed [within twelve months of the effective date]. The plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. The plan must provide for analyses of all applicable bacteria indicators for which the Basin Plan and subsequent amendments have established objectives. The plan must also include a minimum of two sampling locations in Ballona Estuary and Ballona Creek (Reach 2), at least one location in Ballona Creek (Reach 1) and Sepulveda Channel, at the confluence with Centinela Creek and Benedict Canyon Channel, and similar monitoring at the connecting tide gates of Del Rey Lagoon."

The City of Los Angeles is the Responsible Agency for Del Rey Lagoon; therefore the Del Rey Lagoon requirement is not included in this CMP.

3.0 MONITORING SITES

For the purpose of this TMDL, eight (8) monitoring locations (**Table 3.1** and ***Figure 1)*** are being proposed. Four of these locations are currently being monitored by Los Angeles County Department of Public Works and/or by City of Los Angeles WPD and EMD as a part of its Status & Trends Program. The other four sites are new, or in close proximity to a historical site. *Appendix B* provides a summary of geographic data.

3.1 Site Selection Guidelines

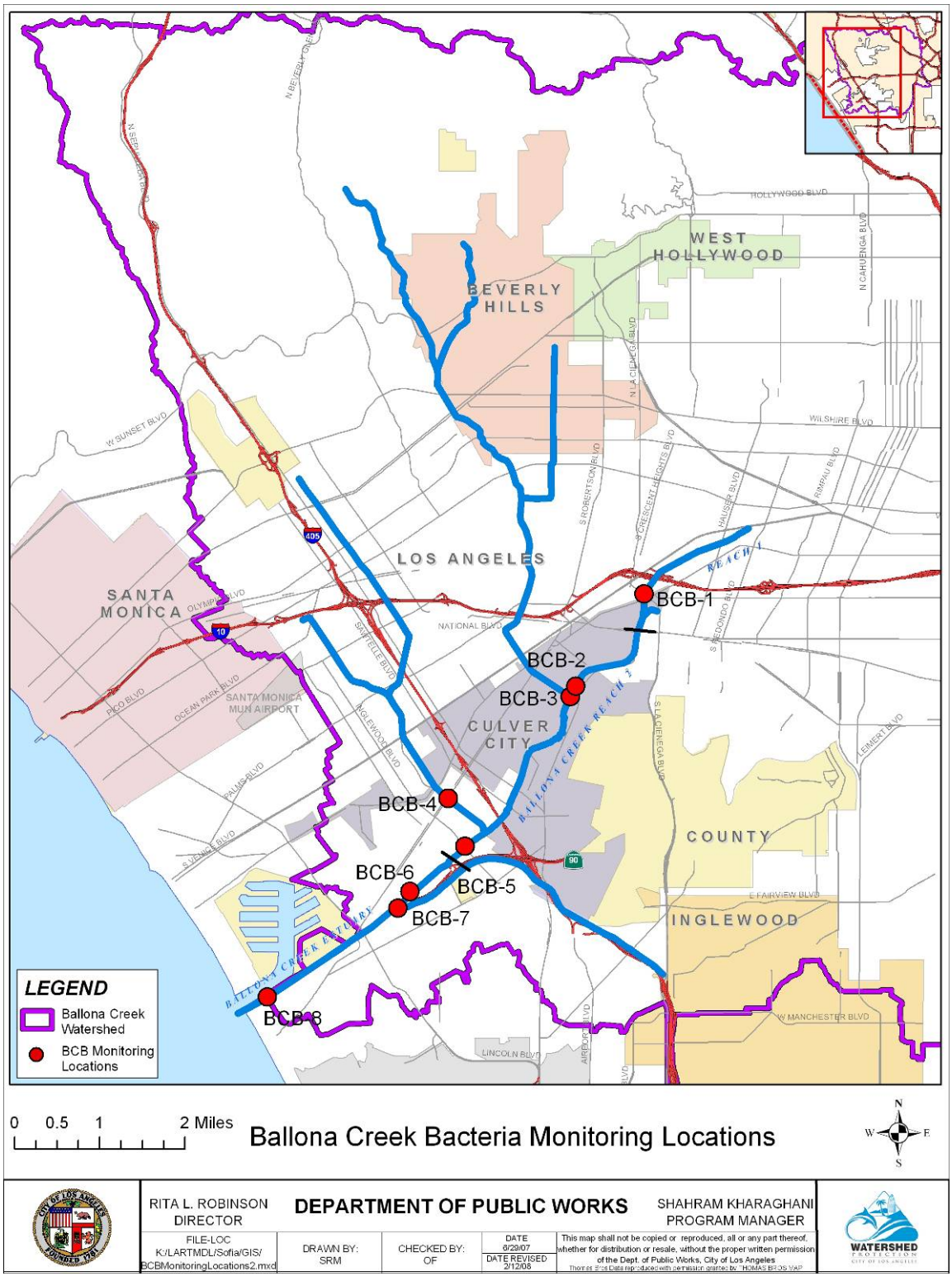
The eight (8) sampling sites (**Table 3.1**) have been selected by all responsible agencies in the Jurisdictional Group using the following set of guidelines:

1. Sampling shall be conducted weekly at locations specified in Attachment A to Resolution No. 2006-011, page 8.
2. Monitoring locations shall be located at or close to the boundary of two reaches.
3. Monitoring locations shall have safe access for sampling.

Table 3.1 Summary of effectiveness monitoring sites

Station ID	BCB-1	BCB-2	BCB-3	BCB-4	BCB-5	BCB-6	BCB-7	BCB-8
Station Name	WASHINGTON	DUQUESNE	BENEDICT CANYON	CULVER	INGLEWOOD	CENTINELA	LINCOLN	PACIFIC
Location	Washington Blvd. (at creek)	Duquesne Ave. (at creek)	Duquesne Ave (at confluence)	Culver Blvd. (at Sepulveda Channel)	Inglewood Blvd. (at creek)	South of Centinela Ave. (McConnell Ave. at creek)	South of Centinela Ave. (at confluence)	Pacific Ave (at creek)
Historical ID & Agency	N/A	N/A	TS09 (LACDPW) Duquesne (S&T)	TS08 (LACDPW) Culver (S&T)	Inglewood (S&T)	N/A	N/A	Pacific (S&T)
Creek Section	Reach 1	Reach 2 (upper; at creek)	Reach 2 (confluence)	Sepulveda Channel	Reach 2 (lower; at creek)	Estuary (upper; at creek)	Estuary (confluence)	Estuary (lower; at creek)
Sampling Frequency	Weekly	Weekly	Weekly	Weekly	Weekly	Weekly	Weekly	Weekly

Figure 3.1 BC Bacteria
TMDL Monitoring Locations



3.2 Monitoring Locations

In accordance with the TMDL requirements, the responsible agencies propose to conduct weekly monitoring at eight (8) locations identified in **Table 3.1**. More details, including drainage maps, locations, and latitude and longitude coordinates of each site are available in *Appendix B*. A brief description of each monitoring location is as follows.

Site Id: BCB – 1	**Status:** New	**Location:** Ballona Creek Reach 1
Historical Site Id: N/A		
Comments: This is a new sample site located at *Washington Blvd*. The location is slightly downstream of the historical site TS10 (LACDPW) at La Cienega Blvd. Refer to Thomas Guide coordinates 633:A7		

Site Id: BCB – 2	**Status:** New	**Location:** Ballona Creek Reach 2
Historical Site Id: N/A		
Comments: This is a new sample site located at *Duquesne Avenue,* along the main channel of Ballona Creek and slightly upstream of the *Benedict Canyon Channel* confluence. Refer to Thomas Guide coordinates 672:H1		

Site Id: BCB – 3	**Status:** Existing	**Location:** Benedict Canyon Confluence
Historical Site Id: TS09 (LACDPW); Duquesne (S&T)		
Comments: This is an existing sampling site, located at the confluence of Ballona Creek and *Benedict Canyon*. The location is currently monitored by the City of Los Angeles as part of its S&T Program and was part of Los Angeles County's Core Monitoring Program under LA County Municipal Stormwater Permit. This site is the same as site BC-5 in Ballona Creek Metals and Estuary Toxics TMDL CMP. Refer to Thomas Guide coordinates 672:H2		

Site Id: BCB – 4	**Status:** Existing	**Location:** Sepulveda Channel
Historical Site Id: TS08 (LACDPW); Culver (S&T)		
Comments: This is an existing sampling site, located near *Culver Blvd*. The location is currently monitored by the City of Los Angeles as part of its Status and Trends Monitoring Program (Culver). This site is the same as site BC-4 in Ballona Creek Metals and Estuary Toxics TMDL CMP. Refer to Thomas Guide coordinates 672:E4		

Site Id: BCB – 5	**Status:** Existing	**Location:** Ballona Creek Reach 2
Historical Site Id: Inglewood (S&T)		
Comments: This is an existing sampling site currently monitored by the City of Los Angeles as part of its Status and Trends Monitoring Program. The site is located at *Inglewood Blvd.* on the main channel of Ballona Creek. Refer to Thomas Guide coordinates 672:E6		

Site Id: BCB – 6	**Status:** New	**Location:** Ballona Creek Estuary
Historical Site Id: N/A		
Comments: This is a new sample site located upstream of the Centinela Creek confluence at *McConnell Ave.* with the closest major street being South *Centinela Avenue.* Refer to Thomas Guide coordinates 672:D7		

Site Id: BCB – 7	**Status:** New	**Location:** Centinela Creek Confluence
Historical Site Id: N/A		
Comments: This is a new sampling site located at the confluence of Centinela Creek and Ballona Creek. The nearest major cross street is *Lincoln Avenue.* Refer to Thomas Guide coordinates 672:D7		

Site Id: BCB – 8	**Status:** Existing	**Location:** Ballona Creek Estuary
Historical Site Id: Pacific (S&T)		
Comments: This is an existing sampling site currently monitored by the City of Los Angeles as part of its Status & Trends Monitoring Program. The site is located at *Pacific Ave.* in the lower estuary. This is also an observation station for the Santa Monica Bay Beaches Bacteria TMDL. Refer to Thomas Guide coordinates 702:A2		

4.0 MATERIALS AND METHODS

This section provides a methodology for conducting field sampling at monitoring locations. Also discussed are procedures for bacterial analyses of the samples and data reporting procedures.

4.1 Sampling Schedule

During the ambient monitoring period the eight (8) proposed monitoring locations will be monitored weekly with samples to be collected on Mondays. When effectiveness monitoring begins, if there are exceedances in the weekly sampling during summer and winter dry weather, accelerated monitoring will be conducted. Accelerated samples will be collected 48 hours after the original bacterial exceedance and, if the 48-hour sample also exceeds, 96 hours after the initial bacterial exceedances. Sample collection and analysis for the proposed monitoring program will be done by the City of Los Angeles Watershed Protection Division (WPD) and Environmental Monitoring Division (EMD) respectively.

4.2 Sampling Procedures

The objective of the sampling program is to provide representative water samples for bacterial analyses, while following defined safety and quality assurance guidelines. The quality assurance guidelines shall include sampling protocol as well as sample documentation, preservation, and holding time requirements. All contracted samplers or agencies (City of Los Angeles) shall submit a Sample Collection Standard Operating Procedure (SOP) which should include sampling protocol and quality assurance guidelines. *Appendices C, D, and L* provide SOPs for review by the Regional Board

Each sampling event shall be associated with recorded observations of site conditions, which should minimally include sample ID, collection date and time, rain measurement (USC rain gauge), weather conditions, sample characteristics (water color and turbidity), and sampler's name (refer to *Appendix E*).

Sampling should only occur when conditions can be assessed as SAFE. The safety of the sample collector is the top priority and should supersede scheduled sampling.

4.2.1 Procedures for missed samples

For missed samples due to inaccessibility, when sample integrity is compromised, or the scheduled sampling day falls on a holiday, the site should be revisited and sampled on the earliest convenient day, except Sunday, within the week of the originally scheduled sampling date.

4.2.2 Procedures during Rainfall Events

During any rain event, field staff must use his/her best judgment to determine if sampling can be performed safely. If a sampling day happens to fall within the 24 hours following a rain event resulting in greater than 0.5" of precipitation, the safety of the sample collector is paramount and sampling may need to be rescheduled to a different time and/or day.

4.2.3 Procedures following Elevated Bacterial Levels (Exceedances)

During effectiveness monitoring, the City of Los Angeles (WPD and EMD) will conduct accelerated sampling and testing 48 hours after the initial bacterial exceedances and, if necessary, additional accelerated testing at 96 hours for those sites that still exceed the single sample limits after 48 hours. The purpose of the accelerated monitoring is to identify the persistence of an exceedance, especially during dry weather when source identification is a priority. Accelerated monitoring may not be as critical during wet weather at every location when the source of the exceedance is known to be stormwater runoff, therefore, accelerated testing during wet weather will be considered after the 4 year the re-opener.

4.2.4 Equipment

Equipment and supplies needed for sample collection are listed in *Appendix C*.

4.2.5 Safety

In an effort to improve employee safety and health awareness, and to prevent occupational related injury and illness, EMD and other participating laboratories have developed a safety program with the intention of satisfying the applicable federal, state, and local regulations. For example, EMD's Safety and Health Program is composed of specific elements required by Cal/OSHA General Industry Safety Order Section 5191:

Occupational Exposure to Hazardous Chemicals in Laboratories, and section 3203: The Injury and Illness Prevention Program, and any other applicable regulations. The written safety plan, titled ***The Chemical Hygiene Plan***, is available to all employees for review, and should be recognized as management's commitment to ensure that all employees carry out their work in the safest and most efficient manner possible. EMD employees will be kept familiar with the Division's written Chemical Hygiene Plan (CHP) through training, annual review and monthly staff safety meetings.

It is the City of Los Angeles' policy and the policy of other participating agencies to provide a safe working environment for all of their employees. In addition, all field and laboratory work is to be performed in a manner that provides the highest level of safety for the protection of every employee. See *Appendix L* for detailed safety protocols.

4.3 Analytical Methodology

Marine/brackish samples collected from the Estuary will be tested for the presence of total coliform, *E. coli*, and enterococcus bacteria. Freshwater samples will be tested for the presence of *E. coli* and fecal coliform in REC-1 and LREC-1 designated areas and for fecal coliform in REC-2 designated areas. All indicator groups will be quantified from a single sample collected at the designated monitoring site. Necessary dilutions or aliquot volumes shall be processed to ensure that compliance with water quality objectives can be determined. Bacterial results will be reported as the number of organisms per 100 mL of sample for each bacterial indicator. When selecting analytical bacterial methods for TMDL monitoring, the importance of fast recovery times (24 hours or less) should be emphasized. The presence of total coliform, *E. coli*, and enterococcus bacteria shall be detected and quantified using the defined chromogenic substrate (CS) method (SM 9223B, APHA 1992-98). Fecal coliforms shall be detected and quantified using the membrane filtration (MF) method (SM9221C APHA 1992-98).

For the marine/brackish samples (Ballona Estuary), the CS method will be used to convert the *E. coli* results to fecal coliform using a 1:1 translator. The application of a 1:1 translator was approved by the Regional Board in October 2002 after review of the Chromogenic Substrate and Membrane Filtration Comparison Study conducted by the City of Los Angeles (approval letter dated October 16, 2002, from Dennis Dickerson, Executive Officer).

The Responsible Agencies may consider conducting a fresh water study to draw conclusions about the relationship between *E. coli* and fecal coliforms similar to the above mentioned study conducted in Santa Monica Bay which led to the development of the 1:1 translator for *E. coli* to fecal coliforms in marine waters. Based on the execution and results of this future study, reporting of fecal coliform densities obtained and quantified by the MF method may be re-evaluated.

All laboratories performing analyses for TMDL bacterial monitoring shall maintain Environmental Laboratory Accreditation Program certification (ELAP administered by

California Department of Health Services) for specified methods from ELAP's "Field of Testing 126: Microbiology of Recreational Water". Additionally, all laboratories shall submit detailed SOPs for review by Regional Board staff. *Appendix G* provides an example of an SOP developed by the City of Los Angeles-EMD. Each analytical method used for the TMDL monitoring program shall be an approved EPA or Standard Methods for the Examination of Water and Wastewater, 18th-20th edition (APHA 1992-98) method. Laboratories receiving Regional Board approval may use other analytical bacterial methods for marine recreational and TMDL monitoring.

4.3.1 Quality Assurance/Quality Control

All laboratories must employ a program that associates quality assurance with the laboratory facility, staff, instrumentation and equipment, materials and methods, media and reagents, and data validation. These QA/QC measures may be included in the submitted SOPs or defined in a separate QA/QC document such as *Appendix I*. The quality assurance procedures shall be in accordance with Standard Methods for the Examination of Water and Wastewater, 18-20th Editions (APHA 1992-98). All participating laboratories must maintain ELAP certification, provide QA/QC documentation as required by the Regional Board, and participate in periodic inter-calibration exercises.

Data from the EMD Microbiology Laboratory will be utilized to comply with the monitoring requirements of the Ballona Creek Bacterial TMDL. The EMD and WPD divisions of the City of Los Angeles Departments will participate in this monitoring program as processing and sampling agencies respectively.

4.4 Data Management and Reporting

4.4.1 Data Tabulation

Results will be entered into Excel spreadsheets that automatically compute results (MPN/100 mL for CS analysis and CFU/100 mL for MF analysis). All entered data will be given secondary review, corrected as needed, to ensure error-free data entry. Examples of EMD's Microbiology Laboratory data worksheets can be found in *Appendix E*. Data acquisition, validation, reduction, and reporting procedures can be found in *Appendix H*.

4.4.2 Data Format and Archive

All data collected will be archived within the City of Los Angeles' Environmental Monitoring Division (EMD) Laboratory Information Management System (LIMS) database or comparable database. For any non-City of Los Angeles monitoring agency performing bacteriological analyses, data will need to be submitted daily to EMD

electronically in a comma-separated value (CSV) format that contains the table structure and syntax provided in *Appendix J*. The City of Los Angeles' Information & Control System Division (ICSD) staff will ensure electronic submissions of data are parsed and stored correctly into the LIMS database.

4.4.3 "Wet Weather" Determination

The BC Bacteria TMDL defines "wet weather" as "days with 0.1 inch of rain or greater and the three days following the rain event" (Attachment A to Resolution No. 2006-011, Page 4); however, the TMDL does not specify where the 0.1-inch of rain is to be measured. For clarification, the Ballona Creek Monitoring Sub-committee proposes in **Table 4.1** the rainfall gage to be used for this monitoring program to determine wet weather days.

Table 4.1 Rainfall gage to be used for the proposed monitoring program.

Jurisdictional Group	Rainfall Gage	Comment
Ballona Creek Watershed	University of Southern California (USC) (375)	LACDPW "Manually Observed Non-Mechanical Rain Gauge" Station

The proposed gage is a Manually Observed Non-Mechanical Rain Gauge station owned and operated by the County of Los Angeles. Data can be obtained at http://www.ladpw.org/wrd/precip/ under "Station Information." The web page displays 148 Manually Observed Non-Mechanical Rain Gages; these gages are measured once daily by volunteers and reported monthly.

4.4.4 Exceedance Determination and Accelerated Sampling

Bacteriological data will be summarized in tabular form on a daily basis by EMD's Microbiology Unit. Exceedances will be clearly notated and triggers indicating "accelerated monitoring needed" will be programmed into the report. Summer dry-weather, winter dry and wet weather spreadsheets with triggers will be created, but as mentioned in section 4.2.3 wet weather accelerated sampling will not be considered until the 4th year reopener. When bacterial levels no longer exceed listed standards, a trigger to return to weekly sampling will be programmed, except for wet weather exceedances which will continue regular sampling regardless of exceedances until the 4th year reopener.

The monitoring agency, the City of Los Angeles, will be responsible for performing accelerated monitoring as required. For the purpose of compliance, this CMP proposes that for single-sample limits, accelerated sampling results should not be counted towards compliance

4.4.5 Data Reporting

Electronically-formatted data will be archived and submitted to the responsible agencies and the Regional Board promptly after the data becomes available, and electronic copies of the monthly reports will be distributed to the responsible agencies. Monthly data summary reports will be submitted to the LARWQCB by the last day of each month for data collected during the previous month.

For EMD, laboratory results will be entered into Microsoft Excel spreadsheets that automatically compute results (MPN/100 mL or CFU/100 mL). All monitoring agencies will archive their own data within LIMS or a comparable database. See *Appendix H*, Data Acquisition, Reduction, Validation, and Reporting Procedures.

5.0 REFERENCES

American Public Health Association. 1992. Standard methods for the Examination of Water and Wastewater, 18th ed. American Public Health Association, Washington, DC, pp. 9-1 to 9-115.

Noble, R. T., J. H. Dorsey, M. K. Leecaster, M. Mazur, C. D. McGee, D. Moore, V. Orozco-Borbón, D. Reid, K. Schiff, P. M. Vainik, and S. B. Weisberg. 1999. Southern California Bight 1998 Regional Monitoring Program. I. Summer Shoreline Microbiology. Appendix C, Comparison of Bacterial Indicator Measurements among Southern California Marine Monitoring Laboratories. Southern California Coastal Water Research Project. Westminster, CA, 54-67.

TMDL Draft. The following TMDL drafts are cited in this report:

Total Maximum Daily Load to Reduce Bacterial Indicator Densities during Dry Weather at Santa Monica Bay Beaches—January 14, 2002

Santa Monica Bay Beaches Wet-weather Bacteria TMDL Draft—Version 4. 11/07/02.

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APPENDIX

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APPENDIX A

Development History of the Ballona Creek Bacteria TMDL

The Ballona Creek Bacteria TMDL was developed by the Los Angeles Regional Water Quality Control Board (RWQCB) to protect beneficial uses associated with water quality in Ballona Creek. Elevated concentrations of bacteria at Ballona Creek have prompted the development of a TMDL. The effective date of the TMDL is April 27, 2007.

Ballona Creek is a ten-mile long channel that begins in Hancock Park and drains into the Pacific Ocean just south of Marina del Rey. The Ballona Creek Watershed totals about 130 square miles. Ballona Creek has 3 segments (or reaches) divided based on the physical characteristics and beneficial use designations: Reach 1 is REC-2, Reach 2 is Limited REC-1, and the Estuary is REC-1. These three segments and Sepulveda Channel are listed as impaired and require a TMDL.

This bacteria TMDL addresses the impaired bacterial water quality of the creek and sets waste load allocations (WLAs) or enforceable bacteria concentration limits in the creek. Affected agencies will be required to reduce the amount of bacteria flowing in Ballona Creek, the Estuary, and Sepulveda Channel.

The watershed is highly developed, consisting of residential, recreational/open space, commercial and industrial land uses. The watershed also includes all or parts of the Cities of Beverly Hills, Culver City, Inglewood, Santa Monica, West Hollywood, and unincorporated Los Angeles County.

The TMDL contains a 14-year compliance schedule to correspond with the Santa Monica Bay Beaches Bacteria TMDL schedule for meeting 100% compliance of waste load allocations (WLAs). The TMDL will be re-evaluated 4 years after the effective date for WLAs based on results of required special studies from year 1 to 3.

A comprehensive Coordinated Monitoring Plan is required 12 months after the TMDL effective date. Compliance monitoring or “Effectiveness Monitoring” is required for 8 locations along the creek.

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APPENDIX B

Monitoring Sites

Table B.1 Effectiveness monitoring sites

Reach	Station ID	Station Name	Water Body	Sampling Frequency	Coordinates		Thomas Guide	Description (including historical sites, if any)
					Latitude	Longitude		
1	BCB-1	WASHINGTON	Main Channel: Ballona Creek	Weekly	N34 º 01.938’	W118 º 22.521’	633:A7	At Washington Blvd. (slightly downstream of LACDPW- TS10 at La Cienega Blvd).
2	BCB-2	DUQUESNE	Main Channel: Ballona Creek	Weekly	N34º 1.036’	W118º 23.35’	672:H1	At Duquesne Blvd. on the main channel of Ballona Creek.
	BCB-3	BENEDICT CANYON	Confluence: Benedict Canyon/Ballona Creek	Weekly	N 34º 00.870’	W118º 23.464’	672:H2	At the confluence of Benedict Canyon Channel/Ballona Creek (cross street is Duquesne Avenue).
	BCB-4	CULVER	Tributary: Sepulveda Channel	Weekly	N33º 59.886’	W118º 24.923’	672:E4	Near Culver Blvd. (same as site BC-4 in Ballona Creek Metals and Estuary Toxics TMDL CMP).
	BCB-5	INGLEWOOD	Main Channel: Ballona Creek	Weekly	N33º 59.387’	W118º 24.704’	672:E6	At Inglewood Blvd. on the main channel of Ballona Creek.
Estuary	BCB-6	CENTINELA	Main Channel: Ballona Creek	Weekly	N33º 58.922’	W118º 25.376’	672:D7	At McConnell Ave. on the main channel of Ballona Creek
	BCB-7	LINCOLN	Confluence: Centinela Creek/Ballona Creek	Weekly	N 33º 58.711’	W118º 25.549’	672:D7	At the confluence of Centinela Creek/Ballona Creek (cross street is Lincoln Avenue).
	BCB-8	PACIFIC	Main Channel: Ballona Creek	Weekly	N33º 57.679	W118º 27.142’	702:A2	In Ballona Creek Estuary, from Pacific Avenue bridge.

Figure B.1 Effectiveness monitoring sites drainage areas

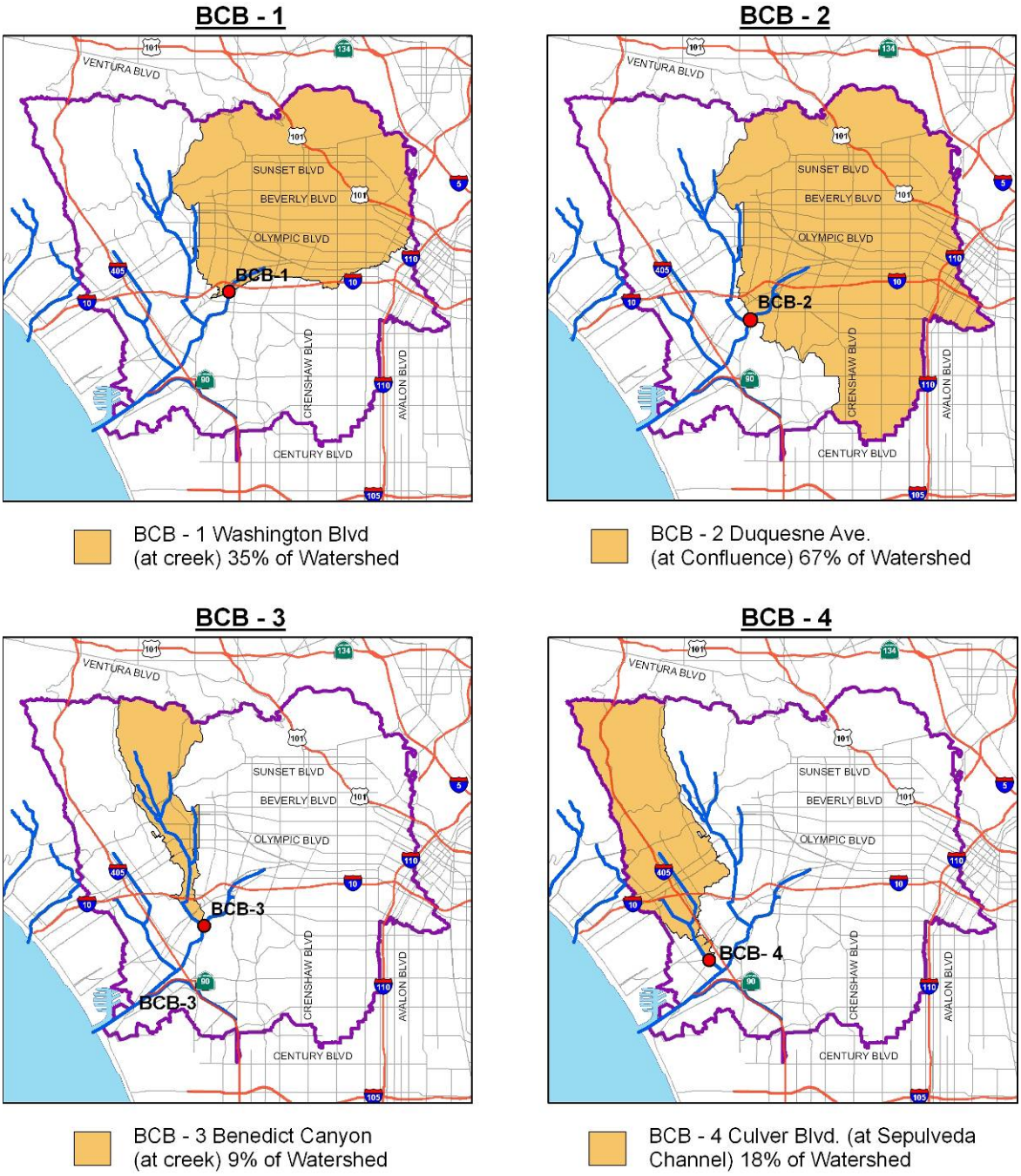
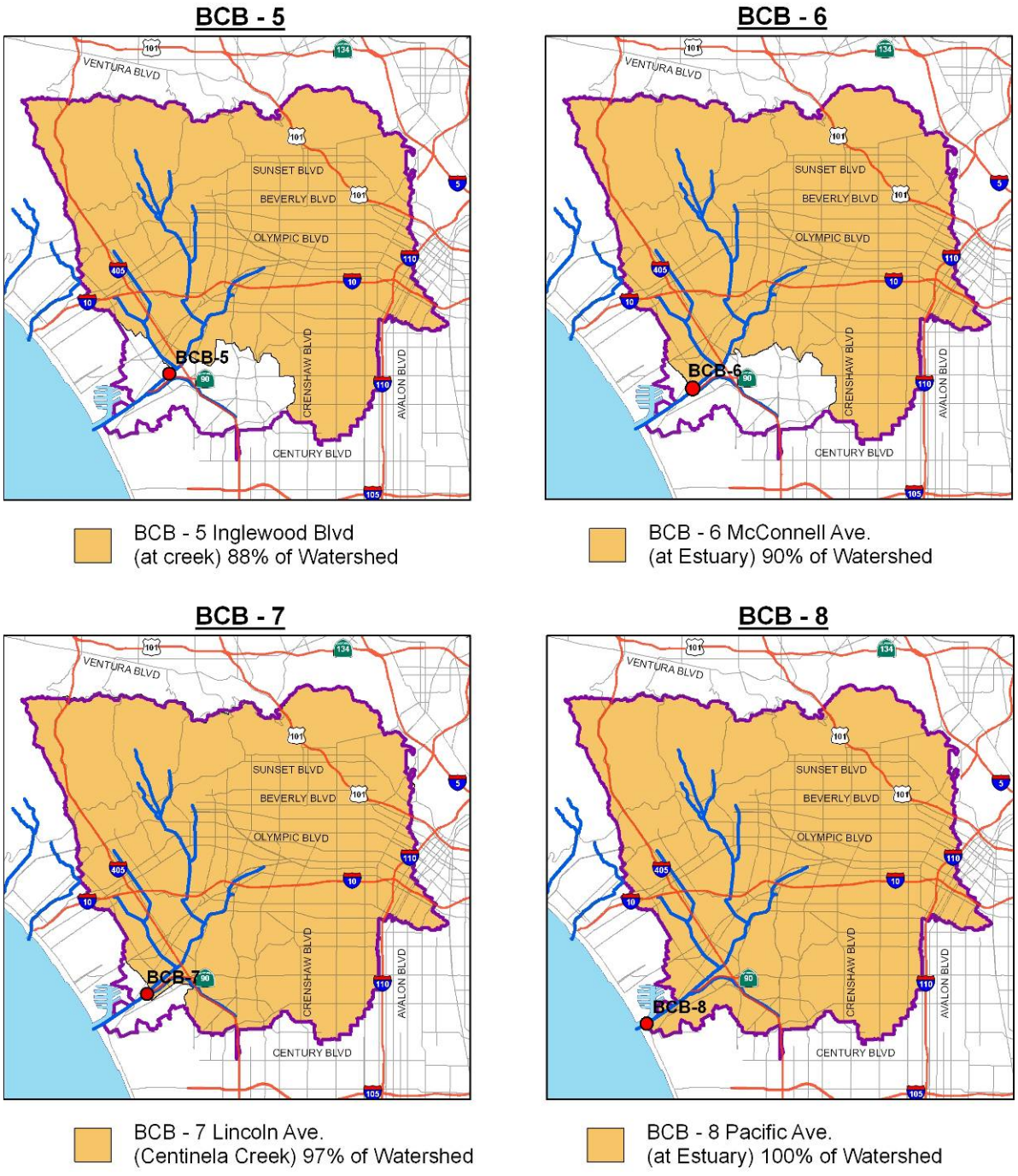


Figure B.2 Effectiveness monitoring sites drainage areas continued



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APPENDIX C

Field Sampling Equipment and Supply List

The following equipment is needed for dry weather water quality sample collection.

1. First Aid kit
2. Portable eyewash bottle with saline solution
3. Ice chest (with ice)
4. Sampling pole with reel
5. Weighted bottle holder (attaches to fishing line/reel)
6. Sterilized polypropylene 125 mL bottles with 1% Sodium Thiosulfate (necessary for freshwater/stormwater samples)
7. Wash bottle with de-ionized water
8. Foaming disinfectant hand cleanser
9. Waterproof labels
10. Paper towels
11. Water-safe pen and Lab marker
12. Field log sheet
13. Chain-of-Custody (COC) sheet
14. Thomas Guide (street map)/Electronic Navigation System
15. Trash bag
16. Cell phones (1 for each person)
17. Watch
18. Personal protective equipment:
    i. Safety vest (ANSI 107 Class 2 compliant, high visibility)
    ii. Protective gloves (latex, nitrile, etc.)
    iii. Slip-resistant shoes/boots
    iv. Protective eyewear: UV protection; impact resistant
    v. Foul weather gear (when necessary)
    vi. Rain boots (when necessary)
    vii. Life vest (if entering the flood channel).

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APPENDIX D

Field Sampling Standard Operating Procedures

I. Water Quality Sampling

A. Overview of Procedure

At the beginning of each month, Field Sampling staff provides Laboratory Staff at the Environmental Monitoring Division (EMD) with a sampling schedule detailing when sampling will be conducted, and the number of samples to be delivered. The Laboratory supplies Field Sampling staff with clean, sterile polypropylene bottles with the necessary additives. Sample bottles are labeled and Chain-of-Custody (COC) sheets are prepared prior to going out to the field. All necessary gear, including personal protective equipment, must be brought to the field. Grab samples are collected at designated sampling stations, and the time of collection is recorded on the COC and Field Log sheets. Samples are then stored on ice, sample temperature read and recorded by EMD laboratory staff at DSM (5th floor, Pregerson Building, Hyperion Treatment Plant), and then delivered to the Microbiology Laboratory at the Environmental Monitoring Division (4th floor, Pregerson Building, Hyperion Treatment Plant). Laboratory staff will need to make sure the samples are received within the maximum allowable holding time. The original COC sheet is signed, dated, noted as to the time samples are received and given to EMD staff. The Field Sampling crew retains a copy of the COC.

II. Sampling Procedure:

A. Coordination with Laboratory

At the beginning of each month, the monthly sampling schedule is sent via email to the supervisors of the Microbiology Section at EMD. If unforeseen changes are made to the schedule, EMD staff is notified immediately. Contact name is listed below:

Microbiology Section:

Water Microbiologist III

Supervisor: Ioannice Lee

Phone: (310) 648-5196

Email: Ioannice.Lee@lacity.org

B. Gather the necessary equipment:

See Appendix C

Sampling Locations/Frequency:

Reach	Station ID	Water Body	Sampling Frequency	Thomas Guide	Description (including historical sites, if any)
1	BCB-1	Washington Blvd.; Main Channel: Ballona Creek	Weekly	633:A7	At Washington Blvd. (slightly downstream of LACDPW-TS10 at La Cienega Blvd).
2	BCB-2	Duquesne Ave., Main Channel: Ballona Creek	Weekly	672:H1	At Duquesne Blvd. on the main channel of Ballona Creek.
	BCB-3	*Duquesne Ave., Confluence: Benedict Canyon/Ballona Creek	Weekly	672:H2	At the confluence of Benedict Canyon Channel/Ballona Creek (cross street is Duquesne Avenue).
	BCB-4	Culver Blvd.; Tributary: Sepulveda Channel	Weekly	672:E4	Near Culver Blvd. (same as site BC-4 in Ballona Creek Metals and Estuary Toxics TMDL CMP).
	BCB-5	Inglewood Blvd., Main Channel: Ballona Creek	Weekly	672:E6	At Inglewood Blvd. on the main channel of Ballona Creek.
Estuary	BCB-6	*Centinela Ave., Main Channel: Ballona Creek	Weekly	672:D7	At McConnell Ave. on the main channel of Ballona Creek
	BCB-7	*Lincoln Blvd., Confluence: Centinela Creek/Ballona Creek	Weekly	672:D7	At the confluence of Centinela Creek/Ballona Creek (cross street is Lincoln Avenue).
	BCB-8	Pacific Ave., Main Channel: Ballona Creek	Weekly	702:A2	In Ballona Creek Estuary, from Pacific Avenue bridge.

* Nearest major cross street to sample site. See provided GPS coordinate for actual sampling site.

C. Field Log sheet.
A field log sheet is provided in Appendix E. This form is for recording details about each sampling event (including date, time, locations, samplers, comments), and is retained by the sampling staff. The form is to be prepared before leaving to the field, and the appropriate information is filled out after each sample is collected.

D. Chain of Custody (COC) form.
A COC form is to be completed for each sampling event. The form should be prepared prior to leaving to the field. At each sampling station, the sampler enters his/her initials, along with time of collection. The original COC is to follow the samples at all times. The sampler must sign and date the COC when relinquishing the sample to Laboratory Staff (Sample Receiving, EMD) who in turn, signs the form to indicate receipt of the sample. A photocopy is given to the sampling staff, and the laboratory retains the original COC along with the samples to be analyzed. A blank COC is provided in Appendix E.

E. Collecting Samples
When sampling from a bridge, a fishing pole/reel is used to lower the sample bottle into the stream.
   a. Obtain clean and sterile polypropylene bottles with Sodium Thiosulfate (necessary for freshwater/stormwater samples). Confirm that the bottle has the appropriate pre-printed label.
   b. Note the sample collection time on the Field Log sheet, COC, and sample label.
   c. Be very careful to avoid contamination of the sample bottle. Wear clean gloves and avoid touching the mouth of the bottle and the inside of the cap.
   d. Attach the bottle-holder to the fishing line, and secure the bottle. Unscrew the bottle lid, and set it aside. Release the drag on the reel, and lower the bottle into the stream. Allow the bottle to fill with water, and then reel it in. Replace the lid securely, and place the sample into the ice chest.
   e. Rinse bottle holder with de-ionized water after each station.
   f. Fill in appropriate information on the COC and field log sheet.
   g. Samples should be delivered to the laboratory as soon as possible. When relinquishing custody of the samples, inform Laboratory staff of the start time of the six hour holding time limit for the samples. Laboratory staff will read the sample temperature, sign and date the COC, and make a copy of the COC for field staff to keep.
   h. Upon returning from the field, file the COC (copy) and field log sheet in the appropriate binder. Rinse all field equipment with de-ionized water.

III. Contact Information:

Laboratory:
Environmental Monitoring Division

Microbiology Section
Water Microbiologist III
Supervisor: Ioannice Lee
Phone: (323) 648-5196
Email: Ioannice.Lee@lacity.org

Watershed Protection Division

Pollution Assessment Section
Water Biologist III
Supervisor: Jon Ball
Phone: (323) 342-1557
Email: Jon.Ball@lacity.org

TMDL Implementation Section
Senior Engineer: Reza Iranpour, Ph.D., P.E.
Phone: (213) 485-0577
Email: Reza.Iranpour@lacity.org

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APPENDIX E

Field and Data Entry Worksheets

Examples of worksheets for Chain of Custody sheets (2 pages) and recording analytical results used by the City of Los Angeles' Watershed Protection Division and Environmental Monitoring Division are provided herein. They include field observations, Chromogenic Substrate data entry, and Membrane Filtration data entry. Once completed, data are then entered into the LIMS database.

CITY OF LOS ANGELES – DEPARTMENT OF PUBLIC WORKS – BUREAU OF SANITATION

WATERSHED PROTECTION DIVISION – SECTION

FIELD COLLECTION SHEET

Program:_____

Sampling Date: _____

STATIONS	STATION CODE	STAFF INITIALS	COLLECTION TIME	TEST REQUESTED	SAMPLE ID	COMMENTS (Weather, Water condition,…)

CHAIN-OF-CUSTODY

Relinquished by: (signature)	Print Name	Date/Time	Accepted by: (signature)	Print Name	Date/Time

Email results to:

REVISED DATE

Date:

Department of Public Works
Bureau of Sanitation
Environmental Monitoring Division

Sample Chain of Custody

EMD
LIMS #: _____

EMD Sample ID: _____
Project Name: _____

Sampling Information:
Sampling Agency: _____
Agency Sample ID#: _____
Phone Number: _____
Fax Number: _____
Contact Person: _____
email address: _____

Sampler's Name: _____
Sampler's Title _____

Sampler's Signature: _____

Witness: Name _____
Title _____

Name _____
Title _____

Sample Location: _____

Sampling Program: _____

Purpose of program: _____

Report Time Frame: _____

Sample Date: _____

Sampling Time: _____

Sampling Address: _____

Requested Analysis:
Metals: ☐
Organics: ☐
Conventional Chemistry: ☐
Micro Biological: ☐
Toxicity: ☐
Air Testing: ☐
See back of page for specifics analyses

Sample Notification:

PC: _____ Date: _____

Wet: _____ Date: _____

Micro: _____ Date: _____

Toxicity: _____ Date: _____

Metals: _____ Date: _____

Semi-Vol: _____ Date: _____

Volatile: _____ Date: _____

Current Holder Name	Signature	Title	Received Date	Received Time	Released Date

Analysis to be performed on the Sample(s):

EMD
LIMS #: _____

	Locator:	Collection Time:		Locator:	Collection Time:
-1			-6		
-2			-7		
-3			-8		
-4			-9		
-5			-10		

Sample Information: Liquid: ☐ Solid: ☐ Other: ☐ Temperature _____
Grab ☐ Composite: ☐
Start time: _____ Finish time: _____ pH _____
Container: Glass Size: _____ Color: _____ Number: ___
Plastic Size: _____ Color: _____ Number: ___ Residual Cl2 _____
Preservative ☐ Number of samples: ☐

Metals:

☐ Ag	☐ Cu	☐ Pb	☐ Other: _____	
☐ Al	☐ Fe	☐ Sb		
☐ As	☐ Hg	☐ Se		
☐ Ba	☐ K	☐ Sn		
☐ Be	☐ Mg	☐ Sr	☐ Total	
85 ☐ Ca	☐ Mn	☐ Tl	☐ Dissolved	
☐ Cd	☐ Mo	☐ V		
☐ Co	☐ Na	☐ Zn		
☐ Cr	☐ Ni			

Organics:

☐ VOC	☐ Pesticides/PCB	☐ Clopyralid	☐ Air VOC
☐ BNA	☐ Dioxin - screen	☐ Dioxin - low resolution	☐ Fixed Gases
☐ TOX	☐ Other: _____	☐ Dioxin - high resolution	☐ GC Sulfur
☐ Herbicides		☐ Tributyltin	☐ Siloxanes

Conventional Chemical:

☐ Alkalinity	☐ MBAS	☐ Solids:
☐ BOD	☐ Nitrogen:	☐ Total Solids
☐ Boron	☐ Ammonia Nitrogen	☐ Total Dissolved Solids
☐ Chloride	☐ Nitrate-N	☐ Total Suspended Solids
☐ COD	☐ Nitrite-N	☐ Settleable Solids
☐ Conductivity	☐ Organic-N	☐ Volatile Suspended Solids
☐ Cyanide (Free)	☐ Kjeldahl Nitrogen	☐ Volatile Total Solids
☐ Cyanide (Total)	☐ Oil & Grease	☐ Sulfates
☐ Flashpoint	☐ pH	☐ Sulfides, Total
☐ Fluoride	☐ Phenols	☐ Sulfides, Dissolved
☐ Grain Size	☐ Phosphate, Total	☐ Thiosulfate
☐ Hardness	☐ Phosphate, Dissolved	☐ TOC
☐ Hexavalent Chromium	☐ Radioactivity	☐ Turbidity
☐ H_2S	☐ Salinity	☐ Other:

Biological:

☐ Total Coliform	☐ Salmonella	☐ Other: _____
☐ Fecal Coliform	☐ Acute Toxicity (Fresh water)	
☐ E. coli	☐ Chronic Toxicity (Sea water)	
☐ Enterococcus	☐ Chronic Toxicity (Fresh water)	

Remarks: _____

Date:_____

Read by:_____ Time:_____

Environmental Monitoring Division

Microbiology Group

Validated:_____

QUANTITRAY COUNTS

TOTAL

Station	BCB-1	BCB-2	BCB-3	BCB-4	BCB-5	BCB-6	BCB-7	BCB-8	Blank	*Dup*
10 ml										
Large cells										
Small cells										
Blank 100 mL									Blank	
Large Cells										
Small Cells										

Station	BCB-1	BCB-2	BCB-3	BCB-4	BCB-5	BCB-6	BCB-7	BCB-8	Blank	*Dup*
10 ml										
Large cells										
Small cells										
Blank 100 mL									Blank	
Large Cells										
Small Cells										

Date: _____

ENVIRONMENTAL MONITORING DIVISION
Entered by 1: _____ 2: Validated by:_____
MICROBIOLOGY UNIT

BACTERIAL DENSITIES

ENTEROCOCCUS Read by: _____ Time: _____

VOL. (mL)	BCB-1	BCB-2	BCB-3	BCB-4	BCB-5	BCB-6	BCB-7	BCB-8	Blank	Dup
10										
50										
100										

E. coli ENTERO/100 mL

VOL. (mL)	BCB-1	BCB-2	BCB-3	BCB-4	BCB-5	BCB-6	BCB-7	BCB-8	Blank	Dup
10										
50										
100										

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APPENDIX F

Laboratory Equipment and Supply List

Chromogenic Substrate Method

- **Materials and Equipment**

  - Sterile, transparent, non-fluorescent container - 125 mL volume (use containers provided by Colilert kit if available)
  - Colilert-18 reagent packets
  - Enterolert reagent packets
  - Quantitray/2000 trays
  - Graduated cylinder, sterile - 100 mL (optional)
  - Quantitray/2000 rubber tray insert
  - UV cabinet or lamp - long wave, 366nm
  - Deionized water – sterile
  - Colilert Quantitray/2000 color/fluorescence comparators

Membrane Filtration Method

- **Materials and Equipment**

  - Plate Labeling
    - Indelible marking pen
    - Kimwipes
    - Prepared mEndo, mFC, and mE agar plates
    - Agar plate carrier with dark cover
  - Filtration
    - 1 mL and 10 mL sterile, bacteriological or Mohr disposable pipets
    - Pipet biohazard container
    - Vacuum pump
    - Filtration manifold
    - Microfil vacuum support base
    - Microfil filter screen disc (in 95% alcohol jar)
    - Sterile, disposable Microfil funnels
    - Membrane filters - sterile, white, grid-marked, 7mm diameter filters with 0.45µM pore size
    - Labeled mEndo, mFC, and mE agar plates in covered plate carrier
    - Alcohol lamp
    - 95% and 70% ethanol
    - Glass safety jar with lid
    - Paper towels
    - Sterile, plastic squirt bottle

- Forceps - smooth-tipped stainless steel
- Pipet bulb
- Alcohol pads
- Incubator, 35.0 ± 0.5°C
- Water bath, 44.5 ± 0.2°C
- Incubator, 41.0 ± 0.5°C
- Solid heat-sink fecal coliform incubator, 44.5 ± 0.2°C
- Matches
- Long-handled forceps
- Sterile, phosphate-buffered rinse water
- Sterile, phosphate-buffered water dilution tubes

o Colony Counting
- Binocular, stereoscopic microscope with fluorescent lamp
- Disposable gloves
- Data worksheets
- Large biohazard container
- Incubated mEndo, mFC, and mE agar plates
- EIA agar plates

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APPENDIX G

Laboratory Standard Operating Procedures (SOPs)

Chromogenic Substrate Method: Shoreline/Marine Samples

- **Procedure**
  - Disinfect the workbench area with 70% ethanol. Let air-dry.
  - Preparation of sample container
    - You will need one sterile container per sample. Label each sample container with station name and test to be performed (e.g., Container1: S01, TC/EC, Container 2: S01, Entero).
    - Remove the outer plastic ring/label seal around the container cap. Remove the container cap, being careful not to touch the inside of the cap. Pour sterile D.I. water from a flask into each container. Be careful not to touch the rim of the D.I. flask or the container. Pour the D.I. water to the 100 mL mark on each container and replace the cap. Replace the cap back onto the D.I. water flask if there is any D.I. water left in the flask.
    - If a 10-ml sample aliquot is to be used, remove 10 ml of D.I. water from all sample containers using a sterile 10 ml pipet. If only 1 ml of sample is to be analyzed, skip this step of removing 10 ml of D.I. water.
    - You will need one Coli-18 reagent pak for each sample container labeled TC/EC and one Enterolert reagent pak for each container labeled Entero. Carefully separate one reagent snap pak from the strip, taking care not to accidentally open the adjacent pak. Tap the snap pak to ensure that all of the reagent powder is in the bottom part of the pack.
    - Open the pak by snapping back the top at the scoreline. Do not touch the opening of the pak.
    - Add the reagents to the appropriate sample containers filled with D.I. water. Replace the cap on the container, tighten, and gently mix until the reagent is dissolved. Note that when the Coli-18 reagent is added to the D.I. water in the container, the solution is a clear color and when Enterolert reagent is added to the D.I. water, the solution is a yellow color.
    - Pipet 10 mL of each sample into the appropriate sample containers. Place the used pipets into the pipet biohazard container. Replace the sample container caps and mix gently.

  - Quanti-tray/2000
    - Turn on Quanti-tray® sealer at the start of sample preparation.
    - You will need **one** Quanti-tray for **each** labeled sample container.
    - Check to see that the green Ready Light (above the amber power light) is illuminated on the sealer. The sealer will not operate until

both the amber power light and the green Ready Light are illuminated.

- Using one hand, hold a Quanti-tray upright with the well side (plastic) facing your palm. Squeeze the upper part of the Quanti-tray so that it bends towards the palm of your hand. Using your other hand, gently pull the foil tab at the top of the tray to separate the foil from the top of the tray, creating an open pouch. Avoid touching the inside of the foil or tray and be careful not to tear the foil.
- Pour the reagent/sample mixture directly into the Quanti-tray, avoiding contact with the foil tab at the top of the tray. Tap the small wells at the bottom of the tray to release any air bubbles. Allow any foam present to settle.
- Place the sample-filled tray onto the rubber insert of the sealer with the well side (plastic) of the tray facing down. Align the small and large wells with their corresponding holes in the rubber insert. Make sure the tray is properly seated in the rubber insert. With your hand, gently press on the back of the tray to distribute some of the liquid into the larger wells.
- Slide the rubber insert into the sealer until the motor grabs the rubber insert and begins to draw it into the sealer.
- In approximately 15 seconds, the tray will be sealed and partially ejected from the rear of the sealer. Remove the rubber insert and tray from the rear of the sealer.
- If a misaligned tray is accidentally fed into the sealer, press and hold the "**reverse"** button (located on the top, front center of the sealer). This will reverse the motor and you can then remove the tray. Do not reverse the motor once the rubber insert has been drawn fully into the input slot of the sealer.
- Repeat for each labeled tray. Turn off the sealer and unplug the unit when you are finished sealing all the trays.
- Using a felt-tipped marker, label the front of each tray with the incubation time.
- Place all Quanti-trays labeled "TC/EC" into the 35°C (Total coliform) incubator for 18 hours.
- Place all Quanti-trays labeled "Entero" into the 41°C (Enterococcus) incubator for 24 hours.

o QA Controls
  - Refer to QA/QC SOP

o Clean-up
  - Dispose of the empty, used sample container in the large, red biohazard containers.
  - Dispose of all pipet wrappers and empty reagent packs in the regular trash receptacle. Return all lab supplies to their proper storage areas.

- Disinfect the workbench area with 70% ethanol. Let air-dry.
- Discard original sample remaining in sample bottle (can discard down sink drain). Rinse with tap water and place empty bottles on trash cart for later cleaning.

- Reading Quanti-Tray Sample Results
  - Disinfect the workbench area with 70% ethanol. Let air-dry.
  - TOTAL COLIFORMS - read 18-22 hours after incubation.
    - Remove the Quanti-trays from the 35°C (Total coliform) incubator.
    - Record the date, time, and analyst name or initials on the sample data sheet for the reading of Total Coliforms.
    - Compare the intensity of the yellow color of the sample wells to the intensity of the yellow color of the Comparator Quanti-tray. Any well with a yellow color of equal or greater intensity than the Comparator is considered a "positive" well. Wells with a clear color or a yellow intensity less than the Comparator are considered as "negative". **If reaction is unclear or borderline yellow, replace the tray in incubator for further incubation up to a total of 22 hours.**
    - Count the number of positive large wells. Remember that the single, large well at the very top of the Quanti-tray should also be included in the count if it is positive. Record the number of positive large wells on the sample data sheet. Count and record the number of large positive wells for each sample dilution that was set.
    - Count the number of positive small wells. Record the number of positive small wells on the sample data sheet. Count and record the number of small positive wells for each sample dilution that was set.

  - *E. coli*- read 18-22 hours after incubation.
    - These results are read from the Total coliform Quanti-trays.
    - Record the date, time, and analyst name or initials on the sample data sheet for the reading of *E. coli*.
    - Place Quanti-tray under a UV cabinet or lamp.
    - Press the red button on the top of the UV lamp to turn the lamp on. Make sure the lamp is pointed away from you.
    - Count the number of large and small fluorescent wells for each sample dilution. Remember that the single, large well at the very top of the Quanti-tray should also be included in the count for the large wells if it is positive. Record the results on the sample data sheet.
    - If in doubt as to the fluorescence of a well, compare it to the negative fluorescence of the Quanti-tray Comparator. This Comparator is "negative" for fluorescence. **If fluorescence on the well(s) is/are still questionable, mark the well(s) with an indelible pen or marker and re-incubate Quanti-tray for an additional 2 - 4 hours**. Read Quanti-tray again following the incubation period.

ENTEROCOCCUS - read 24-28 hours after incubation

- Remove the Quanti-trays from the 41°C (Enterococcus) incubator.
- Record the date, time, and analyst name or initials on the sample data sheet for the reading of Enterococcus.
- Place Quanti-tray under a UV cabinet or lamp
- Press the red button on the top of the UV lamp to turn the lamp on. Make sure the lamp is pointed away from you.
- Shine the UV lamp directly on the sample Quanti-tray within five inches of the tray. Count the number of large and small fluorescent wells for each sample dilution. Remember that the single, large well at the very top of the Quanti-tray should also be included in the count for the large wells if it is positive. Record the results on the sample data sheet.
- If in doubt as to the fluorescence of a well, compare it to the negative fluorescence of the Quanti-tray Comparator. This Comparator is "negative" for fluorescence. **If fluorescence on the well(s) is/are still questionable, mark the well(s) with an indelible pen or marker and re-incubate Quanti-tray for an additional 2 – 4 hours**. Read Quanti-tray again following the incubation period.

- When finished reading all the Quanti-trays, turn off UV lamp and dispose of all trays into the large red biohazard containers.
- Disinfect the work bench area with 70% ethanol. Let air dry.
- Leave the sample data sheets on the clipboard by the Quanti-tray sealer.

- Quanti-Tray Calculations
  - Enter the number of positive large and small wells into the Idexx generator or read from the Idexx MPN table. Multiply the number given in the table by the dilution factor used. If more than one dilution generates a result, take the average.

    Example # Positive large wells: 23

    # Positive small wells: 16

    Idexx MPN table: 52.7

    Calculation (10 ml aliquot of sample):

    52.7 (**number from table**) x 10 (**Result based on a 100 ml sample size**) = 530 MPN/100 ml

Membrane Filtration Method (for Enterococci analysis)

- **Media Preparation**
  - mEndo Agar LES

- To rehydrate the medium, suspend 51 grams in 1 liter deionized water containing 20 mL 95% ethanol and heat to boiling to dissolve completely. Cool to 45-50°C. (If using the agarmatic, follow the agarmatic directions for making mEndo.) Aseptically dispense 4-5 mL amounts into the lower halves of 60x15 mm sterile, disposable petri dishes and allow to solidify. Final pH 7.2 ± 0.2. Record pH results in the media prep log book.

- Set QA media controls.
  - Refer to QA/QC SOP
- Place agar plates in a labeled media container and refrigerate until needed. The holding time for agar plates is two weeks.

o mFC Agar

- To rehydrate the medium, suspend 52 grams in 1 liter deionized water and heat to boiling to dissolve completely. Add 10 mL of a 1% solution of rosolic acid in 0.2 *N* NaOH. Continue heating for 1 minute. Cool to 45 -50°C. (If using the agarmatic, follow the agarmatic directions for making mFC.) Aseptically dispense 4-5 mL amounts into the lower halves of 50-60x15 mm tight-fitting sterile, disposable petri dishes and allow to solidify. Final pH 7.4 ± 0.2. Record pH results in the media prep log book.

- 1% Rosolic Acid Solution - Add 0.1 grams rosolic acid to 10 mL of stock 0.2 *N* NaOH. Mix well.

- Stock 0.2 *N* NaOH - Add 0.8 grams NaOH to 100 mL deionized water. Mix to dissolve. Store in a labeled polyethylene reagent bottle.

- Set QA media controls.
  - Refer to QA/QC SOP
- Place agar plates in a labeled Tupperware container and refrigerate until needed. The holding time for agar plates is two weeks.

o mE Agar

- To rehydrate the medium, suspend 7.12 grams in 100 mL of deionized water. Heat to boiling to dissolve completely. Autoclave for 15 minutes at 121°C. Promptly remove from the autoclave and cool to 45-50°C. Add 0.024 grams Nalidixic Acid and 1.5 mL of a 1% solution of triphenyl tetrazolium chloride (TTC). (If using the agarmatic, follow the agarmatic directions for making mE.) Aseptically dispense 4-5 mL amounts into the lower halves of 60x15 mm sterile, disposable petri dishes and allow to solidify. Final pH 7.1 ± 0.2. Record pH results in the media prep log book.

  1% TTC Solution - Add 1 gram TTC to 100 mL of deionized water. Mix well. Using a sterile 0.22µm Millex-GS filter, filter-sterilize the

solution into a sterile, labeled 500 mL reagent bottle. Store in the refrigerator.

- Set QA media controls.
  - Refer to QA/QC SOP
- Place agar plates in a labeled Tupperware container and refrigerate until needed. The holding time for agar plates is two weeks.

o Esculin Iron Agar (EIA)
- To rehydrate the medium, suspend 1.65 grams in 100 mL of deionized water. Heat to boiling to dissolve completely. Autoclave for 15 minutes at 121°C. Promptly remove from the autoclave and cool to 45-50°C. (If using the agarmatic, follow the agarmatic directions for making EIA.) Aseptically dispense 4-5 mL amounts into the lower halves of 60x15 mm sterile, disposable petri dishes and allow to solidify. Final pH 7.1 ± 0.2. Record pH results in the media prep log book.
- Set QA media controls.
  - Refer to QA/QC SOP
- Place agar plates in a labeled Tupperware container and refrigerate until needed. The holding time for agar plates is two weeks.

o Phosphate-Buffered Water
- 1 *N* NaOH - Carefully add 4 grams NaOH to 100 mL deionized water. Mix to dissolve. Store in a labeled polyethylene reagent bottle.
- Stock Phosphate Buffer Solution - add 34.0 grams potassium dihydrogen phosphate (KH_2PO_4) to 500 mL deionized water and mix to dissolve. Adjust pH to 7.2 ± 0.5 with 1 *N* NaOH and bring volume to 1 liter, using a 1 liter volumetric flask. Transfer to a reagent bottle and autoclave for 15 minutes at 121°C. Let cool and refrigerate. Discard if turbidity is present.
- Stock Magnesium Chloride Solution - add 81.1 grams $MgCl_2 \cdot 6H_2O$ to 1 liter deionized water and mix to dissolve. Transfer to a reagent bottle and autoclave for 15 minutes at 121°C. Let cool and refrigerate. Discard if turbidity is present.
- Working Solution of Phosphate-Buffered Dilution/Rinse Water
  - Add 1.25 mL stock phosphate buffer solution and 5 mL stock magnesium chloride solution to 1 liter deionized water. Adjust pH to approximately 7.6-7.7 with 1 *N* NaOH. Mix and dispense approximately 9.5 mL into specially marked dilution test tubes. Autoclave at 121°C for 15 minutes. If phosphate-buffered rinse water is needed, autoclave 1-2 L volumes in large flasks for 45 minutes at 121°C.
  - Cool and check that buffered water level is at the marked line (9 mL) on the test tube. Aseptically adjust water level if necessary. Tightened test tube or flask caps and store at room temperature. Holding time for screw-capped media is

3 months. Final pH 7.2 ± 0.1.

- Sterility control - test the sterility of the buffered dilution water by aseptically pouring 2 test tubes of dilution water into a sterile bottle containing 100 mL of Tryptic Soy Broth. Test the sterility of the liter flasks of rinse water by aseptically adding 20 mL buffer to a sterile bottle containing 100 mL TSB. Incubate the bottle for 48 hours at 35.0 ± 0.5°C. Record pH and sterility check results in the media prep log book.

- Tryptic Soy Broth (TSB)
  - To rehydrate the medium, suspend 30 grams in 1 liter of deionized water and mix to dissolve completely. Dispense 100 mL of broth into 125 mL Nalgene bottles. Autoclave for 15 minutes at 121°C. Promptly remove from the autoclave when done. Let cool and then tighten caps. Final pH 7.3 ± 0.2. Record pH results in the media prep log book.
  - Set QA media controls.
    - Refer to QA/QC SOP
  - Place TSB bottles in the refrigerator until needed. The holding time for screw-capped media is three months.

- **Plate Labeling Procedure**
  - Clean and wipe the bench-top work area with 70% ethanol and let air dry.
  - Check the monthly sample calendar for the samples and duplicates scheduled for the day.
  - Check the QA results of the prepared agar plates to be used. These results are recorded in the media prep log book. Use only media that have passed the sterility, positive control, and negative control checks.
  - Record the media preparation dates for all the agar plates being labeled. The dates are recorded in the media prep log book under "Prep Date of Media in Use".
  - Inspect all agar plates.
    - Discard any plates that have bubbles that will interfere with bacterial growth when the membrane filter is placed on the agar surface.
    - Check plates for contamination of any kind (bacterial growth, mold, or strange color). Discard any contaminated plates into a biohazard bag.
  - Using an indelible marking pen or pre-printed labels, label each plate with the station name or location at the top of the petri dish, sample volume or dilution in the middle, and sample date at the bottom of the dish.
    - Consult the Sample Dilution Table for the necessary dilutions for each sample type.
    - mEndo and mFC agar plates are labeled on the bottom (agar side) of the petri dish.
    - mE agar plates are labeled on the top (lid side) and the bottom

(agar side) of the petri dish.

- Stack all the agar plates for the same station together after the plates are labeled. Stack plates by ascending volume order (smallest volume on top).
- When stacking, be sure to place all plates, agar side up.
- Place the stack of plates for each sample into a slot in one of the agar plate carriers.
- Add a small stack of unlabelled mEndo agar plates to the carrier. These plates will be used for QA blanks as needed during filtering.
- Label the cover of each plate carrier with the sample stations or locations for all plates in the carrier. Include duplicate stations on the label for all boat plate carriers.
- If plates are labeled one day in advance of use, refrigerate the plate carriers. Labeled plates that are refrigerated need to be taken out of the refrigerator on the day of use.
- If plates are labeled on the day of use, the plate carriers can be left out at room temperature until needed.

- **Filtration Procedure**
  - Clean and wipe the bench top work area with 70% ethanol and let air dry.
  - Gather the necessary filtration equipment.
  - Aseptically transfer sterile, phosphate-buffered rinse water into a sterile squirt bottle.
  - Select samples to be filtered. Select the proper agar plates for the samples and check the plate stacking order to make sure sample volumes are in ascending order.
  - Make 1:10 serial dilutions (if needed).
    - Shake the sample vigorously for several seconds (about 25 - 30 times) to break up any bacterial cell aggregates, to separate cells from particulate matter, and to make the sample homogenous.
    - Aseptically pipet 1 mL of the sample into a sterile 9 mL dilution test tube and shake or vortex vigorously. This is a 1:10 (10^{-1}) dilution of the sample.
    - Aseptically pipet 1 mL of the 10^{-1} dilution into a second 9 mL dilution tube and shake or vortex vigorously. This is a 1:100 (10^{-2}) dilution.
    - Aseptically pipet 1 mL from the second (10^{-2}) dilution tube into a third 9 mL dilution tube and shake or vortex vigorously. This is a 1:1000 (10^{-3}) dilution.
    - Continue making 1:10 serial dilutions as needed.
  - Fill the alcohol lamp with 95% ethanol and light it.
  - Prepare filtration equipment, one filtration unit per sample.
    - Wipe the Microfil support base with an alcohol pad. Let dry.
    - Remove filter screen disc from the 95% alcohol jar using the long-handled forceps. Gently shake the disc over the alcohol jar to remove any excess alcohol. Flame-sterilize the disc. Allow flame

to self-extinguish. Place disc onto the Microfil support base.
    - Squirt the disc with a small amount of sterile buffer to wash any residual alcohol off the disc. Apply vacuum to drain the buffer off the disc.
    - Aseptically remove a membrane filter from the filter dispenser, using an alcohol flame-sterilized forceps. Place the filter, grid-side-up on filter support base.
    - Aseptically remove a sterile, disposable Microfil funnel from the funnel dispenser.
    - Put the funnel over the filter on the support base. Place thumbs and index fingers of both hands on the upper, outside ridge of the funnel. Evenly push down on the funnel to securely lock it into place.
- Shake sample vigorously for several seconds (about 25 - 30 times) to break up any bacterial cell aggregates, to separate cells from particulate matter, and to make the sample homogenous. Place bottle at a slant to let any sand or debris in the sample settle to the bottom sides of the bottle.
- Record filtering start time and initials in the LIMS "Micro Log-in" Excel worksheet on the PC computer. Move the cursor to the appropriate cell for the sample being filtered.
    - If the starting time is the current time, press "CTRL+T".
    - Alternately, enter the time using a colon, ex. "10:25 or 14:00".
- Before filtering the sample, determine if a QA sterility blank needs to be done.
    - Refer to QA/QC SOP
- Wet the membrane filter with an adequate amount of sterile rinse water before adding sample aliquots delivered with a pipet. Add the sample aliquot to the filter according to the plate stacking order. Use a new filter for each sample aliquot.
- Use sterile pipets for sample volumes < 20 mL. If the pipet is to be used again, rest the pipet tip against the inner lip of the sample bottle. Do not let the pipet tip rest on the bottom of the sample bottle. Discard used pipets into the pipet biohazard container.
- For sample volumes of 50 mL or 100 mL, aseptically pour the sample to the measured lines on the Microfil funnel. If an excess amount of sample is poured into the funnel, use a sterile pipet to remove the excess. Discard the excess sample along with the pipet into the pipet biohazard container.
- Before applying the vacuum, swirl the sample in Microfil funnel by moving the funnel in a gentle circular motion to evenly distribute bacterial cells on the membrane filter surface.
- Apply vacuum, letting the sample drain through the filter.
- Thoroughly rinse down the walls of the funnel two times with a generous amount of sterile buffer water. This will wash down any bacteria that may adhere to the sides of the funnel.
- With one hand on the outside walls of the funnel, use a backwards and

upwards motion to pop the funnel off the support base. Continue to hold the funnel with your hand. Use your other hand to aseptically remove the filter with a flame-sterilized forceps (one sterile forceps per membrane filter). Aseptically replace the funnel back on the support base.

- Aseptically place the filter on the surface of the appropriate agar plate, using a rolling motion to avoid trapping air between the agar and the filter, which will result in the formation of bubbles. If any air is trapped under the filter, reset the membrane filter onto the agar surface. Place the used forceps into the jar of ethanol.
- Stack finished plates by sample and media type. Remember to always position finished plates agar (bottom) side up. This is to avoid any condensation dripping onto the surface of the filter during incubation, which may interfere with or distort bacterial growth.
- Continue filtering the sample, following the steps detailed above for each sample volume or dilution labeled on the stack of plates.
- If a duplicate sample is being filtered, the same pipets and dilution tubes (if needed) may be used for both the regular sample and the duplicate sample.
- When the sample is finished being filtered, place mEndo and mE agar plates in a covered incubation container (with moist sponges) according to media type. Total coliform mEndo agar plates are incubated for 23 ± 1 hour at 35.0 ± 0.5 °C. Fecal coliform mFC agar plates are incubated for 24 ± 2 hours at 44.5.0 ± 0.2 °C. It is important that fecal plates are incubated within 20 minutes of filtration to ensure heat-shock of the non-fecal bacteria. Plates are incubated in either the dry heat-sink incubators or sealed in water-proof bags and placed in the 44.5 ± 0.2°C water bath. Enterococcus mE agar plates are incubated for 48 ± 2 hours at 41.0 ± 0.5°C.
- Record filtration finish time, initials, and incubation time in the LIMS "Micro Log-in" Excel worksheet on the PC computer.
- The incubation containers should be labeled with the indicator bacteria, test date, and incubation time.
- Place used Microfil funnels in the biohazard bag for the funnels. Place sample bottles, empty buffer flasks, and used squirt bottles (if not being used for filtering more samples) in a tub for later washing.
- Wipe down the bench-top work area with 70% ethanol and let air dry.
- To filter another set of samples, wipe the Microfil support base and filter screen disc with a new alcohol pad. Rinse the disc with sterile rinse water. Repeat procedure as detailed in the above sections.
- When taking a long break between filtering samples, wipe the Microfil support base and filter screen disc with a new alcohol pad. Leave the alcohol pad on the screen disc. Place an alcohol-wiped cap over the Microfil unit. Before filtering again, remove the cap and re-wipe the Microfil unit and filter screen disc with the alcohol pad. Rinse the disc with sterile rinse water. Repeat procedure as detailed in the above sections.
- When all samples have been filtered, remove the filter screen disc from

the Microfil support base and put in the 95% alcohol jar. Wipe the Microfil support base with a new alcohol pad. Leave the alcohol pad in the empty disc space. Place an alcohol-wiped cap over the Microfil unit.

- **Colony Counting Procedure**
  - Check the LIMS "Micro Log-in" Excel worksheet for the incubation times of the plates that need to be read that day. Determine when the plates can be read according to their required incubation times.
  - Gather the necessary data worksheets for all samples to be read. Each test and sample type has separate data worksheets.
  - Record the time the plates are read and analyst initials in the LIMS "Micro Log-in" Excel worksheet and also on the data worksheets.
    - If the read time is the current time, press "CTRL+T".
    - Alternately, enter the time using a colon, ex. "10:25 or 14:00".
  - If desired, wear disposable gloves when handling and reading the plates.
  - Remove plates from the incubator when it is time to read them and arrange them in ascending volume order for each station.
  - Use the stereoscopic microscope with a fluorescent lamp to aid in identifying and counting colonies.
  - Starting with the control blank plate if one was done; examine the filter for bacterial contamination or any notable changes on the filter or agar media.
  - Examine and count all the plates set for a single sample, starting with the smallest sample volume filtered or the most dilute sample.
  - Colonies that have grown into each other should be counted individually. Separate nuclei or a fine line of contact may usually be seen.
  - Colonies in each and every filter grid square within the filtering area are to be counted.
  - To make counting easy and simple, start counting at the top of the filter. Count from left to right, following the grid lines, and continue to the bottom of the filter.
  - Countable ranges - Due to the possible adverse effect of colony crowding on sheen or color development on the filter membrane, and to be assured of a statistically valid colony count, minimum and maximum bacterial levels have been set for each of the indicator bacteria.
    - Total bacteria: <200 total colonies (background and indicator bacteria).
    - Total Coliform: 20 - 80 coliform colonies
    - Fecal Coliform: 20 - 60 fecal coliform colonies
    - Enterococcus: 20 - 60 enterococcus colonies
  - Colony Morphology
    - Total Coliforms
      - The typical colony has a pink to dark-red color with a shiny, greenish-gold, metallic surface sheen. The sheen may cover the entire colony, or it may appear only in the central area or on the periphery.
      - This sheen is produced as a by-product of lactose

fermentation (acid aldehyde complex) in combination with the Schiff's reagent (fuschin sulfite) in the mEndo media.

- Fecal Coliforms
  - Any colony exhibiting any light or dark blue color, whether covering the entire colony or only in or on part of the colony.
  - This blue color is a result of the acid produced by the fermentation of lactose combining with the aniline blue dye in the mFC media.
  - Colonies exhibiting a cream or grey color are not fecal coliforms.
- Enterococcus
  - After 48 ± 2 hours incubation, mE filters with growth on them are transferred to room temperature EIA plates.
  - Using forceps, remove the filter (handling the filter by its edge, outside of the filtration area) from the mE plate and roll it onto the agar surface of the EIA plate.
  - Replace the top of the EIA plate with the labeled top lid of the original mE plate.
  - Incubate the EIA plates for 20 minutes at 41.0 ± 0.5 C.
  - Enterococci are pink to carmine-red colonies with black or reddish-brown precipitate or halos on the underside of the filter when placed on EIA agar.
  - The colony color is due to the reduction of the vital indicator TTC (2,3,5-Triphenyl tetrazolium chloride) to non-reversible formazin. The dark precipitate or halo is the result of the hydrolysis of esculin.

- Record all colony counts and any other notable information on the data worksheet. Comments should include information about unusual conditions on the filter, such as the presence of solids, artifacts or high background counts. The condition of the growth on the filter should also be noted, such as confluent areas or confluent growth over the filter.
  - CG = confluent bacterial growth with indistinct or non-discrete colonies.
  - TNTC = Too Numerous To Count
  - >200 = greater than 200 background and indicator colonies on a filter.
- If there are any questions regarding counting colonies or any unusual or suspicious plates, save all plates for that sample and show them to a microbiologist.
- Dispose of all plates and gloves in a biohazard container. Autoclave at the end of the day.

- **Calculations**
  - Due to the possible adverse effect of colony crowding or color development on the filter membrane, and to be assured of a statistically valid colony count, minimum and maximum bacterial levels have been set

for each of the indicator bacteria.

- Total bacteria: <200 total colonies (background and indicator bacteria).
- Total Coliform: 20 - 80 coliform colonies
- Fecal Coliform: 20 - 60 fecal coliform colonies
- Enterococcus: 20 - 60 enterococcus colonies

o Indicator bacteria are expressed as bacterial density (CFU) per 100 mL of sample.

o The raw bacterial counts from the data worksheets are entered into LIMS "Sample Data Entry" Excel worksheets on the PC computer by a technician. The computer calculates the final bacterial densities for each sample and prints a copy of the data worksheet. See the LIMS Data Entry SOP for more details.

o The supervisor verifies the daily calculated bacterial densities. Daily bacterial density reports are printed out by the computer and E-mailed to the primary leads of the jurisdictional groups, who in turn will communicate this data to its jurisdictional members. The data reports are kept in a labeled notebook and the original data worksheets are kept in the data file cabinet. See the LIMS Data Validation SOP for more details.

o If the final bacterial densities need to be calculated by hand, the following guidelines should be used. All calculated values should have only 1 or 2 significant figures, depending on the colony counts.

- Countable Range (Std.Meth., EPA):

  Countable range number of colonies x 100 = (value) CFU/100 **mL filter volume**

Disregard non-countable range counts and volumes.

Volume	Count	
blank	0	
0.5	0	
5.0	6	$\frac{35}{20} \times 100$ = **180 CFU/100 mL**
20	35	
50	95	

- Two volumes in the countable range (EPA):

  Calculate each count independently as in 6.4.1. above and then average the results.

Volume	Count		
blank	0	$\frac{20}{20} \times 100 = 100$	$\frac{60}{50} \times 100 = 120$
0.5	0		

5.0	6	
20	20	100 + 120 = **110 CFU/100 mL**
50	60	2

- Counts less than the countable range (Std. Meth.):

  Add all colonies x 100 = (value) CFU/100 mL
  Total all volumes

Volume	Count	
blank	0	
0.5	0	
5.0	1	19 + 4 + 1 + 0 x 100 = **32 CFU/100 mL**
20	4	50 + 20 + 5 + 0.5
50	19	

- No counts on any filter volume (EPA):

  1 x 100 = < (value) CFU/100 mL
  Largest vol filtered

Volume	Count	
blank	0	
0.5	0	1 x 100 = **<2 CFU/100 mL**
5.0	0	50
20	0	
50	0	

- Counts greater than the countable range - too numerous to count (TNTC) or confluent growth (CG) (EPA):

Highest upper limit count x 100 = >(value) CFU/ 100 mL
Smallest vol filtered

Volume	Count	For Total Coliforms:
blank	0	80 x 100 = **>16,000 CFU/100 mL**
0.5*	TNTC or CG	0.5
5.0	TNTC or CG	For Fecal Coliforms or Enterococci:
20	TNTC or CG	60 x 100 = **>12,000 CFU/100 mL**
50	TNTC or CG	0.5

*NOTE: If the count at the lowest dilution is TNTC, try to estimate the count on the plate. Estimate the count in a quadrant if necessary. Use this number to calculate the count per 100 mL.

- Confluent Growth Counts (Std. Meth., EPA):

  Disregard all dilution volumes that are confluent growth.
  Analyze remaining counts and volumes.

Volume	Count
blank	0
0.5	0
5.0	CG
20	CG
50	CG

$\frac{1}{0.5} \times 100 =$ **<200 CFU/100 mL**

Volume	Count
blank	0
0.5	3
5.0	20
20	CG
50	CG

$\frac{20}{5.0} \times 100 =$ **400 CFU/100 mL**

- Total bacterial count (background bacteria plus indicator bacteria) greater than 200 colonies (Std. Meth.):

  Analyze counts and volumes. Report as a greater than value.

Volume	Count
blank	0
0.5	0 (>200)
5.0	0 (>200)
20	CG
50	CG

$\frac{1}{5} \times 100 =$ **>20 CFU/100 mL**

Volume	Count
blank	0
0.5	0
5.0	3
20	18 (>200)
50	60 (>200)

$\frac{60}{50} \times 100 =$ **>120 CFU/100 mL**

- Total colonies less than 200, but indicator bacteria greater than upper limit (Std. Meth.):

  If plate has well isolated, discrete colonies that can be easily counted, use the higher count.

Volume	Count
blank	0
0.5	85
5.0	TNTC
20	TNTC
50	TNTC

$\frac{85}{0.5} \times 100 =$ **17,000 CFU/100 mL**

Volume	Count
blank	0
0.5	2
5.0	95
20	TNTC
50	CG

$\frac{95}{5} \times 100 =$ **1,900 CFU/100 mL**

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APPENDIX H

Data Acquisition, Reduction, Validation, and Reporting Standard Operating Procedure (SOP)

When performing analyses, results are generally tabulated onto laboratory worksheets (see Appendix E, Field and Laboratory Worksheets) but sometimes are generated electronically via instrumentation. Data on laboratory worksheets are entered into the Laboratory Information Management System using an Excel interface. These data are then validated through a quality assurance process that checks for correctness of data entry and validity of results. The analyst who generates the data has the initial and primary responsibility for the completeness and correctness of the data. The data are then checked by the unit supervisor (or designee). The following procedures describe the data acquisition and entry process then the quality assurance and quality control procedures.

Data Acquisition

Both raw and calculated data are acquired in the laboratory by manual, electronic, or direct computer acquisition. Acquired data are properly and securely stored for the duration specified by regulatory agencies or the customer. Guidelines for documentation and recording of information are as follows:

- Manual (Hand-written) Data Entry
    - Data are entered directly into the notebook or worksheet with non-erasable ink.
    - Data entries are signed and dated by the analyst making the entry. If the entry is more than one page, each page is signed and dated.
    - Mistakes are canceled by drawing a line through the entry, entering the correct value, and signing and dating the correction. The use of correction fluid is not acceptable.
    - Blank pages or substantial portions of pages with no entries are marked with a large "X" to indicate that they were intentionally left blank.

- Direct Computer Acquisition
    - In EMD's Microbiology Unit, the program/software used to generate results is prepared internally. A designated staff member of the Information & Control System Division (ICSD) at Hyperion has the responsibility of preparing the program and maintaining the supporting documents.
    - The laboratory relies on vendor-supplied information for the validity and integrity of instruments equipped with significant computer functions as an integral part of the system.

Data Reduction

Data reduction, where applicable, is described in specific SOP's. It involves reporting values with the appropriate significant figures in the concentration units established by the regulatory agency or the data user.

Procedure for Entering Microbiology Data into LIMS

- Log-On to LIMS Computer System
  - To log onto the LIMS system, double-click on the "Data Entry" icon on the PC computer screen.
  - A Microsoft Excel dialog box will appear. Select the "Enable Macros" button.
  - Wait until the "Microbiology Laboratory Worksheet StartDialog" dialog box appears.

- Data Entry for CS
  - Enter the sample date in the dialog box. Please note that current date is filled in by default.
  - Select the sample type. There is a list of sample locations to choose from. (E.g. 5-Mile, Ballona Creek, Cabrillo Beach, LAH Plume, SMB Plume Day1, Shoreline, Inshore, and so on.)
  - Dilutions for the CS method are not modified for rain events. For this method always make sure the "No" button is selected.
  - Select the "OK" button.
  - A computer form similar to the raw data worksheet will appear. Select the Excel worksheet tab for the type of test data to be entered. (ex. Total, *E. coli*, or Total & *E. coli*)
  - Enter analyst initials, date, and time into the computer in the designated cells.
  - Check to make sure the sample volumes or dilutions in the computer match the volumes or dilutions on the raw data worksheet. In the case of Ballona Creek, make changes to the volumes on the computer form, if necessary.
  - Enter the number of large and small positive wells.
  - Check to make sure all data has been entered correctly. If a calculated value does not appear for a sample, notify a microbiologist or the supervisor.
  - At the top of the computer worksheet, select the "Send Data to LIMS/Wisard" button.
  - Select the "Print" button at the top of the computer worksheet. A printed hardcopy of the raw data worksheet will print out on the printer in the micro lab.
  - Select the "New Worksheet" button at the top of the computer screen if entering data for another sample location. Select the "Save/Exit" button if all the data entry has been done.
  - If there are any problems or error messages regarding sending the data to LIMS, please contact LIMS staff at 55749 or 55120.

- Data Entry for MF
  - Enter the sample date in the dialog box. Please note that current date is filled in by default.
  - Select the sample type. There is a list of sample locations to choose from. (E.g. 5-Mile, Ballona Creek, Cabrillo Beach, LAH Plume, SMB Plume Day1, Shoreline, Inshore, and so on.)
  - If rain dilutions were used on the data worksheet, select "Yes" in the small "Rain" box. If normal dilutions were used, make sure the "No" button is selected.
  - Select the "OK" button.
  - A computer form similar to the raw data worksheet will appear. Select the Excel worksheet tab for the type of test data to be entered. (ex. Total, Fecal, Entero, or Total & Fecal)
  - Enter analyst initials, date, and time into the computer in the designated cells.
  - Check to make sure the sample volumes or dilutions in the computer match the volumes or dilutions on the raw data worksheet. In the case of Ballona Creek, make changes to the volumes on the computer form, if necessary.
  - Enter the bacterial colony counts.
  - Check to make sure all data has been entered correctly. If a calculated value does not appear for a sample, notify a microbiologist or the supervisor.
  - At the top of the computer worksheet, select the "Send Data to LIMS/Wisard" button.
  - Select the "Print" button at the top of the computer worksheet. A printed hardcopy of the raw data worksheet will print out on the printer in the micro lab.
  - Select the "New Worksheet" button at the top of the computer screen if entering data for another sample location. Select the "Save/Exit" button if all the data entry has been done.
  - If there are any problems or error messages regarding sending the data to LIMS, please contact LIMS staff at 55749 or 55120.

Review and Validation

Review

Data review is the process of comparing results to all available information, such as sample preparation and QC sample data, to evaluate the validity of the results. It supports the contention that the data are:

- Reasonable (experience with similar situations, common sense), and
- Capable of supporting a defensible decision.

The analyst and the unit supervisor (or designee) are responsible for reviewing the data relative to the following:

- Method blanks and QC sample
- Raw data
- Calculations
- Transcription

Validation

Data validation is the systematic procedure of reviewing data against a set of criteria to provide assurance of its validity before reporting the data. It is accomplished through routine examination of data collection, flow procedures, and QC sample results. It uses QC criteria to reject or accept specific data

- Validation includes the following:

    - Dated and signed entries by analysts on the worksheets and logbooks used for all samples.
    - Use of QC criteria to reject or accept specific data.
    - Checking of LIMS data entry and reporting

Validation Guidelines include the following:

    - Documentation of methods used and QC applied.
    - Maintenance performed on instruments.
    - Documentation of sample preservation, transport, and storage.
    - Review of QC sample data.

Data validation is performed, signed, and dated by the analyst, the unit supervisor (or designee), and where applicable, the laboratory manager.

Reporting

Data prepared for release to the Legal Reporting Unit are checked and approved by the unit supervisor (or designee) by the 5th of the following month for the previous month's data. The final report is prepared by the Legal Reporting Unit of EMD. The report is again scanned for missing data and outliers. Regulatory limitation calculations will be applied to the data set and exceedances clearly listed. If stations are out-of-compliance, accelerated monitoring will be indicated. Any regulatory required summary reports of source identification findings or sanitary surveys will be included. The report is signed by the Division Manager before distribution and may include the following:

- Sample ID used by the laboratory and the client (if available).
- Sample matrix type, description, and method number.
- The chemical/physical/biological parameters analyzed with the reported values and units of measurement.
- Data for all parameters reported with consistent number of significant figures.
- Results of QC samples, if appropriate.

- Footnotes referenced to specific data, if required, to explain reported values.
- If there are regulatory limits applicable to specific analyses, then limits are clearly notated and exceedances listed.
- Discussion on non-compliance data
- Report transmittal letter or memorandum identifying the person sending the report and the person(s) receiving the data.

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APPENDIX I

Quality Assurance/Quality Control (QA/QC)

The quality assurance objectives for measurement of data are unique to the particular program for which the data are collected and utilized. They describe the overall uncertainty that the data user is willing to accept in order to make decisions for environmental or other concerns. This uncertainty describes the data quality that is needed, which are usually expressed in terms of precision, bias, representativeness, comparability, and completeness.

The participating laboratories will use approved and recognized test methods, and comply with uncertainty requirements of the method. Quality control samples are measured and uncertainties are assessed and results must be within the range prescribed by the methods. Internal acceptance criteria are established by analyzing laboratory control samples on a daily basis. The participating laboratories will strive to meet the QA/QC goals described in this section and, therefore, be able to attest to the integrity of the sampling and analytical process.

The following QA/QC procedures will be conducted for sample collection, laboratory analyses, and data management to ensure the production of reliable and defensible data for Ballona Creek, estuary and tributaries.

Sample Collection

Only trained laboratory staff will be assigned to collect samples using proper sampling procedures, appropriate sampling equipment, required containers, and proper preservation techniques.

General guidelines for sample collection by laboratory staff are as follows:

- Assure sterility check on sample bottles and avoid contamination.
- Label sample containers with sample date, sample time, sampling point, sample type (grab/composite), preservatives added (if needed), the name of the sampler, and analyses needed.
- Use aseptic technique when collecting samples to prevent contamination (e.g. the inner surfaces or lip edges of the bottle or cap are not to be touched).
- Avoid collecting sample in multiple sweeps and no refilling of the sample bottle.
- Once the sample is collected, immerse at least one-third of the sample bottle in ice.
- Do not exceed maximum allowable transport time (time of sample collection to sample analysis) of 6 hours.
- Once received, log the samples into the laboratory system as soon as possible, assigned a unique login number, and properly stored.
- Sample preparation steps done prior to analysis, such as sample preservation are described in individual test SOP's.

Sample Handling

Chain-of-Custody

The purpose of the chain-of-custody is to establish detailed written and legal documentation of all transactions in which samples are transferred from the custody of one individual to another. The custody procedure is also used whenever samples are submitted to a laboratory within the division or to a contract laboratory. The chain-of-custody begins at the sample collection site and includes couriers or messengers who handle the sample in transit. It follows the sample in the laboratory until its ultimate disposal. It is a form of proof used to establish the authenticity and integrity of the sample, since the results will be used to show compliance with the TMDL requirements, i.e., numeric targets and waste load allocations.

A Chain-of-Custody (COC) must accompany each sample submitted to a participating laboratory. If a COC has not been filled out prior to delivery of the sample, a form will be provided to the delivery person prior to acceptance of said sample. The COC will be reviewed to make sure that all of the needed information has been supplied. As an example, the Chain-of-Custody Form being used at EMD is attached (Appendix E).

Samples that are collected by EMD's Microbiology Unit staff for bacteriological testing are delivered directly to the microbiology laboratory. A COC sheet is not required since technically there is no sample exchange, i.e., the sample collection staff and the analytical staff are one and the same.

Sample Holding & Preservation

Samples must meet EPA holding time requirements for each testing parameter. The sample refrigeration and holding time of six hours until analyses are performed are crucial for microbiological testing. Microbiological samples must be handled and stored under contamination free environments.

After the sample is received, the participating laboratory will enter the sample information into the Laboratory Information Management System (LIMS) or comparable database and a unique laboratory registration number will be generated for that sample.

Sample Disposal

After the analyses are completed, the sample will be retained as legal evidence or legally disposed of as determined by the microbiological analysis of the sample. Analyzed samples and standards used in analyses are disposed of in accordance with the laboratories written procedures, e.g., EMD's Chemical Hygiene Plan.

Analytical Procedures
Analyses

Analyses performed at EMD laboratories are generally driven by regulatory concerns and plant operations' requirements. There are many different analytical methods applicable to environmental analyses. EMD's methods are generally based on those specified by EPA, Federal and State regulatory agencies, or professional organizations. As a guide, references for the microbiological procedures are listed below.

"Standard Methods for the Examination of Water and Wastewater", 18th – 20thedition, 1992, 1998 respectively, APHA, AWWA, WPCF, Washington, DC.

"Microbiological Methods for Monitoring the Environment, Water, and Wastes", EPA-600/8-78-017.

Standard Operating Procedures (SOPs)

Routine analyses are defined in Standard Operating Procedures (SOPs), which are detailed descriptions of how to use and what to expect from a method. They contain method-specific QC criteria (i.e., instrument calibration, reagent blank, method blank, calibration standards, etc.), and QC requirements such as duplicate analysis, spike recoveries, holding time, etc. EMD follows a standardized SOP format, its content and application is presented in Appendix H of this document.

Microbiological Analyses

The following methods and target organisms are used in analysis of samples for Ballona Creek,estuary and tributaries:

- Membrane Filtration
  - Fecal coliform
- Chromogenic Substrate
  - Total coliform
  - *E. coli*
  - *Enterococcus*

For the BCB TMDL Monitoring Program, all methods used will be EPA, Regional Board, or Standard Methods for the Examination of Water and Wastewater (APHA, 18th-20th 1992, 1998, respectively) approved methods

The following QA/QC checklist is applicable for the chromogenic substrate and membrane filtration methods.

Chromogenic Substrate

- QC Checks on Idexx Reagent
    - Colilert-18 and Enterolert –sterility check performed with each use; autofluorescence, positive and negative controls; performed on each new lot of reagent
    - Monthly QC verification of at least 10 positive wells/target organism

- Quanti-trays:
    - Leak test performed on each new lot of trays

- DI Water
    - Sterility check performed with each autoclaved batch
    - Heterotrophic plate count performed monthly
    - Amm-N, Org-N, and TOC performed monthly
    - Heavy metals, total and single, performed annually
    - Total chlorine performed with each new batch
    - Water suitability test performed with change of E-Pure system filters or water source

- Equipment and Laboratory Environment:
    - Incubator temperatures checked twice daily (morning and late afternoon)
    - Refrigerator temperatures checked twice daily (morning and late afternoon)
    - Thermometers calibrated semiannually
    - Autoclaves calibrated semiannually; preventative maintenance performed quarterly
    - Air and Rodac testing for laboratory air and surface environments performed monthly.
    - Balances calibrated semiannually; weight check with each use
    - PH meters- calibrated semiannually; standardized with each use
    - Quanti-tray sealers checked and cleaned weekly

- Personnel QA checks
    - Reagent blanks
    - Sample duplicates (done on 10% of the samples per month)
    - Standard sample analysis and comparison count performed monthly

Membrane Filtration

- QC Checks on Media (mEndo, mFC, mE, EIA; phosphate buffered water):

    - mEndo, mFC, mE, EIA: pH, sterility check, and positive and negative controls with each new batch
    - Phosphate buffered water: pH and sterility check with each new batch
    - Monthly QC verification of at least 10 positive colonies/target organism

- Equipment and Laboratory Environment:
    - Incubator temperatures checked twice daily (morning and late afternoon)
    - Refrigerator temperatures checked twice daily (morning and late afternoon)
    - Thermometers calibrated semi-annually
    - Autoclaves calibrated semi-annually; preventative maintenance performed quarterly
    - Air and Rodac testing for laboratory air and surface environments performed monthly.
    - Balances calibrated semi-annually; weight check with each use
    - PH meters- calibrated semi-annually; standardized with each use
    - Residue on glass- performed annually for glassware and petri dishes
    - Water suitability test performed with change of E-Pure system filters or water source

- Personnel QA checks (performed by all technical lab staff)
    - Reagents blanks
    - Sample duplicates (done on 10% of the samples per month)
    - Standard sample analysis and comparison count performed monthly for MF analysis

System and Performance Audits

An audit is a periodic check to ensure that the laboratory operates according to the policies and procedures described in the Quality Assurance Manual, complies with good laboratory practices, and meets the requirements of regulatory agencies. It may be either a system or performance audit.

<u>System Audit</u>

A system audit is a review of laboratory operations conducted to verify that the laboratory has the necessary facilities, equipment, staff, and procedures in place to generate acceptable data. It is an on-site inspection of the laboratory's system of operations. It may be an internal or external audit. Internal inspections may be performed by quality assurance personnel. External audits are generally laboratory certification-related activities.

1. Internal

Periodically, the QA Officer (or designee) audits the laboratories and reports the results to the Division Manager (or laboratory director), laboratory managers, and unit supervisors.

2. External

State-certified laboratories are site visited every two years by auditors from the Environmental Laboratory Accreditation Program (ELAP) of the California Department of Health Services (CA DOHS). Accreditation is by scientific discipline or field of testing. Non-compliances with good laboratory practices are identified and reported as deficiencies and are subject to corrective action before accreditation is renewed.

Performance Audit

A performance audit is a review to evaluate the laboratory's analytical activities as well as the data produced by analysts. It verifies the ability of the laboratory to correctly identify and quantify compounds in unknown samples submitted by the auditing entity. The purpose of these audits is to determine the laboratory's capability to generate scientifically sound data.

1. Internal

Periodically, the QA staff submits unknown samples to most of the laboratories. These samples are usually from the inventory of previous Performance Evaluation (PE) samples from EPA. Analysis of these samples is also a corrective action requirement for Discharge Monitoring Report (DMR) and/or Water Pollution (WP) samples evaluated with "unacceptable results". The QA staff may also conduct intra- and inter-comparison studies.

2. External

All laboratory units, including the Microbiology laboratory, at EMD participate in mandatory QA Performance Evaluation (PE) Study Programs.

a. Mandatory PE Programs

* Water Pollution QA Study Program (WP) serves a dual purpose. It satisfies EPA's wastewater testing laboratory requirements and meets one of ELAP's laboratory certification criteria. Test samples are analyzed for parameters listed under each field of testing on our certifications and are specified in the WP Program following certified procedures. A laboratory can participate in a WP Study twice a year.

* For the Microbiology Performance Evaluation (PE) Study, Drinking Water/Wastewater Enumeration is required for ELAP certification. Like all the other PE programs, the samples are acquired from NIST-approved vendors and analyses are done for certified analytes.

b. Voluntary PE Program

The Microbiology Unit also takes part in the inter-laboratory calibration studies with EPA. These programs are performance based.

Assessment of Precision and Accuracy

Data quality may be assessed in terms of precision, accuracy, representativeness, completeness, and comparability. The latter three are usually determined outside of the laboratory operations and with limited involvement of laboratory staff. These measures are not included in this section. The internal quality control measures (i.e., precision and accuracy) that are performed in the laboratory to evaluate data quality are described in this section.

Precision

Precision is the agreement among a set of replicate measurements without knowledge of the true value. It is the degree to which a measurement is reproducible. Precision, expressed as Relative Percent Difference (RPD), is determined for each laboratory unit by analyzing replicates of the same sample, a number of duplicate pairs, or matrix-spiked duplicate samples.

Accuracy

Accuracy is a measurement of how close the result is to the true value. Each laboratory unit establishes its accuracy of measurement by analyzing QC check samples (spiked samples, standard reference materials from a reliable source, etc). The results of the QC samples are correlated to documented, certified values. Results of spiked samples are calculated as Percent Recovery. Actual Percent Recovery is compared to established reference data. The degree of closeness of the QC check sample contributes to the general assurance that the accuracy of the data is within acceptable limits.

Corrective Action

Laboratory events and data that fall outside established quality acceptance criteria may require investigation or corrective action. The corrective action implemented depends on the type of analysis, the extent of the error, and whether the error can be determined and

corrected. The purpose of the corrective action is to resolve the problem and to restore the system to proper operation. Investigative steps and corrective actions implemented are documented.

Corrective Action Procedures

1. The initial corrective action procedures may be handled at the bench level. The unit supervisor is immediately notified of the deviation. The analyst reviews the sample preparation for possible errors and checks the instrument calibration, calibration and spike solutions, instrument sensitivity, etc.

2. If the error cannot be resolved by the analyst, the unit supervisor has the responsibility of resolving the problem with assistance, if needed, from the laboratory manager and/or the QA Officer.

3. The corrective action adopted may be determined by the analyst, the unit supervisor, the laboratory manager, the QA Officer, or through a consensus. If needed, the final decision for corrective action rests with the laboratory manager after consultation with the QA Officer.

4. The unit supervisor shall maintain an accurate and up-to-date record of corrective actions taken in the unit. A corrective action report form (included herein as an attachment) is available for use.

5. The laboratory manager shall periodically review corrective action records and plan for system improvement by involving analysts, unit supervisors, and QA personnel.

General Guidelines for Initiating a Corrective Action

1. Identify/define the problem.
2. Assign responsibility for investigating the problem.
3. Investigate and determine the causes.
4. Develop corrective action to eliminate the problem.
5. Measure the effectiveness of the corrective action.
6. Analyst, unit supervisor, laboratory manager, and the QA Officer meet to review and evaluate the process, if necessary.
7. Document the process by filling out the Corrective Action Report Form.

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APPENDIX J

Data Format and Archive

Data format. List of fields, type of data, whether it is required, and description of data format to be used for submission for archival.

Field Name	*Type*	*Required*	*Description*
Agency	Text	Y	A unique code used by the submitting agency (luAgency)
Account	Text	Y	Place-holder code to contain "TMDL".
Program	Text	Y	Place-holder code to contain "BC TMDL".
StationID	Text	Y	The station name from the list of stations provided in lookup list (luStations).
AgencySampleID	Text	N	The laboratory internal sample identifier
SampleDate	Date/Time	Y	The date the sample was analyzed (must be the same date as when the sample was taken) expressed as dd-mmm-yyyy
SampleTime	Number	Y	The time the sample was collected expressed as hh:mm
SamplerID	Text	Y	Name of person collecting sample
AnalysisDate	Date/Time	Y	The date the sample was analyzed (must be the same date as when the sample was taken) expressed as dd-mmm-yyyy
AnalysisTime	Number	Y	The time the testing was started expressed as hh:mm
AnalystID	Text	Y	Name of person analyzing sample
ParameterCode	Text	Y	What type of bacteria are being tested
Qualifier	Text	N	Qualifier for the result
Result	Number	Y	The numerical results of the test
ResultUnits	Text	Y	The units for the results
TextValue	Text	Y	Explanation for sample not analyzed, default None, luAnalyticalFailure
Dilution	Number	Y	The dilution factor associated with the result.
LabRep	Text	Y	The count of the lab replicate.
AnalysisMethod	Text	Y	The Method used to do the analysis
Comments	Text	N	Additional comments

luAgencyCode	
Agency Code	**Agency Description**
CLA EMD	City of Los Angeles, Environmental Monitoring Division
DHS	Department of Health Services
LACSD	Los Angeles County Sanitation Districts

luStations	
Station Name	**DESCRIPTION**

luAnalyticalFailure	
None	No analytical failure, default value
AE	Analyst error
NA	Station not accessible, no sample taken
NS	No sample
NT	Sample not tested

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APPENDIX K

State of California
California Regional Water Quality Control Board, Los Angeles Region

RESOLUTION NO. 2006-011
June 8, 2006

Amendment to the Water Quality Control Plan for the Los Angeles Region to Incorporate a Total Maximum Daily Load for Bacteria in Ballona Creek, Ballona Estuary and Sepulveda Channel.

WHEREAS, the California Regional Water Quality Control Board, Los Angeles Region, finds that:

1. The Federal Clean Water Act (CWA) requires the California Regional Water Quality Control Board (Regional Board) to develop water quality objectives which are sufficient to protect beneficial uses for each water body found within its region.

2. A consent decree between the U.S. Environmental Protection Agency (USEPA), Heal the Bay, Inc. and BayKeeper, Inc. was approved on March 22, 1999. This court order directs the USEPA to complete Total Maximum Daily Loads (TMDLs) for all impaired waters within 13 years. A schedule was established in the consent decree for the completion of the first 29 TMDLs within 7 years. The remaining TMDLs will be scheduled by Regional Board staff within the 13-year period.

3. The elements of a TMDL are described in 40 CFR 130.2 and 130.7 and section 303(d) of the CWA, as well as in USEPA guidance documents (Report No. EPA/440/4-91/001). A TMDL is defined as the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background (40 CFR 130.2). Regulations further stipulate that TMDLs must be set at levels necessary to attain and maintain the applicable narrative and numeric water quality standards with seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality (40 CFR 130.7(c)(1)). The regulations in 40 CFR 130.7 also state that TMDLs shall take into account critical conditions for stream flow, loading and water quality parameters.

4. The numeric targets in this TMDL are not water quality objectives and do not create new bases for enforcement against dischargers apart from the water quality objectives they translate. The targets merely establish the bases through which load allocations (LAs) and waste load allocations (WLAs) are calculated. WLAs are only enforced for a discharger's own discharges, and then only in the context of it National Pollutant Discharge Elimination System (NPDES) permit, which must be consistent with the assumptions and requirements of the WLA. The Regional Board will develop permit requirements through a subsequent permit action that will allow all interested persons, including but not limited to municipal

storm water dischargers, to provide comments on how the WLA will be translated into permit requirements.

5. Upon establishment of TMDLs by the State or USEPA, the State is required to incorporate the TMDLs along with appropriate implementation measures into the State Water Quality Management Plan (40 CFR 130.6(c)(1), 130.7). This Water Quality Control Plan for the Los Angeles Region (Basin Plan), and applicable statewide plans, serve as the State Water Quality Management Plans governing the watersheds under the jurisdiction of the Regional Board.

6. As envisioned by Water Code section 13242, the TMDL contains a "description of surveillance to be undertaken to determine compliance with objectives." The Compliance Monitoring and Special Studies elements of the TMDL recognize that monitoring will be necessary to assess the on-going condition of the Ballona Creek, Estuary, and their tributaries and to assess the on-going effectiveness of efforts by dischargers to reduce bacteria loading to these waterbodies. Special studies may also be appropriate to provide further information about new data, new or alternative sources, and revised scientific assumptions. The TMDL does not establish the requirements for these monitoring programs or reports, although it does recognize the type of information that will be necessary to secure. The Regional Board's Executive Officer will issue orders to appropriate entities to develop and to submit monitoring programs and technical reports. The Executive Officer will determine the scope of these programs and reports, taking into account any legal requirements, and issue the orders to the appropriate entities.

7. Ballona Creek flows as an open channel for just under 10 miles from Los Angeles (South of Hancock Park) through Culver City, reaching the Pacific Ocean at Playa del Rey. It is entirely lined in concrete and is fed by a complex underground network of storm drains, which reaches north to Beverly Hills and West Hollywood. Tributaries of the creek include Centinela Creek, Sepulveda Canyon Channel, Benedict Canyon Channel, and numerous other storm drains. The creek meets Ballona Estuary, at Centinela Avenue, where concrete is replaced by grouted riprap side slopes and an earthen bottom. Ballona estuary flows into the Santa Monica Bay, and its water quality affects the adjacent shoreline of Dockweiler Beach.

8. The Regional Board's goal in establishing the Ballona Creek, Ballona Estuary, and Sepulveda Channel TMDL is to reduce the risk of illness associated with recreating in waters contaminated with human sewage and other sources of bacteria. Local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects, such as gastroenteritis, and recreational water quality, as measured by bacteria indicator densities.

9. The Regional Board recognizes that there are two broad approaches to implementing the TMDL. One approach is an integrated water resources approach. An integrated water resources approach has been previously defined by the Regional Board in the Santa Monica Bay Beaches Bacteria Wet Weather TMDL (Regional Board Resolution No. 2002-022 and attachments). For clarification, the Regional Board considers natural treatment systems (e.g. grassy swales, wetlands, vegetated buffers) to be consistent with an integrated water resources approach.

10. Regional Board staff have prepared a detailed technical document that analyzes and describes the specific necessity and rationale for the development of this TMDL. The technical

document entitled "Total Maximum Daily Loads for Bacterial Indicator Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel" is an integral part of this Regional Board action and was reviewed, considered, and accepted by the Regional Board before acting. Further, the technical document provides the detailed factual basis and analysis supporting the problem statement, numeric targets (interpretation of the numeric water quality objective, used to calculate the load allocations), source analysis, linkage analysis, waste load allocations (for point sources), load allocation (for nonpoint sources), margin of safety, and seasonal variations and critical conditions of this TMDL.

11. On June 8, 2006, prior to the Board's action on this resolution, public hearings were conducted on the "Total Maximum Daily Loads for Bacterial Indicator Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel". Notice of the hearing for the "Total Maximum Daily Loads for Bacteria Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel" was published in accordance with the requirements of Water Code section 13244. This notice was published in the Los Angeles Times on April 3, 2006.

12. The public has had reasonable opportunity to participate in review of the amendment to the Basin Plan. A draft of the TMDL for bacteria densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel was released for public comment on April 3, 2006; a Notice of Hearing and Notice of Filing were published and circulated 45 days preceding Board action; Regional Board staff responded to oral and written comments received from the public; and the Regional Board held a public hearing on June 8, 2006 to consider adoption of the TMDL. In addition, input from participants in the stakeholder group "Cleaner Rivers through Effective Stakeholder TMDLs" (CREST) was solicited in developing potential implementation options to achieve compliance with the waste load allocations, and in estimating associated costs of selected strategies. CREST is a stakeholder effort initiated by the City of Los Angeles geared towards collaborative TMDL development in the Los Angeles River and Ballona Creek watersheds.

13. In amending the Basin Plan, the Regional Board considered the factors set forth in sections 13240 and 13242 of the Water Code.

14. The amendment is consistent with the State Antidegradation Policy (State Board Resolution No. 68-16), in that the changes to water quality objectives (i) consider maximum benefits to the people of the state, (ii) will not unreasonably affect present and anticipated beneficial use of waters, and (iii) will not result in water quality less than that prescribed in policies. Likewise, the amendment is consistent with the federal Antidegradation Policy (40 CFR 131.12).

15. Pursuant to Public Resources Code section 21080.5, the Resources Agency has approved the Regional Water Boards' basin planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act (CEQA) (Public Resources Code, Section 21000 et seq) requirements for preparing environmental documents. (14 Cal. Code Regs. § 15251(g); 23 Cal. Code Regs. § 3782.) As such, the Regional Water Board's basin planning documents together with an Environmental Checklist, are the "substitute documents" that contain the required environmental documentation under CEQA. (23 Cal Code Regs. § 3777.) The detailed technical report entitled "Total Maximum Daily Load for Bacteria Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel," responses prepared by staff to address comments raised during the development of the TMDL, this resolution, and the Environmental Checklist serve as the substitute documents for this project. The project itself is the establishment of a TMDL for bacteria in Ballona Creek, Ballona

Estuary, and Sepulveda Channel. While the Regional Board has no discretion to not establish a TMDL (the TMDL is required by federal law) or for determining the water quality standard to be applied (the Basin Plan establishes the numeric water quality objectives that must be implemented), the Board does exercise discretion in assigning waste load allocations and load allocations, determining the program of implementation, and setting various milestones in achieving the numeric water quality standards established in the Basin Plan.

16. A CEQA Scoping hearing was conducted on June 12, 2003 at the Los Angeles Regional Water Quality Control Board, 320 W. 4th Street, Los Angeles, CA 90013. A notice of the CEQA Scoping hearing was sent to interested parties including cities and/or counties with jurisdiction in or bordering the Ballona Creek watershed.

17. The lengthy implementation period allowed by the TMDL, will allow many compliance approaches to be pursued. In preparing the accompanying CEQA substitute documents, the Regional Board has considered the requirements of Public Resources Code section 21159 and California Code of Regulations, title 14, section 15187, and intends the substitute documents to serve as a tier 1 environmental review. Nearly all of the compliance obligations will be undertaken by public agencies that will have their own obligations under CEQA. Project level impacts will need to be considered in any subsequent environmental analysis performed by other public agencies, pursuant to Public Resources Code section 21159.2. If not properly mitigated at the project level, there could be adverse environmental impacts. The substitute documents for this TMDL., and in particular the Environmental Checklist and staff's responses to comments, identify broad mitigation approaches that should be considered at the project level. Consistent with CEQA, the substitute documents do not engage in speculation or conjecture and only consider the reasonably foreseeable environmental impacts of the methods of compliance, the reasonably foreseeable feasible mitigation measures, and the reasonably foreseeable alternative means of compliance, which would avoid or eliminate the identified impacts.

18. The proposed amendment could have a significant adverse effect on the environment. However, there are feasible alternatives, feasible mitigation measures, or both that would substantially lessen any significant adverse impact. The public agencies responsible for those parts of the project can and should incorporate such alternatives and mitigation into any subsequent projects or project approvals. Possible alternatives and mitigation are described in the CEQA substitute documents, specifically the TMDL technical report and the Environmental Checklist. To the extent the alternatives, mitigation measures, or both are not deemed feasible by those agencies, the necessity of implementing the federally required bacteria TMDL and reducing the elevated bacteria densities from Ballona Creek, Ballona Estuary, and Sepulveda Channel (an action required to achieve the express, national policy of the Clean Water Act) outweigh the unavoidable adverse environmental effects.

19. The regulatory action meets the "Necessity" standard of the Administrative Procedures Act, Government Code, Section 11353, Subdivision (b). As specified above, federal regulations require that TMDLs be incorporated into the water quality management plan. The Regional Board's Basin Plan is the Regional Board's component of the water quality management plan, and the Basin Plan is how the Regional Board takes quasi-legislative, planning actions. Moreover, the TMDL is a program of implementation for existing water quality objectives, and is, therefore, appropriately a component of the Basin Plan under Water Code section 13242. The necessity of developing a TMDL is established in the TMDL staff report, the section 303(d) list, and the data contained in the administrative record documenting the bacteria impairments of the Ballona Creek, Ballona Estuary, and Sepulveda Channel.

20. The Basin Plan amendment incorporating a TMDL for Bacteria Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel must be submitted for review and approval by the State Water Resources Control Board (State Board), the State Office of Administrative Law (OAL), and the USEPA. The Basin Plan amendment will become effective upon approval by OAL and USEPA. A Notice of Decision will be filed.

21. If during its approval process Regional Board staff, the SWRCB or OAL determines that minor, non-substantive corrections to the language of the amendment are needed for clarity or consistency, the Executive Officer may make such changes, and shall inform the Board of any such changes.

THEREFORE, be it resolved that pursuant to sections 13240 and 13242 of the Water Code, the Regional Board hereby amends the Basin Plan as follows:

1. Pursuant to sections 13240 and 13242 of the California Water Code, the Regional Board, after considering the entire record, including oral testimony at the hearing, hereby adopts the amendments to Chapters 3 and 7 of the Water Quality Control Plan for the Los Angeles Region, as set forth in Attachment A hereto, to incorporate the elements of the bacteria TMDL for Ballona Creek, Ballona Estuary, and Sepulveda Channel.

2. The Executive Officer is directed to forward copies of the Basin Plan amendment to the State Board in accordance with the requirements of section 13245 of the California Water Code.

3. The Regional Board requests that the State Board approve the Basin Plan amendment in accordance with the requirements of sections 13245 and 13246 of the California Water Code and forward it to OAL and the USEPA.

4. If during its approval process the State Board or OAL determines that minor, non-substantive corrections to the language of the amendment are needed for clarity or consistency, the Executive Officer may make such changes, and shall inform the Board of any such changes.

5. The Executive Officer is authorized to sign a Certificate of Fee Exemption.

I, Jonathan S. Bishop, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a resolution adopted by the California Regional Water Quality Control Board, Los Angeles Region, on June 8, 2006.

Chief Deputy for

Jonathan S. Bishop
Executive Officer

As adopted on June 8, 2006

Attachment A to Resolution No. 06-011

Amendment to the Water Quality Control Plan – Los Angeles Region to incorporate the TMDL for Bacterial Indicator Densities in Ballona Creek, Ballona Estuary, and Sepulveda Channel.

Adopted by the California Regional Water Quality Control Board, Los Angeles Region on June 8, 2006.

Amendments:

Table of Contents
Add:

Chapter 7. Total Maximum Daily Loads (TMDLs) Summaries
7-21 Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL

List of Figures, Tables and Inserts
Add:

Chapter 7. Total Maximum Daily Loads (TMDLs)
Tables
7-21 Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL
7-21.1. Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: Elements
7-21.2a. Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL; Final Allowable Exceedance Days by Reach
7.21.2b. Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: WLAs and LAs for tributaries to the Impaired Reaches.
7-21.3. Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: Significant Dates

Chapter 7. Total Maximum Daily Loads (TMDLs) Summaries, Section 7-21 (Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL)

This TMDL was adopted by the Regional Water Quality Control Board on June 8, 2006.

This TMDL was approved by:

The State Water Resources Control Board on [Insert Date].
The Office of Administrative Law on [Insert Date].
The U.S. Environmental Protection Agency on [Insert Date].

The following table includes all the elements of this TMDL.

Table 7-21.1. Ballona Creek, Estuary, and Tributaries s Bacteria TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Elevated bacterial indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use designated for Ballona Estuary and Sepulveda Channel, limited water contact recreation (LREC) designated for Ballona Creek Reach 2, and non-contact recreation (REC-2) beneficial uses of Ballona Creek Reach 1. Recreating in waters with elevated bacterial indicator densities has long been associated with adverse human health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities.
Numeric Target *(Interpretation of the numeric water quality objective, used to calculate the waste load allocations)*	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine and fresh water to protect the contact and non-contact recreation uses. These targets are the most appropriate indicators of public health risk in recreational waters. These bacteriological objectives are set forth in Chapter 3 of the Basin Plan.[1] The objectives are based on four bacterial indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are: In Marine Waters Designated for Water Contact Recreation (REC-1) 1. Geometric Mean Limits a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. 2. Single Sample Limits a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1. In Fresh Waters Designated for Water Contact Recreation (REC-1) 1. Geometric Mean Limits a. *E. coli* density shall not exceed 126/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. 2. Single Sample Limits a. *E. coli* density shall not exceed 235/100 ml. b. Fecal coliform density shall not exceed 400/100 ml.

[1] The bacteriological objectives were revised by a Basin Plan amendment adopted by the Regional Board on October 25, 2001, and subsequently approved by the State Water Resources Control Board, the Office of Administrative Law and finally by U.S. EPA on September 25, 2002.

Element	Key Findings and Regulatory Provisions
	In Fresh Waters Designated for Limited Water Contact Recreation (LREC-1)[2] 1. Geometric Mean Limits a. *E. coli* density shall not exceed 126/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. 2. Single Sample Limits a. *E. coli* density shall not exceed 576/100 ml. In Fresh Waters Designated for Non-Contact Water Recreation (REC-2) 1. Geometric Mean Limits a. Fecal coliform density shall not exceed 2000/100 ml. 2. Single Sample Limits a. Fecal coliform density shall not exceed 4000/100 ml. The targets apply throughout the year. Determination of attainment of the targets will be at in-stream monitoring sites to be specified in the compliance monitoring report. Implementation of the above REC-1 and LREC-1 bacteria objectives and the associated TMDL numeric targets is achieved using a 'reference system/anti-degradation approach' rather than the alternative 'natural sources exclusion approach subject to antidegradation policies' or strict application of the single sample objectives. As required by the CWA and Porter-Cologne Water Quality Control Act, Basin Plans include beneficial uses of waters, water quality objectives to protect those uses, an anti-degradation policy, collectively referred to as water quality standards, and other plans and policies necessary to implement water quality standards. This TMDL and its associated waste load allocations, which shall be incorporated into relevant permits, and load allocations are the vehicles for implementation of the Region's standards. The 'reference system/anti-degradation approach' means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within Santa Monica Bay, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the single sample objectives and that it is not the intent of the Regional Board to require treatment or diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas.

[2] The bacteriological objectives for the LREC-1 use designation were provided in a Basin Plan Amendment adopted by State Board on January 20, 2005, and subsequently approved by the Office of Administrative Law and finally by U.S. EPA on February 17, 2006

Element	Key Findings and Regulatory Provisions
	The geometric mean targets may not be exceeded at any time. The rolling 30-day geometric means will be calculated on each day. If weekly sampling is conducted, the weekly sample result will be assigned to the remaining days of the week in order to calculate the daily rolling 30-day geometric mean. For the single sample targets, each existing monitoring site is assigned an allowable number of exceedance days for three time periods (1) summer dry-weather (April 1 to October 31), (2) winter dry-weather (November 1 to March 31), and (3) wet-weather (defined as days with 0.1 inch of rain or greater and the three days following the rain event.) Implementation of the REC-2 target will be as specified in the Basin Plan. The REC-2 bacteria objectives allow for a 10% exceedance frequency of the single sample limit in samples collected during a 30-day period. This allowance, which is based on an acceptable level of health risk, will be applied in lieu of the allowable exceedance days discussed earlier. As with the other REC-1 and LREC-1 objectives, the geometric mean target for REC-2, which is based on a rolling 30-day period, will be strictly adhered to and may not be exceeded at any time.
Source Analysis	The major contributors of flows and associated bacteria loading to Ballona Creek and Estuary, are dry- and wet-weather urban runoff discharges from the storm water conveyance system. Run-off to Ballona Creek is regulated as a point source under the Los Angeles County MS4 Permit, the Caltrans Storm Water Permit, and the General Construction and Industrial Storm Water Permits. In addition to these regulated point sources, the Ballona Estuary receives input from the Del Rey Lagoon and Ballona Wetlands through connecting tide gates. Preliminary data suggest that the Ballona Wetlands are a sink for bacteria from Ballona Creek and it is therefore not considered a source in this TMDL. Inputs to Ballona Estuary from Del Rey Lagoon, are considered non-point sources of bacterial contamination. This waterbody may be considered for a natural source exclusion if its contributing bacteria loads are determined to be as a result of wildlife in the area, as opposed to anthropogenic inputs. The TMDL will require a source identification study for the lagoon in order to apply the natural source exclusion. Other nonpoint sources in Ballona Creek and Estuary include natural sources from birds, waterfowl and other wildlife. Data do not currently exist to quantify the extent of the impact of wildlife on bacteria water quality in the Estuary.
Loading Capacity	The loading capacity is defined in terms of bacterial indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above.
Waste Load Allocations *(for point sources)*	The Los Angeles County MS4 and Caltrans storm water permittees and co-permittees are assigned waste load allocations (WLAs) expressed as the number of daily or weekly sample days that may exceed the single sample targets equal to the TMDLs established for the impaired reaches (see Table 7.21.2a), and Waste Load Allocations assigned to waters tributary to impaired reaches (Table 7.21.2b). Waste load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample

Element	Key Findings and Regulatory Provisions
	exceedances are the most relevant to public health protection. For each monitoring site, allowable exceedance days are set on an annual basis as well as for three time periods. These three periods are: 1. summer dry-weather (April 1 to October 31) 2. winter dry-weather (November 1 to March 31) 3. wet-weather days (defined as days of 0.1 inch of rain or more plus three days following the rain event). The County of Los Angeles, Caltrans, and the Cities of Los Angeles, Culver City, Beverly Hills, Inglewood, West Hollywood, and Santa Monica are the responsible jurisdictions and responsible agencies[3] for the Ballona Creek Watershed. The responsible jurisdictions and responsible agencies within the watershed are jointly responsible for complying with the waste load allocation in each reach. For the single sample objectives of the impaired REC-1 and LREC-1 reaches, the proposed WLA for summer dry-weather are zero (0) days of allowable exceedances, and those for winter dry-weather and wet-weather are three (3) days and seventeen (17) days of exceedance, respectively. In the instances where more than one single sample objective applies, exceedance of any one of the limits constitutes an exceedance day. The proposed waste load allocation for the rolling 30-day geometric mean for the responsible agencies and jurisdictions is zero (0) days of allowable exceedances. For the single sample objectives of the impaired REC-2 reach, the proposed WLA for all periods is a 10% exceedance frequency of the REC-2 single sample water quality objectives. The proposed waste load allocation for the rolling 30-day geometric mean for the responsible agencies and jurisdictions is zero (0) days of allowable exceedances. In addition to assigning TMDLs for the impaired reaches, Waste Load Allocations and Load Allocations are assigned to the tributaries to these impaired reaches. These WLAs and LAs are to be met at the confluence of each tributary and its downstream reach (see Table 7.21.2b).
Load Allocations *(for nonpoint sources)*	Load allocations are expressed as the number of daily or weekly sample days that may exceed the single sample targets identified under "Numeric Target" at a monitoring site, along with a rolling 30-day geometric mean. Load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. Del Rey Lagoon is considered a nonpoint source and is therefore subject to load allocations. The proposed LA for summer dry-weather are zero (0) days of allowable exceedances, and those for winter dry-weather and wet-weather are three (3) days and seventeen (17) days of exceedance, respectively. In the instances where more than one single sample objective applies, exceedance of any one of the limits constitutes an exceedance day. The proposed load allocation for the rolling 30-day geometric mean for the responsible agencies and

[3] For the purposes of this TMDL, "responsible jurisdictions and responsible agencies" are defined as (1) local agencies that are permittees or co-permittees on a municipal storm water permit, (2) local or state agencies that have jurisdiction over Ballona Creek and Estuary, and (3) the California Department of Transportation pursuant to its storm water permit.

Element	Key Findings and Regulatory Provisions
	jurisdictions is zero (0) days of allowable exceedances (see Table 7.21.2a). The City of Los Angeles is the responsible jurisdiction for the Del Rey lagoon, and is responsible for complying with the assigned load allocations presented in Table 7.21.2b at the tide gate(s) between the Lagoon and the Estuary. If other unidentified nonpoint sources are directly impacting bacteriological water quality and causing an exceedance of the numeric targets, within the Estuary, the permittee(s) under the Municipal Storm Water NPDES Permits are not responsible through these permits. However, the jurisdiction or agency adjacent to the monitoring location may have further obligations to identify such sources.
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the Caltrans Storm Water Permit, general NPDES permits, general industrial storm water permits, general construction storm water permits, and the authority contained in Sections 13263 and 13267 of the Water Code. Each NPDES permit assigned a WLA shall be reopened or amended at re-issuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. Each responsible jurisdictions and agency will be required to meet the storm water waste load allocations shared by the LA County MS4 and Caltrans permittees at the designated TMDL effectiveness monitoring points. An iterative implementation approach using a combination of non-structural and structural BMPs may be used to achieve compliance with the waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the waste load allocation. Load allocations for nonpoint sources will be incorporated into Waste Discharge Requirements and MOUs with the responsible jurisdictional agencies. This TMDL will be implemented in two phases over a ten-year period (see Table 7-21.3). Within six years of the effective date of the TMDL, compliance with the allowable number of summer dry-weather (April 1 to October 31), winter dry-weather exceedance days (November 1 to March 31) and the rolling 30-day geometric mean targets for both periods must be achieved. Within ten years of the effective date of the TMDL, compliance with the allowable number of wet-weather exceedance days and rolling 30-day geometric mean targets must be achieved. In order to clearly justify an extended implementation schedule beyond 10 years and up to 14 years from the effective date of the TMDL, the responsible agencies are required to submit additional quantifiable analyses as described below to demonstrate (1) the proposed plans will meet the final WLAs and (2) the proposed implementation actions will achieve multiple water quality benefits and other public goals. The types of approaches proposed coupled with quantifiable estimates of the integrated water resources benefits of the proposed structural and non-structural BMPs included in the Implementation Plan would provide the obligatory demonstration that an integrated water resources approach is being

Element	Key Findings and Regulatory Provisions
	pursued. This demonstration shall include numeric estimates of the benefits, including but not limited to reductions in other pollutants, groundwater recharged, acres of multi-use projects and water (e.g. urban runoff) beneficially reused. The responsible jurisdictions and the responsible agencies must submit a report to the Executive Officer (see Table 7-21.3) describing how they intend to comply with the dry-weather and wet-weather WLAs. As the primary jurisdiction, the City of Los Angeles is responsible for submitting the implementation plan report described above. In addition, as the responsible agency for Del Rey Lagoon, the City of Los Angeles must submit a report detailing how it intends to comply with the load allocations assigned to this waterbody. Alternatively, the City of Los Angeles may submit data clearly demonstrating that Del Rey Lagoon is not a source, for the Regional Board's consideration.. The Regional Board intends to reconsider this TMDL, within 4 years of its effective date to incorporate modifications to the WLAs based on results of the scheduled reconsideration of the Santa Monica Bay (SMB) beaches TMDLs. The SMB beaches TMDLs are scheduled to be reconsidered in four years to re-evaluate the allowable winter dry-weather and wet-weather exceedance days based on additional data on bacterial indicator densities in the wave wash; to re-evaluate the reference system selected to set allowable exceedance levels; to re-evaluate the reference year used in the calculation of allowable exceedance days, and to re-evaluate the need for revision of the geometric mean implementation provision. The Regional Board also intends to re-asses the WLAs for Benedict Canyon Channel, Sepulveda Channel, and Centinela Creek based on results of the required compliance monitoring, and/or any voluntary beneficial use investigations.
Margin of Safety	By directly applying the numeric water quality standards and implementation procedures as Waste Load Allocations, there is little uncertainty about whether meeting the TMDLs will result in meeting the water quality standards.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for three time periods (summer dry-weather, winter-dry weather, and wet-weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators. The critical condition for bacteria loading to the Ballona Creek, Ballona Estuary, and Sepulveda Channel is during wet weather when monitoring data indicate greater exceedance probabilities of the single sample bacteria objectives than during dry-weather. The Santa Monica Bay Beaches Bacteria TMDL identified the critical condition within wet weather more specifically, in order to set the allowable number of exceedances of the single sample limit days. The 90th percentile storm year in terms of wet days was used as the reference year. The 90th percentile year was selected for several reasons. First, selecting the 90th percentile year avoids an untenable situation where the reference system is frequently out of compliance. Second, selecting the 90th percentile year allows responsible jurisdictions and responsible agencies to plan for a 'worst-case scenario', as a critical condition is intended to do

Attachment A to Resolution No. 2006-011

Element	Key Findings and Regulatory Provisions
Monitoring	The TMDL effectiveness monitoring program will assess attainment of the allowable exceedances for Ballona Creek, Ballona Estuary, and Sepulveda Channel, and the WLAs for the tributaries. Responsible jurisdictions and responsible agencies shall conduct daily or systematic weekly sampling at a minimum of two locations within Ballona Estuary and Reach 2 of Ballona Creek, at least one location each in Reach 1 of Ballona Creek and Sepulveda Channel, and at the confluence with Centinela Creek and Benedict Canyon Channel, to determine compliance. Similar monitoring at the connecting tide gates of Del Rey Lagoon is also required. Where monitoring locations are located at or close to the boundary of two reaches, data from sampling points will also be used to assess the immediate downstream reach. This will ensure that the downstream reaches, which have more stringent water quality objectives, are adequately protected. If the number of exceedance days is greater than the allowable number of exceedance days in the REC-1 and LREC-1 waters, and/or the frequency of exceedance is greater than 10% in the REC-2 waters, the responsible jurisdictions and/or responsible agencies shall be considered not to be attaining the TMDLs and/or assigned allocations (non-attaining). Responsible jurisdictions or agencies shall not be deemed non-attaining if the investigation described in the paragraph below demonstrates that bacterial sources originating within the jurisdiction of the responsible agency have not caused or contributed to the exceedance. If an in-stream location is non-attaining as determined in the previous paragraph, the Regional Board shall require responsible agencies to initiate an investigation, which at a minimum shall include daily sampling at the existing monitoring location until all single sample events meet bacteria water quality objectives.
Special Studies	Should the jurisdictional agency for Del Rey Lagoon opt for the natural source exclusion, the TMDL requires that a separate bacteria source identification study be conducted to determine its eligibility.. The study should identify all probable sources of bacteria loads, their estimated contributions to the Lagoon, and a determination of the frequency of exceedances of the single sample bacteria objectives caused by the identified natural sources.

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Table 7.21.2a: Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: Final Allowable Exceedance Days by Reach

Time Period	Ballona Estuary, Ballona Creek Reach 2, and Sepulveda Channel *	Ballona Creek Reach 1**
Summer Dry-Weather (April 1 to October 31)	Zero (0) exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives
Winter Dry-Weather (November 1-March 31)	Three (3) exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives
Wet-Weather (days with ≥0.1 inch of rain + 3 days following the rain event)	17*** exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives

* Exceedance days for Ballona Estuary based on REC-1 marine water numeric targets; for Ballona Creek Reach 2 based on LREC-1 freshwater numeric targets; and for Sepulveda Channel, based on fresh water REC-1 numeric targets

**Exceedance frequency for Ballona Creek Reach 1 based on freshwater REC-2 numeric targets

*** In Reach 2, the greater of the allowable exceedance days under the reference system approach or high flow suspension shall apply.

Table 7.21.2b: Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: WLAs and LAs for tributaries to the Impaired Reaches.

Tributary	Point of Application	Water Quality Objectives	Waste Load Allocation (No. exceedance days)
Ballona Creek Reach 1	At confluence with Reach 2	LREC-1 Freshwater	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17*) winter wet weather* For geometric mean objectives: *(0) for all periods*
Benedict Canyon Channel	At confluence with Reach 2	LREC-1 Freshwater	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17*) winter wet weather* For geometric mean objectives: *(0) for all periods*
Ballona Creek Reach 2	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*
Centinela Creek	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*
Del Rey Lagoon	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3)winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*

*At the confluence with Reach 2, the greater of the allowable exceedance days under the reference system approach or high flow suspension shall apply.

Sepulveda Channel was not assigned a waste load allocation at its confluence with Reach 2 since the TMDL requires the more stringent REC-1 objectives to be met in this waterbody, which should lead to the attainment of the less stringent LREC-1 objectives of the downstream reach.

Table 7.21.3 Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: Significant Dates

Date	Action
Responsible Jurisdictions for the Waste Load Allocations	
12 months after the effective date of the TMDL	Responsible jurisdictions and responsible agencies must submit, for Regional Board approval, a comprehensive bacteria water quality monitoring plan for the Ballona Creek Watershed. The plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. The plan must provide for analyses of all applicable bacteria indicators for which the Basin Plan and subsequent amendments have established objectives The plan must also include a minimum of two sampling locations (mid-stream and downstream) in Ballona Estuary, Ballona Creek (Reach 1 and 2), and their tributaries. The draft monitoring report shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days. Once the coordinated monitoring plan is approved by the Executive Officer, monitoring shall commence within 6 months.
$2^1/_2$ years after the effective date of the TMDL	Responsible jurisdictions and agencies must provide a draft Implementation Plan to the Regional Board outlining how each intends to cooperatively achieve compliance with the dry-weather and wet-weather TMDL Waste Load Allocations. The report shall include implementation methods, an implementation schedule, and proposed milestones. The description of the implementation methods and milestones shall include a technically defensible quantitative linkage to the interim and final waste load allocations (WLAs). The linkage should include target reductions in stormwater runoff and/or fecal indicator bacteria. The plan shall include quantitative estimates of the water quality benefits provided by the proposed structural and non-structural BMPs. Estimates should address reductions in exceedance days, bacteria concentration and loading, and flow in the drain and at each beach compliance monitoring location. As part of the draft plan, responsible agencies must submit results of all special studies and/or Environmental Impact Assessments, designed to determine feasibility of any strategy that requires diversion and/or reduction of Creek flows. If a responsible jurisdiction or agency is requesting a longer schedule for wet-weather compliance based on an integrated approach, the plan must include a clear demonstration that the plan meets the criteria of an IWRA, and a clear demonstration of the need for the proposed schedule. Compliance with the wet-weather allocations shall be as soon as possible but under no circumstances shall it exceed the time frame adopted in the

Date	Action
	TMDL for non-integrated approaches or for an integrated approach. The draft Plan shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days.
3 months after receipt of Regional Board comments on the draft plan	Responsible jurisdictions and agencies submit a Final Implementation Plan to the Regional Board.
Responsible agencies for Load Allocations	
1 year after the effective date of the TMDL	Responsible agencies must submit, for Regional Board approval, separate comprehensive bacteria water quality monitoring plans for inputs from Del Rey Lagoon and the Ballona Wetlands to the Ballona Estuary. Each plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. The plan must provide for analyses of all applicable bacteria indicators for which the Basin Plan and subsequent amendments have established objectives The plan must also include a minimum of one sampling location at the connecting tide gate(s). The draft monitoring reports shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days. Once a coordinated monitoring plan is approved by the Executive Officer, monitoring shall commence within 6 months.
3 years after the effective date of the TMDL.	If the responsible agency for the Del Rey Lagoon intends to pursue a natural source exclusion, it shall submit the results of separate natural source study for the Lagoon to the Executive Officer of the Regional Board. The study shall include a comprehensive assessment of all sources of bacteria loads to the Lagoon and estimates of their individual contributions. In addition, a determination of the number of exceedance days caused by these sources should be made These studies shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days.
Responsible Agencies for WLAs and LAs* *(*Only if not eligible for natural source exclusion(s)*	
4 years after the effective date of the TMDL:	The Regional Board shall reconsider this TMDL to: (1) Re-assess the allowable winter dry-weather and wet-weather exceedance days based on a re-evaluation of the selected reference watershed and consideration of other reference watersheds that may better represent reaches of Ballona

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Date	Action
	Creek and Estuary, (2) Consider whether the allowable winter dry-weather and wet-weather exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s), (3) Re-evaluate the reference year used in the calculation of allowable exceedance days, and (4) Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision. (5) Consider natural source exclusions for bacteria loading from Del Rey Lagoon and the Ballona Wetlands based on results of the source identification study. (6) Re-assess WLAs for Benedict Canyon Channel, Sepulveda Channel, and Centinela Creek based on results of the required compliance monitoring, and/or any voluntary beneficial use investigations.
6 years after the effective date of the TMDL:	Achieve compliance with the allowable exceedance days for summer and winter dry-weather as set forth in Table 6-1 and rolling 30-day geometric mean targets.
10 years after effective date of the TMDL or, if an Integrated Water Resources Approach is implemented, up to July 15, 2021.*	Achieve compliance with the allowable exceedance days as set forth in Table 6-1 and rolling 30-day geometric mean targets during wet-weather.

*July 15, 2021 is the final compliance date of the Santa Monica Bay Beaches Bacteria Wet-Weather TMDL.

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APPENDIX L

Laboratory Safety

The collection and analysis of environmental samples involves contact with samples that may contain agents that pose a microbiological hazard. The primary means of exposure to these microbiological hazards involve body contact during sample collection and hand-mouth or nose contact while handling the samples. Personal protective measures are mandatory while working in the field and laboratory. Following are some key steps to be followed by all laboratory analysts:

a. Assure that all persons wear appropriate eye protection when toxic materials (chemicals or biochemicals) are handled. Contact lenses should not be worn when working with chemicals.
b. Wear appropriate gloves when the potential for contact with toxic materials exists; inspect gloves before each use, wash them before removal, and replace them periodically.
c. Persons doing sampling must wear boots. The boots must be cleaned before entering the building. Boots cannot be worn in the lunchroom, under any circumstances. Steel-toed chemical resistant boots should be worn for the harshest environments, where there is also risk of injury to the foot and toes.
d. Use any other protective and emergency apparel and equipment as appropriate.
e. Remove laboratory coats immediately on significant contamination.

In addition, persons who work in biological laboratories are often at risk of exposing themselves to a number of infectious agents, especially those known to be indigenous to wastewater. Most persons trained in biological and especially microbiological fields usually are aware of the risks involved, and even if precautions are taken, most of the work-related infections are due to certain practices conducted in the laboratory resulting in the generation of aerosols or through cutaneous pathways. The following guidelines are designed to prevent any exposure of personnel to infectious agents.

1. General chemical hygiene practices apply as well to the biological laboratories.
2. All work areas must be disinfected before and after all laboratory operations.
3. Hazardous areas and receptacles of contaminated items are to be marked with a biohazard sign.
4. No eating or drinking in the laboratory. No food or drink is to be stored in laboratory refrigerators, incubators or on bench tops.
5. Store personal effects outside the microbiology laboratory area to prevent contamination. Manager and supervisors are responsible for enforcing this rule.
6. It is policy to wear a lab coat while working in the microbiology lab. Lab coats and street clothes should be stored separately. Lab coats are prohibited in the lunchroom.

7. Latex or plastic gloves are to be provided and used by employees.
8. Always wash your hands thoroughly after handling sewage, sludge, or receiving water samples of any source before handling food or leaving the lab. “All” samples should be treated as potentially hazardous. Germicidal soap is to be available to all employees, and should be kept in stock.
9. Laboratory workers should not touch their hands to their face, especially the eyes, nose, and mouth when working with wastewater and sludge samples.
10. For workers who handle wastewater and its byproducts, it is recommended that they have been vaccinated for polio and tetanus. Persons in poor health and at risk of infection should inform their supervisor, and arrange for an improvement in their personal protection.
11. Handle all microorganisms as if they are pathogenic. The principle of sterile technique should be understood and applied during the handling of cultures and their related equipments.
12. Never pipette by mouth. Use bulbs or other mechanical means to draw up the liquid. Discard all used pipettes into a jar containing disinfectant solution for decontamination before washing them.
13. Avoid generation of aerosols during operations such as inoculation, pipetting, mixing, or centrifuging.
14. Equipment:
    a. Microscopes, colony counters, etc. are to be kept in the work area and be dust free; they are to be cleaned after use.
    b. Water baths should be kept free of growth deposits.
    c. Autoclaves, hot air sterilizing ovens, and water distilling equipment and centrifuges should be cleaned regularly to ensure safe operating.
    d. Employees are to be trained in autoclave operation and operating instructions posted near each instrument.
    e. Performance checks of autoclaves and hot air sterilizers should be conducted with the use of spore strips, spore ampoules, indicators, etc.
15. Safety cabinets of the appropriate type and class are to be supplied, maintained, and used.
16. Personnel are to be trained in the proper procedures for handling lyophilized (freeze-dried) cultures when used.
17. Employees should use the provided bottle carriers when moving reagents, acids, and solvents through the building.
18. Laboratory personnel must follow labeling protocols in the laboratory to prevent mix-ups of reagents, and when possible use the pre-labeled or permanently labeled bottles. Secondary containers are to be labeled as well.
19. In the event of a spill, all possible contaminated surfaces and tools are to be disinfected and the absorbent material placed in a biohazard bag for disposal.
20. All contaminated plates and Quanti-trays are to be autoclaved in biohazard bags at the end of the analysis and then disposed of in the labeled bags as regular trash.
21. Sterilize biological waste materials and contaminated equipment (cultures, glassware, etc.) before washing, storage, or disposal by autoclaving or decontaminating.

22. Eliminate flies and other insects to prevent contamination vectors of sterile equipment, media, samples, cultures, and infection of personnel (i.e., provide screens on windows and doors to outside if there is no air conditioning).

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APPENDIX M.

Participating Organizations and Contacts

Responsible Agencies

	Contact	Phone	E-mail
City of Los Angeles	Reza Iranpour	(213) 485-0577	reza.iranpour@lacity.org
	Gerry McGowen	(310) 648-5611	gerald.mcgowen@lacity.org
County of Los Angeles	Angela George	(626) 458-4341	ageorge@dpw.lacounty.gov
	Nathan Stevenson	(626) 458-4368	nstevenson@dpw.lacounty.gov
Beverly Hills	Josette Descalzo	(310) 285-2498	jdescalzo@beverlyhills.org
Culver City	Steven Finton	(310) 253-6406	steven.finton@culvercity.org
Inglewood	Salvador Ramirez	(626) 396-9424	sramirez@tecsenv.com
West Hollywood	Jan Harmon	(323) 848-6499	Jharmon@weho.org
Santa Monica	Neal Shapiro	(310) 458-8223	neal.shapiro@smgov.net
Caltrans	Bob Wu	(213) 897-8936	robert_wu@dot.ca.gov

Other Participants

Regional Board	**Contact**	**Phone**	**E-mail**
	Ginachi Amah	(213) 576-6685	gamah@waterboards.ca.gov
Heal the Bay	Mark Gold	(310) 453-0395	mgold@healthebay.org
SM Baykeeper	Carlos Carreon	(310) 305-9645	sandpiper@smbaykeeper.org

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APPENDIX N
INTERVIEW DOCUMENTATION RELATED TO TIDE GATES

Watearth
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TELE-CON

TO:	Luis Valenzuela-Mariposa (626) 705-0622	PROJECT:	City of LA Venice Auxiliary Pumping
FROM:	Jennifer Buchanan	JOB NO.	
DATE:	September 16, 2015	TIME:	4:10 pm

SUBJECT: Operation of Washington Street Tide Gates

PURPOSE: Interested in the general description of the tidal gates and how the coffer dam (temporary during construction) and diversion structure would impact the operation/water levels and get a description of the operation of the tide gates in general, as well as get information on the historic water surface elevations. Also, gain information on how coffer dams are typically constructed and how large they are.

CONVERSATION: Mariposa Landscapes operates the Washington Street tide gate as part of their maintenance contract. Luis asked me to e-mail him with specific questions and he will respond tomorrow.

Jennifer Buchanan

From: Luis Valenzuela <luisv@mariposa-ca.com>
Sent: Monday, October 12, 2015 9:39 AM
To: Jennifer Buchanan
Cc: Jorge Salazar
Subject: Re: Washington Street Tidal Gates and LA VAPP

Please contact me with any questions or comments regarding this email.

Thank You

Luis Valenzuela - Division Manager, Landscape Maintenance

MARIPOSA LANDSCAPES, INC.
"Blending nature and craftsmanship to create ultimate outdoor settings"
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Email: luisv@mariposa-ca.com
Visit our web site!

On 10/12/2015 7:06 AM, Jennifer Buchanan wrote:

> Hi Luis,
>
> If you could please provide a little more information, we have a few more questions:
>
> - What does flushing entail? Using high and low tides to flush the canals at least twice per week depending on weather and available tides.
> - How much water, for how long, etc.? We do not have a quantity of water, but it takes approximately 2 to 3 hours to fill depending on the tides.
> - Are they just opening gates or are they adding water? We add water using the tides.
> - Is it scheduled? We do generate a monthly schedule, but always subject to change depending on the weather.
> - Do they flush if it's raining? Yes.
> - Are the gates normally left open?
>
> I understand you would also like to know if the construction of the coffer dam will hinder the flushing of the canal twice a week. Please let me know if you have any other questions and I will get the answers to you as soon as I can.
>
> Thank you,
>
> Jennifer
>
> Jennifer Buchanan, GISP
> Senior Hydrologist
> Watearth, Inc.
> jbuchanan@watearth.com
> 916.240.7010
> 1.800.519.3774 (F)

Visit our website at: www.watearth.com

From: Luis Valenzuela [mailto:luisv@mariposa-ca.com]
Sent: Tuesday, September 29, 2015 12:44 PM
To: Jennifer Buchanan
Subject: Re: Washington Street Tidal Gates and LA VAPP

Answers in Red.

Please contact me with any questions or comments regarding this email.

Thank You

Luis Valenzuela - Division Manager, Landscape Maintenance

MARIPOSA LANDSCAPES, INC.
"Blending nature and craftsmanship to create ultimate outdoor settings"
Cell 626-705-0622 Fax 626-960-8477
Email: luisv@mariposa-ca.com
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On 9/17/2015 2:55 PM, Jennifer Buchanan wrote:

> Hi Luis,
>
> Thank you for your time in answering a few questions relating to maintenance of the Washington Street tidal gates. Any information you can provide will be helpful in the planning of the proposed LA Venice Auxiliary Pumping Plant. My questions are as follows:
>
> 1. Please describe the operation of the Washington Street tide gate. We flush twice per week. Day of the week varies due to changes of tides.
> 2. Would temporary construction of a coffer dam and diversion structure in the Grand Canal adjacent to the existing Venice Pumping Plant impact the operation or water levels? I am not sure because I am not familiar with the project.
> 3. Do you have information on the historic water surface elevations in Grand Canal? I do not.
>
> Sincerely,
>
> Jennifer
>
> Jennifer Buchanan, GISP
> Senior Hydrologist
> Watearth, Inc.
> jbuchanan@watearth.com
> 916.240.7010
> 1.800.519.3774 (F)
>
> Visit our website at: www.watearth.com

APPENDIX O
SITE PHOTOS/DESCRIPTIONS



Venice pump station



Looking at Grand Canal at Hurricane and Esplanade at pump station



Looking downstream on Grand Canal towards Ballona Lagoon from pump station



Looking upstream on grand canal from pump station



Storm outfall from Hurricane St. into Grand Canal at road between existing and auxiliary sites



Close up of storm outfall from Hurricane St. into Grand Canal



Looking across Grand Canal at optional lot from existing pump station



Inlet on Hurricane St. into Grand Canal



Looking downstream on Grand Canal towards Ballona Lagoon from pump station



Unidentified outfall under existing pump station into Ballona Lagoon



Unidentified outfall under existing pump station (2)



Looking at site of auxiliary pumping plant from existing plant side of street



Looking down Hurricane St. towards grand canal with existing plant on right and auxiliary plant on left.



Existing Venice pumping plant from end of Hurricane St. at the Grand Canal



Primary staging area adjacent to Ballona Lagoon from Hurricane St.



Looking at auxiliary pumping plant site and manholes for manifold project on Hurricane St.



Looking across Grand Canal at optional staging site-2 lots-from Hurricane and Esplanade



Auxiliary plant site



Looking upstream along Grand Canal with Auxiliary plant site on left



Close up of optional staging lot across Grand Canal



Close up 2 of optional staging lot across Grand Canal



Close up 3 of optional staging lot across Grand Canal



Side slope of Grand Canal looking upstream with auxiliary plant site on left



Side slope of Grand Canal looking upstream with auxiliary plant site on left (2)



Ballona Lagoon trail on back side of staging lot adjacent to Lagoon



Ballona Lagoon trail on backside of stagin lot adjacent to Lagoon (2)



View of Ballona Lagoon from South Side of existing plant



Looking at staging lot towards Hurricane from back side adjacent to Ballona Lagoon.



Staging lot from back



Staging lot from back (2)



Looking downstream towards existing plant with auxiliary site on right and existing natural ground



Looking across Grand Canal at optional staging lot from upstream of existing and auxiliary plant sites



Auxiliary plant site from Grand Canal-Esplanade side



Natural ground along Grand Canal with erosion potential near auxiliary site



Bare soil on bank of Grand Canal near auxiliary site and looking across stream at optional staging site



Looking upstream at Grand Canal at Galleon and Esplanade



Looking downstream at Grand Canal at Galleon and Esplanade



Esplanade and unnamed intersection just upstream of Galleon

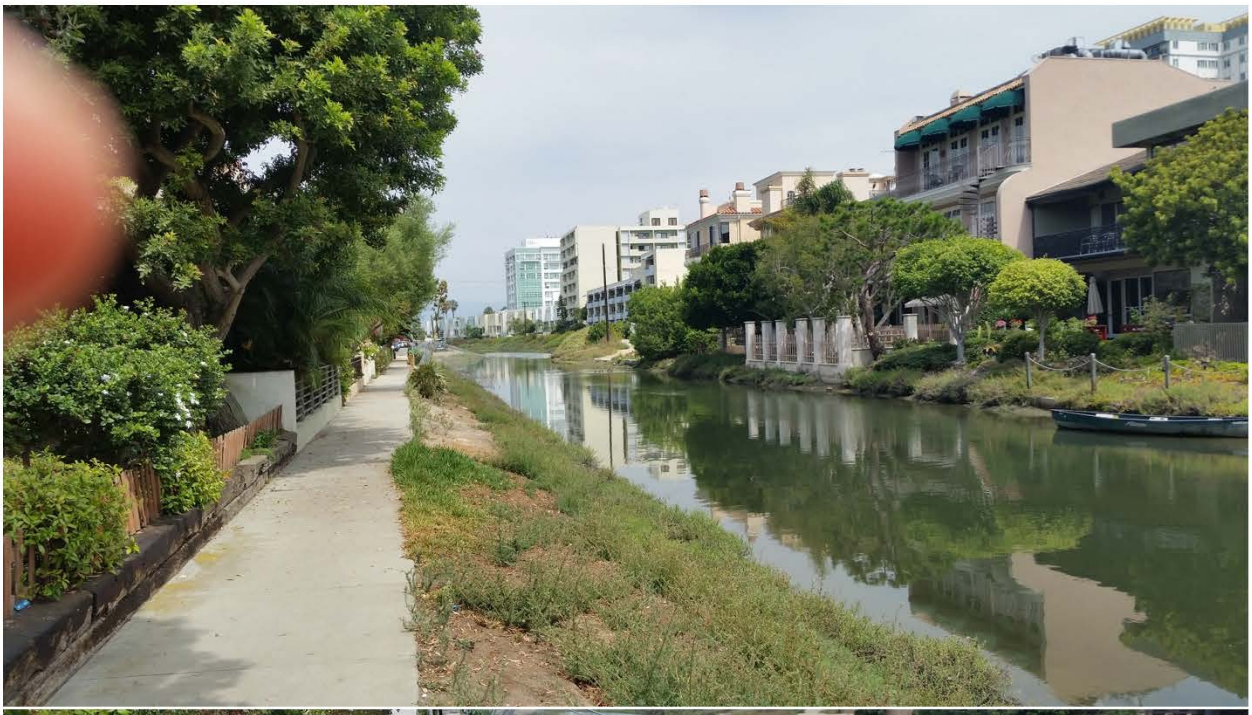


Inlet at Esplanade and unnamed intersection just upstream of Galleon



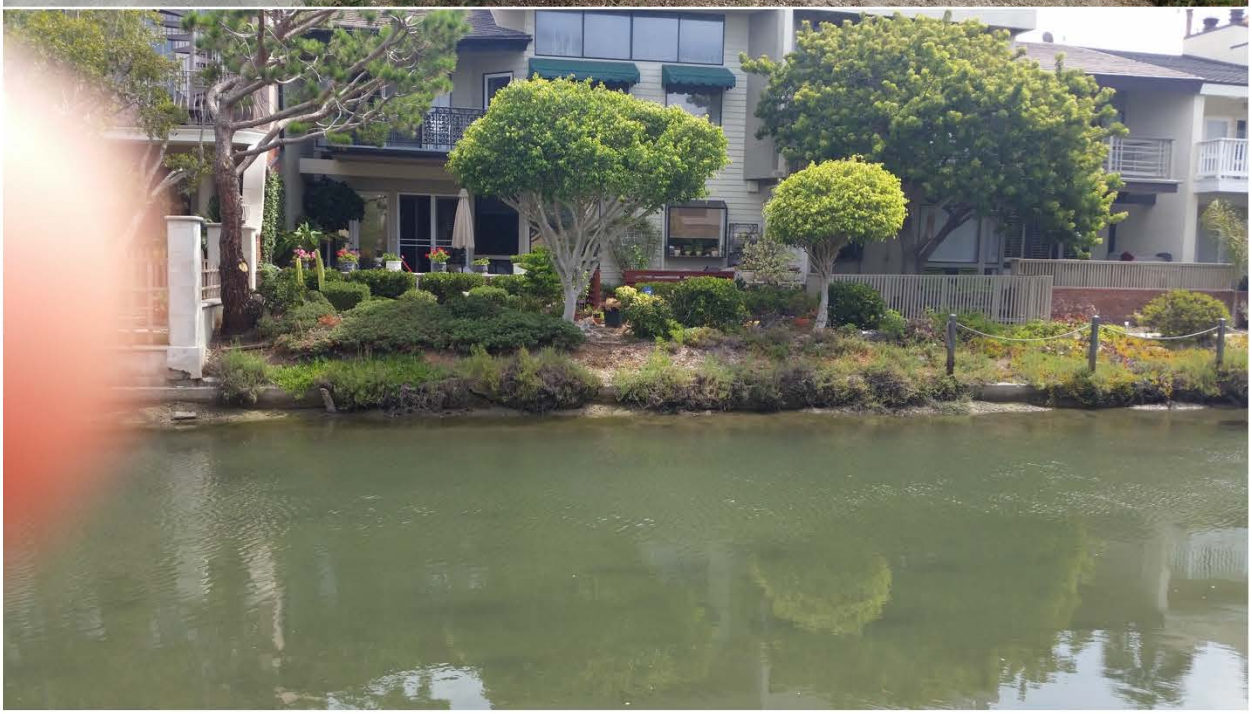
Looking away from Grand Canal at unnamed street just upstream of Galleon













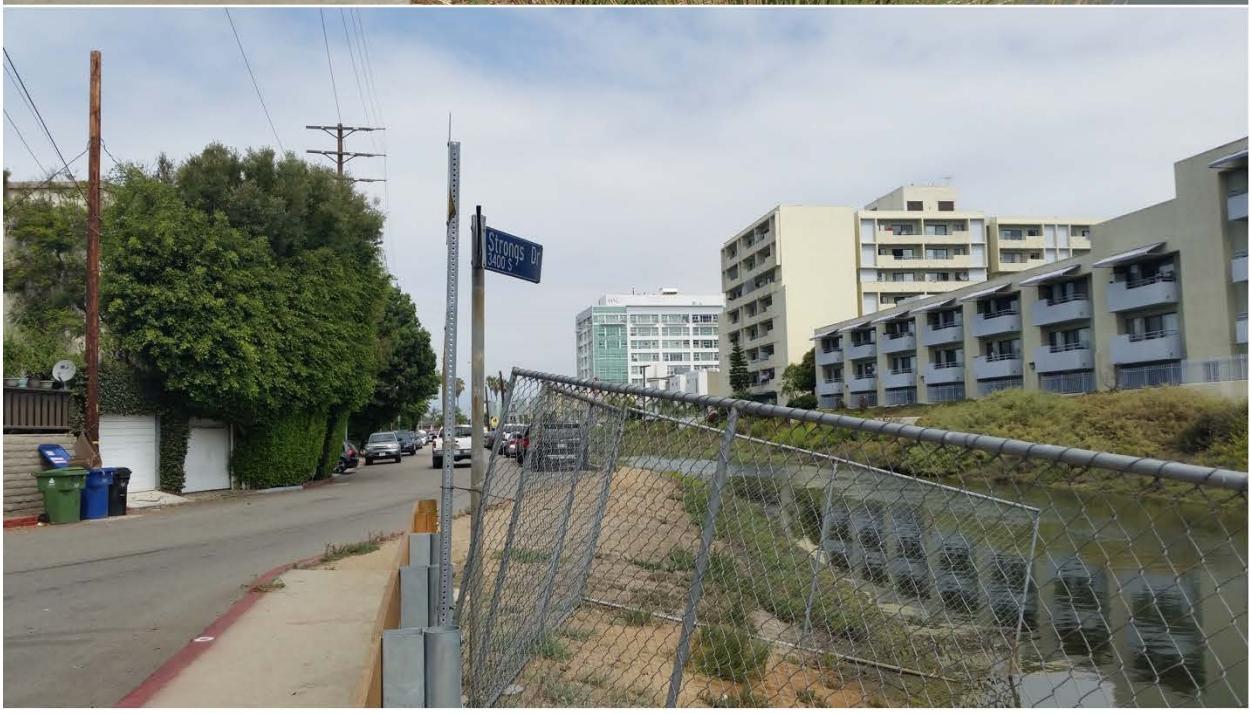
Esplanade and second unnamed intersection upstream of Galleon



Looking downstream from Esplanade and second unnamed intersection upstream of Galleon






Strongs Dr
3400 S



Looking upstream at Strongs Drive



Looking downstream at Strongs Drive



Looking at Strongs Drive heading away from Grand Canal



Inlet at Strongs Drive and Esplanade into Grand Canal



Looking upstream at Strongs Drive



Natural ground near Strongs Drive



Looking upstream at Catamaran St. and Esplanade



Looking downstream at Catamaran St. and Esplanade



Looking upstream at Buccaneer St and Esplanade



Looking downstream at Buccaneer St. and Esplanade



Looking upstream at Anchorage and Esplanade



Looking downstream at Anchorage and Esplanade



Looking towards Anchorage Alley from Grand Canal



Looking upstream towards Washington



Looking upstream towards Washington (2)



Looking upstream at Washington intersection



Looking downstream from south side of Washington



Looking upstream at face of crossing structure at Washington



Looking down alley just south of Washington away from Grand Canal



Side view of Grand Canal and tide gates at upstream side of Washington from Strongs



Looking towards tide gates at upstream side of Washington from Strongs Drive.



Looking towards tide gates at upstream side of Washington from Strongs Drive



Looking upstream on Grand Canal-Venice Canals from Washington



Looking upstream on Grand Canal-Venice canals from Washington (2)



Looking upstream on Grand Canal-Venice canals from Washington (3)



Looking downstream at tide gates on upstream side of Washington



Looking upstream towards first foot bridge north of Washington



Looking downstream from first foot bridge North of Washington



Looking upstream from first foot bridge North of Washington



Looking up first side canal just upstream of first foot bridge north of Washington



Looking up second side canal just downstream of second foot bridge North of Washington



Looking upstream at second foot bridge North of Washington



Looking downstream from second foot bridge North of Washington



Looking upstream from second foot bridge North of Washington



Looking up third side canal from second foot bridge North of Washington



Looking up fourth side canal from upstream of second foot bridge North of Washington



Looking upstream towards South Venice Blvd.



Looking downstream from South Venice Blvd.



Looking between North and South Venice Blvd.



Looking upstream at end of canal from North Venice Blvd



Looking downstream at upstream face of North Venice Blvd. bridge



Looking upstream at upstream end of canal from North Venice Blvd (2)



Miracle Fertilizer example adjacent to Canal (water quality issue)



Looking towards Washington from upstream



Looking towards Washington tide gates from upstream



Ballona Creek



Downstream of Ballona Lagoon



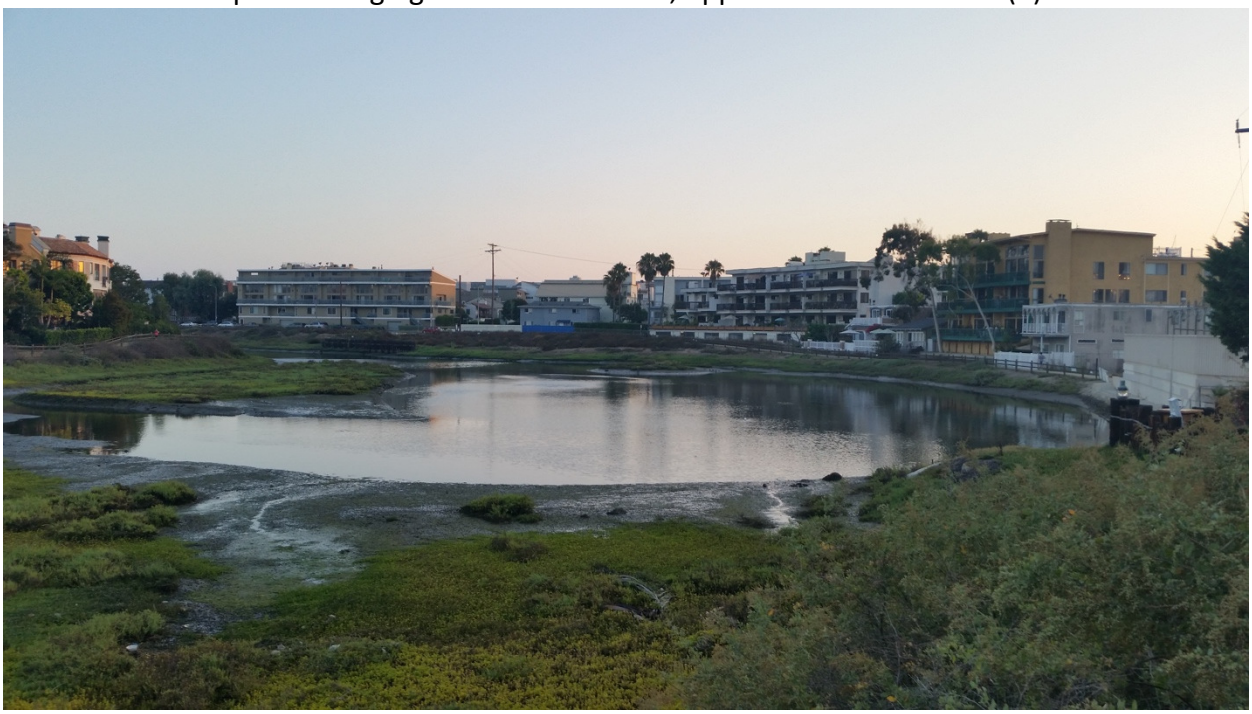
Optional staging lot from front side, opposite of Grand Canal



Optional staging lot from front side, opposite of Grand Canal (2)

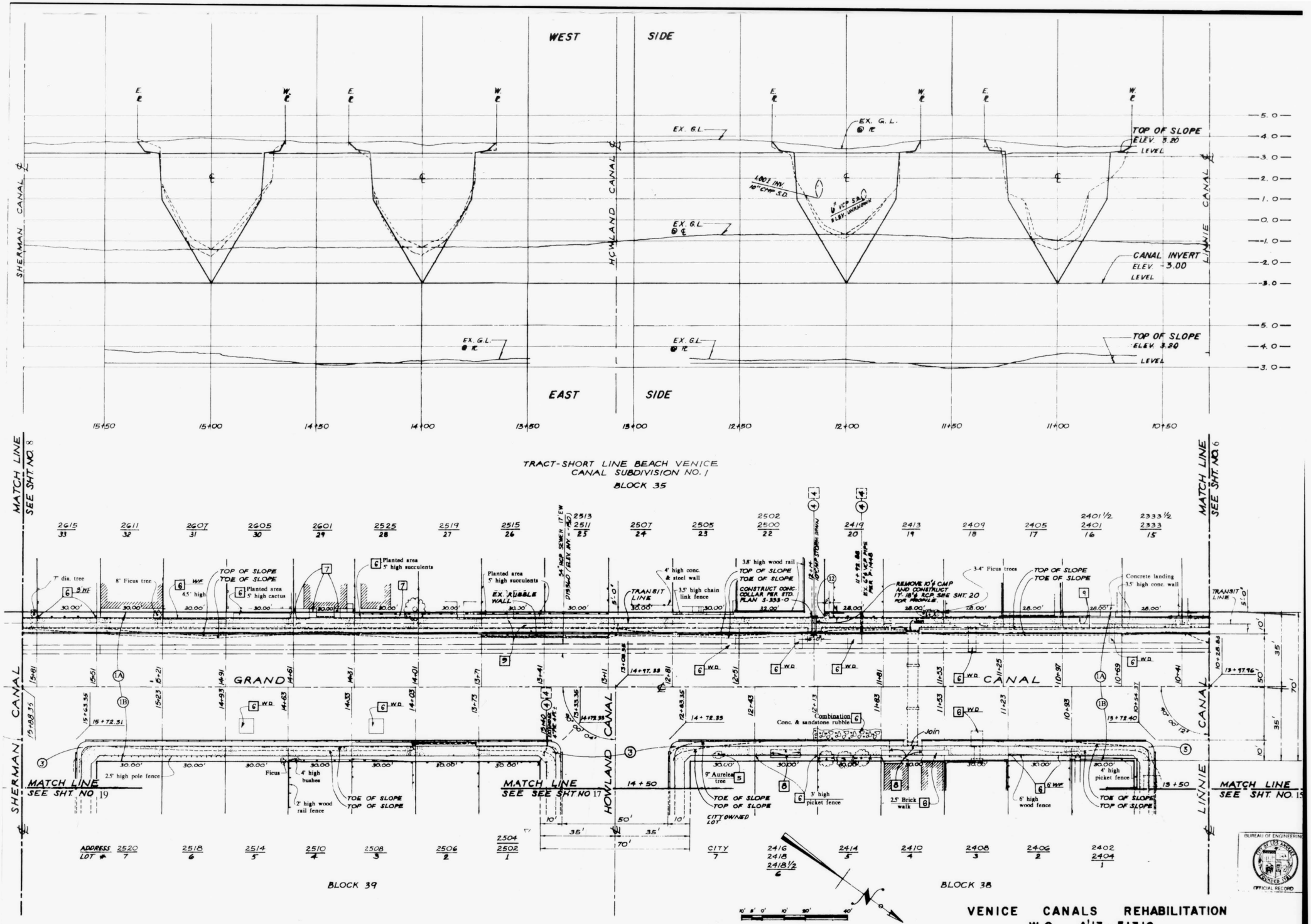


Optional staging lot from front side, opposite of Grand Canal (3)



Looking towards Ballona Lagoon from opposite side of canal with existing plant in extreme right.

APPENDIX P
CROSS SECTION OF GRAND CANAL, PLAN SHEET D-29976, VENICE CANALS REHABILITATION, SHEET NO. 7 OF 26



HAER No. CA-124-44

APPENDIX Q
SEA LEVEL RISE VULNERABILITY STUDY FOR THE CITY OF LOS ANGELES

Sea Level Rise Vulnerability Study for the City of Los Angeles

Prepared by the
University of Southern California Sea Grant Program



Sea Grant
University of Southern California

Partners



Sea Grant
University of Southern California

LARC
Los Angeles Regional Collaborative
for Climate Action and Sustainability

ICLEI
Local
Governments
for Sustainability

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Acknowledgments

USC Sea Grant is grateful to the key contributors to this study. Most importantly, we would like to acknowledge the authors who contributed the vulnerability assessments: Dr. Reinhard Flick, Mr. Brian Holland, Ms. Melissa Higbee, Dr. Julia Ekstrom, Dr. Susanne Moser, Dr. Dan Wei, and Dr. Sam Chatterjee. All of these authors are recognized locally, nationally, and internationally as experts in their respective fields of study. They worked to complete these assessments on a very tight timeline and with modest budgets. We would like to thank Dr. Patrick Barnard and his team at the U.S. Geological Survey for their invaluable work applying the coastal storm modeling system to Los Angeles. Dr. Flick, Ms. Lesley Ewing, Dr. Mark Gold and Dr. Guangyu Wang, as advisors to USC Sea Grant, provided valuable insight, advice and guidance on this study. Dr. Paul Bunje, Ms. Krista Kline, and Ms. Monica Gilchrist, as members of the Adaptation Planning Team, also played an enormous role in the development of the planning process and all the steps along the way. We would also like to thank the external reviewers of the vulnerability assessments for taking the time to review these studies and for providing insightful and helpful suggestions. We thank the City of Los Angeles for the opportunity to work with City officials to begin the important task of identifying the City's vulnerability to sea level rise.

Abstract

The City of Los Angeles (City of L.A. or the City) has initiated research to support planning for the impacts of climate change. The City, the University of Southern California Sea Grant Program (USC Sea Grant) and project partners developed a science-based and stakeholder-supported adaptation planning process to support research on the impacts of sea level rise on City assets, resources and communities. As a first step, this report, *Sea Level Rise Vulnerability Report for the City of Los Angeles*, is a summary of initial research on the potential impacts of sea level rise and associated flooding from storms for coastal communities in the City of L.A. The study concentrates on the City's three coastal regions: Pacific Palisades from Malibu to Santa Monica; Venice and Playa del Rey; and San Pedro, Wilmington and the Port of Los Angeles.

An interdisciplinary team of world-renowned experts was engaged to identify the City's potential exposure to sea level rise. A sophisticated model, developed by the U.S. Geological Survey (USGS), was used to examine the impacts from rising seas, as well as flood impacts from storms and high tides that could be exacerbated with those rising sea levels. The model is based on an *El Nino*-fueled storm that occurred in the Los Angeles region during January 2010, considered a moderately severe "10-year" storm (10% chance of occurring annually). As new data become available for the L.A. region, they can be applied to evaluate impacts of more severe storms, such as a 100-year event (1% chance of occurring annually).

In this study, we provide an initial report by Dr. Reinhard Flick focused on coastal vulnerabilities in locales within City boundaries, and provide recommendations for beach monitoring programs. We then highlight the findings of three vulnerability assessments that provide a preliminary examination of the physical, social, and economic impacts of sea level rise on the City's coastal assets, resources and communities, and include a summary discussion of ecological vulnerability at Ballona Wetlands. One of the next steps for the City will be to develop an Adaptation Plan. We help get this process started with a matrix of available adaptation measures the City can consider in planning for sea level rise as well as recommendations for moving forward with adaptation planning.

The summary of coastal issues and full texts of each vulnerability assessment are included as appendices to this report:

- Appendix 1 - *City of Los Angeles Coastal Issues Related to Future Mean Sea Level Rise*
- Appendix 2 - *Physical Vulnerability Assessment Findings for the City of Los Angeles*
- Appendix 3 - *Sea-Level Rise Impacts and Flooding Risks in the Context of Social Vulnerability: An Assessment for the City of Los Angeles*
- Appendix 4 - *Economic Impact of Sea Level Rise to the City of Los Angeles*

This report provides an initial and conservative assessment of the potential vulnerabilities the City may face due to rising sea levels. It draws attention to potentially vulnerable City assets (i.e. water and power infrastructure), possible building-related economic losses, and indicators of social vulnerability to begin to identify the most vulnerable communities in the City of L.A. It is not meant to be a comprehensive or regional review. It includes strategies the City may wish to consider; however this report in no way replaces the critical science and engineering studies that should be conducted as part of the development of any adaptation strategy or plan.

Executive Summary

Climate change is expected to usher in an era of higher temperatures, increased precipitation and/or severe drought, and increased rates of sea level rise around the world. According to the National Research Council (NRC), global sea level has risen at an increasing rate since the late 19th / early 20th Century, when global temperatures first started to rise. Climate researchers believe sea level rise will drive storm surge and wave run-up higher than current conditions, thereby causing more extensive and frequent coastal, storm-driven flooding.

Sea level rise in Los Angeles is expected to match global projections over the next century with an increase of 0.1 - 0.6 meters (m), or 0.3 - 2.0 feet (ft), from 2000 - 2050 and 0.4 - 1.7 m (or 1.3 - 5.6 ft) from 2000 - 2100 (NRC 2012). Tides, wave-driven run-up, and storm surge play critical roles in coastal flooding in Southern California, especially when big wave storms occur at or near peak high tides. Sea level rise will potentially exacerbate the damage from these events.

The City of Los Angeles (City of L.A. or the City) owns and maintains critical coastal infrastructure that includes two power plants and two wastewater treatment plants, and the Port of Los Angeles (Port), all of which are approximately 10 ft above sea level. Under current conditions, some of this infrastructure is vulnerable to flooding during high tide events and severe storms. This flooding is expected to worsen as sea level rise contributes to increased total water levels. The Port is among the busiest in the world, contributing more than $63 billion to the State of California, and more than $260 billion to the U.S. economy. More than 40% of all imports arriving in the U.S. comes through the Ports of Los Angeles and Long Beach, where it is loaded onto trucks and trains for overland shipping (Port of Los Angeles 2012).

Beyond these critical assets, a major component of Los Angeles' economy is dependent upon beach tourism. In 2012, the Los Angeles region attracted over 41 million tourists, who accounted for more than $16.5 billion in expenditures (Los Angeles Division of Tourism 2012).

The City recognizes that this is the time to begin planning for the impacts of climate change, not 20 or 30 years in the future when disruptions to business and damage to critical coastal infrastructure will prompt *ad hoc* and poorly coordinated responses. Because of the unprecedented degree of stakeholder collaboration and inter-agency cooperation required for large-scale regional adaptation, an extended timeframe for planning is critical.

The City of L.A. engaged the University of Southern California (USC) Sea Grant Program, along with the Los Angeles Regional Collaborative on Climate Action and Sustainability (LARC) and ICLEI – Local Governments for Sustainability, U.S.A. (ICLEI), to begin research into the impacts of sea level rise on the City's coastal assets, resources and communities. In December 2011, the City launched this project; a science-based and stakeholder-supported sea level rise adaptation planning effort. The methodology 1) supports the City in identifying the vulnerabilities of its coastal assets, resources and communities to sea level rise, 2) provides information for developing meaningful and effective adaptation strategies, and 3) builds on the City's ongoing environmental and climate policies.

Geographic Scope and Purpose of this Report

This report focuses on the potential impacts of sea level rise and associated coastal flooding for the coastal communities of the City of L.A. We highlight the findings of a coastal issues report; three vulnerability assessments that provide a preliminary examination of the physical, social, and economic impacts of sea level rise on the City of L. A.; and a discussion of ecological vulnerability at Ballona

Wetlands. We conclude the report with a set of guidelines for identifying and evaluating possible adaptation strategies and measures to address these potential vulnerabilities. This report is meant to provide a first glimpse into the vulnerabilities the City of L.A. may face under rising sea levels and to start building the capacity within the City to begin an adaptive approach to planning for sea level rise and other climate change impacts.

Sea Level Rise Exposure

For the vulnerability assessments, the City utilized a coastal impacts model developed by Dr. Patrick Barnard and colleagues at the United States Geological Survey (USGS). This model incorporates not only the impacts of rising sea levels, but also the impacts of waves and storm surge associated with coastal storms. The USGS model is based on a storm that occurred in the Los Angeles region during January 2010. The modelers applied two sea level rise scenarios using upper-end estimates of 0.5 meters (m) sea level rise between 2000 - 2050 and 1.4 m sea level rise between 2000 - 2100 (scenarios based on Rahmstorf 2007). The scenarios were added to the tide, wave and wind conditions of the January 2010 storm to project what could be expected for a similar type of storm event under conditions related to rising seas. While there are a number of sea level rise and coastal impact models available for use, it was determined at the time of this analysis that the USGS model provided the best available science.

Major Findings

Coastal and Shoreline Assets[1]

This section summarizes a preliminary report on coastal vulnerabilities for those beaches located within City boundaries, and provides recommendations for monitoring programs. This report provides a first glimpse into potential strategies the City may wish to consider, however this report in no way replaces the critical engineering studies that should be conducted before committing to any strategy or plan.

Physical Vulnerability Assessment[2]

The physical vulnerability assessment considers areas where important structural community assets are susceptible to and/or unable to accommodate adverse effects of sea level rise. The major findings include:

- The City's roads and water systems (wastewater, stormwater, potable water) are vulnerable to impacts from sea level rise and associated storm surge.

- The City's cultural assets are vulnerable to sea level rise. Museums and cultural centers are considered to be highly vulnerable because of the damages that can result to the physical buildings and resources. Parks and open space, while in vulnerable locations, are less vulnerable to flooding impacts since they can be restored relatively quickly.

- The Port and the City energy facilities have relatively low vulnerability to sea level rise.

Under current conditions, City assets are already vulnerable to damages that could occur during concurrent high tide and large storm events. Highlighting future possible vulnerabilities allows the City to start planning now on how to better address the potentially increasing frequency and severity of these events in the future.

It is also important to highlight that some agencies within the City have already begun planning for sea

---

1. This report, funded by the City of L.A., was developed by Dr. Reinhard Flick (see Appendix 1).

2. This study, funded by the City of L.A., was conducted by ICLEI (see Appendix 2).

level rise, even prior to the initiation of this study. For instance, the Bureau of Sanitation has recognized that climate change effects may impact assets and operations and has developed strategic planning goals and outcomes to mitigate these impacts. The Bureau has commissioned engineering studies to plan for potential flooding at several critical locations. Since 2011, the Port has been working with the RAND Corporation to conduct a sea level rise vulnerability study. Similarly, in 2010, the Department of Water and Power conducted a tsunami study. Analyses from all of these studies have been incorporated in the sea level rise vulnerability study we discuss here.

Social Vulnerability Assessment[3]

The social vulnerability assessment describes the impacts that sea level rise and its associated effects may pose to the City's coastal residents. Demographic overviews of the three coastal areas within the City of L.A. that will experience direct impacts of sea level rise are followed by a description of population characteristics that help predict the degree of social vulnerability for certain segments of communities vulnerable to flooding. The characteristics examined in this assessment include: income, poverty, education, females as head of household, race, linguistic isolation, age, housing type and age, and physical and mental illnesses and disabilities. These characteristics are associated with higher sensitivity and/or lower adaptive capacity to flooding and sea level rise, and thus can be used to inform adaptation planning. Major findings include:

- Low-lying San Pedro and Wilmington, communities around the Port of Los Angeles, are more vulnerable to the impacts of sea level rise, due to lower per capita income, lower education levels and linguistic isolation.

- Venice, and low-lying San Pedro and Wilmington may also have reduced capacity to adapt to the impacts of sea level rise because of an older housing stock and a high percentage of renters.

- The Social Vulnerability Index (developed by Cutter et al. 2003), which calculates a vulnerability index based on a combination of 32 census-based population characteristics, corroborates findings that communities in Venice, San Pedro and Wilmington are the most socially vulnerable coastal communities in the City.

This assessment allows the City to begin identifying adaptation and communication strategies that target vulnerable populations. Strategies may include: documenting where vulnerable populations reside so first responders understand the extent of the need and can direct assistance appropriately when the time comes; conducting workshops and preparing other public outreach materials for non-English speakers; and, given low education and high poverty levels, using alternative educational/informational methods that do not require literacy or internet access.

Economic Vulnerability Assessment[4]

The economic impacts analyzed in this study include both property damage losses and direct and indirect business interruption losses due to sea level rise and associated storm surge. These findings present a "worst case" assumption if the City takes no action to plan for the potential impacts from these events.

Major findings include:

---

[3] This study, funded by the City of L.A., was conducted by Dr. Julie Ekstrom and Dr. Susanne Moser (see Appendix 3).
[4] This study, funded by USC Sea Grant, was conducted by Dr. Dan Wei and Dr. Sam Chatterjee (see Appendix 4).

- For a 10-year flood event, the direct building losses are estimated to be $410.3 million with 0.5 m sea level rise, and nearly doubled with 1.4 m sea level rise. Losses to residential buildings comprise about 50% of the total losses. The other 50% of losses are split evenly between the commercial buildings and industrial buildings in most simulated scenarios.

- Business interruption losses are relatively small compared with the building stock losses. For a 10-year flood event, the total output losses in the City are expected to be $5.8 million to $9.1 million under the two simulated sea level rise scenarios.

- Simulations show that the transportation system and the utility system in the City would suffer very limited damages from flooding in the limited scenarios evaluated in this study.

Impacts caused by long-term and permanent coastal erosion and beach area losses of sea level rise are not covered in this study. The potential economic impacts of sea level rise to the City in this analysis should be considered to be conservative estimates. Further economic studies to assess potential impacts on tourism, transportation systems, goods movement, and the regional economy would help to elucidate a more robust picture of potential impacts. Identifying these vulnerabilities allows the City to identify where it should focus its adaptation efforts with respect to sea level rise to minimize the losses due to damage to its building stock and to minimize business interruption losses and the ensuing ripple effects.

Ecological Vulnerability Assessment

Most of the City's coastal zone is highly urbanized. The vulnerability of the less urbanized areas such as City beaches, open space areas, parks or recreation centers, was assessed in the physical vulnerability assessment conducted by ICLEI (Appendix 2). We do highlight one important ecological asset located within City boundaries: the Ballona Wetlands Ecological Reserve. This wetland provides a plethora of ecosystem services including, but not limited to, biological productivity energy flow, nutrient cycling, foraging, nursery, sheltering, and resting places for wildlife, sediment accretion, and wave attenuation.

We cite results from a recent sea level rise study conducted by researchers from Loyola Marymount University and the Santa Monica Bay Restoration Foundation, which indicate that Ballona is vulnerable to sea level rise and associated storm surge impacts (Bergquist et al. 2012). Even though the City does not manage Ballona Wetlands, it provides important ecosystem functions for the City, and therefore we suggest that it is in the interest of the City to participate in the development of sea level rise adaptation strategies and plans for this important ecological resource.

Moving Forward: Considerations for Identifying Appropriate Adaptation Strategies

In the final section, we identify a suite of adaptation measures the City can consider utilizing in planning for sea level rise. We also provide several recommendations for moving forward. These recommendations include:

- Continue the "adaptive adaptation planning" process that reassesses the City's vulnerabilities as scientific information and further vulnerability assessments evolve;

- Invest in a strong foundation for climate adaptation;

- Define clear adaptation goals;

- Develop clear prioritization and selection criteria for choosing among possible adaptation strategies;

- Expand partnerships in developing adaptation options, both within the City itself, as well as in the regional context;

- Invest in scientific and engineering studies and coastal monitoring efforts to clearly delineate the necessary modifications in physical assets and infrastructure, determine the time frame for responses, and begin constructing an estimate of financial needs; and,

- Conduct robust and thorough risk analyses.

Regional Stakeholder Participation

Stakeholder input is an invaluable part of the public process when planning for a future with potentially significant impacts on the public. A Regional Stakeholder Working Group (RSWG) was appointed early in the process. The group includes representatives from the Los Angeles City Council, Los Angeles County, State of California, the private sector, government associations, and non-governmental organizations. Through formal meetings and a review and comment process, the Regional Stakeholder Working Group (RSWG) provided critical input to the process and the final version of this study. RSWG members commented on the sea level rise report by providing suggestions on how to move forward in adaptation planning, expand this study in future iterations, and communicate the findings to wider audiences. While some comments were out of the scope and intent of this initial study, it is important to capture comments to assist the City as it moves to the next milestones of the process and updates this study as new science and information become available.

City Leadership Already Underway

Already, the City adaptation process is well underway to meeting, and exceeding, some of the recommendations listed above. The City has demonstrated proactive leadership in developing the process and undertaking this study to identify its potential vulnerabilities to sea level rise and associated flood impacts from storms. The City has engaged a team of world renowned experts to identify its potential exposure to sea level rise, using a sophisticated model that examines both the impacts from rising seas, as well as flood impacts from storms and high tides, which could be exacerbated with those rising sea levels. It has identified its potential vulnerabilities in order to begin planning now and not in 20 or 30 years.

Prior even to the recommendations of this study, agencies within the City were already commissioning studies to understand the impacts of sea level rise on critical infrastructure, as well as other climate change impacts. LARC commissioned a simulation of climate change by Dr. Alex Hall at the University of California, Los Angeles, to examine localized impacts such as temperature change, urban heat islands, fresh water supply, increased fire frequency, and human health impacts to the greater L.A. metropolis. Further results describing changes in precipitation, cloud cover, snowpack, winds, storms, and other patterns will be released in 2013 and 2014. Equally, the best adaptation strategy is mitigation, or the reduction of greenhouse gas (GHG) emissions. The City of L.A. has emerged as a leader in its varied and numerous mitigation strategies. Adaptation to current and potential impacts is the next important phase in tackling climate change head-on.

Sea Level Rise in Southern California

The Global Picture of Climate Change

Aside from a warmer planet, climate change is expected to usher in an era of higher winds, flooding and/or severe drought, and increased rates of sea level rise around the world. Caused by both the thermal expansion of seawater and the melting of land-based ice, global sea level rise is expected to accelerate due to increasing rates of ice cap and glacier melting and transfers of more heat from the atmosphere to the oceans. According to a recent report by the National Research Council (NRC) (NRC 2012), based on tide gage measurements from around the world, global sea level rose an average of 0.17 cm (or 0.07 in) per year, for a total of about 18 cm (7 in) over the entire 20th century. In comparison, global rates for 1993–2003 were almost double at 0.31 cm (or 0.12 inches) per year, based on precise satellite altimetry measurements and confirmed by tide gage records (Nicholls et al. 2011; NRC 2012). The most recent NRC report (2012) reports estimates global sea level will rise by as much as 8 - 23 cm (3 - 9 in) by 2030 relative to 2000; 18 - 48 cm (7 - 19 in) by 2050; and 50-140 cm (20-55 in) by 2100.

Many argue that we are already seeing evidence of this change. The fall of 2012, for example, witnessed "Superstorm Sandy" along the Eastern Seaboard of the U.S. The 14-foot storm surge at its peak washed away dozens of homes and destroyed entire neighborhoods; flooded streets, subways and other infrastructure, including a main substation of the power grid. Approximately 8.5 million people were without power, many without heat, refrigeration and communication for almost three weeks. All told, Sandy cost 159 lives and resulted in $65 billion in damages and economic loss, including significant business interruption (Hurricane Sandy Rebuilding Task Force 2013). While there is no definitive evidence that Sandy was a direct consequence of climate change, she left behind a path of devastation that demonstrates the damage that can accrue from major storms.

The Local Picture of Sea Level Rise

Although it is occurring around the globe, sea level rise is not uniform; it varies from place to place (NRC 2012). Along the West Coast, sea level is influenced by a number of regional factors, such as decadal (or about a 10 year cycle) ocean and atmospheric circulation patterns (Bromirski et al., 2011) and shorter-term heating and cooling effects, such as *El Niños* in the Pacific Ocean, as well as plate tectonics (NRC 2012).

Sea level rise in Los Angeles is expected to match global projections over the next century, despite the fact that local sea level has been relatively static for the past decade. For the Los Angeles region, the NRC report projects sea level rise of an increase of 0.1 - 0.6 m (or, 0.3 - 2.0 ft), from 2000 - 2050 and 0.4 - 1.7 m (or 1.3 - 5.6 ft) from 2000 - 2100 (NRC 2012).

Tides, wave-driven run-up, and storms play the most critical roles in coastal flooding in Southern California, especially when big wave storms occur at or near peak high tides. Sea level rise slowly but inexorably exacerbates these effects by making the occurrence of extreme total high water levels more and more frequent over time.



Image of the Hyperion Wastewater Treatment Plant and the Scattergood Generating Plant, two coastal assets in the City of Los Angeles. (Photo credit: Kenneth & Gabrielle Adelman, California Coastal Records Project, www.Californiacoastline.org).

As a result, climate researchers believe storms will impact the West Coast more powerfully in the future because sea level rise will raise wave run-up (or maximum vertical extent of wave up-rush on a beach) and storm surge, thereby causing more erosion and more extensive and frequent flooding and damages.

The Need for Sea Level Rise Adaptation Planning in Los Angeles

The City of L.A. owns and maintains critical coastal infrastructure that includes two power plants and two wastewater treatment plants that are approximately 10 feet above mean sea level. Under current conditions, some of this infrastructure is already vulnerable to flooding during high tide events and severe storms. This flooding is expected to worsen as sea level rise contributes to increased total extreme water levels.

Beyond these critical assets, beaches and beach tourism are major contributions to Los Angeles' economy. L.A. County attracted almost 27 million tourists who accounted for more than $15 billion in expenditures, and more than $8 billion in tax revenues in 2011, climbing to over 41 million tourists and $16.5 billion in expenditures in 2012 (Los Angeles Division of Tourism, 2011 and 2012). Many of these visitors were attracted to the region's wide sandy beaches and other attractions that make coastal communities special, such as piers, boardwalks and marinas.

Among the most famous of these beach communities in Los Angeles is Venice, whose natural beach has been altered significantly by coastal engineering and advantageous sand placement. Over the last five decades, sand has already been replenished at a cost of millions of dollars (Flick 2012). Like Venice, other coastal communities such as Pacific Palisades, Santa Monica and Malibu, are dependent upon their wide sandy beaches and other coastal assets for tourism and economic development. As sea level rise accelerates, more will have to be done to expand and stabilize beaches, perhaps including sand and dune replenishment and the construction of groins, jetties, and breakwaters to safeguard these world-famous tourist destinations for future generations.





Los Angeles Harbor/San Pedro and the Port of Los Angeles are two important economic engines for the City of Los Angeles. (Photo Credit Top to Bottom: California Coastal Records; Jim Fawcett).

South of Venice, on the southern side of the Palos Verdes Peninsula, the Port of Los Angeles is one of the busiest in the world, contributing more than $63 billion to the State of California, and more than $230 billion to the U.S. economy (Port of Los Angeles 2012). In fact, more than 40 percent of all imports arriving in the U.S. comes through the Ports of Los Angeles and Long Beach, where it is loaded onto trucks and trains for overland shipping.

These and other invaluable coastal assets and resources are all threatened by climate change and sea level rise. A recent study by King et al. (2011) modeled the economic impacts of 100-year floods (e.g., flooding, upland erosion and beach erosion) on five coastal California communities using baseline conditions compared to sea level rise scenarios of 1.0 m and 1.4 m. For iconic Venice Beach, King's study indicates that a 100-year storm under current conditions with no sea level rise would cause an estimated $7 million in damages. By contrast, a 100-year storm with a 1.4 m rise in sea level (projected by 2100) could potentially cause $15.1 million in damages, more than doubling the economic impact. In our study, we provide revised estimates of expected economic impacts through our Economic Vulnerability Assessment (Appendix 4).

Mitigation and Adaptation Planning Ongoing in Los Angeles

More than half of the world's population lives in urban areas, and as a result, cities have taken on the mantle of being the "first responders" to the coming climate crisis. As one of the largest cities in the world, Los Angeles has become a model for the rest of the global community in planning for climate change.

In 2007, then-Mayor Antonio Villaraigosa released *GreenLA: An Action Plan to Lead the Nation in Fighting Global Warming*, a mitigation strategy that laid out standards for reducing greenhouse gas emissions by restricting energy and land use. Among other objectives, the plan set forth a goal of reducing greenhouse gas emissions to 35 percent below 1990 levels by 2030, one of the most aggressive climate goals put forth by any city in the country. The voluntary plan identifies more than 50 action items, grouped into focus areas, to reduce emissions. ClimateLA is the implementation program that provides detailed information about each action item discussed in the GreenLA framework. Action items include harnessing wind power to generate electricity, retrofitting City buildings to make them more energy efficient, and converting the City's fleet vehicles to cleaner models.

In 2008, the City began conducting research on adaptation planning, working with the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC), the University of Southern California (USC) Sea Grant Program, and the University of California, Los Angeles (UCLA). Adaptation planning, in contrast to mitigation, focuses on planning for the projected impacts of climate change to minimize harm. Together, mitigation strategies and adaptation planning are tools that help to ensure community resilience.[5]

Through a federal Energy and Efficiency Community Block Grant to the City of L.A., LARC commissioned a simulation of climate change in Greater L.A. UCLA's Dr. Alex Hall, a leading climate scientist and member of the Intergovernmental Panel on Climate Change, is using the most scientifically advanced models in the world to simulate the impacts of climate change at an extremely high resolution. These climate change simulations will allow the City of L.A. and LARC to plan for adaptation to such impacts as temperature change, urban heat islands, increased fire frequency, and human health impacts. The research is also informative about the potential for development of local renewable energy resources that would also lead to GHG reductions. The first results of these models, describing possible temperature changes in communities across Southern California by mid-century, were released in June of 2012. Further results describing changes in precipitation, cloud cover, snowpack, winds, storms, and other patterns will be released in 2013 and 2014.

[5.] Resilience can be defined as the ability of a system to absorb some amount of change, including shocks from extreme events, bounce back and recover from that change, and, if necessary, transform itself to continue to be able to function and provide essential services and amenities that it has been designed to provide (California Natural Resources Agency, 2009).

Geographic Scope of this Study

The configuration of municipal boundaries in the City of L.A. reflects the history of the City as a collection of what were once separate municipalities. As a result, the City's coastal boundaries are discontiguous; and each region displays a variety of geomorphological and demographic traits. This plan focuses on the City's three coastal reaches: Pacific Palisades from Malibu to Santa Monica; Venice, Playa Del Rey and LAX; and San Pedro, Wilmington, and the Port of Los Angeles (Figure 1).

In the north, the coastal boundary of the City of L.A. begins in the hillside community of Pacific Palisades, an area distinguished by coastal canyons and high bluffs above a narrow coastal shelf. The Pacific Coast Highway runs along the narrow margin between Santa Monica Bay and already eroding coastal bluffs.

The community of Venice lies at low elevation along the Santa Monica Bay coastline, adjacent to the L.A. County enclave of Marina del Rey. A renowned beach destination, Venice occupies the northern side of the former Los Angeles River basin as it makes its way to the ocean.

The Playa del Rey and Playa Vista communities occupy a broad coastal plain, the former riverbed and delta of the Los Angeles River, now channelized 15 miles east and redirected to San Pedro Bay. Further south along the coast, LAX, and the community of Westchester occupy a coastal bluff bounded by wide beaches that have received significant sand nourishment during the last half century.

In the south, the coast has an east-west orientation, with south-facing beaches fronting San Pedro Bay, and a hillside community built on the eastern side of the Palos Verdes promontory. The Port of Los Angeles is built at its base and extends onto the western side of Terminal Island, a human-made island whose eastern half is part of the City of Long Beach. Wilmington lies on the north side of the Port of Los Angeles. Wilmington is a lower-income neighborhood, many of whose residents work in harbor-related businesses. To the west of Wilmington is the Harbor City community, a business area serving San Pedro and Wilmington.

Coastal Regions in the City of Los Angeles



Figure 1: Google Maps image showing the boundaries of the City of Los Angeles with the major coastal regions indicated.

Adaptation Planning Process

The time to begin planning for the impacts of climate change is now, not 20 or 30 years in the future when these effects will already have begun to disrupt business and damage critical coastal infrastructure, prompting *ad hoc* and poorly coordinated responses. Because of the unprecedented degree of stakeholder collaboration and inter-agency cooperation required for regional-scale planning, an extended time frame for taking action is critical. Understanding this urgency, the City of L.A. has decided to commence proactive planning now.

The USC Sea Grant Program worked with the City, LARC and ICLEI - Local Governments for Sustainability, USA (ICLEI), to develop an adaptation planning process. This process is collaborative, science-based, and participatory. It provides a methodology to help the City identify the vulnerabilities to sea level rise of its assets, resources and communities, and establish mechanisms for moving forward with developing adaptation strategies. This methodology draws heavily from a variety of adaptation planning guides and resources (NRC 2010, Snover et al. 2007, Russell and Griggs, 2012), as well as the considerable on-the-ground experience of the project partners.

The project began with the development of three teams, which will be key to its long-term success: an Adaptation Planning Team; the City Adaptation Leadership Team (CAL); and a Regional Stakeholder Working Group (RSWG).

The Adaptation Planning Team is comprised of Mayor's office staff and representatives from USC Sea Grant, LARC, and ICLEI. This group oversees and coordinates the process.

The CAL brings together City department principals who will be at the forefront of facing the impacts of accelerating sea level rise. Departments include: Department of Water and Power; Department of Public Works; Bureau of Sanitation; Harbor Department; Planning Department; Department of Recreation and Parks; and Emergency Management Services.



City Adaptation Leadership members at a meeting to discuss current known vulnerabilities. (Photo credit: Marika Schulhof).

The RSWG includes Los Angeles City Council staff, Los Angeles County representatives, State of California representatives, business, industry, government associations, and non-governmental organizations. The City maintains close relationships with L.A. County, which manages several important facilities in its jurisdiction (i.e., waste treatment facilities, numerous roads, the 800-acre yacht harbor and residential enclave at Marina del Rey, and County-managed beaches), and neighboring cities such as Santa Monica, Malibu, and the South Bay beach cities of Manhattan Beach, Hermosa Beach and Redondo Beach. These communities are represented in the RSWG.

There are four major milestones in the process for sea level rise adaptation planning:

1. *Identification of Current Observed Vulnerabilities*: This entails identifying City assets, resources and communities located in the coastal zone. Since many of the impacts the City will feel from sea level rise are ones the City already experiences, effort was placed towards identifying current vulnerabilities and impacts from coastal storms and extreme high tides (e.g. flooding of major infrastructure).

2. *Sea Level Rise Vulnerability Assessments*: A sea level rise vulnerability assessment evaluates the degree to which important community assets are susceptible to, and unable to accommodate, the adverse effects of climate change. In this effort, partners have examined the physical, social, economic and ecological vulnerabilities the City may face under sea level rise.

3. *Identification of Sea Level Rise Adaptation Measures*: Once vulnerabilities are understood, the City can then begin to assess how best to manage the expected impacts. There are a number of tools available for the City to consider.

4. *Development of Sea Level Rise Adaptation Plan*: This is a long-term milestone that entails the development of a sea level rise adaptation plan that is approved by the Mayor and City Council. Using the strategies and guidance put forth in this study, the City can move forward with developing site-specific adaptation and financial strategies for implementation.

While the milestones above describe a linear process that culminates in an adaptation plan, adaptation planning is indeed far from complete once a plan has been developed and approved. Scientific information is always being updated and improved and this new information should be called upon to reassess the City's vulnerabilities, plans and actions. Moreover, any action to provide adaptation will trigger other changes and will require monitoring of effectiveness. We refer to this notion as "adaptive adaptation planning." The model has been developed with this concept in mind (Figure 2).

Sea level rise is one of many climate change impacts to be addressed using this iterative and adaptive planning process. It is hoped that the process developed for sea level rise will be useful in planning for other impacts of climate change, and that the City of L.A. will be a model for the region, as well as the rest of the country, in developing climate change adaptation strategies. The City looks to LARC to transfer the knowledge gained and lessons learned from this pilot sea level rise effort within the City.

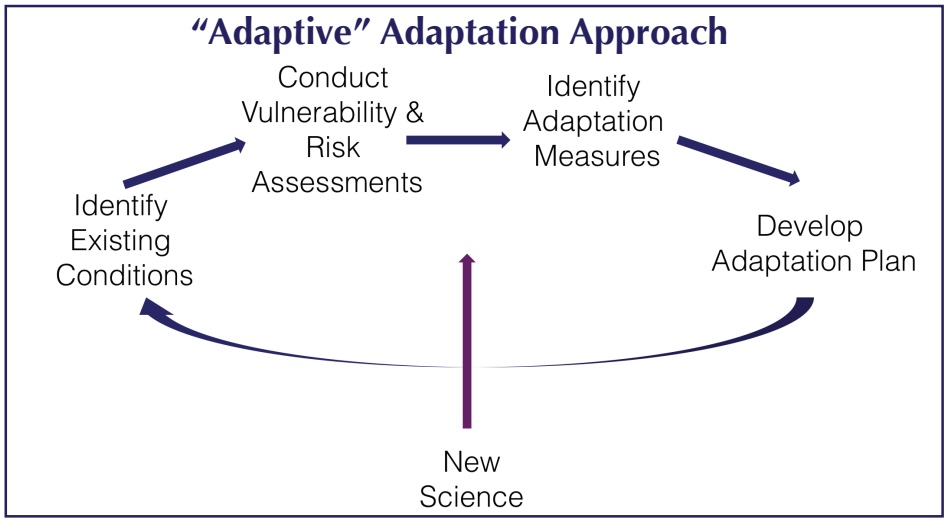


Figure 2: This schematic describes the "adaptive" adaptation planning approach. The four milestones do not describe a linear process, but rather, an iterative process that incorporates new science and information as it becomes available.

Regional Stakeholder Working Group Participation and Review

Stakeholder input is an invaluable part of the public process and particularly so when planning for a future with potentially significant impacts on the public. A Regional Stakeholder Working Group (RSWG)[1] was appointed early in the process. Through formal meetings and a review and comment process, the RSWG provided critical input to the draft and final versions of this study. RSWG members commented on the sea level rise report by providing suggestions on how to move forward in adaptation planning, expand this study in future iterations, and communicate the findings to wider audiences. While some comments were out of the scope and intent of this initial study, it is important to capture comments to assist the City as it moves to the next milestones of the process and updates this study as new science and information become available.

Comments from the RSWG include:

- It is important to look at how the methodology could be applied to regional or statewide efforts. Lessons learned would be valuable for other cities or regions undergoing vulnerability assessments.

- It may be disadvantageous to assume that the 10-year storm of the last fifty years will be the 10-year storm of the future. It is important to examine changes in strength and frequency of storm events.

- While not directly managed by the City, certain assets and resources should be closely examined and considered for further engineering studies. A few mentioned include: critical roads (i.e. PCH); seawater barriers in the County; breakwaters; piers (i.e. Santa Monica); and current or pending construction (i.e. the City's Temescal Canyon Park stormwater project).

- Consider conducting a full ecological vulnerability assessment to include all ecological resources in the City such as beaches, wetlands, open spaces and other coastal habitats.

- Consider including the impact to tourist resources and other indirect economic impacts in the analysis of economic vulnerability.

- Recommend including business continuity planning, insurance industry, risk management, emergency planning, and building design groups among groups to communicate study results and consider involving representatives in the planning process.

- An important next step would be to conduct a quantitative physical vulnerability and risk assessment to go beyond the qualitative assessment conducted in this study.

Climate Change Planning is Already Underway in the City of L.A.

By commissioning this study and by initiating this participatory process, the City of L.A. has shown tremendous leadership in proactively confronting climate change, rather than responding reactively. This study is part of a series of efforts on different aspects of climate change – heat, fresh water, fires, and human health impacts.

This preliminary sea level rise vulnerability assessment provides a first glimpse into the challenges the City may expect due to sea level rise (and other associated impacts) on its infrastructure assets, resources, and communities. The City has engaged a team of world renowned experts to identify its potential exposure to sea level rise, using a sophisticated model that examines both the impacts from rising seas, as well as flood impacts from storms and high tides, which could be exacerbated with

[6.] Members are listed on page 65.

rising sea levels. It has identified its potential vulnerabilities in order to begin planning now. Due to the participatory nature of the planning process, the City recognizes the importance of community stakeholders in identifying appropriate adaptation measures to increase its resilience and is actively engaging them in their planning process.

Prior even to the recommendations of this study, agencies within the City were already commissioning studies to understand the impacts of sea level rise on critical infrastructure. For instance, the Bureau of Sanitation, the Port of Los Angeles and the Department of Water and Power have already commissioned independent studies to assess their vulnerability to sea level rise, climate change, and tsunami risks. These studies will serve to bolster the resilience already built into many of the agencies' operations and planning.

An important adaptation strategy is mitigation through the reduction of greenhouse gas (GHG) emissions. In any sea level rise, or climate change, model, much of the uncertainty lies in not knowing which way society as a whole will move with respect to limiting its GHG emissions. Under business as usual scenarios in which we continue to emit greenhouse gases at current rates, climate change impacts will be far more severe than if we work to limit our emissions. Through its GreenLA and ClimateLA plans, the City of L.A. has emerged as a leader in its varied and numerous mitigation strategies.

The Purpose of this Document

This report contains the results of the coastal vulnerabilities report, the current observed vulnerabilities identification exercise and the physical, social and economic vulnerability assessment studies that were commissioned by the City and USC Sea Grant. In addition, a discussion of the ecological vulnerability of Ballona Creek, the City's major remaining natural coastal feature, is included. This report is meant to inform policymaking by identifying the systems and sectors most likely to be affected by sea level rise, and by furthering an understanding of each sector's vulnerabilities. Understanding these vulnerabilities will enable the City to develop strategies that increase its resilience to accelerated sea level rise and other impacts of coastal change. In the final section of the report, we identify a broad range of adaptation strategies that can serve as a foundation for future adaptation planning.

This document is one of the first tangible products of the adaptation planning effort. It represents a preliminary and first step in an ongoing process to assess the City's vulnerability and work to increase its resilience to climate change impacts. Because the science of climate change is advancing so rapidly, it is vitally important to build flexibility into the City's efforts. The result is this living document that must be continually updated to integrate new science; iterative and collaborative "adaptive adaptation planning" process is as important as the document itself.

Coastal and Shoreline Assets

Dr. Reinhard Flick, Scripps Institution of Oceanography, has developed a preliminary review of the major geographic regions within the City of L.A. and provides a brief overview of the potential adaptation strategies and next steps the City can consider in planning for sea level rise (see Appendix 1 for full report). Dr. Flick's report provides a first glimpse into potential strategies the City may wish to consider; however this report in no way replaces the critical engineering studies that should be conducted before committing to any strategy or plan. We summarize some of the key recommendations from that report below.

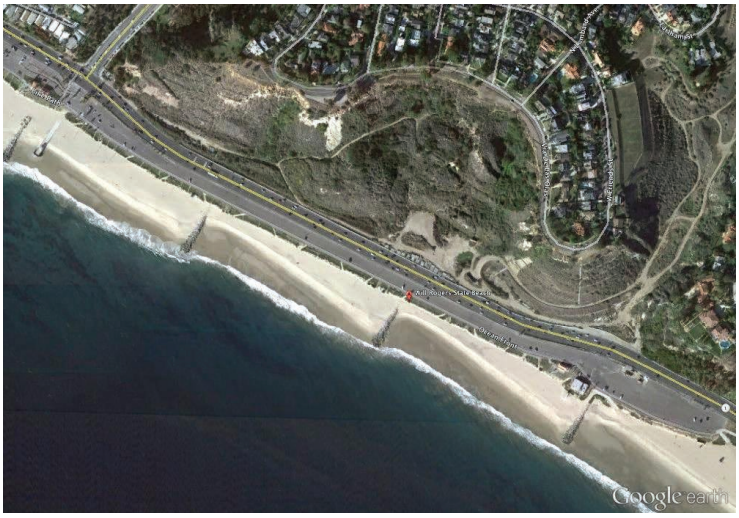
Pacific Palisades (Topanga Canyon Boulevard to Santa Monica)

This reach, or section of coastline, presents mainly major geotechnical and coastal engineering challenges, as well as complex societal and legal issues. The inland stretch along PCH is heavily developed with few or no good options for retreat of the highway. Since PCH is not likely to be moved, continued and improved armoring is the most realistic choice for avoiding undermining the roadway by wave-driven erosion. This seems to be the most vulnerable part of the entire City shoreline. Heavily-used PCH has occasionally been undermined in some spots and has required attention since it was first constructed, and will continue to do so in the future. L.A. City, County, and Caltrans highway engineers are aware of these problems, and are in the best position to suggest solutions once the future vulnerabilities are better defined. Careful quantification of the times, locations, and extent of future overtopping; ocean flooding; and undermining of PCH and other infrastructure due to erosion can eventually form the basis for a phased and ongoing plan to address geotechnical needs.

As sea level rise accelerates, it would be wise to initiate a storm watch and notification program using standard available weather and wave forecast products to provide warnings several days in advance of dangerous wave and tide combination conditions. This would facilitate traffic management, increase safety, and provide engineering data that will be useful once adaptation measures become necessary.

Beaches show a typical configuration with wave-driven sand transport predominantly to the east; that is, they are narrow or non-existent upcoast (west) where headlands block the flow of sand or divert it offshore, and widen downcoast, reaching maximum width just west of the next headland. At least annual monitoring beach widths will eventually provide the history that will be necessary to address the issues of stabilization with groins or other measures, and periodic nourishment that will almost certainly be needed in the future to maintain a sandy beach.

Will Rogers State Beach is highly instructive in that it illustrates successful and relatively unobtrusive groin beach width stabilization structures that will almost certainly become increasingly necessary if area beaches are to be preserved in the future. Everts Coastal (2002) provides quantitative assessments of major shoreline sand retention structures and guidelines that will be helpful for engineers planning future structures. As with the beaches to the west, at least annual systematic monitoring of beach width should be conducted.



Google Earth image of Will Rogers State Beach with effective groin beach stabilization.

Venice-Marina Peninsula-Playa Del Rey-LAX

This reach is a central part of Santa Monica Bay's iconic "Bay Watch" beach system that extends from Malibu to Redondo Beach and provides major economic benefits from recreation, boating, utility siting, and tourism. It has mostly wide to very wide beaches that were largely created by sand supplied as a by-product of coastal construction activity, including LAX, Marina Del Rey, and the Hyperion Wastewater Treatment Plant (Flick 1993; Leidersdorf and Woodell 1993, 1994).



View south of iconic beaches of central Santa Monica Bay: from Venice (pier, lower right) past Marina Del Rey jetties and west end of LAX runways, toward Redondo Beach (Wikimedia Commons photo, 2007).

While these beaches have been wide and stable for many decades, gradual retreat is already in progress. The main concern for the future is that sand is not being provided at nearly the rate it was up until the 1960s. As sea level rise accelerates in the future, these iconic L.A. beaches will undoubtedly narrow at an even faster rate. It is unlikely that any storm-wave driven flooding or property damage will occur in the foreseeable future, but if sea level rise takes one of the higher trajectories, problems would become evident around mid-century.

To maintain the property protection and recreational benefits of these beaches, sand nourishment will be necessary at some point in the future. To enable sound engineering benefit/cost analyses for these inevitable projects, it will be necessary to monitor the beach width going forward, in a manner similar to that discussed in the context of the beaches in the Pacific Palisades reach. The Venice-Marina Peninsula-Playa Del Rey-LAX reach is ripe for wave- and sea level rise-driven beach retreat modeling, since a wealth of historical beach profile, shoreline position, and wave data already exists. Such work could help to narrow the uncertainty of future rates of beach loss due to sea level rise using empirical models currently under development. This is of course a regional, and in fact a state-wide necessity, and not only a City of L.A. concern. However, the City can play a vital role in highlighting the need for monitoring and coordination of local, regional, state, and federal constituencies.

San Pedro-Wilmington-Terminal Island-L.A. Harbor Exposed Coast

The San Pedro part of L.A. has a south-facing exposed open-coast portion, and an east-facing section sheltered behind the L.A.-Long Beach outer breakwater. Both sections are heavily suburbanized atop a flat coastal terrace that has a 35 m (115 ft) high sea cliff at its seaward edge. The geology suggests relatively resistant formations at sea level near Cabrillo Point, but more erodible material to the west toward Point Fermin. As sea level rise accelerates, the weaker cliff sections will be subject to more undermining from wave action and eventual collapse than the more resistant sections. Ongoing — at least annual — monitoring of cliff retreat is recommended.

Inspection of aerial photos (Google Earth) shows that about 25% of the cliff edge in San Pedro is occupied by park or other open space, which minimizes the vulnerability of property loss from cliff failure. Cliff-top development on the other 75% of the exposed western end of San Pedro has substantial setback from the edge of the cliff. Therefore, few if any developments will be immediately threatened. However, several areas of geotechnical instability are evident, especially related to land sliding. Some

residential development on the cliff top at the eastern end of the exposed section of San Pedro has little setback and may be threatened if cliff retreat resumes or accelerates in response to sea level rise.

L.A. Harbor

The L.A.-Long Beach outer breakwater starts at Cabrillo Beach and protects everything behind it (to the north) from wave attack. Components of harbor infrastructure and Port of Los Angeles operations may be vulnerable to sea level rise. But this again presents mostly a major harbor engineering project that will have to be undertaken in stages as problems become apparent. For example, the outer breakwater is highly effective at sheltering the harbor and adjacent coast from wave action, but it is frequently overtopped during high wave events coinciding with high tides. If wave climate becomes more severe, more damage to the breakwater itself is likely and may require elevation.



View north over L.A.-Long beach outer breakwater Angel's Gate toward Port of Los Angeles and Terminal Island (lower right) Wilmington is visible in the distance (Port of Los Angeles photo).

Anecdotal evidence suggests that the Port infrastructure can accommodate even mid-to high-range sea level rise scenarios by periodically being raised during major refitting construction projects. A study by the RAND Corporation was conducted to determine the Port's vulnerabilities and what accommodation and adaptation strategies will be needed (Lempert et al. 2012).

Immediate Sea Level Rise Adaptation Actions

Each coastal community within the City of L.A. will require its own specific adaptation strategies. In the cases of the need for geoengineering solutions, these strategies will require the accompanying engineering and geotechnical studies. There are, however, several important actions that can be taken immediately, requiring minimal financial expenditures, that would serve to advance the City's efforts to prepare for the impacts of sea level rise. These include:

- Storm watch and notification;
- Semi-annual beach width monitoring;
- Annual monitoring of cliff retreat;
- Use of historical beach profiles and existing wave data to develop predictions; and
- Coordination with local, regional, state and federal agencies, especially Los Angeles County (Public Works and the Department of Beaches and Harbors) and the U.S. Army Corps of Engineers.

Current Observed Vulnerabilities and Physical Vulnerability Assessment

This section provides an overview of current observed vulnerabilities conducted by USC Sea Grant and the physical vulnerability assessment survey conducted by ICLEI – Local Governments for Sustainability, U.S.A. (ICLEI). The ICLEI report is presented in its entirety in Appendix 2. All of the information on the City's assets is presented in a series of matrices in this section that include a description of the asset, an overview of current observed vulnerabilities to storms and high tide events, and a description of its potential physical vulnerabilities due to rising sea levels as described by ICLEI.

Current Observed Vulnerabilities

The first step in the adaptation planning process, conducted during the winter of 2012, was to work with City staff from the City Adaptation Leadership team (CAL) to identify and examine current observed vulnerabilities and existing conditions. Members of the CAL were asked to:

- Identify their major assets within the coastal zone;
- Provide a brief description of the asset; and,
- Provide a description of the current known vulnerabilities and environmental issues related to maintenance and functioning of these assets.

The assets and observed conditions were identified in a two-fold process. First, we developed a series of maps on which City officials identified coastal assets and known vulnerabilities. This was followed by a worksheet in which officials provided more detailed information about the asset and its current vulnerabilities. We also include a replacement value, where that information is available, for some of the City assets. It should be noted that these replacement values were not derived from the economic study described in Appendix 4, but rather were self-reported by City agency officials. Information gathered during this exercise is summarized in the asset matrices presented at the end of this section (pages 20-48).





Members of the CAL during a mapping exercise in which members were asked to identify coastal assets and their current vulnerabilities. (Photo credit: Marika Schulhof).

Physical Vulnerability Assessment

Overview on Physical Vulnerability Assessments

A sea level rise physical vulnerability assessment considers areas where important community assets are susceptible to, and unable to accommodate, the adverse effects of sea level rise. Four factors are generally considered in vulnerability assessments: *exposure*, *sensitivity*, *adaptive capacity* and *consequences*.

Exposure is defined as the nature and degree to which a system experiences a stress or hazard. In the case of sea level rise, this would entail identifying which assets, resources or communities may be vulnerable to impacts from sea level rise. This includes examining both flooding (defined as land that was once dry that becomes *temporarily* wet either periodically or episodically) and inundation (defined as land that was once dry that becomes *permanently* wet or underwater), (Flick et al. 2012).

Sensitivity is defined as the degree to which exposed assets would be impaired by sea level rise. Assets that are greatly impaired by sea level rise have a *high* sensitivity, whereas assets that are minimally impaired by the same change in sea level have a *low* sensitivity.

Adaptive capacity is the ability of an asset to make adjustments in response to a climate impact to maintain its primary functions. This does not mean that the asset must look the same as before the impact, but it must provide the same services and functions as it did before the impact occurred.

Consequences are the adverse effects that occur as a result of an asset being impaired by a climate impact. City officials were asked to describe consequences for the economy, environment, and communities and populations. They were also asked to consider the magnitude of the consequence, such as a size of the population, land area, or resources that would be affected.

Identifying the City's Exposure

While the exercise conducted to identify current observed vulnerabilities served as guidance for preliminary analysis, it was imperative to use the best available science when focusing in on the City's potential vulnerabilities to sea level rise. This was determined to be a coastal impacts model developed by Dr. Patrick Barnard and colleagues from the U.S. Geological Survey (USGS). This model incorporates not only the impacts of a rising sea, but also the impacts of tides, and extreme waves and storm surge associated with severe coastal storms.

The USGS model is based on a storm that occurred in the Los Angeles region during January 2010. This El Niño-fueled storm produced large waves (with a maximum wave height offshore of Los Angeles of 7.5 m, or 25 ft) that remained elevated for a week, producing some of the most extreme coastal erosion observed for several decades in Southern California and causing severe flooding in some coastal communities.



Image of flooding in San Pedro (5th St. and Pacific Ave.) during the January 2010 storm. (Photo credit: Robert Casillas, http://lapd.com/news/headlines/torrential_rains_pound_san_pedro/).

Once the model appropriately recreated, or hindcast, the impacts from this 2010 storm, the modelers applied two sea level rise

Components of Total Water Predictions

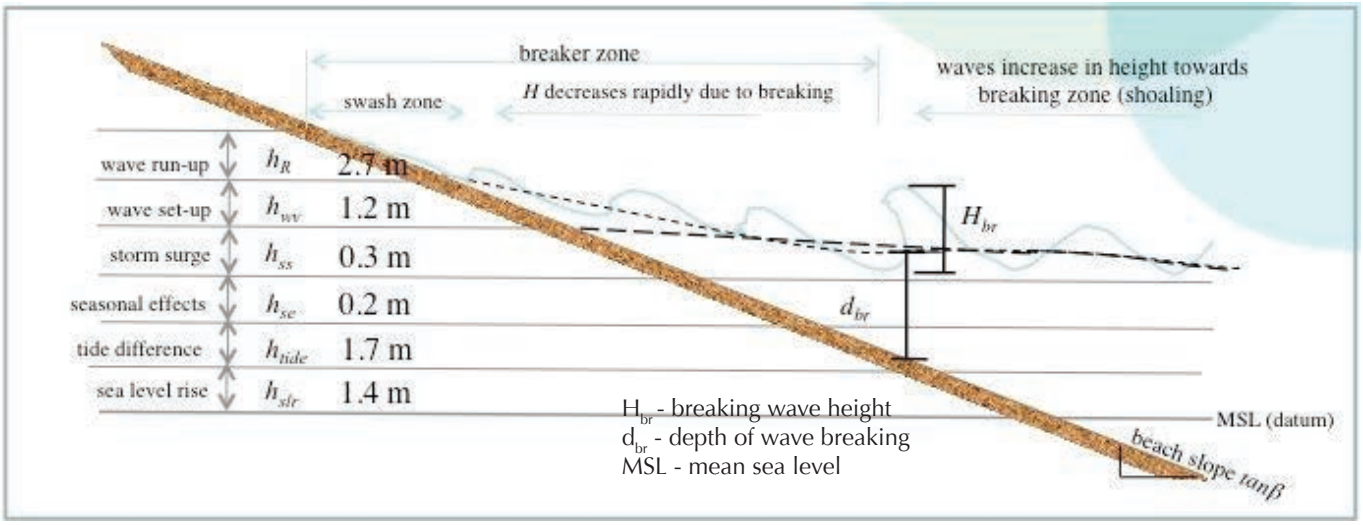


Figure 3: This diagram depicts the total coastal water level components caused by both sea level rise and storms driven by climate change that are used in the coastal impacts model to predict coastal flooding. The diagram includes the upper-end sea level rise scenario predicted between 2000-2100 and the wave height, surge and tidal ranges predicted for Southern California under a 10-year storm scenario. (Source: Patrick Barnard, USGS).

scenarios using the upper-end sea level rise scenarios of 0.5 m (1.6 ft) between 2000 - 2050 and 1.4 m (4.6 ft) between 2000 - 2100 based on Rahmstorf (2007). These sea levels were added to the tide, wave, and wind conditions of the January 2010 storm to project the potential for increased flooding that could result from various sea level rise scenarios under a similar storm event (Figure 3).

The City used these scenarios to identify the exposure of its assets to sea level rise. The maps used by the City to assess vulnerability are presented in subsequent pages of this report (Figures 4-6, pages 17 - 19).

While there are a number of coastal impact and sea level rise models available for use, it was determined at the time of this analysis that the USGS model provides the best scientific description of what could be expected from the combination of sea level rise and a moderately severe winter storm. However, there are two important caveats that should be noted:

- The January 2010 storm is considered a moderately severe "10-year" storm, which means it has a 10% chance of occurring on a yearly basis. Most planning departments and insurance estimates base their analyses on the "100-year" storm, or a storm that has a 1% chance of occurring in a single year. This model therefore provides a conservative estimate of flooding.

- As the science advances, sea level rise scenarios and the ranges and average rates of sea level rise associated with those scenarios will continue to be updated and modified. For this report, the USGS model used sea level rise scenarios based on a highly-respected and cited report published in 2007 (Rahmstorf 2007). Since then, a study by the NRC has refined these scenarios specifically for the West Coast of the U.S. This new study suggests that Southern California should plan for a range of sea level rise of 0.1 - 0.6 m between 2000 - 2050 and 0.4 – 1.7 m between 2000 - 2100. The difference in these scenarios (recent NRC study vs. Rahmstorf's estimates) does not invalidate the results of our preliminary vulnerability assessment, but rather underscores the need to continually reassess vulnerabilities based on the best available science. Sea level rise, and climate change, vulnerability assessment is an iterative process and it is critical to allow for the "adaptive adaptation planning" approach we advocate in this report. We strongly recommend that as more information becomes available, the City incorporate this new information and reassess their assets' vulnerabilities.

Analysis of the City's Assets Exposure

Based on the exposure of City assets identified by the USGS model, ICLEI employed a qualitative and participatory methodology to gauge the sensitivity and adaptive capacity of the systems addressed in this report. Specifically, ICLEI developed a detailed survey that required respondents to consider a system's sensitivity, adaptive capacity, and consequences of not protecting these assets from accelerated sea level rise. The vulnerabilities for each asset were determined using answers to the survey and subsequent follow-up conversations with City staff.

The ICLEI report revealed vulnerabilities in wastewater management, stormwater management, potable water systems, and roads. Within the City's wastewater management system, collection systems in low-lying areas are particularly vulnerable to flooding, tidal and groundwater inflow, which cause wastewater to discharge into the ocean. Wastewater treatment plants also are vulnerable to inundation and flooding, which could damage systems and impact operations, and also result in wastewater being discharged into the ocean.

The ICLEI report found that the City's stormwater management system is vulnerable to flooding and inundation, potentially causing flooding in low-lying areas. Likewise, the potable water system is vulnerable to flooding, inundation and groundwater intrusion, making access to underground infrastructure difficult and thereby posing a risk to public health. The City's roads are also vulnerable to flooding, inundation, and groundwater inflow, potentially putting access to transportation and emergency services at risk. Coastal buildings, especially in Venice, which is near sea level, are vulnerable to flooding and inundation.

In contrast, the ICLEI report revealed that the Port and City energy facilities have relatively low vulnerability to sea level rise. The Port, although susceptible to flooding and inundation because of its low elevation, was found to have a high capacity to adapt, as it plans to build future infrastructure at higher elevations. However, the vulnerability of roadways surrounding the Port needs to be a consideration in future assessments due to the potential to interrupt the movement of goods. Energy systems have low vulnerability because of replacement schedules and built-in system redundancies.



A sand dune protects a L.A. power generation plant while residents enjoy coastal recreation. (Photo credit: Marika Schulhof)

City parks and open areas were determined to have moderate vulnerability to flooding because they can be restored relatively quickly. On the other hand, museums and other structures have higher vulnerability because of the damage that would be incurred by flooding or inundation.

Identifying components of the City's infrastructure that are at risk is the first step toward building future resilience for sensitive assets. It also helps educate the public about potential risks and opportunities to manage those risks. Proactive planning at this relatively early juncture will increase the City and region's capacity for building the Los Angeles of the future.

It is important to highlight, however, that many of the City's agencies had already begun planning for climate change prior to the initiation of this study. For instance, the Bureau of Sanitation (BOS) has

recognized that climate change effects may impact assets and operations and has developed strategic planning goals and outcomes to lessen these impacts. Additionally, the BOS includes capabilities for upgrades and replacement of equipment, facilities and infrastructure in its planning and capital improvement programs. They have already commissioned engineering studies to address potential flooding at several critical locations. Since 2011, the Port has been working with the RAND Corporation to conduct a sea level rise vulnerability study. Similarly, in 2010, the Department of Water and Power conducted a tsunami study. While tsunamis are not directly related to sea level rise and climate change, wave run-up and surge from a tsunami provide a good, if extreme, corollary to what could be expected in the future with higher sea levels and a major storm. Analyses from all of these studies have been incorporated in the sea level rise vulnerability study we discuss here.

Sea Level Rise Exposure Maps
Pacific Palisades Area

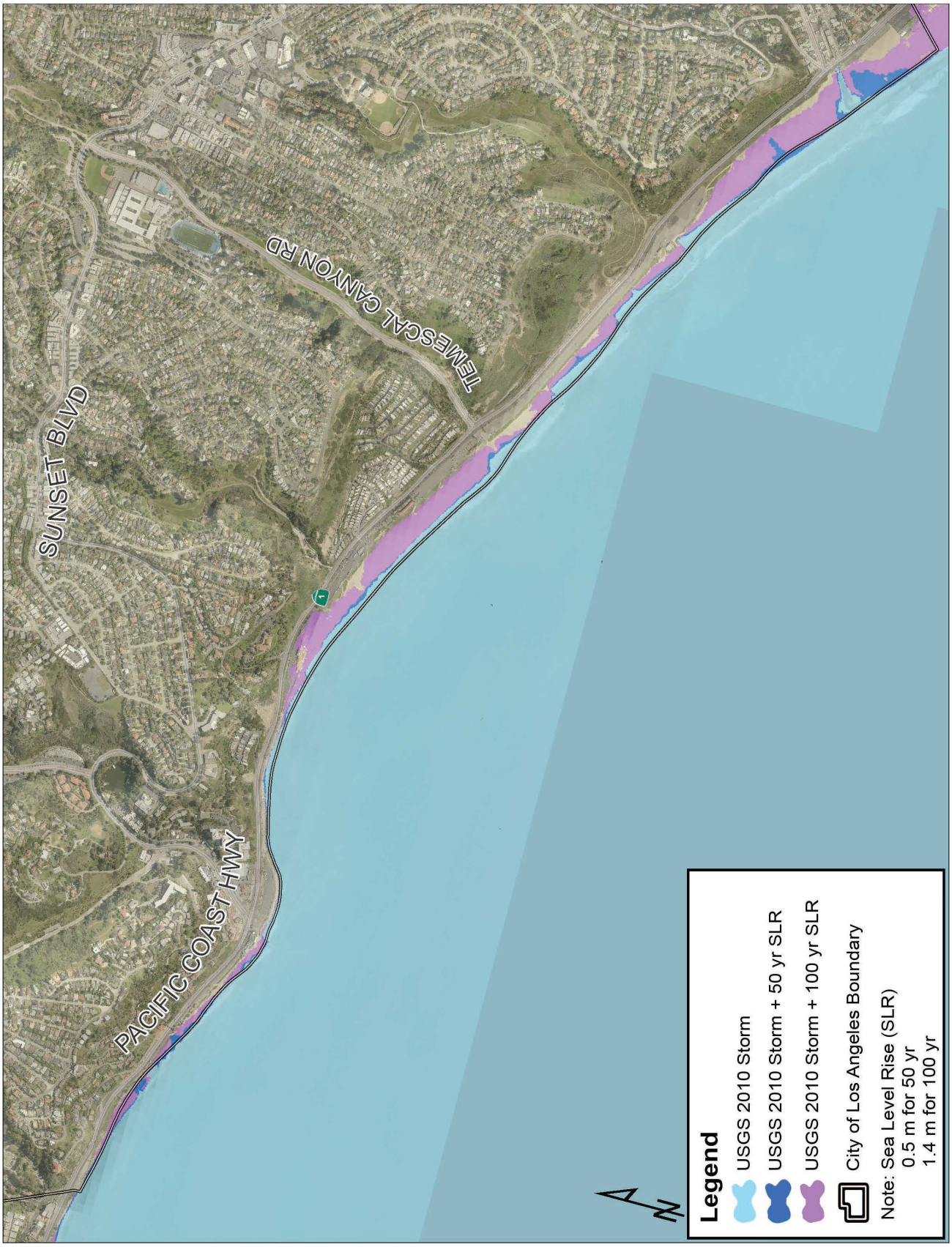


Figure 4

Sea Level Rise Exposure Maps
Venice Area

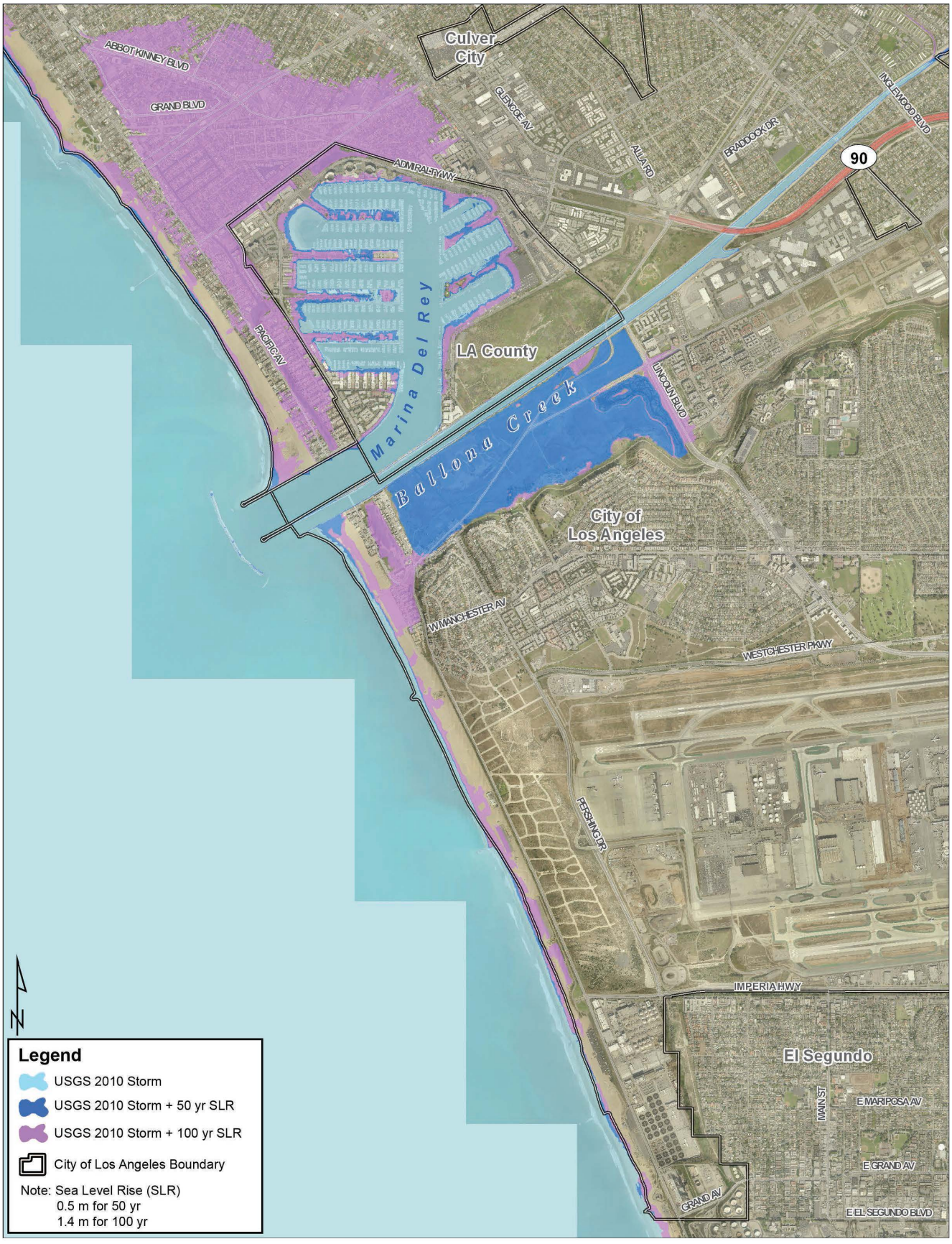


Figure 5

Sea Level Rise Exposure Maps
Harbor Area

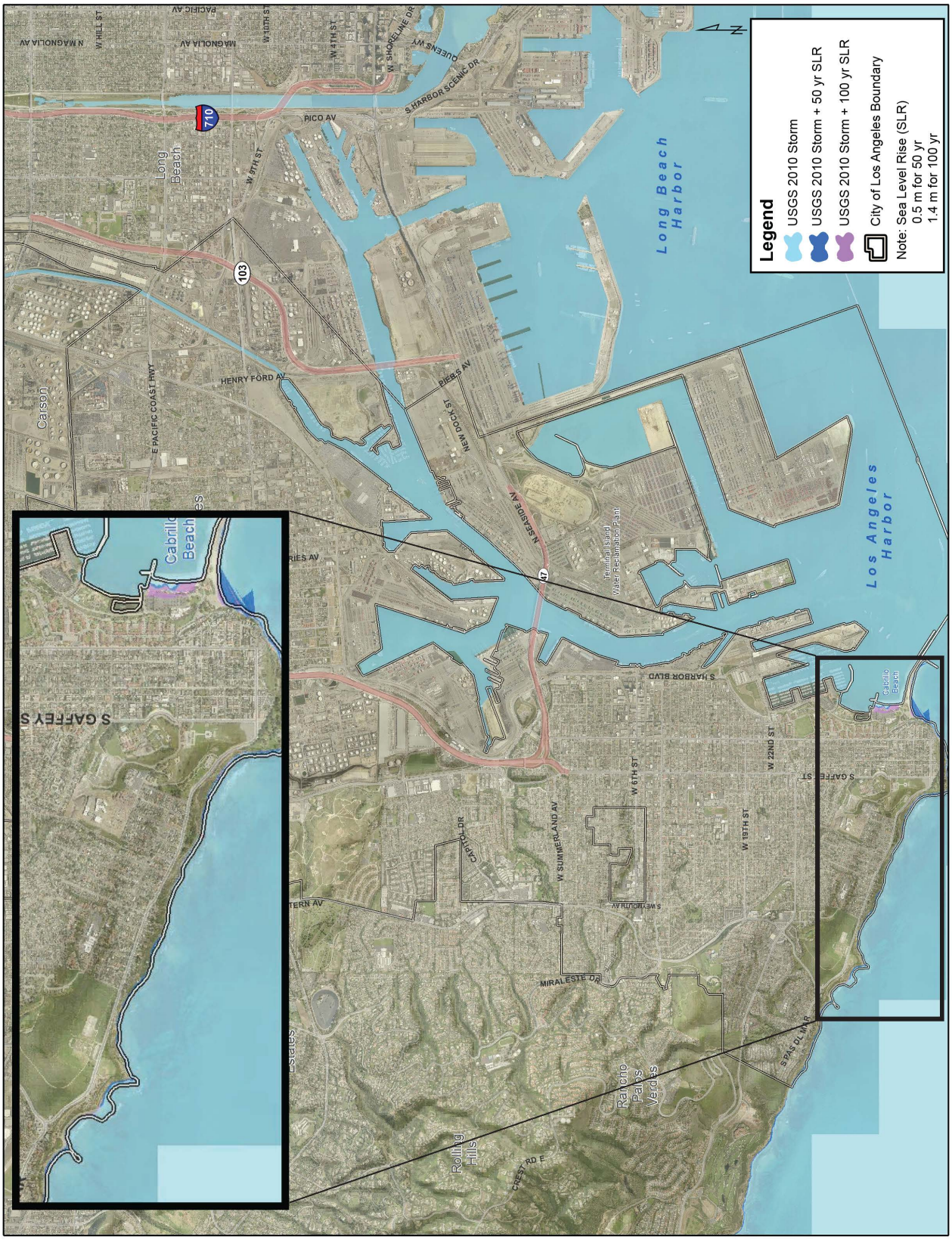


Figure 6

City Asset Matrices: Current Observed and Expected Physical Vulnerabilities

In the subsequent pages, we provide matrices for each asset by City sector. These matrices provide:

1. An overview of the asset that describes the function of the asset, the responsible City department/ point of contact, the associated regulatory oversight and a description of the asset;

2. Current, known vulnerabilities (e.g., does the asset currently flood under extreme high tides or severe storms?);

3. A summary of the asset's sensitivity and adaptive capacity in response to sea level rise associated impacts, along with the consequences of inaction; and,

4. An estimate of replacement value. It should be noted that these values are self-reported by the responsible City department and are not correlated with the economic vulnerability assessment described below (see also Appendix 4).

In some of the matrices, a unique asset is described (e.g., Hyperion Wastewater Treatment Plant). For these, exposure maps are included that demonstrate the potential flooding due to both 0.5 m and 1.4 m sea level rise. In other instances, assets are grouped by type (e.g., fire hydrants). In these matrices, maps are not included because the assets cover too broad of a geographic region. The number of assets for each sub-region (Pacific Palisades, Venice/LAX, and San Pedro/Harbor) are included.

Hyperion Wastewater Treatment Plant (HTP)
12000 Vista Del Mar Blvd
Playa Del Rey, CA 90293

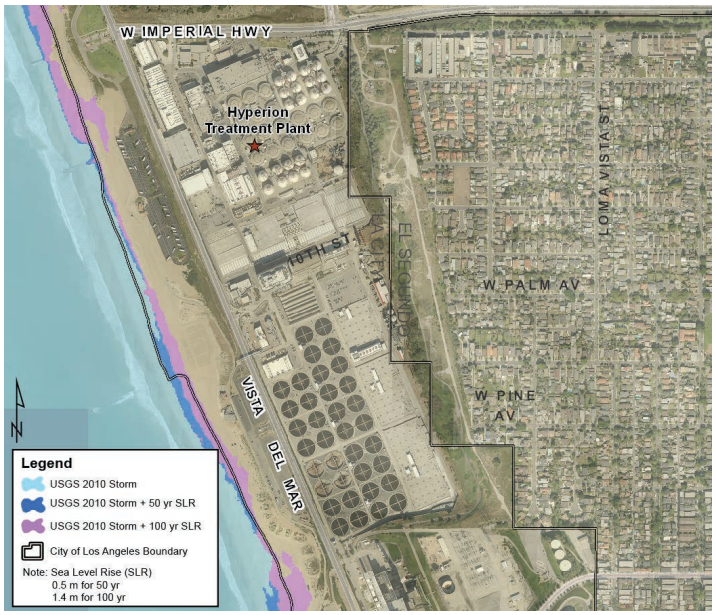
Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Public Works, Bureau of Sanitation

Regulatory Oversight:
Regional Water Quality Control Board
State Water Resources Control Board
Environmental Protection Agency
South Coast Air Quality Management District

Summary of Asset:
HTP is located next to Dockweiler State Beach at approximately 32 feet above sea level. The major treatment processes at this plant include screening, grit removal, primary sedimentation, and secondary treatment. After secondary treatment, the wastewater is discharged into Santa Monica Bay through the five-mile submerged outfall.



Current Observed Vulnerabilities

Localized flooding and damage to equipment and structure of facility is possible due to extreme wet weather, if there are failure(s) to critical individual unit processes (facilities), failure of effluent pumping, or failure of influent bypass pumping of influent sewer flow. Damage to process control operations (secondary treatment) is possible from extreme wet weather washout.

Possible structural damage from seismic or tsunami events, combined with extreme wet weather, could result in failure of critical plant process equipment and/or inability to transport biosolids to reuse sites, due to restricted local road and interstate highway access.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (MEDIUM)
HTP is sensitive to storm-related flooding which could cause equipment and operations failures due to damage of electrical pumps and panels from exposure to water. A dramatic increase in sea level could reduce the plant's efficiency in the discharge of effluent, because the pumped flow would be met with more water pressure. While erosion could result in some loss of the beach in front of the plant, the plant itself is not very sensitive to erosion or interaction with the groundwater because it is built on top of a large cement catacomb.	The plant's ability to continue to function if it is partially disabled depends on the severity of the impact. The plant maintains additional flow capacity, so if one part of it becomes impaired, the plant will continue to treat and handle the quantity of wastewater entering the plant. The plant is equipped with pumps that could remove water relatively quickly and has a redundant 1-mile outfall. Emergency generators have been placed at all critical facilities. The Bureau of Sanitation is securing an on-site renewable energy power source to maintain service in case of grid failure.	The primary economic consequences would be repairing the plant. Impacts to individual pieces of equipment would cost significantly less than the loss of the entire facility. The primary environmental consequence would be the discharge of partially treated wastewater into Santa Monica Bay which would be temporary in nature and therefore may impact habitat and wildlife.

Replacement value (i.e., cost of inaction):	$3 billion

Terminal Island Water Reclamation Plant (TIWRP)
445 Ferry Street, San Pedro, CA 90731

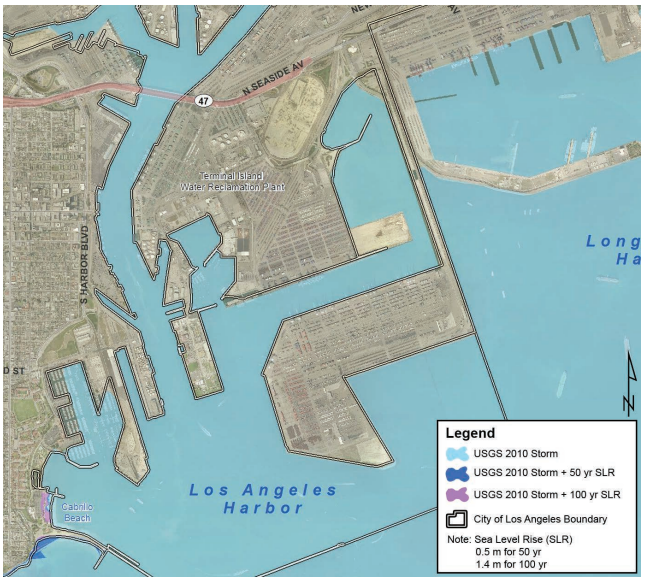
Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Public Works, Bureau of Sanitation

Regulatory Oversight:
Regional Water Quality Control Board
State Water Resources Control Board
Environmental Protection Agency
South Coast Air Quality Management District

Summary of Asset:
TIWRP is a tertiary/advanced water reclamation plant that treats municipal and industrial wastewater. It is located on Terminal Island, and is situated on a 19.8-acre site, parts of which are located below sea level. Raw wastewater reaches the plant through a series of pumping plants and force mains. The plant provides preliminary, primary, secondary, tertiary, advanced and solids handling and treatment facilities. The TIWRP currently discharges tertiary effluent to the Los Angeles Harbor.



Current Observed Vulnerabilities

Localized flooding and damage to equipment and structure of facility is possible due to extreme wet weather, possibly resulting in failure(s) to critical individual unit processes (facilities), failure of effluent pumping, or failure of influent bypass pumping of influent sewer flow. Damage may occur to process control operations (secondary treatment) from extreme wet weather washout and gallery flooding.

Possible structural damage from seismic or tsunami events, combined with extreme wet weather, could result in failure of critical plant process equipment and/or inability to transport biosolids to reuse sites, due to weather related road closures and interstate highway access.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (MEDIUM)	Adaptive Capacity (MEDIUM)	Consequences (MEDIUM)
Terminal Island Reclamation Plant is sensitive to storm-related and tidal flooding, which could cause equipment damage and operations failures. The property is impacted by extreme high tides during which it pumps out seawater. With sea level rise, king high tides could pass through the gates at the rear of the plant, inundating some facilities. A storm-related event could exceed the design capacity of the plant, flooding galleries and damaging equipment. As a result, partially treated wastewater could be discharged into the Los Angeles Harbor.	The plant would continue to function if partially disabled. At the current flow of 15 MGD the plant has some additional capacity to handle increased flow during storm events. Depending on the equipment damage caused by a storm event, the plant may be temporarily or partially disabled and may require emergency generators or pumps to be used to ensure that wastewater continues to be discharged to the outfall. Engineering studies that include assumptions about flood depth and duration would help to refine an evaluation of adaptive capacity.	The economic consequences of impairment of TIWRP are medium. If the pumps fail, emergency response actions would be needed to remove the water to return the plant to service. Impacts to individual pieces of equipment would cost significantly less than the loss of the entire facility. Damage to processes could result in partially treated wastewater discharges, with public health impacts and environmental consequences that would be localized and temporary. Partially treated wastewater could spill into the San Pedro Harbor, affecting fishing communities, recreational opportunities and habitat.

Replacement value (i.e., cost of inaction):	None provided

Venice Collection System

Coastal Interceptor Sewer runs along the coastline; the south end begins at the Hyperion Treatment Plant.

Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Public Works, Bureau of Sanitation

Regulatory Oversight:
Regional Water Quality Control Board
State Water Resources Control Board
Environmental Protection Agency

Summary of Asset:
The Venice Collection System is part of the Coastal Interceptor Sewer, which runs along the coast from West Los Angeles to the Hyperion Treatment Plant.



Current Observed Vulnerabilities

Structural damage possible from seismic or tsunami, combined with Extreme Wet Weather, could result in failure of critical conveyance equipment.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (MEDIUM)	Adaptive Capacity (MEDIUM)	Consequences (HIGH)
The Venice collection system is sensitive to interaction with groundwater, storm-related and tidal flooding, because water entering the collection system reduces its capacity. Erosion could also potentially damage the pipes.	The collection system can continue to function if partially disabled, because it will continue to convey wastewater into the Hyperion Treatment plant at reduced capacity. The BOS is upgrading the system to be more resilient to storm-related flooding through proactive maintenance and functional improvements and has emergency response plans to control overflows and maintain the integrity of the collection system.	The economic consequences of impairment of this asset include the costs of repairing the system. Damage to the system could also cause wastewater spills in the Santa Monica Bay, which would have environmental, public health and economic impacts.

Replacement value (i.e., cost of inaction):	None provided

Venice Storm Water / Urban Runoff Pumping Plant (VSPP)
1600 Main Street
Venice, CA 90291

Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Public Works, Bureau of Sanitation

Regulatory Oversight:
Regional Water Quality Control Board
State Water Resources Control Board
Environmental Protection Agency

Summary of Asset:
The Venice Storm Water / Urban Runoff Pumping plant is a low flow diversion pump designed to move urban runoff and, in the wet season, stormwater flows from a lower elevation up to a higher one, so that it can be transported through pipelines by gravity for eventual processing at a treatment plant during low flows and discharge into the ocean during storm flows.



Current Observed Vulnerabilities

Pumping plant may be damaged if an extreme wet weather event floods electrical components. It is in the Tsunami Warning Area. Severe tidal condition could flood the plant.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (LOW)
The VSPP is not sensitive to storm-related flooding, tidal flooding, and erosion. Discharge during each storm season continues as designed and does not impact pumping capacity. The pump does not operate during rain events and the flow is conveyed to the discharge locations by gravity. The plant is located between the beach and a channel, so the plant could potentially be inundated by sea level rise from both sides.	The plant has been identified as an asset that is functioning as intended. Any flooding would not be related to function of the low flow pump. The BOS is evaluating the need to make the plant more resilient to storm-related flooding through functional and reliability improvements. The BOS has emergency plans in place to restore function. A study to better understand the impacts of groundwater and seawater intrusion into the VSPP is underway.	Any localized flooding would not be related to function of the low flow urban runoff diversion pump. Flooding would have high social consequences including displacement and public health concerns. The replacement value of the plant itself is ten million dollars however impacts to individual pieces of equipment would cost significantly less than the loss of the entire facility.

Replacement value (e.g., cost of inaction):	$10 million

San Pedro Storm Water Collection System
San Pedro Storm Drain Network
Harbor Area, Terminal Island Basin

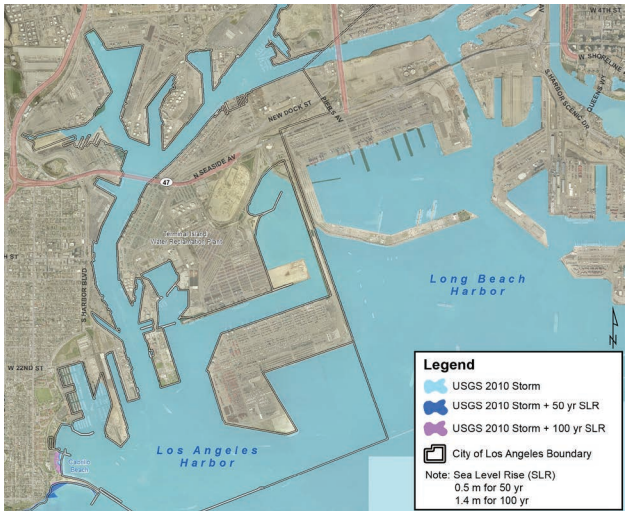
Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Public Works, Bureau of Sanitation

Regulatory Oversight:
Regional Water Quality Control Board
State Water Resources Control Board
Environmental Protection Agency

Summary of Asset:
The San Pedro storm water collection system includes the storm drain network in the San Pedro area. Many lines are located below sea level.



Current Observed Vulnerabilities

The stormwater management system is vulnerable to extreme weather, flooding, and inundation, which could exacerbate flooding in low-lying areas.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (MEDIUM)	Adaptive Capacity (MEDIUM)	Consequences (MEDIUM)
This system is sensitive to storm-related and tidal flooding. Large amounts of water may enter the system, either through storm-water or high tides, exceeding the capacity of the system and causing neighborhoods to flood.	The system is able to function if partially disabled and will continue to convey storm water at a reduced capacity. The ability of the system to be quickly restored depends on the severity of the storm and the functionality of other connected facilities in the system. This system has been impacted by storm-related flooding and the Department of Public Works was able to reroute, relocate and resize the pipes, as well as remove some turns which had constrained the flow to eliminate the localized flooding.	The consequences of an impaired system are medium related to the economic impacts of flooded homes and streets.

Replacement value (e.g., cost of inaction):	None provided

Wastewater Pumping Plants

Asset Overview

Location and Number of Assets*

Pacific Palisades Sub-Region:	Venice/LAX Sub-Region:	San Pedro/Harbor Sub-Region:
Pacific Palisades (4)	Los Angeles (1) Venice (1) Playa del Rey (1)	Wilmington (6) Terminal Island (4) San Pedro (6)

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Public Works, Bureau of Sanitation

Regulatory Oversight:
Regional Water Quality Control Board
State Water Resources Control Board
Environmental Protection Agency

Description of Assets:
Wastewater pumping plants are located underground and move wastewater from a lower elevation up to a higher one, so that it can be transported through municipal sewer lines for eventual processing at a treatment plant. There are approximately 21 plants located in the exposure zone.

Current Observed Vulnerabilities

Pumping plants may be damaged if an extreme wet weather event floods electrical components and there is no emergency generator on site. The pumping plants are located in a Tsunami Warning Area. Severe tidal conditions could flood plants causing a wastewater spill.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (HIGH)	Adaptive Capacity (MEDIUM)	Consequences (HIGH)
The wastewater pumping plants are taxed by storm-related flooding and the impacts of sea level rise would only exacerbate those problems. Storm-related and daily tidal flooding could cause electrical equipment to fail or flood the plant.	Many locations have backup generators on site. The BOS has plans to be able to get to these plants so they could be quickly and easily restored if impaired. This depends on the severity of the event. The BOS is undertaking efforts to make these plants more resilient to flooding.	Impairment of these plants would have significant economic consequences. Each of these 21 plants has an approximate two million dollar replacement value. In addition, damage to these plants could result in wastewater spills resulting in negative economic and environmental impacts.

Replacement value (e.g., cost of inaction)	$2 million/per plant (21 plants in exposure zone)

* Please refer to subregional maps on pages 17-19.

Low Flow Diversion Pumps

Asset Overview

Location and Number of Assets*

Pacific Palisades Sub-Region:	Venice/LAX Sub-Region:	San Pedro/Harbor Sub-Region:
Pacific Palisades (3)	Venice (1)	none in coastal zone

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Public Works, Bureau of Sanitation

Regulatory Oversight:
Regional Water Quality Control Board
State Water Resources Control Board
Environmental Protection Agency

Description of Assets:
There are four low flow diversion pumping plants located in the exposure zone, and they are designed to move water during low flow periods from lower to higher elevation, so it can be transported through pipes by gravity for eventual processing and cleaning at a treatment plant. They do not usually operate during storm events.

Current Observed Vulnerabilities

Pumping plant may be damaged if extreme wet weather event floods electrical components. Located in a Tsunami Warning Area. Severe tidal condition could flood the plant causing inability to divert storm water. Severe tidal condition could flood the plant causing wastewater spill.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (LOW)
Discharge during each storm season continues as designed and does not impact pumping capacity as the pump does not operate during rain events and the flow is conveyed to the discharge locations by gravity.	The pumps can be restored to operation prior to the dry season if they are impaired by storm-related flooding.	The primary economic consequence would be repair or replacement of the plants, which have a million dollar replacement value each.

Replacement value (e.g., cost of inaction)	$1 million/per plant (4 plants in exposure zone)

* Please refer to subregional maps on pages 17-19.

Harbor Generating Station
161 N Island Ave
Wilmington, CA 90744

Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Water and Power

Regulatory Oversight:
North American Electric Reliability Corporation (NERC), Western Electricity Coordination Council (WECC), Southern California Air Quality Management District (SCAQMD)

Summary of Asset:
The Harbor Generation Station is a natural gas fired steam electric generating facility located in the Wilmington area. The facility's total capacity is 472 megawatts and it occupies approximately 20 acres.



Current Observed Vulnerabilities

Energy facilities have low vulnerability to the impacts of sea level rise, because all coastal assets were designed to withstand exposure to water. In addition, replacement schedules and system redundancies reduce vulnerability.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (MEDIUM)
The Harbor Generation Station is not sensitive to the impacts of sea level rise, such as storm-related flooding, tidal flooding, erosion, and interaction with groundwater, because, as a coastal asset, it was designed to be able to cope with these impacts.	This asset can continue to function if partially disabled and its functionality can be restored quickly if impaired. Outdoor components are designed for water resistance and exposure. Indoor components are designed for water to drain into sumps and are also equipped with pumps to quickly remove the water from the sumps.	Impacts would be equally distributed to the immediate area.

Replacement value (e.g., cost of inaction):	None provided

Haynes Generating Station
6801 E 2nd Street
Long Beach CA 90803

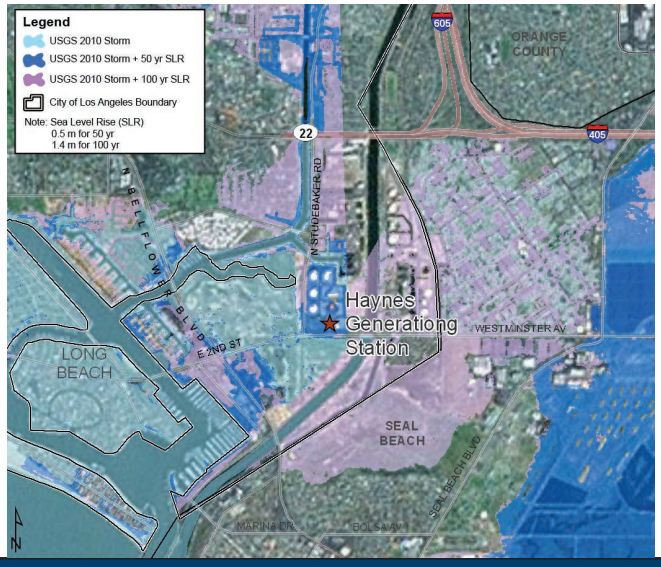
Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Water and Power

Regulatory Oversight:
North American Electric Reliability Corporation (NERC), Western Electricity Coordination Council (WECC), Southern California Air Quality Management District (SCAQMD), California State Water Resources Control Board (SWRCB)

Summary of Asset:
Haynes Generation Station is a natural gas fired power plant located in the Long Beach area with a capacity of 1556 megawatts.



Current Observed Vulnerabilities

Energy facilities have low vulnerability to the impacts of sea level rise, because all coastal assets were designed to withstand exposure to water. In addition, replacement schedules and system redundancies reduce vulnerability.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (MEDIUM)
This asset is not sensitive to the impacts of sea level rise, such as storm-related flooding, tidal flooding, erosion, and interaction with groundwater because, as a coastal asset, it was designed to be able to cope with these impacts.	This asset can continue to function if partially disabled and its functionality can be restored quickly, because outdoor assets are designed for water resistance and exposure. Indoor assets are designed for water to drain into sumps and are also equipped with pumps to quickly remove the water from the sumps.	Impairment of Haynes would have moderate economic consequences, because clean-up could take time, potentially affecting the power supply to other parts of Los Angeles. The disruption of power supply could have environmental consequences, because it could impact power supply to waste water treatment plants, potentially resulting in sewage spills.

Replacement value (e.g., cost of inaction):	None provided

Receiving Station Q (RSQ)
150 N Island Ave
Wilmington, CA 90744

Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Water and Power

Regulatory Oversight:
North American Electric Reliability Corporation (NERC) and Western Electricity Coordination Council (WECC) Reliability Standards. California Public Utilities Commission (CPUC) claims jurisdiction over matters of safety.

Summary of Asset:
Receiving Station (RS) Q is located in the Wilmington area and is comprised of equipment that receives power from generation, transforms the voltage, and distributes the power out again into the distribution network. Specifically, it has underground transmission connections to RS-C and Harbor Generation stations and connection to distribution stations that serve the San Pedro and Wilmington areas.



Current Observed Vulnerabilities

Energy facilities have low vulnerability to the impacts of sea level rise, because all coastal assets were designed to withstand exposure to water. In addition, replacement schedules and system redundancies reduce vulnerability.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (MEDIUM)
This asset is not sensitive to the impacts of sea level rise, such as storm-related flooding, tidal flooding, erosion, and interaction with groundwater, because as a coastal asset, it was designed to be able to cope with these impacts.	This asset can continue to function if partially disabled and its functionality can be restored quickly, because outdoor assets are designed for water resistance and exposure. Indoor assets are designed for water to drain into sumps and are also equipped with pumps to quickly evacuate the water from the sumps.	The DWP reports minor economic consequences from the potential impairment of RS-Q, because impacts would be distributed equally in the immediate area. Impairment of RS-Q could have moderate environmental consequences, however, because it could impact power supply to wastewater treatment plants, potentially resulting in a sewage spill.

Replacement value (e.g., cost of inaction):	None provided

230 KV Scattergood-Olympic Cable
Dockweiler Beach/Venice Area

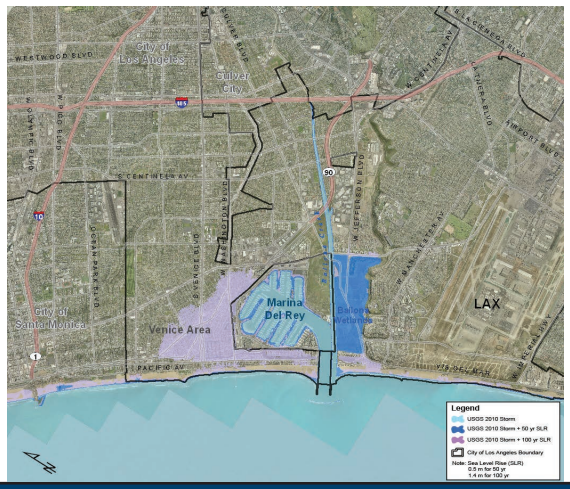
Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Water and Power

Regulatory Oversight:
North American Electric Reliability Corporation (NERC) and Western Electricity Coordination Council (WECC) Reliability Standards.

Summary of Asset:
This is an underground cable in the Dockweiler Beach/Venice area that connects to a high voltage interstate line.



Current Observed Vulnerabilities

None identified

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (MEDIUM)	Adaptive Capacity (HIGH)	Consequences (MEDIUM)
This asset is potentially sensitive to daily tidal flooding, because flooding of low-lying areas around the cable could make maintenance and repair difficult.	This asset can continue to function if partially disabled. Outdoor assets are designed for water resistance and exterior exposure. Their function can also be restored quickly.	The DWP reports minor consequences from the potential impairment of this asset, because impacts would be distributed equally in the immediate area.

Replacement value (e.g., cost of inaction):	None provided

Electrode Vault
17300 Pacific Coast Highway
Pacific Palisades, 90272

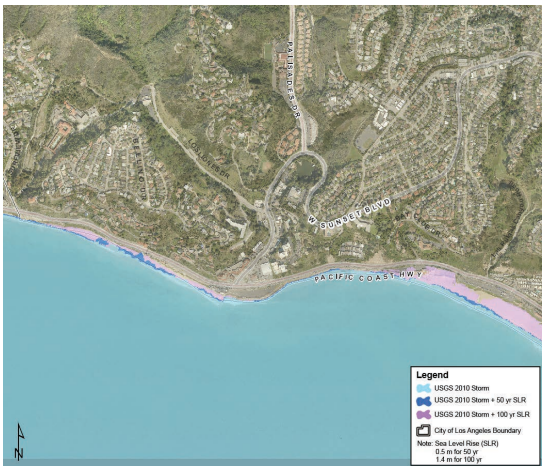
Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Water and Power

Regulatory Oversight:
California Public Utilities Commission (CPUC) claims jurisdiction over power equipment based on safety matters.

Summary of Asset:
This is an underground vault. It is currently being redesigned and moved for reasons unrelated to sea level rise.



Current Observed Vulnerabilities

Energy facilities have low vulnerability to the impacts of sea level rise, because all coastal assets were designed to withstand exposure to water. In addition, replacement schedules and system redundancies reduce vulnerability.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (MEDIUM)
This asset is not sensitive to the impacts of sea level rise, such as storm-related flooding, tidal flooding, erosion, and interaction with groundwater, because, as a coastal asset, it was designed to deal with these impacts.	This asset can continue to function if partially disabled. Outdoor assets are designed for water resistance and exterior exposure. Their function can also be restored quickly.	The DWP reports minor consequences from the potential impairment of this asset, because impacts would be distributed equally in the immediate area.

Replacement value (i.e., cost of inaction):	None provided

Local Electricity Distribution Assets

Asset Overview

Location and Number of Assets*

Pacific Palisades Sub-Region:	Venice/LAX Sub-Region:	San Pedro/Harbor Sub-Region:
Poles (multiple) Transformers (multiple) Wires (multiple)	Poles (multiple) Transformers (multiple) Wires (multiple)	Distribution Stations (3) Poles (multiple) Transformers (multiple) Wires (multiple)

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Water and Power

Regulatory Oversight:
California Public Utilities Commission (CPUC) claims jurisdiction over power equipment based on safety matters.

Description of Assets:
Local electricity distribution assets include three distribution stations, poles, transformers, wires, vaults, and cables. These assets help deliver electricity at relatively low voltages to customers.

Current Observed Vulnerabilities

Energy facilities have low vulnerability to the impacts of sea level rise, because all coastal assets were designed to withstand exposure to water. In addition, replacement schedules and system redundancies reduce vulnerability.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (LOW)	Adaptive Capacity (HIGH)	Consequences (MEDIUM)
These assets are not sensitive to the impacts of sea level rise, such as storm-related flooding, tidal flooding, erosion, and interaction with groundwater, because, as coastal assets, they were designed to be able to cope with these impacts.	These assets can continue to function if partially disabled. Outdoor assets are designed for water resistance and exterior exposure. Indoor assets are designed for water to drain into sumps and are also equipped with pumps to quickly evacuate the water from the sumps. In addition, assets are laid out in a manner that is easily reparable and their function can also be restored quickly. Lastly, if needed, power can be re-routed to other parts of the network.	The DWP reports minor consequences from the potential impairment of these assets, because impacts would be distributed equally in the immediate area.

Replacement value (e.g., cost of inaction)	None provided

* Please refer to subregional maps on pages 17-19.

Water Pipes

Asset Overview		
Location and Number of Assets*		
Pacific Palisades Sub-Region: 1919 feet	Venice/LAX Sub-Region: 186,961 feet	San Pedro/Harbor Sub-Region: 10,632 feet
Owner: City of Los Angeles		
City Department and Point of Contact: Department of Water and Power		
Regulatory Oversight: Los Angeles Department of Water and Power, California Department of Public Health (CDPH), U.S. Environmental Protection Agency (USEPA)		
Summary of Asset: LADWP's water infrastructure distributes water supply to 676,000 active service connections through a distribution network of over 7,200 miles of pipelines. About 500 miles of pipe in the distribution system is 24 inches or larger in diameter (trunkline). The remaining pipes have a diameter of less than 24 inches (mainline). There are approximately 199,512 feet of pipe in the exposure zone. Pipes carry water through the distribution system to customers.		

Current Observed Vulnerabilities
The potable water system is vulnerable to storm-related flooding, daily tidal flooding, and interaction with groundwater, which makes accessing underground assets, such as pipes, extremely challenging and raise public health concerns. Erosion could also damage many of the assets.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis		
Sensitivity (HIGH)	Adaptive Capacity (MEDIUM)	Consequences (MEDIUM)
Pipes are sensitive to storm-related flooding, tidal flooding, and interaction with groundwater because the water makes it difficult for crews to access the buried pipes, thus impairing construction and maintenance. The pipes are also sensitive to erosion, because the loss of ground stability could damage or break the pipes, thus impairing operation.	By pumping water out from flooded areas, the pipes could continue to function even if partially disabled. Crews can also limit construction and maintenance to low tide periods. Lastly, because the pipes are part of a networked system, LADWP could potentially bypass an impaired section of the network. The functionality of the pipes, however, might not be quickly or easily restored, because major excavation and construction is required to restore operations. There are no current efforts in place to make the pipes more resilient to these impacts.	Impairment of pipes from sea level rise impacts would have high economic consequences because it affects construction and reduces the life span of the pipes. In addition, there are public health concerns regarding salt water, groundwater, or other substances potentially infiltrating the potable water system. Lastly, pipe failure could potentially exacerbate flooding in flat areas with poor drainage.

Replacement value (e.g., cost of inaction)	None provided

* Please refer to subregional maps on pages 17-19.

Water Services

Asset Overview		
Location and Number of Assets*		
Pacific Palisades Sub-Region: 9	Venice/LAX Sub-Region: 4,208	San Pedro/Harbor Sub-Region: 11
Owner: City of Los Angeles		
City Department and Point of Contact: Department of Water and Power		
Regulatory Oversight: Los Angeles Department of Water and Power, California Department of Public Health (CDPH), U.S. Environmental Protection Agency (USEPA)		
Summary of Asset: Approximately 4,228 water services in the exposure area connect water mains to customers. This asset includes connections between the water main and the meter, the meters, and meter boxes.		

Current Observed Vulnerabilities
The potable water system is vulnerable to storm-related flooding, daily tidal flooding, and interaction with groundwater, which makes accessing underground assets, such as pipes, extremely challenging and raise public health concerns. Erosion could also damage many of the assets.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis		
Sensitivity (HIGH)	Adaptive Capacity (MEDIUM)	Consequences (MEDIUM)
Many water services are located below ground. Thus, if they were submerged in water, such as from storm-related flooding, daily tidal flooding, or interaction with groundwater, the water would need to be pumped out before the asset could be placed back into operation. These impacts could impair construction, maintenance, and operation of water services.	By removing the water to a minimum level needed for operations, the water services could continue to function even if they were partially disabled. In addition, there is some redundancy and flexibility in the system, which provides some resilience, but this is highly dependent on the location. If impaired, however, the functionality of water services might not easily or quickly restore. The DWP has undertaken some efforts to make water services more resilient by installing some of the larger services above ground.	These impacts have high economic consequences because they affect construction and reduce the life span of these assets. In addition, there are public health concerns resulting from salt water, groundwater, and/or other substances potentially infiltrating the potable water system. Lastly, failure could exacerbate flooding in flat areas with poor drainage.

Replacement value (i.e., cost of inaction)	None provided

* Please refer to subregional maps on pages 17-19.

Fire Hydrants

Asset Overview		
Location and Number of Assets*		
Pacific Palisades Sub-Region: 0	Venice/LAX Sub-Region: 248	San Pedro/Harbor Sub-Region: 1
Owner: City of Los Angeles		
City Department and Point of Contact: Department of Water and Power		
Regulatory Oversight: Los Angeles Department of Water and Power, California Department of Public Health (CDPH), U.S. Environmental Protection Agency (USEPA)		
Description of Assets: There are approximately 249 fire hydrants in the exposure area that provide high pressure water for fire fighting efforts and temporary water services.		

Current Observed Vulnerabilities
None identified.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis		
Sensitivity (HIGH)	Adaptive Capacity (LOW)	Consequences (MEDIUM)
Fire hydrants are sensitive to storm related and tidal flooding, because if the hydrants are submerged in water, firefighting personnel will not be able to access or operate them. Fire hydrants are also sensitive to erosion, because the loss of ground stability could damage the fire hydrant and render it inoperable.	Fire hydrants can function if partially disabled, because they will continue to work in semi-submerged conditions. The function, however, cannot be restored quickly or easily if impaired and there are no current efforts in place to make hydrants more resilient to these impacts.	Flooding, inundation, and groundwater have high economic consequences because they impact the construction and lifespan of the asset. In addition, there are public health concerns regarding salt water, groundwater, or other substances potentially infiltrating the potable water system, since fire hydrants are connected to the potable water system. Lastly, failure of fire hydrants could exacerbate flooding in flat areas with poor drainage because water at high pressure could spill from a broken hydrant.

Replacement value (i.e., cost of inaction)	None provided

* Please refer to subregional maps on pages 17-19.

Cultural Facilities

Asset Overview		
Location and Number of Assets*		
Pacific Palisades Sub-Region: None in coastal zone	Venice/LAX Sub-Region: None in coastal zone	San Pedro/Harbor Sub-Region: LA Maritime Museum
Owner: City of Los Angeles		
City Department and Point of Contact: Department of Recreation and Parks		
Regulatory Oversight: No Regulatory Oversight		
Description of Assets: The L.A. Maritime Museum is located in the coastal zone, in the 1941 Municipal Ferry Terminal, and is on the National Register of Historic Places.		

Current Observed Vulnerabilities
Structures like recreation centers and museums are highly vulnerable to flooding and inundation, because the structures would be damaged, inoperable, and/or inaccessible.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis		
Sensitivity (HIGH)	Adaptive Capacity (LOW)	Consequences (MEDIUM)
The museum is sensitive to storm-related flooding, tidal flooding, and erosion. These impacts would cause damage to the structure and/or content of the building and would cause the facility to close to the public.	This facility cannot function if it is partially impaired and cannot be quickly or easily restored if impaired. There are no current efforts in place to make the museum more resilient to the impacts of sea level rise.	The greatest consequence would be the economic impact of a storm-related flood, because this could cause damage to the valuable artifacts within the museum. In addition, closure of the Maritime Museum would be a cultural loss for the local community and greater City of Los Angeles, as this site attracts visitors from around the region.
Replacement value (e.g., cost of inaction)	None provided	

* Please refer to subregional maps on pages 17-19.

Cabrillo Beach
3720 Stephen M. White Dr.
San Pedro, CA 90731

Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Recreation and Parks

Regulatory Oversight:
No Regulatory Oversight

Summary of Asset:
Cabrillo Beach includes a public beach, a marine aquarium, a recreation center, and a fishing pier.



Current Observed Vulnerabilities

Currently has poor water quality; sand has been replaced twice already.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (HIGH)	Adaptive Capacity (MEDIUM)	Consequences (HIGH)
The public beach is sensitive to storm-related flooding, daily tidal flooding, erosion, and interaction with groundwater. The public beach could potentially be lost to erosion. In fact, in 2007, a large storm washed away the sand and the outer beach was exposed down to rocks. The sand was replaced naturally over time, but with higher sea level, it is uncertain if the sand would return naturally following a storm event. Storm-related flooding, tidal flooding, and groundwater could damage the recreation center and aquarium.	The public beach could potentially continue to function if partially impaired. For example, if the beach is flooded only during high tides, visitors could potentially use the beach during low tides. Also, it could potentially continue to function if impaired by storm-related flooding. After previous storm events, some of the beach sand still remained, but with a two- to three-foot berm that visitors had to navigate to access the water. On the other hand, partial impairment of the aquarium and recreation center would render them non-functional. Also, these facilities could not be quickly or easily restored if impaired. Flooding in the parking lot or road would result in a loss of access for visitors. There are no current efforts in place to make the facilities at Cabrillo Beach more resilient to the impacts of sea level rise.	Impairment of this asset would have high economic consequences, because the beach and aquarium attract visitors from all over Southern California. The local communities of Wilmington, San Pedro, and Harbor City also use the beach and the recreation center, and the impairment of these assets would be a loss of open space and recreation opportunities for these park-poor communities.

Replacement value (e.g., cost of inaction):	None provided

Parks and Open Space

Asset Overview

Location and Number of Assets*

Pacific Palisades Sub-Region:	Venice/LAX Sub-Region:	San Pedro/Harbor Sub-Region:
None in coastal zone	Playa del Rey: Del Rey Lagoon Park (Playa del Rey)** Venice: Canal Park/Linnie Canal (Venice)** Westminster Park (Venice) Triangle Park (Marr Park) Culver City: Titmouse Park (Culver City)**	San Pedro: John S. Gibson Jr. Park

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Recreation and Parks

Regulatory Oversight:
No Regulatory Oversight

Description of Assets:
Neighborhood Parks located in the sea level rise exposure zone include Del Rey Lagoon Park, Canal Park, and Titmouse Park. Del Rey Lagoon features a tidal basin, children's play area, a ball field, and restroom facility. Canal Park is a pocket park located along the Venice canals and it includes grass and a children's play area. Titmouse Park is a small park located near Ballona Creek consisting of native plants that provide habitat for birds.

Current Observed Vulnerabilities

Parks and other open spaces are generally fairly resilient assets. They can be restored relatively quickly or they can change to cope with new environmental conditions. For example, different landscaping can be introduced to deal with periodic flooding without significantly changing the function of the park. Built structures, such as recreational buildings and museums are much less resilient, because damage takes longer to repair and they cannot function if partially impaired.

The consequences of impairment of these facilities are highly dependent on the location. Some facilities, like the Venice Beach Boardwalk, are iconic destinations and their impairment could have significant economic consequences. Some parks are unique because they provide habitat for rare plants and animals. Other parks and recreation centers are highly valued and used by the local communities, especially in the San Pedro/Harbor area, because few other parks exists in the area.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (HIGH)	Adaptive Capacity (MEDIUM)	Consequences (LOW)
These parks are sensitive to storm-related flooding, daily tidal flooding, and erosion which could damage the park facilities and make the park unusable an inaccessible.	The parks could function if partially impaired. For example, if only a small part of the park experiences tidal flooding, other parts of the park could be used. The park could be quickly restored depending on how fast storm water recedes. The landscape and vegetation of the parks could change given these impacts and still be useful as habitat for plants and animals.	The consequences of impairment of these parks would be relatively minor given their small size. There would be a loss of recreational opportunities for residents and habitat for plants and animals.

Replacement value (e.g., cost of inaction)	None provided

* Please refer to subregional maps on pages 17-19.
**The physical vulnerability assessment only considers the impacts to these parks.

Recreation Centers

Asset Overview		
Location and Number of Assets*		
Pacific Palisades Sub-Region: None in exposure zone	Venice/LAX Sub-Region: Venice Beach Recreation Center** San Juan Garage	San Pedro/Harbor Sub-Region: None in exposure zone
Owner: City of Los Angeles		
City Department and Point of Contact: Department of Recreation and Parks		
Regulatory Oversight: No Regulatory Oversight		
Description of Assets: Recreation Centers located in the exposure zone include the Venice Beach Recreation Center and San Juan Garage. The Venice Beach Recreation Center consists of a boardwalk, fishing pier, picnic areas, skateboard arena and athletic courts.		

Current Observed Vulnerabilities
Structures like recreation centers and museums are highly vulnerable to flooding and inundation, because the structures would be damaged, inoperable, and/or inaccessible.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis		
Sensitivity (HIGH)	Adaptive Capacity (LOW)	Consequences (HIGH)
This asset is sensitive to storm-related and daily tidal flooding, which could damage the various elements of the recreation center and render them unusable by the public. The pier already has some structural weakness and it could be further damaged by these impacts. Erosion could also weaken the structural stability of the pier and the boardwalk.	This asset cannot function if partially impaired. The boardwalk and athletic courts could be quickly restored if impaired, but the pier would take considerably longer to restore if damaged. Recreation and Parks is currently working on a plan to reinforce the pier to better withstand current impacts, but the plan does not explicitly take the impacts of sea level rise into consideration.	Impairment of these iconic facilities, particularly the boardwalk, would have high economic consequences, because of their cultural, recreational, and tourist value. They draw visitors from around the region and even from around the world. The boardwalk also includes spaces for about 200 vendors, who would have to seek other locations to sell their goods.
Replacement value (e.g., cost of inaction)	None provided	

* Please refer to subregional maps on pages 17-19.
**The physical vulnerability assessment only considers the impacts to the Venice Beach Recreation Center.

Building Stock and Roads - Venice Area

Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Planning

Regulatory Oversight:
US Army Corps of Engineers (USACE)*
Los Angeles County Department of Water and Power (LACDWP)*
City of Los Angeles Bureau of Engineering (BOE)*
California Coastal Commission*
City of Los Angeles Ordinance (No. 172,081)**

Description of Assets:
None provided.

Current Observed Vulnerabilities

Roads are vulnerable to flooding, inundation, erosion, and groundwater, which could result in reduced access for residents and impaired regional transport. The building stock is most vulnerable to flooding and inundation in Venice, where it is located very near sea level and there are many older structures.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (HIGH)	Adaptive Capacity (MEDIUM)	Consequences (HIGH)
The building stock and roads in the Venice area are sensitive to storm-related flooding, tidal flooding, and erosion. The impacts of sea level rise could lead to damaged and/or uninhabitable homes, businesses, schools, and public buildings. Many structures are built at, or very near, sea level. In addition, many of the structures were built before the 1970s, which means they are more sensitive to flooding. In fact, some residents already experience flooded basements during storm events. Damage to roads from the impacts of sea level rise could also result in a lack of access for residents and emergency services.	The ability of the roads and building stock in Venice to continue to function if partially disabled depends on the extent of damage. The functionality of these assets could not be restored very quickly or easily. The City Planning department, in collaboration with the Departments of Building and Safety, Public Works, and Transportation can identify an adaptation strategy for these assets during the next update of the Venice Community Plan.	The economic and social consequences of the impairment of these assets would be high due to the displacement of residents and businesses. In particular, the displacement of low-income residents in the Venice Beach area would have significant social consequences. In addition, flooding in this area could cause damage to the Ballona wetlands, which provides habitat for plants and animals and helps filter groundwater.

Replacement value (e.g., cost of inaction)	None provided

*Flood Protection in the region is managed by 3 agencies: 1) United States Army Corps of Engineers (USACE); 2) Los Angeles County Department of Public Works (LACDPW); and 3) City of Los Angeles Bureau of Engineering (BOE). The USACE oversees projects associated with navigable bodies of water, including ocean harbors. The LACDPW oversees county flood control drainage facilities to reduce the impacts of 100- and 500- year storms. The BOE oversees the City's storm drainage system, which is designed to reduce the impacts of 50-year magnitude storms. Various city agencies implement development permit and slope stability permits. The California Coastal Commission also has permit responsibility in the coastal zone located in San Pedro and the Port of Los Angeles.

**The City of Los Angeles has an ordinance governing permit review and mitigation procedures for issuance of development permits in areas prone to flooding, mudflow, or coastal inundation. The Ordinance (No. 172,081) specifies mitigation measures, which include relocation of structures within a property, increased base elevation, additional structural reinforcement, anchoring, and installation of protective barriers.

Building Stock and Roads - San Pedro/Harbor Area

Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Planning

Regulatory Oversight:
U.S. Army Corps of Engineers (USACE)*
Los Angeles County Department of Water and Power (LACDWP)*
City of Los Angeles Bureau of Engineering (BOE)*
California Coastal Commission*
City of Los Angeles Ordinance (No. 172,081)**

Description of Assets:
The San Pedro and Harbor area are served by a circulation system of highways (freeways or high capacity roadways), arterials (moderate capacity roadways), collector streets and local streets. Paseo Del Mar, in the southern portion of San Pedro runs in an east-west direction along the coastline. Harbor Boulevard runs in a north-south direction along the harbor shoreline. Being located on a peninsula, San Pedro and the harbor area are limited in the number of through routes.

Current Observed Vulnerabilities

Roads are vulnerable to flooding, inundation, erosion, and groundwater, which could result in reduced access for residents and impaired regional transport.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (HIGH)	Adaptive Capacity (MEDIUM)	Consequences (HIGH)
The building stock and roads in the San Pedro/Harbor Area are sensitive to storm-related flooding, tidal flooding, and erosion. Not many residential buildings will be exposed to sea level rise because they are terraced up on the hillside, but there are some people that live on boats in the marina. Roads could be damaged by these impacts.	The City Planning department is uncertain if this asset could continue to function if partially disabled, because it depends upon the extent of the damage. The City Planning department, in collaboration with the Departments of Building and Safety, Public Works, and Transportation can identify an adaptation strategy for these assets during the next update of the San Pedro Community Plan.	Impairment of roads would have significant economic consequences because they are important for regional goods movement due to their proximity to the Port of Los Angeles. Damage to roads could also limit access to neighborhoods. Damage to building stock could displace businesses and low-income residents.

Replacement value (e.g., cost of inaction)	None provided

*Flood Protection in the region is managed by 3 agencies: 1) United States Army Corps of Engineers (USACE); 2) Los Angeles County Department of Public Works (LACDPW); and 3) City of Los Angeles Bureau of Engineering (BOE). The USACE oversees projects associated with navigable bodies of water, including ocean harbors. The LACDPW oversees county flood control drainage facilities to reduce the impacts of 100- and 500- year storms. The BOE oversees the City's storm drainage system, which is designed to reduce the impacts of 50-year magnitude storms. Various city agencies implement development permit and slope stability permits. The California Coastal Commission also has permit responsibility in the coastal zone located in San Pedro and the Port of Los Angeles.

**The City of Los Angeles has an ordinance governing permit review and mitigation procedures for issuance of development permits in areas prone to flooding, mudflow, or coastal inundation. The Ordinance (No. 172,081) specifies mitigation measures, which include relocation of structures within a property, increased base elevation, additional structural reinforcement, anchoring, and installation of protective barriers.

Pacific Coast Highway (PCH) - Pacific Palisades Area

Asset Overview

Owner:
City of Los Angeles

City Department and Point of Contact:
Department of Planning

Regulatory Oversight:
U.S. Army Corps of Engineers (USACE)*
Los Angeles County Department of Water and Power (LACDWP)*
City of Los Angeles Bureau of Engineering (BOE)*
California Coastal Commission*
City of Los Angeles Ordinance (No. 172,081)**

Summary of Asset:
This asset consists of approximately 2.5 miles of PCH from Sunset Boulevard to Entrada Drive. The highway in this stretch generally has six lanes and runs near the ocean, separated from the sea by sandy beaches and some coastal armoring. California Department of Transportation has jurisdiction over PCH, but it provides a critical connection to coastal communities.



Current Observed Vulnerabilities

Roads are vulnerable to flooding, inundation, erosion, and groundwater, which could result in reduced access for residents and impaired regional transport

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (HIGH)	Adaptive Capacity (MEDIUM)	Consequences (HIGH)
This asset is sensitive to storm-related flooding, tidal flooding, and erosion. All of these impacts could result in damage to the highway, potentially causing frequent closures and even structural failure.	It is uncertain if PCH could continue to function if partially disabled, because it would depend on decision-making by Caltrans regarding keeping the highway open with a reduced number of lanes.	Impairment of PCH would have significant economic consequences, because it is an important transportation connection in the region. In addition, it would have adverse consequences for communities living in Pacific Palisades who could have difficulty accessing their homes or be less accessible to emergency services.

Replacement value (e.g., cost of inaction)	None provided

*Flood Protection in the region is managed by 3 agencies: 1) United States Army Corps of Engineers (USACE); 2) Los Angeles County Department of Public Works (LACDPW); and 3) City of Los Angeles Bureau of Engineering (BOE). The USACE oversees projects associated with navigable bodies of water, including ocean harbors. The LACDPW oversees county flood control drainage facilities to reduce the impacts of 100- and 500- year storms. The BOE oversees the City's storm drainage system, which is designed to reduce the impacts of 50-year magnitude storms. Various city agencies implement development permit and slope stability permits. The California Coastal Commission also has permit responsibility in the coastal zone located in San Pedro and the Port of Los Angeles.

**The City of Los Angeles has an ordinance governing permit review and mitigation procedures for issuance of development permits in areas prone to flooding, mudflow, or coastal inundation. The Ordinance (No. 172,081) specifies mitigation measures, which include relocation of structures within a property, increased base elevation, additional structural reinforcement, anchoring, and installation of protective barriers.

Port of Los Angeles
Container Terminals
425 South Palos Verdes Street
San Pedro California 90731

Asset Overview

Owner:
Port of Los Angeles

City Department and Point of Contact:
Harbor

Regulatory Oversight:
No description provided.

Description of Assets:
Container terminals are the facilities where cranes load cargo containers to and from ships and onto trucks or trains for onward transportation. These facilities also provide storage for containers in stacks while awaiting transport.

Current Observed Vulnerabilities

Although the Port's assets are highly sensitive to flooding and inundation, the port has low vulnerability because of its high capacity to adapt by building future infrastructure at a higher elevation.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (MEDIUM)	Adaptive Capacity (HIGH)	Consequences (HIGH)
Container terminals will be sensitive to storm-related flooding during high tide events in the later years of this study. This flooding could render the terminals inaccessible and non-operational with unsecured containers and no power supply for equipment.	In the short-term, container terminals have low adaptive capacity, because they cannot continue to function if partially disabled and their functionality cannot be restored quickly after suffering damage. However, in the long-term the terminals could be redesigned and re-built at higher elevations.	The economic consequences of impaired container terminals are very significant. They are the port's highest revenue generating resource and they have a $2.85 billion replacement value. Furthermore, the economic impacts would ripple through the economy as shipments would be delayed or re-routed. Quantifying the economic consequences of impaired container terminals is extremely difficult because it depends on a variety of factors. According to the National Oceanic and Atmospheric Administration 2008-2017 Strategic Plan, the cost of a shutdown of the POLA/POLB would cost $1 billion per day in regional economic losses.

Replacement value (i.e., cost of inaction)	$2.85 billion replacement value, $1 billion per day cost of shut down of POLA/POLB

Port of Los Angeles
Electrical Infrastructure
425 South Palos Verdes Street
San Pedro California 90731

Asset Overview
Owner: Port of Los Angeles
City Department and Point of Contact: Harbor
Regulatory Oversight: Los Angeles Department of Building and Safety (LADBS)
Description of Assets: Electrical infrastructure for container handling and lighting.

Current Observed Vulnerabilities
Although the Port's assets are highly sensitive to flooding and inundation, the port has low vulnerability because of its high capacity to adapt by building future infrastructure at a higher elevation.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis		
Sensitivity (MEDIUM)	Adaptive Capacity (HIGH)	Consequences (HIGH)
The Port's electrical infrastructure could be severely damaged by regular storm-related flooding in the later years of the study, as it is not designed to be flooded or inundated.	In the short term, this asset has low adaptive capacity, because it cannot function if partially disabled and the functionality is not quickly or easily restored if impaired. However, in the long-term, the electrical infrastructure could be redesigned at higher elevations.	This infrastructure is vital to port operations and impairment would cause equipment, such as cranes, to be non-operational. This could cause delays and disruptions in cargo loading and offloading. This asset has a $350 million replacement value.

Replacement value (e.g., cost of inaction)	$350 million

Port of Los Angeles
Breakwater
425 South Palos Verdes Street
San Pedro California 90731

Asset Overview		
Owner: Port of Los Angeles		
City Department and Point of Contact: Harbor		
Regulatory Oversight: Army Corps of Engineers		
Description of Assets: The breakwater is an 8.5-mile rock structure that prevents waves from entering the harbor. It has two openings to allow ships to enter the port areas behind it.		
Current Observed Vulnerabilities		
Although the Port's assets are highly sensitive to flooding and inundation, the port has low vulnerability because of its high capacity to adapt by building future infrastructure at a higher elevation.		
Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis		
Sensitivity (MEDIUM)	**Adaptive Capacity (HIGH)**	**Consequences (HIGH)**
The breakwater would be sensitive to overtopping and storm surge damage during the later years of the study. This would impact its ability to shelter harbor facilities.	The breakwater could potentially function if partially impaired. For example, if a portion of the breakwater is eroded, the rest of the structure would continue to block waves. Also, if the breakwater is flooded only during high tide, it would continue to function during low tide.	An impaired breakwater would have high economic consequences because it could cause damage to the port, rendering shipping terminals unusable and interrupting flow of cargo. There could also be environmental damage to the shallow water habitat adjacent to breakwater, which is a built ecosystem that supports eelgrass, fish, and bird life. The breakwater has a $500 million replacement value and is managed by the Army Corps of Engineers.
Replacement value (e.g., cost of inaction)	$500 million	

Port of Los Angeles
Transportation
425 South Palos Verdes Street
San Pedro California 90731

Asset Overview

Owner:
Port of Los Angeles

City Department and Point of Contact:
Harbor

Regulatory Oversight:
Los Angeles Department of Transportation (LADOT), Metropolitan Transportation Authority (MTA), California Department of Transportation (Caltrans), Public Utilities Commission (PUC)

Description of Assets:
Transportation assets include roads, rails, and grade separations that help move cargo to and from the Port.

Current Observed Vulnerabilities

Although the Port's assets are highly sensitive to flooding and inundation, the port has low vulnerability because of its high capacity to adapt by building future infrastructure at a higher elevation.

Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis

Sensitivity (MEDIUM)	Adaptive Capacity (HIGH)	Consequences (HIGH)
Transportation assets will be sensitive to storm-related flooding and daily tidal flooding, erosion, and groundwater interaction in later years of the study. These impacts could cause the assets to be damaged and thus unusable.	Compared to other port assets, roads can be re-built relatively quickly. In addition, if only one lane is affected by flooding or erosion, the road can potentially still continue to function.	Impaired transportation facilities would have a high economic consequence, because they are vital for transporting cargo from terminals to their final destinations. It could also have a high impact on communities living in San Pedro, Wilmington, and permanent residents in the marinas due to reduced access. The transportation assets are estimated to have a $1 billion replacement value.

Replacement value (e.g., cost of inaction)	$1 billion

Port of Los Angeles
Marinas
425 South Palos Verdes Street
San Pedro California 90731

Asset Overview		
Owner: Port of Los Angeles		
City Department and Point of Contact: Harbor		
Regulatory Oversight: California Coastal Commission, California Department of Boating and Waterways		
Description of Assets: Marinas are docks with moorings for relatively small boats.		
Current Observed Vulnerabilities		
Although the Port's assets are highly sensitive to flooding and inundation, the port has low vulnerability because of its high capacity to adapt by building future infrastructure at a higher elevation.		
Physical Vulnerability to Sea Level Rise Based on USGS Exposure Analysis		
Sensitivity (MEDIUM)	**Adaptive Capacity (HIGH)**	**Consequences (MEDIUM)**
Marinas are sensitive to storm-related flooding, daily tidal flooding, and erosion, because they would be damaged by such impacts.	Marinas are relatively resilient to storm-related flooding, because they float on the water, but their groundings would become deteriorated from daily tidal flooding and erosion. In addition, these impacts could reduce access to the marinas.	The consequences of impaired marinas primary relates to their recreational value. They also have an estimated $180 million replacement value. Lastly, permanent residents of the marinas could potentially be displaced.
Replacement value (e.g., cost of inaction)	$180 million	

Social Vulnerability Assessment

A social vulnerability study was conducted by Dr. Julia Ekstrom and Dr. Susanne Moser (see Appendix 3 for full report), which examined the socioeconomic implications of sea level rise to residents and communities in the City of L.A. The authors provide demographic overviews of the three coastal areas within the City of L.A. (Pacific Palisades, Venice/Playa del Rey/LAX, San Pedro/Harbor area) that are likely to experience impacts from sea level rise and other associated flooding (i.e., such as that from stormwater system overflows) (see report in Appendix 3 for more details on demographics). The social vulnerability study focused on census data-derived demographics of the coastal communities rather than directly on the flood models. The demographic overviews are followed by a description of population characteristics that demonstrate which segments of coastal communities may be more socially vulnerable to flooding than others.

The assessment utilizes a variety of sources to discuss characteristics that are commonly associated with higher sensitivity and/or lower adaptive capacity to flooding and sea level rise. Information was compiled from Census 2010 data when available, American Communities Survey Census 2006-2010 data, Census 2000 data (when it provided information at a higher resolution), and pre-existing information from secondary data sources, such as City and County planning documents, other assessments related to vulnerable segments of the City (and some cases County's) population, and newspaper articles about past floods. The characteristics discussed include: income, poverty, education, females as head of household, race, linguistic isolation, age, housing type and age, and physical and mental illnesses and disabilities.

Income and poverty level are considered the primary indicators of adaptive capacity. While per capita income in Los Angeles overall tends to be higher along the coast than in the interior, there are communities along the coast that average some of the lowest income levels in L.A. County (Figure 7), (e.g., portions of San Pedro and Wilmington have an average income of $13,000 per year compared to

Per Capita Income ($) - City of L.A.

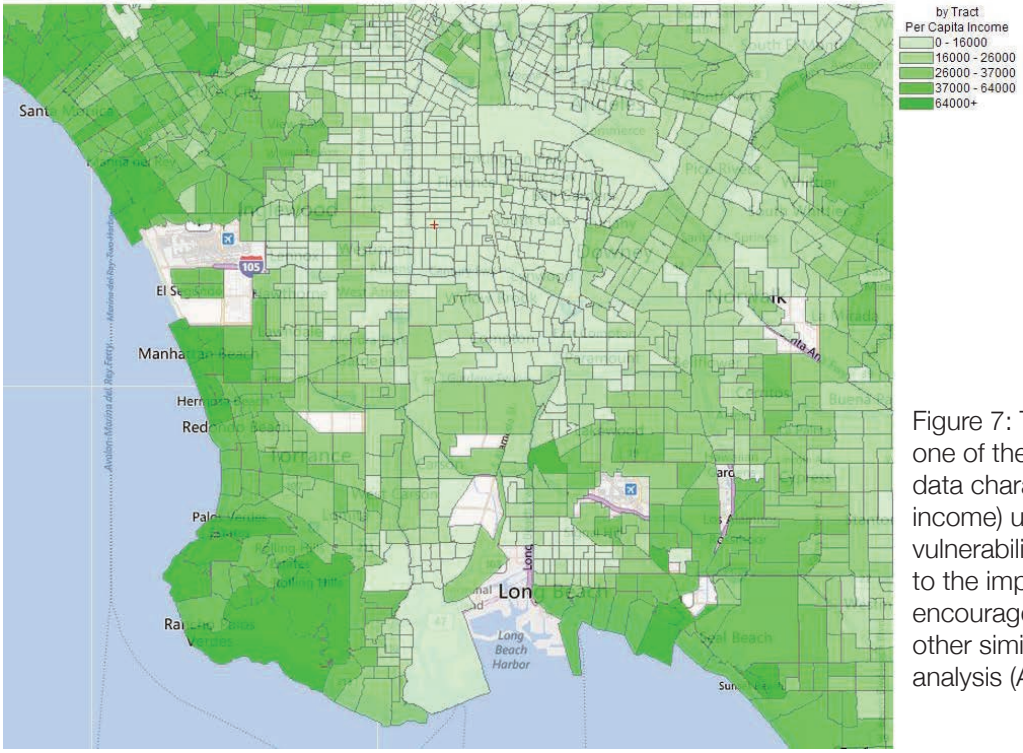


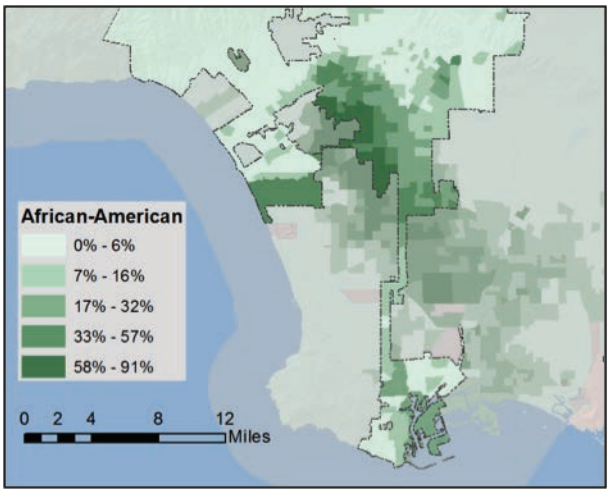
Figure 7: This figure provides an example of one of the many figures representing census data characteristics (in this case per capita income) utilized to determine the social vulnerability of City of Los Angeles residents to the impacts of sea level rise. Readers are encouraged to view the full report to review other similar figures for other census data analysis (Appendix 3).

the more affluent communities on the Palos Verdes Peninsula which average $128,000 per year). Similarly, over 76% of the census tract population on the west side of Wilmington lives below the federal poverty level. While these are not the only areas in the City of L.A. that have this combination of low income and high poverty levels, these are the most vulnerable communities within the sea level rise exposure zone.

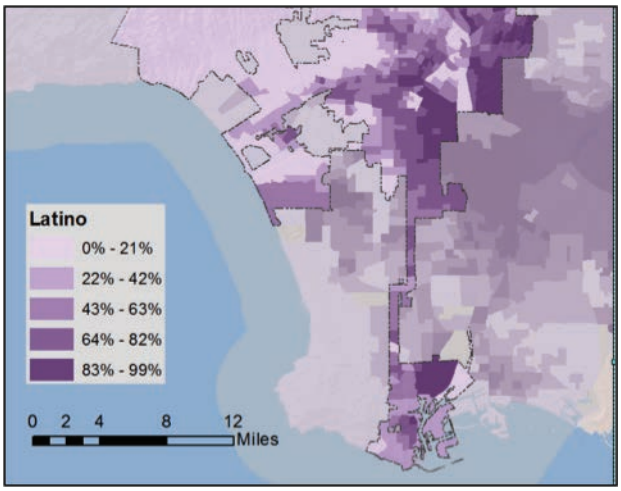
Studies of public health and vulnerability to disasters also indicate that minority populations tend to have lower capacity for responding to disasters and adapting to climate change than non-Hispanic whites. Other studies have shown that the likely reason for the correlation between race and lower adaptive capacity is the disproportionate amount of poverty and lower incomes among African Americans and Latinos compared to White/non-Hispanic segments of the population. In coastal communities within the City of L.A., there are very high concentrations of Latino populations residing in the eastern, low lying portion of San Pedro (closest to the inner Harbor/Port) and throughout Wilmington, as well as some small areas of Latino populations in Venice and El Segundo. African Americans are mainly concentrated in the interior of Los Angeles, but some higher concentrations reside in San Pedro, Wilmington and Long Beach (the latter is outside of the City of L.A.'s boundaries) (Figure 8).

Geography of Race in L.A. by Percent of Total Population

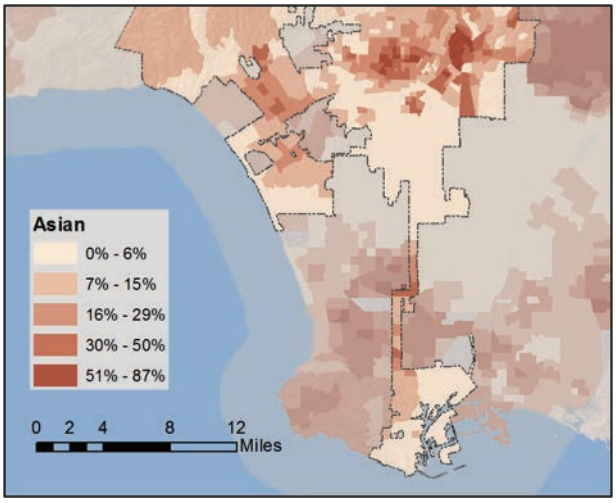
A. Percent African American



B. Percent Latino



C. Percent Asian



D. Percent Native American/Pacific Islander

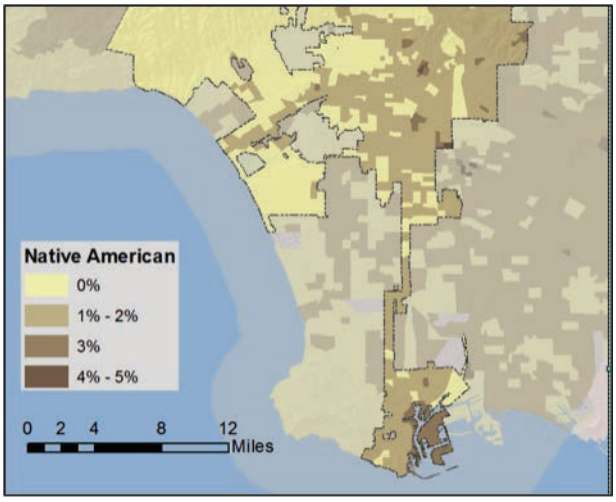


Figure 8: Figures showing the geography of race in Los Angeles by percentage of the total population. The boundaries of the City of Los Angeles are indicated by the black dashed line (Source: Census 2010).

Similarly, low education levels and linguistic isolation (defined by the U.S. Census Bureau, as a household in which no one over the age of 14 speaks English or speaks English less than "very well") leads to lower adaptive capacity by limiting the household's ability to obtain and understand emergency preparedness and response information. Census data in San Pedro and Wilmington show high proportions of Latino populations that are linguistically isolated. Identifying populations that are more vulnerable because of these factors (low education level, race and linguistic isolation) can inform emergency response planning for flooding and help to develop communication strategies to engage community members in the climate adaptation planning process.

Other vulnerable communities include segments of the population that may need special assistance in emergencies because of lack of mobility or other disadvantages. These include the elderly, homeless, those with physical or mental illness or disabilities, and those living in group quarters. An important first step in preparing special assistance for these populations during emergency situations is to document where they reside so first responders understand the extent of the need and can direct assistance appropriately when the time comes.

Beyond examining census data in isolation, in recent years, a number of tools and indices have been developed that identify communities' social vulnerability to various hazards. The social vulnerability index (SOVI), a method developed by Susan Cutter and colleagues at the University of South Carolina, integrates 32 census variables to create a picture of relative social vulnerability within a given region

Social Vulnerability Index (SOVI) Results for the City of L.A.

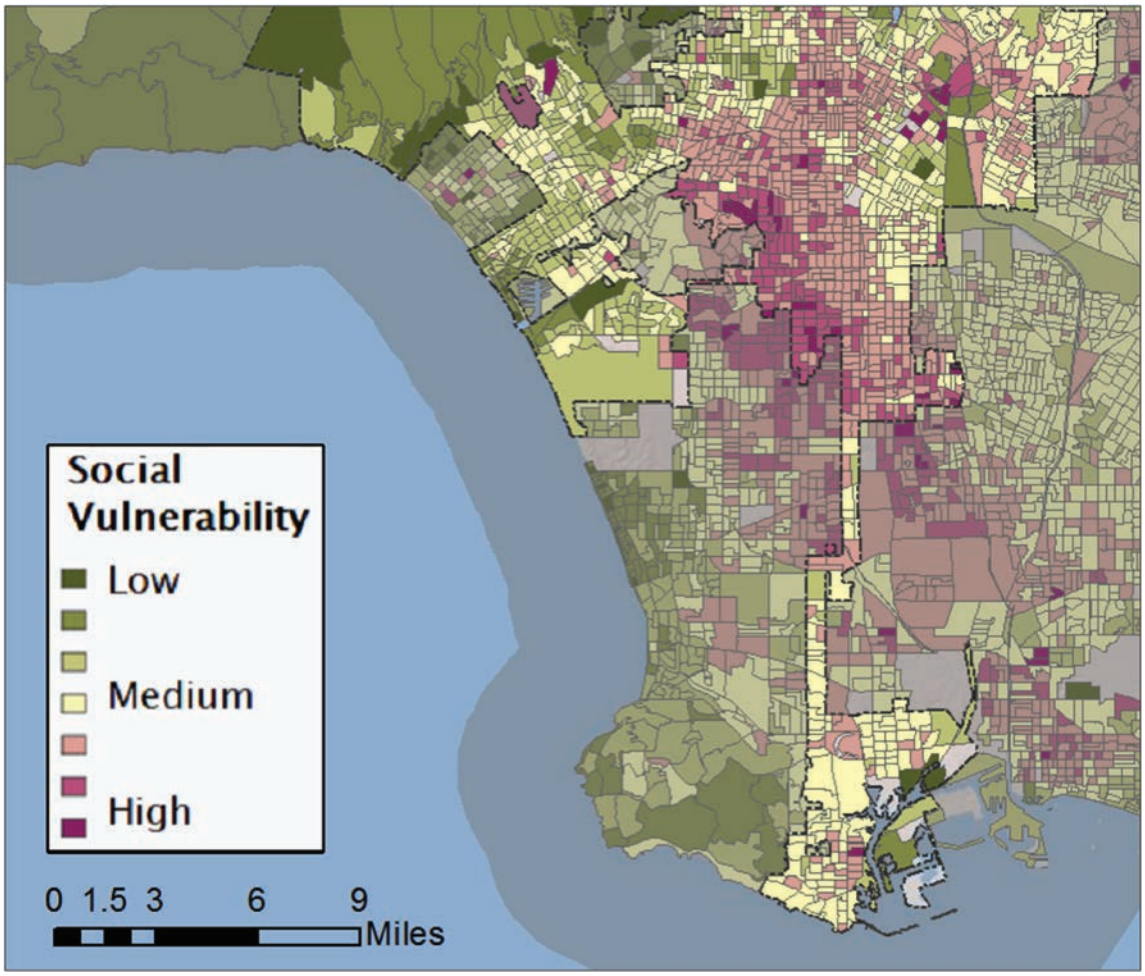


Figure 9: The social vulnerability index (SOVI) provides an integrated view of a population's social vulnerability. The index integrates 32 socioeconomic and demographic variables. (Source: Census 2000 data, Integrated summary provided by NOAA Coastal Services Center).

(Cutter et al. 2003). It does not integrate physical climate change factors, thus providing an objective snapshot of where the populations reside that are associated with low adaptive capacity and high sensitivity to hazardous events. Based on these data, portions of San Pedro, Wilmington and a portion of Venice show relatively high social vulnerability compared to the rest of the City (Figure 9).

The results of the integrated SOVI analysis provide the same snapshot of vulnerability as the analysis of specific census data sets. That is, the communities of Wilmington, Venice, and low-lying portions of San Pedro, seem to have the highest social vulnerability with respect to sea level rise impacts.

Other social characteristics presented by Ekstrom and Moser that indicate high vulnerability include housing type and control over living situation. Census data show a high proportion of older housing units, which may be more sensitive to flooding (e.g., less restrictive building codes, less flood-proofing), in Venice and in neighborhoods around the Port of Los Angeles. These same communities have a high proportion of renters (over 80% in Wilmington and eastern portions of San Pedro and 45 - 80% in Venice), who tend not to have the means or incentive to flood-proof their homes.

The social vulnerability assessment also reveals that a number of community services and supporting infrastructure are potentially at risk of impairment from short-term or long-term damage from flood events as sea level rises. These include impairment of drainage and treatment of wastewater and sewage, rapid emergency response, access to food and prescription medicines, risk of salinization to coastal groundwater reservoirs, access to and functionality of energy-related facilities, transmission and transformers, and important ecosystem services. Interruption of these services can have disproportionate impacts on residents who are more sensitive and have lower adaptive capacity for dealing with flooding as sea level rises.

This assessment thus allows the City to begin to identify adaptation and communication strategies that target these populations. Strategies can include: documenting where these vulnerable populations reside, so first responders understand the extent of the need and can direct assistance appropriately when the time comes; conducting workshops and preparing other public outreach materials in multiple languages; and, given low education and high poverty levels, using alternative educational/informational methods that do not require literacy or internet access.

Economic Vulnerability Assessment

USC Sea Grant commissioned Dr. Dan Wei and Dr. Sam Chatterjee from the USC Price School of Public Policy to conduct a preliminary analysis of the potential economic impact of sea level rise on the City of L.A. (see Appendix 4 for full report).

In this study, the researchers analyzed temporary flooding in the coastal zone caused by extreme coastal storms (10-year and 100-year flood event scenarios) and sea level rise increase of 0.5 m from 2000 - 2050 and 1.4 m from 2000 - 2100. The study focused on the coastal regions within the City that are directly affected by coastal flooding events (Pacific Palisades, Venice/Playa del Rey, and San Pedro/ Wilmington).

Economic impacts evaluated in this study included property losses (building and content losses), as well as direct and indirect business interruption losses due to extreme coastal flooding events. Indirect business interruption losses included not only the multiplier (ripple) effects of the direct business interruption losses taking place within the City, but also the indirect effects to the City stemming from the losses to the coastal regions that are outside of the City but within the boundaries of L.A. County. Potential impacts to the transportation and utility systems were evaluated. Impacts caused by long-term and permanent beach area losses from sea level rise were not covered in this study.

The analysis in the study was performed based on the application of two modeling tools. HAZUS MH 2.1, the Federal Emergency Management Agency's (FEMA) standardized modeling tool for estimating potential losses from hazards, was used to evaluate the property damage to building stocks (including both buildings and their contents) and the direct business interruption losses in the flooding affected region. The Input-Output (I-O) model, one of the most widely used tools for analyzing regional impacts, was then applied to calculate the total business interruption losses based on the direct loss estimates from the HAZUS model.[6]

Based on the researchers' analysis, the potential direct building-related losses could be substantial. Direct property losses with respect to buildings include: 1) building repair and replacement costs (including both structural and non-structural damage); 2) building contents losses; and 3) building inventory losses. The results indicate that the expected general building losses increase with sea level rise and the severity of the flooding. For a 10-year flood event, the total building losses are $242.7 million under baseline conditions. The losses increase to $410.3 million in the 0.5 m sea level rise scenario, and to $714.9 million in the 1.4 m sea level rise scenario. For a 100-yr flood event, the building losses increase from $588.6 million under current conditions to $820.2 million and $1,441.3 million in the 0.5 m and 1.4 m sea level rise scenarios, respectively. Losses to residential buildings account for about 50% of the total losses. The other 50% losses are split evenly between the commercial buildings and the industrial buildings in all the scenarios except for the scenario of a 100-yr flood with 1.4 m sea level rise (Table 1).

Notably, and consistent with findings from the physical vulnerability assessment, the researchers found that flood events with the two sea level rise scenarios simulated in this study would only cause very limited impacts to the utility systems. According to their simulation, in the worst case scenario (the 100-year flood event in the 1.4 m sea level rise scenario), there are only moderate damages to two

[7.] Please refer to the full study for more specific information on the modeling analysis tools utilized (see Appendix 4).

Category	Baseline Conditions		0.5 m Sea Level Rise		1.4 m Sea Level Rise	
	10-yr Flood	100-yr Flood	10-yr Flood	100-yr Flood	10-yr Flood	100-yr Flood
Building Losses	$103.3	$260.9	$179.4	$364.4	$315.0	$649.9
Content Losses	$132.6	$312.1	$219.6	$435.5	$380.2	$759.9
Inventory Losses	$6.8	$15.5	$11.3	$20.3	$19.7	$31.5
Total Building Losses	$242.7	$588.6	$410.3	$820.2	$714.9	$1,441.3

Table 1. This table presents the summary results of general building losses in millions of 2010 $US. (Table from Wei & Chatterjee Economic Vulnerability Assessment, Appendix 4).

Category	Baseline Conditions		0.5 m Sea Level Rise		1.4 m Sea Level Rise	
	10-yr Flood	100-yr Flood	10-yr Flood	100-yr Flood	10-yr Flood	100-yr Flood
Output Losses	$3.4	$7.4	$5.8	$10.5	$9.1	$21.9
Income Losses	$2.3	$4.9	$3.8	$6.6	$5.9	$13.6
Employment Losses	24	52	41	74	64	158

Table 2. This table presents the summary of business interruption losses in millions of 2010 $US (output/income losses) and number of jobs (employment losses). (Table from Wei & Chatterjee Economic Vulnerability Assessment, Appendix 4).

wastewater treatment facilities and three oil refineries. The simulations indicate no damages in all the scenarios for other critical lifeline facilities, including water, natural gas, and electricity. In examining business interruption losses, the simulation suggested that for a 10-year flood event, the total output losses (i.e., total business interruption losses) increase from $3.4 million under current conditions to $5.8 million in the 0.5 m sea level rise scenario, and to $9.1 million in the 1.4 m sea level rise scenario. For a 100-year flood event, the output losses increase from $7.4 million under current conditions to $10.5 million in the 0.5 m and $21.9 million in the 1.4 m sea level rise scenarios (Table 2). The impacts to income and employment have similar patterns across the scenarios. The major reason for the relatively low business interruption losses caused by the coastal flood events is that over 95% of the damaged buildings are residential buildings, rather than buildings of producing sectors. Another reason for the relatively low business interruption losses is the HAZUS model has taken into consideration likely production recapture. This refers to the ability of businesses to recapture lost production through overtime and extra shifts until operational capability is restored.

The researchers emphasize that the potential economic impacts of sea level rise to the City in their analysis should be considered to be on the conservative side. The analysis only focuses on the potential impacts from the temporary flooding in the coastal area due to extreme coastal storms, and how those impacts can be amplified by sea level rise. Any impacts caused by long-term and permanent coastal erosion and beach area losses were not covered in this study. Also, the researchers did not perform further economic impact analysis on the potential damages to the transportation system. While the preliminary simulation results indicated there are minimal impacts to the transportation system in the City, analysis under the Physical Vulnerability Assessment found that city roads are vulnerable to flooding, inundation, and groundwater inflow. Further economic studies to assess potential impacts on tourism, transportation systems, goods movement, and the regional economy would help to elucidate a more robust picture of potential impacts. At the same time, addressing the impacts of which we are aware could be viewed as strengthening resilience and therefore maintaining a strong economic climate in Southern California.

Ecological Vulnerability Assessment

Most of the coastal zone in the City of L.A. is highly urbanized. The vulnerability of the least urbanized areas such as open space areas, parks or recreation centers, was assessed in the physical vulnerability assessment conducted by ICLEI (Appendix 2). While most of the beaches along the coast, with the exception of Cabrillo Beach, fall within city lines, these are primarily managed by L.A. County's Department of Beaches and Harbors. Therefore, these resources were not analyzed directly in this vulnerability assessment. We anticipate that these resources will be studied more thoroughly when the planning process is expanded to include other coastal cities and L.A. County, through collaboration with LARC and coastal cities.

However, it is necessary to highlight one very important ecological asset located within City boundaries: the Ballona Wetlands Ecological Reserve. Ballona Wetlands Ecological Reserve is located between Marina del Rey and Playa Del Rey (the del Rey bluff) at the estuary of Ballona Creek (Figure 10). It is a 600-acre ecological reserve mostly owned by the State of California with a portion of the site in unincorporated L.A. County and the rest in the City of L.A. Elevation varies and ranges from 0 to 25 feet above sea level. Remnant areas of the wetland complex also include Del Rey Lagoon, Ballona Lagoon, Marina del Rey, Oxford Basin, and the Venice Canals.

The Ballona Wetlands is the largest remaining coastal wetland within urban L.A. County and is an ecological treasure. It supports a range of habitats and functions, including estuarine-dependent plants and animals and creates opportunities for aesthetic, cultural, recreational, research and educational uses by people throughout the region.

Researchers from Loyola Marymount University and the Santa Monica Bay Restoration Foundation (SMBRC), with funding from the Environmental Protection Agency's Climate Ready Estuaries Program, recently conducted a study to understand the climate change implications for Ballona Wetlands Restoration (Bergquist et al. 2012). This included an analysis of the impacts of 0.5 m and 1.4 m sea level rise with a 100-year storm scenario.[7]

It was determined that an increase in frequency, duration, and intensity of storm events would cause flooding over the current flood control levee structures that divide Ballona Creek from the

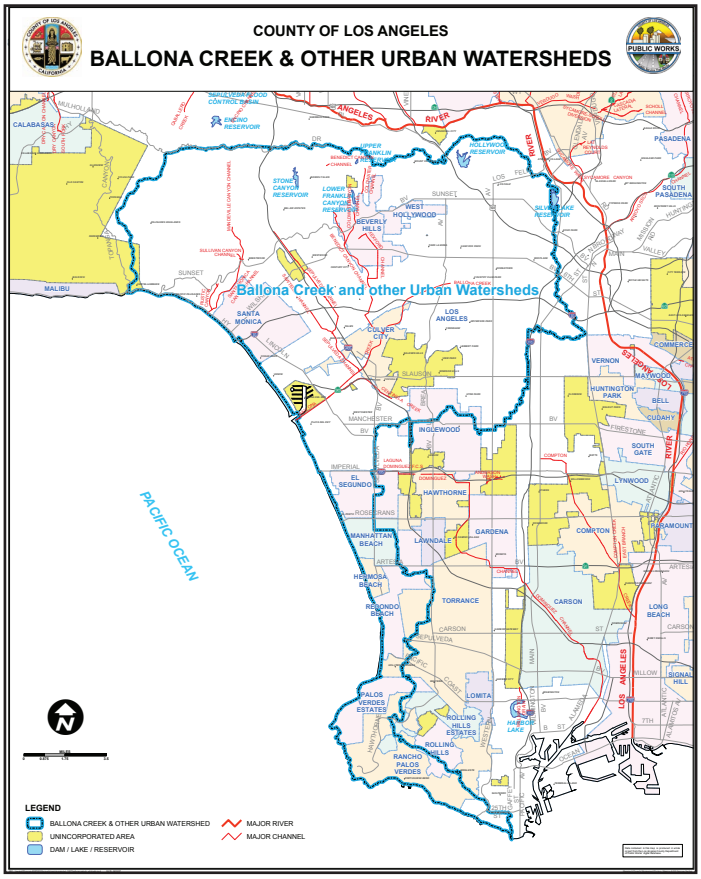


Figure 10: Map of the Ballona Creek Watershed. (Map courtesy of L.A. County Department of Public Works: http://ladpw.org/wmd/watershed/bc/).

[8] *Climate Change Implications for Ballona Wetlands Restoration* study was not funded by the City of L.A. or USC Sea Grant; thus, it was not included in the appendix of this report. If readers are interested in this research, the study report can be accessed at http://www.santamonicabay.org/ballonarestoration.html. For further information, contact USC Sea Grant (seagrant@usc.edu) or SMBRC (http://www.santamonicabay.org/).

Reserve. The levees are not currently sufficient to support a 100-year storm event. This flooding could cause significant impacts to the habitats currently within the Reserve. Furthermore, extreme wet weather will cause additional flooding in developed areas and roadways adjacent to the site boundary that are below sea level and currently experience flooding in wet weather conditions (e.g. Culver Boulevard and Playa Del Rey).



Ballona Wetlands Ecological Reserve. (Photo credit: Lisa Fimiani, http://www.cooperecological.com/BallonaBirds.htm).

Additionally, the current western wetland habitats of the Reserve receive muted tidal flooding via self-regulated tide gates. Sea level rise would reduce the functionality of these gates, resulting in altered hydrology and tidal influence. Significant sea level rise would prevent the tide gates from functioning at all and would allow no tidal influence to remain to the wetland habitats. This altered hydrology and freshwater influence would have significant effects on the habitat types, salinity, and current ecosystem of the area. To alleviate the predicted impacts of sea level rise on the restored wetlands, planners and land managers may want to consider a restoration alternative that can accommodate the transgression of habitats upslope.

Although the City of Los Angeles does not manage Ballona Wetlands, this wetland is an important ecological resource for the City, which provides a plethora of ecosystem services including, but not limited to, biological productivity energy flow, nutrient cycling, foraging, nursery, and sheltering and resting places for wildlife, sediment accretion, and wave attenuation. Another important and well-known function of the wetlands is water purification such as infiltrating and thereby treating runoff and stormwater from the watershed upstream. As such, it is in the interest of the City to ensure that the wetland is protected and that it is involved in identifying any adaptation strategies and plans.

Moving Forward - Guidance for Developing Adaptation Measures

The main purpose of this report is to provide information on the vulnerabilities the City of L.A. currently faces and may face in the future due to sea level rise. Understanding these vulnerabilities is an important first step toward preparing to meet the challenges of climate change. The next milestone is to begin to identify appropriate adaptation strategies. To help the City of L.A. move forward on this next step, in this section, we review several important considerations for the development of adaptation strategies and provide a matrix of possible coastal adaptation strategies.

Considerations for Development of Adaptation Strategies

Invest in a Strong Foundation for Climate Adaptation

Climate adaptation is a complex process, involving decision-makers at all levels of government (even if the focus of adaptation is a local community), as well as in civil society and the private sector. As we have noted throughout this study, we advocate a model of "adaptive adaptation planning." This means that adaptation planning is not a one-time effort; it requires periodic updates of information to correspond with the latest scientific understanding and needs to include this new information in the decision-making process. Ideally, the process goes far beyond technical and structural actions, and involves policy changes, creative financing, capacity-building among key staff and decision-makers, and effective public engagement.

At this early stage in sea level rise adaptation, it is important to lay a strong foundation for such an ongoing planning process. Elements of such a foundation could include:

- Acquiring the best available science and developing a formal strategy for regular updates of scientific information in planning and decision-making procedures;

- Investing in engineering and geotechnical studies for vulnerable assets that require technical approaches (e.g. as noted in the physical vulnerability assessment for Bureau of Sanitation, engineering studies that include assumptions about flood depth and duration would help to refine an evaluation of adaptive capacity);

- Conducting robust and thorough risk analyses;

- Assessing and ascertaining the information needs of local government departments, agencies, commissions, and boards as well as their capacity and willingness to integrate sea level rise vulnerability and social vulnerability into their planning, budgetary, and policy decisions;

- Initiating 'soft' adaptation strategies, such as staff training, developing trusting relationships with community organizations, identifying and supporting local champions in government, business, and civic organizations, and building governance structures across sectors and jurisdictions to increase adaptive capacity, foster buy-in, and generate the necessary institutional and political support (Cicin-Sain et al. 1998);

- Creating opportunities to foster periodic, meaningful public engagement that gathers information about affected neighborhoods and communities' concerns, vulnerabilities, and constraints; to educate communities about risks related to climate change; and to jointly develop strategies that are designed to meet current and future needs. Such engagement should also offer opportunities for communities to express any concerns and needs around procedural justice and equitable burden sharing and outcomes of adaptation.

Define Clear Adaptation Goals

Most adaptation planning processes to date in the U.S. have been undertaken without clearly defining goals and "success." Goals could focus on both procedural and outcome intentions. Failing to define success has several important implications directly relevant to local decision-making: it is difficult to prioritize and justify expenditures when a goal or purpose is not identified, and it is politically difficult to justify when people cannot visualize the intended outcome (even if just a temporary outcome). It is also difficult to show that a strategy made a positive difference or to measure progress toward the desired goal. The City would therefore be well advised in not just stating a "pie in the sky" goal, but to spend concerted effort both internally and with community involvement to define desirable and feasible outcomes of adaptation. Effective strategies flow more easily from clearly identified goals.

Develop Clear Prioritization and Selection Criteria for Choosing Among Possible Adaptation Strategies

A corollary to the need for a clearly defined goal is the establishment of criteria that help select options from the universe of potential adaptation strategies. Such criteria would help with prioritization when budgets, timelines, technical considerations, and social concerns and political feasibility inevitably place constraints on preferred solutions. Again, such criteria are best selected in consultation and agreement with affected stakeholder communities, as exclusion from defining how decisions will be made can lead to political resistance and lack of buy-in. That, of course, could endanger the ultimate success of the entire effort.

Continue "Adaptive Adaptation Planning" Approach

As stated in this report, the use of a 10-year flood scenario with sea level rise was a pragmatic choice in light of the best available, most defensible physical science at this time. Ten-year floods, however, are not the common planning standards (100- and 500-year floods are benchmarks for FEMA, for example). In addition, sea level rise scenarios may change over time; as the science advances, so will decisions about land use, the level of coastal protection, and the demographic and socioeconomic situation of coastal populations. Thus, the City would be well advised to closely track scientific developments and update the current vulnerability assessment as needed to ensure its adaptation plans and preparedness measures are up-to-date.

Expand Partnerships in Developing Adaptation Options

Much adaptation that addresses social vulnerability and public concerns requires close collaboration with the affected groups. Thus, to the extent collaborative ties are not yet established, it is important to establish working relationships with marginalized groups or organizations that represent them, and to expand the network of adaptation stakeholders to include those already working on increasing community resilience in the face of disasters. Doing this early in the process helps to build the trust and long-lasting bonds that will be needed to make difficult choices.

LARC
Los Angeles Regional Collaborative
for Climate Action and Sustainability

The Los Angeles Regional Collaborative on Climate Action and Sustainability (LARC) is an important partner of the City's effort and will serve to help expand partnerships within the region by applying the techniques and strategies to the hazards posed in the other coastal communities and municipalities through greater Los Angeles.

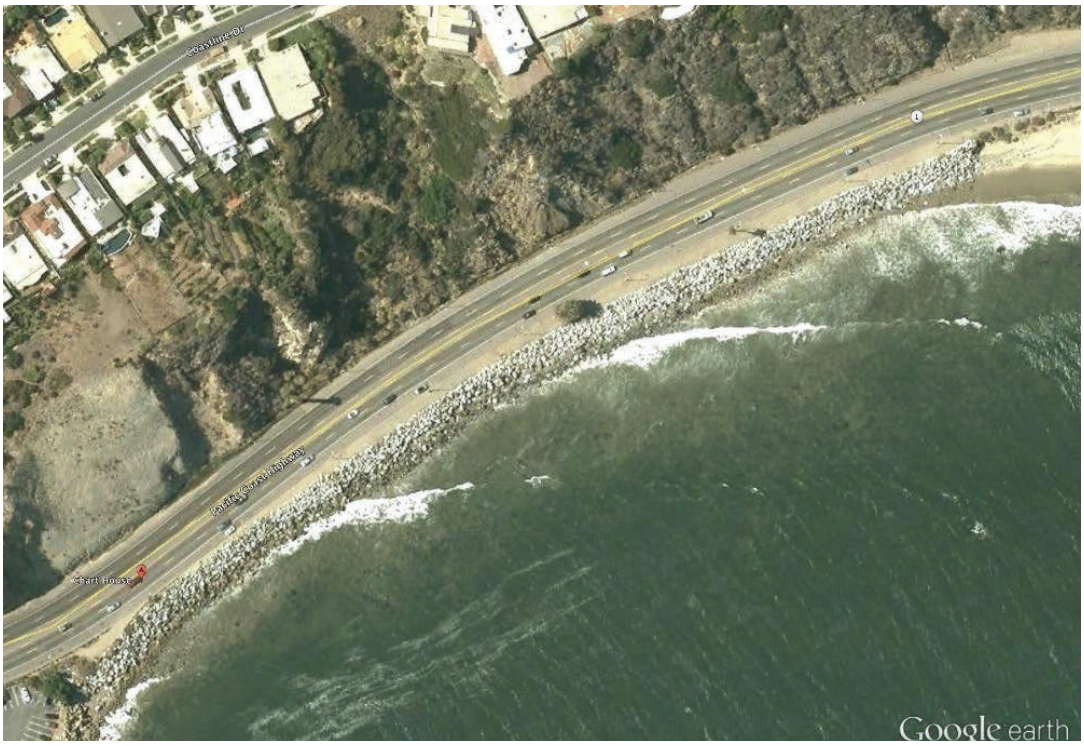
Matrix of Potential Coastal Adaptation Strategies

The matrix provided on pages 60-76, developed by Lesley Ewing (California Coastal Commission) and Dr. Reinhard Flick, outlines some of the most common coastal adaptation techniques available to coastal communities. This matrix is divided into adaptation techniques that help communities:

- Avoid hazards;
- Move development away from hazards;
- Move hazards away from development;
- Provide barriers between hazards and development; and
- Flood-proof.

For each of these sub-categories, information is provided on the details of the technique, the spatial and temporal scales associated with the technique, the ability to adjust the technique depending on changing conditions (referred to in the matrix as "adaptive capacity"), the party or agency that would be responsible for managing the adaptation technique, a relative approximation of costs (e.g. high, medium or low), and general comments.

This matrix is intended to provide insight into the available options for communities and help the community better understand the described technique. In considering any of these options for application in the adaptation planning effort, each should be analyzed for the site-specific conditions, environmental concerns, technical feasibility and compatibility with existing constraints. Clearly, not all techniques are available for all situations; rather, this matrix is meant to provide a range of adaptation response options.



A Google Earth image of heavy rock armoring along PCH in Malibu. Rock armoring is one of the many adaptation strategies described in the matrix on pages 67-83.

Avoid Hazards

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Land Acquisition	Fee Simple Acquisition	One or more lots	Short/ Long-term	Yes	Government, Non-Governmental Organization, Homeowner Association, Geologic Hazard Abatement District	High	Provides greatest control over land use and hazard response. Land can be purchased from willing sellers or by governments using eminent domain.
	Conservation Easements	One or more lots	Short/ Long-term – lessen with time	Yes	Government, Non-Governmental Organization, Homeowner Association, Geologic Hazard Abatement District	Low to Moderate	Provides less control than fee simple acquisition. Can be part of a permit action. Land can be purchased from willing sellers.
	Transfer Development Credit	Jurisdiction, Region	Moderate/ Long-term	Yes	Government, Geologic Hazard Abatement District	Low to Moderate	Provides fee simple acquisition of high hazard lots. Takes time to set up TDC Program and develop criteria for hazardous lot acquisitions. Costs to administer are low. Acquisition costs paid by developers. Cost of coastal land may make program infeasible.

Move Development Away from Hazards

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Land Acquisition	(see above)						
Managed Retreat		One or more lots	Moderate/ Long-term – Increase with time	Yes	Government, Homeowner Association, Geologic Hazard Abatement District	Moderate	Best if included in initial design to allow phased removal of development. Costs paid by owners with or without government or non-profit contributions.
Rolling Easements		One or more lots	Moderate/ Long-term – Increase with time	Yes	Government, Non-Governmental Organization, Homeowner Association, Geologic Hazard Abatement District	Moderate to high	Easements acquired by government or NGO. Costs to acquire will be likely to vary indirectly with risk.
Setbacks		One or more lots	Moderate/ Long-term – Lessen with time	Not normally	Government, Homeowner Association, Geologic Hazard Abatement District	Low	Setback provides protection from hazard until setback is gone. Variable cost to developer and/or homeowner - foregoing use of some portions of the property.
Elevation		One or more lots	Moderate/ Long-term – Lessen with time	Not normally	Government, Homeowner Association, Geologic Hazard Abatement District	Low to moderate	Elevation provides protection from ocean hazards. May introduce other risks from slope instability, etc. Need to include access and utilities for long-term effectiveness.

Move Hazards Away from Development

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Maintain or Restore Natural Sand Supply	Remove dams	Region/ watershed	Long time/ Long-term	No	Government, Water Board, Non-Governmental Organization	High to Very High	Only effective if stream flows are sufficient to move sediment to the coast. Raises difficult engineering issues if sand must be moved to the coast. Involves multiple jurisdictions. But, dam removal is occurring with as yet unknown benefits.
	By-pass sand around dams	Region/ Littoral cell	Moderate/ As long as continued	Yes	Government, Water Board	High to Very High	Only effective if stream flows are sufficient to move sediment to the coast. Raises difficult engineering issues if sand must be moved to the coast. Feasibility for large volumes is unlikely, since sand transportation cost to the coast is high, and may have unacceptable traffic and air quality impacts as well as barriers to truck access at the beach.

Move Hazards Away from Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Maintain or Restore Natural Sand Supply	Harbor dredging or By-passing	Region/ Littoral Cell	On-going/ As long as continued	Yes	Government, Harbor district	Moderate to High	Dredging is often necessary for harbor maintenance. Historically, this has been a major source of nourishment sand in certain locations. Testing and placing sand on beaches often adds only a marginal cost.
Improve or Augment Sand Supplies/ Beneficial Reuse of Sand	Interrupt rip currents	Local	Long time/ As long as continued	Yes	Government	High	Complex engineering issue. Unlikely to be feasible even for fixed rip currents located at structures or geomorphic features. This is an unproven idea likely not suitable to high tide-range environments with public opposition to surf-zone structures and likely high cost. Effects would be similar to offshore breakwaters with less guarantee of success.
	Nourish with coarser sand than native	Multiple lot/ Region	Moderate/ As long as continued	Yes	Government, Non-Governmental Organization, Homeowner Association, Geologic Hazard Abatement District	High	This approach is widely used by engineers to increase the lifetime of beach replenishment projects. Feasibility depends on availability of suitable sand sources.

Move Hazards Away from Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Improve or Augment Sand Supplies/ Beneficial Reuse of Sand	Canyon Interceptors	Region/ Littoral Cell	Long time/ As long as continued	Yes	Government	Very High	Complex and unproven engineering concept that would need detailed studies to determine feasibility. Likelihood of success is not knowable since the amount of offshore sand loss in canyons versus offshore losses along the beach is unknown.
Sources of Beach Material	Offshore Sand	Multiple lot/ Region	Short to moderate/ As long as continued	Yes		Moderate to High	Costs very dependent on scale --- mobilizing the dredge is a fixed cost regardless of volume delivered.
	Reservoir and Debris Basins	A few lots to multiple lots	Moderate/ As long as continued	Yes		High to extreme	Sand testing important. Sorting and handling costs can be large. No unit savings on transport costs with larger volumes moved. Feasibility is unlikely for large volumes, since sand transportation cost to the coast is high, and may have unacceptable traffic and air quality impacts as well as barriers to truck access at the beach. Involves multiple jurisdictions.

Move Hazards Away from Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Sources of Beach Material	Back-passing	Region/ Littoral Cell	Moderate/ As long as continued	Yes		Moderate to high	Sand quality normally compatible with existing beach material. This method holds promise since fixed plants can be used and engineering basis is relatively simple.
	Cobbles	A few lots to multiple lots	Moderate to long/ As long as continued	Yes		High to Very high	Cobble sources are limited. Poses environmental concerns for beaches without existing cobble.
	Crushed glass	A few lots to multiple lots	Moderate to long/ As long as continued	Yes		Very high	Crushed glass would need to be tumbled to round off sharp edges. Handling costs would be high.
Retention of Sand/Beach Material	Beach Berms	A few lots to multiple lots	Short/ As long as continued	Yes	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District	Low	May need to be repeated multiple times a season. Source of sand should be identified. State sovereign land issues arise.

Move Hazards Away from Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Retention of Sand/Beach Material	Groins	Region/ Littoral Cell	Long/ Moderate to long	Yes	Government, Homeowners Association, Geologic Hazard Abatement District	Very high	Engineering issue. Pre-fill likely to be required to minimize downcoast impacts. Sensitive to orientation of waves and sediment supplies and transport direction and magnitude. Public opposition to structures is an issue that needs to be solved.
	Jetties	Region/ Littoral Cell	Long/ Long	No	Government, Harbor District	Very High	Engineering issue. Normally only used at river mouths and harbor entrances. Public opposition to structures is an issue that needs to be solved.
	Dune Nourishment	A few lots to multiple lots	Moderate/ As long as continued	Yes	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, individual		Limited application in CA, since few beaches depend on dune storage of sand, especially in southern California.

Move Hazards Away from Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Retention of Sand/Beach Material	Breakwaters	Region/ Littoral Cell	Long/ Long	No	Government, Harbor District	High	Proven effective and feasible. Public opposition to structures, especially ones that directly impact surfing, is an issue that needs to be solved. Presents potential swimming and boating safety hazards. Construction cost is high, but benefits are long-term. Santa Monica Breakwater is about 80 years old and functions well with little maintenance.

Move Hazards Away from Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Innovative Options for Retention of Sand/Beach Material	Perched beach	A few lots to multiple lots	Long/ Long	No	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, individual		May require frequent re-nourishment. Also can produce negative consequences if large storm waves remove sand shoreward of perching structure that then cannot migrate back upslope onto the beach. Can modify offshore slope and pose a danger to swimmers. Also reduces circulation in the perched beach area, leading to water quality and sand contamination issues.
	Artificial seaweed	Region		Possible	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	Low to high	Never shown to be effective in field tests, and almost certainly cannot be effective due to low mass in high wave and tide-range environment. Clean up costs can be high.

Move Hazards Away from Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Innovative Options for Retention of Sand/Beach Material	Artificial headland	Region/ Littoral Cell		No	Government	Very high	Complex engineering; experimental effort. Likely to be effective and feasible if designed to function like a groin or jetty. Public opposition to structures, especially ones that impact beach access or surfing, is an issue that needs to be solved.
	Delta augmentation	Region/ Littoral Cell		Possible	Government	Very high to extreme	Complex engineering; experimental effort unproven in practice. Would require large additions of material spread over large area, and may require multiple additions of material.
	Active Beach dewatering	A few lots to multiple lots	Short to moderate/ As long as continued	Yes	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	Moderate	Principle is sound. Would be a localized effort. Only financially feasible if co-located with other active dewatering, such as desalination plants. May have consequences on other beach communities downcoast. No long-term results known in the reviewed engineering literature.

Move Hazards Away from Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Innovative Options for Retention of Sand/Beach Material	Passive beach dewatering	A few lots to multiple lots	Short/ As long as maintained	Yes	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	Low	Passive beach dewatering has never been successfully demonstrated.
	Floating breakwaters	Region/ Littoral Cell	Short to moderate/ Moderate	Slightly	Government	High	Complex engineering, but proven principle. Most uses have been for temporary protection or ship deployment.
	Multi-purpose reefs	Region/ Littoral Cell	Long/ Moderate to long	No	Government	High to very high	Complex engineering; experimental efforts. Costs to remove have proven to be very high (i.e., Pratte's Reef). Engineering criteria conflict for dual-use surfing-shore protection reefs because of high tide range in CA. Reef must be low to enable surfing at most tide elevations, but high to protect property during high wave and tide events.

Barriers between Hazards and Development

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Revetments	Rock	One or more lots	Moderate/ Moderate	Possible if part of initial design	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	High	High impact on beach areas short and long-term, including passive erosion. Changes habitat along a sandy shoreline. Public opposition to structures, especially ones that impact beach access is an issue that needs to be solved.
	Concrete units	One or more lots	Moderate/ Moderate	Possible if part of initial design	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	High	High impact on beach areas short and long-term, including passive erosion. Changes habitat along a sandy shoreline. Also, public opposition (see above).
	Gabions	One or more lots	Moderate/ Short	Possible, but not likely	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	Moderate to high	High impact on beach areas short and long-term, including passive erosion. Changes habitat along a sandy shoreline. Poor long-term performance due to weaknesses in netting. Also, public opposition (see above).

Barriers between Hazards and Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Seawalls	Vertical tie-back walls	One or more lots	Moderate/ Moderate	Possible if part of initial design	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	High	Low initial impact on beach, high long-term passive-erosion impact. Also, public opposition (see above).
	Gravity walls	One or more lots	Moderate/ Moderate	Possible if part of initial design	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	High	High impact on beach areas short and long-term, including passive erosion. Also, public opposition (see above).
	Cantilever walls	One or more lots	Moderate/ Moderate	Possible if part of initial design	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	High	Low initial impact on beach, high long-term passive-erosion impact. Also, public opposition (see above).

Barriers between Hazards and Development (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Miscellaneous	Native vegetation	One or more lots	Short/ As long as continued	Yes	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	Low	Not useful by itself on the CA moderate-wave energy and high tide-range coast. Normally used as part of a larger sand nourishment project to stabilize back shore.
	Sea cave fills	One or more lots	Moderate/ Moderate	No	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	Low to moderate	Can slow erosion in areas with bluff undercutting or cave formation. Proven feasible and cost effective. Low initial impact on beach, high long-term passive-erosion impact. Also, public opposition (see above).
	Surface & ground water controls	One or more lots	Short/ As long as continued	Yes	Government, Non-Governmental Organization, Homeowners Association, Geologic Hazard Abatement District, Individual	Low	Normally used as part of a larger project. Proven feasible and effective (even necessary) to reduce or prevent sudden cliff collapse. Not usually considered a form of beach sand erosion control.

Flood Protection

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Building Protection	Elevate structure	Individual structures	Moderate/ Long-term – Lessen with rising sea level	Not unless part of initial design	Building Owner	Low to Moderate	Elevation can provide protection from flood water if building is high enough. Often includes lower stories with break-away walls that can become floating debris.
	Sand Bags	Individual structures	Short term/ Long-term – lessen with rising sea level	Height will depend on bag stability	Building Owner	Low	Sand bagging can provide short-term protection. Requires warning of impending flood and ability for rapid response prior to the flood event. Interrupts building access while in use.
	Storm shutters	Individual structures	Moderate/ Long-term	Moderate	Building Owner	Low	Storm shutters can be available to cover all openings (normally doors and windows). Requires warning of impending flood to secure all entrances. Interrupts building access while in use.

Flood Protection (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Electrical Equipment	Elevation	Individual structures	Short term/ Long-term	Depends on building height	Building Owner Building Code	Low	Elevation of electrical equipment can insure continuity of power during and after a flood provided equipment can be located higher than flood levels
	Vaults	Individual structures	Short-term/ Long-term	None	Building Owner	Low to Moderate	Vaults would protect electrical equipment from flooding; would need routine maintenance to insure effectiveness when needed.
	Pumps	Individual structures	Short-term/ Moderate	None	Building Owner	Moderate	Useful to remove flood waters from sensitive areas. Require a reliable power source and location to which water can be pumped.

Flood Protection (continued)

General Techniques	Technique Details	Spatial Scale	Temporal Scale (Implement/ Effective)	Adaptive Capacity	Responsible Party	Costs	Comments
Tunnels	Permanent Storm Barriers	Individual systems	Moderate/ Long-term – Lessen with rising sea level	Low	Community/ Project Manager	Moderate	Storm barriers would need to cover all openings – tunnel openings, ventilation, etc. Requires warning of impending flood to secure all entrances. Interrupts access and tunnel use while barriers are in place. Depending upon storage method, they can be an annoyance to travelers when not in use.
	Temporary Entrance covers	Individual structures	Short term/ Long-term – lessen with rising sea level	Low	Building Owner	Low	Entrance covers (sand bags, inflatable plugs, etc,) can provide short-term protection. Requires warning of impending flood and ability for rapid response prior to the flood event. Interrupts tunnel access while in use.

Conclusion

By commissioning these studies and implementing the planning process, the City of L.A. has shown leadership by confronting climate change, and sea level rise specifically, proactively rather than reactively.

We have summarized the findings from a coastal issues report, and three commissioned vulnerability assessments that examined the potential social, physical and economic challenges the City of L.A. may face in the future due to accelerated sea level rise. We also discuss the importance of the Ballona Wetlands Ecological Reserve to the City and the region. We close by providing guidance for moving ahead with identifying the range of appropriate adaptation strategies that will build the City's resilience. The findings in this report, while preliminary, are meant to provide the City with a starting point for planning.

Although the results of this study highlight some of the City's physical, social and economic vulnerabilities, the City is now well poised to begin planning now and not in 20 years when many of the impacts of sea level rise will already be felt. We encourage the City to continue its efforts and to embrace the "adaptive adaptation planning" process in which new science and information is continuously assessed and incorporated. This will allow the City to plan in the efficient manner necessary to tackle the challenges. We also encourage the City to continue its strategy to include stakeholder and public input to the greatest extent possible. With broad public support and a coherent and continuous strategy for confronting change, Los Angeles will continue to serve as a model for other large metropolises facing a changing future.

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Ms. Grifman is Associate Director of the USC Sea Grant Program. Her background in marine and environmental policy underscores work administering the NOAA Sea Grant Program at the University of Southern California. As Associate Director, she manages the program's research, outreach and education portfolios, in addition to working with stakeholders at state, local and federal levels. Her responsibilities include improving public awareness of Sea Grant's mission and accomplishments and developing programs and partnerships to foster the connections between science and policy. Ms. Grifman received her B.A. and M.A. (Political Science) from the University of California Santa Barbara. Her major interests include marine policy development and implementation, and public education.

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Appendices

The University of Southern California Sea Grant Program assembled an interdisciplinary team of experts to identify the potential exposure to and vulnerabilities of sea level rise in the City of Los Angeles. The authors are recognized locally, nationally, and internationally as experts in their respective fields of study. The following reports include a review of the coastal and shoreline assets within City boundaries and three vulnerability assessments examining physical, social and economic vulnerabilities to sea level rise and coastal storm events. While all are appendices in support of the overall summary report, each can be considered a standalone study. Instructions on how to access the appendices is provided in the information below.

Appendix 1: City of Los Angeles Coastal Issues Related to Future Mean Sea Level Rise by Dr. Reinhard E. Flick, Principal Oceanographer, TerraCosta Consulting Group, Inc.

Appendix 2: Physical Vulnerability Assessment Findings for the City of Los Angeles by Brian Holland and Melissa Higbee, ICLEI - Local Governments for Sustainability U.S.A.

Appendix 3: Sea-Level Rise Impacts and Flooding Risks in the Context of Social Vulnerability: An Assessment for the City of Los Angeles by Dr. Julia A. Ekstrom and Dr. Susanne C. Moser, Susanne Moser Research & Consulting

Appendix 4: Economic Impact of Sea Level Rise to the City of Los Angeles by Dr. Dan Wei and Dr. Sam Chatterjee, USC Price School of Public Policy, Center for Risk and Economic Analysis of Terrorism Events

Access at: http://www.usc.edu/org/seagrant/research/sea_level_rise_vulnerability.html



Sea Grant
University of Southern California

University of Southern California Sea Grant
Technical Report USCSG-TR-05-2013

APPENDIX R
LOS ANGELES RWQCB BASIN PLAN
(CHAPTER 7)

California Regional Water Quality Control Board
Los Angeles Region

Attachment to Resolution No. R11-013

7 TMDLs (Total Maximum Daily Loads)

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Introduction

Legal Basis and Authority

Section 303(d)(1)(a) of the Clean Water Act (CWA) requires that "each state shall identify those waters within its boundaries for which the effluent limitations … are not stringent enough to implement any water quality standard applicable to such waters." The CWA also requires states to establish a priority ranking for these waters. This list of prioritized impaired waterbodies is known as the 303(d) list. The CWA then requires that Total Maximum Daily Loads (TMDLs) be established for waters on the 303(d) list. On California's 1998 303(d) list, the Los Angeles Regional Water Quality Control Board (RWQCB) identified 832 waterbody reaches as water quality impaired. Since this listing, these impaired reaches have been consolidated into 92 "TMDL Analytical Units" in order to better manage and prioritize impaired watersheds for TMDL development.

A consent decree between the U.S. Environmental Protection Agency (USEPA), Heal the Bay, Inc. and BayKeeper, Inc. was approved on March 22, 1999. This court order directs the USEPA to complete TMDLs for all impaired waters within 12 years. A schedule was established in the consent decree for the completion of the first 29 TMDLs within 7 years. The remaining TMDLs will be scheduled by Regional Board staff within the 12-year period.

The elements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the CWA, as well as in USEPA guidance documents (e.g., USEPA, 1991). A TMDL is defined as "the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2). Regulations further stipulate that TMDLs must be set at "levels necessary to attain and maintain the applicable narrative and numeric water quality standards with seasonal variations and a margin of safety that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality" (40 CFR 130.7(c)(1)). The regulations in 40 CFR 130.7 also state that TMDLs shall take into account critical conditions for stream flow, loading and water quality parameters.

Upon establishment of TMDLs by the State or USEPA, the State is required to incorporate the TMDLs along with appropriate implementation measures into the State Water Quality Management Plan (40 CFR 130.6(c)(1), 130.7). This Water Quality Control Plan for the Los Angeles Region (Basin Plan), and applicable statewide plans, serve as the State Water Quality Management Plans governing the watersheds under the jurisdiction of the RWQCB.

Before approval by USEPA or incorporation into the Basin Plan, TMDLs must be subject to public review (40 CFR 130.7). Public review requirements for Basin Plan Amendments are described in Chapter 1 of this document.

TMDL Components

TMDLs include the following technical components, which provide the analytical basis for the TMDLs.

- **Problem Statement**: A description of the waterbody/watershed setting, beneficial use impairments, and pollutants or stressors causing the impairment.
- **Numeric Targets**: For each stressor addressed in the TMDL, appropriate measurable indicators and associated numeric targets based on numeric or narrative water quality standards, which express the target or desired condition for the existing or potential beneficial uses.
- **Source Analysis**: An assessment of relative contributions of pollutant or stressor sources to the waterbody and the extent of needed discharge reductions or controls.
- **Loading Capacity/Seasonal Variations and Critical Conditions/Linkage Analysis**: The loading capacity is an estimate of the assimilative capacity of the waterbody for the pollutant of concern taking into account seasonal variations and critical conditions. The linkage analysis describes the analytical basis for concluding that the load allocations along with the margin of safety will not exceed the loading capacity of the waterbody.
- **Load Allocations/Margin of Safety**: The allocation of allowable loads or load reductions among different sources, providing an adequate margin of safety. These allocations are usually expressed as waste load allocations for point sources, load allocations for nonpoint sources, and contributions from natural sources. The margin of safety takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. Allocations can be expressed in terms of mass loads or other appropriate measures. The TMDL equals the sum of the above allocations and the margin of safety and cannot exceed the loading capacity for the waterbody.

In addition to these technical components, TMDLs must include a public participation component, an implementation plan, and a monitoring plan. Before approval by USEPA or incorporation into the Basin Plan, TMDLs must be subject to public review (40 CFR 130.7). Public review requirements for Basin Plan Amendments are described in Chapter 1 of this document. The implementation plan should include a description of best management practices, point source controls or other actions necessary to implement the TMDL as well as how and when the necessary controls will be accomplished and who is responsible for each measure. The monitoring plan is required to evaluate the effectiveness of the TMDL and should include a schedule for reviewing and revising, if necessary, the TMDL and associated implementation measures.

Organization of Chapter

As TMDLs are developed, this chapter (Chapter 7) of the Basin Plan will be amended to include summaries of each TMDL in chronological order of Board approval.

7-1 San Gabriel River East Fork Trash TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on October 28, 1999.

This TMDL was amended and adopted by:
The Regional Water Quality Control Board on May 25, 2000.

This TMDL was approved by:
The State Water Resources Control Board on June 15, 2000.
The Office of Administrative Law on September 8, 2000.
The U.S. Environmental Protection Agency on December 14, 2000.

The effective date of this TMDL is: April 17, 2001.

The following table includes all the elements of this TMDL.

Table 7-1 TMDL Summaries

Watershed	**Reach**	**Pollutant**
San Gabriel River	***East Fork***	***Trash***
Element	**Derivation of Numbers**	
Problem Statement	High recreational use of the river results in trash being deposited in and along the stream, posing a threat to water quality.	
Water Quality Objective	Waters shall not contain floating materials, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses. Water shall not contain suspended or settable material in concentrations that cause nuisance or adversely affect beneficial uses.	
Numeric Target	No trash in the river	
Source Analysis	Picnicking and camping are the primary sources of trash.	
Responsible Party	U.S. Forest Service	
Load Allocations	Zero trash discharged to the river.	
Margin of Safety	Implicit Margin of Safety based on conservative interpretation of narrative standard	
Seasonal Variations and Critical Conditions	Peak recreational usage is June through September based on Forest Service, Regional Board and Los Angeles County Department of Public Works field observations.	

Implementation Measures	The USFS shall submit a "TMDL Implementation Plan" within 60 days of the effective date of this amendment. The Plan shall include a detailed discussion of litter control measures to be implemented. The TMDL specifies that implementation and monitoring must begin by no later than 90 days after the effective date of this amendment. The USFS must demonstrate compliance with the TMDL (numeric target) by April 1, 2003. The Regional Board must approve any variations from this schedule.
Monitoring	The USFS must conduct monitoring downstream of each of the four informal picnic areas referenced in the TMDL once per month during the peak use season (June-September.) Monitoring of each of the four informal picnic areas may be conducted every other month during the rest of the year. Two short-term surveys shall be conducted each year. One survey shall be conducted during a summer holiday weekend by setting up trash collection nets in the river over a period of four days (Friday through Monday). A wet season survey using trash collection nets over four days shall also be conducted.

*The complete administrative record for the TMDL is available for review upon request.

7-2 Los Angeles River Watershed Trash TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on September 19, 2001.

This TMDL was approved by:
The State Water Resources Control Board on February 19, 2002.
The Office of Administrative Law on July 16, 2002
The U.S. Environmental Protection Agency on August 1, 2002.

This TMDL was set aside by:
The Regional Water Quality Control Board on June 8, 2006.

This TMDL was remanded by:
The State Water Resources Control Board on July 19, 2006.

This TMDL was adopted by:
The Regional Water Quality Control Board on August 9, 2007.

This TMDL was approved by:
The State Water Resources Control Board on April 15, 2008.
The Office of Administrative Law on July 1, 2008.
The U.S. Environmental Protection Agency on July 24, 2008.

The effective date of this TMDL is: September 23, 2008.

The following table includes all the elements of this TMDL.

Table 7-2.1. Los Angeles River Watershed Trash TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Trash in the Los Angeles River is causing impairment of beneficial uses. The following designated beneficial uses are impacted by trash: water contact recreation (REC1); non-contact water recreation (REC2); warm freshwater habitat (WARM); wildlife habitat (WILD), estuarine habitat (EST); marine habitat (MAR); rare and threatened or endangered species (RARE); migration of aquatic organisms (MIGR); spawning, reproduction and early development of fish (SPWN); commercial and sport fishing (COMM); shellfish harvesting (SHELL); wetland habitat (WET); and cold freshwater habitat (COLD).
Numeric Target *(Interpretation of the numeric water quality objective, used to calculate the waste load allocations)*	Zero trash in all waterbodies.
Source Analysis	Stormwater discharge is the major source of trash in the river. Nonpoint sources, i.e., direct deposition of trash by people or wind into the water body, is a de minimus source of trash loading to the LA River.
Loading Capacity	Zero

Element	Key Findings and Regulatory Provisions
Waste Load Allocations	Baseline Waste Load Allocations for each city in the Los Angeles River Watershed are as provided in Table 7.2.2. The TMDL requires phased reductions over a period of 9 years, from existing baseline loads to zero (0). Phase II stormwater permittees (including educational institutions) also have a final wasteload allocation of zero. An implementation schedule for these permittees will be established once their stormwater permit has been developed.
Load Allocations	The load allocations for nonpoint source trash discharges to the LA River are zero.
Implementation	This TMDL will be implemented through stormwater permits and via the authority vested in the Executive Officer by section 13267 of the Porter-Cologne Water Quality Control Act: (Water Code section 13000 et seq.). Compliance with the final waste load allocation may be achieved through a full capture system. A full capture system is any device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the subdrainage area. The Rational Equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour, as determined per the rainfall isohyetal map in Figure A), and A= subdrainage area (acres). The isohyetal map may be updated annually by the Los Angeles County hydrologist to reflect additional rain data gathered during the previous year. Annual updates published by the Los Angeles County Department of Public Works are prospectively incorporated by reference into this TMDL and accompanying Basin Plan amendment. The Executive Officer has authority to certify, as full-capture, any trash reduction system that meets the operating and performance requirements as described above. To the extent nonpoint source implementation of load allocations is necessary, it will be accomplished, consistent with the Plan for Nonpoint Source Pollution Control Policy, with waste discharge requirements, waivers of waste discharge requirements, or any appropriate order, including a cleanup and abatement order, pursuant to e.g., sections 13263, 13269, and/or 13304. An implementation report, outlining how responsible agencies intend to comply with the TMDL, will be prepared six months after the effective date of the TMDL.
Margin of Safety	"Zero discharge" is a conservative standard which contains an implicit margin of safety.
Seasonal Variations and Critical Conditions	Discharge of trash from the storm drain occurs primarily during or shortly after a rain event of greater than 0.25 inches.

Figure A

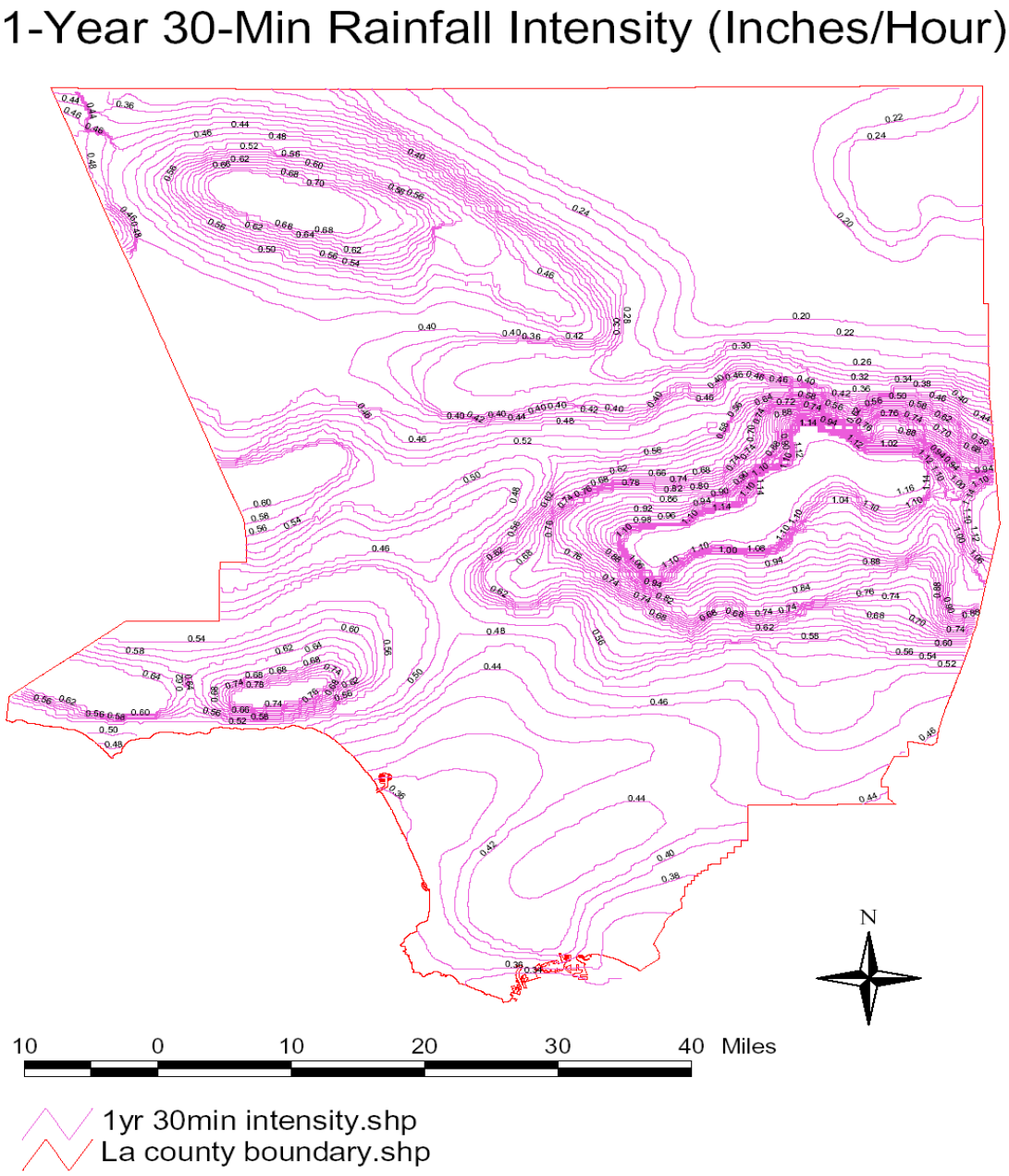

Figure A: Isohyethal Map of Rainfall Intensities in Portions of Los Angeles County

Table 7-2.2. Los Angeles River Trash TMDL Baseline Waste Load Allocations (gallons and lbs of trash).

City	WLA (gals)	WLA (lbs)
Alhambra	39903	68761
Arcadia	50108	93036
Bell*	16026	25337
Bell Gardens	13500	23371
Bradbury	4277	12160
Burbank*	92590	170389
Calabasas	22505	52230
Carson	6832	10208
Commerce	58733	85481
Compton*	53191	86356
Cudahy	5935	10061
Downey	39063	68507
Duarte	12210	23687
El Monte	42208	68267
Glendale*	140314	293498
Hidden Hills	3663	10821
Huntington Park	19159	30929
Irwindale	12352	17911
La Cañada Flintridge	33496	73747
Long Beach*	87135	149759
Los Angeles*	1374845	2572500
Los Angeles County*	310223	651806
Lynwood	28201	46467
Maywood	6129	10549
Monrovia	46687	100988
Montebello	50369	83707
Monterey Park	38899	70456
Paramount	27452	44490
Pasadena*	111998	207514
Pico Rivera	13953	22549
Rosemead	27305	47378
San Fernando	13947	23077
San Gabriel	20343	36437
San Marino	14391	29147
Santa Clarita	901	2326
Sierra Madre	11611	25192
Signal Hill	9434	14220
Simi Valley	137	344
South El Monte	15999	24319
South Gate	43904	72333
South Pasadena	14907	28357
Temple City	17572	31819
Vernon	47203	66814
Caltrans	59421	66566

*Military Installations were not included in calculation of Baseline WLA.

Table 7.2.3. Los Angeles River Trash TMDL: Implementation Schedule.[1]

(Required percent reductions based on initial baseline wasteload allocation of each city)

End of Storm Year	Implementation	Waste Load Allocation	Compliance Point
Sept 30, 2008	Implementation: Year 1	60% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 60% of the baseline load
Sept 30, 2009	Implementation: Year 2	50% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 55% of the baseline load calculated as a 2-year annual average
Sept 30, 2010	Implementation: Year 3[2]	40% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 50% of the baseline load calculated as a rolling 3-year annual average
Sept 30, 2011	Implementation: Year 4	30% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 40% of the baseline load calculated as a rolling 3-year annual average
Sept 30, 2012	Implementation: Year 5	20% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 30% of the baseline load calculated as a rolling 3-year annual average
Sept 30, 2013	Implementation: Year 6	10% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 20% of the baseline load calculated as a rolling 3-year annual average
Sept 30, 2014	Implementation: Year 7	0% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 10% of the baseline load calculated as a rolling 3-year annual average
Sept 30, 2015	Implementation: Year 8	0% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 3.3% of the baseline load calculated as a rolling 3-year annual average
Sept 30, 2016	Implementation: Year 9	0% of Baseline Waste Load Allocations for the Municipal permittees; and Caltrans	Compliance is 0% of the baseline load calculated as a rolling 3-year annual average

1 "Notwithstanding the zero trash target and the baseline waste load allocations shown in Table 5, a Permittee will be deemed in compliance with the Trash TMDL in areas served by a Full Capture System within the Los Angeles River Watershed."

2 As specified in Section VI.A., the Regional Board will review and reconsider the final Waste Load Allocations once a reduction of 50% has been achieved and sustained.

7-3 Ballona Creek Trash TMDL*

This TMDL was adopted by:
The Regional Water Quality Control Board on September 19, 2001.

This TMDL was approved by:
The State Water Resources Control Board on February 19, 2002.
The Office of Administrative Law on July 18, 2002.
The U.S. Environmental Protection Agency on August 1, 2002.

This TMDL was amended and adopted by:
The Regional Water Quality Control Board on March 4, 2004.

This amended TMDL was approved by:
The State Water Resources Control Board on September 30, 2004.
The Office of Administrative Law on February 8, 2005.
[U.S. Environmental Protection Agency approval not required for amendment to implementation plan]

The effective date of this TMDL is: August 11, 2005.

The following table presents the key elements of this TMDL.

Table 7-3.1 Ballona Creek: Trash TMDL Elements

Element	Derivation of Numbers
Problem Statement	Trash in Ballona Creek is causing impairment of beneficial uses. The following designated beneficial uses are impacted by trash: water contact recreation (REC1); non-contact water recreation (REC2); warm freshwater habitat (WARM); wildlife habitat (WILD), estuarine habitat (EST); marine habitat (MAR); rare and threatened or endangered species (RARE); migration of aquatic organisms (MIGR); spawning, reproduction and early development of fish (SPWN); commercial and sport fishing (COMM); shellfish harvesting (SHELL); wetland habitat (WET); and cold freshwater habitat (COLD).
Numeric Target *(Interpretation of the narrative water quality objective, used to calculate the load allocations)*	Zero trash in the river.
Source Analysis	Stormwater discharge is the major source of trash in the river.
Loading Capacity	Zero.
Waste Load Allocations	Phased reduction for a period of 10 years, from existing baseline load to zero.
Implementation	This TMDL will be implemented through stormwater permits and via the authority vested in the Executive Officer by section13267 of the Porter-Cologne Water Quality Control Act: Water Code section 13000 et seq. Compliance with the final waste load allocation may be achieved through a full capture system. A full capture system is any device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the subdrainage area.

Implementation (continued)	Rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour, as determined per the rainfall isohyetal map in Figure A), and A= subdrainage area (acres). The isohyetal map may be updated annually by the Los Angeles County hydrologist to reflect additional rain data gathered during the previous year. Annual updates published by the Los Angeles County Department of Public Works are prospectively incorporated by reference into this TMDL and accompanying Basin Plan amendment.
Margin of Safety	"Zero discharge" is a conservative standard which contains an implicit margin of safety.
Seasonal Variations and Critical Conditions	Discharge of trash from the storm drain occurs primarily during or shortly after a rain event of greater than 0.25 inches.

*The complete administrative record for the TMDL is available for review upon request.

Figure A

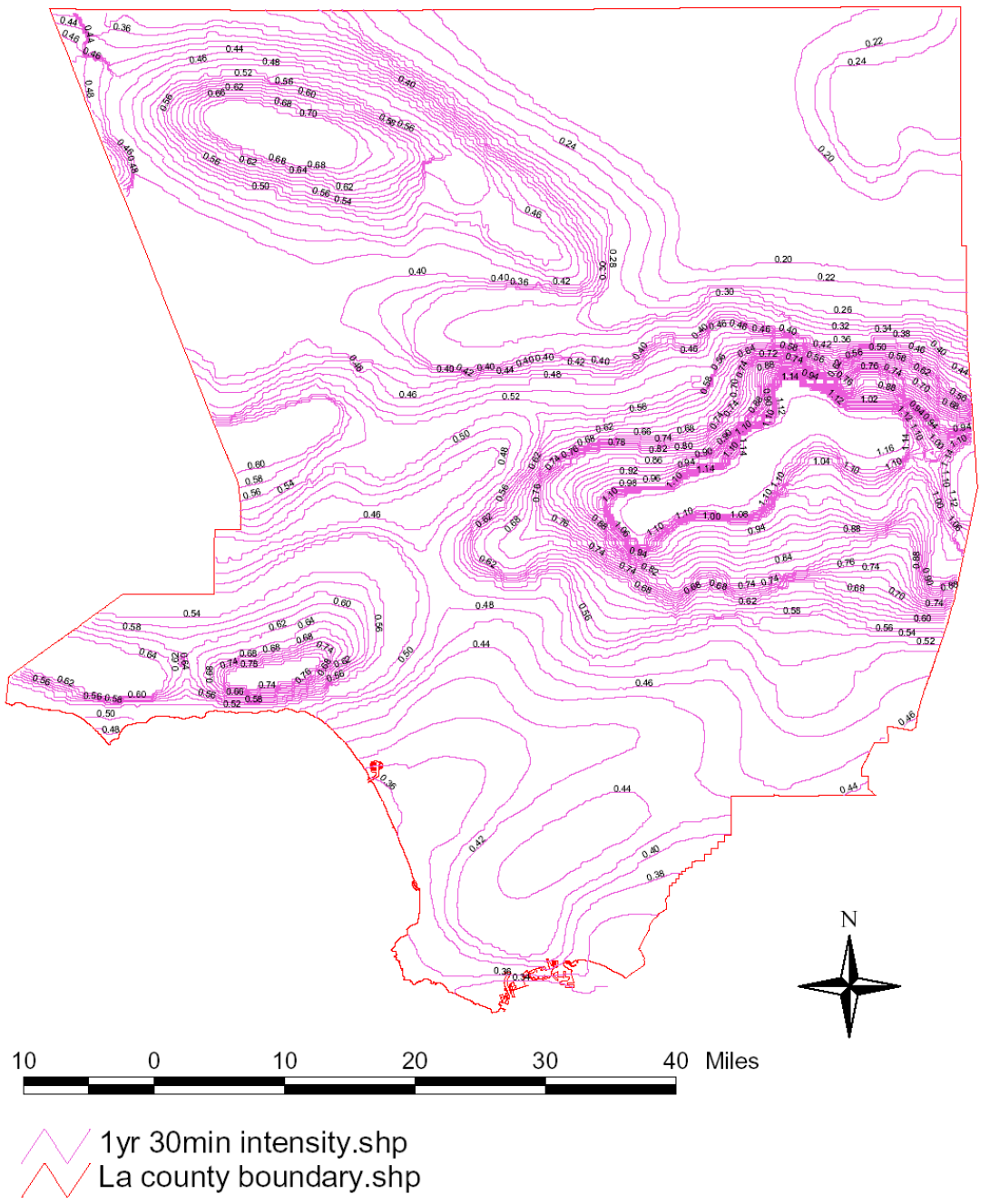
1-Year 30-Min Rainfall Intensity (Inches/Hour)
N
10 0 10 20 30 40 Miles
1yr 30min intensity.shp
La county boundary.shp

Table 7-3.2 Ballona Creek Trash TMDL: Implementation Schedule[1]
(Default waste load allocations expressed as cubic feet of uncompressed trash and % reduction)

Year	Baseline Monitoring/ Implementation	Waste Load Allocation	Compliance Point
1 10/1/01-- 9/30/02	Baseline Monitoring	No allocation specified. Trash will be reduced by levels collected during the baseline monitoring program.	Achieved through timely compliance with baseline monitoring program.
2 10/1/02-- 9/30/03	Baseline Monitoring	No allocation specified. Trash will be reduced by levels collected during the baseline monitoring program.	Achieved through timely compliance with baseline monitoring program.
3 10/1/03-- 9/30/04	Baseline Monitoring (optional)/ Implementation: Year 1	90% (9,985 for the Municipal permittees, 1,472 for Caltrans)	No compliance point (target of 90%)
4 10/1/04-- 9/30/05	Baseline Monitoring (optional)/ Implementation: Year 2	80% (8,875 for the Municipal permittees, 1,308 for Caltrans)	No compliance point (target of 80%)
5 10/1/05-- 9/30/06	Implementation: Year 3	70% (7,776 for the Municipal permittees; 1,146 for Caltrans)	Compliance is 80% of the baseline load calculated as a rolling 3-year annual average (8,875 for the Municipal permittees; 1,308 for Caltrans).
6 10/1/06-- 9/30/07	Implementation: Year 4	60% (6,656 for the Municipal permittees; 981 for Caltrans)	70% of the baseline load the baseline load calculated as a rolling 3-year annual average (7,776 for the Municipal permittees; 1,146 for Caltrans).
7 10/1/07-- 9/30/08	Implementation: Year 5[2]	50% (5,547 for the Municipal permittees; 818 for Caltrans)	60% of the baseline load calculated as a rolling 3-year annual average (6,656 for the Municipal permittees; 981 for Caltrans)
8 10/1/08-- 9/30/09	Implementation: Year 6	40% (4,438 for the Municipal permittees; 654 for Caltrans)	50% of the baseline load calculated as a rolling 3-year annual average (5,547 for the Municipal permittees; 818 for Caltrans).
9 10/1/09-- 9/30/10	Implementation: Year 7	30% (3,328 for the Municipal permittees; 491 for Caltrans)	40% of the baseline load calculated as a rolling 3-year annual average (4,438 for the Municipal permittees; 654 for Caltrans).
10 10/1/10-- 9/30/11	Implementation: Year 8	20% (2,218 for the Municipal permittees; 327 for Caltrans).	30% of the baseline load calculated as a rolling 3-year annual average (3,328 for the Municipal permittees; 491 for Caltrans).
11 10/1/11-- 9/30/12	Implementation: Year 9	10% (1,110 for the Municipal permittees; 164 for Caltrans).	20% of the baseline load calculated as a rolling 3-year annual average (2,220 for the Municipal permittees; 327 for Caltrans).
12 10/1/12-- 9/30/13	Implementation: Year 10	0 or 0 % of the baseline load.	10% of the baseline load calculated as a rolling 3-year annual average (1,110 for the Municipal permittees; 164 for Caltrans.

13 10/1/13-- 9/30/14	Implementation: Year 11	0 or 0 % of the baseline load.	3.3 % of the baseline load calculated as a rolling 3-year annual average (366 for the Municipal permittees, 54 for Caltrans).
14 10/1/14-- 9/30/15	Implementation: Year 12	0 or 0 % of the baseline.	0 or 0 % of the baseline load.

1 "Notwithstanding the zero trash target and the default waste load allocations shown in Table 7-3.2, a Permittee will be deemed in compliance with the Trash TMDL in areas served by a Full Capture System within the Ballona Creek and Estuary Watershed."

2 The Regional Board will review and reconsider the final Waste Load Allocations once a reduction of 50% has been achieved and sustained.

Table 7-3.3. Ballona Creek Trash TMDL: Significant Dates

30 days after receipt of the Executive Officer's request as authorized by Section 13267 of the Water Code.	Submit baseline monitoring plan(s).
120 days after receipt of the Executive Officer's request as authorized by Section 13267 of the Water Code.	List of facilities that are outside of the permittee's jurisdiction but drain to a portion of the permittee's storm drain system, which discharges to Ballona Creek.
Within the first 2 years after approval of this basin plan amendment; to be extended to 4 years at the option of the permittees	Collection of baseline data.
72 hours after each rain event	Clean out of and measurement of trash retained.
Every 3 months during dry weather	Clean out of and measurement of trash retained.

7-4 Santa Monica Bay Beaches Bacteria TMDL (Dry Weather Only)*

This TMDL was adopted by:
The Regional Water Quality Control Board on January 24, 2002.

This TMDL was approved by:
The State Water Resources Control Board on September 19, 2002.
The Office of Administrative Law on December 9, 2002.
The U.S. Environmental Protection Agency on June 19, 2003.

This TMDL was amended and adopted by:
The Regional Water Quality Control Board on December 12, 2002.

This amended TMDL was approved by:
The State Water Resources Control Board on March 19, 2003.
The Office of Administrative Law on May 20, 2003.
The U.S. Environmental Protection Agency on June 19, 2003.

The effective date of this TMDL is: July 15, 2003.

The following table summarizes the key elements of this TMDL.

Table 7-4.1. Santa Monica Bay Beaches Bacteria TMDL (Dry Weather Only): Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Elevated bacterial indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use at many Santa Monica Bay (SMB) beaches. Swimming in waters with elevated bacterial indicator densities has long been associated with adverse health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine water to protect the water contact recreation use. These targets are the most appropriate indicators of public health risk in recreational waters. These bacteriological objectives are set forth in Chapter 3 of the Basin Plan, as amended by the Regional Board on October 25, 2001. The objectives are based on four bacterial indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives are as follows: <u>1. Rolling 30-day Geometric Mean Limits</u> a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. <u>2. Single Sample Limits</u> a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Element	Key Findings and Regulatory Provisions
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	The targets apply throughout the year. The compliance point for the targets is the wave wash[1], where there is a freshwater outlet (i.e., storm drain or creek) to the beach, or at ankle depth at beaches without a freshwater outlet. The geometric mean targets may not be exceeded at any time. For the single sample targets, each existing shoreline monitoring site is assigned an allowable number of exceedance days for two time periods (summer dry weather and winter dry weather as defined in Table 7-4.2a). (A separate amendment will address the allowable number of wet weather exceedance days.) The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing shoreline bacteriological water quality.
Source Analysis	With the exception of isolated sewage spills, dry weather urban runoff conveyed by storm drains and creeks is the primary source of elevated bacterial indicator densities to SMB beaches during dry weather. Limited natural runoff and groundwater may also potentially contribute to elevated bacterial indicator densities during winter dry weather. This is supported by the finding that historical monitoring data from the reference beach indicate no exceedances of the single sample targets during summer dry weather and on average only three percent exceedance during winter dry weather.
Loading Capacity	Studies show that bacterial degradation and dilution during transport from the watershed to the beach do not significantly affect bacterial indicator densities at SMB beaches. Therefore, the loading capacity is defined in terms of bacterial indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above.
Waste Load Allocations	Waste load allocations are expressed as the number of sample days at a shoreline monitoring site that may exceed the single sample targets identified under "Numeric Target." Waste load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. For each shoreline monitoring site and corresponding subwatershed, the allowable number of exceedance days is set for two time periods. These two periods are: 1. summer dry weather (April 1 to October 31), and 2. winter dry weather (November 1 to March 31).

Element	Key Findings and Regulatory Provisions
Waste Load Allocations	The allowable number of exceedance days for a shoreline monitoring site for each time period is based on the lesser of two criteria (1) exceedance days in the designated reference system and (2) exceedance days based on historical bacteriological data at the monitoring site. This ensures that shoreline bacteriological water quality is at least as good as that of a largely undeveloped system and that there is no degradation of existing shoreline bacteriological water quality.[2]All responsible jurisdictions and responsible agencies[3] within a subwatershed are jointly responsible for complying with the allowable number of exceedance days for each associated shoreline monitoring site identified in Table 7-4.2a below. The three Publicly Owned Treatment Works (POTWs)[4] discharging to Santa Monica Bay are each given individual WLAs of zero (0) days of exceedance during both summer dry weather and winter dry weather.
Implementation	This TMDL will be implemented in two phases over a 6-year period. The regulatory mechanisms used to implement the TMDL will include primarily the Los Angeles County Municipal Storm Water NPDES Permit, the Caltrans Storm Water Permit, the three NPDES permits for the POTWs, and the authority vested in the Executive Officer via 13267 of the Porter-Cologne Water Quality Control Act. Within 3 years of the effective date of the TMDL, summer dry-weather allowable exceedance days and the rolling 30-day geometric mean targets must be achieved. Within 6 years of the effective date, winter dry-weather allowable exceedance days and the rolling 30-day geometric mean targets must be achieved.
Margin of Safety	WLAs of zero days of exceedance during the summer include an implicit margin of safety. The WLAs of a maximum of three days of exceedance during winter dry weather include an implicit margin of safety because the maximum allowable days of exceedance are based on samples collected 50 yards downcurrent of the freshwater outlet at the reference beach. Findings from a bacterial dispersion study of selected freshwater outlets show that there is typically significant dilution between the freshwater outlet, the wave wash (the compliance point), and a point 50 yards downcurrent.

Element	Key Findings and Regulatory Provisions
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for two time periods (summer dry weather and winter dry weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators. The critical period for this dry weather bacteria TMDL is during winter months, when historic shoreline monitoring data for the reference beach indicate that the single sample bacteria objectives are exceeded on average 3% of the dry weather days sampled.

Note: The complete staff report for the TMDL is available for review upon request.

1 The wave wash is defined as the point at which the storm drain or creek empties and the effluent from the storm drain initially mixes with the receiving ocean water.

2 In order to fully protect public health, no exceedances are permitted at any shoreline monitoring location during summer dry weather (April 1 to October 31). In addition to being consistent with the two criteria, waste load allocations of zero (0) exceedance days are further supported by the fact that the California Department of Health Services has established minimum protective bacteriological standards – the same as the numeric targets in this TMDL – which, when exceeded during the period April 1 to October 31, result in posting a beach with a health hazard warning (California Code of Regulations, title 17, section 7958).

3 For the purposes of this TMDL, "responsible jurisdictions and responsible agencies" includes: (1) local agencies that are responsible for discharges from a publicly owned treatment works to the Santa Monica Bay watershed or directly to the Bay, (2) local agencies that are permittees or co-permittees on a municipal storm water permit, (3) local or state agencies that have jurisdiction over a beach adjacent to Santa Monica Bay, and (4) the California Department of Transportation pursuant to its storm water permit.

4 Hyperion Wastewater Treatment Plant, Joint Water Pollution Control Plant, and Tapia Wastewater Reclamation Facility.

Table 7-4.2a. Santa Monica Bay Beaches Bacteria TMDL Implementation Schedule (Dry Weather Only)
Allowable number of days that may exceed Any Single Sample Bacterial Indicator Target For Existing Shoreline Monitoring Stations

Compliance Deadline			3 years after effective date		6 years after effective date	
			Summer Dry Weather^		Winter Dry Weather^*	
			Apr. 1-Oct. 31		Nov. 1-Mar. 31	
Station ID	Location Name	Subwatershed	Daily sampling (No. days)	Weekly sampling (No. days)	Daily sampling (No. days)	Weekly sampling (No. days)
City of Los Angeles, Environmental Monitoring Division Sites						
S1	Surfrider Beach (breach point) - daily	Malibu Canyon	0	0	3	1
S2	Topanga State Beach	Topanga Canyon	0	0	3	1
S3	Pulga Canyon storm drain - 50 yards east (Will Rogers)	Pulga Canyon	0	0	3	1
S4	Santa Monica Canyon, Will Rogers State Beach	Santa Monica Canyon	0	0	3	1
S5	Santa Monica Municipal Pier - 50 yards southeast	Santa Monica	0	0	3	1
S6	Santa Monica Beach at Pico/Kenter storm drain	Santa Monica	0	0	3	1
S7	Ashland Av. storm drain - 50 yards south (Venice)	Santa Monica	0	0	3	1
S8	Venice City Beach at Windward Av. - 50 yards north	Ballona	0	0	2	1
S10	Ballona Creek entrance - 50 yards south (Dockweiler)	Dockweiler	0	0	3	1
S11	Dockweiler State Beach at Culver Bl.	Dockweiler	0	0	3	1
S12	Imperial Highway storm drain - 50 yards north (Dockweiler)	Dockweiler	0	0	2	1
S13	Manhattan State Beach at 40th Street	Hermosa	0	0	1	1
S14	Manhattan Beach Pier - 50 yards south	Hermosa	0	0	1	1
S15	Hermosa Beach Pier - 50 yards south	Hermosa	0	0	2	1
S16	Redondo Municipal Pier - 50 yards south	Redondo	0	0	3	1
S17	Redondo State Beach at Avenue I	Redondo	0	0	3	1
S18	Malaga Cove, Palos Verdes Estates - daily	Palos Verdes	0	0	1	1
Los Angeles County Department of Health Services Sites						
DHS (010)	Leo Carillo Beach (REFERENCE BEACH)	Arroyo Sequit Canyon	0	0	3	1
DHS (009)	Nicholas Beach	Nicholas Canyon	0	0	0	0
DHS (010a)	Broad Beach	Trancas Canyon	0	0	3	1
DHS (008)	Trancas Beach entrance	Trancas Canyon	0	0	0	0
DHS (007)	Westward Beach, SE end	Zuma Canyon	0	0	0	0

Compliance Deadline			3 years after effective date		6 years after effective date	
			Summer Dry Weather^		Winter Dry Weather^*	
			Apr. 1-Oct. 31		Nov. 1-Mar. 31	
Station ID	Location Name	Subwatershed	Daily sampling (No. days)	Weekly sam-pling (No. days)	Daily sampling (No. days)	Weekly sam-pling (No. days)
DHS (006)	Paradise Cove	Ramirez Canyon	0	0	3	1
DHS (005)	26610 Latigo Shore Drive	Latigo Canyon	0	0	3	1
DHS (005a)	Corral Beach	Latigo Canyon	0	0	3	1
DHS (004)	Puerco Beach	Corral Canyon	0	0	3	1
DHS (003)	Malibu Point, Malibu Colony Dr.	Malibu Canyon	0	0	3	1
DHS (003a)	Surfrider Beach, Malibu, 50 yds.	Malibu Canyon	0	0	3	1
DHS (002)	Malibu Pier	Malibu Canyon	0	0	3	1
DHS (001a)	Las Flores Beach	Las Flores Canyon	0	0	3	1
DHS (001)	Big Rock Beach	Piedra Gorda Canyon	0	0	3	1
DHS (101)	17200 Pacific Coast Hwy.	Santa Ynez Canyon	0	0	3	1
DHS (102)	Bel Air Bay Club, 16801 Pacific	Santa Ynez Canyon	0	0	3	1
DHS (103)	Temescal Storm Drain	Pulga Canyon	0	0	3	1
DHS (104a)	San Vicente Blvd. extended	Santa Monica	0	0	3	1
DHS (104)	Montana Ave. Storm Drain	Santa Monica	0	0	3	1
DHS (105)	Wilshire Blvd., Santa Monica	Santa Monica	0	0	3	1
DHS (106)	Strand Street extended	Santa Monica	0	0	3	1
DHS (106a)	Ashland Storm Drain	Santa Monica	0	0	3	1
DHS (107)	Venice City Beach at Brooks Av.	Ballona	0	0	3	1
DHS (108)	Venice Pier, Venice	Ballona	0	0	3	1
DHS (109)	Topsail Street extended	Ballona	0	0	3	1
DHS (110)	World Way extended	Dockweiler	0	0	3	1
DHS (111)	Opposite Hyperion Plant, 1 mile	Dockweiler	0	0	3	1
DHS (112)	Grand Avenue extended	Dockweiler	0	0	3	1

Compliance Deadline			3 years after effective date		6 years after effective date	
			Summer Dry Weather^		Winter Dry Weather^*	
			Apr. 1-Oct. 31		Nov. 1-Mar. 31	
Station ID	Location Name	Subwatershed	Daily sampling (No. days)	Weekly sampling (No. days)	Daily sampling (No. days)	Weekly sampling (No. days)
DHS (113)	26th Street extended	Hermosa	0	0	0	0
DHS (114)	Herondo Street extended	Hermosa	0	0	3	1
DHS (115)	Topaz Street extended	Redondo	0	0	3	1
County Sanitation Districts of Los Angeles County Sites						
LACSD1	Long Point	Palos Verdes	0	0	1	1
LACSD2	Abalone Cove	Palos Verdes	0	0	0	0
LACSD3	Portuguese Bend Cove	Palos Verdes	0	0	1	1
LACSD5	Royal Palms	Palos Verdes	0	0	1	1
LACSD6	Wilder Annex	Palos Verdes	0	0	1	1
LACSD7	Cabrillo Beach, oceanside	Palos Verdes	0	0	1	1
LACS-DMC	Malaga Cove	Palos Verdes	0	0	1	1
LACSDBC	Bluff Cove	Palos Verdes	0	0	1	1

Notes: The allowable number of exceedance days during winter dry weather is calculated based on the 10th percentile year in terms of non-rain days at the LAX meteorological station.

The number of allowable exceedances during winter dry weather is based on the lesser of (1) the reference system or (2) existing levels of exceedance based on historical shoreline data.

^Dry weather days are defined as those with <0.1 inch of rain and those days not less than 3 days after a rain day. Rain days are defined as those with >=0.1 inch of rain.

* A re-opener is scheduled for four years after the effective date of the TMDL in order to re-evaluate the allowable exceedance days during winter dry weather based on additional monitoring data.

Table 7-4.2b. Santa Monica Bay Beaches Bacteria TMDL Implementation Schedule (Dry Weather Only) Required Reduction in Number of Days Exceeding Single Sample Bacterial Indicator Targets for Existing Shoreline Monitoring Stations

	Compliance Deadline		**3 years after effective date**	**6 years after effective date**
	Location Name	Subwatershed	Summer Dry Weather (Apr. 1-Oct. 31)	Winter Dry Weather (Nov. 1-Mar. 31)*
	City of Los Angeles, Environmental Monitoring Division Sites			
S1	Surfrider Beach (breach point) - daily	Malibu Canyon	48	31
S2	Topanga State Beach	Topanga Canyon	10	8
S3	Pulga Canyon storm drain - 50 yards east (Will Rogers)	Pulga Canyon	4	6
S4	Santa Monica Canyon, Will Rogers State Beach	Santa Monica Canyon	36	7
S5	Santa Monica Municipal Pier - 50 yards south-east (Santa Monica)	Santa Monica	54	22
S6	Santa Monica Beach at Pico/Kenter storm drain (Santa Monica)	Santa Monica	15	20
S7	Ashland Av. storm drain - 50 yards south (Venice)	Santa Monica	16	6
S8	Venice City Beach at Windward Av. - 50 yards north	Ballona	3	0
S10	Ballona Creek entrance - 50 yards south (Dockweiler)	Dockweiler	7	3
S11	Dockweiler State Beach at Culver Bl.	Dockweiler	6	1
S12	Imperial Highway storm drain - 50 yards north (Dockweiler)	Dockweiler	7	0
S13	Manhattan State Beach at 40th Street	Hermosa	1	0
S14	Manhattan Beach Pier - 50 yards south	Hermosa	1	0
S15	Hermosa Beach Pier - 50 yards south	Hermosa	2	0
S16	Redondo Municipal Pier - 50 yards south	Redondo	16	9
S17	Redondo State Beach at Avenue I	Redondo	2	0
S18	Malaga Cove, Palos Verdes Estates - daily	Palos Verdes	1	0
	Los Angeles County Department of Health Services Sites			
DHS (010)	Leo Carillo Beach (REFERENCE BEACH)	Arroyo Sequit Canyon	0	0
DHS (009)	Nicholas Beach	Nicholas Canyon	7	0
DHS (010a)	Broad Beach	Trancas Canyon	3	3
DHS (008)	Trancas Beach entrance	Trancas Canyon	5	0
DHS (007)	Westward Beach, SE end	Zuma Canyon	8	0

	Compliance Deadline		**3 years after effective date**	**6 years after effective date**
	Location Name	Subwatershed	Summer Dry Weather (Apr. 1-Oct. 31)	Winter Dry Weather (Nov. 1-Mar. 31)*
DHS (006)	Paradise Cove	Ramirez Canyon	16	9
DHS (005)	26610 Latigo Shore Drive	Latigo Canyon	11	13
DHS (005a)	Corral Beach	Latigo Canyon	3	5
DHS (004)	Puerco Beach	Corral Canyon	0	7
DHS (003)	Malibu Point, Malibu Colony Dr.	Malibu Canyon	23	6
DHS (003a)	Surfrider Beach, Malibu, 50 yds.	Malibu Canyon	58	25
DHS (002)	Malibu Pier	Malibu Canyon	42	14
DHS (001a)	Las Flores Beach	Las Flores Canyon	18	7
DHS (001)	Big Rock Beach	Piedra Gorda Canyon	32	20
DHS (101)	17200 Pacific Coast Hwy.	Santa Ynez Canyon	3	9
DHS (102)	Bel Air Bay Club, 16801 Pacific	Santa Ynez Canyon	14	5
DHS (103)	Temescal Storm Drain	Pulga Canyon	17	0
DHS (104a)	San Vicente Blvd. extended	Santa Monica	7	0
DHS (104)	Montana Ave. Storm Drain	Santa Monica	7	0
DHS (105)	Wilshire Blvd., Santa Monica	Santa Monica	15	4
DHS (106)	Strand Street extended	Santa Monica	8	6
DHS (106a)	Ashland Storm Drain	Santa Monica	24	2
DHS (107)	Venice City Beach at Brooks Av.	Ballona	3	10
DHS (108)	Venice Pier, Venice	Ballona	4	0

	Compliance Deadline		**3 years after effective date**	**6 years after effective date**
	Location Name	Subwatershed	Summer Dry Weather (Apr. 1-Oct. 31)	Winter Dry Weather (Nov. 1-Mar. 31)*
DHS (109)	Topsail Street extended	Ballona	11	0
DHS (110)	World Way extended	Dockweiler	5	1
DHS (111)	Opposite Hyperion Plant, 1 mile	Dockweiler	3	4
DHS (112)	Grand Avenue extended	Dockweiler	8	5
DHS (113)	26th Street extended	Hermosa	5	0
DHS (114)	Herondo Street extended	Hermosa	5	1
DHS (115)	Topaz Street extended	Redondo	8	12
	County Sanitation Districts of Los Angeles County Sites			
	Long Point	Palos Verdes	1	0
	Abalone Cove	Palos Verdes	1	0
	Portuguese Bend Cove	Palos Verdes	1	0
	Royal Palms	Palos Verdes	1	0
	Wilder Annex	Palos Verdes	1	0
	Cabrillo Beach, oceanside	Palos Verdes	1	0
	Malaga Cove	Palos Verdes	2	0
	Bluff Cove	Palos Verdes	0	0

* A re-opener is scheduled for four years after the effective date of the TMDL in order to re-evaluate the allowable exceedance days and necessary reductions during winter dry weather based on additional monitoring data.
** Required reductions are based on the assumption of daily sampling.

Table 7-4.3. Santa Monica Bay Beaches Bacteria TMDL (Dry Weather Only): Significant Dates

Date	Action
120 days after the effective date of the TMDL	Responsible jurisdictions and responsible agencies must submit coordinated shoreline monitoring plan(s), including a list of new sites or sites relocated to the wave wash at which time responsible jurisdictions and responsible agencies will select between daily and weekly shoreline sampling.
120 days after the effective date of the TMDL	Responsible jurisdictions and responsible agencies must identify and provide documentation on 342 potential discharges to Santa Monica Bay beaches listed in Appendix C of the TMDL Staff Report dated January 11, 2002. Documentation must include a Report of Waste Discharge (ROWD) where necessary. Responsible jurisdictions and responsible agencies must identify and provide documentation on potential discharges to the Area of Special Biological Significance (ASBS) in northern Santa Monica Bay from Latigo Point to the County line. Cessation of the discharges into the ASBS shall be required in conformance with the California Ocean Plan.
4 years after effective date of TMDL	Re-open TMDL to re-evaluate allowable winter dry weather exceedance days based on additional data on bacterial indicator densities in the wave wash, a re-evaluation of the reference system selected to set allowable exceedance levels, and a re-evaluation of the reference year used in the calculation of allowable exceedance days.
3 years after effective date of the TMDL	Achieve compliance with allowable exceedance days as set forth in Table 7-4.2a and rolling 30-day geometric mean targets during summer dry weather (April 1 to October 31).
6 years after effective date of the TMDL	Achieve compliance with allowable exceedance days as set forth in Table 7-4.2a and rolling 30-day geometric mean targets during winter dry weather (November 1 to March 31).

7-4 Santa Monica Bay Beaches Bacteria TMDL (Wet Weather Only)*

This TMDL was adopted by:
The Regional Water Quality Control Board on December 12, 2002.

This TMDL was approved by:
The State Water Resources Control Board on March 19, 2003.
The Office of Administrative Law on May 20, 2003.
The U.S. Environmental Protection Agency on June 19, 2003.

The effective date of this TMDL is: July 15, 2003.

The following table summarizes the key elements of this TMDL.

Table 7-4.4. Santa Monica Bay Beaches Bacteria TMDL (Wet Weather Only): Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Elevated bacterial indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use at many Santa Monica Bay (SMB) beaches. Swimming in waters with elevated bacterial indicator densities has long been associated with adverse health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine water to protect the water contact recreation (REC-1) use. These targets are the most appropriate indicators of public health risk in recreational waters. These bacteriological objectives are set forth in Chapter 3 of the Basin Plan, as amended by the Regional Board on October 25, 2001. The objectives are based on four bacterial indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as numeric targets for this TMDL are: <u>1. Rolling 30-day Geometric Mean Limits</u> a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. <u>2. Single Sample Limits</u> a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Element	Key Findings and Regulatory Provisions
Numeric Target (continued) (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	These objectives are generally based on an acceptable health risk for marine recreational waters of 19 illnesses per 1,000 exposed individuals as set by the US EPA (US EPA, 1986). The targets apply throughout the year. The final compliance point for the targets is the wave wash[1] where there is a freshwater outlet (i.e., publicly-owned storm drain or natural creek) to the beach, or at ankle depth at beaches without a freshwater outlet. Implementation of the above bacteria objectives and the associated TMDL numeric targets is achieved using a 'reference system/anti-degradation approach' rather than the alternative 'natural sources exclusion approach' or strict application of the single sample objectives. As required by the CWA and Porter-Cologne Water Quality Control Act, Basin Plans include beneficial uses of waters, water quality objectives to protect those uses, an anti-degradation policy, collectively referred to as water quality standards, and other plans and policies necessary to implement water quality standards. This TMDL and its associated waste load allocations, which shall be incorporated into relevant permits, are the vehicles for implementation of the Region's standards. The 'reference system/anti-degradation approach' means that on the basis of historical exceedance levels at existing shoreline monitoring locations, including a local reference beach within Santa Monica Bay, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing shoreline bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the single sample objectives and that it is not the intent of the Regional Board to require treatment or diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas. The geometric mean targets may not be exceeded at any time. The rolling 30-day geometric means will be calculated on each day. If weekly sampling is conducted, the weekly sample result will be assigned to the remaining days of the week in order to calculate the daily rolling 30-day geometric mean. For the single sample targets, each existing shoreline monitoring site is assigned an allowable number of exceedance days during wet weather, defined as days with 0.1 inch of rain or greater and the three days following the rain event. (A separate amendment incorporating the Santa Monica Bay Beaches Dry-Weather Bacteria TMDL addressed the allowable number of summer and winter dry-weather exceedance days.)

Element	Key Findings and Regulatory Provisions
Source Analysis	With the exception of isolated sewage spills, storm water runoff conveyed by storm drains and creeks is the primary source of elevated bacterial indicator densities to SMB beaches during wet weather. Because the bacterial indicators used as targets in the TMDL are not specific to human sewage, storm water runoff from undeveloped areas may also be a source of elevated bacterial indicator densities. For example, storm water runoff from natural areas may convey fecal matter from wildlife and birds or bacteria from soil. This is supported by the finding that, at the reference beach, the probability of exceedance of the single sample targets during wet weather is 0.22.
Loading Capacity	Studies show that bacterial degradation and dilution during transport from the watershed to the beach do not significantly affect bacterial indicator densities at SMB beaches. Therefore, the loading capacity is defined in terms of bacterial indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above. As the numeric targets must be met in the wave wash and throughout the day, no degradation allowance is provided.
Waste Load Allocations (for point sources)	Waste load allocations are expressed as the number of sample days at a shoreline monitoring site that may exceed the single sample targets identified under "Numeric Target." Waste load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. For each shoreline monitoring site and corresponding subwatershed, an allowable number of exceedance days is set for wet weather. The allowable number of exceedance days for a shoreline monitoring site for each time period is based on the lesser of two criteria (1) exceedance days in the designated reference system and (2) exceedance days based on historical bacteriological data at the monitoring site. This ensures that shoreline bacteriological water quality is at least as good as that of a largely undeveloped system and that there is no degradation of existing shoreline bacteriological water quality. All responsible jurisdictions and responsible agencies[2] within a subwatershed are jointly responsible for complying with the allowable number of exceedance days for each associated shoreline monitoring site identified in Table 7-4.5 below. The three Publicly Owned Treatment Works (POTWs), the City of Los Angeles' Hyperion Wastewater Treatment Plant, Los Angeles County Sanitation Districts' Joint Water Pollution Control Plant, and the Las Virgenes Municipal Water Districts' Tapia Wastewater Reclamation Facility, discharging to Santa Monica Bay are each given individual WLAs of zero (0) days of exceedance during wet weather.

Element	Key Findings and Regulatory Provisions
Load Allocations (for nonpoint sources)	Because all storm water runoff to SMB beaches is regulated as a point source, load allocations of zero days of exceedance are set in this TMDL. If a nonpoint source is directly impacting shoreline bacteriological quality and causing an exceedance of the numeric target(s), the permittee(s) under the Municipal Storm Water NPDES Permits are not responsible through these permits. However, the jurisdiction or agency adjacent to the shoreline monitoring location may have further obligations as described under "Compliance Monitoring" below.
Implementation	The regulatory mechanisms used to implement the TMDL will include primarily the Los Angeles County Municipal Storm Water NPDES Permit (MS4 Permit), the Caltrans Storm Water Permit, the three NPDES permits for the POTWs, the authority contained in sections 13267 and 13263 of the Water Code, and regulations to be adopted pursuant to section 13291 of the Water Code. Each NPDES permit assigned a waste load allocation shall be reopened or amended at reissuance, in accordance with applicable laws, to incorporate the applicable waste load allocation(s) as a permit requirement. The implementation schedule will be determined on the basis of the implementation plan(s), which must be submitted to the Regional Board by responsible jurisdictions and agencies within two years of the effective date of the TMDL (see Table 7-4.7). After considering the implementation plan(s), the Regional Board shall amend the TMDL at a public hearing and, in doing so, will adopt an individual implementation schedule for each jurisdictional group (described in paragraph 3 below) that is as short as possible taking into account the implementation approach being undertaken. Responsible jurisdictions and agencies must clearly demonstrate in the above-mentioned plan whether they intend to pursue an integrated water resources approach.[3] If an integrated water resources approach is pursued, responsible jurisdictions and agencies may be allotted up to an 18-year implementation timeframe, based on a clear demonstration of the need for a longer schedule in the implementation plan, in recognition of the additional planning and time needed to achieve the multiple benefits of this approach. Otherwise, at most a 10-year implementation timeframe will be allotted, depending upon a clear demonstration of the time needed in the implementation plan. The subwatersheds associated with each beach monitoring location may include multiple responsible jurisdictions and responsible agencies. Therefore, a "primary jurisdiction," defined as the jurisdiction comprising greater than fifty percent of the subwatershed land area, is identified for each subwatershed (see Table 7-4.6).[4] Seven primary jurisdictions are identified within the Santa Monica Bay watershed, each with a group of associated subwatersheds and beach monitoring locations. These are identified as "jurisdictional groups" (see Table 7-4.6).

Element	Key Findings and Regulatory Provisions
Implementation (continued)	The primary jurisdiction of each "jurisdictional group" shall be responsible for submitting the implementation plan described above, which will determine the implementation timeframe for the subwatershed. A jurisdictional group may change its primary jurisdiction by submitting a joint, written request, submitted by the current primary jurisdiction and the proposed primary jurisdiction, to the Executive Officer requesting a reassignment of primary responsibility. Two jurisdictional groups may also choose to change the assignment of monitoring locations between the two groups by submitting a joint, written request, submitted by the current primary jurisdiction and the proposed primary jurisdiction, to the Executive Officer requesting a reassignment of the monitoring location. If an integrated water resources approach is pursued, the jurisdictional group(s) must achieve a 10% cumulative percentage reduction from the total exceedance-day reduction required for the group of beach monitoring locations within 6 years, a 25% reduction within 10 years, and a 50% reduction within 15 years of the effective date of the TMDL. These interim milestones for the jurisdictional group(s) will be re-evaluated, considering planning, engineering and construction tasks, based on the written implementation plan submitted to the Regional Board two years after the effective date of the TMDL (see Table 7-4.7). If an integrated water resources approach is not pursued, the jurisdictional group(s) must achieve a 25% cumulative percentage reduction from the total exceedance-day reduction required for the group of beach monitoring locations within 6 years, and a 50% reduction within 8 years of the effective date of the TMDL (see Table 7-4.7). For those beach monitoring locations subject to the antidegradation provision, there shall be no increase in exceedance days during the implementation period above that estimated for the beach monitoring location in the critical year as identified in Table 7-4.5. The final implementation targets in terms of allowable wet-weather exceedance days must be achieved at each individual beach location no later than 18 years after the TMDL's effective date if an integrated water resources approach is pursued, or no later than 10 years after the TMDL's effective date if an integrated water resources approach is not pursued. In addition, the geometric mean targets must be achieved for each individual beach location no later than 18 years or 10 years after the effective date, respectively, depending on whether a integrated water resources approach is pursued or not.

Element	Key Findings and Regulatory Provisions
Margin of Safety	The TMDL is set at levels that are exactly equivalent to the applicable water quality standards along with the proposed reference system/ antidegradation implementation procedure. An implicit margin of safety is included in the supporting water quality model by assuming no dilution between the storm drain and the wave wash, the point of compliance. This is a conservative assumption since studies have shown that there is a high degree of variability in the amount of dilution between the storm drain and wave wash temporally, spatially and among indicators, ranging from 100% to 0%.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for three time periods (wet weather, summer dry weather and winter dry weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators. (The two dry-weather periods are addressed in the Santa Monica Bay Beaches Dry-Weather Bacteria TMDL.) The critical condition for this bacteria TMDL is wet weather generally, when historic shoreline monitoring data for the reference beach indicate that the single sample bacteria objectives are exceeded on 22% of the wet-weather days sampled. To more specifically identify a critical condition within wet weather in order to set the allowable exceedance days shown in Tables 7-4.5 and 7-4.6, the 90th percentile 'storm year'[5] in terms of wet days is used as the reference year. Selecting the 90th percentile year avoids a situation where the reference beach is frequently out of compliance. It is expected that because responsible jurisdictions and agencies will be planning for this 'worst-case' scenario, there will be fewer exceedance days than the maximum allowed in drier years. Conversely, in the 10% of wetter years, it is expected that there may be more than the allowable number of exceedance days.
Compliance Monitoring	Responsible jurisdictions and agencies as defined in Footnote 2 shall conduct daily or systematic weekly sampling in the wave wash at all major drains[6] and creeks or at existing monitoring stations at beaches without storm drains or freshwater outlets to determine compliance.[7] At all locations, samples shall be taken at ankle depth and on an incoming wave. At locations where there is a freshwater outlet, during wet weather, samples should be taken as close as possible to the wave wash, and no further away than 10 meters down current of the storm drain or outlet.[8] At locations where there is a freshwater outlet, samples shall be taken when the freshwater outlet is flowing into the surf zone.

Element	Key Findings and Regulatory Provisions
Compliance Monitoring (continued)	If the number of exceedance days is greater than the allowable number of exceedance days for any jurisdictional group at the interim implementation milestones the responsible jurisdictions and agencies shall be considered out-of-compliance with the TMDL. If the number of exceedance days exceeds the allowable number of exceedance days for a target beach at the final implementation deadline, the responsible jurisdictions and agencies within the contributing subwatershed shall be considered out-of-compliance with the TMDL. Responsible jurisdictions or agencies shall not be deemed out of compliance with the TMDL if the investigation described in the paragraph below demonstrates that bacterial sources originating within the jurisdiction of the responsible agency have not caused or contributed to the exceedance. If a single sample shows the discharge or contributing area to be out of compliance, the Regional Board may require, through permit requirements or the authority contained in Water Code section 13267, daily sampling in the wave wash or at the existing open shoreline monitoring location (if it is not already) until all single sample events meet bacteria water quality objectives. Furthermore, if a beach location is out-of-compliance as determined in the previous paragraph, the Regional Board shall require responsible agencies to initiate an investigation, which at a minimum shall include daily sampling in the wave wash or at the existing open shoreline monitoring location until all single sample events meet bacteria water quality objectives. If bacteriological water quality objectives are exceeded in any three weeks of a four-week period when weekly sampling is performed, or, for areas where testing is done more than once a week, 75% of testing days produce an exceedence of bacteria water quality objectives, the responsible agencies shall conduct a source investigation of the subwatershed(s) pursuant to protocols established under Water Code 13178.

Element	Key Findings and Regulatory Provisions
Compliance Monitoring (continued)	If a beach location without a freshwater outlet is out-of-compliance or if the outlet is diverted or being treated, the adjacent municipality, County agency(s), or State or federal agency(s) shall be responsible for conducting the investigation and shall submit its findings to the Regional Board to facilitate the Regional Board exercising further authority to regulate the source of the exceedance in conformance with the Porter-Cologne Water Quality Control Act.

Note: The complete staff report for the TMDL is available for review upon request.

1 The wave wash is defined as the point at which the storm drain or creek empties and the effluent from the storm drain initially mixes with the receiving ocean water.

2 For the purposes of this TMDL, "responsible jurisdictions and responsible agencies" are defined as: (1) local agencies that are responsible for discharges from a publicly owned treatment works to the Santa Monica Bay watershed or directly to the Bay, (2) local agencies that are permittees or co-permittees on a municipal storm water permit, (3) local or state agencies that have jurisdiction over a beach adjacent to Santa Monica Bay, and (4) the California Department of Transportation pursuant to its storm water permit.

3 An integrated water resources approach is one that takes a holistic view of regional water resources management by integrating planning for future wastewater, storm water, recycled water, and potable water needs and systems; focuses on beneficial re-use of storm water, including groundwater infiltration, at multiple points throughout a watershed; and addresses multiple pollutants for which Santa Monica Bay or its watershed are listed on the CWA section 303(d) List as impaired. Because an integrated water resources approach will address multiple pollutants, responsible jurisdictions can recognize cost-savings because capital expenses for the integrated approach will implement several TMDLs that address pollutants in storm water. An integrated water resources approach shall not only provide water quality benefits to the people of the Los Angeles Region, but it is also anticipated that an integrated approach will incorporate and enhance other public goals. These may include, but are not limited to, water supply, recycling and storage; environmental justice; parks, greenways and open space; and active and passive recreational and environmental education opportunities.

4 Primary jurisdictions are not defined for the Ballona Creek subwatershed or the Malibu Creek subwatershed, since separate bacteria TMDLs are being developed for these subwatersheds.

5 For purposes of this TMDL, a 'storm year' means November 1 to October 31. The 90th percentile storm year was 1993 with 75 wet days at the LAX meteorological station.

6 Major drains are those that are publicly owned and have measurable flow to the beach during dry weather.

7 The frequency of sampling (i.e., daily versus weekly) will be at the discretion of the implementing agencies. However, the number of sample days that may exceed the objectives will be scaled accordingly.

8 Safety considerations during wet weather may preclude taking a sample in the wave wash.

Table 7-4.5. Final Allowable Wet-Weather Exceedance Days by Beach Location

Beach Monitoring Location	Estimated no. of wet weather exceedance days in critical year (90th percentile)*	Final allowable no. of wet weather exceedance days (daily sampling)*
DHS 010 - Leo Carrillo Beach, at 35000 PCH	17	17
DHS 009 - Nicholas Beach- 100 feet west of lifeguard tower	14	14
DHS 010a - Broad Beach	15	15
DHS 008 - Trancas Beach entrance, 50 yards east of Trancas Bridge	19	17
DHS 007 - Westward Beach, east of Zuma Creek	**17**	**17**
DHS 006 - Paradise Cove, adjacent to west side of Pier	**23**	**17**
DHS 005 - Latigo Canyon Creek entrance	**33**	**17**
DHS 005a - Corral State Beach	**17**	**17**
DHS 001a - Las Flores Beach	**29**	**17**
DHS 001 - Big Rock Beach, at 19900 PCH	**30**	**17**
DHS 003 - Malibu Point	**18**	**17**
DHS 003a - Surfrider Beach (second point)- weekly	**45**	**17**
S1 - Surfrider Beach (breach point)- daily	**47**	**17**
DHS 002 - Malibu Pier- 50 yards east	**45**	**17**
S2 - Topanga State Beach	**26**	**17**
DHS 101 - PCH and Sunset Bl.- 400 yards east	**25**	**17**
DHS 102 - 16801 Pacific Coast Highway, Bel Air Bay Club (chain fence)	**28**	**17**
S3 - Pulga Canyon storm drain- 50 yards east	**23**	**17**
DHS 103 - Will Rogers State Beach- Temescal Canyon (25 yrds. so. of drain)	**31**	**17**
S4 - Santa Monica Canyon, Will Rogers State Beach	**25**	**17**
DHS 104a - Santa Monica Beach at San Vicente Bl.	**34**	**17**
DHS 104 - Santa Monica at Montana Av. (25 yrds. so. of drain)	**31**	**17**
DHS 105 - Santa Monica at Arizona (in front of the drain)	**31**	**17**
S5 - Santa Monica Municipal Pier- 50 yards southeast	**35**	**17**
S6 - Santa Monica Beach at Pico/Kenter storm drain	**42**	**17**
DHS 106 - Santa Monica Beach at Strand St. (in front of the restrooms)	**36**	**17**
DHS 106a - Ashland Av. storm drain- 50 yards north	**39**	**17**
S7 - Ashland Av. storm drain- 50 yards south	**22**	**17**
DHS 107 - Venice City Beach at Brooks Av. (in front of the drain)	**40**	**17**
S8 - Venice City Beach at Windward Av.- 50 yards north	**13**	**13**
DHS 108 - Venice Fishing Pier- 50 yards south	**17**	**17**
DHS 109 - Venice City Beach at Topsail St.	**38**	**17**
S11 - Dockweiler State Beach at Culver Bl.	**23**	**17**
DHS 110 - Dockweiler State Beach- south of D&W jetty	**30**	**17**
S12 - Imperial HWY storm drain- 50 yards north	**17**	**17**
DHS 111 - Hyperion Treatment Plant One Mile Outfall	**18**	**17**
DHS 112 - Dockweiler State Beach at Grand Av. (in front of the drain)	**25**	**17**
S10 - Ballona Creek entrance- 50 yards south	**34**	**17**

Beach Monitoring Location	Estimated no. of wet weather exceedance days in critical year (90th percentile)*	Final allowable no. of wet weather exceedance days (daily sampling)*
S13 - Manhattan State Beach at 40th Street	4	4
S14 - Manhattan Beach Pier- 50 yards south	5	5
DHS 114 - Hermosa City Beach at 26th St.	12	12
S15 - Hermosa Beach Pier- 50 yards south	8	8
DHS 115 - Herondo Street storm drain- (in front of the drain)	19	17
S16 - Redondo Municipal Pier- 50 yards south	14	14
DHS 116 - Redondo State Beach at Topaz St. - north of jetty	19	17
S17 - Redondo State Beach at Avenue I	6	6
S18 - Malaga Cove, Palos Verdes Estates-daily	3	3
LACSDM - Malaga Cove, Palos Verdes Estates-weekly	14	14
LACSDB - Palos Verdes (Bluff) Cove, Palos Verdes Estates	0	0
LACSD1 - Long Point, Rancho Palos Verdes	5	5
LACSD2 - Abalone Cove Shoreline Park	1	1
LACSD3 - Portuguese Bend Cove, Rancho Palos Verdes	2	2
LACSD5 - Royal Palms State Beach	6	6
LACSD6 - Wilder Annex, San Pedro	2	2
LACSD7 - Cabrillo Beach, oceanside	3	3

Notes: * The compliance targets are based on existing shoreline monitoring data and assume daily sampling. If systematic weekly sampling is conducted, the compliance targets will be scaled accordingly. These are the compliance targets until additional shoreline monitoring data are collected prior to revision of the TMDL. Once additional shoreline monitoring data are available, the following will be re-evaluated when the TMDL is revised 1) estimated number of wet-weather exceedance days in the critical year at all beach locations, including the reference system(s) and 2) final allowable wet-weather exceedance days for each beach location.

Table 7-4.6. Interim Compliance Targets by Jurisdictional Group

Jurisdiction Group	Primary Jurisdiction	Additional Responsible Jurisdictions & Agencies	Subwatershed(s)	Monitoring Site(s)***	Interim Compliance Targets as Maximum Allowable Exceedance Days during Wet Weather*,**		
					10% Reduction Milestone	25% Reduction Milestone	50% Reduction Milestone
1	County of Los Angeles	Caltrans Malibu City of Los Angeles (Topanga only) Calabasas (Topanga only)	Arroyo Sequit	DHS 010	221	212	197
			Carbon Canyon	none			
			Corral Canyon	DHS 005a			
			Encinal Canyon	DHS 010a[#]			
			Escondido Canyon	none			
			Las Flores Canyon	DHS 001a			
			Latigo Canyon	DHS 005			
			Los Alisos Canyon	none			
			Pena Canyon	none			
			Piedra Gorda Canyon	DHS 001			
			Ramirez Canyon	DHS 006			
			Solstice Canyon	none			
			Topanga Canyon	S2			
			Trancas Canyon	DHS 008			
			Tuna Canyon	none			
			Zuma Canyon	DHS 007			

Jurisdiction Group	Primary Jurisdiction	Additional Responsible Jurisdictions & Agencies	Subwatershed(s)	Monitoring Site(s)***	Interim Compliance Targets as Maximum Allowable Exceedance Days during Wet Weather*,**		
					10% Reduction Milestone	25% Reduction Milestone	50% Reduction Milestone
2	City of Los Angeles	Caltrans County of Los Angeles El Segundo (DW only) Manhattan Beach (DW only) Culver City (MDR only) Santa Monica	Castlerock	none	342	324	294
			Dockweiler	S11, DHS 110, S12, DHS 111, DHS 112			
			Marina del Rey	DHS 107, S8#, DHS 108, DHS 109			
			Pulga Canyon	S3, DHS 103			
			Santa Monica Canyon	S4			
			Santa Ynez Canyon	DHS 101, DHS 102			
3	Santa Monica	Caltrans City of Los Angeles County of Los Angeles	Santa Monica	DHS 104a, DHS 104, DHS 105, S5, S6, DHS 106, DHS 106a, S7	257	237	203
4	Malibu	Caltrans County of Los Angeles	Nicholas Canyon	DHS 009#	14	14	14
5	Manhattan Beach	Caltrans El Segundo Hermosa Beach Redondo Beach	Hermosa	S13#, S14#, DHS 114#, S15#	29	29	29

Jurisdiction Group	Primary Jurisdiction	Additional Responsible Jurisdictions & Agencies	Subwatershed(s)	Monitoring Site(s)***	Interim Compliance Targets as Maximum Allowable Exceedance Days during Wet Weather*,**		
					10% Reduction Milestone	25% Reduction Milestone	50% Reduction Milestone
6	Redondo Beach	Caltrans Hermosa Beach Manhattan Beach Torrance County of Los Angeles	Redondo	DHS 115, S16#, DHS 116, S17#	58	57	56
7	Rancho Palos Verdes	Caltrans City of Los Angeles Palos Verdes Estates Redondo Beach Rolling Hills Rolling Hills Estates Torrance County of Los Angeles	Palos Verdes Peninsula	S18#, LACSDM#, LACSDB#, LACSD1#, LACSD2#, LACSD3#, LACSD5#, LACSD6#, LACSD7#	36	36	36

Notes: *Interim milestones will be re-calculated during the revision of the TMDL based on shoreline monitoring data collected from the wave wash and a re-evaluation of the most appropriate reference system and reference year. Furthermore, if an integrated water resources approach is pursued, as demonstrated by the implementation plans to be submitted to the Regional Board by the primary jurisdictions within two years of the effective date of the TMDL, the interim milestones will be re-evaluated on the basis of the implementation plan, considering planning, engineering and construction tasks. **Interim milestones for the Malibu and Ballona shoreline monitoring locations will be identified in subsequent bacteria TMDLs to be developed for these two watersheds. ***Monitoring sites are those locations currently monitored by the City of Los Angeles, County Sanitation Districts of Los Angeles County, and the Los Angeles County Department of Health Services at the time of adoption by the Regional Board. This list does not preclude the establishment of additional monitoring stations. For those subwatersheds without an existing shoreline monitoring site, responsible jurisdictions and agencies must establish a shoreline monitoring site if there is measurable flow from a creek or publicly owned storm drain to the beach during dry weather. # For those beach monitoring locations subject to the antidegradation provision, there shall be no increase in exceedance days during the implementation period above that estimated for the beach monitoring location in the critical year as identified in Table 7-4.5.

Table 7-4.7. Santa Monica Bay Beaches Bacteria TMDL (Wet Weather Only): Significant Dates

Date	Action
120 days after the effective date of the TMDL	Pursuant to a request from the Regional Board, responsible jurisdictions and responsible agencies must submit coordinated shoreline monitoring plan(s) to be approved by the Executive Officer, including a list of new sites* and/or sites relocated to the wave wash at which time responsible jurisdictions and responsible agencies shall select between daily or systematic weekly shoreline sampling.
20 months after the effective date of the TMDL	Responsible jurisdictions and agencies shall provide a draft written report to the Regional Board outlining how each intends to cooperatively (through Jurisdictional Groups) achieve compliance with the TMDL. The report shall include implementation methods, an implementation schedule, and proposed milestones.
Two years after effective date of TMDL	Responsible jurisdictions and agencies shall provide a written report to the Regional Board outlining how each intends to cooperatively (through Jurisdictional Groups) achieve compliance with the TMDL. The report shall include implementation methods, an implementation schedule, and proposed milestones. Under no circumstances shall final compliance dates exceed 10 years for non-integrated approaches or 18 years for integrated water resources approaches. Regional Board staff shall bring to the Regional Board the aforementioned plans as soon as practicable for consideration.
4 years after effective date of TMDL	The Regional Board shall reconsider the TMDL to: (1) refine allowable wet weather exceedance days based on additional data on bacterial indicator densities in the wave wash and an evaluation of site-specific variability in exceedance levels, (2) re-evaluate the reference system selected to set allowable exceedance levels, including a reconsideration of whether the allowable number of exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s), (3) re-evaluate the reference year used in the calculation of allowable exceedance days, and (4) re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision.

Date	Action
Significant Dates for Responsible Jurisdictions and Agencies *Not* Pursuing an Integrated Water Resources Approach	
6 years after effective date of the TMDL	Each defined jurisdictional group must achieve a 25% cumulative percentage reduction from the total exceedance-day reductions required for that jurisdictional group as identified in Table 7-4.6.
8 years after effective date of the TMDL	Each defined jurisdictional group must achieve a 50% cumulative percentage reduction from the total exceedance-day reductions required for that jurisdictional group as identified in Table 7-4.6.
10 years after effective date of the TMDL	Final implementation targets in terms of allowable wet-weather exceedance days must be achieved at each individual beach as identified in Table 7-4.5. In addition, the geometric mean targets must be achieved for each individual beach location.
Significant Dates for Responsible Jurisdictions and Agencies Pursuing an Integrated Water Resources Approach to Implementation	
6 years after effective date of the TMDL	Each defined jurisdictional group must achieve a 10% cumulative percentage reduction from the total exceedance-day reductions required for that jurisdictional group as identified in Table 7-4.6.
10 years after effective date of the TMDL	Each defined jurisdictional group must achieve a 25% cumulative percentage reduction from the total exceedance-day reductions required for that jurisdictional group as identified in Table 7-4.6.
15 years after effective date of the TMDL	Each defined jurisdictional group must achieve a 50% cumulative percentage reduction from the total exceedance-day reductions required for that jurisdictional group as identified in Table 7-4.6.
18 years after effective date of the TMDL	Final implementation targets in terms of allowable wet-weather exceedance days must be achieved at each individual beach as identified in Table 7-4.5. In addition, the geometric mean targets must be achieved for each individual beach location.

Notes: *For those subwatersheds without an existing shoreline monitoring site, responsible jurisdictions and agencies must establish a shoreline monitoring site if there is measurable flow from a creek or publicly owned storm drain to the beach during dry weather.

7-5 Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on August 7, 2003.

This TMDL was approved by:
The State Water Resources Control Board on November 19, 2003.
The Office of Administrative Law on January 30, 2004.
The U.S. Environmental Protection Agency on March 18, 2004.

The effective date of this TMDL is: March 18, 2004

The following table includes the elements of this TMDL.

Table 7-5.1. Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Elevated bacterial indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use at Marina del Rey Harbor (MdRH) Mothers' Beach and back basins. Swimming in marine waters with elevated bacterial indicator densities has long been associated with adverse health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine water to protect the water contact recreation use. These targets are the most appropriate indicators of public health risk in recreational waters. These bacteriological objectives are set forth in Chapter 3 of the Basin Plan.[1] The objectives are based on four bacterial indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are: 1. Rolling 30-day Geometric Mean Limits a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. 2. Single Sample Limits a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Element	Key Findings and Regulatory Provisions
Numeric Target (continued) (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	These objectives are generally based on an acceptable health risk for marine recreational waters of 19 illnesses per 1,000 exposed individuals as set by the US EPA (US EPA, 1986). The targets apply throughout the year. The final compliance point for the targets is the point at which the effluent from a storm drain initially mixes with the receiving water where there is a freshwater outlet (i.e., publicly-owned storm drain) to the beach, or at ankle depth at beaches without a freshwater outlet, and at surface and depth throughout the Harbor. For Mothers' Beach the targets will apply at existing or new monitoring sites, with samples taken at ankle depth. For Basins D, E, and F the targets will also apply at existing or new monitoring sites with samples collected at surface and at depth. Implementation of the above bacteria objectives and the associated TMDL numeric targets is achieved using a 'reference system/anti-degradation approach' rather than the alternative 'natural sources exclusion approach subject to antidegradation policies' or strict application of the single sample objectives. As required by the CWA and Porter-Cologne Water Quality Control Act, Basin Plans include beneficial uses of waters, water quality objectives to protect those uses, an anti-degradation policy, collectively referred to as water quality standards, and other plans and policies necessary to implement water quality standards. This TMDL and its associated waste load allocations, which shall be incorporated into relevant permits, and load allocations are the vehicles for implementation of the Region's standards. The 'reference system/anti-degradation approach' means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within Santa Monica Bay, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the single sample objectives and that it is not the intent of the Regional Board to require treatment or diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas. The geometric mean targets may not be exceeded at any time. The rolling 30-day geometric means will be calculated on each day. If weekly sampling is conducted, the weekly sample result will be assigned to the remaining days of the week in order to calculate the daily rolling 30-day geometric mean. For the single sample targets, each existing monitoring site is assigned an allowable number of exceedance days for three time periods (1) summer dry-weather (April 1 to October 31), (2) winter dry-weather (November 1 to March 31), and (3) wet-weather (defined as days with 0.1 inch of rain or greater and the three days following the rain event.)

Element	Key Findings and Regulatory Provisions
Source Analysis	Dry-weather urban runoff and storm water conveyed by storm drains are the primary sources of elevated bacterial indicator densities to MdRH Mothers' Beach and back basins during dry and wet-weather. As of December 2002, there were seven dischargers located within the Marina del Rey watershed. These dischargers were issued general NPDES permits, general industrial and/or general construction storm water permits. The bacteria loads associated with these discharges are largely unknown, since most do not monitor for bacteria. However, these discharges are not expected to be a significant source of bacteria. Potential nonpoint sources of bacterial contamination at Mothers' Beach and the back basins of MdRH include marina activities such as waste disposal from boats, boat deck and slip washing, swimmer "wash-off", restaurant washouts and natural sources from birds, waterfowl and other wildlife. The bacteria loads associated with these nonpoint sources are unknown.
Loading Capacity	Studies show that bacterial degradation and dilution during transport from the watershed to the receiving water do not significantly affect bacterial indicator densities. Therefore, the loading capacity is defined in terms of bacterial indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above. As the numeric targets must be met at the point where the effluent from storm drains initially mixes with the receiving water and back basins throughout the day, no degradation or dilution allowance is provided.
Waste Load Allocations (for point sources)	The Los Angeles County MS4 and CalTrans storm water permittees and co-permittees are assigned waste load allocations (WLAs) expressed as the number of daily or weekly sample days that may exceed the single sample targets identified under "Numeric Target" at a monitoring site. Waste load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. The allowable number of exceedance days for a monitoring site for each time period is based on the lesser of two criteria (1) exceedance days in the designated reference system and (2) exceedance days based on historical bacteriological data at the monitoring site. This ensures that bacteriological water quality is at least as good as that of a largely undeveloped system and that there is no degradation of existing water quality. For each monitoring site, allowable exceedance days are set on an annual basis as well as for three time periods. These three periods are: 1. summer dry-weather (April 1 to October 31) 2. winter dry-weather (November 1 to March 31) 3. wet-weather days (defined as days of 0.1 inch of rain or more plus three days following the rain event).

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	The County of Los Angeles, City of Los Angeles, Culver City, and California Department of Transportation (CalTrans) are the responsible jurisdictions and responsible agencies[2] for the Marina del Rey Watershed. The County of Los Angeles is the primary jurisdiction because Marina del Rey Harbor is located in an unincorporated area of the County, the County is the lead Permittee in the Los Angeles County Municipal Storm Water NPDES Permit (MS4) stormwater permit, and the Marina is owned and operated by the County of Los Angeles. The responsible jurisdictions and responsible agencies within the Marina del Rey Watershed are jointly responsible for complying with the waste load allocation at monitoring locations impacted by MS4 stormwater discharges. All proposed WLAs for summer dry-weather are zero (0) days of allowable exceedances.[3] The proposed WLAs for winter dry-weather and wet-weather vary by monitoring location as identified in Table 7-5.2. The waste load allocation for the rolling 30-day geometric mean for the County of Los Angeles, City of Los Angeles, Culver City, and CalTrans is zero (0) days of allowable exceedances. As discussed in "Source Analysis", discharges from general NPDES permits, general industrial storm water permits and general construction storm water permits are not expected to be a significant source of bacteria. Therefore, the WLAs for these discharges are zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, general industrial storm water permit or general construction storm water permit within the MdR Watershed will also be subject to a WLA of zero days of allowable exceedances.
Load Allocations (for nonpoint sources)	Load allocations are expressed as the number of daily or weekly sample days that may exceed the single sample targets identified under "Numeric Target" at a monitoring site. Load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. Since all storm water runoff to MdRH is regulated as a point source, load allocations of zero (0) days of allowable exceedances for nonpoint sources are set in this TMDL for each time period. The load allocation for the rolling 30-day geometric mean for nonpoint sources is zero (0) days of allowable exceedances. If a nonpoint source is directly impacting bacteriological quality and causing an exceedance of the numeric target(s), the permittee(s) under the Municipal Storm Water NPDES Permits are not responsible through these permits. However, the jurisdiction or agency adjacent to the monitoring location may have further obligations to identify such sources, as described under "Compliance Monitoring" below.

Element	Key Findings and Regulatory Provisions
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the CalTrans Storm Water Permit, general NPDES permits, general industrial storm water permits, general construction storm water permits, and the authority contained in Sections 13263 and 13267 of the Water Code. Each NPDES permit assigned a WLA shall be reopened or amended at reissuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. Load allocations for nonpoint sources will be implemented within the context of this TMDL. This TMDL will be implemented in three phases over a ten-year period (see Table 7-5.3), unless an Integrated Water Resources Approach is implemented (in which case compliance must be achieved in the shortest time possible but not to exceed 18 years from the effective date of the Santa Monica Bay Beaches Bacteria TMDL). Within three years of the effective date of the TMDL, there shall be no allowable exceedances of the single sample limits at any location during summer dry-weather (April 1 to October 31) or winter dry-weather (November 1 to March 31) and the rolling 30-day geometric mean targets must be achieved. The Executive Officer of the Regional Board may extend the compliance date no more than one year if he finds that there is insufficient capacity in the sewer line between Marina del Rey and the Hyperion Treatment Plant. Within ten years of the effective date of the TMDL, compliance with the allowable number of wet-weather exceedance days and rolling 30-day geometric mean targets must be achieved, unless an Integrated Water Resources Approach is implemented (in which case compliance must be achieved in the shortest time possible but not to exceed 18 years from the effective date of the Santa Monica Bay Beaches Bacteria TMDL). For those monitoring locations subject to the antidegradation provision, there shall be no increase in exceedance days during the implementation period above the estimated days for the monitoring location in the critical year as identified in Table 7-5.2. The responsible jurisdictions and the responsible agencies must submit a report to the Executive Officer by July 30, 2005 (see Table 7-5.3) describing how they intend to comply with the dry-weather and wet-weather WLAs. As the primary jurisdiction, the County of Los Angeles is responsible for submitting the implementation plan report described above. In addition, the County of Los Angeles Department of Beaches and Harbor must submit a report detailing its efforts to prohibit discharges from boats in the Harbor (see Table 7-5.3).

Element	Key Findings and Regulatory Provisions
Implementation (continued)	The Marina del Rey Harbor jurisdictional unit may change its primary jurisdiction by submitting a joint, written request, submitted by the current primary jurisdiction and the proposed primary jurisdiction, to the Executive Officer requesting reassignment of primary responsibility. The Regional Board intends to reconsider this TMDL, consistent with the scheduled reconsideraton of the Santa Monica Bay (SMB) beaches TMDLs. The SMB beaches TMDLs are scheduled to be reconsidered in four years to re-evaluate the allowable winter dry-weather and wet-weather exceedance days based on additional data on bacterial indicator densities in the wave wash; to re-evaluate the reference system selected to set allowable exceedance levels; to re-evaluate the reference year used in the calculation of allowable exceedance days, and to re-evaluate the need for revision of the geometric mean implementation provision. The Regional Board intends to conduct a similar review of this TMDL within 4 years after the effective date. In addition, if a suitable reference watershed that is representative of an enclosed harbor has not been found by this time, the Regional Board may consider implementing a 'natural source exclusion approach subject to antidegradation policies' to the Marina del Rey Harbor in lieu of the 'reference watershed/antidegradation approach'.
Margin of Safety	A margin of safety has been implicitly included through several conservative assumptions, such as the assumption that no dilution takes place between the storm drain and where the effluent initially mixes with the receiving water, and that bacterial degradation rates are not fast enough to affect bacteria densities in the receiving water. In addition, an explicit margin of safety has been incorporated, as the load allocations will allow exceedances of the single sample targets no more than 5% of the time on an annual basis, based on the cumulative allocations proposed for dry and wet weather. Currently, the Regional Board concludes that there is water quality impairment if more than 10% of samples at a site exceed the single sample bacteria objectives annually.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for three time periods (summer dry-weather, winter-dry weather, and wet-weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators. The critical condition for bacteria loading is during wet weather, when historic monitoring data for MdRH and the reference beach indicate greater exceedance probabilities of the single sample bacteria objectives then during dry-weather.

Element	Key Findings and Regulatory Provisions
Seasonal Variations and Critical Conditions (continued)	To more specifically identify a critical condition within wet-weather, in order to set the allowable exceedance days shown in Table 7-5.2, the 90th percentile 'storm year'[4] in terms of wet days[5] is used as the reference year. Selecting the 90th percentile year avoids a situation where the reference system is frequently out of compliance. It is expected that because responsible jurisdictions and agencies will be planning for this 'worst-case' scenario, there will be fewer exceedance days than the maximum allowed in drier years. Conversely, in the 10% of wetter years, it is expected that there may be more than the allowable number of exceedance days.
Compliance Monitoring	Responsible jurisdictions and agencies shall conduct daily or systematic weekly sampling at the initial point of mixing with the receiving water at all major drains[6], at existing monitoring stations and at other designated monitoring stations to determine compliance.[7] For Mothers' Beach the targets will also apply at existing or new monitoring sites, with samples taken at ankle depth. For Basins D, E, and F the targets will also apply at existing or new monitoring sites with samples collected at surface and at depth. Samples collected at ankle depth shall be taken on an incoming wave. At locations where there is a freshwater outlet, during wet weather, samples should be taken as close as possible to the initial point of mixing with the receiving water, and no further away than 10 meters down current of the storm drain or outlet.[8] At locations where there is a freshwater outlet, samples shall be taken when the freshwater outlet is flowing into the surf zone.[9] If the number of exceedance days is greater than the allowable number of exceedance days, the responsible jurisdictions and agencies shall be considered out of compliance with the TMDL. Responsible jurisdictions or agencies shall not be deemed out of compliance with the TMDL if the investigation described in the paragraph below demonstrates that bacterial sources originating within the jurisdiction of the responsible agency have not caused or contributed to the exceedance. If a single sample shows the discharge or contributing area to be out of compliance, the Regional Board may require, through permit requirements or the authority contained in Water Code Section 13267, daily sampling where the effluent from the storm drain initially mixes with the receiving water or at the existing monitoring location (if it is not already) until all single sample events meet bacteria water quality objectives. Furthermore, if a location is out-of-compliance as determined in the previous paragraph, the Regional Board shall require responsible agencies to initiate an investigation, which at a minimum shall include daily sampling where the effluent from the storm drain initially mixes with the receiving water or at the existing monitoring location until all single sample events meet bacteria water quality objectives.

Element	Key Findings and Regulatory Provisions
Compliance Monitoring (continued)	If bacteriological water quality objectives are exceeded in any three weeks of a four-week period when weekly sampling is performed, or, for areas where testing is done more than once a week, 75% of testing days produce an exceedance of bacteria water quality objectives, the responsible agencies shall conduct a source investigation of the subwatershed(s) pursuant to protocols established under Water Code Section 13178. Responsible jurisdictions may wish to conduct compliance monitoring at key jurisdictional boundaries as part of this effort. If a location without a freshwater outlet is out-of-compliance or if the outlet is diverted or being treated, the adjacent municipality, County agency(s), or State or federal agency(s) shall be responsible for conducting the investigation and shall submit its findings to the Regional Board to facilitate the Regional Board exercising further authority to regulate the source of the exceedance in conformance with the Water Code. In addition, the MdR responsible jurisdictions and responsible agencies are required to conduct a study to determine the relative bacterial loading from sources including but not limited to storm drains, boats, birds, and other nonpoint sources.. Once this study is completed in three years, the Regional Board will adjust the WLAs, if appropriate, based on the study, during the scheduled review of this TMDL.

Note: The complete staff report for the TMDL is available for review upon request.

1 The bacteriological objectives were revised by a Basin Plan amendment adopted by the Regional Board on October 25, 2001, and subsequently approved by the State Water Resources Control Board, the Office of Administrative Law and finally by U.S. EPA on September 25, 2002.

2 For the purposes of this TMDL, "responsible jurisdictions and responsible agencies" are defined as (1) local agencies that are permittees or co-permittees on a municipal storm water permit, (2) local or state agencies that have jurisdiction over Mothers' Beach or the back basins of MdRH, and (3) the California Department of Transportation pursuant to its storm water permit.

3 In order to fully protect public health, no exceedances are permitted at any monitoring location during summer dry-weather (April 1 to October 31). In addition to being consistent with the two criteria, waste load allocations of zero (0) days of allowable exceedances are further supported by the fact that the California Department of Health Services has established minimum protective bacteriological standards – the same as the numeric targets in this TMDL – which, when exceeded during the period April 1 to October 31, result in posting a beach with a health hazard warning (California Code of Regulations, Title 17, Section 7958).

4 For purposes of this TMDL, a 'storm year' means November 1 to October 31. The 90th percentile storm year was 1993 with 75 wet days at the LAX meteorological station.

5 A wet day is defined as a day with rainfall of 0.1 inch or more plus the 3 days following the rain event.

6 Major drains are those that are publicly owned and have measurable flow to the beach during dry weather.

7 The frequency of sampling (i.e., daily versus weekly) will be at the discretion of the implementing agencies. However, the number of sample days that may exceed the objectives will be scaled by solving for the variable "X" in the following equation: (Number of wet-weather days or dry-weather days in 1993 / 365 days = X / 52 weeks), where the number of wet-weather days and dry-weather days are based on the historical rainfall record at the Los Angeles International Airport also known as "LAX".

8 Safety considerations during wet weather may preclude taking a sample at the initial point of mixing with the receiving water.

9 At some freshwater outlets and storm drains, during high tide conditions, the tide pushes the freshwater discharge back into the drain. As a result, sampling under these conditions is not representative of water quality conditions when the drain is flowing into the surf zone. The tide height at which this situation occurs will vary with the size, slope and configuration of the drain and the beach. Responsible agencies must ensure that samples are collected only when drains are flowing into the surf zone, not when the discharge is pushed back into the drain. Responsible agencies must submit a coordinated monitoring plan within 120 days of the effective date of the TMDL, in which this assurance should be included.

Table 7-5.2. Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL: Final Allowable Exceedance Days by Sampling Location

Compliance Deadline		3 years after effective date[1]		3 years after effective date[1]		10 years after effective date[2]	
		Summer Dry Weather ^		Winter Dry Weather ^*		Wet Weather ^*	
		April 1 - October 31		November 1 – March 31		November 1 - October 31	
Station ID	Location Name	Daily sampling (No. days)	Weekly sampling (No. days)	Daily sampling (No. days)	Weekly sampling (No. days)	Daily sampling (No. days)	Weekly sampling (No. days)
HYP (S9)	Mothers' Beach, at Lifeguard Tower	0	0	3	1	17	3
DHS (109a)	Mothers' Beach, at Playground Area	0	0	3	1	17	3
DHS (109b)	Mothers' Beach, between Lifeguard Tower and Boat Dock	0	0	3	1	17	3
DHS (109c)	Los Angeles County Fire Dock - end of main channel	0	0	3	1	17	3
DHB (MDR-8)	Mothers' Beach, near first slips outside swim area	0	0	3	1	17	3
DHB (MDR-18)	Mothers' Beach, 20 meters off of the wheel chair ramp	0	0	0	0	15	3
DHB (MDR-19)	Mothers' Beach, end of wheel chair ramp	0	0	3	1	17	3
DHB (MDR-9)	Basin F, innermost end	0	0	3	1	8	1
DHB (MDR-11)	End of Main Channel	0	0	3	1	17	3
DHB (MDR-10)	Basin E, near center of basin	0	0	3	1	17	3
DHB (MDR-20)	Basin E, in front of Tidegate from Oxford Basin	0	0	3	1	17	3

Notes: The number of allowable exceedances is based on the lesser of (1) the reference system or (2) existing levels of exceedance based on historical monitoring data.
The allowable number of exceedance days during winter dry-weather is calculated based on the 10th percentile storm year in terms of dry days at the LAX meteorological station
The allowable number of exceedance days during wet-weather is calculated based on the 90th percentile storm year in terms of wet days at the LAX meteorological station.

[1] The Executive Officer of the Regional Board may extend the compliance date by no more than one year if he finds that there is insufficient capacity in the existing sewer line from Marina del Rey to the Hyperion Treatment Plant.

[2] If an Integrated Water Resources Approach is implemented, the compliance period must be the shortest time possible but not to exceed 18 years from the effective date of the Santa Monica Bay Beaches Bacteria Wet-Weather TMDL.

^ A dry day is defined as a non-wet day. A wet day is defined as a day with a 0.1-inch or more of rain and the three days following the rain event.

* A revision of the TMDL is scheduled for four years after the effective date of the Santa Monica Bay Beaches TMDLs in order to re-evaluate the allowable exceedance days during winter dry-weather and wet-weather based on additional monitoring data and the results of the study of relative loading from sources including but not limited to storm drains, boats, birds and other nonpoint sources.

Table 7-5.3. Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL: Significant Dates

Date	Action
120 days after the effective date of the TMDL	Responsible jurisdictions and responsible agencies shall submit coordinated monitoring plan(s) to be approved by the Executive Officer. The monitoring plans shall including a list of new sites* and/or sites relocated to include the point where the effluent from the storm drain initially mixes with the receiving water, at least three locations off of Mothers' Beach, and at least one location in each of the other Marina del Rey Basins (i.e., Basins A, B, C, E, F, G, and H). The plan shall include the responsible jurisdictions' and responsible agencies' recommended sampling frequency at each location. The Los Angeles County Department of Beaches and Harbors shall provide a written report to the Regional Board detailing efforts to control discharges from boats, including but not limited to the number of live-aboards and the number of pump-outs per month. The responsible jurisdictions and the responsible agencies must identify and provide documentation on small drains discharging to Mothers' Beach and the Marina del Rey Harbor. Documentation must include a report of waste discharge where necessary.
March 30, 2005 (Draft Report) July 30, 2005 (Final Report)	Responsible jurisdictions and responsible agencies shall provide a written report to the Regional Board outlining how each intends to cooperatively achieve compliance with the dry-weather and wet-weather TMDL Waste Load Allocations. The report shall include implementation methods, an implementation schedule, and proposed milestones.
3 years after effective date of the TMDL	Responsible jurisdictions and responsible agencies shall provide to the Regional Board results of the study conducted to determine the relative bacterial loading from sources including but not limited to storm drains, boats, birds and other nonpoint sources at the Oxford Flood Control Basin, Mothers' Beach, and the Harbor
3 years after effective date of the TMDL	Achieve compliance with the allowable exceedance days as set forth in Table 7-5.2 and rolling 30-day geometric mean targets during summer dry-weather (April 1 to October 31) and winter dry weather (November 1 to March 31). The Executive Officer of the Regional Board may extend the compliance date by no more than one year if he finds that there is insufficient capacity in the existing sewer line from Marina del Rey to the Hyperion Treatment Plant.
4 years after effective date of the TMDL	The Regional Board shall reconsider this TMDL to: (1) refine allowable winter dry-weather and wet-weather exceedance days based on additional data on bacterial indicator densities, an evaluation of site-specific variability in exceedance levels, and the results of the study of relative bacterial loading from sources including but not limited to storm drains, boats, birds, and other nonpoint sources,

Date	Action
4 years after effective date of the TMDL (continued)	(2) re-evaluate the reference system selected to set allowable exceedance levels, including a reconsideration of whether the allowable number of exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s), and if an appropriate reference system cannot be identified for this enclosed harbor, evaluate using the 'natural sources exclusion approach subject to antidegradation policies' rather than the 'reference system/antidegradation' approach, (3) re-evaluate the reference year used in the calculation of allowable exceedance days, and (4) re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision.
10 years after effective date of the TMDL or, if an Integrated Water Resources Approach is implemented, in the shortest time possible but not to exceed 18 years from the effective date of the Santa Monica Bay Beaches Bacteria Wet-Weather TMDL	Achieve compliance with the allowable exceedance days as set forth in Table 7-5.2 and rolling 30-day geometric mean targets during wet-weather.

* For those areas of the marina without an existing monitoring site, responsible jurisdictions and responsible agencies must establish a monitoring site if there is measurable flow from a publicly owned storm drain to the basin during dry weather.

7-6 Upper Santa Clara River Chloride TMDL

This TMDL was adopted by: The Regional Water Quality Control Board on October 24, 2002.
This TMDL was remanded by: The State Water Resources Control Board on February 19, 2003
This TMDL was adopted by: The Regional Water Quality Control Board on July 10, 2003.

This TMDL was revised and adopted by:
The Regional Water Quality Control Board on May 6, 2004.
This TMDL was approved by:
The State Water Resource Control Board on July 22, 2004
The Office of Administrative Law on November 15, 2004
The U.S. Environmental Protection Agency on April 28, 2005

This TMDL was revised and adopted by:
The Regional Water Quality Control Board on August 3, 2006.
This TMDL was approved by:
The State Water Resource Control Board on May 22, 2007.
The Office of Administrative Law on July 3, 2007.

This TMDL was revised and adopted by:
The Regional Water Quality Control Board on December 11, 2008.
This TMDL was approved by:
The State Water Resource Control Board on October 20, 2009.
The Office of Administrative Law on January 26, 2010.
The U.S. Environmental Protection Agency on April 6, 2010.

The effective date of this TMDL is: April 6, 2010.

Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements

Element	Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements Santa Clara River Chloride
Problem Statement	Elevated chloride concentrations are causing impairments of the water quality objective in Reach 5 (EPA 303(d) list Reach 7) and Reach 6 (EPA 303(d) list Reach 8) of the Santa Clara River (SCR). These reaches are on the 1998 and 2002 Clean Water Act (CWA) 303(d) lists of impaired water bodies as impaired due to chloride. The objectives for these reaches were set to protect all beneficial uses; agricultural beneficial uses have been determined to be most sensitive, and not currently attained at the downstream end of Reach 5 (EPA 303(d) list Reach 7) and Reach 6 (EPA 303(d) list Reach 8) in the Upper Santa Clara River (USCR). Irrigation of salt sensitive crops such as avocados, strawberries, and nursery crops with water containing elevated levels of chloride results in reduced crop yields. Chloride levels in groundwater in Piru Basin underlying the reach downstream of Reach 5 are also rising.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the load allocations)	Numeric targets are equivalent to conditional site specific objectives (SSOs) that are based on technical studies regarding chloride levels which protect salt sensitive crops and endangered and threatened species, chloride source identification, and the magnitude of assimilative capacity in the upper reaches of the Santa Clara River and underlying groundwater basin. The TMDL special study, Literature Review Evaluation, shows that the most sensitive beneficial uses can be supported with rolling averaging periods as shown in the tables below.

Element	Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements Santa Clara River Chloride
Numeric Target (continued) (Interpretation of the numeric water quality objective, used to calculate the load allocations)	1. Conditional Surface Water SSOs The conditional SSOs for chloride in the surface water of Reaches 4B, 5, and 6 shall apply and supersede the existing water quality objectives of 100 mg/L only when chloride load reductions and/or chloride export projects are in operation by the SCVSD according to the implementation section in Table 7-6.1. Conditional surface water SSOs for Reaches 4B, 5, and 6 of the Santa Clara River are listed as follows:

Reach	Conditional SSO for Chloride (mg/L)	Rolling Averaging Period
6	150	12-month
5	150	12-month
4B	117	3-month
4B Critical Conditions	130[a]	3-month[b]

a. The conditional SSO for chloride in Reach 4B under critical condition shall apply only if the following conditions and implementation requirements are met:

1. Water supply chloride concentrations measured in Castaic Lake are ≥ 80 mg/L.
2. The Santa Clarita Valley Sanitation District (SCVSD) shall provide supplemental water to salt-sensitive agricultural uses that are irrigated with surface water during periods when Reach 4B surface water exceeds 117 mg/L.
3. By May 4, 2020, the 10-year cumulative net chloride loading above 117 mg/L ($CNCl_{117}$)[i] to Reach 4B of the SCR, calculated annually, from the SCVSD Water Reclamation Plants (WRPs) shall be zero or less.

[i] $CNCl_{117} = Cl_{(Above\ 117)} - Cl_{(Below\ 117)} - Cl_{(Export\ Ews)}$

Where:

$Cl_{(Above\ 117)}$ = [WRP Cl Load[1]/Reach 4B Cl Load[2]] * [Reach 4B Cl $Load_{>117}$[3]]

$Cl_{(Below\ 117)}$ = [WRP Cl Load[1]/Reach 4B Cl Load[2]] * [Reach 4B Cl $Load_{<=117}$[4]]

$Cl_{(Export\ EWs)}$ = Cl Load Removed by Extraction Wells

[1] WRP Cl Load is determined as the monthly average Cl concentration multiplied by the monthly average flow measured at the Valencia WRP.

[2] Reach 4B Cl Load is determined as the monthly average Cl concentration at SCVSD Receiving Water Station RF multiplied by the monthly average flow measured at USGS Gauging Station 11109000 (Las Brisas Bridge).

[3] Reach 4B Cl $Load_{>117}$ means the calculated Cl load to Reach 4B when monthly average Cl concentration in Reach 4B is above 117 mg/L.

[4] Reach 4B Cl $Load_{<=117}$ means the calculated Cl load to Reach 4B when monthly average Cl concentration in Reach 4B is below or equal to 117 mg/L.

<table>
<tr><th>Element</th><th>Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements
Santa Clara River Chloride</th></tr>
<tr><td>Numeric Target (continued) (Interpretation of the numeric water quality objective, used to calculate the load allocations)</td><td>
4. The chief engineer of the SCVSD signs under penalty of perjury and submits to the Los Angeles Regional Water Quality Control Board (Regional Board) a letter documenting the fulfillment of conditions 1, 2, and 3.

b. The averaging period for the critical condition SSO may be reconsidered based on results of chloride trend monitoring after the conditional WLAs of this TMDL are implemented.

2. Conditional SSOs for Groundwater

Conditional groundwater SSOs are listed as follows:
<table>
<tr><th>Groundwater Basin</th><th>Conditional Groundwater SSO for Chloride (mg/L)</th><th>Rolling Averaging Period</th></tr>
<tr><td>Santa Clara--Bouquet & San Francisquito Canyons</td><td>150</td><td>12-month</td></tr>
<tr><td>Castaic Valley</td><td>150</td><td>12-month</td></tr>
<tr><td>Lower area east of Piru Creek [a]</td><td>150</td><td>12-month</td></tr>
</table>
[a] This objective only applies to the San Pedro formation. Existing objective of 200 mg/L applies to shallow alluvium layer above San Pedro formation.

The conditional SSOs for chloride in the groundwater in Santa Clara--Bouquet & San Francisquito Canyons, Castaic Valley and the lower area east of Piru Creek (San Pedro Formation) shall apply and supersede the existing groundwater quality objectives only when chloride load reductions and/or chloride export projects are in operation by the SCVSD according to the implementation section in Table 7-6.1.
</td></tr>
<tr><td>Source Analysis</td><td>The principal source of chloride into Reaches 5 and 6 of the Santa Clara River is discharges from the Saugus WRP and Valencia WRP, which are estimated to contribute 70% of the chloride load in Reaches 5 and 6. These sources of chloride accumulate and degrade groundwater in the lower area east of Piru Creek in the basin.</td></tr>
</table>

<table>
<tr><th>Element</th><th>Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements
Santa Clara River Chloride</th></tr>
<tr><td>Linkage Analysis</td><td>A groundwater-surface water interaction (GSWI) model was developed to assess the linkage between chloride sources and in-stream water quality and to quantify the assimilative capacity of Reaches 4A, 4B, 5, and 6 and the groundwater basins underlying those reaches. GSWI was then used to predict the effects of WRP discharges on chloride loading to surface water and groundwater under a variety of future hydrology, land use, and water use assumptions including future discharges from the Newhall Ranch WRP in order to determine appropriate wasteload allocations (WLAs) and load allocations (LAs).

The linkage analysis demonstrates that beneficial uses can be protected through a combination of SSOs for surface water and groundwater and reduction of chloride levels from the Valencia WRP effluent through advanced treatment.</td></tr>
<tr><td>Waste Load Allocations (for point sources)</td><td>The conditional WLAs for chloride for all point sources shall apply only when chloride load reductions and/or chloride export projects are in operation by the SCVSD according to the implementation section in Table 7-6.1. If these conditions are not met, WLAs shall be based on existing water quality objectives for chloride of 100 mg/L.

Conditional WLAs for chloride for discharges to Reach 4B by the Saugus and Valencia WRPs are as follows:

<table>
<tr><th>Reach</th><th>Concentration-based Conditional WLA for Chloride (mg/L)</th></tr>
<tr><td>4B</td><td>117 (3-month Average),
230 (Daily Maximum)</td></tr>
<tr><td>4B Critical Conditions</td><td>130[a] (3-month Average[b]),
230 (Daily Maximum)</td></tr>
</table>
a. The Conditional WLA under critical conditions shall apply only if the following conditions and implementation requirements are met:
1. Water supply chloride concentrations measured in Castaic Lake are ≥ 80 mg/L.

2. SCVSD shall provide supplemental water to salt-sensitive agricultural uses that are irrigated with surface water during periods when Reach 4B surface water exceeds 117 mg/L.
3. By May 4, 2020, the 10-year cumulative net chloride loading above 117 mg/L ($CNCl_{117}$)[i] to Reach 4B of the SCR, calculated annually, from the Saugus and Valencia WRPs shall be zero or less.</td></tr>
</table>

Element	Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements Santa Clara River Chloride
Waste Load Allocations (for point sources) (continued)	[i] $CNCl_{117} = Cl_{(Above\ 117)} - Cl_{(Below\ 117)} - Cl_{(Export\ Ews)}$ Where: $Cl_{(Above\ 117)}$ = [WRP Cl Load[1]/Reach 4B Cl Load[2]] * [Reach 4B Cl $Load_{>117}$[3]] $Cl_{(Below\ 117)}$ = [WRP Cl Load[1]/Reach 4B Cl Load[2]] * [Reach 4B Cl $Load_{<=117}$[4]] $Cl_{(Export\ EWs)}$ = Cl Load Removed by Extraction Wells [1] WRP Cl Load is determined as the monthly average Cl concentration multiplied by the monthly average flow measured at the Valencia WRP. [2] Reach 4B Cl Load is determined as the monthly average Cl concentration at SCVSD Receiving Water Station RF multiplied by the monthly average flow measured at USGS Gauging Station 11109000 (Las Brisas Bridge). [3] Reach 4B Cl $Load_{>117}$ means the calculated Cl load to Reach 4B when monthly average Cl concentration in Reach 4B is above 117 mg/L. [4] Reach 4B Cl $Load_{<=117}$ means the calculated Cl load to Reach 4B when monthly average Cl concentration in Reach 4B is below or equal to 117 mg/L. 4. The chief engineer of the SCVSD signs under penalty of perjury and submits to the Regional Board a letter documenting the fulfillment of conditions 1, 2, and 3. b. The averaging period for the critical condition WLA may be reconsidered based on results of chloride trend monitoring after the conditional WLAs of this TMDL are implemented. Discharges to Reaches 5 and 6 by the Saugus and Valencia WRPs will have final concentration-based and mass-based conditional WLAs for chloride based on conditional SSOs as follows:

WRP	Concentration-based Conditional WLA for Chloride (mg/L)	Mass-based Conditional WLA for Chloride (pounds/day)
Saugus	150 (12-month Average), 230 (Daily Maximum)	Q_{Design}*150 mg/L*8.34 (12-month Average)
Valencia	150 (12-month Average), 230 (Daily Maximum)	Q_{Design}*150 mg/L*8.34 – AF_{RO} (12-month Average)

Where Q_{design} is the design capacity of WRPs in units of million gallons per day (MGD), AF_{RO} is the chloride mass loading adjustment factor for operation of reverse osmosis (RO) facilities, where:

Element	Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements Santa Clara River Chloride
Waste Load Allocations (for point sources) (continued)	If RO facilities are operated at ≥ 50% Capacity Factor[a] in preceding 12 months $AF_{RO} = 0$ If RO facilities are operated at < 50% Capacity Factor[b] in preceding 12 months AF_{RO} = (50% Capacity Factor – %RO Capacity) * *ChlorideLoadRO*[c] [a] Capacity Factor is based on 3 MGD of recycled water treated with RO, 90% of the time. [b] If operation of RO facilities at <50% rated capacity is the result of conditions that are outside the control of SCVSD, then under the discretion of the Executive Officer of the Regional Board, the AF_{RO} may be set to 0. [c] Chloride load reduction is based on operation of a RO treatment plant treating 3 MGD of recycled water with chloride concentration of 50 mg/L + Water Supply Chloride. Assumes operational capacity factor of 90% and RO membrane chloride rejection rate of 95%. Determination of chloride load based on the following: $ChlorideLoadRO = 90\% \times [(Q_{RO} \times C_{WRP} \times 8.34) \times r] \times (30\ Days/Month)$ Where: Q_{RO} = 3 MGD of recycled water treated with RO C_{WRP} = Chloride concentration in water supply + 50 mg/L r = % Reverse Osmosis chloride rejection (95% or 0.95) 8.34 = Conversion factor (ppd/(mg/L*MGD)) The final WLAs for TDS and sulfate are equal to existing surface water and groundwater quality objectives for TDS and sulfate in Tables 3-8 and 3-10 of the Basin Plan. The Regional Board may revise the final WLAs based on review of trend monitoring data as detailed in the monitoring section of this Basin Plan amendment. Other minor NPDES discharges (as defined in Table 4-1 of the Basin Plan) receive conditional WLAs. The conditional WLA for these point sources is as follows: **Reach** / **Concentration-based Conditional WLA for Chloride (mg/L)** 6 / 150 (12-month Average), 230 (Daily Maximum) 5 / 150 (12-month Average), 230 (Daily Maximum) 4B / 117 (3-month Average), 230 (Daily Maximum) Other major NPDES discharges (as defined in Table 4-1 of the Basin Plan) receive WLAs equal to 100 mg/L. The Regional Board may consider assigning conditional WLAs to other major dischargers based on an analysis of the downstream increase in net chloride loading to surface water and groundwater as a result of implementation of conditional WLAs.

<table>
<tr><th>Element</th><th>Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements
Santa Clara River Chloride</th></tr>
<tr><td>Load Allocation (for non point sources)</td><td>The source analysis indicates nonpoint sources are not a major source of chloride. The conditional LAs for these nonpoint sources are as below:

<table>
<tr><th>Reach</th><th>Concentration-based Conditional LA for Chloride (mg/L)</th></tr>
<tr><td>6</td><td>150 (12-month Average),
230 (Daily Maximum)</td></tr>
<tr><td>5</td><td>150 (12-month Average),
230 (Daily Maximum)</td></tr>
<tr><td>4B</td><td>117 (3-month Average),
230 (Daily Maximum)</td></tr>
</table>

The conditional LAs shall apply only when chloride load reductions and/or chloride export projects are in operation by the SCVSD according to the implementation section in Table 7-6.1. If these conditions are not met, LAs are based on existing water quality objectives of 100 mg/L.</td></tr>
<tr><td>Implementation</td><td>Refer to Table 7-6.2.

<u>Implementation of Upper Santa Clara River Conditional Site Specific Objectives for Chloride</u>

In accordance with Regional Board resolution 97-002, the Regional Board and stakeholders have developed an integrated watershed plan to address chloride impairments and protect beneficial uses of surface waters and groundwater basins underlying Reaches 4B, 5, and 6 of the Santa Clara River. The plan involves: 1) Reducing chloride loads and/or increasing chloride exports from the USCR watershed through implementation of advanced treatment (RO) of a portion of the effluent from the Valencia WRP. The advanced treated effluent will be discharged into Reach 4B or blended with extracted groundwater from the Piru Basin underlying Reach 4B and discharged into Reach 4A. The resultant brine from the advanced treatment process will be disposed in a legal and environmentally sound manner. 2) Implementing the conditional SSOs for chloride in surface waters and underlying groundwater basins of the USCR watershed provided in Chapter 3.</td></tr>
</table>

Element	Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements Santa Clara River Chloride
Implementation *(continued)*	The watershed chloride reduction plan will be implemented through NPDES permits for the Valencia WRP and a new NPDES permit for discharge into Reach 4A. The conditional SSOs for chloride in the USCR watershed shall apply and supersede the regional water quality objectives only when chloride load reductions and/or chloride export projects are in operation and reduce chloride loading in accordance with the following table:

Water Supply Chloride[1]	Chloride Load Reductions[2]
40 mg/L	58,000 lbs per month
50 mg/L	64,000 lbs per month
60 mg/L	71,000 lbs per month
70 mg/L	77,000 lbs per month
80 mg/L	83,000 lbs per month
90 mg/L	90,000 lbs per month
100 mg/L	96,000 lbs per month

[1] Based on measured chloride of the State Water Project (SWP) water stored in Castaic Lake.
[2] Chloride load reduction is based on operation of a RO treatment plant treating 3 MGD of recycled water with chloride concentration of 50 mg/L + Water Supply Chloride. Assumes operational capacity factor of 90% and RO membrane chloride rejection rate of 95%. Determination of chloride load based on the following:

$$ChlorideLoad = 90\% \times [(Q_{RO} \times C_{WRP} \times 8.34) \times r] \times (30\ Days/Month)$$

where r = % chloride rejection (95%)
Q_{RO} = 3 MGD of recycled water treated with RO
C_{WRP} = SWP Cl + 50 mg/L

Conditional WLAs

Conditional WLAs for the Saugus and Valencia WRPs will be implemented through effluent limits, receiving water limits and monitoring requirements in NPDES permits. Conditional WLAs for Reach 4B will be implemented as receiving water limits. Conditional WLAs for Reaches 5 and 6 will be implemented as effluent limits.

The implementation plan proposes that during the period of TMDL implementation, compliance for the WRPs' effluent limits will be evaluated in accordance with interim WLAs.

Element	Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements Santa Clara River Chloride
Implementation *(continued)*	Saugus WRP: The interim WLA for chloride is equal to the interim limit for chloride specified in order No. R4-04-004. The interim WLA for TDS is 1000 mg/L as an annual average. The interim WLA for sulfate is 450 mg/L as an annual average. These interim WLAs shall apply as interim end-of-pipe effluent limits, interim groundwater limits, and interim limits in the Non-NPDES WDR for recycled water uses from the Saugus WRP instead of existing water quality objectives. Valencia WRP: The interim WLA for chloride is equal to the interim limit for chloride specified in order No. R4-04-004. The interim WLA for TDS is 1000 mg/L as an annual average. The interim WLA for sulfate is 450 mg/L as an annual average. These interim WLAs shall apply as interim end-of-pipe effluent limits, interim groundwater limits, and interim limits in the Non-NPDES WDR for recycled water uses from the Valencia WRP instead of existing water quality objectives. Other Major NPDES Permits (including Newhall Ranch WRP): The Regional Board may consider assigning conditional WLAs for other major NPDES permits, including the Newhall Ranch WRP, pending implementation of a chloride mass removal quantity that is proportional to mass based chloride removal required for the Valencia WRP. Supplemental Water released to Reach 6 of Santa Clara River: In order to accommodate the discharge of supplemental water to Reach 6, interim WLAs are provided for sulfate of 450 mg/L and TDS of 1000 mg/L as annual averages. The final WLAs are equal to the existing water quality objectives for sulfate and TDS in Table 3-8 of the Basin Plan. The Regional Board may revise the final WLA based on review of trend monitoring data as detailed in the monitoring section of this Basin Plan amendment.
Monitoring	NPDES monitoring: NPDES Permittees will conduct chloride, TDS, and sulfate monitoring to ensure that water quality objectives are being met. Trend monitoring: The SCVSD will submit a monitoring plan to conduct chloride, TDS, and sulfate trend monitoring to ensure that the goal of chloride export in the watershed is being achieved, water quality objectives are being met, and downstream groundwater and surface water quality is not degraded due to implementation of compliance measures. The SCVSD monitoring plan shall include plans to monitor chloride, TDS, and sulfate in groundwater and identify representative wells to be approved by the Regional Board Executive Officer in the following locations: (a) Shallow alluvium layer in east Piru Basin, (b) San Pedro Formation in east Piru Basin, and (c) groundwater basins under Reaches 5 and 6, which shall be equivalent or greater than existing groundwater monitoring required by NPDES permits for Saugus and Valencia WRPs. The monitoring plan shall also include a plan for chloride, TDS, and sulfate trend monitoring for surface water for Reaches 4B, 5 and 6. The monitoring plan shall include plans to monitor chloride, TDS, and sulfate at a minimum of once per quarter for groundwater and at a minimum of once per month for surface water.

Element	Table 7-6.1. Upper Santa Clara River Chloride TMDL: Elements Santa Clara River Chloride
Monitoring *(continued)*	The plan should propose a monitoring schedule that extends beyond the completion date of this TMDL to evaluate impacts of compliance measures to downstream groundwater and surface water quality. This TMDL shall be reconsidered if chloride, TDS, and sulfate trend monitoring indicates degradation of groundwater or surface water due to implementation of compliance measures. Trend monitoring: The Reach 4A Permittee will submit a monitoring plan to conduct chloride, TDS, and sulfate trend monitoring to ensure that the goal of chloride export in the watershed is being achieved, water quality objectives are being met, and downstream groundwater and surface water quality is not degraded due to implementation of compliance measures. The Reach 4A permittee monitoring plan shall include plans to monitor chloride, TDS, and sulfate in groundwater and identify representative wells to be approved by the Regional Board Executive Officer in the following locations (a) Fillmore Basin, and (b) Santa Paula Basin. The monitoring plan shall also include a plan for chloride, TDS, and sulfate trend monitoring for surface water for Reaches 3 and 4A. The monitoring plan should include plans to monitor chloride, TDS, and sulfate at a minimum of once per quarter for groundwater and at a minimum of once per month for surface water. The plan should propose a monitoring schedule that shall extend beyond the completion date of this TMDL to evaluate impacts of compliance measures to downstream groundwater and surface water quality. This TMDL shall be reconsidered if chloride, TDS, and sulfate trend monitoring indicates degradation of groundwater or surface water due to implementation of compliance measures.
Margin of Safety	An implicit margin of safety is incorporated through conservative model assumptions and chloride mass balance analysis. The model is an integrated groundwater surface water model which shows that chloride discharged from the WRPs accumulates in the east Piru Basin. Further mass balance analysis shows that the chloride mass removed from the Piru Basin exceeds the chloride loaded into the Piru Basin from implementation of the conditional SSOs.
Seasonal Variations and Critical Conditions	During dry weather conditions, less surface flow is available to dilute effluent discharge, groundwater pumping rates for agricultural purposes are higher, groundwater discharge is lower, poorer quality groundwater may be drawn into the aquifer, and evapotranspiration effects are greater than in wet weather conditions. During drought, reduced surface flow and increased groundwater extraction continues through several seasons with greater impacts on groundwater resources and discharges. Dry and critically dry periods affecting the Sacramento and San Joaquin River Valleys reduce fresh-water flow into the Sacramento-San Joaquin Delta and result in higher than normal chloride concentrations in the State Water Project supply within the California aqueduct system. These increased chloride levels are transferred to the upper Santa Clara River. This critical condition is defined as when water supply concentrations measured in Castaic Lake are $\geq$ 80 mg/L. These critical conditions were included in the GSWI model to determine appropriate allocations and implementation scenarios for the TMDL.

Table 7-6.2. Upper Santa Clara River Chloride TMDL Implementation Implementation Tasks	Completion Date
1. Alternate Water Supply a) Should (1) the in-river concentration at Blue Cut, the Reach 4B boundary, exceed the conditional SSO of 117 mg/L, measured for the purposes of this TMDL as a rolling three-month average, (2) each agricultural diverter provide records of the diversion dates and amounts to the Regional Board and Santa Clarita Valley County Sanitation Districts of Los Angeles County (SCVSD) for at least 2 years after May 4, 2005 and (3) each agricultural diverter provides photographic evidence that diverted water is applied to avocado, strawberry or other chloride sensitive crop and evidence of a water right to divert, then the SCVSD will be responsible for providing an alternative water supply, negotiating the delivery of alternative water by a third party, or providing fiscal remediation to be quantified in negotiations between the SCVSD and the agricultural diverter at the direction of the Regional Water Quality Control Board until such time as the in-river chloride concentrations do not exceed the conditional SSO. b) Should the instream concentration exceed 230 mg/L more than two times in the three year period, the discharger identified by the Regional Board Executive Officer shall be required to submit, within ninety days of a request by the Regional Board Executive Officer, a workplan for an accelerated schedule to reduce chloride discharges.	05/04/2005
2. Progress reports will be submitted by the SCVSD to Regional Board staff on a semiannual basis from May 4, 2005 for tasks 4, 6, and 7, and on an annual basis for Tasks 5 and 11. Progress reports will be submitted by the Reach 4A Permittee to Regional Board staff on an annual basis for Task 12.	Semiannually and annually
3. Chloride Source Identification/Reduction, Pollution Prevention and Public Outreach Plan: Six months after May 4, 2005, the SCVSD will submit a plan to the Regional Board that addresses measures taken and planned to be taken to quantify and control sources of chloride, including, but not limited to: execute community-wide outreach programs, which were developed based on the pilot outreach efforts conducted by the SCVSD, assess potential incentive/disincentive programs for residential self-regenerating water softeners, and other measures that may be effective in controlling chloride. The SCVSD shall develop and implement the source reduction/pollution prevention and public outreach program, and report results annually thereafter to the Regional Board. Chloride sources from imported water supplies will be assessed. The assessment will include conditions of drought and low rainfall, and will analyze the alternatives for reducing this source.	11/04/2005

Table 7-6.2. Upper Santa Clara River Chloride TMDL Implementation Implementation Tasks	Completion Date
4. The SCVSD will convene a technical advisory committee or committees (TAC(s)) in cooperation with the Regional Board to review literature develop a methodology for assessment, and provide recommendations with detailed timelines and task descriptions to support any needed changes to the time schedule for evaluation of appropriate chloride threshold for Task 6. The Regional Board, at a public hearing will re-evaluate the schedule for Task 6 and subsequent linked tasks based on input from the TAC(s), along with Regional Board staff analysis and assessment consistent with state and federal law, as to the types of studies needed and the time needed to conduct the necessary scientific studies to determine the appropriate chloride threshold for the protection of salt sensitive agricultural uses, and will take action to amend the schedule if there is sufficient technical justification.	05/04/2006
5. Groundwater/Surface Water Interaction Model: The SCVSD will solicit proposals, collect data, develop a model in cooperation with the Regional Board, obtain peer review, and report results. The impact of source waters and reclaimed water plans on achieving the water quality objective and protecting beneficial uses, including impacts on underlying groundwater quality, will also be assessed and specific recommendations for management developed for Regional Board consideration. The purpose of the modeling and sampling effort is to determine the interaction between surface water and groundwater as it may affect the loading of chloride from groundwater and its linkage to surface water quality.	11/20/2007
6. Evaluation of Appropriate Chloride Threshold for the Protection of Sensitive Agricultural Supply Use and Endangered Species Protection: The SCVSD will prepare and submit a report on endangered species protection thresholds. The SCVSD will also prepare and submit a report presenting the results of the evaluation of chloride thresholds for salt sensitive agricultural uses, which shall consider the impact of drought and low rainfall conditions and the associated increase in imported water concentrations on downstream crops utilizing the result of Task 5.	11/20/2007
7. Develop SSO for Chloride for Sensitive Agriculture: The SCVSD will solicit proposals and develop technical analyses upon which the Regional Board may base a Basin Plan amendment. 8. Develop Anti-Degradation Analysis for Revision of Chloride Objective by SSO: The SCVSD will solicit proposals and develop draft anti-degradation analysis for Regional Board consideration. 9. Develop a pre-planning report on conceptual compliance measures to meet different hypothetical final conditional wasteload allocations. The SCVSD shall solicit proposals and develop and submit a report to the Regional Board that identifies potential chloride control measures and costs based on different hypothetical scenarios for chloride SSOs and final conditional wasteload allocations.	02/20/2008

Table 7-6.2. Upper Santa Clara River Chloride TMDL Implementation Implementation Tasks	Completion Date
10. a) Preparation and Consideration of a Basin Plan Amendment (BPA) to revise the chloride objective by the Regional Board. b) Evaluation of Alternative Water Supplies for Agricultural Beneficial Uses: The SCVSD will quantify water needs, identify alternative water supplies, evaluate necessary facilities, and report results, including the long-term application of this remedy. c) Analysis of Feasible Compliance Measures to Meet Final Conditional Wasteload Allocations for Proposed Chloride Objective. The SCVSD will assess and report on feasible implementation actions to meet the chloride objective established pursuant to Task 10a). d) Reconsideration of and action taken on the Chloride TMDL and Final Conditional Wasteload Allocations for the Upper Santa Clara River by the Regional Board.	12/11/2008
11. Trend monitoring: The SCVSD will submit a monitoring plan to conduct chloride, TDS, and sulfate trend monitoring to ensure that the goal of chloride export in the watershed is being achieved, water quality objectives are being met, and downstream groundwater and surface water quality is not degraded due to implementation of compliance measures. The SCVSD monitoring plan shall include plans to monitor chloride, TDS, and sulfate in groundwater and identify representative wells to be approved by the Regional Board Executive Officer, in the following locations: (a) Shallow alluvium layer in east Piru Basin, (b) San Pedro Formation in east Piru Basin, and (c) groundwater basins under Reaches 5 and 6, which shall be equivalent or greater than existing groundwater monitoring required by NPDES permits for Saugus and Valencia WRPs. The monitoring plan shall also include a plan for chloride, TDS, and sulfate trend monitoring for surface water for Reaches 4B, 5 and 6. The monitoring plan shall include plans to monitor chloride, TDS, and sulfate at a minimum of once per quarter for groundwater and at a minimum of once per month for surface water. The plan should propose a monitoring schedule that extends beyond the completion date of this TMDL to evaluate impacts of compliance measures to downstream groundwater and surface water quality. This TMDL shall be reconsidered if chloride, TDS, and sulfate trend monitoring indicates degradation of groundwater or surface water due to implementation of compliance measures.	05/04/2009

Table 7-6.2. Upper Santa Clara River Chloride TMDL Implementation Implementation Tasks	Completion Date
12. Trend monitoring: The Reach 4A Permittee will submit a monitoring plan to conduct chloride, TDS, and sulfate trend monitoring to ensure that the goal of chloride export in the watershed is being achieved, water quality objectives are being met, and downstream groundwater and surface water quality is not degraded due to implementation of compliance measures. The Reach 4A permittee monitoring plan shall include plans to monitor chloride, TDS, and sulfate in groundwater and identify representative wells to be approved by the Regional Board Executive Officer in the following locations (a) Fillmore Basin, and (b) Santa Paula Basin. The monitoring plan shall also include a plan for chloride, TDS, and sulfate trend monitoring for surface water for Reaches 3 and 4A. The monitoring plan should include plans to monitor chloride, TDS, and sulfate at a minimum of once per quarter for groundwater and at a minimum of once per month for surface water. The plan should propose a monitoring schedule that shall extend beyond the completion date of this TMDL to evaluate impacts of compliance measures to downstream groundwater and surface water quality. This TMDL shall be reconsidered if chloride, TDS, and sulfate trend monitoring indicates degradation of groundwater or surface water due to implementation of compliance measures.	Submitted with permit application
13. Begin monitoring per approved SVCSD monitoring plan completed in Task 11.	One year after Executive Officer approval of Task 11 monitoring plan for SCVSD
14. Begin monitoring per approved Reach 4A Permittee monitoring plan.	One year after Executive Officer approval of Task 12 monitoring plan for Reach 4A Permittee

Table 7-6.2. Upper Santa Clara River Chloride TMDL Implementation Implementation Tasks	Completion Date
15. a) Implementation of Compliance Measures, Planning: The SCVSD shall submit a report of planning activities which include but are not limited to: (1) identifying lead state/federal agencies; (2) administering a competitive bid process for the selection of EIR/EIS and Engineering Consultants; (3) Development of Preliminary Planning and Feasibility Analyses; (4) Submittal of Project Notice of Preparation/Notice of Intent; (5) Preparation of Draft Wastewater Facilities Plan and Programmatic EIR; (6) Administration of Public Review and Comment Periods; (7) Development of Final Wastewater Facilities Plan and Programmatic EIR and incorporation and response to comments; (8) Administration of final public review and certification process; and (9) Filing a Notice of Determination and Record of Decision.	05/04/2010
b) Implementation of Compliance Measures, Planning: The SCVSD shall provide a schedule of related tasks and subtasks related to Task 15a), and provide semi-annual progress reports on progress of planning activities, thereafter, until completion of Final Wastewater Facilities Plan and Programmatic EIR.	05/04/2010
16. The Regional Board staff will re-evaluate the schedule to implement control measures needed to meet final conditional WLAs adopted pursuant to Task 10 d) and the schedule for Task 17. The Regional Board, at a public meeting will consider extending the completion date of Task 17 and reconsider the schedule to implement control measures to meet final conditional WLAs adopted pursuant to Task 10 d). The SCVSD will provide the justification for the need for an extension to the Regional Board Executive Officer at least 6 months in advance of the deadline for this task.	05/04/2011

Table 7-6.2. Upper Santa Clara River Chloride TMDL Implementation Implementation Tasks	Completion Date
17. a) Implementation of Compliance Measures, Complete Environmental Impact Report: The SCVSD shall complete a Wastewater Facilities Plan and Programmatic Environmental Impact Report for facilities to comply with final effluent permit limits for chloride.	05/04/2011
b) Implementation of Compliance Measures, Engineering Design: The SCVSD will begin the engineering design of the recommended project wastewater facilities.	05/04/2011
c) Implementation of Compliance Measures, Engineering Design: The SCVSD will provide a design schedule of related tasks and sub-tasks, and provide semi-annual progress reports on progress of design activities, thereafter, until completion of Final Design. In addition the SCVSD will provide a construction schedule of related tasks and sub-tasks, and provide semi-annual progress reports on progress of construction activities, thereafter, until completion of recommended project wastewater facilities.	05/04/2012
d) Implementation of Compliance Measures, Construction: The SCVSD shall have applied and received all appropriate permits and have completed construction of the recommended project wastewater facilities.	11/04/2014
e) Implementation of Compliance Measures, Start-Up: The SCVSD shall have completed start-up, testing and certification of the recommended project wastewater facilities.	05/04/2015
18. The Regional Board Executive Officer may consider conditional SSOs for TDS and sulfate for Reaches 4B, 5, and 6 based on results of groundwater-surface water interaction studies on accumulation of TDS and sulfate in groundwater, potential impacts to beneficial uses, and an anti-degradation analysis.	05/04/2012
19. The Regional Board staff will re-evaluate the schedule to implement control measures needed to meet final conditional WLAs adopted pursuant to Task 10 d) and the schedule for Task 17. The Regional Board, at a public meeting will consider extending the completion of Task 17 and reconsider the schedule to implement control measures to meet final conditional WLAs adopted for chloride pursuant to Task 10 d). The SCVSD will provide the justification for the need for an extension to the Regional Board Executive Officer at least 6 months in advance of the deadline for this task. The Regional Board will also consider conditional SSOs and final conditional WLAs for TDS and sulfate based on results of Task 18.	11/04/2014

Table 7-6.2. Upper Santa Clara River Chloride TMDL Implementation Implementation Tasks	Completion Date
20. The interim WLAs for chloride shall remain in effect for no more than 10 years after May 4, 2005. Conditional SSO for chloride in the USCR shall be achieved. Final conditional WLAs for chloride in Reaches 4B, 5, and 6 shall apply by May 5, 2015. The Regional Board may consider extending the completion date of this task as necessary to account for events beyond the control of the SCVSD.	05/04/2015
21. The interim WLAs for TDS and sulfate contained in this BPA (Resolution No. R4-2008-012) shall be implemented no sooner than May 4, 2005, and shall remain in effect until May 4, 2015. Final WLAs shall apply by May 5, 2015 unless conditional SSOs and final conditional WLAs for TDS and sulfate are adopted as described in Task 19.	05/04/2015

7-7 Calleguas Creek Nitrogen Compounds and Related Effects TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on October 24, 2002.

This TMDL was approved by:
The State Water Resources Control Board on March 19, 2003.
The Office of Administrative Law on June 5, 2003.
The U.S. Environmental Protection Agency on June 20, 2003.

This TMDL was revised and adopted by:
The Regional Water Quality Control Board on September 11, 2008.

This TMDL was re-approved by:
The State Water Resources Control Board on June 16, 2009.
The Office of Administrative Law on October 5, 2009.
The U.S. Environmental Protection Agency on October 15, 2009.

The effective date of this TMDL is: October 15, 2009.

The elements of the TMDL are presented in Table 7-7.1 and the Implementation Plan in Table 7-7.2

Table 7-7.1. Calleguas Creek Nitrogen Compounds and Related Effects TMDL: Elements

Element	Calleguas Creek Nitrogen Compound and Related Effects
Problem Statement	Elevated nitrogen concentrations (ammonia, nitrite and nitrate) are causing impairments of the warm water fish and wildlife habitat, and groundwater recharge beneficial uses of Calleguas Creek. Nitrite and nitrate contribute to eutrophic effects such as low dissolved oxygen and algae growth. Ammonia contributes to toxicity.

Element	Calleguas Creek Nitrogen Compound and Related Effects
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the load allocations)	Numeric targets for this TMDL are listed as follows: 1. Total Ammonia as Nitrogen (NH_3-N) *Reach* — *NH_3-N concentration (mg/L)*: *One-hour average* / *Thirty-day average* • Mugu Lagoon: 8.1 / 2.9 • Calleguas Creek, South: 5.5 / 2.4 • Calleguas Creek, North: 8.4 / 3.0 • Revlon Slough: 5.7 / 2.9 • Beardsley Channel: 5.7 / 2.9 • Arroyo Las Posas: 8.1 / 2.6 • Arroyo Simi: 4.7 / 2.4 • Tapo Canyon: 3.9 / 1.9 • Conejo Creek (Confluence with Calleguas Creek to Santa Rosa Rd.): 9.5 / 3.5 • Conejo Creek (Santa Rosa Road to Thousand Oaks City Limit): 8.4 / 3.4 • Conejo Creek, Hill Canyon Reach: 8.4 / 3.1 • Conejo Creek, North Fork: 3.2 / 1.7 • Arroyo Conejo (South Fork Conejo Creek): 5.1 / 3.4 • Arroyo Santa Rosa: 5.7 / 2.4 2. Nitrate and nitrite as nitrogen (NO_3-N and NO_2-N) *Constituent* — *Concentration (mg/L)* • NO_3-N: 10 • NO_2-N: 1 • NO_3-N + NO_2-N: 10 Numeric targets to address narrative objectives required to protect warm freshwater and wildlife habitat are intended to implement the narrative objectives and may be revised based on the results of monitoring and special studies conducted pursuant to the implementation plan.
Source Analysis	The principal sources of nitrogen into Calleguas Creek are discharges from the POTWs in the watershed and runoff from agricultural activities in the watershed.
Linkage Analysis	Linkage between nitrogen sources and the in-stream water quality was established through a mass continuity model based on an evaluation of recent hydrodynamic and water quality data.

<table>
<tr><th>Element</th><th>Calleguas Creek Nitrogen Compound and Related Effects</th></tr>
<tr><td>Waste Load Allocations (for point sources)</td><td>The waste load allocations (WLAs) are as follows:
<table>
<tr><th rowspan="2">POTWs</th><th colspan="3">NH_3-N</th><th rowspan="2">NO_3-N (mg/L)</th><th rowspan="2">NO_2-N (mg/L)</th><th rowspan="2">NO_3-N + NO_2-N (mg/L)</th></tr>
<tr><th>MDEL[1] (mg/L)</th><th>AMEL[2] (mg/L)</th><th>Daily WLA[3] (lbs/day)</th></tr>
<tr><td>Hill Canyon WTP[4]</td><td>5.6</td><td>3.1</td><td>5.1xQ</td><td>9.0</td><td>0.9</td><td>9.0</td></tr>
<tr><td>Simi Valley WQCF[5]</td><td>3.3</td><td>2.4</td><td>2.9xQ</td><td>9.0</td><td>0.9</td><td>9.0</td></tr>
<tr><td>Moorpark WTP</td><td>6.4</td><td>2.6</td><td>5.7xQ</td><td>9.0</td><td>0.9</td><td>9.0</td></tr>
<tr><td>Camarillo WRP[6]</td><td>7.8</td><td>3.5</td><td>7.0xQ</td><td>9.0</td><td>0.9</td><td>9.0</td></tr>
<tr><td>Camrosa WRF[7]</td><td>7.2</td><td>3.0</td><td>6.5xQ</td><td>9.0</td><td>0.9</td><td>9.0</td></tr>
</table></td></tr>
<tr><td>Load Allocation (for non point sources)</td><td>The source analysis indicates that agricultural discharge is the major non-point source of oxidized nitrogen to Calleguas Creek and its tributaries. This source is particularly significant in Revolon Slough and other agricultural drains in the lower Calleguas watershed where there are no point sources of ammonia and oxidized nitrogen. Load allocations for non-point sources are:
<table>
<tr><th>Nonpoint Source</th><th>NO_3-N + NO_2-N (mg/L)</th></tr>
<tr><td>Agriculture</td><td>9.0</td></tr>
<tr><td>Other Nonpoint Source</td><td>9.0</td></tr>
</table></td></tr>
<tr><td>Implementation</td><td>1. Refer to Table 7-7.2
2. Several of the POTWs in the Calleguas Creek watershed will require additional time to meet the nitrogen (NO_3-N, NO_2-N, and NO_3-N + NO_2-N) waste load allocations. To allow time to meet the nitrogen waste load allocations, interim limits will be allowed for a period of four years from July 16, 2003 during which the POTWs will be required to meet the effluent limit for NO_3-N + NO_2-N only. Effluent limits for the individual compounds NO_3-N and NO_2-N are not required during the interim period.</td></tr>
</table>

Element	Calleguas Creek Nitrogen Compound and Related Effects
Implementation (continued)	*Interim Limits* for NO_3-N + NO_2-N* *POTWs* — *Monthly Average (mg/L)* — *Daily Maximum (mg/L)* • Hill Canyon WTP — 36.03 — 38.32 • Simi Valley WQCF — 31.60 — 32.17 • Moorpark WTP — 31.5 — 32.01 • Camarillo WRP — 36.23 — 37.75 *The monthly average and daily maximum interim limits are based on the 95th and 99th percentiles of effluent performance data reported in the Calleguas Creek Characterization Study 3. The waste load allocations for ammonia will be applicable on July 16, 2003. Interim limits for ammonia will be applicable for no more than 2 years starting from October 24, 2002 for POTWs that are not able to achieve immediate compliance with the assigned waste load allocations. The interim limits for ammonia may be established at the discretion of the Regional Board when a POTW's NPDES permit is reissued.
Margin of Safety	An implicit margin of safety is incorporated through conservative model assumptions and statistical analysis. In addition, an explicit margin of safety is incorporated by reserving 10% of the load, calculated on a concentration basis, from allocation to POTW effluent sources.
Seasonal Variations and Critical Conditions	A low flow critical condition is identified for this TMDL based on a review of flow data for the past twenty years. This flow condition was identified because less assimilative capacity is available to dilute effluent discharge.

1 Maximum daily effluent limitation
2 Average monthly effluent limitation
3 Q represents the POTW effluent flow at the time the water quality measurement is collected and a conversion factor to lb/day based on the units of measurement for the effluent flow.
4 Wastewater Treatment Plant
5 Water Quality Control Facility
6 Water Reclamation Plant
7 Water Reclamation Facility

Table 7-7.2. Calleguas Creek Nitrogen Compounds and Related Effects TMDL Implementation Schedule

IMPLEMENTATION TASKS, MILESTONES AND PROVISIONS*		COMPLETION DATE
1. 2. 3.	WLA for ammonia apply to POTWs. Interim Limits for NO_3-N + NO_2-N apply to POTWs. Formation of Nonpoint Source BMP Evaluation Committee.	July 16, 2003
4.

	IMPLEMENTATION TASKS, MILESTONES AND PROVISIONS*	COMPLETION DATE
6.	Submittal of Special Studies Workplan by CCWMP Subcommittee. These special studies include: Monitoring of minor point sources for nutrients to confirm assumptions that the loadings from these sources are minor; Monitoring of greenhouse discharges and runoff to assess loadings from these sources; Monitoring of groundwater extraction and discharges in the Arroyo Santa Rosa subwatershed and other areas that may add significant nutrient loadings to Calleguas Creek; and Additional studies of the type and extent of algae impairment in Calleguas Creek and Mugu Lagoon.	July 16, 2004
7. 8. 9.	Complete Special Studies for minor sources, greenhouses, and groundwater loadings. Completion of ammonia Water Effect Ratio (WER) studies. Complete planning and preparation for construction of TMDL remedies to reduce non-point source nitrogen loads.	July 16, 2006
10.	Interim Limits for NO_3-N + NO_2-N expire and WLAs for NO_3-N, NO_2-N, NO_3-N + NO_2-N apply to POTWs.	July 16, 2007
11.	Complete Special Studies for algae impairments of Calleguas Creek, its tributaries and Mugu Lagoon.	July 16, 2008
12.	Regional Board consideration of revised water quality objectives for nitrogen compounds based on monitoring data, special studies, and ammonia WER, if appropriate.	July 16, 2009
13.	Final achievement of ammonia and oxidized nitrogen standards.	July 16, 2010

* The CCWMP Subcommittee has offered to complete tasks 4 through 9 and 11. In the event the CCWMP Subcommittee fails to timely complete these tasks, the Regional Board will consider whether to amend this Implementation Plan to assign tasks to responsible dischargers in the regulatory approach. The Regional Board also reserves its right to take any other appropriate actions including, but not limited to, exercising its authorities under Water Code section 13267.

7-8 Los Angeles River Nitrogen Compounds and Related Effects TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on July 10, 2003.

This TMDL was approved by:
The State Water Resources Control Board on November 19, 2003.
The Office of Administrative Law on February 27, 2004.
The U.S. Environmental Protection Agency on March 18, 2004.

This TMDL was amended and adopted by:
The Regional Water Quality Control Board on December 4, 2003.

This amended TMDL was approved by:
The State Water Resources Control Board on March 24, 2004.
The Office of Administrative Law on September 27, 2004.
[U.S. Environmental Protection Agency approval not required for amendment to Implementation Plan]

The effective date of this TMDL is: September 27, 2004.

Table 7-8.1. Los Angeles River Nitrogen Compounds and Related Effects TMDL: Elements

Element	Los Angeles River Nitrogen Compounds and Related Effects TMDL
Problem Statement	Reaches of the Los Angeles River and its tributaries were listed as impaired for nitrogen compounds (ammonia, nitrate, and nitrate) and related effects such as algae, pH, odor, and scum on the 2002 303(d) list. These reaches were listed because numeric and narrative water quality objectives for nitrogen compounds and related effects were exceeded, thereby impairing warm, freshwater, and wildlife habitats, and recreation beneficial uses.

Element	Los Angeles River Nitrogen Compounds and Related Effects TMDL
Numeric Target *(Interpretation of the numeric water quality objective, used to calculate the load allocations)*	Numeric targets for this TMDL are listed as follows: a) Total ammonia as nitrogen (NH_3-N) Numeric targets are dependent on temperature and pH of receiving water. Based on the last three years of temperature and pH data, the ammonia numeric targets for receiving waters correspondent to major discharge points are provided below: ***Receiving water correspondent to major discharge point*** ***One-hour average*** ***Thirty-day average*** Los Angeles River Reach 5 (within Sepulveda Basin) - Donald C. Tillman WRP 4.7 mg/L 1.6 mg/L Los Angeles River Reach 3 (Riverside Dr. to Figueroa St.) - Los Angeles/ Glendale WRP 8.7 mg/L 2.4 mg/L Burbank Western Channel - Burbank WRP 10.1 mg/L 2.3 mg/L b) Nitrate-nitrogen and nitrite-nitrogen ***Constituent*** ***Thirty-day average*** Nitrate-nitrogen (NO_3-N) 8 mg/L Nitrite-nitrogen (NO_2-N) 1 mg/L Nitrate-nitrogen plus nitrite-nitrogen (NO_3-N + NO_2-N) 8 mg/L Numeric targets to address narrative objectives required to protect warm freshwater and wildlife habitats are intended to implement the narrative objectives and may be revised based on the results of monitoring and studies conducted pursuant to the implementation plan.
Source Analysis	The principal source of nitrogen compounds to the Los Angeles River is discharges from the Donald C. Tillman Water Reclamation Plant (WRP), the Los Angeles-Glendale WRP, and the Burbank WRP. During dry weather period, the major POTWs contribute 84.1% of the total dry weather nitrogen load. Urban runoff, stormwater, and groundwater discharge may also contribute nitrate loads. Further evaluation of these sources is set forth in the Implementation Plan.

Element	Los Angeles River Nitrogen Compounds and Related Effects TMDL
Linkage Analysis	Linkage between nutrient sources and the instream water quality was established through hydrodynamic and water quality models. The Environmental Fluid Dynamics Code 1-D was used to model the hydrodynamic characteristics of the Los Angeles River and the Water Quality Analysis Simulation Program was used to model water quality. Additional studies were conducted to develop the residence time and determine the nutrient uptake rates by algae.
Wasteload Allocations (for point sources)	1. Major point sources: a) Total ammonia as nitrogen (NH_3-N): ***POTW*** ***One-hour average WLA*** ***Thirty-day average WLA*** Donald C. Tillman WRP 4.2 mg/L 1.4 mg/L Los Angeles-Glendale WRP 7.8 mg/L 2.2 mg/L Burbank WRP 9.1 mg/L 2.1 mg/L b) Nitrate-nitrogen (NO_3-N), nitrite-nitrogen (NO_2-N), and Nitrate-nitrogen plus nitrite-nitrogen (NO_3-N + NO_2-N): ***Constituent*** ***Thirty-day average WLA**** NO_3-N 7.2 mg/L NO_2-N 0.9 mg/L NO_3-N + NO_2-N 7.2 mg/L *Receiving water monitoring is required on a weekly basis to ensure compliance with the water quality objective.

Element	Los Angeles River Nitrogen Compounds and Related Effects TMDL
Waste Load Allocations (for point sources) (continued)	2. Minor point sources: Waste loads are allocated to minor point sources enrolled under NPDES or WDR permits including but not limited to Tapia WRP, Whittier Narrows WRP, Los Angeles Zoo WRP, industrial and construction stormwater, and municipal storm water and urban runoff from municipal separate storm sewer systems (MS4s): a) Ammonia wasteload allocations (WLAs) for minor point sources are listed below by receiving waters: ***Water Body*** ***One-hour average WLA*** ***Thirty-day average WLA*** Los Angeles River above Los Angeles-Glendale WRP (LAG) 4.7 mg/L 1.6 mg/L Los Angeles River below LAG 8.7 mg/L 2.4 mg/L Los AngelesTributaries 10.1 mg/L 2.3 mg/L b) WLAs for nitrate-nitrogen, nitrite-nitrogen, and nitrate-nitrogen plus nitrite-nitrogen for minor discharges are listed below: ***Constituent*** ***Thirty-day average WLA*** NO_3-N 8.0 mg/L NO_2-N 1.0 mg/L NO_3-N + NO_2-N 8.0 mg/L
Load Allocation *(for nonpoint sources)*	The Source Assessment indicates that nitrogen loads from nonpoint sources are negligible compared to loading from point sources and their contribution is adequately accounted for in the margin of safety. Consequently, load allocations will not be developed unless it is determined they are necessary after load reductions are effected through implementation of the wasteload allocations. Additional monitoring is included in the implementation plan to verify the nitrogen nonpoint source contributions.

Element	Los Angeles River Nitrogen Compounds and Related Effects TMDL
Implementation	1. Refer to Table 7-8.2 2. The Implementation Plan includes upgrades to the WRPs discharging to Los Angeles River for removal of ammonia, nitrate, and nitrite. At the discretion of the Regional Board, the following interim limits for ammonia, and nitrate plus nitrite will be allowed for major point sources for a period not to exceed 3.5 years from March 23, 2004. Effluent limits for the individual compounds NO3-N, and NO2-N are not required during the interim period. ***Interim Limits for NH3-N and NO3-N + NO2-N*** ***Total ammonia as Nitrogen*** ***POTW*** ***Daily Maximum**** ***Monthly Average**** Donald C. Tillman WRP 24.7 mg/L 20.5 mg/L Los Angeles-Glendale WRP 24.2 mg/L 18.8 mg/L Burbank WRP 24.1 mg/L 22.7 mg/L *The monthly average and daily maximum interim limits are based on the 95th and 99th percentiles of effluent performance data reported by dischargers. ***Nitrite-nitrogen + Nitrate-nitrogen*** ***Monthly Average*** 8.0 mg/L The Implementation Plan also includes additional studies to evaluate the effectiveness of nitrogen reductions on related effects such as algae growth, odors and scum. Ammonia and nitrate reductions will be regulated through effluent limits prescribed in NPDES permits.
Margin of Safety	An explicit margin of safety of 10% of the ammonia, nitrate, nitrite and nitrate + nitrite loads is allocated to address uncertainty in the sources and linkage analyses. In addition, an implicit margin of safety is incorporated through conservative model assumptions and statistical analysis.
Seasonal Variations and Critical Conditions	The critical condition identified for this TMDL is based on low flow condition. The driest six months of the year are the most critical condition for nutrients because less surface flow is available to dilute effluent discharge.

Table 7-8.2. Los Angeles River Nitrogen Compounds and Related Effects TMDL: Implementation Schedule

Implementation Tasks	Completion Date
1. Apply interim limits for NH_3-N and NO_3-N + NO_2-N to major Publicly Owned Treatment Works (POTWs). 2. Apply Waste Load Allocations (WLAs) to minor point source dischargers and MS4 permittees. 3. Begin to include monitoring for nitrogen compounds in NPDES permits for minor NPDES dischargers above 0.1 mgd as permits are renewed.	03/23/2004
4. Submittal of a Monitoring Work Plan by MS4 permittees to estimate nitrogen loadings associated with runoff loads from the storm drain system for approval by the Executive Officer of the Regional Board. The Work Plan will include monitoring for ammonia, nitrate, and nitrite. The Work Plan may include a phased approach wherein the first phase is based on monitoring from the existing mass emission station in the Los Angeles River. The results will be used to calibrate the linkage analysis. The Work Plan will also contain protocol and a schedule for implementing additional monitoring if necessary. The Work Plan will also propose triggers for conducting source identification and implementing BMPs, if necessary. Source identification and BMPs will be in accordance with the requirements of MS4 permits.	03/23/2005
5. Submittal of a Workplan by major NPDES permittees to evaluate the effectiveness of nitrogen reductions on removing impairments from algae odors, scums, and pH for approval by the Executive Officer of the Regional Board. The monitoring program will include instream monitoring of algae, foam, scum, pH, and odors in the Los Angeles River. In addition, groundwater discharge to Los Angeles River will also be analyzed for nutrients to determine the magnitude of these loadings and the need for load allocations. The Workplan will include protocol and schedule for refining numeric targets for nitrogen compounds and related effects such as excessive algae in the Los Angeles River. The Workplan will also contain protocol and a schedule for identification of limiting nutrients.	03/23/2005
6. Submission of a special studies Workplan by the City of Los Angeles to evaluate site-specific objectives for ammonia, nitrate, and nitrite, including the following issues: pH and temperature distribution downstream of the D.C. Tillman WRP to determine the point of compliance for ammonia, establishment of ammonia WLAs based on seasonality.	03/23/2005
7. Submission of all results from Task 6, and results from water effects ratio study for ammonia which has been performed by the City of Los Angeles.	No later than 09/23/2006

Implementation Tasks	Completion Date
8. Regional Board considers site-specific objectives for ammonia, nitrate, nitrite and nitrite + nitrate and revision of wasteload allocations based on results from Tasks 6 and 7. The Regional Board will consider factors such as seasonal variation, averaging periods, and water effects ratios when determining whether it is appropriate to adopt site-specific objectives for ammonia. If a site specific objective is adopted by the Regional Board, and approved by relevant approving agencies, this TMDL will need to be revised, readopted, and reapproved to reflect the revised water quality objectives.	No later than 09/23/2007
9. Interim limits for ammonia and nitrate + nitrite expire and WLAs for ammonia, nitrate, nitrite, and nitrate + nitrite apply to major point sources.	09/23/2007
10. Complete evaluation of monitoring for nutrient effects and determine need for revising wasteload allocations, including but not limited to establishing new WLAs for other nutrient and related effects such as algal growth	03/23/2008
11. Regional Board considers results of Tasks 5 and 10 and revises or establishes WLAs as appropriate.	03/23/2009

7-9 Santa Clara River Nitrogen Compounds TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on August 7, 2003.

This TMDL was approved by:

The State Water Resources Control Board on November 19, 2003.
The Office of Administrative Law on February 27, 2004.
The U.S. Environmental Protection Agency on March 18, 2004.

The effective date of this TMDL is: March 23, 2004.

The following table describes the key elements of this TMDL.

Table 7-9.1. Santa Clara River Nitrogen Compounds TMDL: Elements

Element	Santa Clara River Nitrogen Compounds TMDL
Problem Statement	Discharge of wastes containing nitrite, nitrate and ammonia to the Santa Clara River causes exceedances of water quality objectives for ammonia, nitrate and nitrite established in the Basin Plan. The Santa Clara River is listed as impaired by ammonia in Reach 3 and by nitrate plus nitrite in Reach 7 on the 2002 303(d) list of impaired water bodies. Reach 8 of the Santa Clara River is included on the State Monitoring List for organic enrichment/dissolved oxygen, which may be caused by excessive nitrogen. Nitrate and nitrate are biostimulatory substances that can cause eutrophic effects such as low dissolved oxygen and algae growth. Excessive ammonia can cause aquatic life toxicity.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the load allocations)	• Total ammonia as nitrogen (NH_3-N) Reach 8: One-hour Average 14.8 mg/L; Thirty-day Average 3.2 mg/L Reach 7 above Valencia: 4.8; 2.0 Reach 7 below Valencia: 5.5; 2.0 Reach 7 at County Line: 3.4; 1.2 Reach 3 above Santa Paula: 2.4; 1.9 Reach 3 at Santa Paula: 2.4; 1.9 Reach 3 below Santa Paula: 2.2; 1.7 • Nitrate plus Nitrite as Nitrogen (NO_3-N + NO_2-N) Reach 3: Thirty-day Average 4.5 mg/L Reach 7: 4.5 Reach 8: 9.0 Narrative objectives for biostimulatory substances and toxicity are based on the Basin Plan. The TMDL analysis indicates that the numeric targets will implement the narrative objectives. The Implementation Plan includes monitoring and special studies to verify that the TMDL will implement the narrative objectives.

Element	Santa Clara River Nitrogen Compounds TMDL
Source Analysis	The principal source of ammonia, nitrite, and nitrate to the Santa Clara River is discharges from the Saugus and Valencia Water Reclamation Plants (WRPs) and the Fillmore and Santa Paula Publicly Owned Treatment Works (POTWs). Agricultural runoff, stormwater discharge and groundwater discharge may also contribute nitrate loads. Further evaluation of these sources is set forth in the Implementation Plan.
Linkage Analysis	Linkage between nitrogen sources and the in-stream water quality was established through hydrodynamic and water quality models. The Watershed Analysis Risk Management Framework was used to model the hydrodynamic characteristics and water quality of the Santa Clara River. The analysis demonstrated that major point sources (WRPs and POTWs) were the primary contributors to in-stream ammonia and nitrate plus nitrite loads. Nonpoint sources and minor point sources contributed a much smaller fraction of these loads.
Wasteload Allocations (for point sources)	Major point sources: Concentration-based wasteloads are allocated to major point sources of ammonia and nitrate+nitrite in Reach 3, which include the Fillmore and Santa Paula POTWs; concentration-based wasteloads are allocated to major point sources of ammonia and nitrite+nitrate in Reaches 7 and 8, which include the Valencia and Saugus WRPs. • Total ammonia as nitrogen (NH_3-N) in mg/L: POTW — One-hour average — Thirty-day average Saugus WRP — 5.6 — 2.0 Valencia WRP — 5.2 — 1.75 Fillmore POTW — 4.2 — 2.0 Santa Paula POTW — 4.2 — 2.0 • Nitrate-nitrogen (NO_3-N), Nitrite-nitrogen (NO_2-N), and Nitrate plus Nitrite as nitrogen (NO2-N+NO3-N) in mg/L: Thirty-day average WLA* POTW — NO_2-N — NO_3-N — NO2-N+NO3-N Saugus WRP — 0.9 — 7.1 — 7.1 Valencia WRP — 0.9 — 6.8 — 6.8 Fillmore POTW — 0.9 — 8.0 — 8.0 Santa Paula POTW — 0.9 — 8.0 — 8.0 *Receiving water monitoring is required on a weekly basis to ensure compliance with the water quality objectives for nitrite, nitrate, nitrite + nitrate, and dissolved oxygen.

Element	Santa Clara River Nitrogen Compounds TMDL
Wasteload Allocations (for point sources) (continued)	Minor Point Sources: Concentration-based wasteloads are allocated to minor discharges enrolled under NPDES or WDR permits. The allocations for minor point sources are based on the water quality objectives for ammonia, nitrite, nitrate and nitrite plus nitrate. For minor dischargers discharging into Reach 7, the thirty-day average WLA for ammonia as nitrogen is 1.75 mg/L, the one-hour WLA for ammonia as nitrogen is 5.2 mg/L, and the thirty-day average WLA for nitrate plus nitrite as nitrogen is 6.8 mg/L. For minor dischargers discharging into Reach 3, the thirty-day average WLA for ammonia as nitrogen is 2.0 mg/L and the one hour average WLA for ammonia as nitrogen is 4.2 mg/L, and the thirty-day average WLA for nitrate plus nitrite as nitrogen is 8.1 mg/L. MS4 and Stormwater Sources: Concentration-based wasteloads are allocated to municipal, industrial and construction stormwater sources regulated under NPDES permits. For stormwater permittees discharging into Reach 7, the thirty-day WLA for ammonia as nitrogen is 1.75 mg/L and the one-hour WLA for ammonia as nitrogen is 5.2 mg/L; the thirty-day average WLA for nitrate plus nitrite as nitrogen is 6.8 mg/L. For stormwater permittees discharging into Reach 3, the thirty-day WLA for ammonia as nitrogen is 2.0 mg/L and the one-hour WLA for ammonia as nitrogen is 4.2 mg/L; the thirty-day average WLA for nitrate plus nitrite nitrogen is 8.1 mg/L.
Load Allocation (for nonpoint sources)	Concentration-based loads for nitrogen compounds are allocated for nonpoint sources. For nonpoint sources discharging to Reach 7, the combined ammonia, nitrate, nitrite (NH_3-N + NO_2-N + NO_3-N) load as nitrogen is 8.5 mg/L. For non-point sources discharging into other reaches of the Santa Clara River, Mint Canyon Reach 1, Wheeler Canyon/Todd Barranca, and Brown Barranca/Long Canyon, the combined ammonia, nitrate, nitrite (NH_3-N + NO_2-N + NO_3-N) loads as nitrogen is 10 mg/L. Monitoring is established in the TMDL Implementation Plan to verify the nitrogen nonpoint source contributions from agricultural and urban runoff and groundwater discharge.

<table>
<tr><th>Element</th><th>Santa Clara River Nitrogen Compounds TMDL</th></tr>
<tr><td>Implementation</td><td>

Ammonia, nitrite, and nitrate reductions will be regulated through effluent limits prescribed in POTW and minor point source NPDES Permits, Best Management Practices required in NPDES MS4 Permits, and SWRCB Management Measures for non point source discharges.
At the Regional Board's discretion, the following interim effluent limits will be allowed for a period as short as possible, but not to exceed eight years from the effective date of the TMDL:

<u>Interim Limits in mg/L for Nitrite, Nitrate, and Nitrite plus Nitrate as nitrogen</u>
Thirty-day Average Interim Limits
<table>
<tr><th>POTW</th><th>NO_2-N</th><th>NO_3-N</th><th>NO_2-N + NO_3-N</th></tr>
<tr><td>Saugus WRP</td><td>1</td><td>10</td><td>10</td></tr>
<tr><td>Valencia WRP</td><td>1</td><td>10</td><td>10</td></tr>
</table>
<u>Interim Limits in mg/L for combined Ammonia, Nitrate, and Nitrite as nitrogen</u>
<table>
<tr><th>POTW</th><th>Thirty-day Average</th><th>Daily Maximum</th></tr>
<tr><td>Fillmore WRP</td><td>32.8</td><td>38.9</td></tr>
<tr><td>Santa Paula WRP</td><td>41.8</td><td>49.0</td></tr>
</table>
The Implementation Plan also includes special studies and monitoring for ammonia, nitrite, and nitrate to evaluate the effectiveness of nitrogen reductions.

The Implementation Plan also includes special studies to address issues regarding water quality standards and site-specific objectives and a reconsideration of waste load allocations based on monitoring data and special studies.
</td></tr>
<tr><td>Margin of Safety</td><td>An explicit margin of safety of 10 percent of the nitrogen loads is allocated to address uncertainty in the source and linkage analyses. In addition, an implicit margin of safety is incorporated through conservative model assumptions and statistical analysis.</td></tr>
<tr><td>Future Growth</td><td>Urban growth in the upper watershed is predicted to require the expansion of the Valencia Water Reclamation Plan, construction of an additional water reclamation plant, and increased use of reclaimed water. Wasteload and load allocations will be developed for these new sources as required to implement appropriate water quality objectives for ammonia, nitrite, and nitrate.</td></tr>
<tr><td>Seasonal Variations and Critical Conditions</td><td>The critical condition identified for this TMDL is based on the low flow condition defined as the 7Q10. In addition, the driest six months of the year are identified as a more critical condition for nitrogen compounds because less surface flow is available to dilute effluent discharge. The model result also indicates a critical condition during the first major storm event after a dry period. The implementation plan includes monitoring to verify this potential critical condition.</td></tr>
</table>

Table 7-9.2. Santa Clara River Nitrogen Compounds TMDL: Implementation Schedule

Implementation Tasks, Milestones and Provisions	Responsible Party	Completion Date
1. Apply interim limits for ammonia, nitrite, and nitrate to Fillmore and Santa Paula POTWs. 2. Apply interim limits for Nitrate to Saugus and Valencia WRPs. 3. Apply WLAs to minor point source dischargers and MS4 permittees. 4. Include monitoring for nitrogen compounds in NPDES and WDR permits for minor dischargers as permits are renewed.	Fillmore and Santa Paula POTWs; NPDES and WDR permittees	Effective Date of TMDL
5. Submittal of a Work Plan by Los Angeles County and Ventura County MS4 permittees to estimate ammonia and nitrogen loadings associated with runoff loads from the storm drain system for approval by the Executive Officer of the Regional Board. The Work Plan will include monitoring for ammonia, nitrate, and nitrite. The Work Plan may include a phased approach wherein the first phase is based on monitoring from the existing mass emission station in the Santa Clara River. If the monitoring studies reflect a higher average concentration in stormwater than originally considered, then the linkage analysis would be refined to consider the increased loading. The Work Plan will also contain protocol and a schedule for implementing additional monitoring if necessary. The Work Plan will also propose triggers for conducting source identification and implementing BMPs, if necessary. Source identification and BMPs will be in accordance with the requirements of MS4 permits.	Los Angeles and Ventura Counties MS4 Permittees	1 year after the Effective Date of TMDL
6. Submittal of Work Plan by major NPDES permittees to asses and monitor the surface water quality, including, without limitation, monthly measurement of dissolved oxygen on an hourly basis, pH and instream denitrification processes, and groundwater where appropriate, for aquatic life impacts, macroinvertebrate diversity, algal mass, and nutrient species in the Santa Clara River for approval by the Regional Board's Executive Officer. The Work Plan will include evaluation of the effectiveness of the POTW in meeting WLAs. Submittal of a work plan that demonstrates compliance with final wasteload allocations or demonstrates a schedule for compliance with final wasteload allocations is as short as possible.	Cities of Fillmore and Santa Paula, and County Sanitation Districts of Los Angeles County	1 year after Effective Date of TMDL

Implementation Tasks, Milestones and Provisions	Responsible Party	Completion Date
7. Submittal of special studies Work Plan by County Sanitation Districts of Los Angeles County to evaluate site-specific objectives (SSOs) for nitrate for approval by the Regional Board's Executive Officer.	County Sanitation Districts of Los Angeles County	1 year after Effective Date of TMDL
8. Submittal of results from water effects ratio study for ammonia by County Sanitation Districts of Los Angeles County.	County Sanitation Districts of Los Angeles County	Effective Date of TMDL
9. Evaluation of feasibility of including stakeholders in the Upper Santa Clara River watershed in the Regional Board Septic Tank task force.	Regional Board	3.5 year after Effective Date of TMDL
10. Regional Board considers a Basin Plan Amendment for site-specific objectives for ammonia, nitrate and nitrite plus nitrate based on results of Tasks 7 and 8.	Regional Board	1 year after Effective Date of TMDL for ammonia; 4 years after the Effective Date of the TMDL for nitrate and nitrite plus nitrate
11. Based on the results Task 5-10 and NPDES Monitoring, complete implementation of advanced treatment or additional treatment modifications to achieve WLAs for POTWs, if necessary in as short a period of time as possible, as determined during NPDES permit issuance or modification, but not later than eight years after the effective date of the TMDL; if advanced treatment is not required, interim limits will expire in as short a period of time as possible, as determined during NPDES permit reissuance or modification, no later than five years after the effective date of the TMDL. The wasteload allocation compliance date will be synchronized with the expiration date of interim limits specified in Task 13.	POTW Permittees	8 years after Effective Date of TMDL

Implementation Tasks, Milestones and Provisions	Responsible Party	Completion Date
12. Interim limits for ammonia and nitrate expire and WLAs apply to WRPs and POTWs. The Regional Board will consider extending the duration of the remaining schedule and re-evaluating interim limits if WLAs for WRPs and POTWs are reduced after SSO considerations.	POTW Permittees; Regional Board	Based on results of Tasks 6 and 10: if additional modifications or advanced nitrification/denitrification facilities are required, interim limits will expire in as short a period of time as possible, as determined during NPDES permit issuance or modification interim limits, but not later than eight years after the effective date of the TMDL; if advanced treatment is not required, interim limits will expire in as short a period of time as possible, as determined during NPDES permit issuance or modification, but not later than 5 years after the Effective Date of the TMDL.
13. Annual progress reports on the Implementation Plan shall be provided to the Regional Board by the responsible parties or their representatives.	•NPDES permitees, •Board staff •MS-4 permittees. •Newhall Land and Farming •United Water Conservation District •Friends of the Santa Clara River • Ventura Coast Keeper and Heal the Bay.	Annually after Effective Date of TMDL.

7-10 Malibu Creek and Lagoon Bacteria TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on December 13, 2004.

This TMDL was approved by:
The State Water Resources Control Board on September 22, 2005.
The Office of Administrative Law on December 1, 2005.
The U.S. Environmental Protection Agency on January 10, 2006.

The effective date of this TMDL is: January 24, 2006.

The following table includes the elements of this TMDL.

Table 7-10.1. Malibu Creek and Lagoon Bacteria TMDL: Elements

TMDL Element	Key Findings and Regulatory Provisions
Problem Statement	Elevated bacterial indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use at Malibu Creek, Lagoon, and adjacent beach. Swimming in waters with elevated bacterial indicator densities has long been associated with adverse health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine and fresh water to protect the water contact recreation use. These targets are the most appropriate indicators of public health risk in recreational waters. These bacteriological objectives are set forth in Chapter 3 of the Basin Plan.[1] The objectives are based on four bacterial indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are: In Marine Waters Designated for Water Contact Recreation (REC-1) <u>1. Geometric Mean Limits</u> a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. <u>2. Single Sample Limits</u> a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

TMDL Element	Key Findings and Regulatory Provisions
Numeric Target (continued) (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	In Fresh Waters Designated for Water Contact Recreation (REC-1) 1. Geometric Mean Limits a. E. coli density shall not exceed 126/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. 2. Single Sample Limits a. E. coli density shall not exceed 235/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. These objectives are generally based on an acceptable health risk for marine recreational waters of 19 illnesses per 1,000 exposed individuals as set by the US EPA (US EPA, 1986). The targets apply throughout the year. The final compliance point for the targets is the point at which the effluent from a discharge initially mixes with the receiving water. Implementation of the above bacteria objectives and the associated TMDL numeric targets is achieved using a 'reference system/anti-degradation approach' rather than the alternative 'natural sources exclusion approach' or strict application of the single sample objectives. As required by the CWA and Porter-Cologne Water Quality Control Act, Basin Plans include beneficial uses of waters, water quality objectives to protect those uses, an anti-degradation policy, collectively referred to as water quality standards, and other plans and policies necessary to implement water quality standards. The 'reference system/anti-degradation approach' means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within Santa Monica Bay, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the single sample objectives and that it is not the intent of the Regional Board to require treatment or diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas. The geometric mean targets may not be exceeded at any time. The rolling 30-day geometric means will be calculated on each day. If weekly sampling is conducted, the weekly sample result will be assigned to the remaining days of the week in order to calculate the daily rolling 30-day geometric mean. For the single sample targets, each existing monitoring site is assigned an allowable number of exceedance days for three time periods (1) summer dry-weather (April 1 to October 31), (2) winter dry-weather (November 1 to March 31), and (3) wet-weather (defined as days with 0.1 inch of rain or greater and the three days following the rain event.)
Source Analysis	Fecal coliform bacteria may be introduced from a variety of sources including storm water runoff, dry-weather runoff, onsite wastewater treatment systems, and animal wastes. An inventory of possible point and nonpoint sources of fecal coliform bacteria to the waterbody was compiled, and both simple methods and computer modeling were used to estimate bacteria loads for those sources. Source inventories were used in the analysis to identify all potential sources within the Malibu Creek watershed, modeling was used to identify the potential delivery of pathogens into the creeks and the lagoon.

TMDL Element	Key Findings and Regulatory Provisions
Loading Capacity	The loading capacity is defined in terms of bacterial indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above. As the numeric targets must be met at the point where the effluent from storm drains or other discharge initially mixes with the receiving water throughout the day, no degradation or dilution allowance is provided.
Waste Load Allocations (for point sources)	Waste Load Allocations (WLAs) are expressed as the number of daily or weekly sample days that may exceed the single sample limits or 30-day geometric mean limits as identified under "Numeric Target." WLAs are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. Zero days of exceedance are allowed for the 30-day geometric mean limits. The allowable days of exceedance for the single sample limits differ depending on season, dry weather or wet-weather, and by sampling locations as described in Table 7-10.2. The allowable number of exceedance days for a monitoring site for each time period is based on the lesser of two criteria (1) exceedance days in the designated reference system and (2) exceedance days based on historical bacteriological data at the monitoring site. This ensures that bacteriological water quality is at least as good as that of a largely undeveloped system and that there is no degradation of existing water quality. However, existing data indicates that the number of exceedance days for all locations assessed in this TMDL were greater than the allowable exceedance days (i.e., number of exceedance days greater than the number at the reference sites). For each monitoring site, allowable exceedance days are set on an annual basis as well as for three time periods. These three periods are: 1. summer dry-weather (April 1 to October 31) 2. winter dry-weather (November 1 to March 31) 3. wet-weather (defined as days of 0.1 inch of rain or more plus three days following the rain event). The responsible jurisdictions and responsible agencies are the County of Los Angeles, County of Ventura, the cities of Malibu, Calabasas, Agoura Hills, Hidden Hills, Simi Valley, Westlake Village, and Thousand Oaks; Caltrans, and the California Department of Parks and Recreation.The responsible jurisdictions and responsible agencies include the permittees and co-permittees of the municipal storm water (MS4) permits for Los Angeles County and Ventura County, and Caltrans. The storm water permittees are individually responsible for the discharges from their municipal separate storm sewer systems to Malibu Creek, Malibu Lagoon or tributaries thereto.

TMDL Element	Key Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	The California Department of Parks and Recreation (State Parks), as the owner of the Malibu Lagoon and Malibu Creek State Park, is the responsible agency for these properties. However, since the reference watershed approach used in developing this TMDL is intended to make allowances for natural sources, State Parks is only responsible for: conducting a study of bacteria loadings from birds in the Malibu Lagoon, water quality monitoring, and compliance with load allocations applicable to anthropogenic sources on State Park property (e.g., onsite wastewater treatment systems). The Santa Monica Mountains Conservancy and the National Park Service as the owner of natural parkland also are responsible for water quality monitoring and compliance with load allocations resulting from anthropogenic sources (e.g.,onsite wastewater treatment systems) from lands under their jurisdiction. As discussed in "Source Analysis", discharges from Tapia WWRF and effluent irrigation, and general construction storm water permits are not expected to be a significant source of bacteria. Therefore, the WLAs for these discharges are zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean.
Load Allocations (for nonpoint sources)	Load Allocations (LA) are expressed as the number of daily or weekly sample days that may exceed the single sample limits or 30-day geometric mean limits as identified under "Numeric Target." LAs are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. Zero days of exceedance are allowed for the 30-day geometric mean limits. The allowable days of exceedance for the single sample limits differ depending on season, dry weather or wet-weather, and by sampling locations as described in Table 7-10.2. The allowable number of exceedance days for a monitoring site for each time period is based on the lesser of two criteria (1) exceedance days in the designated reference system and (2) exceedance days based on historical bacteriological data at the monitoring site. This ensures that bacteriological water quality is at least as good as that of a largely undeveloped system and that there is no degradation of existing water quality. However, existing data indicates that the number of exceedance days for all locations assessed in this TMDL were greater than the allowable exceedance days. For each monitoring site, allowable exceedance days are set on an annual basis as well as for three time periods. These three periods are: 1. summer dry-weather (April 1 to October 31) 2. winter dry-weather (November 1 to March 31) 3. wet-weather (defined as days of 0.1 inch of rain or more plus three days following the rain event). Onsite wastewater treatment systems were identified as the major nonpoint anthropogenic source within the watershed. The responsible agencies are the county and city health departments and/or other local agencies that oversee installation and operation of on-site wastewater treatment systems. However, owners of on-site wastewater treatment systems are responsible for actual discharges.

TMDL Element	Key Findings and Regulatory Provisions
Implementation	The regulatory mechanisms to implement the TMDL may include, but are not limited to the Los Angeles County Municipal Storm Water NPDES Permit (MS4), Ventura County Municipal Storm Water NPDES Permit, the Caltrans Storm Water Permit, waste discharge requirements (WDRs), MOUs, revised MOUs, general NPDES permits, general industrial storm water permits, general construction storm water permits, and the authority contained in Sections 13225, 13263 and 13267 of the Water Code. Each NPDES permit assigned a WLA shall be reopened or amended at reissuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. This TMDL will be implemented in three phases over a ten-year period as outlined in Table 7-10.3. Within three years of the effective date of the TMDL, compliance with the allowable number of summer dry-weather exceedance days and the rolling 30-day geometric mean targets must be achieved. In response to a written request from the responsible jurisdiction or responsible agency subject to conditions described in Table 7-10.3, the Executive Officer of the Regional Board may extend the compliance date for the summer dry-weather allocations from 3 to up to six years from the effective date of this TMDL Within six years of the effective date of the TMDL, compliance with the allowable number of winter dry-weather exceedance days and the rolling 30-day geometric mean targets must be achieved.Within ten years of the effective date of the TMDL, compliance with the allowable number of wet-weather exceedance days and rolling 30-day geometric mean targets must be achieved. To be consistent with the Santa Monica Bay (SMB) Beaches TMDLs, the Regional Board intends to reconsider this TMDL in coordination with the reconsideration of the SMB Beaches TMDLs. The SMB Beaches TMDLs are scheduled to be reviewed in July 2007 (four years from the effective date of the SMB Beaches TMDLs). The review will include a possible revision to the allowable winter dry-weather and wet-weather exceedance days based on additional data on bacterial indicator densities in the wave wash; to re-evaluate the reference system selected to set allowable exceedance levels; and to re-evaluate the reference year used in the calculation of allowable exceedance days. In addition, the method for applying the 30-day geometric mean limit also will be reviewed. The Malibu Creek Bacteria TMDL is scheduled to be reconsidered in three years from the effective date, which is expected to approximately coincide with the reassessment required under the SMB Beaches TMDLs.
Margin of Safety	A margin of safety has been implicitly included through the following conservative assumptions. • The watershed loadings were based on the 90th percentile year for rain (1993) based on the number of wet weather days. This should provide conservatively high runoff from different land uses for sources of storm water loads • The watershed loadings were also based on a very dry rain year (1994). This ensures compliance with the numeric target during low flows when septic systems and dry urban runoff loads are the major bacterial sources.

TMDL Element	Key Findings and Regulatory Provisions
Margin of Safety (continued)	• The TMDL was based on meeting the fecal 30-day geometric mean target of 200 MPN/ 100 ml, which for these watersheds was estimated to be more stringent level than the allowable exceedance of the single sample standard. This approach also provides assurance that the E. coli single sample standard will not be exceed. • The load reductions established in this TMDL were based on reduction required during the two different critical year conditions. A wet year when storm loads are high, and a more typical dry year when base flows and assimilative capacity is low. This adds a margin of safety for more typical years. In addition, an explicit margin of safety has been incorporated, as the load allocations will allow exceedances of the single sample targets no more than 5% of the time on an annual basis, based on the cumulative allocations proposed for dry and wet weather. Currently, the Regional Board concludes that there is water quality impairment if more than 10% of samples at a site exceed the single sample bacteria objectives annually.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for three time periods (summer dry-weather, winter-dry weather, and wet-weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators. To establish the critical condition for the wet days, we used rain data from 1993. Based on data from the Regional Board's Santa Monica Bay TMDL this represents the 90th percentile rain year based on rain data from 1947 to 2000. To further evaluate the critical conditions, we modeled a representative dry year. The dry-year critical condition was based on 1994, which was the 50th percentile year in terms of dry weather days for the period of 1947-2000.
Compliance Monitoring	Responsible jurisdictions and agencies shall submit a compliance monitoring plan to the Executive Officer of the Regional Board for approval. The compliance monitoring plan shall specify sampling frequency (daily or weekly) and sampling locations and that will serve as compliance points. This compliance monitoring program is to determine the effectiveness of the TMDL and not to determine compliance with individual load or wasteload allocations for purposes of enforcement. If the number of exceedance days is greater than the allowable number of exceedance days the water body segment shall be considered out-of-compliance with the TMDL. Responsible jurisdictions or agencies shall not be required to initiate an investigation detailed in the next paragraph if a demonstration is made that bacterial sources originating within the jurisdiction of the responsible agency have not caused or contributed to the exceedance. If a single sample shows the discharge or contributing area to be out of compliance, the Regional Board may require, through permit requirements or the authority contained in Water Code section 13267, daily sampling at the downstream location (if it is not already) until all single sample events meet bacteria water quality objectives. Furthermore, if a creek location is out of compliance as determined in the previous paragraph, the Regional Board shall require responsible agencies to initiate an investigation, which at a minimum shall include daily sampling in the target receiving waterbody reach or at the existing monitoring location until all single sample events meet bacteria water quality objectives.

TMDL Element	Key Findings and Regulatory Provisions
Compliance Monitoring (continued)	The County of Los Angeles, County of Ventura, and municipalities within the Malibu Creek watershed, Caltrans, and the California Department of Parks and Recreation are strongly encouraged to pool efforts and coordinate with other appropriate monitoring agencies in order to meet the challenges posed by this TMDL by developing cooperative compliance monitoring programs.

Note: The complete staff report for the TMDL is available for review upon request.

[1] The bacteriological objectives were revised by a Basin Plan amendment adopted by the Regional Board on October 25, 2001, and subsequently approved by the State Water Resources Control Board, the Office of Administrative Law and finally by U.S. EPA on September 25, 2002.

Table 7-10.2. Malibu Creek and Lagoon Bacteria TMDL: Final Annual Allowable Exceedance Days for Single Sample Limits by Sampling Location

Compliance Deadline		3* years after effective date		6 years after effective date		10 years after effective date	
		Summer Dry Weather ^		Winter Dry Weather ^**		Wet Weather ^**	
		April 1 – October 31		November 1 - March 31		November 1 - October 31	
Station ID	Location Name	Daily sampling (No. days)	Weekly sampling (No. days)	Daily sampling (No. days)	Weekly sampling (No. days)	Daily sampling (No. days)	Weekly sampling (No. days)
LA RWQCB	Triunfo Creek	0	0	3	1	17	3
LA RWQCB	Lower Las Virgenes Creek	0	0	3	1	17	3
LA RWQCB	Lower Medea Creek	0	0	3	1	17	3
LVMWD (R-9)	Upper Malibu Creek, above Las Virgenes Creek	0	0	3	1	17	3
LVMWD (R-2)	Middle Malibu Creek, below Tapia discharge 001	0	0	3	1	17	3
LVMWD (R-3)	Lower Malibu Creek, 3 mi below Tapia	0	0	3	1	17	3
LVMWD (R-4)	Malibu Lagoon, above PCH	0	0	3	1	17	3
LVMWD (R-11)	Malibu Lagoon, below PCH	0	0	3	1	17	3
------	Other sampling stations as identified in the Compliance Monitoring Plan as approved by the Executive Officer including at least one sampling station in each subwatershed, and areas where frequent REC-1 use is known to occur.	0	0	3	1	17	3

Notes: The number of allowable exceedances is based on the lesser of (1) the reference system or (2) existing levels of exceedance based on historical monitoring data.

The allowable number of exceedance days during winter dry-weather is calculated based on the 10th percentile storm year in terms of dry days at the LAX meteorological station

The allowable number of exceedance days during wet-weather is calculated based on the 90th percentile storm year in terms of wet days at the LAX meteorological station.

^ A dry day is defined as a non-wet day. A wet day is defined as a day with a 0.1-inch or more of rain and the three days following the rain event.

* The compliance date may be extended by the Executive Officer to up to 6 years from the effective date.

* *A revision of the TMDL is scheduled for four years after the effective date of the Santa Monica Bay Beaches TMDLs in order to re-evaluate the allowable exceedance days during winter dry-weather and wet-weather based on additional monitoring data and the results of the study of relative loading from storm drains versus birds.

Table 7-10.3. Malibu Creek and Lagoon Bacteria TMDL: Significant Dates

Date	Action
120 days after the effective date of this TMDL	Responsible jurisdictions and responsible agencies must submit a comprehensive bacteria water quality monitoring plan for the Malibu Creek Watershed to the Executive Officer of the Regional Board. The plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. In developing the 13267 order, the EO will consider costs in relation to the need for data. With respect to benefits to be gained, the TMDL staff report demonstrates the significant impairment and bacteria loading. Further documenting success or failure in achieving waste load allocations will benefit the responsible agencies and all recreational water users. The purpose of the plan is to better characterize existing water quality as compared to water quality at the reference watershed,-and ultimately, to serve as a compliance monitoring plan. The plan must provide for analyses of all applicable bacteria indicators for which the Basin Plan has established objectives including E. coli. For fresh water and enterococcus for marine water. The plan must also include sampling locations that are specified in Table 7-10.2, at least one location in each subwatershed, and areas where frequent REC-1 use is known to occur. However, this is not to imply that a mixing zone has been applied; water quality objectives apply throughout the watershed—not just at the sampling locations.
1 year after effective date of this TMDL	1. Responsible jurisdictions and responsible agencies shall provide a written report to the Regional Board outlining how each intends to cooperatively achieve compliance with the TMDL. The report shall include implementation methods, an implementation schedule, and proposed milestones. Specifically, the plan must include a comprehensive description of all steps to be taken to meet the 3-year summer dry weather compliance schedule, including but not limited to a detailed timeline for all category of bacteria sources under their jurisdictions including but not limited to nuisance flows, urban stormwater, on-site wastewater treatment systems, runoff from homeless encampments, horse facilities, and agricultural runoff.

Date	Action
1 year after effective date of this TMDL (continued)	2. If the responsible jurisdiction or agency is requesting an extension of the summer dry-weather compliance schedule, the plan must include a description of all local ordinances necessary to implement the detailed workplan and assurances that such ordinances have been adopted before the request for an extension is granted. 3. Local agencies regulating on-site wastewater treatment systems shall provide a written report to the Regional Board's Executive Officer detailing the rationale and criteria used to identify high-risk areas where on-site systems have a potential to impact surface waters in the Malibu Creek watershed. Local agencies may use the approaches outlined below in (a) and (b), or an alternative approach as approved by the Executive Officer. (a) Responsible agencies may screen for high-risk areas by establishing a monitoring program to determine if discharges from OWTS have impacted or are impacting water quality in Malibu Creek and/or its tributaries. A surface water monitoring program demonstration must include monitoring locations upstream and downstream of the discharge, as well as a location at mid-stream (or at the approximate point of discharge to the surface water) of single or clustered OWTS. Surface water sampling frequency will be weekly for bacteria indicators and monthly for nutrients. A successful demonstration will show no statistically significant increase in bacteria levels in the downstream sampling location(s). (b) Responsible agencies may define the boundaries of high-risk or contributing areas or identify individual OWTS that are contributing to bacteria water quality impairments through groundwater monitoring or through hydrogeologic modeling as described below: (1) Groundwater monitoring must include monitoring in a well no greater than 50-feet hydraulically downgradient from the furthermost extent of the disposal area, or property line of the discharger, whichever is less. At a minimum, sampling frequency for

Date	Action
1 year after effective date of this TMDL (continued)	groundwater monitoring will be quarterly. The number, location and construction details of all monitoring wells are subject to approval of the Executive Officer. (2) Responsible agencies may use a risk assessment approach, which uses hydrogeologic modeling to define the boundaries of the high-risk and contributing areas. A workplan for the risk assessment study must be approved by the Executive Officer of the Regional Board. 4. OWTS located in high-risk areas are subject to system upgrades as necessary to demonstrate compliance with applicable effluent limits and/or receiving water objectives. 5. If a responsible jurisdiction or agency is requesting an extension to the wet-weather compliance schedule, the plan must include a description of the integrated water resources (IRP) approach to be implemented, identification of potential markets for water re-use, an estimate of the percentage of collected stormwater that can be re-used, identification of new local ordinances that will be required, a description of new infrastructure required, a list of potential adverse environmental impacts that may result from the IRP, and a workplan and schedule with significant milestones identified. Compliance with the wet-weather allocations shall be as soon as possible but under no circumstances shall it exceed 10 years for non-integrated approaches or extend beyond July 15, 2021 for an integrated approach. The Regional Board staff will bring to the Regional Board the aforementioned plans for consideration of extension of the wet-weather compliance date as soon as possible.
2 years after the effective date of this TMDL	The California Department of Parks and Recreation shall provide the Regional Board Executive Officer, a report quantifying the bacteria loading from birds to the Malibu Lagoon. The Regional Board's Executive Officer shall require the responsible jurisdictions and responsible agencies to provide the Regional Board with a reference watershed study. The study shall be designed to collect sufficient information to establish a defensible reference condition for the Malibu Creek and Lagoon watershed.

Date	Action
3 years after effective date of this TMDL** ** May be extended to up to 6 years from the effective date of this TMDL	Achieve compliance with the applicable Load Allocations and Waste Load Allocations, as expressed in terms of allowable days of exceedances of the single sample bacteria limits and the 30-day geometric mean limit during summer dry-weather (April 1 to October 31). In response to a written request from a responsible jurisdiction or responsible agency, the Executive Officer of the Regional Board may extend the compliance date for the summer dry-weather allocations from 3 years to up to 6 years from the effective date of this TMDL. The Executive Officer's decision to extend the summer dry-weather compliance date must be based on supporting documentation to justify the extension, including a detailed work plan, budget and contractual or other commitments by the responsible jurisdiction or responsible agency.
3 years after effective date of this TMDL	The Regional Board shall reconsider this TMDL to: (1) Consider a natural source exclusion for bacteria loadings from birds in the Malibu Lagoon if all anthropogenic sources to the Lagoon have been controlled. (2) Reassess the allowable winter dry-weather and wet-weather exceedances days based on additional data on bacterial indicator densities, and an evaluation of site-specific variability in exceedance levels to determine whether existing water quality is better than water quality at the reference watershed, (3) Reassess the allowable winter dry-weather and wet-weather exceedance days based on a re-evaluation of the selected reference watershed and consideration of other reference watersheds that may better represent reaches of the Malibu Creek and Lagoon. (4) Consider whether the allowable winter dry-weather and wet-weather exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s), (5) Re-evaluate the reference year used in the calculation of allowable exceedance days, and (6) Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision.
6 years after the effective date of this TMDL	Achieve compliance with the applicable Load Allocations and Waste Load Allocations, expressed as allowable exceedance days during winter dry weather (November 1-March 31) single sample limits and the rolling 30-day geometric mean limit.

Date	Action
10 years after the effective date of this TMDL ** May be extended up to July 15, 2021.	Achieve compliance with the wet-weather Load Allocations and Waste Load Allocations (expressed as allowable exceedance days for wet weather and compliance with the rolling 30-day geometric mean limit.) The Regional Board may extend the wet-weather compliance date up to July 15, 2021 at the Regional Board's discretion, by adopting a subsequent Basin Plan amendment that complies with applicable law.

7-11 Los Angeles Harbor Bacteria TMDL - Inner Cabrillo Beach and Main Ship Channel

This TMDL was adopted by:
The Regional Water Quality Control Board on July 1, 2004.

This TMDL was approved by:
The State Water Resources Control Board on October 21, 2004.
The Office of Administrative Law on January 5, 2005.
The U.S. Environmental Protection Agency on March 1, 2005.

The effective date of this TMDL is: March 10, 2005.

The following table includes the elements of this TMDL.

Table 7-11.1. Los Angeles Harbor Bacteria TMDL (Inner Cabrillo Beach and Main Ship Channel): Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Elevated bacterial indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use of Inner Cabrillo Beach and the potential REC-1 uses of the Main Ship Channel in the Los Angeles Harbor. Swimming in marine waters with elevated bacterial indicator densities has long been associated with adverse health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine waters to protect the water contact recreation use. These targets are the most appropriate indicators of public health risk in recreational waters. These bacteriological objectives are set forth in Chapter 3 of the Basin Plan.[1] The objectives are based on four bacterial indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are: <u>1. Rolling 30-day Geometric Mean Limits</u> a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. <u>2. Single Sample Limits</u> a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Element	Key Findings and Regulatory Provisions
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations) (continued)	These objectives are generally based on an acceptable health risk for marine recreational waters of 19 illnesses per 1,000 exposed individuals as set by the US EPA. For Cabrillo Beach, the targets will apply at existing monitoring sites, with samples taken at ankle depth as they are now. For the Main Ship Channel, the targets will apply at existing or new monitoring sites with samples collected at the surface. Any new monitoring sites must be approved by the Executive Officer. These targets apply during both dry and wet weather, since there is water contact recreation throughout the year, including during wet weather. Implementation of the above bacteria objectives and the associated TMDL numeric targets is achieved using a 'reference system/anti-degradation approach' rather than the alternative 'natural sources exclusion approach subject to antidegradation policies' or strict application of the single sample objectives. As required by the CWA and Porter-Cologne Water Quality Control Act, Basin Plans include beneficial uses of waters, water quality objectives to protect those uses, and an anti-degradation policy, collectively referred to as water quality standards, and other plans and policies necessary to implement water quality standards. This TMDL and its associated waste load allocations, which shall be incorporated into relevant permits, and load allocations are the vehicles for implementation of the Region's standards. The 'reference system/anti-degradation approach' means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within Santa Monica Bay, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the single sample objectives and that it is not the intent of the Regional Board to require treatment or diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas. The geometric mean targets may not be exceeded at any time. The rolling 30-day geometric means will be calculated on each day. For the single sample targets, each existing monitoring site is assigned an allowable number of exceedance days for three time periods (1) summer dry-weather (April 1 to October 31), (2) winter dry-weather (November 1 to March 31), and (3) wet-weather (defined as days with 0.1 inch of rain or greater and the three days following the rain event.)

Element	Key Findings and Regulatory Provisions
Source Analysis	Dry-weather urban runoff and storm water conveyed by storm drains are major sources of elevated bacterial indicator densities to Inner Cabrillo Beach and the Main Ship Channel during dry and wet-weather. As of March 2004, there are 15 active individual and 15 active general, NPDES permits for discharges to the Inner or Outer Los Angeles Harbor including the Terminal Island Treatment Plant. While the fecal coliform counts in the wastewater field indicate a contribution of bacteria to the Harbor by the Terminal Treatment Plant, the wastewater field is sufficiently diluted and the bacterial densities are so much lower in the Harbor than the high bacterial densities and exceedences at the sites at Cabrillo Beach and in the Main Ship Channel that it appears that the Treatment Plant is not a significant source of bacteria to the Beach or to the Ship Channel. Potential nonpoint sources of bacterial contamination at Inner Cabrillo Beach and Main Ship Channel include marina activities such as waste disposal from boats, boat deck and slip washing, swimmer "wash-off", restaurant washouts and natural sources from birds, waterfowl and other wildlife. The bacteria loads associated with these nonpoint sources are not well quantified. However, bacterial contamination at the beach is concentrated in the shallow (ankle depth) waters more than even waters a few feet away (at knee or chest depth). This supports the contention that high bacterial densities may be largely from the beach, itself.
Loading Capacity	Studies (for example, Haile, R.W., Witte, J.S. 1997. Addendum to "An epidemiological study of possible adverse health effects of swimming in Santa Monica Bay." Santa Monica Bay Restoration Project) show that bacterial degradation and dilution during transport from the watershed to the receiving water do not significantly affect bacterial indicator densities. Therefore, the loading capacity is defined in terms of bacterial indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above. As the numeric targets must be met at the point where the effluent from storm drains or other sources initially mix with the receiving water throughout the day, no degradation or dilution allowance is provided.
Waste Load Allocations (for point sources)	Waste load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. The allowable number of exceedance days for a monitoring site for each time period is based on the lesser of two criteria (1) exceedance days in the designated reference system and (2) exceedance days based on historical bacteriological data at the monitoring site. This ensures that bacteriological water quality is at least as good as that of a largely undeveloped system and that there is no degradation of existing water quality. For each monitoring site, allowable exceedance days are set on an annual basis as well as for three time periods. These three periods are:

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	1. summer dry-weather (April 1 to October 31) 2. winter dry-weather (November 1 to March 31) 3. wet-weather days (defined as days of 0.1 inch of rain or more plus three days following the rain event). For the MSC and the Inner Harbor, the City of Los Angeles and the County of Los Angeles are the responsible agencies[2]. The City of Los Angeles is the primary jurisdiction because Inner Cabrillo Beach and Main Ship Channel are located entirely in the City of Los Angeles. The Los Angeles Harbor is owned and operated by the City. All proposed WLAs for summer, dry-weather, single sample bacterial densities in the MSC or the Inner Harbor are zero (0) days of allowable exceedances.[3] The proposed WLAs for single sample winter dry-weather and wet-weather for the monitoring location HW07 is as shown in Table 7-11.2. WLAs for storm drains in the Inner Harbor for summer, dry-weather, single sample bacterial densities are also zero (0) days of allowable exceedances. The waste load allocation for the rolling 30-day geometric mean during any time period or monitoring site in MSC or the Inner Harbor is zero (0) days of allowable exceedances. Discharges from general NPDES permits, general industrial storm water permits and general construction storm water permits are not expected to be a significant source of bacteria. Therefore, the WLAs for these discharges are zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, general industrial storm water permit or general construction storm water permit within the Watershed will also be subject to a WLA of zero days of allowable exceedances. For Inner Cabrillo Beach, the City of Los Angeles is the responsible agency. For the Southern area of Inner Cabrillo Beach, the proposed WLAs for summer, dry-weather, winter dry-weather and wet-weather single sample bacterial densities at the ICB swimming beach are zero (0) days of allowable exceedances. Further study of the storm drains on the north part of ICB may lead to the establishment of WLAs for single sample winter dry-weather and wet-weather for these storm drains. The waste load allocation for the rolling 30-day geometric mean during any time period or monitoring site at ICB is zero (0) days of allowable exceedances.

Element	Key Findings and Regulatory Provisions
Load Allocations (for nonpoint sources)	Load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. All proposed LAs for summer, dry-weather, winter dry-weather and wet-weather, single sample bacterial densities in the MSC are zero (0) days of allowable exceedances The load allocation for the rolling 30-day geometric mean during any time period or monitoring site in MSC or the Inner Harbor is zero (0) days of allowable exceedances. All proposed LAs for summer, dry-weather, single sample bacterial densities at the ICB swimming beach are zero (0) days of allowable exceedances. The proposed LAs for single sample winter dry-weather and wet-weather for the monitoring locations CB1 and CB2 are as shown in Table 7-11.2. Further study of the the north part of ICB may lead to the establishment of LAs for this area. The waste load allocation for the rolling 30-day geometric mean during any time period or monitoring site at ICB is zero (0) days of allowable exceedances.
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), general and individual NPDES permits, general industrial storm water permits, general construction storm water permits, and the authority contained in Sections 13263 and 13267 of the Water Code. Each NPDES permit assigned a WLA shall be reopened or amended at reissuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. Load allocations for nonpoint sources will be implemented within the context of this TMDL. This TMDL will be implemented in three phases over a five-year period (see Table 7-11.3. Within five years of the effective date of the TMDL, there shall be no allowable exceedances of the single sample limits at any location during summer dry-weather (April 1 to October 31) or winter dry-weather s (November 1 to March 31) and the rolling 30-day geometric mean targets must be achieved. Within five years of the effective date of the TMDL, compliance with the allowable number of wet-weather exceedance days and rolling 30-day geometric mean targets must be achieved.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	For those monitoring locations subject to the antidegradation provision (HW07, wet weather), there shall be no increase in exceedance days during the implementation period above the estimated days for the monitoring location in the critical year as identified in Table 7-11.2. The Regional Board intends to reconsider this TMDL, consistent with the scheduled reconsideraton of the Santa Monica Bay (SMB) beaches TMDLs. The SMB beaches TMDLs are scheduled to be reconsidered in four years to re-evaluate the allowable winter dry-weather and wet-weather exceedance days based on additional data on bacterial indicator densities in the wave wash; to re-evaluate the reference system selected to set allowable exceedance levels; to re-evaluate the reference year used in the calculation of allowable exceedance days, and to re-evaluate the need for revision of the geometric mean implementation provision. The Regional Board intends to conduct a similar review of this TMDL within 4 years after the effective date. In addition, if a suitable reference watershed that is representative of an enclosed harbor has not been found by this time, the Regional Board may consider implementing a 'natural source exclusion approach subject to antidegradation policies' to the Los Angeles Harbor in lieu of the 'reference watershed/antidegradation approach'.
Margin of Safety	A margin of safety has been implicitly included through several conservative assumptions, such as the assumption that no dilution takes place between the on-shore sources and where the effluent initially mixes with the receiving water, and that bacterial degradation rates are not fast enough to affect bacteria densities in the receiving water. In addition, an explicit margin of safety has been incorporated, as the load allocations will allow exceedances of the single sample targets no more than 5% of the time on an annual basis, based on the cumulative allocations proposed for dry and wet weather. Currently, the Regional Board concludes that there is water quality impairment if more than 10% of samples at a site exceed the single sample bacteria objectives annually.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for three time periods (summer dry-weather, winter-dry weather, and wet-weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators. The critical condition for bacteria loading is during wet weather, when historic monitoring data for Los Angeles Habor and the reference beach indicate greater exceedance probabilities of the single sample bacteria objectives then during dry-weather. To more specifically identify a critical condition within wet-weather, in order to set the allowable exceedance days shown in Table 7-11.2, the 90th percentile 'storm year'[4] in terms of wet days[5] is used as the reference year.

Element	Key Findings and Regulatory Provisions
Seasonal Variations and Critical Conditions (continued)	Selecting the 90th percentile year avoids a situation where the reference system is frequently out of compliance. It is expected that because responsible jurisdictions and agencies will be planning for this 'worst-case' scenario, there will be fewer exceedance days than the maximum allowed in drier years. Conversely, in the 10% of wetter years, it is expected that there may be more than the allowable number of exceedance days.
Compliance Monitoring	The City of Los Angeles will continue to monitor at sites CB1, CB2 and HW07 as required by Terminal Island Treatment Plant NPDES Permit. This permit is scheduled to be revised in 2004 and will consider this TMDL. Additional monitoring sites may be added by responsible parties as necessary and the compliance monitoring requirment may be moved to another permit if determined to be more appropriate by the Regional Board. A special study shall be conducted by the City of Los Angles in the North area of Inner Cabrillo Beach to assess water quality and compliance with the standards in this TMDL. The special study of the North portion of Inner Cabrillo Beach can include details to support development of a Natural Sources Exclusion in this area if it is found that natural sources such as birds are the sources of bacterial impairment of the northern area of Inner Cabrillo Beach. Beach monitoring sites will be taken in compliance with AB411 and the Southern California Beach Water Quality Working Group procedures. Open water sampling sites will be taken at the surface. A special study shall be conducted by the County of Los Angeles and City of Los Angeles to assess water quality and compliance with the standards in this TMDL in the MSC. The schedules for special studies are shown in Table 7-11.3.

Note: The complete staff report for the TMDL is available for review upon request.

1 The bacteriological objectives were revised by a Basin Plan amendment adopted by the Regional Board on October 25, 2001, and subsequently approved by the State Water Resources Control Board, the Office of Administrative Law and finally by U.S. EPA on September 25, 2002.

2 For the purposes of this TMDL, "responsible jurisdictions and responsible agencies" are defined as (1) local or state agencies that have jurisdiction over Los Angeles Harbor including Inner Cabrillo Beach and Main Ship Channel, (2) local agencies that are permittees or co-permittees on a municipal storm water permit.

3 In order to fully protect public health, no exceedances are permitted at any monitoring location during summer dry-weather (April 1 to October 31). In addition to being consistent with the two criteria, waste load allocations of zero (0) days of allowable exceedances are further supported by the fact that the California Department of Health Services has established minimum protective bacteriological standards – the same as the numeric targets in this TMDL – which, when exceeded during the period April 1 to October 31, result in posting a beach with a health hazard warning (California Code of Regulations, Title 17, Section 7958).

4 For purposes of this TMDL, a 'storm year' means November 1 to October 31. The 90th percentile storm year was 1993 with 75 wet days at the LAX meteorological station.

5 A wet day is defined as a day with rainfall of 0.1 inch or more plus the 3 days following the rain event.

Table 7-11.2 Los Angeles Harbor Bacteria TMDL: Final Allowable Exceedance Days by Sampling Location

Compliance Deadline		5 years after effective date		5years after effective date		5 years after effective date[2]	
		Summer Dry Weather ^		Winter Dry Weather ^*		Wet Weather ^*	
		April 1 - October 31		November 1 – March 31		November 1 - October 31	
Station ID	Location Name	Daily sampling (No. days)	Weekly sampling (No. days)	Daily sampling (No. days)	Weekly sampling (No. days)	Daily sampling (No. days)	Weekly sampling (No. days)
CB1; CB2	Inner Cabrillo Beach	0	0	3 (LA)	1 (LA)	17 (LA)	3 (LA)
HW07	Main Ship Channel	0	0	3 (WLA)	1 (WLA)	15** (WLA)	3** (WLA)

Notes: The number of allowable exceedances is based on the lesser of (1) the reference system or (2) existing levels of exceedance based on historical monitoring data.
The allowable number of exceedance days during winter dry-weather is calculated based on the 10th percentile storm year in terms of dry days at the LAX meteorological station
The allowable number of exceedance days during wet-weather is calculated based on the 90th percentile storm year in terms of wet days at the LAX meteorological station.
^ A dry day is defined as a non-wet day. A wet day is defined as a day with a 0.1-inch or more of rain and the three days following the rain event.
*A revision of the TMDL is scheduled for four years after the effective date of the Los Angeles Harbor TMDL in order to re-evaluate the allowable exceedance days during winter dry-weather and wet-weather based on additional monitoring data and the results of the study of relative loading from sources including but not limited to storm drains, boats, birds and other nonpoint sources.
**The Main Ship Channel (HW07) is already meeting the allowable exceedance days for wet weather and is subject to the antidegradation provision; there shall be no increase in exceedance days during the implementation period above that estimated for the monitoring location in the critical year (15 days/daily sampling, 3 days/weekly sampling).

Table 7-11.3 Los Angeles Harbor Bacteria TMDL (Inner Cabrillo Beach & Main Ship Channel): Significant Dates

Implementation Action	Responsible Party	Date
Implementation (ICB): Implement additional simple Best Management Practices at ICB including additional trash pickup and educational signage. (Tier 1)	• City of Los Angeles	Six months after Effective Date of TMDL.
Implementation (ICB): Submit Work Plan to Implement Best Management Practices and Source Control at ICB for Executive Officer Approval including, but not limited to storm drain repair and reroute; inspect and repair gravity sewer line; implement sand cleaning; repair bird exclusion structure; additional education and signage. (Tier 1)	• City of Los Angeles	Six months after Effective Date of TMDL
Special Studies (ICB): Submit work plan to assess water quality in the northern area of Inner Cabrillo Beach for Executive Officer approval including a plan to monitor northern ICB and assess the discharge from storm drains into the Saltwater Marsh (Tier 2).	• City of Los Angeles	Six months after Effective Date of TMDL.
Special Studies (MSC): Submit work plan to assess water quality in the Inner Harbor for Executive Officer approval including a plan to monitor in proximity to selected storm drains. (Tier 2).	• City of Los Angeles • County of Los Angeles	Six months after Effective Date of TMDL.
Implementation (ICB): Submit work plan for Tier 2 BMPs for Executive Officer approval, including but not limited to alteration of bird exclusion structure, control of sources from cat population, and sand management. (Tier 2)	• City of Los Angeles	Six months after Effective Date of TMDL
Implementation (ICB): Complete implementation of Source Control and BMPs at ICB as identified in work plan including, but not limited to storm drain repair and reroute; inspection and repair gravity sewer line; trash disposal, sand cleanup; and repair bird exclusion structure. (Tier 1)	• City of Los Angeles	Twelve months after Effective Date of TMDL
Compliance (ICB): After implementation of Tier 1 and 2 actions, submit results of monitoring to determine degree of compliance with allowable exceedance days. (Tier 3)	• City of Los Angeles	Two years after Effective Date of TMDL
Implementation (MSC): Based on the results of the MSC special studies and compliance evaluation, submit Work Plan for Executive Officer approval for source control or diversion of storm drains that are found to be sources of bacterial loading to the MSC.	• City of Los Angeles • County of Los Angeles	Two-1/2 years after Effective Date of TMDL
Implementation (ICB): If compliance is not achieved at the southern portion of Inner Cabrillo Beach, provide report to be approved by the Executive Officer of Tier III actions, to include but not be limited to, nearshore circulation or treatment of shallow water improvements, with a time schedule to attain water quality objectives. (Tier 3)	• City of Los Angeles	Three years after Effective Date of TMDL

Regional Board shall reconsider this TMDL to: a) refine allowable exceedance days based on additional data on bacterial indicator densities b) re-evaluate the reference system selected to set allowable exceedance levels, including a reconsideration of whether the allowable number of exceedance days should be adjusted annually dependant on the rainfall conditions and an evaluation of natural variability in the reference system(s), and if an appropriate reference system cannot be identified for this enclosed harbor, evaluate using the 'natural sources exclusion approach subject to antidegradation policies' rather than the 'reference system/antidegradation' approach, c) re-evaluate the reference year used in the calculation of allowable exceedance days, and d) Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision. e) Evaluate the feasibility of a natural sources exclusion for the non-swimming portion of ICB f) Re-evaluate the implementation schedule.	• Regional Board	Four years after Effective Date of TMDL, or at the time of reconsideration of the Santa Monica Beaches Bacteria
Final Compliance (MSC): Within five years of the effective date of the TMDL, there shall be no exceedances in excess of the numbers in Table 6-3 and 6-4 of the single sample limits at any location during summer dry-weather (April 1 to October 31) or winter dry-weather (November 1 to March 31) and the rolling 30-day geometric mean targets must be achieved.	• City of Los Angeles • County of Los Angeles	Five years after Effective Date of TMDL
Implementation (ICB): All tier 3 remedies to be completed within five years of the Effective Date of the TMDL. (Tier 3)	• City of Los Angeles	Five years after Effective Date of TMDL
Final Compliance (ICB): Within five years of the effective date of the TMDL, there shall be no allowable exceedances of the single sample limits at any location during any of the periods (Tables 6-3, 6-4 and 6-5) and the rolling 30-day geometric mean targets must be achieved.	• City of Los Angeles	Five years after the Effective Date of the TMDL

7-12 Ballona Creek Metals TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on July 7, 2005

This TMDL was approved by:
The State Water Resources Control Board on October 20, 2005.
The Office of Administrative Law on December 9, 2005.
The U.S. Environmental Protection Agency on December 22, 2005.

This TMDL was voided and set aside on: May 6, 2009.

This TMDL was re-adopted by:
The Regional Water Quality Control Board on September 6, 2007.

This amended TMDL was approved by:
The State Water Resources Control Board on June 17, 2008.
The Office of Administrative Law on October 6, 2008.
The U.S. Environmental Protection Agency on October 29, 2008.

The effective date of this TMDL is: October 29, 2008.

The following tables include the elements of this TMDL.

Table 7-12.1. Ballona Creek Metals TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Ballona Creek is on Clean Water Act Section 303(d) list of impaired waterbodies for dissolved copper, dissolved lead, total selenium, and dissolved zinc and Sepulveda Canyon Channel is 303(d) listed for lead. The metals subject to this TMDL are toxic pollutants, and the existing water quality objectives for the metals reflect national policy that the discharge of toxic pollutants in toxic amounts be prohibited. When one of the metals subject to this TMDL is present at levels exceeding the existing numeric objectives, then the receiving water is toxic. The following designated beneficial uses are impaired by these metals: water contact recreation (REC1); non-contact water recreation (REC2); warm freshwater habitat (WARM); estuarine habitat (EST); marine habitat (MAR); wildlife habitat (WILD); rare and threatened or endangered species (RARE); migration of aquatic organisms (MIGR); reproduction and early development of fish (SPWN); commercial and sport fishing (COMM); and shellfish harvesting (SHELL). TMDLs are developed for reaches on the 303(d) list and metal allocations are developed for tributaries that drain to impaired reaches. This TMDL address dry- and wet-weather discharges of copper, lead, selenium and zinc in Ballona Creek and Sepulveda Canyon Channel.
Numeric Target (Interpretation of the narrative and numeric water quality objective, used to calculate the load allocations)	Numeric water quality targets are based on the numeric water quality standards established for metals by the California Toxics Rule (CTR). The targets are expressed in terms of total recoverable metals. There are separate numeric targets for dry and wet weather because hardness values and flow conditions in Ballona Creek and Sepulveda Canyon Channel vary between dry and wet weather. The dry-weather targets apply to days when the maximum daily flow in Ballona Creek is less than 40 cubic feet per second (cfs). The wet-weather targets apply to days when the maximum daily flow in Ballona Creek is equal to or greater than 40 cfs.

Element	Key Findings and Regulatory Provisions
Numeric Target (Interpretation of the narrative and numeric water quality objective, used to calculate the load allocations) (continued)	**Dry Weather** The dry-weather targets are based on the chronic CTR criteria. The copper, lead and zinc targets are dependent on hardness to adjust for site-specific conditions and require conversion factors to convert between dissolved and total recoverable metals. These targets are based on the 50th percentile hardness value of 300 mg/L and the CTR default conversion factors. The conversion factor for lead is hardness dependent, which is also based on a hardness of 300 mg/L. The dry-weather target for selenium is independent of hardness and expressed as total recoverable metals. **Dry-weather numeric targets (µg total recoverable metals/L)** Dissolved / Conversion Factor / Total Recoverable Copper: 23 / 0.96 / 24 Lead: 8.1 / 0.631 / 13 Selenium: / / 5 Zinc: 300 / 0.986 / 304 **Wet Weather** The wet-weather targets for copper, lead and zinc are based on the acute CTR criteria and the 50th percentile hardness value of 77 mg/L for storm water collected at Sawtelle Boulevard. Conversion factors for copper and zinc are based on a regression of dissolved metal values to total metal values collected at Sawtelle. The CTR default conversion factor based on a hardness value of 77 mg/L is used for lead. The wet-weather target for selenium is independent of hardness and expressed as total recoverable metals. **Wet-weather numeric targets (µg total recoverable metals/L)** Dissolved / Conversion Factor / Total Recoverable Copper: 11 / 0.62 / 18 Lead: 49 / 0.829 / 59 Selenium: / / 5 Zinc: 94 / 0.79 / 119
Source Analysis	There are significant difference in the sources of copper, lead, selenium and zinc loadings during dry weather and wet weather. During dry weather, most of the metals loadings are in the dissolved form. Storm drains convey a large percentage of the metals loadings during dry weather because although their flows are typically low, concentrations of metals in urban runoff may be quite high. During dry years, dry-weather loadings account for 25-35% of the annual metals loadings. Additional sources of dry weather flow and metals loading include groundwater discharge and flows from other permitted NPDES discharges within the watershed.

Element	Key Findings and Regulatory Provisions
Source Analysis (continued)	During wet weather, most of the metals loadings in Ballona Creek are in the particulate form and are associated with wet-weather storm water flows. On an annual basis, storm water contributes about 91% of the copper loading and 92% of the lead loading to Ballona Creek. Storm water flow is permitted through the municipal separate storm sewer system (MS4) permit issued to the County of Los Angeles, a separate Caltrans storm water permit, a general construction storm water permit, and a general industrial storm water permit. Non-point sources are not considered to be a significant source in this TMDL. Direct atmospheric deposition of metals is insignificant relative to the annual dry-weather loading or the total annual loading. Indirect atmospheric deposition reflects the process by which metals deposited on the land surface may be washed off during storm events and delivered to Ballona Creek and its tributaries. The loading of metals associated with indirect atmospheric deposition are accounted for in the estimates of the storm water loading.
Loading Capacity	TMDLs are developed for copper, lead, selenium and zinc for Ballona Creek and Sepulveda Canyon Channel. **Dry Weather** Dry-weather loading capacities for Ballona Creek and Sepulveda Canyon Channel are equal to the dry-weather numeric targets multiplied by the critical dry-weather flow for each waterbody. Based on long-term flow records for Ballona Creek at Sawtelle the median dry-weather flow is 14 cfs. The median dry-weather flow for Sepulveda Canyon Channel, based on measurements conducted in 2003, is 6.3 cfs. **Dry-weather loading capacity (grams total recoverable metals/day)** Copper / Lead / Selenium / Zinc Ballona Creek: 821 / 440 / 171 / 10,423 Sepulveda Channel: 371 / 199 / 77 / 4,712 **Wet Weather** Wet-weather loading capacities are calculated by multiplying the daily storm volume by the wet-weather numeric target for each metal. **Wet-weather loading capacity (total recoverable metals)** Metal — Load Capacity Copper: Daily storm volume x 18 µg/L Lead: Daily storm volume x 59 µg/L Selenium: Daily storm volume x 5 µg/L Zinc: Daily storm volume x 119 µg/L

Element	Key Findings and Regulatory Provisions
Load Allocations (for nonpoint sources)	Load allocations (LA) are assigned to non-point sources for Ballona Creek and Sepulveda Canyon Channel. **Dry Weather** Dry-weather load allocations for copper, lead and zinc are developed for direct atmospheric deposition. The mass-based load allocations are equal to the ratio of the length of each segment over the total length multiplied by the estimates of direct atmospheric loading for Ballona Creek (3.5 g/day for copper, 2.3 g/day for lead, and 11.7 k/day for zinc). **Dry-weather direct air deposition LAs (total recoverable metals)** Copper (g/day) / Lead (g/day) / Zinc (g/day) Ballona Creek: 2.0 / 1.4 / 6.8 Sepulveda Channel: 0.3 / 0.2 / 0.9 **Wet Weather** Wet-weather load allocations for copper, lead, selenium and zinc are developed for direct atmospheric deposition. The mass-based load allocations for direct atmospheric deposition are equal to the percent area of surface water (0.6%) multiplied by the total loading capacity. **Wet-weather direct air deposition LAs (total recoverable metals)** Load Allocation (grams/day) Copper: 1.05E-07 x Daily storm volume (L) Lead: 3.54E-07 x Daily storm volume (L) Selenium: 3.00E-08 x Daily storm volume (L) Zinc: 7.14E-07 x Daily storm volume (L)
Waste Load Allocations (for point sources)	Waste load allocations (WLA) are assigned to point sources for Ballona Creek and Sepulveda Canyon Channel. A grouped mass-based waste load allocation is developed for the storm water permittees (Los Angeles County MS4, Caltrans, General Construction and General Industrial) by subtracting the load allocation from the total loading capacity. Concentration-based waste load allocations are developed for other point sources in the watershed. **Dry Weather** Dry-weather waste load allocation for storm water is equal to the dry-weather critical flow multiplied by the dry-weather numeric target minus the load allocation for direct atmospheric deposition. **Dry-weather Storm Water WLAs (grams total recoverable metals/day)** Copper / Lead / Selenium / Zinc Ballona Creek: 818.9 / 438.6 / 171 / 10,416.2 Sepulveda Channel: 370.7 / 198.8 / 77 / 4,711.1

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	A waste load allocation of zero is assigned to all general construction and industrial storm water permits during dry weather. Therefore, the storm water waste load allocations are apportioned between the MS4 permittees and Caltrans, based on an areal weighting approach. **Dry-weather Storm Water WLAs Apportioned between Storm Water Permits (grams total recoverable metals/day)** Ballona Creek MS4 permittees: Copper 807.7, Lead 432.6, Selenium 169, Zinc 10,273.1 Caltrans: Copper 11.2, Lead 6.0, Selenium 2, Zinc 143.1 Sepulveda Channel MS4 Permittees: Copper 365.6, Lead 196.1, Selenium 76, Zinc 4646.4 Caltrans: Copper 5.1, Lead 2.7, Selenium 1, Zinc 64.7 Concentration-based dry-weather waste load allocations are assigned to the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries. Any future minor NPDES permits or enrollees under a general non-storm water NPDES permit will also be subject to the concentration-based waste load allocations. **Dry-weather WLAs for other permits (total recoverable metals)** Copper (µg/L): 24; Lead (µg/L): 13; Selenium (µg/L): 5; Zinc (µg/L): 304 **Wet Weather** Wet-weather waste load allocation for storm water is equal to the total loading capacity minus the load allocation for direct atmospheric deposition. Wet-weather waste load allocations for the grouped storm water permittees apply to all reaches and tributaries. **Wet-weather Storm Water WLAs (total recoverable metals)** Copper: 1.79E-05 x Daily storm volume (L) Lead: 5.87E-05 x Daily storm volume (L) Selenium: 4.97E-06 x Daily storm volume (L) Zinc: 1.18E-04 x Daily storm volume (L) The storm water waste load allocations are apportioned between the MS4 permittees, Caltrans, the general construction and the general industrial storm water permits based on an areal weighting approach.

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	**Wet-weather Storm Water WLAs Apportioned Between Storm Water Permits (total recoverable metals)**

Waste Load Allocation (grams/day)	
Copper	
MS4 Permittees	1.70E-05 x Daily storm volume (L)
Caltrans	2.37E-07 x Daily storm volume (L)
General Construction	4.94E-07 x Daily storm volume (L)
General Industrial	1.24E-07 x Daily storm volume (L)
Lead	
MS4 Permittees	5.58E-05 x Daily storm volume (L)
Caltrans	7.78E-07 x Daily storm volume (L)
General Construction	1.62E-06 x Daily storm volume (L)
General Industrial	4.06E-07 x Daily storm volume (L)
Selenium	
MS4 Permittees	4.73E-06 x Daily storm volume (L)
Caltrans	6.59E-08 x Daily storm volume (L)
General Construction	1.37E-07 x Daily storm volume (L)
General Industrial	3.44E-08 x Daily storm volume (L)
Zinc	
MS4 Permittees	1.13E-04 x Daily storm volume (L)
Caltrans	1.57E-06 x Daily storm volume (L)
General Construction	3.27E-06 x Daily storm volume (L)
General Industrial	8.19E-07 x Daily storm volume (L)

Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility.

Individual per Acre WLAs for General Construction or Industrial Storm Water Permittees (total recoverable metals)

Waste Load Allocation (grams/day/acre)	
Copper	2.20E-10 x Daily storm volume (L)
Lead	7.20E-10 x Daily storm volume (L)
Selenium	6.10E-11 x Daily storm volume (L)
Zinc	1.45E-09 x Daily storm volume (L)

Concentration-based wet-weather waste load allocations are assigned to the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries. Any future minor NPDES permits or enrollees under a general non-storm water NPDES permit will also be subject to the concentration-based waste load allocations.

Wet-weather WLAs for other permits (total recoverable metals)

Copper (µg/L)	Lead (µg/L)	Selenium (µg/L)	Zinc (µg/L)
18	59	5	119

Element	Key Findings and Regulatory Provisions
Margin of Safety	There is an implicit margin of safety through the use of conservative values for the conversion from total recoverable metals to the dissolved fraction during dry and wet weather. In addition, the TMDL includes a margin of safety by evaluating dry-weather and wet-weather conditions separately and assigning allocations based on two disparate critical conditions.
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the State of California Department of Transportation (Caltrans) Storm Water Permit, minor NPDES permits, general NPDES permits, general industrial storm water NPDES permits, and general construction storm water NPDES permits. Nonpoint sources will be regulated through the authority contained in Sections 13263 and 13269 of the Water Code, in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy (May 2004). Each NPDES permit assigned a WLA shall be reopened or amended at re-issuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. The Regional Board shall reconsider this TMDL by January 11, 2011 based on additional data obtained from special studies. Table 7-12.2 presents the implementation schedule for the responsible permittees. **Minor NPDES Permits and General Non-Storm Water NPDES Permits:** Permit writers may translate applicable waste load allocations into effluent limits for the minor and general NPDES permits by applying the effluent limitation procedures in Section 1.4 of the State Water Resources Control Board's Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (2000) or other applicable engineering practices authorized under federal regulations. Compliance schedules may be established in individual NPDES permits, allowing up to 5 years within a permit cycle to achieve compliance. Compliance schedules may not be established in general NPDES permits. A discharger that can not comply immediately with effluent limitations specified to meet waste load allocations will be required to apply for an individual permit, in order to, demonstrate the need for a compliance schedule. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to January 11, 2016 to achieve compliance with final WLAs. **General Industrial Storm Water Permits:** The Regional Board will develop a watershed specific general industrial storm water permit to incorporate waste load allocations.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	Dry-weather Implementation Non-storm water flows authorized by Order No. 97-03 DWQ, or any successor order, are exempt from the dry-weather waste load allocation equal to zero. Instead, these authorized non-storm water flows shall meet the concentration-based waste load allocations assigned to the other NPDES Permits. The dry-weather waste load allocation equal to zero applies to unauthorized non-storm water flows, which are prohibited by Order No. 97-03 DWQ. It is anticipated that the dry-weather waste load allocations will be implemented by requiring improved best management practices (BMPs) to eliminate the discharge of non-storm water flows. However, the permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of the numeric waste load allocations. Wet-weather Implementation The general industrial storm water permittees are allowed interim wet-weather concentration-based waste load allocations based on benchmarks contained in EPA's Storm Water Multi-sector General Permit for Industrial Activities. The interim waste load allocations apply to all industry sectors until no later than January 11, 2016. **Interim Wet-Weather WLAs for General Industrial Storm Water Permittees (total recoverable metals)** Copper (µg/L) — Lead (µg/L) — Selenium (µg/L) — Zinc (µg/L) 63.6 — 81.6 — 238.5 — 117 Until January 11, 2011, interim waste load allocations will not be interpreted as enforceable permit conditions. If monitoring demonstrates that interim waste load allocations are being exceeded, the permittee shall evaluate existing and potential BMPs, including structural BMPs, and implement any necessary BMP improvements. It is anticipated that monitoring results and any necessary BMP improvements would occur as part of an annual reporting process. After January 11, 2011, interim waste load allocations shall be translated into enforceable permit conditions. Compliance with permit conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. If this method of compliance is chosen, permit writers must provide adequate justification and documentation to demonstrate that BMPs are expected to result in attainment of interim waste load allocations.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	The general industrial storm water permits shall achieve final wet-weather waste load allocations no later than January 11, 2016, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs if adequate justification and documentation demonstrate that BMPs are expected to result in attainment of waste load allocations. **General Construction Storm Water Permits:** Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board. <u>Dry-weather Implementation</u> Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3 and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be (1) infeasible to eliminate (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order. Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ. <u>Wet-weather Implementation</u> By January 11, 2013, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration by January 11, 2014. General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs by January 11, 2015. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board by January 11, 2014, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	**MS4 and Caltrans Storm Water Permits:** The County of Los Angeles, City of Los Angeles, Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood are jointly responsible for meeting the mass-based waste load allocations for the MS4 permittees. Caltrans is responsible for meeting their mass-based waste load allocations, however, they may choose to work with the MS4 permittees. The primary jurisdiction for the Ballona Creek watershed is the City of Los Angeles. Applicable CTR limits are being met most of the time during dry weather, with episodic exceedances. Due to the expense of obtaining accurate flow measurements required for calculating loads, concentration-based permit limits may apply during dry weather. These concentration-based limits would be equal to the dry-weather concentration-based waste load allocations assigned to the other NPDES permits. Each municipality and permittee will be required to meet the storm water waste load allocation at the designated TMDL effectiveness monitoring points. A phased implementation approach, using a combination of non-structural and structural BMPs may be used to achieve compliance with the stormwater waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the waste load allocations. The implementation schedule for the MS4 and Caltrans permittees consists of a phased approach, with compliance to be achieved in prescribed percentages of the watershed, with total compliance to be achieved within 15 years.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for dry weather and wet weather. Based on long-term flow records, dry-weather flows in Ballona Creek are estimated to be 14 cubic feet per second (cfs). Since, this flow has been very consistent, 14 cfs is used to define the critical dry-weather flow for Ballona Creek at Sawtelle Boulevard (upstream of Sepulveda Canyon Channel). There are no historic flow records to determine the average long-term flows for Sepulveda Canyon Channel. Therefore, in the absence of historical records the 2003 dry-weather characterization study measurements are assumed reasonable estimates of flow for this channel. The critical dry-weather flow for Sepulveda Canyon Channel is defined as the average flow of 6.3 cfs. Wet-weather allocations are developed using the load-duration curve concept. The total wet-weather waste load allocation varies by storm, therefore, given this variability in storm water flows, no justification was found for selecting a particular sized storm as the critical condition.

Element	Key Findings and Regulatory Provisions
Monitoring	Effective monitoring will be required to assess the condition of the Ballona Creek and to assess the on-going effectiveness of efforts by dischargers to reduce metals loading to Ballona Creek. Special studies may also be appropriate to provide further information about new data, new or alternative sources, and revised scientific assumptions. Below the Regional Board identifies the various goals of monitoring efforts and studies. The programs, reports, and studies will be developed in response to subsequent orders issued by the Executive Officer. **Ambient monitoring** An ambient monitoring program is necessary to assess water quality throughout Ballona Creek and its tributaries and the progress being made to remove the metals impairments. The MS4 and Caltrans storm water NPDES permittees are jointly responsible for implementing the ambient monitoring program. The responsible agencies shall analyze samples for total recoverable metals and dissolved metals, including cadmium and silver, and hardness once a month at each monitoring location. The reported detection limits shall be lower than the hardness adjusted CTR criteria to determine if water quality objectives are being met. There are three ambient monitoring locations. **Ambient Monitoring Locations** Waterbody — Location Ballona Creek — At Sawtelle Boulevard Sepulveda Channel — Just Above the Confluence with Ballona Creek Ballona Creek — At Inglewood Boulevard **TMDL Effectiveness Monitoring** The MS4 and Caltrans storm water NPDES permittees are jointly responsible for assessing the progress in reducing pollutant loads to achieve the TMDL. The MS4 and Caltrans storm water NPDES permittees are required to submit for approval of the Executive Officer a coordinated monitoring plan that will demonstrate the effectiveness of the phased implementation schedule for this TMDL, which requires attainment of the applicable waste load allocations in prescribed percentages of the watershed over a 15-year period. The monitoring locations specified for the ambient monitoring program may be used as the effectiveness monitoring locations.

Element	Key Findings and Regulatory Provisions
Monitoring	The MS4 and Caltrans storm water NPDES permittees will be found to be effectively meeting the dry-weather waste load allocations if the in-stream pollutant concentrations or load at the first downstream monitoring location is equal to or less than the corresponding concentration- or load-based waste load allocation. Alternatively, effectiveness of the TMDL may be assessed at the storm drain outlet based on the concentration-based waste load allocation for the receiving water. For storm drains that discharge to other storm drains, the waste load allocation will be based on the waste load allocation for the ultimate receiving water for that storm drain system. The MS4 and Caltrans storm water NPDES permittees will be found to be effectively meeting the wet-weather waste load allocations if the loading at the most downstream monitoring location is equal to or less then the wet-weather waste load allocation. Compliance with individual general construction and industrial storm water permittees will be based on monitoring of discharges at the property boundary. Compliance may be assessed based on concentration and/or load allocations. The general storm water permits shall contain a model monitoring and reporting program to evaluate BMP effectiveness. A permittee enrolled under the general permits shall have the choice of conducting individual monitoring based on the model program or participating in a group monitoring effort. MS4 permittees are encouraged to take the lead in group monitoring efforts for industrial facilities under their jurisdiction because compliance with waste load allocations by these facilities will in many cases translate to reductions in metals loads to the MS4 system. **Special studies** The implementation schedule, Table 7-12.2, allows time for special studies that may serve to refine the estimate of loading capacity, waste load and/or load allocations, and other studies that may serve to optimize implementation efforts. The Regional Board will re-consider the TMDL by January 11, 2011 in light of the findings of these studies. Studies may include: • Refinement of hydrologic and water quality model • Additional source assessment • Refinement of potency factors correlation between total suspended solids and metals loadings during dry and wet weather • Correlation between short-term rainfall intensity and metals loadings for use in sizing in-line structural BMPs • Correlation between storm volume and total recoverable metals loading for use in sizing storm water retention facilities • Refined estimates of metals partitioning coefficients, conversion factors, and site-specific toxicity. • Evaluation of potential contribution of aerial deposition and sources of aerial deposition.

Table 7-12.2. Ballona Creek Metals TMDL: Implementation Schedule

Date	Action
January 11, 2006	Regional Board permit writers shall incorporate the waste load allocations into the NPDES permits. Waste load allocations will be implemented through NPDES permit limits in accordance with the implementation schedule contained herein, at the time of permit issuance or re-issuance.
January 11, 2010	Responsible jurisdictions and agencies shall provide to the Regional Board results of the special studies.
January 11, 2011	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
MINOR NPDES PERMITS AND GENERAL NON-STORM WATER NPDES PERMITS	
Upon permit issuance or renewal	The non-storm water NPDES permittees shall achieve the waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Compliance schedules may allow up to five years in individual NPDES permits to meet permit requirements. Compliance schedules may not be established in general NPDES permits. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to January 11, 2016 to achieve compliance with final WLAs.
GENERAL INDUSTRIAL STORM WATER PERMITS	
Upon permit issuance or renewal	The general industrial storm water NPDES permittees shall achieve dry-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall begin to install and test BMPs to meet the interim wet-weather WLAs. BMP effectiveness monitoring will be implemented to determine progress in achieving interim wet-weather waste load allocations.
January 11, 2011	The general industrial storm water NPDES permittees shall achieve the interim wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall begin an iterative BMP process including BMP effectiveness monitoring to achieve compliance with final wet-weather WLAs.

Date	Action
January 11, 2016	The general industrial storm water NPDES permittees shall achieve the final wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
GENERAL CONSTRUCTION STORM WATER PERMITS	
Upon permit issuance, renewal, or re-opener	Non-storm water flows not authorized by Order No. 99-08 DWQ, or any successor order, shall achieve dry-weather waste load allocations of zero. Waste load allocations shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
January 11, 2013	The construction industry will submit the results of wet-weather BMP effectiveness studies to the Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.
January 11, 2014	The Regional Board will consider results of the wet-weather BMP effectiveness studies and consider approval of BMPs.
January 11, 2015	All general construction storm water permittees shall implement Regional Board-approved BMPs.
MS4 AND CALTRANS STORM WATER PERMITS	
January 11, 2007	In response to an order issued by the Executive Officer, the MS4 and Caltrans storm water NPDES permittees must submit a coordinated monitoring plan, to be approved by the Executive Officer, which includes both ambient monitoring and TMDL effectiveness monitoring. Once the coordinated monitoring plan is approved by the Executive Officer ambient monitoring shall commence within 6 months.
January 11, 2010 (Draft Report) July 11, 2010 (Final Report)	MS4 and Caltrans storm water NPDES permittees shall provide a written report to the Regional Board outlining the drainage areas to be address and how these areas will achieve compliance with the waste load allocations. The report shall include implementation methods, an implementation schedule, proposed milestones, and any applicable revisions to the TMDL effectiveness monitoring plan.
January 11, 2012	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 50% of the total drainage area served by the MS4 system is effectively meeting the dry-weather waste load allocations and 25% of the total drainage area served by the MS4 system is effectively meeting the wet-weather waste load allocations.

Date	Action
January 11, 2014	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 75% of the total drainage area served by the MS4 system is effectively meeting the dry-weather waste load allocations.
January 11, 2016	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the MS4 system is effectively meeting the dry-weather waste load allocations and 50% of the total drainage area served by the MS4 system is effectively meeting the wet-weather waste load allocations.
January 11, 2021	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the MS4 system is effectively meeting both the dry-weather and wet-weather waste load allocations.

7-13 Los Angeles River and Tributaries Metals TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on June 2, 2005.

This TMDL was approved by:
The State Water Resources Control Board on October 20, 2005.
Office of Administrative Law on December 9, 2005.
The U.S. Environmental Protection Agency on December 22, 2005.

This TMDL was voided and set aside on: May 6, 2009.

This TMDL was re-adopted by
The Regional Water Quality Control Board on September 6, 2007.

This TMDL was approved by:
The State Water Resources Control Board on June 17, 2008.
The Office of Administrative Law on October 14, 2008.
The U.S. Environmental Protection Agency on October 29, 2008.

This TMDL was revised and adopted by
The Regional Water Quality Control Board on May 6, 2010.

This TMDL revision was approved by:
The State Water Resources Control Board on April 19, 2011.
The Office of Administrative Law on July 27, 2011.
The U.S. Environmental Protection Agency on TBD.

The effective date of this TMDL is: October 29, 2008.

The following table includes the elements of this TMDL.

Table 7-13.1 Los Angeles River and Tributaries Metals TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Segments of the Los Angeles River and its tributaries are on the Clean Water Act section 303(d) list of impaired waterbodies for copper, cadmium, lead, zinc, aluminum and selenium. The metals subject to this TMDL are toxic pollutants, and the existing water quality objectives for the metals reflect national policy that the discharge of toxic pollutants in toxic amounts be prohibited. When one of the metals subject to this TMDL is present at levels exceeding the existing numeric objectives, then the receiving water is toxic. The beneficial uses impaired by metals in the Los Angeles River and its tributaries are those associated with aquatic life and water supply, including wildlife habitat, rare, threatened or endangered species, warm freshwater habitat, wetlands, and groundwater recharge. TMDLs are developed for reaches on the 303(d) list and for reaches where recent data indicate additional impairments. Addressing the impairing metals throughout the Los Angeles River watershed will ensure that the metals do not contribute to an impairment elsewhere in the watershed. Metals allocations are therefore developed for upstream reaches and tributaries that drain to impaired reaches. These TMDLs address wet- and dry-weather discharges of copper, lead, zinc and selenium and wet-weather discharges of cadmium. Impairments related to cadmium only occur during wet weather. Impairments related to selenium are confined to Reach 6 and its tributaries. Dry-weather impairments related to zinc only occur in Rio Hondo Reach 1. The aluminum listing was based on water quality objectives set to support the municipal water supply beneficial use (MUN). MUN is a conditional use in the Los Angeles River watershed. The United States Environmental Protection Agency (USEPA) has determined that TMDLs are not required for impairments of conditional uses.

Element	Key Findings and Regulatory Provisions
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	Numeric water quality targets are based on the numeric water quality criteria established by the California Toxics Rule (CTR). The targets are expressed in terms of total recoverable metals. There are separate targets for dry and wet weather because hardness values and flow conditions in the Los Angeles River and tributaries vary between dry and wet weather. The dry-weather targets apply to days when the maximum daily flow in the River is less than 500 cfs. The wet-weather targets apply to days when the maximum daily flow in the River is equal to or greater than 500 cfs. The dry-weather targets for copper and lead are based on chronic CTR criteria. The dry-weather targets for zinc are based on acute CTR criteria. Copper, lead and zinc targets are dependent on hardness and a water effects ratio (WER), which are both factors built into the CTR criteria to adjust for site specific conditions, and conversion factors to convert between dissolved and total recoverable metals. Copper and lead targets are based on 50th percentile hardness values. Zinc targets are based on 10th percentile hardness values. Site-specific copper conversion factors are applied immediately downstream of the Tillman and LA-Glendale water reclamation plants (WRP). CTR default conversion factors are used for copper, lead, and zinc in all other cases. The dry-weather target for selenium is independent of hardness or conversion factors. **Dry-weather conversion factors:** Default / Below Tillman WRP / Below LA-Glendale WRP Copper 0.96 / 0.74 / 0.80 Lead 0.79 Zinc 0.61 **Dry-weather numeric targets (µg total recoverable metals/L)** **Cu / Pb / Zn / Se** Reach 5, 6 and Bell Creek: WER[1] x 30 / WER[1] x 19 / 5 Reach 4: WER[2] x 26 / WER[1] x 10 Reach 3 above LA-Glendale WRP and Verdugo: WER[2] x 23 / WER[1] x 12 Reach 3 below LA-Glendale WRP: WER[2] x 26 / WER[1] x 12 Burbank Western Channel (above WRP): WER[2] x 26 / WER[1] x 14 Burbank Western Channel (below WRP): WER[2] x 19 / WER[1] x 9.1 Reach 2 and Arroyo Seco: WER[2] x 22 / WER[1] x 11 Reach 1: WER[2] x 23 / WER[1] x 12 Compton Creek: WER[1] x 19 / WER[1] x 8.9 Rio Hondo Reach 1: WER[1] x 13 / WER[1] x 5.0 / WER[1] x 131 Monrovia Canyon: WER[1] x 8.2 [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. [2] The WER for this constituent in this reach is 3.96.

Element	Key Findings and Regulatory Provisions
Numeric Target (continued) (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	The wet-weather targets for cadmium, copper, lead and zinc are based on acute CTR criteria and the 50th percentile hardness values for storm water collected at the Wardlow gage station, multiplied by a WER. Conversion factors for copper, lead and zinc are based on a regression of dissolved metals values to total recoverable metals values collected at Wardlow. The CTR default conversion factor is applied to cadmium. The wet-weather target for selenium is independent of hardness or conversion factors. **Wet-weather conversion factors:** Cadmium 0.94 Copper 0.65 Lead 0.82 Zinc 0.61 **Wet-weather numeric targets (µg total recoverable metals/L)** Cd: WER[1] x 3.1 | Cu: WER[2] x 17 | Pb: WER[1] x 62 | Zn: WER[1] x 159 | Se: 5 [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. [2] The WER for this constituent is 3.96.
Source Analysis	There are significant differences in the sources of metals loadings during dry weather and wet weather. During dry weather, most of the metals loadings are in the dissolved form. The three major publicly owned treatment works (POTWs) that discharge to the river (Tillman WRP, LA-Glendale WRP, and Burbank WRP) constitute the majority of the flow and metals loadings during dry weather. The storm drains also contribute a large percentage of the loadings during dry weather because although their flows are typically low, concentrations of metals in urban runoff may be quite high. The remaining portion of the dry weather flow and metals loadings represents a combination of tributary flows, groundwater discharge, and flows from other permitted NPDES discharges within the watershed. During wet weather, most of the metals loadings are in the particulate form and are associated with wet-weather storm water flow. On an annual basis, storm water contributes about 40% of the cadmium loading, 80% of the copper loading, 95% of the lead loading and 90% of the zinc loading. This storm water flow is permitted through two municipal separate storm sewer system (MS4) permits, a separate Caltrans MS4 permit, a general construction storm water permit and a general industrial storm water permit. Nonpoint sources of metals may include tributaries that drain the open space areas of the watershed. Direct atmospheric deposition of metals on the river is also a small source. Indirect atmospheric deposition on the land surface that is washed off during storms is a larger source, which is accounted for in the estimates of storm water loadings. The sources of selenium appear to be related to natural levels of selenium in soils in the upper watershed. Separate studies are underway to evaluate whether selenium levels represent a “natural condition” for this watershed.

Element	Key Findings and Regulatory Provisions
Loading Capacity	**Dry Weather** Dry-weather TMDLs are developed for the following pollutant waterbody combinations (allocations are developed for upstream reaches and tributaries to meet TMDLs in downstream reaches): • Copper for the Los Angeles River Reaches 1, 2, 3, 4, and 5, Burbank Channel, Compton Creek, Tujunga Wash, Rio Hondo Reach 1. • Lead for the Los Angeles River Reaches 1, 2, 3, 4, and 5, Burbank Channel, Rio Hondo Reach 1, Compton Creek, Monrovia Canyon Creek. • Zinc for Rio Hondo Reach 1. • Selenium for Reach 6, Aliso Creek, Dry Canyon Creek, McCoy Canyon Creek. For dry weather, loading capacities are equal to reach-specific numeric targets multiplied by reach-specific critical dry-weather flows. Summing the critical flows for each reach and tributary, the critical flow for the entire river is 203 cfs, which is equal to the combined design flow of the three POTWs (169 cfs) plus the median flow from the storm drains and tributaries (34 cfs). The median storm drain and tributary flow is equal to the median flow at Wardlow (145 cfs) minus the existing median POTW flow (111 cfs). The dry-weather loading capacities for each impaired reach include the critical flows for upstream reaches. The dry-weather loading capacity for Reach 5 includes flows from Reach 6 and Bell Creek, the dry-weather loading capacity for Reach 3 includes flows from Verdugo Wash, and the dry-weather loading capacity for Reach 2 includes flows from Arroyo Seco. **Dry-weather loading capacity (total recoverable metals)** **Critical Flow (cfs) / Cu (kg/day) / Pb (kg/day) / Zn (kg/day)** LA River Reach 5: 8.74 / WER[1] x 0.65 / WER[1] x 0.39 LA River Reach 4: 129.13 / WER[2] x 8.1 / WER[1] x 3.2 LA River Reach 3: 39.14 / WER[2] x 2.3 / WER[1] x 1.01 LA River Reach 2: 4.44 / WER[2] x 0.16 / WER[1] x 0.084 LA River Reach 1: 2.58 / WER[2] x 0.14 / WER[1] x 0.075 Tujunga Wash: 0.15 / WER[1] x 0.007 / WER[1] x 0.0035 Burbank Channel: 17.3 / WER[2] x 0.80 / WER[1] x 0.39 Rio Hondo Reach 1: 0.50 / WER[1]x 0.015 / WER[1]x0.0061 / WER[1]x0.16 Compton Creek: 0.90 / WER[1] x 0.041 / WER[1] x 0.020 [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. [2] The WER for this constituent in this reach is 3.96. No dry-weather loading capacities are calculated for lead in Monrovia Canyon Creek or selenium in Reach 6 or its tributaries. Concentration-based allocations are assigned for these metals in these reaches.

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td>Loading Capacity (continued)</td><td>
Wet Weather

Wet-weather TMDLs are calculated for cadmium, copper, lead, and zinc in Reach 1. Allocations are developed for all upstream reaches and tributaries to meet these TMDLs.
Wet-weather loading capacities are calculated by multiplying daily storm volumes by the wet-weather numeric target for each metal. The resulting curves identify the load allowance for a given flow.

Wet-weather loading capacity (total recoverable metals)
<table>
<tr><th>Metal</th><th>Load Duration Curve (kg/day)</th></tr>
<tr><td>Cadmium</td><td>Daily storm volume x WER[1] x 3.1 µg/L</td></tr>
<tr><td>Copper</td><td>Daily storm volume x WER[2] x 17 µg/L</td></tr>
<tr><td>Lead</td><td>Daily storm volume x WER[1] x 62 µg/L</td></tr>
<tr><td>Zinc</td><td>Daily storm volume x WER[1] x 159 µg/L</td></tr>
</table>
[1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. [2] The WER for this constituent is 3.96.
</td></tr>
<tr><td>Load Allocations
(for nonpoint sources)</td><td>
Dry Weather

Dry-weather nonpoint source load allocations (LAs) for copper and lead apply to open space and direct atmospheric deposition to the river. Dry-weather open space load allocations are equal to the critical flow for the upper portion of tributaries that drain open space, multiplied by the numeric targets for these tributaries.

Open space dry-weather LAs (total recoverable metals)
<table>
<tr><th></th><th>Critical Flow</th><th>Cu (kg/day)</th><th>Pb (kg/day)</th></tr>
<tr><td>Tujunga Wash</td><td>0.12</td><td>WER[1] x 0.0056</td><td>WER[1] x 0.0028</td></tr>
<tr><td>Arroyo Seco</td><td>0.33</td><td>WER[1] x 0.018</td><td>WER[1] x 0.009</td></tr>
</table>
[1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved.

Load allocations for direct atmospheric deposition to the entire river are obtained from previous studies (3 kg/year for copper, 2 kg/year for lead and 10 kg/year for zinc.) Loads are allocated to each reach and tributary based on their length. The ratio of the length of each river segment to the total length of the river is multiplied by the estimates of direct atmospheric loading to the entire river.
</td></tr>
</table>

Element	Key Findings and Regulatory Provisions
Load Allocations (continued) (for nonpoint sources)	**Direct air deposition dry-weather LAs (total recoverable metals)**

	Cu (kg/day)	Pb (kg/day)	Zn(kg/day)
LA River Reach 6	WER[1] x $3.3x10^{-4}$	WER[1] x $2.2x10^{-4}$	
LA River Reach 5	WER[1] x $3.6x10^{-4}$	WER[1] x $2.4x10^{-4}$	
LA River Reach 4	WER[1] x $8.1x10^{-4}$	WER[1] x $5.4x10^{-4}$	
LA River Reach 3	WER[1] x $6.04x10^{-4}$	WER[1] x $4.03x10^{-4}$	
LA River Reach 2	WER[1] x $1.4 x10^{-3}$	WER[1] x $9.5x10^{-4}$	
LA River Reach 1	WER[1] x $4.4x10^{-4}$	WER[1] x $2.96x10^{-4}$	
Bell Creek	WER[1] x $2.98x10^{-4}$	WER[1] x $1.99x10^{-4}$	
Tujunga Wash	WER[1] x $7.4x10^{-4}$	WER[1] x $4.9x10^{-4}$	
Verdugo Wash	WER[1] x $4.7x10^{-4}$	WER[1] x $3.2x10^{-4}$	
Burbank Channel	WER[1] x $7.1x10^{-4}$	WER[1] x $4.7x10^{-4}$	
Arroyo Seco	WER[1] x $7.3x10^{-4}$	WER[1] x $4.9x10^{-4}$	
Rio Hondo Reach 1	WER[1] x $6.4x10^{-4}$	WER[1] x $4.2x10^{-4}$	WER[1]x $2.1x10^{-3}$
Compton Creek	WER[1] x $6.5x10^{-4}$	WER[1] x $4.3x10^{-4}$	

[1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved.

A dry-weather concentration-based load allocation for lead equal to the dry-weather numeric target (WER[1] x 8.2 µg/L) applies to Monrovia Canyon Creek. The load allocation is not assigned to a particular nonpoint source or group of nonpoint sources.

[1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved.

A dry-weather concentration-based load allocation for selenium equal to the dry-weather numeric target (5 µg/L) is assigned to Reach 6 and its tributaries. The load allocation is not assigned to a particular nonpoint source or group of nonpoint sources.

Wet Weather

Wet-weather load allocations for open space are equal to the percent metals loading from open space (predicted by the wet-weather model) multiplied by the total loading capacity, then by the ratio of open space located outside the storm drain system to the total open space area. There is no load allocation for cadmium because open space is not believed to be a source of the wet-weather cadmium impairment in Reach 1.

Wet-weather open space LAs (total recoverable metals)

Metal	Load Allocation (kg/day)
Copper	WER[1] x $2.6x10^{-10}$ µg /L/day x daily storm volume(L)
Lead	WER[1] x $2.4x10^{-10}$ µg /L/day x daily storm volume(L)
Zinc	WER[1] x $1.4x10^{-9}$ µg /L/day x daily storm volume(L)

[1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved.

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td>Load Allocations (continued)
(for nonpoint sources)</td><td>Wet-weather load allocations for direct atmospheric deposition are equal to the percent area of the watershed comprised by surface water (0.2%) multiplied by the total loading capacity.

<u>Wet-weather direct air deposition LAs (total recoverable metals)</u>
<u>Metal Load Allocation (kg/day)</u>
Cadmium WER[1] x $6.2x10^{-10}$ µg /L/day x daily storm volume(L)
Copper WER[1] x $3.4x10^{-10}$ µg /L/day x daily storm volume(L)
Lead WER[1] x $1.2x10^{-10}$ µg /L/day x daily storm volume(L)
Zinc WER[1] x $3.2x10^{-9}$ µg /L/day x daily storm volume(L)
[1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved.

A wet-weather concentration-based load allocation for selenium equal to the dry-weather numeric target (5 µg/L) is assigned to Reach 6 and its tributaries. The load allocation is not assigned to a particular nonpoint source or group of nonpoint sources.</td></tr>
<tr><td>Waste Load Allocations
(for point sources)</td><td>Dry Weather

Dry-weather point source waste load allocations (WLAs) apply to the three POTWs (Tillman, Glendale, and Burbank). A grouped waste load allocation applies to the storm water permitees (Los Angeles County MS4, Long Beach MS4, Caltrans, General Industrial and General Construction), which is calculated by subtracting load allocations (and waste load allocations for reaches with POTWs) from the total loading capacity. Concentration-based waste load allocations are developed for other point sources in the watershed.

Mass- and concentration-based waste load allocations for Tillman, Los Angeles-Glendale and Burbank WRPs are developed to meet the dry-weather targets for copper and lead in Reach 4, Reach 3 and the Burbank Western Channel, respectively.

POTW dry-weather WLAs (total recoverable metals):
<table><tr><th></th><th>Cu</th><th>Pb</th></tr><tr><td>Tillman</td><td></td><td></td></tr><tr><td>Concentration-based (µg/L)</td><td>WER[2] x 26</td><td>WER[1] x 10</td></tr><tr><td>Mass-based (kg/day)</td><td>WER[2] x 7.8</td><td>WER[1] x 3.03</td></tr><tr><td>Glendale</td><td></td><td></td></tr><tr><td>Concentration-based (µg/L)</td><td>WER[2] x 26</td><td>WER[1] x 12</td></tr><tr><td>Mass-based (kg/day)</td><td>WER[2] x 2.0</td><td>WER[1] x 0.88</td></tr><tr><td>Burbank</td><td></td><td></td></tr><tr><td>Concentration-based (µg/L)</td><td>WER[2] x 19</td><td>WER[1] x 9.1</td></tr><tr><td>Mass-based (kg/day)</td><td>WER[2] x 0.64</td><td>WER[1] x 0.31</td></tr></table>[1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved.
[2] The WER for this constituent is 3.96. Regardless of the WER, effluent limitations shall ensure that effluent concentrations and mass discharges do not exceed the levels of water quality that can be attained by performance of this facility's treatment technologies existing at the time of permit issuance, reissuance, or modification.</td></tr>
</table>

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (continued) (for point sources)	Dry-weather waste load allocations for storm water are equal to storm drain flows (critical flows minus median POTW flows minus median open space flows) multiplied by reach-specific numeric targets, minus the contribution from direct air deposition.

Storm water dry-weather WLAs (total recoverable metals)

	Critical Flow (cfs)	Cu (kg/day)	Pb (kg/day)	Zn (kg/day)
LA River Reach 6	7.20	WER[1] x 0.53	WER[1] x 0.33	
LA River Reach 5	0.75	WER[1] x 0.05	WER[1] x 0.03	
LA River Reach 4	5.13	WER[1] x 0.32	WER[1] x 0.12	
LA River Reach 3	4.84	WER[1] x 0.06	WER[1] x 0.03	
LA River Reach 2	3.86	WER[1] x 0.13	WER[1] x 0.07	
LA River Reach 1	2.58	WER[1] x 0.14	WER[1] x 0.07	
Bell Creek	0.79	WER[1] x 0.06	WER[1] x 0.04	
Tujunga Wash	0.03	WER[1] x 0.001	WER[1] x 0.0002	
Burbank Channel	3.3	WER[1] x 0.15	WER[1] x 0.07	
Verdugo Wash	3.3	WER[1] x 0.18	WER[1] x 0.10	
Arroyo Seco	0.25	WER[1] x 0.01	WER[1] x 0.01	
Rio Hondo Reach 1	0.50	WER[1]x 0.01	WER[1]x0.006	WER[1]x 0.16
Compton Creek	0.90	WER[1] x 0.04	WER[1] x 0.02	

[1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved.

A zero waste load allocation is assigned to all industrial and construction storm water permittees during dry weather. The remaining waste load allocations are shared by the MS4 permittees and Caltrans.

Other NPDES Permits

Concentration-based dry-weather waste load allocations apply to the other NPDES permits* that discharge to the reaches and tributaries in the following table.

* “Other NPDES permits” refers to minor NPDES permits, general non-storm water NDPES permits, and major permits other than the Tillman, LA-Glendale, and Burbank POTWs.

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (continued) (for point sources)	**Other dry-weather WLAs (µg total recoverable metals/L)** **Cu** **Pb** **Zn** **Se** Reach 5, 6 and Bell Creek: WER[1] x 30 / WER[1] x 19 / 5 Reach 4: WER[1] x 26 / WER[1] x 10 Reach 3 above LA-Glendale WRP and Verdugo: WER[1] x 23 / WER[1] x 12 Reach 3 below LA-Glendale WRP: WER[1] x 26 / WER[1] x 12 Burbank Western Channel(above WRP): WER[1] x 26 / WER[1] x 14 Burbank Western Channel (below WRP): WER[1] x 19 / WER[1] x 9.1 Reach 2 and Arroyo Seco: WER[1] x 22 / WER[1] x 11 Reach 1: WER[1] x 23 / WER[1] x 12 Compton Creek: WER[1] x 19 / WER[1] x 8.9 Rio Hondo Reach 1: WER[1] x 13 / WER[1] x 5.0 / WER[1] x 131 [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. **Wet Weather** During wet-weather, POTW allocations are based on dry-weather in-stream numeric targets because the POTWs exert the greatest influence over in-stream water quality during dry weather. During wet weather, the concentration-based dry-weather waste load allocations apply but the mass-based dry-weather allocations do not apply when influent flows exceed the design capacity of the treatment plants. Additionally, the POTWs are assigned reach-specific allocations for cadmium and zinc based on dry weather targets to meet the wet-weather TMDLs in Reach 1.

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (continued) (for point sources)	**POTW wet-weather WLAs (total recoverable metals):** **Cd Cu Pb Zn** **Tillman** Concentration-based (µg/L) WER[1]x4.7 WER[2]x26 WER[1]x10 WER[1]x212 Mass-based (kg/day) WER[1]x1.4 WER[2]x7.8 WER[1]x 3.03 WER[1]x64 **Glendale** Concentration-based (µg/L) WER[1]x5.3 WER[2]x26 WER[1]x12 WER[1]x253 Mass-based (kg/day) WER[1]x0.40 WER[2]x2.0 WER[1]x0.88 WER[1]x19 **Burbank** Concentration-based (µg/L) WER[1]x4.5 WER[2]x19 WER[1]x9.1 WER[1]x 212 Mass-based (kg/day) WER[1]x0.15 WER[2]x0.64 WER[1]x0.31 WER[1]x7.3 [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. [2] The WER for this constituent is 3.96. Regardless of the WER, effluent limitations shall ensure that effluent concentrations and mass discharges do not exceed the levels of water quality that can be attained by performance of this facility's treatment technologies existing at the time of permit issuance, reissuance, or modification. Wet-weather waste load allocations for the grouped storm water permittees are equal to the total loading capacity minus the load allocations for open space and direct air deposition and the waste load allocations for the POTWs. Wet-weather waste load allocations for the grouped storm water permittees apply to all reaches and tributaries. **Storm water wet-weather WLAs (total recoverable metals):** **Metal — Waste Load Allocation (kg/day)** Cadmium — WER[1] x 3.1×10^{-9} x daily volume(L) – 1.95 Copper — WER[1] x 1.7×10^{-8} x daily volume (L) – 10 Lead — WER[1] x 6.2×10^{-8} x daily volume (L) – 4.2 Zinc — WER[1] x 1.6×10^{-7} x daily volume (L) – 90 [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. The combined storm water waste load allocation is apportioned between the different storm water categories by their percent area of the portion of the watershed served by storm drains. **MS4 wet-weather WLAs (total recoverable metals):** **Metal — Waste Load Allocation (kg/day)** Cadmium — WER[1] x 2.8×10^{-9} x daily volume(L) – 1.8 Copper — WER[1] x 1.5×10^{-8} x daily volume (L) – 9.5 Lead — WER[1] x 5.6×10^{-8} x daily volume (L) – 3.85 Zinc — WER[1] x 1.4×10^{-7} x daily volume (L) – 83

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (continued) (for point sources)	**Caltrans wet-weather WLAs (total recoverable metals):** **Metal** — **Waste Load Allocation (kg/day)** Cadmium: $WER^1 \times 5.3\times10^{-11}$ x daily volume(L) – 0.03 Copper: $WER^1 \times 2.9\times10^{-10}$ x daily volume (L) – 0.2 Lead: $WER^1 \times 1.06\times10^{-9}$ x daily volume (L) – 0.07 Zinc: $WER^1 \times 2.7\times10^{-9}$ x daily volume (L) – 1.6 **General Industrial wet-weather WLAs (total recoverable metals):** **Metal** — **Waste Load Allocation (kg/day)** Cadmium: $WER^1 \times 1.6\times10^{-10}$ x daily volume(L) – 0.11 Copper: $WER^1 \times 8.8\times10^{-10}$ x daily volume (L) – 0.5 Lead: $WER^1 \times 3.3\times10^{-9}$ x daily volume (L) – 0.22 Zinc: $WER^1 \times 8.3\times10^{-9}$ x daily volume (L) – 4.8 **General Construction wet-weather WLAs (total recoverable metals):** **Metal** — **Waste Load Allocation (kg/day)** Cadmium: $WER^1 \times 5.9\times10^{-11}$ x daily volume(L) – 0.04 Copper: $WER^1 \times 3.2\times10^{-10}$ x daily volume (L) – 0.2 Lead: $WER^1 \times 1.2\times10^{-9}$ x daily volume (L) – 0.08 Zinc: $WER^1 \times 3.01\times10^{-9}$ x daily volume (L) – 4.8 [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. Each storm water permittee under the general industrial and construction storm water permits will receive individual waste load allocations per acre based on the total acres of their facility. **Individual General Construction or Industrial Permittees WLAs (total recoverable metals):** **Metal** — **Waste Load Allocation (g/day/acre)** Cadmium: $WER^1 \times 7.6\times10^{-12}$ x daily volume(L) – 4.8×10^{-6} Copper: $WER^1 \times 4.2\times10^{-11}$ x daily volume (L) – 2.6×10^{-5} Lead: $WER^1 \times 1.5\times10^{-10}$ x daily volume (L) – 1.04×10^{-5} Zinc: $WER^1 \times 3.9\times10^{-10}$ x daily volume (L) – 2.2×10^{-4} [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved.

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (continued) (for point sources)	**Other NPDES Permits** Concentration-based wet-weather waste load allocations apply to the other NPDES permits* that discharge to all reaches of the Los Angeles River and its tributaries. **Wet-weather WLAs for other permits (total recoverable metals)** **Cadmium (µg /L)** WER[1] x 3.1 **Copper (µg /L)** WER[1] x 17 **Lead (µg /L)** WER[1] x 62 **Zinc (µg /L)** WER[1] x 159 [1] WER(s) have a default value of 1.0 unless site-specific WER(s) are approved. * "Other NPDES permits" refers to minor NPDES permits, general non-storm water NDPES permits, and major permits other than the Tillman, LA-Glendale, and Burbank POTWs.
Margin of Safety	There is an implicit margin of safety that stems from the use of conservative values for the translation from total recoverable to the dissolved fraction during the dry and wet periods. In addition, the TMDL includes a margin of safety by evaluating wet-weather conditions separately from dry-weather conditions, which is in effect, assigning allocations for two distinct critical conditions. Furthermore, the use of the wet-weather model to calculate load allocations for open space can be applied to the margin of safety because it tends to overestimate loads from open spaces, thus reducing the available waste load allocations to the permitted discharges. An additional explicit margin of safety is provided in Reaches 1-4 and Burbank Western Channel for which a site-specific WER has been developed. Specifically, while the copper targets and loading capacity are adjusted based on the final WER of 3.96, only the WLAs for Tillman WRP, LA-Glendale WRP, and Burbank WRP are adjusted using the site-specific WER until additional data are collected to determine whether the site-specific WER is fully protective of aquatic life in all reaches and can be appropriately applied to all LAs and WLAs.
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the City of Long Beach MS4, the Caltrans storm water permit, major NPDES permits, minor NPDES permits, general NPDES permits, general industrial storm water NPDES permits, and general construction storm water NPDES permits. Nonpoint sources will be regulated through the authority contained in sections 13263 and 13269 of the Water Code, in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy (May 2004). Each NPDES permit assigned a WLA shall be reopened or amended at reissuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	The Regional Board shall reconsider this TMDL by January 11, 2011 based on additional data obtained from special studies. Table 7-13-2 presents the implementation schedule for the responsible permittees. **Implementation of WERs** The copper WER of 3.96 for Reaches 1-4 of the Los Angeles River and Burbank Western Channel shall apply until this TMDL is reconsidered. At the time this TMDL is reconsidered, the WER for Reaches 1-4 and Burbank Western Channel may be modified or revert back to a default of 1.0 unless additional data have been collected that support application of a WER to all WLAs and LAs, or confirm continued application of the site-specific WER to the WLAs for the POTWs only. Any WER that is incorporated into a discharger's permit shall include an appropriate reopener that authorizes the Regional Board to modify the WER as appropriate to accommodate new information. **Non storm water NPDES permits (including POTWs, other major, minor, and general permits):** Permit writers may translate applicable waste load allocations into daily maximum and monthly average effluent limits for the major, minor and general NPDES permits by applying the effluent limitation procedures in Section 1.4 of the State Water Resources Control Board's Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (2000) or other applicable engineering practices authorized under federal regulations. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to January 11, 2016 to achieve compliance with final WLAs. **General industrial storm water permits:** The Regional Board will develop a watershed-specific general industrial storm water permit to incorporate waste load allocations. <u>Dry-weather implementation</u> Non-storm water flows authorized by Order No. 97-03 DWQ, or any successor order, are exempt from the dry-weather waste load allocation equal to zero. Instead, these authorized non-storm water flows shall meet the reach-specific concentration-based waste load allocations assigned to the "other NPDES permits". The dry-weather waste load allocation equal to zero applies to unauthorized non-storm water flows, which are prohibited by Order No. 97-03 DWQ.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	It is anticipated that the dry-weather waste load allocations will be implemented by requiring improved best management practices (BMPs) to eliminate the discharge of non-storm water flows. However, permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of the numeric waste load allocations. Wet-weather implementation General industrial storm water permittees are allowed interim wet-weather concentration-based waste load allocations based on benchmarks contained in EPA's Storm Water Multi-sector General Permit for Industrial Activities. The interim waste load allocations apply to all industry sectors and apply until no later than January 11, 2016. **Interim wet-weather WLAs for general industrial storm water permittees (total recoverable metals)*** **Cd (µg/L)** 15.9 **Cu(µg/L)** 63.6 **Pb(µg/L)** 81.6 **Zn(µg/L)** 117 *Based on USEPA benchmarks for industrial storm water sector Until January 11, 2011, interim waste load allocations will not be interpreted as enforceable permit conditions. If monitoring demonstrates that interim waste load allocations are being exceeded, the permittee shall evaluate existing and potential BMPs, including structural BMPs, and implement any necessary BMP improvements. It is anticipated that monitoring results and any necessary BMP improvements would occur as part of an annual reporting process. After January 11, 2011, interim waste load allocations shall be translated into enforceable permit conditions. Compliance with permit conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. If this method of compliance is chosen, permit writers must provide adequate justification and documentation to demonstrate that BMPs are expected to result in attainment of interim waste load allocations. The general industrial storm water permits shall achieve final wet-weather waste load allocations no later than January 11, 2016, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs if adequate justification and documentation demonstrate that BMPs are expected to result in attainment of waste load allocations.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	**General construction storm water permits:** Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board. <u>Dry-weather implementation</u> Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3.and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be (1) infeasible to eliminate (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order. Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ. <u>Wet-weather implementation</u> By January 11, 2013, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration by January 11, 2014. General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs by January 11, 2015. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board by January 11, 2014, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations. **MS4 and Caltrans permits** Applicable CTR limits are being met most of the time during dry weather, with episodic exceedances. Due to the expense of obtaining accurate flow measurements required for calculating loads, concentration-based permit limits may apply during dry weather. These concentration-based limits would be equal to dry-weather reach-specific numeric targets.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	Each municipality and permittee will be required to meet the storm water waste load allocations shared by the two MS4s and Caltrans permittees at the designated TMDL effectiveness monitoring points. A phased implementation approach, using a combination of non-structural and structural BMPs may be used to achieve compliance with the waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the waste load allocations. The implementation schedule for the MS4 and Caltrans permittees consists of a phased approach. The watershed is divided into five jurisdictional groups based on the subwatersheds of the tributaries that drain to each reach of the river, as presented in Table 7-13-3. Each jurisdictional group shall achieve compliance in prescribed percentages of its subwatershed(s), with total compliance to be achieved within 22 years. Jurisdictional groups can be reorganized or subdivided upon approval by the Executive Officer.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for dry weather and wet weather. For dry weather, critical flows for each reach are established from the long-term flow records (1988-2000) generated by stream gages located throughout the watershed and in selected reaches. The median dry-weather urban runoff plus the combined design capacity of the three major POTWs is selected as the critical flow since most of the flow is from effluent which results in a relatively stable dry-weather flow condition. In areas where there are no flow records, an area-weighted approach is used to assign flows to these reaches. Wet-weather allocations are developed using the load-duration curve concept. The total wet-weather waste load allocation for wet weather varies by storm. Given this variability in storm water flows, no justification was found for selecting a particular sized storm as the critical condition.
Compliance Monitoring and Special Studies	Effective monitoring will be necessary to assess the condition of the Los Angeles River and its tributaries and to assess the on-going effectiveness of efforts by dischargers to reduce metals loading to the Los Angeles River. Special studies may also be appropriate to provide further information about new data, new or alternative sources, and revised scientific assumptions. Below the Regional Board identifies the various goals of monitoring efforts and studies. The programs, reports, and studies will be developed in response to subsequent orders issued by the Executive Officer.

Element	Key Findings and Regulatory Provisions
Compliance Monitoring and Special Studies (continued)	**Ambient Monitoring** An ambient monitoring program is necessary to assess water quality throughout the Los Angeles River and its tributaries and the progress being made to remove the metals impairments. The MS4 and Caltrans storm water NPDES permittees in each jurisdictional group are jointly responsible for implementing the ambient monitoring program. The responsible agencies shall sample for total recoverable metals, dissolved metals, including cadmium and zinc, and hardness once per month at each ambient monitoring location at least until the TMDL is re-considered at year 5. The reported detection limits shall be below the hardness adjusted CTR criteria. Eight ambient monitoring points currently exist in the Los Angeles River and its tributaries as part of the City of Los Angeles Watershed Monitoring Program. These monitoring points could be used to assess water quality. **Ambient Monitoring Points** — **Reaches and Tributaries** White Oak Avenue — LA River 6, Aliso Creek, McCoy Creek, Bell Creek Sepulveda Boulevard — LA River 5, Bull Creek Tujunga Avenue — LA River 4, Tujunga Wash Colorado Boulevard — LA River 3, Burbank Western Channel, Verdugo Wash Figueroa Street — LA River 3, Arroyo Seco Washington Boulevard — LA River 2 Rosecrans Avenue — LA River 2, Rio Hondo (gage just above Rio Hondo) Willow Street — LA River 1, Compton Creek (gage at Wardlow) **TMDL Effectiveness Monitoring** The MS4 and Caltrans storm water NPDES permittees in each jurisdictional group are jointly responsible for assessing progress in reducing pollutant loads to achieve the TMDL. Each jurisdictional group is required to submit for approval by the Executive Officer a coordinated monitoring plan that will demonstrate the effectiveness of the phased implementation schedule for this TMDL (See Table 7-13.2), which requires attainment of the applicable waste load allocations in prescribed percentages of each subwatershed over a 22-year period. The monitoring locations specified for the ambient monitoring program may be used as effectiveness monitoring locations.

Element	Key Findings and Regulatory Provisions
Compliance Monitoring and Special Studies (continued)	The MS4 and Caltrans storm water NPDES permittees will be found to be effectively meeting dry-weather waste load allocations if the in-stream pollutant concentration or load at the first downstream monitoring location is equal to or less than the corresponding concentration- or load-based waste load allocation. Alternatively, effectiveness of the TMDL may be assessed at the storm drain outlet based on the waste load allocation for the receiving water. For storm drains that discharge to other storm drains, the waste load allocation will be based on the waste load allocation for the ultimate receiving water for that storm drain system. The MS4 and Caltrans storm water NPDES permittees will be found to be effectively meeting wet-weather waste load allocations if the loading at the downstream monitoring location is equal to or less then the wet-weather waste load allocation. The general industrial storm water permit shall contain a model monitoring and reporting program to evaluate BMP effectiveness. A permittee enrolled under the general permit shall have the choice of conducting individual monitoring based on the model program or participating in a group monitoring effort. MS4 permittees are encouraged to take the lead in group monitoring efforts for industrial facilities within their jurisdiction because compliance with waste load allocations by these facilities will in many cases translate to reductions in metals loads to the MS4 system. The Tillman, LA-Glendale, and Burbank POTWs, and the remaining permitted discharges in the watershed will have effluent monitoring requirements to ensure compliance with waste load allocations. Additionally, the Tillman, LA-Glendale, and Burbank POTWs shall conduct additional receiving water monitoring to verify that water quality conditions are similar to those of the 2008 copper WER study period. Monitoring is also required to determine if the WER-based copper WLAs will achieve downstream water quality standards. This additional monitoring shall be required through the POTWs' NPDES permit monitoring and reporting programs or other Regional Board required monitoring programs. The Regional Board will evaluate the WER-based copper WLAs based on potential changes in the chemical characteristics of the water body that could impact the calculation or application of the WER and will revise the WERs and copper WLAs, if necessary, to ensure protection of beneficial uses. **Special Studies** The implementation schedule (see Table 7-13.2) allows time for special studies that may serve to refine the estimate of loading capacity, waste load and/or load allocations, and other studies that may serve to optimize implementation efforts. The Regional Board will re-consider the TMDL by January 11, 2011 in light of the findings of these studies. Studies may include:

Element	Key Findings and Regulatory Provisions
Compliance Monitoring and Special Studies (continued)	• Refined flow estimates for the Los Angeles River mainstem and tributaries where there presently are no flow gages and for improved gaging of low-flow conditions. • Water quality measurements, including a better assessment of hardness, water chemistry data (e.g., total suspended solids and organic carbon) that may refine the use of metals partitioning coefficients. • Effects studies designed to evaluate site-specific toxic effects of metals on the Los Angeles River and its tributaries. • Source studies designed to characterize loadings from background or natural sources • Review of water quality modeling assumptions including the relationship between metals and total suspended solids as expressed in the potency factors and buildup and washoff and transport coefficients. • Evaluation of aerial deposition and sources of aerial deposition. • POTWs that are unable to demonstrate compliance with final waste load allocations must conduct source reduction audits by January 11, 2008. • POTWs that will be requesting the Regional Board to extend their implementation schedule to allow for the installation of advanced treatment must prepare work plans, with time schedules to allow for the installation advanced treatment. The work plan must be submitted January 11, 2010.

Table 7-13.2 Los Angeles River and Tributaries Metals TMDL: Implementation Schedule

Date	Action
January 11, 2006	Regional Board permit writers shall incorporate waste load allocations into NPDES permits. Waste load allocations will be implemented through NPDES permit limits in accordance with the implementation schedule contained herein, at the time of permit issuance, renewal, or re-opener.
January 11, 2010	Responsible jurisdictions and agencies shall provide to the Regional Board results of the special studies. POTWs that will be requesting the Regional Board to extend their implementation schedule to allow for the installation of advanced treatment must submit work plans.
January 11, 2011	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
NON-STORM WATER NPDES PERMITS (INCLUDING POTWS, OTHER MAJOR, MINOR, AND GENERAL PERMITS)	
Upon permit issuance, renewal, or re-opener	The non-storm water NPDES permits shall achieve waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Permit writers may translate applicable waste load allocations into daily maximum and monthly average effluent limits for the major, minor and general NPDES permits by applying the effluent limitation procedures in Section 1.4 of the SIP or other applicable engineering practices authorized under federal regulations. Effluent limitations based on WER-adjusted WLAs shall ensure that effluent concentrations and mass discharges do not exceed the levels of water quality that can be attained by performance of a facility's treatment technologies existing at the time of permit issuance, reissuance, or modification. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to January 11, 2016 to achieve compliance with final WLAs.
GENERAL INDUSTRIAL STORM WATER PERMITS	
Upon permit issuance, renewal, or re-opener	The general industrial storm water permitees shall achieve dry-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall begin to install and test BMPs to meet the interim wet-weather WLAs. BMP effectiveness monitoring will be implemented to determine progress in achieving interim wet-weather waste load allocations.
January 11, 2011	The general industrial storm water permits shall achieve interim wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall begin an iterative BMP process including BMP effectiveness monitoring to achieve compliance with final waste load allocations.

Date	Action
January 11, 2016	The general industrial storm water permits shall achieve final wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
GENERAL CONSTRUCTION STORM WATER PERMITS	
Upon permit issuance, renewal, or re-opener	Non-storm water flows not authorized by Order No. 99-08 DWQ, or any successor order, shall achieve dry-weather waste load allocations of zero. Waste load allocations shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
January 11, 2013	The construction industry will submit the results of wet-weather BMP effectiveness studies to the Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.
January 11, 2014	The Regional Board will consider results of the wet-weather BMP effectiveness studies and consider approval of BMPs.
January 11, 2015	All general construction storm water permittees shall implement Regional Board-approved BMPs.
MS4 AND CALTRANS STORM WATER PERMITS	
April 11, 2007	In response to an order issued by the Executive Officer, each jurisdictional group must submit a coordinated monitoring plan, to be approved by the Executive Officer, which includes both TMDL effectiveness monitoring and ambient monitoring. Once the coordinated monitoring plan is approved by the Executive Officer ambient monitoring shall commence within 6 months.
January 11, 2010 (Draft Report) July 11, 2010 (Final Report)	Each jurisdictional group shall provide a written report to the Regional Board outlining the how the subwatersheds within the jurisdictional group will achieve compliance with the waste load allocations. The report shall include implementation methods, an implementation schedule, proposed milestones, and any applicable revisions to the TMDL effectiveness monitoring plan.
January 11, 2012	Each jurisdictional group shall demonstrate that 50% of the group's total drainage area served by the storm drain system is effectively meeting the dry-weather waste load allocations and 25% of the group's total drainage area served by the storm drain system is effectively meeting the wet-weather waste load allocations.
January 11, 2020	Each jurisdictional group shall demonstrate that 75% of the group's total drainage area served by the storm drain system is effectively meeting the dry-weather WLAs.

Date	Action
January 11, 2024	Each jurisdictional group shall demonstrate that 100% of the group's total drainage area served by the storm drain system is effectively meeting the dry-weather WLAs and 50% of the group's total drainage area served by the storm drain system is effectively meeting the wet-weather WLAs.
January 11, 2028	Each jurisdictional group shall demonstrate that 100% of the group's total drainage area served by the storm drain system is effectively meeting both the dry-weather and wet-weather WLAs.

Table 7-13.3 Los Angeles River and Tributaries Metals TMDL: Jurisdictional Groups

Jurisdictional Group	Responsible Jurisdictions & Agencies		Subwatershed(s)
1	Carson County of Los Angeles City of Los Angeles Compton Huntington Park Long Beach Lynwood Signal Hill Southgate Vernon		Los Angeles River Reach 1 and Compton Creek
2	Alhambra Arcadia Bell Bell Gardens Bradbury Carson Commerce Compton County of Los Angeles Cudahy Downey Duarte El Monte Glendale Huntington Park Irwindale La Canada Flintridge	Long Beach City of Los Angeles Lynwood Maywood Monrovia Montebello Monterey Park Paramount Pasadena Pico Rivera Rosemead San Gabriel San Marino Sierra Madre South El Monte South Pasadena Southgate Temple City Vernon	Los Angeles River Reach 2, Rio Hondo, Arroyo Seco, and all contributing sub watersheds
3	City of Los Angeles County of Los Angeles Burbank Glendale La Canada Flintridge Pasadena		Los Angeles River Reach 3, Verdugo Wash, Burbank Western Channel
4-5	Burbank Glendale City of Los Angeles County of Los Angeles San Fernando		Los Angeles River Reach 4, Reach 5, Tujunga Wash, and all contributing subwatersheds
6	Calabasas City of Los Angeles County of Los Angeles Hidden Hills		Los Angeles River Reach 6, Bell Creek, and all contributing subwatersheds

7-14 Ballona Creek Estuary Toxic Pollutants TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on July 7, 2005.

This TMDL was approved by:

The State Water Resources Control Board on October 20, 2005.
The Office of Administrative Law on December 15, 2005.
The U.S. Environmental Protection Agency on December 22, 2005.

The effective date of this TMDL is January 11, 2006.

The following tables include the elements of this TMDL.

Table 7-14.1. Ballona Creek Estuary Toxic Pollutants TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Ballona Creek and Ballona Creek Estuary (Estuary) is on the Clean Water Act Section 303(d) list of impaired waterbodies for cadmium, copper, lead, silver, zinc, chlordane, DDT, PCBs and PAHs in sediments. The following designated beneficial uses are impaired by these toxic pollutants: water contact recreation (REC1); non-contact water recreation (REC2); estuarine habitat (EST); marine habitat (MAR); wildlife habitat (WILD); rare and threatened or endangered species (RARE); migration of aquatic organisms (MIGR); reproduction and early development of fish (SPWN); commercial and sport fishing (COMM); and shellfish harvesting (SHELL).
Numeric Target (Interpretation of the narrative and numeric water quality objective, used to calculate the allocations)	Numeric water quality targets are based on the sediment quality guidelines compiled by the National Oceanic and Atmospheric Administration, which are used in evaluating waterbodies within the Los Angeles Region for development of the 303(d) list. The Effects Range-Low (ERLs) guidelines are established as the numeric targets for sediments in Ballona Creek Estuary. **Metal Numeric Targets (mg/kg)** Cadmium: 1.2 | Copper: 34 | Lead: 46.7 | Silver: 1.0 | Zinc: 150 **Organic Numeric Targets (µg/kg)** Chlordane: 0.5 | DDTs: 1.58 | Total PCBs: 22.7 | Total PAHs: 4,022

Element	Key Findings and Regulatory Provisions
Source Analysis	Urban storm water has been recognized as a substantial source of metals. Numerous researchers have documented that the most prevalent metals in urban storm water (i.e., copper, lead, zinc, and to a lesser degree cadmium) are consistently associated with suspended solids. Because metals are typically associated with fine particles in storm water runoff, they have the potential to accumulate in estuarine sediments where they may pose a risk of toxicity. McPherson et al.[1] estimated that 83% of the cadmium and 86% of the lead were associated with the particle phase in Ballona Creek. Similar to metals, the majority of organic constituents in storm water are associated with particulates, measured concentrations of PAHs, phthalates, and organochlorine compounds in Sepulveda Channel, Centinela Creek, and Ballona Creek found that the majority of these compounds occurred in association with suspended solids. There is toxicity associated with suspended solids in urban runoff discharged from Ballona Creek, as well as with the receiving water sediments. This toxicity is likely attributed to metals and PAHs associated with the suspended sediments. Nonpoint sources are not considered a significant source of toxic pollutants in this TMDL. Nonpoint sources are urban runoff from the Ballona Wetland, since this area discharges directly to the Estuary through a tide gate, and direct atmospheric deposition. The Ballona Wetlands cover approximately 460 acres or 0.6% of the watershed, therefore, loading from this source is considered insignificant. Direct atmospheric deposition of metals and PAHs is considered insignificant because the portion of the Ballona Creek watershed covered by water is small, approximately 480 acres or 0.6% of the watershed. Indirect atmospheric deposition reflects the process by which metals deposited on the land surface may be washed off during storm events and delivered to Ballona Creek and its tributaries. The loading of metals associated with indirect atmospheric deposition are accounted for in the storm water runoff.
Loading Capacity	TMDLs are developed for cadmium, copper, lead, silver, zinc, chlordane, DDT, PCBs and PAHs within the sediments of the Ballona Creek Estuary. The loading capacity for Ballona Creek Estuary is calculated by multiplying the numeric targets by the average annual deposition of fine sediment, defined as silts (grain size 0.0625 millimeters) and smaller, within the Estuary by the bulk density of the sediment. The average annual fine sediment deposited is 5,004 cubic meters per year (m^3/yr) and the bulk density is 1.42 metric tons per cubic meter (mt/m^3). The TMDL is set equal to the loading capacity. **Metals Loading Capacity (kilograms/year)** Cadmium: 8.5 — Copper: 241.6 — Lead: 332 — Silver: 7.1 — Zinc: 1,066 **Organics Loading Capacity (grams/year)** Chlordane: 3.55 — DDTs: 11.2 — Total PCBs: 161 — Total PAHs: 28,580

<table>
<tr><th>Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td>Load Allocations
(for nonpoint sources)</td><td>Load allocations (LA) are assigned to nonpoint sources for Ballona Creek Estuary. Load allocations are developed for open space and direct atmospheric deposition.

The mass-based load allocation for open space is equal to the percentage of the watershed covered by the Ballona Wetlands (0.6%) multiplied by the total loading capacity.

Metals Load Allocations for Open Space (kg/yr)
<table><tr><th>Cadmium</th><th>Copper</th><th>Lead</th><th>Silver</th><th>Zinc</th></tr><tr><td>0.05</td><td>1.4</td><td>2</td><td>0.04</td><td>6</td></tr></table>
Organics Load Allocations for Open Space (g/yr)
<table><tr><th>Chlordane</th><th>DDTs</th><th>Total PCBs</th><th>Total PAHs</th></tr><tr><td>0.02</td><td>0.1</td><td>1</td><td>160</td></tr></table>
The mass-based load allocation for direct atmospheric deposition is equal to the percentage of the watershed covered by water (0.6%) multiplied by the total loading capacity.

Metals Load Allocations for Direct Atmospheric Deposition (kg/yr)
<table><tr><th>Cadmium</th><th>Copper</th><th>Lead</th><th>Silver</th><th>Zinc</th></tr><tr><td>0.05</td><td>1.4</td><td>2</td><td>0.04</td><td>6</td></tr></table>
Organics Load Allocations for Direct Atmospheric Deposition (g/yr)
<table><tr><th>Chlordane</th><th>DDTs</th><th>Total PCBs</th><th>Total PAHs</th></tr><tr><td>0.02</td><td>0.1</td><td>1</td><td>170</td></tr></table></td></tr>
<tr><td>Waste Load Allocations
(for point sources)</td><td>Waste load allocations (WLA) are assigned to point sources for the Ballona Creek watershed. A grouped mass-based waste load allocation is developed for the storm water permittees (Los Angeles County MS4, Caltrans, General Construction and General Industrial) by subtracting the load allocations from the total loading capacity. Concentration-based waste load allocations are developed for other point sources in the watershed.

Metals Waste Load Allocations for Storm Water (kg/yr)
<table><tr><th>Cadmium</th><th>Copper</th><th>Lead</th><th>Silver</th><th>Zinc</th></tr><tr><td>8.4</td><td>238.8</td><td>328</td><td>7.02</td><td>1,054</td></tr></table>
Organics Waste Load Allocations for Storm Water (g/yr)
<table><tr><th>Chlordane</th><th>DDTs</th><th>Total PCBs</th><th>Total PAHs</th></tr><tr><td>3.51</td><td>11</td><td>159</td><td>28,250</td></tr></table></td></tr>
</table>

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	The storm water waste load allocations are apportioned between the MS4 permittees, Caltrans, the general construction and the general industrial storm water permits based on an areal weighting approach. **Metals Storm Water WLAs Apportioned between Permits (kg/yr)** Cadmium / Copper / Lead / Silver / Zinc MS4 Permittees: 8.0 / 227.3 / 312.3 / 6.69 / 1003 Caltrans: 0.11 / 3.2 / 4.4 / 0.09 / 14 General Construction: 0.23 / 6.6 / 9.1 / 0.20 / 29 General Industrial: 0.06 / 1.7 / 2.3 / 0.05 / 7 **Organics Storm Water WLAs Apportioned between Permits (g/yr)** Chlordane / DDTs / Total PCBs / Total PAHs MS4 Permittees: 3.34 / 10.56 / 152 / 26,900 Caltrans: 0.05 / 0.15 / 2 / 400 General Construction: 0.10 / 0.31 / 4 / 800 General Industrial: 0.02 / 0.08 / 1 / 200 Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility. **Metals per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (g/yr/ac)** Cadmium / Copper / Lead / Silver / Zinc 0.1 / 3 / 4 / 0.1 / 13 **Organics per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (mg/yr/ac)** Chlordane / DDTs / Total PCBs / Total PAHs 0.04 / 0.14 / 2 / 350 Concentration-based waste load allocations are assigned to the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries. Any future minor NPDES permits or enrollees under a general non-storm water NPDES permit will also be subject to the concentration-based waste load allocations. **Metals Concentration-based Waste Load Allocations (mg/kg)** Cadmium / Copper / Lead / Silver / Zinc 1.2 / 34 / 46.7 / 1.0 / 150 **Organic Concentration-based Waste Load Allocations (µg/kg)** Chlordane / DDTs / Total PCBs / Total PAHs 0.5 / 1.58 / 22.7 / 4,022
Margin of Safety	An implicit margin of safety is applied through the use of the more protective sediment quality guideline values. The ERLs were selected over the higher ERMs as the numeric targets.

Element	Key Findings and Regulatory Provisions
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the State of California Department of Transportation (Caltrans) Storm Water Permit, minor NPDES permits, general NPDES permits, general industrial storm water NPDES permits, general construction storm water NPDES permits. Nonpoint sources will be regulated through the authority contained in sections 13263 and 13269 of the Water Code, in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy (May 2004). Each NPDES permit assigned a WLA shall be reopened or amended at re-issuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. The Regional Board shall reconsider this TMDL in six years after the effective date of the TMDL based on additional data obtained from special studies. Table 7-14.2 presents the implementation schedule for the responsible permittees. **Minor NPDES Permits and General Non-Storm Water NPDES Permits:** The concentration-based waste load allocations for the minor NPDES permits and general non-storm water NPDES permits will be implemented through NPDES permit limits. Permit writers may translate applicable waste load allocations into effluent limits for the minor and general NPDES permits by applying applicable engineering practices authorized under federal regulations. The minor and general non-storm water NPDES permittees are allowed up to seven years from the effective date of the TMDL to achieve the waste load allocations. **General Industrial Storm Water Permit:** The Regional Board will develop a watershed specific general industrial storm water permit to incorporate waste load allocations. Concentration-based permit limits may be set to achieve the mass-based waste load allocations. These concentration-based limits would be equal to the concentration-based waste load allocations assigned to the other NPDES permits. It is expected that permit writers will translate the waste load allocations into BMPs, based on BMP performance data. However, the permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of the numeric waste load allocations. The general industrial storm water permittees are allowed up to seven years from the effective date of the TMDL to achieve the waste load allocations.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	**General Construction Storm Water Permit:** Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed specific general construction storm water permit developed by the Regional Board. Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL. General construction storm water permittees will be considered in compliance with waste load allocations if they implement these Regional Board approved BMPs. All general construction permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with waste load allocations. **MS4 and Caltrans Storm Water Permits:** The County of Los Angeles, City of Los Angeles, Beverly Hills, Culver City, Inglewood, Santa Monica, and West Hollywood are jointly responsible for meeting the mass-based waste load allocations for the MS4 permittees. Caltrans is responsible for meeting their mass-based waste load allocations, however, they may choose to work with the MS4 permittees. The primary jurisdiction for the Ballona Creek watershed is the City of Los Angeles. Each municipality and permittee will be required to meet the waste load allocations at the designated TMDL effectiveness monitoring points. A phased implementation approach, using a combination of non-structural and structural BMPs may be used to achieve compliance with the waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the numeric waste load allocations. We expect that reductions to be achieved by each BMP will be documented and that sufficient monitoring will be put in place to verify that the desired reductions are achieved. The permits should also provide a mechanism to adjust the required BMPs as necessary to ensure their adequate performance. The implementation schedule for the MS4 and Caltrans permittees consists of a phased approach, with compliance to be achieved in prescribed percentages of the watershed, with total compliance to be achieved within 15 years.

Element	Key Findings and Regulatory Provisions
Seasonal Variations and Critical Conditions	There is a high degree of inter- and intra-annual variability in sediments deposited at the mouth of Ballona Creek. This is a function of the storms, which are highly variable between years. Studies by the Army Corps of Engineers have shown that sediment delivery to Ballona Creek is related to the size of the storm (USACE, 2003). The TMDL is based on a long-term average deposition patterns over a 10-year period from 1991 to 2001. This time period contains a wide range of storm conditions and flows in the Ballona Creek watershed. Use of the average condition for the TMDL is appropriate because issues of sediment effects on benthic communities and potential for bioaccumulation to higher trophic levels occurs over long time periods.
Monitoring	Effective monitoring will be required to assess the condition of Ballona Creek and Estuary and to assess the on-going effectiveness of efforts by dischargers to reduce toxic pollutants loading to the Ballona Creek Estuary. Special studies may also be appropriate to provide further information about new data, new or alternative sources, and revised scientific assumptions. Below the Regional Board identifies the various goals of monitoring efforts and studies. The programs, reports, and studies will be developed in response to subsequent orders issued by the Executive Officer. **Ambient Monitoring** An ambient monitoring program is necessary to assess water quality throughout Ballona Creek and its tributaries and to assess the progress being made to remove the toxic pollutant impairments in Ballona Creek Estuary sediments. Data on background water quality for organics and sediments will help refine the numeric targets and waste load allocations and assist in the effective placement of BMPs. In addition, fish and mussel tissue data is required in Ballona Creek Estuary to confirm the fish tissue listings. Water quality samples shall be collected from Ballona Creek and Estuary monthly and analyzed for cadmium, copper, lead, silver, zinc, chlordane, dieldrin, DDT, total PCBs and total PAHs at detection limits that are at or below the minimum levels until the TMDL is reconsidered in the sixth year. The minimum levels are those published by the State Water Resources Control Board in Appendix 4 of the Policy for the Implementation of Toxic Standards for Inland Surface Water, Enclosed Bays, and Estuaries of California, March 2, 2000. Special emphasis should be placed on achieving detection limits that will allow evaluation relative to the CTR standards. If these can not be achieved with conventional techniques, then a special study should be proposed to evaluate concentrations of organics.

Element	Key Findings and Regulatory Provisions
Monitoring (continued)	Storm water monitoring conducted as part of the MS4 storm water monitoring program should continue to provide assessment of water quality during wet-weather conditions and loading estimates from the watershed to the Estuary. If analysis of chlordane, dieldrin, DDT, total PCBs or total PAHs are not currently part of the sampling programs these organics should be added. In addition, special emphasis should be placed on achieving lower detection limits for DDTs, PCBs and PAHs. The MS4 and Caltrans storm water permittees are jointly responsible for conducting bioaccumulation testing of fish and mussel tissue within the Estuary. The permittees are required to submit for approval of the Executive Officer a monitoring plan that will provide the data needed to confirm the 303(d) listing or delisting, as applicable. Representative sediment sampling locations shall be randomly selected within the Estuary and analyzed for cadmium, copper, lead, silver, zinc, chlordane, dieldrin, DDT, total PCBs and total PAHs at detection limits that are lower than the ERLs. Sediment samples shall also be analyzed for total organic carbon, grain size and sediment toxicity testing. Initial sediment monitoring should be done quarterly in the first year of the TMDL to define the baseline and semi-annually, thereafter, to evaluate effectiveness of the BMPs until the TMDL is reconsidered in the sixth year. The sediment toxicity testing shall include testing of multiple species, a minimum of three, for lethal and non-lethal endpoints. Toxicity testing may include: the 28-day and 10-day amphipod mortality test; the sea urchin fertilization testing of sediment pore water; and the bivalve embryo testing of the sediment/water interface. The chronic 28-day and shorter-term 10-day amphipod tests may be conducted in the initial year of quarterly testing and the results compared. If there is no significant difference in the tests, then the less expensive 10-day test can be used throughout the rest of the monitoring, with some periodic 28-day testing. **TMDL Effectiveness Monitoring** The water quality samples collected during wet weather as part of the MS4 storm water monitoring program shall be analyzed for total dissolved solids, settable solids and total suspended solids if not already part of the existing sampling program. Sampling shall be designed to collect sufficient volumes of settable and suspended solids to allow for analysis of cadmium, copper, lead, silver, zinc, chlordane, dieldrin, total DDT, total PCBs, total PAHs, and total organic carbon in the bulk sediment.

Element	Key Findings and Regulatory Provisions
Monitoring (continued)	Semi-annually, representative sediment sampling locations shall be randomly selected within the Estuary and analyzed for cadmium, copper, lead, silver, zinc, chlordane, dieldrin, DDT, total PCBs, and total PAHs at detection limits that are lower than the ERLs. The sediment samples shall also be analyzed for total organic carbon, grain size and sediment toxicity. The sediment toxicity testing shall include testing of multiple species, a minimum of three, for lethal and non-lethal endpoints. Toxicity testing may include: the 28-day and 10-day amphipod mortality test; the sea urchin fertilization testing of sediment pore water; and the bivalve embryo testing of the sediment/water interface. Toxicity shall be indicated by an amphipod survival rate of 70% or less in a single test. Accelerated monitoring shall be conducted to confirm toxicity at stations identified as toxic. Accelerated monitoring shall consist of six additional tests, approximately every two weeks, over a 12-week period. If the results of any two of the six accelerated tests are less than 90% survival, then the MS4 and Caltrans permittees shall conduct a Toxicity Identification Evaluation (TIE). The TIE shall include reasonable steps to identify the sources of toxicity and steps to reduce the toxicity. The Phase I TIE shall include the following treatments and corresponding blanks: baseline toxicity; particle removal by centrifugation; solid phase extraction of the centrifuged sample using C8, C18, or another media; complexation of metals using ethylenediaminetetraacetic acid (EDTA) addition to the raw sample; neutralization of oxidants/metals using sodium thiosulfate addition to the raw sample; and inhibition of organo-phosphate (OP) pesticide activation using piperonyl butoxide addition to the raw sample (crustacean toxicity tests only). Bioaccumulation monitoring of fish and mussel tissue within the Estuary shall be conducted. The permittees are required to submit for approval of the Executive Officer a monitoring plan that will provide the data needed to assess the effectiveness of the TMDL. The general industrial storm water permit shall contain a model monitoring and reporting program to evaluate BMP effectiveness. A permittee enrolled under the general industrial permit shall have the choice of conducting individual monitoring based on the model program or participating in a group monitoring effort. MS4 permittees are encouraged to take the lead in group monitoring efforts for industrial facilities within their jurisdiction because compliance with waste load allocations by these facilities will in many cases translate to reductions in contaminate loads to the MS4 system.

Element	Key Findings and Regulatory Provisions
Monitoring (continued)	**Special Studies** Special studies are recommended to refine source assessments, to provide better estimates of loading capacity, and to optimize implementation efforts. The Regional Board will re-consider the TMDL in the sixth year after the effective date in light of the findings of these studies. Special studies may include: • Evaluation and use of low detection level techniques to evaluate water quality concentrations for those contaminants where standard detection limits cannot be used to assess compliance for CTR standards or are not sufficient for estimating source loadings from tributaries and storm water. • Developing and implementing a monitoring program to collection the data necessary to apply a multiple lines of evidence approach. • Evaluation and use of sediment TIEs to evaluate causes of any recurring sediment toxicity. • Evaluate partitioning coefficients between water column and sediment to assess the contribution of water column discharges to sediment concentrations in the Estuary. • Studies to refine relationship between pollutants and suspended solids aimed at better understanding of the delivery of pollutants to the watershed. • Studies to understand transport of sediments to the estuary, including the relationship between storm flows, sediment loadings to the estuary, and sediment deposition patterns within the estuary. • Studies to evaluate effectiveness of BMPs to address pollutants and/or sediments.

1 McPherson, T.N., S.J. Burian, H.J. Turin, M.K. Stenstrom and I.H. Suffet. 2002. Comparison of Pollutant Loads in Dry and Wet Weather Runoff in a Southern California Urban Watershed. *Water Science and Technology* 45:255-261.

Table 7-14.2. Ballona Creek Estuary Toxic Pollutants TMDL: Implementation Schedule

Date	Action
Effective date of the TMDL	Regional Board permit writers shall incorporate the waste load allocations for sediment into the NPDES permits. Waste load allocations will be implemented through NPDES permit limits in accordance with the implementation schedule contained herein, at the time of permit issuance, renewal or re-opener.
Within 6 months after the effective date of the State Board adopted sediment quality objectives and implementation policy	The Regional Board will re-assess the numeric targets and waste load allocations for consistency with the State Board adopted sediment quality objectives.
5 years after effective date of the TMDL	Responsible jurisdictions and agencies shall provide to the Regional Board result of any special studies.
6 years after effective date of the TMDL	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
MINOR NPDES PERMITS AND GENERAL NON-STORM WATER NPDES PERMITS	
7 years after effective date of the TMDL	The non-storm water NPDES permits shall achieve the concentration-based waste load allocations for sediment per provisions allowed for in NPDES permits.
GENERAL INDUSTRIAL STORM WATER PERMIT	
7 years after effective date of the TMDL	The general industrial storm water permits shall achieve the mass-based waste load allocations for sediment per provisions allowed for in NPDES permits. Permits shall allow an iterative BMP process including BMP effectiveness monitoring to achieve compliance with permit requirements.
GENERAL CONSTRUCTION STORM WATER PERMIT	
7 years from the effective date of the TMDL	The construction industry will submit the results of the BMP effectiveness studies to the Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.
8 years from the effective date of the TMDL	The Regional Board will consider results of the BMP effectiveness studies and consider approval of BMPs no later than six years from the effective date of the TMDL.
9 years from the effective date of the TMDL	All general construction storm water permittees shall implement Regional Board-approved BMPs.
MS4 AND CALTRANS STORM WATER PERMITS	
12 months after the effective date of the TMDL	In response to an order issued by the Executive Officer, the MS4 and Caltrans storm water NPDES permittees must submit a coordinated monitoring plan, to be approved by the Executive Officer, which includes both ambient monitoring and TMDL effectiveness monitoring. Once the coordinated monitoring plan is approved by the Executive Officer, ambient monitoring shall commence within 6 months.

Date	Action
5 years after effective date of TMDL (Draft Report) 5 ½ years after effective date of TMDL (Final Report)	The MS4 and Caltrans storm water NPDES permittees shall provide a written report to the Regional Board outlining how they will achieve the waste load allocations for sediment to Ballona Creek Estuary. The report shall include implementation methods, an implementation schedule, proposed milestones, and any applicable revisions to the TMDL effectiveness monitoring plan.
7 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 25% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
9 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 50% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
11 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 75% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
15 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.

7-16 Calleguas Creek Watershed Toxicity TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on July 7, 2005.

This TMDL was approved by:

The State Water Resources Control Board on September 22, 2005.
The Office of Administrative Law on December 22, 2005.
The U.S. Environmental Protection Agency on March 14, 2006.

The effective date of this TMDL is: March 24, 2006.

Table 7-16.1. Calleguas Creek Watershed Toxicity TMDL: Elements

TMDL Element	Calleguas Creek Watershed Toxicity TMDL
Problem Statement	Discharge of wastes containing chlorpyrifos, diazinon, other pesticides and/or other toxicants to Calleguas Creek, its tributaries and Mugu Lagoon cause exceedances of water quality objectives for toxicity established in the Basin Plan. Elevated levels of chlorpyrifos have been found in fish tissue samples collected from a segment of Calleguas Creek. Chlorpyrifos and diazinon are organophosphate pesticides used in both agricultural and urban settings. Excessive chlorpyrifos and diazinon can cause aquatic life toxicity in inland surface and estuarine waters such as Calleguas Creek and Mugu Lagoon. The California 2002 303(d) list of impaired waterbodies includes listings for "water column toxicity," "sediment toxicity," chlorpyrifos in fish tissue," and "organophosphate pesticides in water" for various reaches of Calleguas Creek, its tributaries and Mugu Lagoon.
Numeric Targets	A water column toxicity target of 1.0 toxicity unit – chronic (1.0 TUc) is established to address toxicity in reaches where the toxicant has not been identified through a Toxicity Identification Evaluation (TIE) (unknown toxicity). TU_C = Toxicity Unit Chronic = 100/NOEC (no observable effects concentration) A sediment toxicity target was defined in the technical report for reaches where the sediment toxicant has not been identified through a TIE. The target is based on the definition of a toxic sediment sample as defined by the September 2004 Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List (SWRCB). Chlorpyrifos Numeric Targets (ug/L) Chronic (4 day average) / Acute (1 hour average) Freshwater 0.014 / 0.025 Saltwater (Mugu Lagoon) 0.009 / 0.02

TMDL Element	Calleguas Creek Watershed Toxicity TMDL
Numeric Targets (continued)	Diazinon Numeric Targets (ug/L) Chronic (4 day average) / Acute (1 hour average) Freshwater 0.10 / 0.10 Saltwater (Mugu Lagoon) 0.40 / 0.82 Additionally, the diazinon criteria selected as numeric targets are currently under review by the USEPA. If water quality objectives become available, the Regional Board may reconsider this TMDL and revise the water toxicity numeric target.
Source Analysis	Source analysis determined that agricultural and urban uses are the largest sources of chlorpyrifos and diazinon in the watershed. Urban use of diazinon and chlorpyrifos is unlikely to be a long-term source to the Calleguas Creek Watershed (CCW) as both of these pesticides have been banned for sale for non-agricultural uses on December 31, 2005 by federal regulation. As a result, the proportion of the loading from urban sources will likely decrease after December 2005. Chlorpyrifos – Sources by Use Dry Weather / Wet Weather Agriculture 66% / 80% Urban 23% / 20% POTW 11% / <1% Other <1% / <1% Diazinon – Sources by Use Dry Weather / Wet Weather Agriculture 30% / 1% Urban 13% / 62% POTW 57% / 37% Other <1% / <1%

TMDL Element	Calleguas Creek Watershed Toxicity TMDL
Linkage Analysis	Water quality modeling established the linkage of sources of chlorpyrifos and diazinon in the CCW to observed water quality data. The linkage analysis qualitatively describes the connection between water column concentrations and sediment and fish tissue concentrations. The qualitative analysis demonstrates that the water column analysis conducted by laboratories implicitly includes sediment associated diazinon and chlorpyrifos loads transported to receiving waters as almost all water quality data do not differentiate between dissolved and particulate fractions. The linkage analysis assumes a reduction in water column concentrations will result in a reduction in fish tissue as chlorpyrifos in freshwater fish tissue rapidly depurate within several days of removal from exposure. Additionally, as chlorpyrifos preferentially binds to sediment the linkage analysis suggests that sediment concentrations of chlorpyrifos will need to decrease to achieve water quality numeric targets. The modeling approach reflects the uncertainty in current conditions and the potential impacts of watershed planning actions that may affect those conditions. A detailed description of the model is provided in an Attachment to the TMDL Technical Report.
Wasteload Allocations (WLA)	**Major point sources:** A wasteload of 1.0 TU_c is allocated to the major point sources (POTWs) discharging to the Calleguas Creek Watershed. Additionally, the following wasteloads for chlorpyrifos and diazinon are established and based on the numeric target for POTWs. The concentration based wasteload allocations for Camarillo and Camrosa WRPs for chlopyrifos is reduced by a 5% margin of safety from the numeric targets. This margin of safety is applied to the Calleguas Creek and Revelon subwatersheds based on uncertainty in the linkages between the water column criteria and fish tissue and sediment concentrations. **Chlorpyrifos WLAs, ug/L** POTW — Interim WLA: Chronic (4 day) 0.030; Final WLA: Acute (1hour) / Chronic (4 day) Hill Canyon WWTP: 0.025 / 0.014 Simi Valley WQCP: 0.025 / 0.014 Ventura County (Moorpark) WTP: 0.025 / 0.014 Camarillo WRP: 0.024 / 0.0133 Camrosa WRP: 0.024 / 0.0133

TMDL Element	Calleguas Creek Watershed Toxicity TMDL
Wasteload Allocations (WLA) (continued)	**Diazinon WLAs, ug/L** POTW: Hill Canyon WWTP; Simi Valley WQCP; Ventura County (Morepark) WTP; Camarillo WRP; Camrosa WRP Interim Acute (1 hour): 0.567 Interim Chronic (4 day): 0.312 Final WLA (Acute or Chronic): 0.10 A wasteload of 1.0 TU_c is allocated to Urban Stormwater Co-Permittees (MS4) discharges to the Calleguas Creek Watershed. Additionally, the following wasteloads for chlorpyrifos and diazinon are established for MS4 discharges. **Chlorpyrifos WLAs, ug/L** Interim WLA (4 day): 0.45 Final WLA (4 day): 0.014 **Diazinon WLAs, ug/L** Interim WLA Acute (1 hour): 1.73 Interim WLA Chronic (4 day): 0.556 Final WLA Acute and Chronic: 0.10 **Minor point sources:** Minor sources include NPDES permittees other than POTWs, and Urban Stormwater Co-Permittees (MS4s) discharging to the Calleguas Creek Watershed. A wasteload of 1.0 TU_c is allocated to the minor point sources discharging to the Calleguas Creek Watershed. Additionally, the following wasteloads for chlorpyrifos and diazinon are established.

TMDL Element	Calleguas Creek Watershed Toxicity TMDL
Wasteload Allocations (WLA) (continued)	**Chlorpyrifos WLAs, ug/L** Interim WLA Chronic (4 day) 0.45 — Final WLA Acute (1hour) 0.025 — Final WLA Chronic (4 day) 0.014 **Diazinon WLAs, ug/L** Interim WLA Acute (1 hour) 1.73 — Interim WLA Chronic (4 day) 0.556 — Final WLA Acute and Chronic 0.10
Load Allocations	**Non Point Source Dischargers:** A load of 1.0 TU_c is allocated to nonpoint sources discharging to the Calleguas Creek Watershed. Additionally, the following loads for chlorpyrifos and diazinon are established and based on the numeric targets. These loads apply to dischargers in accordance with the subwatershed into which the dischargers discharge. The concentration based load allocations for the Calleguas Creek and Revelon subwatersheds for chlopyrifos is reduced by a 5% margin of safety from the numeric targets. This margin of safety is based on uncertainty in the linkages between the water column criteria and fish tissue and sediment concentrations. **Chlorpyrifos Load Allocations, ug/L** Subwatershed — Interim Acute (1-hour) — Interim Chronic (4-day) — Final Acute (1-hour) — Final Chronic (4-day) Arroyo Simi — 2.57 — 0.810 — 0.025 — 0.014 Las Posas — 2.57 — 0.810 — 0.025 — 0.014 Conejo — 2.57 — 0.810 — 0.025 — 0.014 Calleguas — 2.57 — 0.810 — 0.024 — 0.0133 Revolon — 2.57 — 0.810 — 0.024 — 0.0133 Mugu Lagoon — 2.57 — 0.810 — 0.025 — 0.014 **Diazinon Load Allocations, ug/L** Interim LA Acute (1 hour) 0.278 — Interim LA Chronic (4 day) 0.138 — Final LA Acute and Chronic 0.10

TMDL Element	Calleguas Creek Watershed Toxicity TMDL
Margin of Safety	In addition to the implicit margin of safety achieved by conservative assumptions and by using a concentration based TMDL, an explicit margin of safety of 5% has been added to the targets for chlorpyrifos in the Calleguas and Revolon subwatersheds and to the Camarillo and Camrosa WRPs to address uncertainty in the linkages between the water column criteria and fish tissue and sediment concentrations. The Calleguas and Revolon subwatersheds include those reaches listed for sediment toxicity and chlorpyrifos in fish tissue.
Future Growth	Ventura County accounts for slightly more than 2% of the state's residents with a population of 753,197 (US Census Bureau, 2000). GIS analysis of the 2000 census data yields a population estimate of 334,000 for the CCW, which equals about 44% of the county population. According to the Southern California Association of Governments (SCAG), growth in Ventura County averaged about 51% per decade from 1900-2000; with growth exceeding 70% in the 1920s, 1950s, and 1960s. The phase-out of chlorpyrifos and diazinon is expected to reduce loads from urban and POTWs significantly by 2007. Use of diazinon in agriculture has declined considerably between 1998 and 2003. Conversely, chlorpyrifos use in agriculture has remained relatively stable over the same period. The phase out of chlorpyrifos and diazinon as well as population growth will cause an increase in the use of replacement pesticides (e.g. pyrethroids) in the urban environment and may have an impact on water and/or sediment toxicity. Additionally, population growth may affect an increase in the levels of chlorpyrifos and diazinon loading in the CCW from imported products which contain residues of these pesticides.
Critical Conditions	The critical condition in this TMDL is defined as the flowrate at which the model calculated the greatest in-stream diazinon or chlorpyrifos concentration in comparison to the appropriate criterion. The critical condition for chlorpyrifos was in dry weather based on a chronic numeric target; the critical condition for diazinon was in wet weather based on an acute numeric target except in Mugu Lagoon where it was in dry weather based on the chronic numeric target.
Implementation Plan	WLAs established for the major points sources, including POTWs in the CCW will be implemented through NPDES permit effluent limits. The final WLAs will be included in NPDES permits in accordance with the compliance schedules provided. The Regional Board may revise these WLAs based on additional information as described in the Special Studies and Monitoring Section of the Technical Report. The toxicity WLAs will be implemented in accordance with US EPA, State Board and Regional Board resolutions, guidance and policy at the time of permit issuance or renewal. Currently, these WLAs would be implemented as a trigger for initiation of the TRE/TIE process as outlined in USEPA's "Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination System Program" (2000) and current NPDES permits held by dischargers to the CCW.

TMDL Element	Calleguas Creek Watershed Toxicity TMDL
Implementation Plan (continued)	Stormwater WLAs will be incorporated into the NPDES permit as receiving water limits measured in-stream at the base of each subwatershed and will be achieved through the implementation of BMPs as outlined below. Evaluation of progress of the TMDL will be determined through the measurement of in-stream water quality and sediment at the base of each of the CCW subwatersheds. The Regional Board may revise these WLAs based on additional information developed through special studies and/or monitoring conducted as part of the TMDL. As shown in Table 7-16.2 the following implementation actions will be taken by the MS4s discharging to the CCW and POTWs located in the CCW: • Plan, develop, and implement an urban pesticides public education program; • Plan, develop, and implement urban pesticide education and chlorpyrifos and diazinon collection program; • Study diazinon and chlorpyrifos replacement pesticides for use in the urban environment; and, • Conduct environmental monitoring as outlined in the Monitoring Plan and NPDES Permits. LAs for chlorpyrifos and diazinon will be implemented through the State's Nonpoint Source Pollution Control Program (NPSPCP), nonpoint source pollution (i.e. Load Allocations). The LARWQCB is currently developing a Conditional Waiver for Irrigated Lands. Once adopted, the Conditional Waiver Program will implement allocations and attain numeric targets of this TMDL. Compliance with LAs will be measured at the monitoring sites approved by the Executive Officer of the Regional Board through the monitoring program developed as part of the Conditional Waiver, or through a monitoring program that is required by this TMDL. The toxicity LAs will be implemented in accordance with US EPA, State Board and Regional Board resolutions, guidance and policy at the time of permit or waiver issuance or renewal. The following implementation actions will be taken by agriculture dischargers located in the CCW: • Enroll for coverage under a waiver of waste discharge requirements for irrigated lands; • Implement monitoring required by this TMDL and the Conditional Waiver program; • Complete studies to determine the most appropriate BMPs given crop type, pesticide, site specific conditions, as well as the critical condition defined in the development of the LAs; and, • Implement appropriate BMPs and monitor to evaluate effectiveness on in-stream water and sediment quality.

TMDL Element	Calleguas Creek Watershed Toxicity TMDL
Implementation Plan (continued)	The Regional Board may revise this TMDL based on monitoring data and special studies of this TMDL. If the Regional Board revises NPDES permits or the Basin Plan to use other methods of evaluating toxicity or if other information supporting other methods becomes available, the Regional Board may reconsider this TMDL and revise the water toxicity numeric target. Additionally, the development of sediment quality guidelines or criteria and other water quality criteria revisions may call for the reevaluation of the TMDL. The Implementation Plan includes this provision for reevaluating the TMDL to consider sediment quality guidelines or criteria and revised water quality objectives and the results of implementation studies, if appropriate.

Table 7-16.2. Overall Implementation Schedule for Calleguas Creek Watershed Toxicity TMDL

Implementation Action		Responsible Party	Date
1	Interim chlorpyrifos and diazinon waste-load allocations apply.[1]	POTW permittees and MS4 Copermittees	Effective date[2]
2	Interim chlorpyrifos and diazinon load allocations apply.[1]	Agricultural Dischargers	Effective date[2]
3	Finalize and submit workplan for integrated Calleguas Creek Watershed Monitoring Program for approval by the Regional Board Executive Officer.[3]	POTW permittees, MS4 Copermittees, and Agricultural Dischargers	6 months after effective date of amendment[2]
4	Initiate Calleguas Creek Watershed Toxicity TMDL Monitoring Program developed under Task 3 workplan.	POTW permittees, MS4 Copermittees, and Agricultural Dischargers	6 months after E.O. approval of Monitoring Program (task 3) workplan.
5	Conduct Special Study #1-Investigate the pesticides that will replace diazinon and chlorpyrifos in the urban environment, their potential impact on receiving waters, and potential control measures.	POTW permittees and MS4 Copermittees	2 years after effective date[2]
6	Conduct Special Study #2 – Consider results of monitoring of sediment concentrations by source/land use type through special study required in Special Study #1 of the OC Pesticides, PCBs and siltation TMDL Implementation Plan. If the special study is not completed through the OC Pesticides, PCBs and Siltation TMDL no consideration is necessary[3]	Agricultural Dischargers[3] and MS4 Copermittees	6 months after completion of CCW OC Pesticides, PCBs and Siltation TMDL sediment concentrations special study.[2]
7	Develop and implement collection program for diazinon and chlorpyrifos and an educational program. Collection and education could occur through existing programs such as household hazardous waste collection events	POTW permittees and MS4 Copermittees	3 years after effective date[2]
8	Develop an Agricultural Water Quality Management Plan in conjunction with the Conditional Waiver for Irrigated Lands, or (if the Conditional Waiver is not adopted in a timely manner) develop an Agricultural Water Quality Management Plan as part of the Calleguas Creek WMP.	Agricultural Dischargers[3]	3 years after effective date[2]
9	Identify the most appropriate BMPs given crop type, pesticide, site specific conditions, as well as the critical condition defined in the development of the LAs.	Agricultural Dischargers[3]	3 years after effective date[2]
10	Implement educational program on BMPs identified in the Agricultural Water Quality Management Plan.	Agricultural Dischargers	1 year after E.O. approval of Plan (Task 7)[2]
11	Conduct Special Study #3-Calculation of sediment transport rates in CCW. Consider findings of transport rates developed through Special Study #1 of the OC Pesticides, PCBs and siltation TMDL Implementation Plan. If the special study is not completed through the OCs TMDL, no consideration is necessary.[3]	Agricultural Dischargers[3] and MS4 Copermittees	6 months after completion of CCW OC Pesticides, PCBa and Siltation TMDL sediment transport special study.[2]
12	Begin implementation of BMPs.	Agricultural Dischargers[3]	1 year after E.O. approval of Plan (Task 8)[2]
13	Evaluate effectiveness of BMPs.	Agricultural Dischargers[3]	3 years after E.O. approval of Plan (Task 8)[2]

Implementation Action		Responsible Party	Date
14	Reevaluate the TMDLs, interim or final WLAs and LAs, and implementation schedule based on monitoring data and on the results of Implementation Actions 1-13 and if sediment guidelines are promulgated, or water quality criteria are revised, and/or if targets are achieved without attainment of WLAs or LAs.	Stakeholders and Regional Board	2 years after the submittal of information necessary to reevaluate the TMDL
15	Achievement of Final WLAs	POTW permittees and MS4 Copermittees	2 years after the effective date of the TMDL[2]
16	Achievement of Final LAs	Agricultural Dischargers	10 years after the effective date of the TMDL[2]

1 Interim WLAs and LAs are effective immediately upon TMDL adoption. WLAs will be placed in POTW NPDES permits as effluent limits. WLAs will be placed in stormwater NPDES permits as in-stream limits. LAs will be implemented using applicable regulatory mechanisms.

2 Effective date of this TMDL.

3 The Regional Board regulatory programs addressing all discharges in effect at the time an implementation task is due may contain requirements substantially similar to the requirements of an implementation task. If such a requirement is in place in another regulatory program including other TMDLs, the Executive Officer may determine that such other requirements satisfy the requirements of an implementation task of the TMDL and thereby coordinate this TMDL implementation plan with other regulatory programs.

7-17 Calleguas Creek Organochlorine Pesticides, Polychlorinated Biphenyls, and Siltation TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on July 7, 2005.

This TMDL was approved by:

The State Water Resources Control Board on September 22, 2005.
The Office of Administrative Law on January 20, 2006.
The U.S. Environmental Protection Agency on March 14, 2006.

The effective date of this TMDL is: March 24, 2006.

The following table includes the elements of the TMDL:

Table 7-17.1. Calleguas Creek Watershed OC Pesticides, PCBs, and Siltation TMDL: Elements

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Problem Statement	Eleven of fourteen reaches in the Calleguas Creek Watershed (CCW) were identified on the 2002 303(d) list of water-quality limited segments as impaired due to elevated levels of organochlorine (OC) pesticides and/or polychlorinated biphenyls (PCBs) in water, sediment, and/or fish tissue. Additionally, Mugu Lagoon was listed as impaired for sedimentation/siltation. OC pesticides and PCBs can bioaccumulate in fish tissue and cause toxicity to aquatic life in estuarine and inland waters. Siltation may transport OC Pesticides and PCBs to surface waters and impair aquatic life and wildlife habitats.
Numeric Targets	The following tables provide the targets for water, fish tissue, and sediment for this TMDL. Water column targets were derived from the California Toxic Rule (CTR) water quality criteria for protection of aquatic life. Chronic criteria (Criteria Continuous Concentration, or CCC) were applied unless otherwise noted in the table below:

Water Quality Targets (ng/L)[1]

Constituent	Freshwater	Marine[2]
Aldrin	300.0	130.0
Chlordane	4.3	4.0
Dacthal	3,500,000.0	(a)[3]
4,4'-DDD[4]	(a)[3]	(a)[3]
4,4'-DDE[5]	(a)[3]	(a)[3]
4,4'-DDT[6]	1.0	1.0
Dieldrin	56.0	1.9
Endosulfan I	56.0	8.7
Endosulfan II	56.0	8.7
Endrin	36.0	2.3
HCH (alpha-BHC[7])	(a)[3]	(a)[3]
HCH (beta-BHC)	(a)[3]	(a)[3]
HCH (delta-BHC)	(a)[3]	(a)[3]
HCH (gamma BHC)	950.0	160.0
Heptachlor	3.8	3.6
Heptachlor Epoxide	3.8	3.6
PCBs	140.0[8]	30.0
Toxaphene	0.2	0.2

1 ng/L: nanogram per litter
2 Marine numeric targets applied to Mugu Lagoon
3 Numeric targets have not been established for these constituents
4 DDD: Dichlorodiphenyldichloroethane
5 DDE: Dichlorodiphenyldichloroethylene
6 DDT: Dichlorodiphenyltrichloroethane
7 BHC: Hexachlorocyclohexane
8 Applies to sum of all congener or isomer or homolog or Aroclor analyses

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Numeric Targets (continued)	Fish tissue targets are derived from CTR human health criteria for consumption of organisms.

Fish Tissue Targets (ng/Kg)

Constituent	
Aldrin	50.0
Chlordane	830.0
Dacthal	(a)[9]
4,4'-DDD	45,000.0
4,4'-DDE	32,000.0
4,4'-DDT	32,000.0
Dieldrin	650.0
Endosulfan I	65,000,000.0
Endosulfan II	65,000,000.0
Endrin	3,200,000.0
HCH (alpha-BHC)	1,700.00
HCH (beta-BHC)	6,000.0
HCH (delta-BHC)	(a)[9]
HCH (gamma BHC)	8,200.
Heptachlor	2,400.0
Heptachlor Epoxide	1,200.0
PCBs	5,300.0[10]
Toxaphene	9,800.0

Sediment targets were derived from sediment quality guidelines contained in National Oceanographic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRT, Buchman, 1999).

Sediment Quality Targets (ng/dry Kg)

Constituent	Freshwater, TEL[11]	Marine[12], ERL[13]
Aldrin	(a)[9]	(a)[9]
Chlordane	4,500.0	500.0
Dacthal	(a)[9]	(a)[9]
4,4'-DDD	3,500.0	2,000.0
4,4'-DDE	1,400.0	2,200.0
4,4'-DDT	(a)[9]	1,000.0
Dieldrin	2,900.0	20.0
Endosulfan I	(a)[9]	(a)[9]
Endosulfan II	(a)[9]	(a)[9]
Endrin	2,700.0	(a)[9]
HCH (alpha-BHC)	(a)[9]	(a)[9]
HCH (beta-BHC)	(a)[9]	(a)[9]
HCH (delta-BHC)	(a)[9]	(a)[9]
HCH (gamma BHC)	940.0	(a)[9]
Heptachlor	(a)[9]	(a)[9]
Heptachlor Epoxide	600.0	(a)[9]
PCBs	34,000.0[10]	23,000.0
Toxaphene	(a)[9]	(a)[9]

9 Numeric targets have not been established for these constituents

10 Applies to sum of all congener or isomer or homolog or Aroclor analyses

11 TEL = Threshold Effects Level

12 Marine numeric targets applied to Mugu Lagoon

13 ERL = Effects Range-Low.

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
	Siltation Targets This TMDL includes two numeric targets for siltation reduction and maintenance of existing habitat in Mugu Lagoon which are listed below: • Siltation reduction Annual average reduction in the import of silt of 5,200 tons/year, which will be measured at the US Naval Base total suspended sediment gauge at the entrance to Mugu Lagoon. • Maintenance of existing habitat in Mugu Lagoon Preservation of the existing 1400 acres of aquatic habitat in Mugu Lagoon.
Source Analysis	Monitoring data from major NPDES discharges and land use runoff were analyzed to estimate the magnitude of OC pesticides and PCBs loads to Calleguas Creek, its tributaries and Mugu Lagoon. The largest source of OC pesticides in the listed waters is agricultural runoff. Most PCB residues are due to past use of PCBs as coolants and lubricants in transformers, capacitors, and other electrical equipment. Atmospheric deposition is also a potential source of PCBs. Urban runoff and POTWs are minor sources of OC pesticides and PCBs. Data analysis suggests that groundwater, atmospheric deposition, and imported water are not significant sources of OC pesticides, PCBs, or sediment. Further evaluation of these sources is set forth in the Implementation Plan.
Linkage Analysis	The linkage analysis is based on a conceptual model for the fate, transformation, and uptake of OC pesticides and PCBs and a mass-balance model that connects the sources of OC pesticides and PCBs to their fate and transport in Calleguas Creek, its tributaries, and Mugu Lagoon. The linkage analysis indicates: 1) OC pesticides and PCBs concentrations in tissue are proportional to OC pesticides and PCBs concentrations in sediments; 2) OC pesticides and PCBs concentrations in water are a function of OC pesticides and PCBs concentrations in sediment; and 3) OC pesticides and PCBs concentrations in sediment are a function of OC pesticides and PCBs loading and sediment transport. Because sediments store, convey and serve as a source of OC pesticides and PCBs, a reduction of OC pesticides and PCBs concentrations in sediment will result in a reduction of OC pesticides and PCBs concentration in the water column and fish tissue. In this linkage analysis, DDE is used as a representative constituent, because DDE is consistently detected in monitoring and exceeds numeric targets in water, sediment, and tissue samples. Also, other OC Pesticides and PCBs possess similar physical and chemical properties to DDE.

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Wasteload Allocations	**1. Interim and Final WLAs* for Pollutants in Effluent for POTWs.** The interim wasteload allocations for POTWs will be re-considered by the Regional Board on a 5-year basis. This re-consideration will be based on sufficient data to calculate Interim Wasteload Allocations in accordance with SIP procedures. **a) Interim WLAs (ng/L)** Constituent — POTW Hill Canyon Daily; Simi Valley Daily; Moorpark Daily; Camarillo Daily; Camrosa Daily Chlordane 1.2; 100.0; 100.0; 100.0; 100.0 4,4-DDD 20.0; 50.0; 50.0; 6.0; 50.0 4,4- DDE 260.0; 1.2; 1.2; 188.0; 50.0 4,4-DDT 10.0; 10.0; 10.0; 10.0; 10.0 Dieldrin 10.0; 10.0; 10.0; 10.0; 10.0 PCBs 500.0; 500.0; 500.0; 31.0; 500.0 Toxaphene 500.0; 500.0; 500.0; 500.0; 500.0 * WLAs shall be applied to POTWs'effluent **b) Final WLAs (ng/L)** Constituent — POTW Hill Canyon Daily / Monthly; Simi Valley Daily / Monthly; Moorpark Daily / Monthly; Camarillo Daily / Monthly; Camrosa Daily / Monthly Chlordane 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59 4,4-DDD 1.7 / 0.84; 1.7 / 0.84; 1.7 / 0.84; 1.7 / 0.84; 1.7 / 0.84 4,4- DDE 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59 4,4-DDT 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59; 1.2 / 0.59 Dieldrin 0.28 / 0.14; 0.28 / 0.14; 0.28 / 0.14; 0.28 / 0.14; 0.28 / 0.14 PCBs 0.34 / 0.17; 0.34 / 0.17; 0.34 / 0.17; 0.34 / 0.17; 0.34 / 0.17 Toxaphene 0.33 / 0.16; 0.33 / 0.16; 0.33 / 0.16; 0.33 / 0.16; 0.33 / 0.16 The final WLAs will be included in NPDES permits in accordance with schedule in the implementation plan. The Regional Board may revise final WLAs prior to the dates they are placed into permits and/or prior to the dates of final WLA achievement based on special studies and monitoring of this TMDL.

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Wasteload Allocations (continued)	**2. Interim and Final WLAs for Pollutants in Sediment for Stormwater Permittees**

a) Interim WLAs (ng/g)

Constituent	Subwatershed					
	Mugu Lagoon[1]	Calleguas Creek	Revolon Slough	Arroyo Las Posas	Arroyo Simi	Conejo Creek
Chlordane	25.0	17.0	48.0	3.3	3.3	3.4
4,4-DDD	69.0	66.0	400.0	290.0	14.0	5.3
4,4- DDE	300.0	470.0	1,600.0	950.0	170.0	20.0
4,4-DDT	39.0	110.0	690.0	670.0	25.0	2.0
Dieldrin	19.0	3.0	5.7	1.1	1.1	3.0
PCBs	180.0	3,800.0	7,600.0	25,700.0	25,700.0	3,800.0
Toxaphene	22,900.0	260.0	790.0	230.0	230.0	260.0

Compliance with sediment based WLAs is measured as an in-stream annual average at the base of each subwatershed where the discharges are located.

b) Final WLAs (ng/g)

Constituent	Subwatershed					
	Mugu Lagoon[1]	Calleguas Creek	Revolon Slough	Arroyo Las Posas	Arroyo Simi	Conejo Creek
Chlordane	3.3	3.3	0.9	3.3	3.3	3.3
4,4-DDD	2.0	2.0	2.0	2.0	2.0	2.0
4,4- DDE	2.2	1.4	1.4	1.4	1.4	1.4
4,4-DDT	0.3	0.3	0.3	0.3	0.3	0.3
Dieldrin	4.3	0.2	0.1	0.2	0.2	0.2
PCBs	180.0	120.0	130.0	120.0	120.0	120.0
Toxaphene	360.0	0.6	1.0	0.6	0.6	0.6

[1] The Mugu Lagoon subwatershed includes Duck Pond/Agricultural Drain/Mugu/Oxnard Drain #2.

Compliance with sediment based WLAs is measured as an in-stream annual average at the base of each subwatershed where the discharges are located.

3. Final WLAs for Pollutants in Water Column for Minor Point Sources

WLAs for pollutants in water column are allocated below to minor point sources enrolled under NPDES permits or WDRs, which discharge to Calleguas Creek.

Constituent	Daily Maximum (ng/L)	Monthly Average (ng/L)
Chlordane	1.2	0.59
4,4-DDD	1.7	0.84
4,4- DDE	1.2	0.59
4,4-DDT	1.2	0.59
Dieldrin	0.28	0.14
PCBs	0.34	0.17
Toxaphene	0.33	0.16

4. Siltation WLA for MS4

MS4 dischargers will receive an allocation of 2,496-tons/yr. reduction in sediment yield to Mugu Lagoon. The baseline from which the load reduction will be evaluated will be determined by a special study of this TMDL. The load allocation will apply after the baseline is established, as described in the Implementation Plan.

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Load Allocations	Compliance with sediment based LAs listed below is measured as an in-stream annual average at the base of each subwatershed. **1. Interim and Final Load Allocations** **a) Interim Sediment LAs (ng/g)** Constituent — Subwatershed Mugu Lagoon[1] / Calleguas Creek / Revolon Slough / Arroyo Las Posas / Arroyo Simi / Conejo Creek Chlordane 25.0 / 17.0 / 48.0 / 3.3 / 3.3 / 3.4 4,4-DDD 69.0 / 66.0 / 400.0 / 290.0 / 14.0 / 5.3 4,4- DDE 300.0 / 470.0 / 1,600.0 / 950.0 / 170.0 / 20.0 4,4-DDT 39.0 / 110.0 / 690.0 / 670.0 / 25.0 / 2.0 Dieldrin 19.0 / 3.0 / 5.7 / 1.1 / 1.1 / 3.0 PCBs 180.0 / 3,800.0 / 7,600.0 / 25,700.0 / 25,700.0 / 3,800.0 Toxaphene 22900.0 / 260.0 / 790.0 / 230.0 / 230.0 / 260.0 [1] The Mugu Lagoon subwatershed includes Duck Pond/Agricultural Drain/Mugu/Oxnard Drain #2. **b) Final Sediment LAs (ng/g)** Constituent — Subwatershed Mugu Lagoon[1] / Calleguas Creek / Revolon Slough / Arroyo Las Posas / Arroyo Simi / Conejo Creek Chlordane 3.3 / 3.3 / 0.9 / 3.3 / 3.3 / 3.3 4,4-DDD 2.0 / 2.0 / 2.0 / 2.0 / 2.0 / 2.0 4,4- DDE 2.2 / 1.4 / 1.4 / 1.4 / 1.4 / 1.4 4,4-DDT 0.3 / 0.3 / 0.3 / 0.3 / 0.3 / 0.3 Dieldrin 4.3 / 0.2 / 0.1 / 0.2 / 0.2 / 0.2 PCBs 180.0 / 120.0 / 130.0 / 120.0 / 120.0 / 120.0 Toxaphene 360.0 / 0.6 / 1.0 / 0.6 / 0.6 / 0.6 [1] The Mugu Lagoon subwatershed includes Duck Pond/Agricultural Drain/Mugu/Oxnard Drain #2. **2. Siltation LAs** Agricultural dischargers will receive an allocation of 2,704 tons/yr. Reduction in sediment yield to Mugu Lagoon. The baseline from which the load reduction will be evaluated will be determined by a special study of this TMDL. The load allocation will apply after the baseline is established, as described in the Implementation Plan.
Margin of Safety	This TMDL relies on an implicit margin of safety, by incorporating conservative assumptions throughout its development, including: ▪ Basing percent reductions on the historical data set of water and fish tissue concentrations, which does not reflect the effects of attenuation the over the past ten years. ▪ Determining the percent reduction in sediment, by basing it on the greater percent reduction of either water or fish tissue concentrations based on available data.

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Margin of Safety (continued)	▪ Reducing the allowable concentration for upstream subwatersheds, to ensure protection of those subwatersheds downstream from upstream inputs. ▪ Choosing Threshold Effects Levels (TELs) and Effects Range Lows (ERLs) as numeric targets for sediment, which are the most protective applicable sediment guidelines. ▪ Selecting the more stringent of the allowable concentration (as calculated by percent reduction methodology) or the numeric target for sediment (TEL or ERL), when available, as the WLA and LA for all reaches with 303(d) listings for sediment.
Future Growth	Ventura County accounts for slightly more than 2% of the state's residents with a population of 753,197 (US Census Bureau, 2000). GIS analysis of the 2000 census data yields a population estimate of 334,000 for the CCW, which equals about 44% of the county population. According to the Southern California Association of Governments (SCAG), growth in Ventura County averaged about 51% per decade from 1900-2000; with growth exceeding 70% in the 1920s, 1950s, and 1960s. Significant population growth is expected to occur within and near present city limits until at least 2020. Since most of the listed OCs and PCBs in the CCW are banned, this growth is not expected to increase current loads. Urban application of those OC pesticides which are still legal (dacthal and endosulfan) may increase, but overall use may decrease because urban expansion tends to reduce total acreage of agricultural land. Population growth may result in greater OC loading to POTW influent from washing food products containing OC residues. This loading may be proportional to the increase in population, if per capita domestic water use and pesticide load per household remain constant. Increased flow from POTWs should not result in impairment of the CCW as long as effluent concentration standards are met for each POTW. As urban development occurs, construction activities may have a range of effects on OC loading to the CCW. Exposure of previously vegetated or deeply buried soil might lead to increased rates of transportation and volatilization. Conversely, urbanization of open space and/or agriculture areas may cover OC pesticides bound to sediments. Future growth in the CCW may result in increased groundwater concentrations of currently used OC pesticides. This is a potential concern for dacthal, which is still used and has been found in groundwater (although current levels of dacthal are significantly lower than all available targets). The effects of future growth upon PCB loads are unknown, but not likely to prove significant, since atmospheric deposition and accidental spills are the primary loading pathways. Any increase in OCs due to population growth may be offset by decreased inputs from banned OCs, as their presence attenuates due to fate and transport processes.

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Critical Conditions	The linkage analysis found correlation between concentrations of OC pesticides and PCBs in water and total suspended solids (TSS), and a potential correlation between OC pesticides and PCBs concentrations in water and seasonality (wet vs. dry season). A similar correlation between sediment loading and wet weather is also noted. OC pesticides and PCB pollutants are of potential concern in the Calleguas Creek Watershed due to possible long-term loading and food chain bioaccumulation effects. There is no evidence of short-term effects. However, pollutant loads and transport within the watershed may vary under different flow and runoff conditions. Therefore the TMDLs consider seasonal variations in loads and flows but are established in a manner which accounts for the longer time horizon in which ecological effects may occur. Wet weather events, which may occur at any time of the year, produce extensive sediment redistribution and transport downstream. This would be considered the critical condition for loading. However, the effects of organochlorine compounds are manifested over long time periods in response to bioaccumulation in the food chain. Therefore, short-term loading variations (within the time scale of wet and dry seasons each year) are not likely to cause significant variations in beneficial use effects. Therefore, although seasonal variations in loads and flows were considered, the TMDL was established in a manner which accounts for the longer time horizon in which ecological effects may occur
Implementation Plan	The final WLAs will be included in NPDES permits in accordance with the compliance schedules provided in Table 7-17.2. The Regional Board may revise these WLAs based on additional information developed through Special Studies and/or Monitoring of this TMDL. WLAs established for the five major POTWs in this TMDL will be implemented through NPDES permit limits. The proposed permit limits will be applied as end-of-pipe concentration-based effluent limits for POTWs. Compliance will be determined through monitoring of final effluent discharge as defined in the NPDES permit. The implementation plan for POTWs focuses on implementation of source control activities. Consideration of annual averaging of compliance data will be evaluated at the time of permit renewal based on available information, Regional Board policies, and US EPA approval.

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Implementation Plan (continued)	In accordance with current practice, a group concentration-based WLA has been developed for MS4s, including the Caltrans MS4. The grouped allocation will apply to all NPDES-regulated municipal stormwater discharges in the CCW. Other NPDES-regulated stormwater permittees will be assigned a concentration-based WLA consistent with the interim and final WLAs set forth above. Stormwater WLAs will be incorporated into the NPDES permit as receiving water limits measured at the downstream points of each subwatershed and are expected to be achieved through the implementation of BMPs as outlined in the implementation plan. The Regional Board will need to ensure that permit conditions are consistent with the assumptions of the WLAs. If BMPs are to be used, the Regional Board will need to detail its findings and conclusions supporting the use of BMPs in the NPDES permit fact sheets. Should federal, state, or regional guidance or practice for implementing WLAs into permits be revised, the Regional Board may reevaluated the TMDL to incorporate such guidance. LAs will be implemented through the State's Nonpoint Source Pollution Control Program (NPSPCP). The LARWQCB is developing a Conditional Waiver for Irrigated Lands, which includes monitoring at sites subject to approval by the Executive Officer of the Regional Board. Should adoption of the Conditional Waiver be delayed, monitoring will be required as part of this TMDL. Studies are currently being conducted to assess the effectiveness of BMPs for reduction of pollutants from agricultural operations. Results will be used to develop Agricultural Water Quality Management Plans, including the implementation of agricultural BMPs. Additionally, an agricultural education program will be developed to inform growers of the recommended BMPs and the Management Plan. As shown in Table 7-17.2, implementation actions will be taken by agricultural dischargers located in the CCW. The implementation of agricultural BMPs will be based on a comprehensive approach to address pollutant loads discharged from agricultural operations. The Regional Board may revise these LAs based on the collection of additional information developed through special studies and/or monitoring conducted as part of this TMDL. A number of provisions in this TMDL might provide information that could result in revisions to the TMDL. Additionally, the development of sediment quality criteria and other water quality criteria revisions may require the reevaluation of this TMDL. Finally, the use of OC pesticides in other countries which may be present in imported food products, compounded with the persistence of OC pesticides and PCBs in the environment, indicate that efforts to control sources and transport of OCs to receiving waters may not result in attainment of targets and allocations due to activities that are outside the control of local agencies and agriculture. For these reasons, the Implementation Plan includes this provision for reevaluating the TMDL to consider revised water quality objectives and the results of implementation studies, if appropriate.

TMDL Element	Calleguas Creek Watershed OC Pesticide, PCBs, and Siltation TMDL
Implementation Plan (continued)	The siltation portion of the TMDL includes wasteload and load allocations set as an annual mass reduction from a baseline value of sediment and silt deposited in Mugu Lagoon. The baseline value of sediment and silt conveyed to Mugu Lagoon is to be determined by a TMDL Special Study and established by the Regional Board through an amendment to the TMDL. The Special Study is eight years in duration to ensure that the full range of current conditions that affect loading of sediment and siltation to Mugu Lagoon are considered. If appropriate, the Special Study may also result in a revision to the mass load reduction. The Special Study will be overseen by a Science Advisory Panel consisting of local, regional, and/or national experts in estuarine habitat biology, hydrology, and engineering. At the conclusion of the special study, the Regional Board will reconsider the TMDL to establish sustainable wasteload and load allocations recommended by the Special Study to support aquatic life and wetland habitat beneficial uses. In implementing this TMDL, staff recognize that dischargers may be implementing management measures and management practices to reduce sediment and Siltation loads through permit and waiver programs during the special studies. Further, since the effective date of the Consent Decree, reaches of Calleguas Creek have been listed due to sediment, and another TMDL may be initiated during the Special Study of this TMDL. Staff's intent is to coordinate the requirements of this TMDL with other programs that reduce sedimentation and siltation. The Special Study can consider sediment and silt load reductions through existing permits and the forthcoming conditional waiver for irrigated lands. Load and wasteload allocations become effective after the Regional Board actions based on the Special Study, nine years after the effective date of the TMDL.

Table 7-17.2 Calleguas Creek Watershed OC Pesticides, PCBs, and Siltation TMDL: Implementation Schedule

Item	Implementation Action [1]	Responsible Party	Completion Date
1	Interim organochlorine pesticide and polychlorinated biphenyls wasteload allocations apply.	NPDES Permittees	Effective date of the amendment
2	Interim organochlorine pesticide and polychlorinated biphenyls load allocations apply.	Agricultural Dischargers	Effective date of the amendment
3	Finalize and submit workplan for organochlorine pesticide and polychlorinated biphenyls TMDL monitoring, or finalize and submit a workplan for an Integrated Calleguas Creek Watershed organochlorine pesticide and polychlorinated biphenyls Monitoring Program for approval by the Executive Officer. The monitoring workplan will include, but not be limited to, appropriate water, biota, and sediment loading and monitoring to verify attainment of targets and protection of beneficial uses.	POTW Permittees, MS4 Permittees, Agricultural Dischargers, US Navy	6 months after effective date of the amendment
4	Initiate Calleguas Creek Watershed organochlorine pesticide, polychlorinated biphenyls, and siltation Monitoring Program developed under the Task 3 workplan approved by the Executive Officer.	POTW Permittees, MS4 Permittees, Agricultural Dischargers, US Navy	6 months after Executive Officer approval of Monitoring Program (Task 3) workplan
5	Submit a workplan for approval by the Executive Officer to identify urban, industrial and domestic sources of organochlorine pesticides and polychlorinated biphenyls and control methods and to implement a collection and disposal program for organochlorine pesticides and polychlorinated biphenyls .	POTW Permittees, MS4 Permittees, US Navy	1 year after effective date of the amendment
6	Submit a workplan for approval by the Executive Officer to identify agricultural sources and methods to implement a collection and disposal program for organochlorine pesticides and polychlorinated biphenyls.	Agricultural Dischargers	1 year after effective date of the amendment
7	Special Study #1 – Submit a workplan and convene a Science Advisory Panel to quantify sedimentation in Mugu Lagoon and sediment transport throughout the Calleguas Creek Watershed. Evaluate management methods to control siltation and contaminated sediment transport to Calleguas Creek, identify appropriate BMPs to reduce sediment loadings, evaluate numeric targets and wasteload and load allocations for siltation/sedimentation to support habitat related beneficial uses in Mugu Lagoon, evaluate the effect of sediment on habitat preservation in Mugu Lagoon, and evaluate appropriate habitat baseline, effectiveness of sediment and siltation load allocations on a subwatershed basis, and methods to restore habitat for approval by the Executive Officer. Additionally, this special study will evaluate the concentration of organochlorine pesticides and polychlorinated biphenyls in sediments from various sources/land use types. [2]	POTW Permittees, MS4 Permittees, Agricultural Dischargers, and US Navy	1 year after effective date of the amendment

Item	Implementation Action [1]	Responsible Party	Completion Date
8	Special study #2 – Conduct a study to identify land areas with high organochlorine pesticide and polychlorinated biphenyls concentrations, and submit a workplan including milestones and an implementation period that is as short as possible, but not to exceed 6 years, for removal to mitigate the effects of flood control practices on organochlorine pesticides, polychlorinated biphenyls, and sediment loadings to Calleguas Creek waterbodies from any high concentration areas identified. Milestones shall include proposed percentages of reductions achieved by removal. Such practices include but are not limited to management of agricultural runoff, sediment reduction practices and structures, streambank stabilization, and other projects related to stormwater conveyance and flood control improvements in the Calleguas Creek watershed. [2]	Agricultural Dischargers, MS4 Permittees, US Navy	1 years after effective date of the amendment
9	Develop an Agricultural Water Quality Management Plan in consideration of the forthcoming Conditional Waiver for Irrigated Lands, or, if the Conditional Waiver for Irrigated Lands is not adopted in a timely manner, develop an Agricultural Water Quality Management Plan as part of the Calleguas Creek WMP. Implement an educational program on BMPs identified in the Agricultural Water Quality Management Plan.	Agricultural Dischargers	3 years after effective date of the amendment
10	Based on results of the Task 5 workplan approved by Executive Officer, implement a collection and disposal program for organochlorine pesticides and polychlorinated biphenyls.	POTW Permittees, MS4 Permittees, US Navy	5 years after effective of the amendment
11	Based on results of the Task 6 workplan approved by Executive Officer implement a collection and disposal program for organochlorine pesticides and polychlorinated biphenyls.	Agricultural Dischargers	5 years after effective of the amendment
12	Re-evaluation of POTW Interim wasteload allocations for organochlorine pesticides and polychlorinated biphenyls based on State Implementation Plan procedures.	Regional Board	5 years, 10 years and 15 years after the effective date of the amendment
13	Special Study #1 – Submit results of Special Study #1, including recommendations for refining the siltation load and wasteload allocations.	POTW Permittees, MS4 Permittees, Agricultural Dischargers, and US Navy	8 years after effective date of the amendment
14	Re-evaluation of siltation and sediment load and wasteload allocations based on Special Study #1.	Regional Board	9 years after effective date of the amendment
15	Effective date of siltation load allocation and wasteload allocation.	Agricultural dischargers, US Navy, MS4 permittees	9 years after effective date of the amendment

Item	Implementation Action [1]	Responsible Party	Completion Date
16	Special Study #3 – Evaluate natural attenuation rates and evaluate methods to accelerate organochlorine pesticide and polychlorinated biphenyl attenuation and examine the attainability of wasteload and load allocations in the Calleguas Creek Watershed. [2, 3]	POTW Permittees , Agricultural Dischargers, MS4 Permittees, and US Navy	10 years after effective date of the amendment
17	Special Study #4 (optional) – Examine of the food web and bioconcentration relationships throughout the watershed to evaluate assumptions contained in the Linkage Analysis and ensure that protection of beneficial uses is achieved. [2]	Interested Parties	12 years after effective date of the amendment
18	Based on the results of Implementation Items 1-17, if sediment guidelines are promulgated or water quality criteria are revised, and/or if fish tissue and water column targets are achieved without attainment of WLAs or LAs, the Regional Board will consider revisions to the TMDL targets, allocations, and schedule for expiration of Interim Wasteload and Interim Load Allocations.[3]	Regional Board	10 years after effective date of the amendment
19	Achieve Final WLAs and LAs	Agricultural Dischargers, POTW Permittees, and MS4 Permittees	20 years after effective date of the amendment

1 The Regional Board regulatory programs addressing all discharges in effect at the time an implementation task is due may contain requirements substantially similar to the requirements of an implementation task. If such a requirement is in place in another regulatory program including other TMDLs, the Executive Officer may determine that such other requirements satisfy the requirements of an implementation task of this TMDL and thereby coordinate this TMDL implementation plan with other regulatory programs.

2 Special studies included in the Implementation Plan are based on the TMDL Technical Documents.

3 After completion of this special study, the TMDL will be reopened in order to enable the Regional Board to evaluate whether a shorter time period is appropriate for the achievement of the final WLAs and LAs.

7-18 Marina del Rey Harbor Toxic Pollutants TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on October 6, 2005.

This TMDL was approved by:
The State Water Resources Control Board on January 13, 2006.
The Office of Administrative Law on March 13, 2006.
The U.S. Environmental Protection Agency on March 16, 2006.

The effective date of this TMDL is: March 22, 2006.

The following tables include the elements of this TMDL.

Table 7-18.1. Marina del Rey Harbor Toxic Pollutants TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	The back basins of Marina del Rey Harbor are on the Clean Water Act Section 303(d) list of impaired waterbodies for chlordane, copper, lead, zinc, PCBs, DDT, dieldrin, sediment toxicity and a fish consumption advisory. Review of available data during the development of this TMDL indicated that dieldrin and DDT are no longer causes of impairment. The following designated beneficial uses are impaired by chlordane, copper, lead, zinc, PCBs, and toxicity: water contact recreation (REC1); marine habitat (MAR); wildlife habitat (WILD); commercial and sport fishing (COMM); and shellfish harvesting (SHELL).
Numeric Target (Interpretation of the narrative and numeric water quality objective, used to calculate the allocations)	Numeric targets for the harbor sediments are based on the sediment quality guidelines compiled by the National Oceanic and Atmospheric Administration, which are used in evaluating waterbodies within the Los Angeles Region for development of the 303(d) list. The Effects Range-Low (ERLs) guidelines are established as the numeric targets for sediments in Marina del Rey Harbor. **Numeric Targets for Metals in Sediment (mg/kg)** Copper: 34 | Lead: 46.7 | Zinc: 150 **Numeric Targets for Organic Compounds in Sediment (µg/kg)** Chlordane: 0.5 | Total PCBs: 22.7 In addition to the sediment numeric target, water column and fish tissue targets are set for the PCB impairment in fish tissue.

Element	Key Findings and Regulatory Provisions
Numeric Target (Interpretation of the narrative and numeric water quality objective, used to calculate the allocations) (continued)	The California Toxics Rule (CTR) Criterion for the protection of human health from the consumption of aquatic organisms is selected as the final numeric target for total PCBs in the water column. However, given the inability of current analytical methods to detect concentrations at this low level, an interim numeric target will be applied. The CTR Chronic Criterion for the protection of aquatic life in saltwater is selected as the interim numeric target for the fish tissue impairment by PCBs. This numeric target will remain in effect until advances in technology allow for analysis of PCBs at lower detection limits. **Interim Target for total PCBs in the Water Column:** 0.03µg/L **Final Target for total PCBs in the Water Column:** 0.00017 µg/L The numeric Target for PCBs in fish tissue is the Threshold Tissue Residue Level that is derived from CTR human health criteria, which are adopted criteria for water designated to protect humans from consumption of contaminated fish or other aquatic organisms. **Numeric Target for total PCBs in Fish Tissue:** 5.3 µg/Kg
Source Analysis	Urban storm water has been recognized as a substantial source of metals. Numerous researchers have documented that the most prevalent metals in urban storm water (i.e., copper, lead, and zinc) are consistently associated with suspended solids. Because metals are typically associated with fine particles in storm water runoff, they have the potential to accumulate in marine sediments where they may pose a risk of toxicity. Similar to metals, the majority of organic constituents in storm water are associated with particulates. Passive leaching of copper-based anti-fouling paints is a potential source of copper loading to the sediment. However, there is insufficient information available to quantify the contribution of boat discharges to the sediment pollutant load. This TMDL requires a study designed to estimate copper partitioning between the water column and sediment in Marina del Rey harbor, in order to determine the impact of passive leaching on the marine sediment. Direct deposition of airborne particles to the water surface may be responsible for contributing copper, lead and zinc to the Marina del Rey back basins. The estimated contribution from this source is minor. Indirect atmospheric deposition reflects the process by which metals deposited on the land surface may be washed off during storm events and delivered to Marina del Rey Harbor. The loading of metals associated with indirect atmospheric deposition are accounted for in the storm water runoff.

Element	Key Findings and Regulatory Provisions
Loading Capacity	TMDLs are developed for copper, lead, zinc, chlordane, and PCBs within the sediments of Marina del Rey Harbor's back basins. The loading capacity for Marina del Rey Harbor is calculated by multiplying the numeric targets by the average annual total suspended solids (TSS) loading to the harbor sediment. The average annual TSS discharged to the back basins of the harbor is 64,166 kilograms per year (kg/yr). The TMDL is set equal to the loading capacity. **Metals Loading Capacity (kilograms/year)** Copper: 2.18 Lead: 3.0 Zinc: 9.6 **Organics Loading Capacity (grams/year)** Chlordane: 0.03 Total PCBs: 1.46
Load Allocations (for nonpoint sources)	Load allocations (LA) are developed for nonpoint sources in Marina del Rey Harbor, which includes direct atmospheric deposition. The load allocations are not assigned to a particular nonpoint source or group of nonpoint sources. The mass-based load allocation for direct atmospheric deposition is equal to the percentage of the watershed covered by water (5.4%) multiplied by the total loading capacity. **Metals Load Allocations for Direct Atmospheric Deposition (kg/yr)** Copper: 0.12 Lead: 0.16 Zinc: 0.52 **Organics Load Allocations for Direct Atmospheric Deposition(g/yr)** Chlordane: 0.002 Total PCBs: 0.079
Waste Load Allocations (for point sources)	Waste load allocations (WLA) are assigned to point sources for the Marina del Rey watershed. A grouped mass-based waste load allocation is developed for the storm water permittees (Los Angeles County MS4, Caltrans, General Construction and General Industrial) by subtracting the load allocations from the total loading capacity. Concentration-based waste load allocations are developed for other point sources in the watershed. **Metals Waste Load Allocations for Storm Water (kg/yr)** Copper: 2.06 Lead: 2.83 Zinc: 9.11 **Organics Waste Load Allocations for Storm Water (g/yr)** Chlordane: 0.03 Total PCBs: 1.38

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	The storm water waste load allocations are apportioned between the MS4 permittees, Caltrans, the general construction and the general industrial storm water permits based on an estimate of the percentage of land area covered under each permit. **Metals Storm Water WLAs Apportioned between Permits (kg/yr)** Copper: MS4 Permittees 2.01; Caltrans 0.022; General Construction 0.033; General Industrial 0.004 Lead: MS4 Permittees 2.75; Caltrans 0.03; General Construction 0.045; General Industrial 0.006 Zinc: MS4 Permittees 8.85; Caltrans 0.096; General Construction 0.144; General Industrial 0.018 **Organics Storm Water WLAs Apportioned between Permits (g/yr)** Chlordane: MS4 Permittees 0.0295; Caltrans 0.0003; General Construction 0.0005; General Industrial 0.0001 Total PCBs: MS4 Permittees 1.34; Caltrans 0.015; General Construction 0.022; General Industrial 0.003 Each storm water permittee enrolled under the general construction or industrial storm water permits will receive an individual waste load allocation on a per acre basis, based on the acreage of their facility. **Metals per Acre WLAs for Individual General Construction or Industrial Storm Water Permittees (g/yr/ac)** Copper 2.3; Lead 3.1; Zinc 10 **Organics per acre WLAs for Individual General Construction or Industrial Storm Water Permittees (mg/yr/ac)** Chlordane 0.03; Total PCBs 1.5 Concentration-based waste load allocations are assigned to the minor NPDES permits and general non-storm water NPDES permits that discharge to Marina del Rey Harbor. Any future minor NPDES permits or enrollees under a general non-storm water NPDES permit will also be subject to the concentration-based waste load allocations. **Metals Concentration-based Waste Load Allocations (mg/kg)** Copper 34; Lead 46.7; Zinc 150 **Organic Concentration-based Waste Load Allocations (µg/kg)** Chlordane 0.5; Total PCBs 22.7
Margin of Safety	An implicit margin of safety is applied through the use of the more protective sediment quality guideline values. The ERLs were selected over the higher ERMs as the numeric targets.

Element	Key Findings and Regulatory Provisions
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the State of California Department of Transportation (Caltrans) Storm Water Permit, minor NPDES permits, general NPDES permits, general industrial storm water NPDES permits, general construction storm water NPDES permits. Nonpoint sources will be regulated through the authority contained in sections 13263 and 13269 of the Water Code, in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy (May 2004). Each NPDES permit assigned a WLA shall be reopened or amended at re-issuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. The Regional Board shall reconsider this TMDL in six years after the effective date of the TMDL based on additional data obtained from special studies. Table 7-18.2 presents the implementation schedule for the responsible permittees. **Minor NPDES Permits and General Non-Storm Water NPDES Permits:** The concentration-based waste load allocations for the minor NPDES permits and general non-storm water NPDES permits will be implemented through NPDES permit limits. Permit writers may translate applicable waste load allocations into effluent limits for the minor and general NPDES permits by applying applicable engineering practices authorized under federal regulations. The minor and existing general non-storm water NPDES permittees are allowed up to seven years from the effective date of the TMDL to achieve the waste load allocations. **General Industrial Storm Water Permit:** The Regional Board will develop a watershed specific general industrial storm water permit to incorporate waste load allocations. Concentration-based permit limits may be set to achieve the mass-based waste load allocations. These concentration-based limits would be equal to the concentration-based waste load allocations assigned to the other NPDES permits. It is expected that permit writers will translate the waste load allocations into BMPs, based on BMP performance data. However, the permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of the numeric waste load allocations. The general industrial storm water permittees are allowed up to seven years from the effective date of the TMDL to achieve the waste load allocations.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	**General Construction Storm Water Permit:** Waste load allocations will be incorporated into the State Board general permit upon renewal or into a watershed specific general construction storm water permit developed by the Regional Board. Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL. General construction storm water permittees will be considered in compliance with waste load allocations if they implement these Regional Board approved BMPs. All general construction permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with waste load allocations. **MS4 and Caltrans Storm Water Permits:** The County of Los Angeles, City of Los Angeles, and Culver City are jointly responsible for meeting the mass-based waste load allocations for the MS4 permittees. Caltrans is responsible for meeting their mass-based waste load allocations, however, they may choose to work with the MS4 permittees. The primary jurisdiction for the Marina del Rey Harbor watershed is the County of Los Angeles. Each municipality and permittee will be required to meet the waste load allocations at the designated TMDL effectiveness monitoring points. A phased implementation approach, using a combination of non-structural and structural BMPs may be used to achieve compliance with the waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the numeric waste load allocations. We expect that reductions to be achieved by each BMP will be documented and that sufficient monitoring will be put in place to verify that the desired reductions are achieved. The permits should also provide a mechanism to adjust the required BMPs as necessary to ensure their adequate performance.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	The implementation schedule for the MS4 and Caltrans permittees consists of a phased approach, with compliance to be achieved in prescribed percentages of the watershed, with total compliance to be achieved within 10 years. However, the Regional Board may extend the implementation period up to 15 years if an integrated water resources approach is employed. The waste load allocations and load allocations have been developed to achieve the numeric targets in the back basins of Marina del Rey Harbor by the end of the compliance period. However, the Regional Board is aware of toxic pollutants bound up in sediment. To the extent that the Regional Board or another responsible jurisdiction or agency determines that toxic pollutants bound in sediments are still preventing the attainment of numeric targets, the Regional Board will issue appropriate investigatory orders or cleanup and abatement orders to achieve attainment of the numeric targets.
Seasonal Variations and Critical Conditions	There is a high degree of inter- and intra-annual variability in total suspended solids discharged to Marina del Rey Harbor. This is a function of the storms, which are highly variable between years. The TMDL is based on a TSS load derived from long-term average rainfall over a 52-year period from 1948 to 2000. This time period contains a wide range of storm conditions and drain discharges to Marina del Rey Harbor. Use of the average condition for the TMDL is appropriate because issues of sediment effects on benthic communities and potential for bioaccumulation to higher trophic levels occurs over long time periods.
Monitoring	Effective monitoring will be required to assess the condition of Marina del Rey Harbor and to assess the on-going effectiveness of efforts by dischargers to reduce toxic pollutants loading from the Marina del Rey Watershed. Special studies may also be appropriate to provide further information about new data, new or alternative sources, and revised scientific assumptions. Below the Regional Board identifies the various goals of monitoring efforts and studies that shall be developed in a coordinated manner. The programs, reports, and studies will be developed in response to subsequent orders issued by the Executive Officer. **Ambient Component** A monitoring program is necessary to assess water quality throughout Marina del Rey Harbor and to assess fish tissue and sediment quality in the harbor's back basins. Data on background water quality for copper will help refine the numeric targets and waste load allocations and assist in the effective placement of BMPs. In addition, fish tissue data is required in Marina del Rey's back basins to confirm continued impairment.

Element	Key Findings and Regulatory Provisions
Monitoring (continued)	Water quality samples shall be collected monthly and analyzed for chlordane and total PCBs at detection limits that are at or below the minimum levels until the TMDL is reconsidered in the sixth year. The minimum levels are those published by the State Water Resources Control Board in Appendix 4 of the Policy for the Implementation of Toxic Standards for Inland Surface Water, Enclosed Bays, and Estuaries of California, March 2, 2000. Special emphasis should be placed on achieving detection limits that will allow evaluation relative to the CTR standards. If these can not be achieved with conventional techniques, then a special study should be proposed to evaluate concentrations of organics. Water quality samples shall also be collected monthly and analyzed for copper, lead, and zinc until the TMDL is reconsidered in the sixth year. For metals water column analysis, methods that allow for (1) the removal of salt matrix to reduce interference and avoid inaccurate results prior to the analysis; and (2) the use of trace metal clean sampling techniques, should be applied. Examples of such methods include EPA Method 1669 for sample collection and handling, and EPA Method 1640 for sample preparation and analysis. Storm water monitoring shall be conducted for metals (copper, lead. and zinc) and organics (chlordane and total PCBs) to provide assessment of water quality during wet-weather conditions and loading estimates from the watershed to the harbor. Special emphasis should be placed on achieving lower detection limits for organochlorine compounds. The MS4 and Caltrans storm water permittees are jointly responsible for conducting bioaccumulation testing of fish and mussel tissue within the Harbor. The permittees are required to submit for approval of the Executive Officer a monitoring plan that will provide the data needed to confirm the 303(d) listing or de-listing, as applicable. Representative sediment sampling shall be conducted quarterly within the back basins of the harbor for copper, lead, zinc, chlordane, and total PCBs at detection limits that are lower than the ERLs. Sediment samples shall also be analyzed for total organic carbon, grain size and sediment toxicity.

Element	Key Findings and Regulatory Provisions
Monitoring (continued)	Initial sediment toxicity monitoring should be conducted quarterly in the first year of the TMDL to define the baseline and semi-annually, thereafter, to evaluate effectiveness of the BMPs until the TMDL is reconsidered in the sixth year. The sediment toxicity testing shall include testing of multiple species, a minimum of three, for lethal and non-lethal endpoints. Toxicity testing may include: the 28-day and 10-day amphipod mortality test; the sea urchin fertilization testing of sediment pore water; and the bivalve embryo testing of the sediment/ water interface. The chronic 28-day and shorter-term 10-day amphipod tests may be conducted in the initial year of quarterly testing and the results compared. If there is no significant difference in the tests, then the less expensive 10-day test can be used throughout the rest of the monitoring, with some periodic 28 day testing. **Effectiveness Component** The water quality samples collected during wet weather, defined as rainfall of 0.1 inch or more plus the 3 days following the rain event, shall be analyzed for total dissolved solids, settleable solids and total suspended solids if not already part of the sampling program. Sampling shall be designed to collect sufficient volumes of settable and suspended solids to allow for analysis of copper, lead, zinc, chlordane, total PCBs, and total organic carbon in the sediment. Monthly representative sediment sampling shall be conducted at existing monitoring locations throughout the harbor, and analyzed for copper, lead, zinc, chlordane, and total PCBs at detection limits that are lower than the ERLs. The, sediment samples shall also be analyzed for total organic carbon and grain size. Sediment toxicity testing shall be conducted semi-annually, and shall include testing of multiple species (a minimum of three) for lethal and non-lethal endpoints. Toxicity testing may include: the 28-day or10-day amphipod mortality test; the sea urchin fertilization testing of sediment pore water; and the bivalve embryo testing of the sediment/water interface.

Element	Key Findings and Regulatory Provisions
Monitoring (continued)	Toxicity shall be indicated by an amphipod survival rate of 70% or less in a single test, in conjunction with a statistically significant decrease in amphipod survival relative to control organisms (significance determined by T-test, a=0.05). Accelerated monitoring maybe conducted to confirm toxicity at stations identified as toxic. Accelerated monitoring shall consist of six additional tests, approximately every two weeks, over a 12-week period. If the results of any two of the six accelerated tests are less than 90% survival, then the MS4 and Caltrans permittees shall conduct a Toxicity Identification Evaluation (TIE). Alternatively, responsible parties have the option of foregoing accelerated toxicity testing and conducting a TIE directly following an indication of toxicity. The TIE shall include reasonable steps to identify the sources of toxicity and steps to reduce the toxicity. The Phase I TIE shall include the following treatments and corresponding blanks: baseline toxicity; particle removal by centrifugation; solid phase extraction of the centrifuged sample using C8, C18, or another media; complexation of metals using ethylenediaminetetraacetic acid (EDTA) addition to the raw sample; neutralization of oxidants/metals using sodium thiosulfate addition to the raw sample; and inhibition of organo-phosphate (OP) pesticide activation using piperonyl butoxide addition to the raw sample (crustacean toxicity tests only). Bioaccumulation monitoring of fish and mussel tissue within the Harbor shall be conducted annually. The permittees are required to submit for approval of the Executive Officer a monitoring plan that will provide the data needed to assess the effectiveness of the TMDL. The general industrial storm water permit shall contain a model monitoring and reporting program to evaluate BMP effectiveness. A permittee enrolled under the general industrial permit shall have the choice of conducting individual monitoring based on the model program or participating in a group monitoring effort. MS4 permittees are encouraged to take the lead in group monitoring efforts for industrial facilities within their jurisdiction because compliance with waste load allocations by these facilities will in many cases translate to reductions in contaminate loads to the MS4 system.

Element	Key Findings and Regulatory Provisions
Monitoring (continued)	**Special Studies** Special studies are necessary to refine source assessments, to provide better estimates of loading capacity, and to optimize implementation efforts. The Regional Board will re-consider the TMDL in the sixth year after the effective date in light of the findings of these studies. Studies required for this TMDL include: • Evaluate partitioning coefficients between water column and sediment to assess the contribution of water column discharges to sediment concentrations in the harbor, and • Evaluate the use of low detection level techniques to determine water quality concentrations for those contaminants where standard detection limits cannot be used to assess compliance for CTR standards or are not sufficient for estimating source loadings from tributaries and storm water. Studies recommended for this TMDL include: • Develop and implement a monitoring program to collect the data necessary to apply a multiple lines of evidence approach; • Refine the relationship between pollutants and suspended solids aimed at better understanding of the delivery of pollutants to the watershed, and • Evaluate the effectiveness of BMPs to address pollutants and/or sediments.

Table 7-18.2. Marina del Rey Harbor Toxic Pollutants TMDL: Implementation Schedule

Date	Action
Effective date of the TMDL	Regional Board permit writers shall incorporate the waste load allocations for sediment into the NPDES permits. Waste load allocations will be implemented through NPDES permit limits in accordance with the implementation schedule contained herein, at the time of permit issuance, renewal or re-opener.
On-going	The Executive Officer shall promptly issue appropriate investigatory and clean up and abatement orders to address any toxicity hotspots within sediments identified as a result of data submitted pursuant to this TMDL, any U.S. Army Corps of Engineer dredging activity, or any other investigation.
Within 6 months after the effective date of the State Board adopted sediment quality objectives and implementation policy	The Regional Board will re-assess the numeric targets and waste load allocations for consistency with the State Board adopted sediment quality objectives.
5 years after effective date of the TMDL	Responsible jurisdictions and agencies shall provide to the Regional Board result of any special studies.
6 years after effective date of the TMDL	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
MINOR NPDES PERMITS AND GENERAL NON-STORM WATER NPDES PERMITS	
7 years after effective date of the TMDL	The non-storm water NPDES permits shall achieve the concentration-based waste load allocations for sediment per provisions allowed for in NPDES permits.
GENERAL INDUSTRIAL STORM WATER PERMIT	
7 years after effective date of the TMDL	The general industrial storm water permits shall achieve the mass-based waste load allocations for sediment per provisions allowed for in NPDES permits. Permits shall allow an iterative BMP process including BMP effectiveness monitoring to achieve compliance with permit requirements.
GENERAL CONSTRUCTION STORM WATER PERMIT	
7 years from the effective date of the TMDL	The construction industry will submit the results of the BMP effectiveness studies to the Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.
8 years from the effective date of the TMDL	The Regional Board will consider results of the BMP effectiveness studies and consider approval of BMPs no later than eight years from the effective date of the TMDL.
9 years from the effective date of the TMDL	All general construction storm water permittees shall implement Regional Board-approved BMPs.

Date	Action
MS4 AND CALTRANS STORM WATER PERMITS	
12 months after the effective date of the TMDL	In response to an order issued by the Executive Officer, the MS4 and Caltrans storm water NPDES permittees must submit a coordinated monitoring plan, to be approved by the Executive Officer, which includes both ambient monitoring and TMDL effectiveness monitoring. Once the coordinated monitoring plan is approved by the Executive Officer, monitoring shall commence within 6 months. The draft monitoring report shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days.
5 years after effective date of TMDL (Draft Report) 5 ½ years after effective date of TMDL (Final Report)	The MS4 and Caltrans storm water NPDES permittees shall provide a written report to the Regional Board outlining how they will achieve the waste load allocations for sediment to Marina del Rey Harbor. The report shall include implementation methods, an implementation schedule, proposed milestones, and any applicable revisions to the TMDL effectiveness monitoring plan. The draft report shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days.
Schedule for MS4 and Caltrans Permittees if Pursuing a TMDL Specific Implementation Plan	
8 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 50% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
10 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
Schedule for MS4 and Caltrans Permittees if Pursuing an Integrated Resources Approach, per Regional Board Approval	
7 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 25% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
9 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 50% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
11 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 75% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.
15 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the MS4 system is effectively meeting the waste load allocations for sediment.

7-19 Calleguas Creek Watershed Metals and Selenium TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on June 8, 2006.

This TMDL was approved by:

The State Water Resources Control Board on October 25, 2006.
The Office of Administrative Law on February 2, 2007.
The U.S. Environmental Protection Agency on March 26, 2007.

The effective date of this TMDL is March 26, 2007.

The elements of the TMDL are presented in Table 7-19.1 and the Implementation Plan in Table 7-19.2

Table 7-19.1. Calleguas Creek Watershed Metals and Selenium TMDL: Elements

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Problem Statement	Three of fourteen reaches in the Calleguas Creek Watershed (CCW) including Revolon Slough, Lower Calleguas Creek – Reach 2, and Mugu Lagoon are identified on the 2002 Clean Water Act Section 303(d) list of water-quality limited segments as impaired due to elevated levels of metals and selenium in water. The 303(d) listings, which were approved by the State Water Resources Control Board in February 2003, require the development of Total Maximum Daily Loads (TMDLs) to establish the maximum amount of pollutants a water body can receive without exceeding water quality standards. TMDLs for listed metals and selenium are presented herein in one document because, as a class of compounds, they possess similar physical and chemical properties that influence their persistence, fate, and transport in the environment.
Numeric Targets	This TMDL establishes four types of numeric targets: (1) California Toxics Rule (40 CFR Part 131) (CTR) criteria in dissolved fraction for copper, nickel, and zinc, and in total recoverable form for mercury and selenium; (2) fish tissue targets for mercury; (3) bird egg targets for mercury and selenium; and (4) sediment quality guidelines for copper, nickel, and zinc for 303(d) listed reaches. Attainment of sediment quality targets will be evaluated in combination with sediment toxicity data, if available.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Numeric Targets (continued)	**Copper Targets**

Subwatershed	Water Quality Target (ug dissolved Copper/L)		Sediment Target[3] (SQuiRTs, ERL) (ppb dry weight)
	Dry Weather CCC	Wet Weather CMC	
Mugu Lagoon	3.1*WER[1]	4.8*WER[1]	34000
Calleguas Creek 2	3.1*WER[1]	4.8*WER[1]	34000
Calleguas Creek 3	25.9	26.3	NA[2]
Revolon/Beardsley	3.1*WER[1]	4.8*WER[1]	NA[2]
Conejo	27.9	41.6	NA[2]
Arroyo Simi/Las Posas	29.3	29.8	NA[2]

[1] The water quality targets for copper in the TMDL are expressed as the copper water quality criteria from the federal California Toxics Rule (CTR). Those criteria include a numerical threshold multiplied by a water-effect ratio (WER). The WER has a default value of 1.0 unless a site-specific WER is approved. To use a WER other than the default of 1.0, a study must be conducted consistent with USEPA's WER guidance and adopted by the Regional Board through the state's basin plan amendment process. A WER study for Mugu Lagoon (Reach 1), lower Calleguas Creek (Reach 2), Revolon Slough (Reach 4) and Beardsley Wash (Reach 5) has been submitted to the Regional Board. If the Regional Board approves site-specific WERs for copper in these waterbodies, the TMDL targets will be modified in accordance with all legal and regulatory requirements and implemented in accordance with the approved WERs using the equations set forth above.

[2] Sediment targets were not selected as alternative target for this reach as it is not on the 303(d) list.

[3] Sediment targets are based on screening levels endorsed by the National Oceanic and Atmospheric Administration (NOAA) in their Screening Quick Reference Tables (SQuiRTs) (Buchman, 1999)

Mercury Targets

Media	Target
Fish Tissue (Human Health)	0.3 mg methylmercury/kg wet weight
Fish Tissue (Wildlife)	
*** Trophic Level (TL) 3[1]<50 mm**	0.03 mg methylmercury/kg wet weight
*** TL3 50-150 mm**	0.05 mg methylmercury/kg wet weight
*** TL3 150-350 mm**	0.1 mg methylmercury/kg wet weight
Bird Egg (Wildlife)	less than 0.5 mg total mercury/kg wet weight
Water Column	0.051 ug total mercury/L

[1] Trophic Level 3: Predators (e.g., minnows, sunfish) on trophic level 2 organism (e.g., copepods and water fleas)

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Numeric Targets (continued)	**Nickel Targets**

Subwatershed	Water Quality Target (ug dissolved Nickel/L)		Sediment Target[1] (SQuiRTs, ERL) (ppb dry weight)
	Dry Weather CCC	Wet Weather CMC	
Mugu Lagoon	8.2	74	20900
Calleguas Creek 2	8.2	74	NA[2]
Calleguas Creek 3	149	856	NA[2]
Revolon/Beardsley	8.2	74	NA[2]
Conejo	160	1292	NA[2]
Arroyo Simi/Las Posas	168	958	NA[2]

[1] Sediment targets are based on screening levels endorsed by the National Oceanic and Atmospheric Administration (NOAA) in their Screening Quick Reference Tables (SQuiRTs) (Buchman, 1999)

[2] Sediment targets were not selected as alternative target for this reach as it is not listed on the 303(d) list.

A study to support a site specific objective (SSO) for nickel has been submitted to the Regional Board and is currently under reviewed by the Regional Board and U.S. EPA staff. If a SSO for nickel is approved, the Regional Board will consider revision to the numeric targets for nickel based on the approved SSO.

Selenium Targets

Subwatershed	Water Quality Target (ug total selenium/L)		Bird Egg (ug/g)
	Dry Weather CCC	Wet Weather CMC	
Mugu Lagoon	71	290	6
Calleguas Creek 2	5	290	6
Calleguas Creek 3	5	NA[1]	6
Revolon/Beardsley	5	290	6
Conejo	5	NA[1]	6
Arroyo Simi/Las Posas	5	NA[1]	6

[1] "NA" indicates that a target is not available for this constituent because criterion for fresh water is not defined in the CTR.

<table>
<tr><th>TMDL Element</th><th>Calleguas Creek Watershed Metals and Selenium TMDL</th></tr>
<tr><td>Numeric Targets (continued)</td><td>
Zinc Targets
<table>
<tr><th rowspan="2">Subwatershed</th><th colspan="2">Water Quality Target (ug dissolved Zinc/L)</th><th rowspan="2">Sediment Target[1] (SQuiRTs, ERL) (ppb dry weight)</th></tr>
<tr><th>Dry Weather CCC</th><th>Wet Weather CMC</th></tr>
<tr><td>Mugu Lagoon</td><td>81</td><td>90</td><td>150000</td></tr>
<tr><td>Calleguas Creek 2</td><td>81</td><td>90</td><td>NA[2]</td></tr>
<tr><td>Calleguas Creek 3</td><td>338</td><td>214</td><td>NA[2]</td></tr>
<tr><td>Revolon/Beardsley</td><td>81</td><td>90</td><td>NA[2]</td></tr>
<tr><td>Conejo</td><td>365</td><td>324</td><td>NA[2]</td></tr>
<tr><td>Arroyo Simi/Las Posas</td><td>382</td><td>240</td><td>NA[2]</td></tr>
</table>
[1] Sediment targets are based on screening levels endorsed by the National Oceanic and Atmospheric Administration (NOAA) in their Screening Quick Reference Tables (SQuiRTs) (Buchman, 1999)
[2] Sediment targets were not selected as alternative target for this reach because it is not on the 303(d) list.
</td></tr>
<tr><td>Source Analysis</td><td>Significant sources of metals and selenium include urban runoff, agricultural runoff, groundwater seepage, and POTW effluent. For mercury, open space was also a significant source. Sources were also analyzed as a function of wet and dry weather. Higher loads were delivered during wet weather for all constituents, due to the association between metals and particulate matter.

The source analysis indicates naturally occurring mercury in soil may be a significant source, and that naturally occurring nickel, copper, zinc, and selenium in soil may be a contributing source, and that naturally occurring selenium in groundwater may be a significant source. The TMDL Implementation Plan includes special studies to further assess natural sources of metals in soil.</td></tr>
<tr><td>Linkage Analysis</td><td>Linkage between sources and instream pollutant concentrations was established through a dynamic water quality Hydrologic Simulation Program – FORTRAN (HSPF). The model output generally resulted in a conservative estimate of receiving water concentrations for metals. The model was used to calculate load reductions necessary to meet the numeric targets.The load reductions were used to calculate the load and waste load allocations.</td></tr>
<tr><td>Waste Load Allocations</td><td>In the case of copper, nickel, and selenium, waste load allocations (WLAs) were developed for both wet and dry-weather. The dry-weather WLAs apply to days when flows in the stream are less than the 86th percentile flow rate for each reach. The wet-weather WLAs apply to days when flows in the stream exceed the 86th percentile flow rate for each reach. Annual mass loads of mercury in suspended sediment were developed according to low, medium, and high annual flow categories.</td></tr>
</table>

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Waste Load Allocations (continued)	**Publicly Owned Treatment Works (POTWs)** Concentration-based and mass-based WLAs are established for copper, and nickel, in total recoverable forms, and are applied to POTWs during both wet and dry weather. Mass-based WLAs are developed for mercury for POTWs. Zinc allocations are not set because current information indicate that numeric targets for zinc are attained. The TMDL Implementation Plan includes a task to provide State Board data to support delisting of zinc. Waste load allocations for selenium are not set for POTWs because POTWs do not discharge to reaches listed for selenium. Interim limits are included to allow time for dischargers to put in place implementation measures necessary to achieve final waste load allocations. The daily maximum and monthly average interim limits are set equal to the 99th and 95th percentile of available discharge data, respectively. **Interim and Final WLAs for Total Recoverable Copper in Water Column**

POTW	Interim		Final[1]		
	Daily Maximum (ug/L)	Monthly Average (ug/L)	Daily Maximum (ug/L)[2]	Monthly Average (ug/L)[2]	lb/day
Hill Canyon WWTP	20.0	16.0	(a)	(a)	0.11*WER - 0.04
Simi Valley WQCP	(b)	(b)	31.0	30.5	(c)
Moorpark WTP	(b)	(b)	31.0	30.5	(d)
Camarillo WRP	57.0	20.0	(a)	(a)	0.12*WER - 0.04
Camrosa WRP	(b)	(b)	27.4	27.0	(d)

[1] If site-specific WERs are approved by the Regional Board, TMDL waste load allocations shall be implemented in accordance with the approved WERs using the equations set forth above. Regardless of the final WERs, total copper loading shall not exceed current loading. In addition, effluent concentrations shall not exceed the performance standards of current treatment technologies.

[2] Concentration-based targets have been converted to total recoverable allocations using the CTR default translator of 0.96

(a) Concentration-based final limits will be included in the permits in accordance with NPDES guidance and requirements, but are not calculated as part of the TMDL.

(b) Interim limits are not required because the discharger is meeting the final limits.

(c) Discharges from Simi Valley WQCP do not reach lower Calleguas Creek and Mugu lagoon during dry weather. Monitoring will be conducted and mass-based WLAs will be evaluated if targets are not met in Arroyo Simi/Las Posas or downstream reaches.

(d) Discharger does not contribute loading during dry weather. Concentration-based WLAs apply during wet weather when discharges occur. Monitoring will be conducted and mass-based WLAs will be evaluated if targets are not met in receiving water and/or downstream reaches.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Waste Load Allocations (continued)	**Interim and Final WLAs for Total Recoverable Nickel in Water Column**

POTW	Interim		Final		
	Daily Maximum (ug/L)	Monthly Average (ug/L)	Daily Maximum (ug/L)1	Monthly Average (ug/L)2	lb/day
Hill Canyon WWTP	8.3	6.4	(a)	(a)	0.3
Simi Valley WQCP	(b)	(b)	960.0	169.0	(c)
Moorpark WTP	(b)	(b)	960.0	169.0	(d)
Camarillo WRP	16.0	6.2	(a)	(a)	0.2
Camrosa WRP	(b)	(b)	858.0	149.0	(d)

[1] Concentration-based targets have been converted to total recoverable allocations using the CTR default translator of 0.998.

[2] Concentration-based targets have been converted to total recoverable allocations using the CTR default translator of 0.997.

(a) Concentration-based final limits will be included in the permits in accordance with NPDES guidance and requirements, but are not calculated as part of the TMDL.

(b) Interim limits are not required because the discharger is meeting the final limits.

(c) Discharges from Simi Valley WQCP do not reach lower Calleguas Creek and Mugu lagoon during dry weather. Monitoring will be conducted and mass-based WLAs will be evaluated if targets are not met in Arroyo Simi/Las Posas or downstream reaches.

(d) Discharger does not contribute loading during dry weather. Concentration-based WLAs apply during wet weather when discharges occur. Monitoring will be conducted and mass-based WLAs will be evaluated if targets are not met in receiving water and/or downstream reaches.

A study to support a SSO for nickel has been submitted to the Regional Board and is currently under reviewed by the Regional Board and U.S. EPA staff. If a SSO for nickel is approved, the Regional Board will consider revision to the final WLAs for nickel based on the approved SSO.

Interims and Final WLAs for Mercury in Suspended Sediment

POTW	Interim (lb/month)	Final (lb/month)
Hill Canyon WWTP	0.23	0.022
Simi Valley WQCP	0.18	0.031
Moorpark WTP	N/A	N/A
Camarillo WRP	0.03	0.015
Camrosa WRP	N/A	N/A

Waste load allocations for POTWs are based on the median monthly mercury effluent concentrations multiplied by the design flow where the total load in water is assumed equal to the suspended sediment load. Interim WLAs for mercury are based on the 90th percentile concentration observed in effluent discharge and multiplied by the design flow, and apply to all flow conditions.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Waste Load Allocations (continued)	**Permitted Stormwater Dischargers (PSDs)** PSDs include mass-based WLAs established for copper, nickel, and selenium in total recoverable forms. Mass-based WLAs are developed for mercury in suspended sediment. Interim limits are included to allow time for dischargers to put in place implementation measures necessary to achieve final waste load allocations. The daily maximum and monthly average interim limits are set equal to the 99th and 95th percentile of available discharge data. **Interim Limits and Final WLAs for Total Recoverable Copper, Nickel, and Selenium** Interim limits and waste load allocations are applied to receiving water. **A. Interim Limits**

Constituents	Calleguas and Conejo Creek			Revolon Slough		
	Dry Daily Maximum (ug/L)	Dry Monthly Average (ug/L)	Wet Daily Maximum (ug/L)	Dry Daily Maximum (ug/L)	Dry Monthly Average (ug/L)	Wet Daily Maximum (ug/L)
Copper	23	19	204	23	19	204
Nickel	15	13	(a)	15	13	(a)
Selenium	(b)	(b)	(b)	14 (c)	13 (c)	(a)

(a) The current loads do not exceed the TMDL under wet conditions; interim limits are not required.
(b) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.
(c) Attainment of interim limits will be evaluated in consideration of background loading data, if available.

B. Final WLAs for Total Recoverable Copper, Nickel, and Selenium

Dry-Weather WLAs in Water Column

Flow Range	Calleguas and Conejo Creek			Revolon Slough		
	Low Flow	Average Flow	Elevated Flow	Low Flow	Average Flow	Elevated Flow
Copper[1] (lbs/day)	0.04*WER - 0.02	0.12*WER - 0.02	0.18*WER - 0.03	0.03*WER - 0.01	0.06*WER - 0.03	0.13*WER - 0.02
Nickel (lbs/day)	0.100	0.120	0.440	0.050	0.069	0.116
Selenium (lbs/day)	(a)	(a)	(a)	0.004	0.003	0.004

[1] If site-specific WERs are approved by the Regional Board, TMDL waste load allocations shall be implemented in accordance with the approved WERs using the equations set forth above. Regardless of the final WERs, total copper loading shall not exceed current loading.
(a) Selenium allocations have not been developed for this reach as it is not on the 303(d) list

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Waste Load Allocations (continued)	**Wet-Weather WLAs in Water Column**

Constituent	Calleguas Creek	Revolon Slough
Copper[1] (lbs/day)	(0.00054*Q^2*0.032*Q - 0.17)*WER - 0.06	(0.0002*Q2+0.0005*Q)*WER
Nickel[2] (lbs/day)	0.014*Q^2+0.82*Q	0.027*Q^2+0.47*Q
Selenium[2] (lbs/day)	(a)	0.027*Q^2+0.47*Q

[1] If site-specific WERs are approved by the Regional Board, TMDL waste load allocations shall be implemented in accordance with the approved WERs using the equations set forth above. Regardless of the final WERs, total copper loading shall not exceed current loading.

[2] Current loads do not exceed loading capacity during wet weather. Sum of all loads cannot exceed loads presented in the table

(a) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.

Q: Daily storm volume.

Interim Limits and Final WLAs for Mercury in Suspended Sediment

Final WLAs are set at 80% reduction of HSPF load estimates. Interim limits for mercury in suspended sediment are set equal to the highest annual load within each flow category, based on HSPF output for the years 1993-2003.

Flow Range	Calleguas Creek		Revolon Slough	
	Interim (lbs/yr)	Final (lbs/yr)	Interim (lbs/yr)	Final (lbs/yr)
0-15,000 MGY	3.3	0.4	1.7	0.1
15,000-25,000 MGY	10.5	1.6	4	0.7
Above 25,000 MGY	64.6	9.3	10.2	1.8

MGY: million gallons per year.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Waste Load Allocations (continued)	**Final WLAs for Other NPDES Dischargers** **Final WLAs for Total Recoverable Copper, Nickel, and Selenium**

Reach	Copper[1]		Nickel		Selenium	
	Dry Monthly Everage (ug/L)[2]	Wet Daily Maximum (ug/L)[2]	Dry Monthly Average (ug/L)[3]	Wet Daily Maximum (ug/L)[3]	Dry Monthly Average (ug/L)	Wet Daily Maximum (ug/L)
1	3.7*WER	5.8*WER	8.2	74	(b)	(b)
2	3.7*WER	5.8*WER	8.2	74	(b)	(b)
3	27.0	27.4	149	859	(b)	(b)
4	3.7*WER	5.8*WER	8.3	75	5	290
5	3.7*WER	5.8*WER	8.3	75	5	290
6	(a)	31.0	(a)	958	(b)	(b)
7	(a)	31.0	(a)	958	(b)	(b)
8	(a)	31.0	(a)	958	(b)	(b)
9	29.1	43.3	160	1296	(b)	(b)
10	29.1	43.3	160	1296	(b)	(b)
11	29.1	43.3	160	1296	(b)	(b)
12	29.1	43.3	160	1296	(b)	(b)
13	29.1	43.3	160	1296	(b)	(b)

[1] If site-specific WERs are approved by the Regional Board, TMDL waste load allocations shall be implemented in accordance with the approved WERs using the equations set forth above. Regardless of the final WERs, total copper loading shall not exceed current loading. In addition, effluent concentrations shall not exceed the performance standards of current treatment technologies

[2] Concentration-based targets have been converted to total recoverable allocations using the CTR default translator of 0.96 for freshwater reaches and 0.83 for saltwater reaches.

[3] Concentration-based targets have been converted to total recoverable allocations using the CTR default translator of 0.997 for freshwater reaches and 0.99 for saltwater reaches.

(a) Discharges from these reaches do not reach lower Calleguas Creek and Mugu Lagoon during dry weather. Allocations are not required for these reaches.

(b) Selenium waste load allocations have not been developed for this reach as it is not on the 303(d) list.

Final WLAs for Mercury

There is insufficient information to assign mass based WLAs to these sources. Therefore concentration-based waste loads allocations are set equal to 0.051 ug/L for other NPDES dischargers based on the CTR water column target for protection of human health from consumption organism only.

Load Allocation	Mass-based load allocations (LAs) for agriculture, and open space are developed for copper, nickel, and selenium in total recoverable forms. Open space represents background loads from ambient sources (i.e. natural soil concentrations, atmospheric deposition, and natural groundwater seepage) discharged from undeveloped open space, but not ambient sources that are discharged from developed land, such as agricultural and urban areas. LAs are developed for both wet and dry-weather. The dry-weather LAs apply to days when flows in the stream are less than 86th percentile flow rate for each reach. The wet-weather LAs apply to days when flows in the stream exceed 86th percentile flow rate for each reach. Annual mass loads of mercury in suspended sediment were developed according to low, medium, and high annual flow categories.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Load Allocation	**Interim and Final Load Allocations for Total Recoverable Copper, Nickel, and Selenium**

Interim limits are included to allow time for dischargers to put in place implementation measures necessary to achieve final load allocations. The daily maximum and monthly average interim limits are set equal to the 99th and 95th percentile of available discharge data. Interim limits and final load allocations are applied in receiving water at the compliance points.

A. Interim Limits

Constituents	Calleguas and Conejo Creek			Revolon Slough		
	Dry Daily Maximum (ug/L)	Dry Monthly Average (ug/L)	Wet Daily Maximum (ug/L)	Dry Daily Maximum (ug/L)	Dry Monthly Average (ug/L)	Wet Daily Maximum (ug/L)
Copper	24	19	1390	24	19	1390
Nickel	43	42	(a)	43	42	(a)
Selenium	(b)	(b)	(b)	6.7 (c)	6 (c)	(a)

(a) The current loads do not exceed the TMDL under wet conditions, interim limits are not required.

(b) Selenium allocations have not been developed for this reach as it is not on the 303(d) list. Implementation actions includes consideration of watershed-wide selenium impacts.

(c) Attainment of interim limits will be evaluated in consideration of background loading data, if available.

B. Final Load Allocation

Dry Weather LAs in Water Column

Constituent		Calleguas Creek			Revolon Slough		
		Low Flow	Average Flow	Elevated Flow	Low Flow	Average Flow	Elevated Flow
Copper[1] (lbs/day)	Agriculture	0.07*WER-0.03	0.12*WER-0.02	0.31*WER-0.05	0.07*WER-0.03	0.14*WER-0.07	0.35*WER-0.07
	Open Space	0.150	0.080	0.130	0.050	0.120	0.110
Nickel (lbs/day)	Agriculture	0.420	0.260	0.970	0.390	0.690	1.600
	Open Space	0.450	0.420	0.560	0.010	0.020	0.020
Selenium (lbs/day)	Agriculture	(a)	(a)	(a)	0.008	0.007	0.018
	Open Space	(a)	(a)	(a)	0.180	0.310	0.490

[1] If site-specific WERs are approved by the Regional Board, TMDL load allocations shall be implemented in accordance with the approved WERs using the equations set forth above.

(a) Selenium allocations have not been developed for this reach as it is not on the 303(d) list. Implementation actions include consideration of the watershed-wide selenium impacts.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Load Allocation (continued)	Wet Weather LAs in Water Column

Constituent		Calleguas Creek	Revolon Slough
Copper[1] (lbs/day)	Agriculture	(0.00017*Q^2*0.01*Q - 0.05)*WER - 0.02	(0.00123*Q^2+0.0034*Q)* WER
	Open Space	0.0000537*Q^2+0.00321*Q	0.0000432*Q^2+0.000765*Q
Nickel[2] (lbs/day)	Agriculture	0.014*Q^2+0.82*Q	0.027*Q^2+0.47*Q
	Open Space	0.014*Q^2+0.82*Q	0.027*Q^2+0.47*Q
Selenium[2] (lbs/day)	Agriculture	(a)	0.1*Q^2+1.8*Q
	Open Space	(a)	0.027*Q^2+0.47*Q

[1] If site-specific WERs are approved by the Regional Board, TMDL load allocations shall be implemented in accordance with the approved WERs using the equations set forth above.

[2] Current loads do not exceed loading capacity during wet weather. Sum of all loads cannot exceed loads presented in the table

(a) Selenium allocations have not been developed for this reach as it is not on the 303(d) list.

Q Daily storm volume

Interim and Final LAs for Mercury in Suspended Sediment

Final LAs are set at 80% reduction of HSPF load estimates. Interim limits for mercury in suspended sediment are set equal to the highest annual load within each flow category, based on HSPF output for the years 1993-2003

Flow Range	Calleguas Creek				Revolon Slough			
	Agriculture		Open Space		Agriculture		Open Space	
	Interim (lbs/yr)	Final (lbs/yr)	Interim (lbs/yr)	Final (lbs/yr)	Interim (lbs/yr)	Final (lbs/yr)	Interim (lbs/yr)	Final (lbs/yr)
0-15,000 MGY[1]	3.9	0.5	5.5	0.7	2	.	2.9	0.2
15,000-25,000 MGY	12.6	1.9	17.6	2 .7	4.8	0.8	6.7	1.1
Above 25,000 MGY	77.5	11.2	108.4	17.9	12.2	2.2	17.1	2

MGY: million gallons per year.

Margin of Safety	A margin of safety (MOS) for the TMDL is designed to address any uncertainty in the analysis that could result in targets not being achieved in the water bodies. Both implicit and explicit MOS are included for this TMDL. The implicit MOS stems from 1) the use of conservative assumptions made during development of multiple numeric targets to ensure sufficient protection under all conditions, and 2) conservative methods employed in developing the TMDL. Background loads are assigned to the TMDL and assumed to remain constant throughout implementation of the TMDL. This results in higher required reductions for the other sources. Calculation of allocations is based on never exceeding numeric target concentrations more than once in three years as specified in the CTR. Calculations of current loads and loading capacity for Mugu Lagoon are based on the combined discharges from Calleguas Creek and Revolon Slough (without any dilution provided by tidal flushing), which over predicts actual concentrations in the Lagoon. A 15% explicit MOS is also included for copper and nickel to account for the uncertainty resulting from the calculation of the allowable load based on the median flow rate and translator of each flow category. The 15% explicit MOS is determined sufficient to address the elevated flow category, but still account for the more conservative nature of low and average category.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Future Growth	Ventura County accounts for slightly more than 2% of the state's residents with a population of 753,197 (US Census Bureau, 2000). GIS analysis of the 2000 census data yields a population estimate of 334,000 for the CCW, which equals about 44% of the county population. According to the Southern California Association of Governments (SCAG), growth in Ventura County averaged about 51% per decade from 1900-2000; with growth exceeding 70% in the 1920s, 1950s, and 1960s. Significant population growth is expected to occur within and near present city limits until at least 2020. Future growth may initially increase loadings as construction activities expose bare soil and increase erosion-related discharges to receiving water. However, once development has been completed the presence of impermeable land surface and landscaped areas may reduce the amount of natural soils that are eroded and carried to the stream. For copper, future growth could increase loadings from urban areas and POTWs due to increased traffic (i.e., brake pad residues), architectural copper use and corrosion of copper pipes. Selenium loading may increase if increased irrigation raises the groundwater table and increases high selenium groundwater seepage to surface waters. However, if increased growth results in increased water demand and high selenium groundwater is pumped and treated to supply this demand, the selenium could decrease.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed for copper, nickel, and selenium by developing separate allocations for wet and dry weather. Critical conditions for copper, nickel, and selenium were developed using model results to calculate the maximum observed 4-day average dry weather concentration and the associated flow condition. Wet weather, as a whole, is defined as a critical condition. For mercury, there is no indication that mercury contamination in Mugu Lagoon is consistently exacerbated at any particular time of the year. Since the potential effects of mercury are related to bioaccumulation in the food chain over a long period time, any other short term variations in concentration which might occur are not likely to cause significant impacts upon beneficial uses. Therefore, seasonal variations do not affect critical conditions for the Calleguas Creek watershed mercury TMDL.
Special Studies and Monitoring Plan	<u>Special Studies</u> Several special studies are planned to improve understanding of key aspects related to achievement of WLAs and LAs for the Metals and Selenium TMDL ***1. Special Study #1 (Optional) – Evaluation and Initiation of Natural Sources Exclusion*** The TMDL technical report has identified ambient sources as the primary significant selenium and mercury loadings in the watershed and as potentially significant sources of copper and nickel. The portion of all ambient sources associated with open space runoff and natural groundwater seepage is accounted for in this TMDL as "background load." This special study will evaluate whether or not background loads for each constituent qualify for natural source exclusion.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Special Studies and Monitoring Plan (continued)	This study will also consider whether any portion of the ambient source contribution for agricultural or urban runoff loads qualify for natural source exclusions and/or provide a basis for site specific objectives. The presence of natural sources makes achievement of selenium and mercury targets during all conditions unlikely. For copper, achievement of the CTR targets or the WER based targets (if approved) in Revolon Slough may not be feasible due to the magnitude of background loads. Completion of site specific objectives and/or a use attainability analysis shall be required to review any potential change to water quality objectives for these constituents. This special study will be used to develop the necessary information to revise the water quality objectives for selenium and mercury and possibly for copper and nickel. ***2. Special Study #2 – Identification of selenium contaminated Groundwater Sources*** The purpose of this special study will be to identify groundwater with high concentrations of selenium that is either being discharged directly to the stream or used as irrigation water. The investigation will focus on areas where groundwater has a high probability of reaching the stream and identify practical actions to reduce the discharge of the groundwater to the stream. The analysis will include an assessment of the availability of alternative water supplies for irrigation water, the costs of the alternative water supplies and the costs of reducing groundwater discharges. ***3. Special Study #3– Investigation of Soil Concentrations and Identification of "Hot Spots"*** The purpose of this special study will be to identify terrestrial areas with high concentrations of metals and/or selenium, either due to anthropogenic sources or resulting from high natural concentrations in soils. Use of detailed soil maps for the watershed in combination with field survey and soil sampling may lead to identification of areas important for reducing overall loads reaching the stream. Identification of any areas with elevated soil concentrations of metals and/or selenium would create an opportunity for efficient and targeted implementation actions, such as remediation or erosion control. ***4. Special Study #4 (Optional) – Determination of Water Effect Ratio for Copper in Revolon Slough*** The purpose of this optional special study would be to calculate a WER for copper that is specific to Revolon Slough. A WER was not previously developed for Revolon Slough because it was not listed for copper. Subsequent monitoring demonstrated that the saltwater copper CTR criterion was exceeded in Revolon Slough. This Study would parallel the developed WER for Mugu Lagoon and Calleguas Creek. This is an optional special study to be conducted if desired by the stakeholders or determined necessary by the Executive Officer.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Special Studies and Monitoring Plan (continued)	***5. Special Study #5 (Optional) – Determination of Site-Specific Objectives for Mercury and Selenium*** Special Study #1 will evaluate whether a natural source exclusion is appropriate for background loads of mercury and selenium or any portion of the ambient source contributions to non-background loads in the Calleguas Creek watershed. This special study will develop any SSOs deemed necessary to account for the background conditions and/or site-specific impacts of mercury and selenium (and possibly for copper and nickel) on wildlife and humans in the watershed. This is an optional special study to be conducted if desired by the stakeholders or determined necessary for establishing a natural source exclusion. **<u>Monitoring Plan</u>** The Calleguas Creek Watershed TMDL Monitoring Plan (CCWTMP) is designed to monitor and evaluate the implementation of this TMDL and refine the understanding of metal and selenium loads. CCWTMP is intended to parallel efforts of the Calleguas Creek Watershed Nutrients TMDL, Toxicity TMDL, and OC Pesticide, PCBs, and Sediment TMDL monitoring programs. The proposed CCWTMP shall be made available for public review before approval by the Executive Officer. The goals of the CCWTMP include: (1) to determine compliance with copper, mercury, nickel, and selenium numeric targets at receiving water monitoring stations and at POTWs discharges; (2) to determine compliance with waste load and load allocations for copper, mercury, nickel, and selenium at receiving water monitoring stations and at POTWs discharges; (3) to monitor the effect of implementation action by PSDs, POTW, agricultural dischargers, and other NPDES permittees on in-stream water quality; and (4) to implement the CCWTMP in a manner consistent with other TMDL implementation plans and regulatory actions within the Calleguas Creek watershed. Monitoring conducted through the Conditional Waiver for Disharges from Irrigated Lands (Conditional Waiver Program) may meet part of the needs of the CCWTMP. To the extent monitoring required by the Metals and Selenium TMDL Implementation Plan parallels monitoring required by the Conditional Waiver Program, monitoring shall be coordinated with monitoring conducted by individuals and groups subject to the term and conditions of the Conditional Waiver Program.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Special Studies and Monitoring Plan (continued)	Monitoring will begin within one year of the effective date of the TMDL. For the first year, in-stream water column samples will be collected monthly for analysis of general water quality constituents (GWQC), copper, mercury, nickel, selenium, and zinc. After the first year, the Executive Officer will review the monitoring report and revise the monitoring frequency as appropriate. In-stream water column samples will be generally be collected at the base of Revolon Slough and Calleguas Creek, and in Mugu Lagoon (collection of flow-based samples will occur above the tidal prism). Additionally, sediment samples will be collected semi-annually in Mugu Lagoon and analyzed for sediment toxicity resulting from copper, mercury, nickel, selenium, and zinc. At such a time as numeric targets are consistently met at these points, an additional site or sites will be considered for monitoring to ensure numeric targets are met throughout the lower watershed. Additional samples will be collected concurrently at stations that are representative of agricultural and urban runoff as well as at POTWs in each of the subwatersheds and analyzed for GWQCs, copper, mercury, nickel, selenium, and zinc. The location of these stations will be determined before initiation of the CCWTMP. Environmentally relevant detection limits will be used for metals and selenium (i.e. detection limits lower than applicable target), if available at a commercial laboratory. Compliance sampling station locations:

Subwatershed	Station ID	Station Location	Constituent
Mugu Lagoon	01-11-BR	11th Street Bridge	Water Column: Cu, Ni, Hg, Se, Zn
			Bird Egg: Hg, Se
			Fish Tisue: Hg, Se
			Sediment: Cu, Ni, Hg, Se, Zn
Revolon Slough	04-WOOD	Revolon Slough East Side of Wood Road	Water Column: Cu, Ni, Hg, Se, Zn
			Fish Tisue: Hg, Se
Calleguas Creek	03-CAMAR	Calleguas Creek at University Drive	Water Column: Cu, Ni, Hg, Se, Zn
	03D-CAMR	Camrosa Water Reclamation Plant	Water Column: Cu, Ni, Hg, Se, Zn
	9AD-CAMA	Camarillo Water Reclamation Plant	Water Column: Cu, Ni, Hg, Se, Zn
Conejo Creek	10D-HILL	Hill Canyon Wastew ater Treatment Plant	Water Column: Cu, Ni, Hg, Se, Zn

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Implementation Plan	The final WLAs will be included for permitted stormwater discharges, POTWs, and other NPDES discharges in accordance with the compliance schedules provided in Table 7-19.2. The Regional Board may revise these WLAs based on additional information developed through special studies and/or monitoring conducted as part of this TMDL. In addition, the implementation schedule was developed with the assumption that a WER for copper and a SSO for nickel will proceed following the TMDL. Should adoption and approvals of the WER and SSO not proceed, additional implementation actions could be required. The implementation plan includes discussion of implementation actions to address these conditions. WLAs established for Simi Valley WQCP, Camrosa WRP, and Moorpark WTP in this TMDL will be implemented through NPDES permit limits. Compliance will be determined through monitoring of final effluent discharge as defined in the NPDES permit. The Hill Canyon and Camarillo WRPs are working towards discontinuing the discharge of effluent to Conejo Creek. If this plan is implemented, the POTW allocations for the watershed will be achieved by reduction of effluent discharges to the stream. The implementation plan includes sufficient time for this plan to be implemented. However, if this plan is altered, the POTWs will need to meet allocations through other methods such as source control activities. The Regional Board will need to ensure that permit conditions are consistent with the assumptions of the WLAs. Should federal, state, or regional guidance or practice for implementing WLAs into permits be revised, the Regional Board may reevaluate the TMDL to incorporate such guidance. In accordance with current practice, a group concentration-based WLA has been developed for all permitted stormwater discharges, including municipal separate storm sewer systems (MS4s), Caltrans, general industrial and construction stormwater permits, and Naval Air Weapons Station Point Mugu. MS4 WLAs will be incorporated into the NPDES permit as receiving water limits measured in-stream at the base of Revolon Slough and Calleguas Creek, and in Mugu Lagoon and will be achieved through the implementation of BMPs as outlined in the implementation plan. The Regional Board will need to ensure that permit conditions are consistent with the assumptions of the WLAs. If BMPs are to be used, the Regional Board will need to detail its findings and conclusions supporting the use of BMPs in the NPDES permit fact sheets. Should federal, state, or regional guidance or practice for implementing WLAs into permits be revised, the Regional Board may reevaluate the TMDL to incorporate such guidance. The Regional Board may revise these WLAs based on the collection of additional information developed through special studies and/or monitoring conducted as part of this TMDL.

TMDL Element	Calleguas Creek Watershed Metals and Selenium TMDL
Implementation Plan (continued)	LAs will be implemented through the State's Nonpoint Source Pollution Control Program (NPSPCP) and Conditional Waiver for Discharges from Irrigated Lands adopted by the Los Angeles Regional Water Quality Control Board on November 3, 2005. Compliance with LAs will be measured in-stream at the base of Revolon Slough and Calleguas Creek and in Mugu Lagoon and will be achieved through the implementation of BMPs consistent with the NPSPCP and the Conditional Waiver Program. The Conditional Waiver Program requires the development of an agricultural water quality management plan (AWQMP) to address pollutants that are exceeding receiving water quality objectives as a result of agricultural discharges. Therefore, implementation of the load allocations will be through the development of an AWQMP for metals and selenium. Implementation of the load allocations will also include the coordination of BMPs being implemented under other required programs to ensure metal discharges are considered in the implementation. Additionally, agricultural dischargers will participate in educational seminars on the implementation of BMPs as required under the Conditional Waiver Program. Studies are currently being conducted to assess the extent of BMP implementation and provide information on the effectiveness of BMPs for agriculture. This information will be integrated into the AWQMP that will guide the implementation of agricultural BMPs in the Calleguas Creek watershed. After implementation of these actions, compliance with the allocations and TMDL will be evaluated and the allocations reconsidered if necessary based on the special studies and monitoring plan section of the implementation plan Agricultural and PSDs dischargers will have a required 25%, 50% and 100% reduction in the difference between the current loadings and the load allocations at 5, 10 and 15 years after the effective date, respectively. Achievement of required reductions will be evaluated based on progress towards BMP implementation as outlined in the UWQMPs, AWQMP, Conditional Waiver Program, and in consideration of background loading information, if available. If the interim reductions are not met, the dischargers will submit a report to the Executive Officer detailing why the reductions were not met and the steps that will be taken to meet the required reductions. As shown in Table 7-19.2, implementation of LAs will be conducted over a period of time to allow for implementation of the BMPs, as well as coordination with special studies and implementation actions resulting from other TMDL Implementation Plans for the Calleguas Creek watershed. The Regional Board may revise the LAs based on the collection of additional information developed through special studies and/or monitoring conducted as part of this TMDL.

Table 7-19.2 Calleguas Creek Watershed Metals and Selenium TMDL: Implementation Schedule

Item	Implementation Action[1]	Responsible Party	Completion Date
1	Effective date of interim Metals and Selenium TMDL waste load allocation (WLAs), and final WLAs for other NPDES permittees	POTWs, Permitted Stormwater Dischargers[2] (PSD), Other NPDES Permittees	Effective date of the amendment
2	Effective date of interim Metals and Selenium TMDL load allocation (LAs)	Agricultural Dischargers	Effective date of the amendment
3a	Submit Calleguas Creek Watershed Metals and Selenium Monitoring Program	POTWs, PSD, Agricultural Dischargers	Within 3 months after the effective date of the amendment
3b	Implement Calleguas Creek Watershed Metals and Selenium Monitoring Program	POTWs, PSD, Agricultural Dischargers	Within 3 months of Executive Officer approval of the monitoring program
3c	Re-calibrate HSPF water quality model based on first year of monitoring data	POTWs, PSD, Agricultural Dischargers	1 year after submittal of first annual monitoring report
4a	Conduct a source control study, develop and submit an Urban Water Quality Management Program (UWQMP) for copper, mercury, nickel, and selenium	MS4s	Within 2 years after the effective date of the amendment
4b	Conduct a source control study, develop and submit an UWQMP for copper, mercury, nickel, and selenium	Caltrans	Within 2 years after the effective date of the amendment
4c	Conduct a source control study, develop and submit an UWQMP for copper, mercury, nickel, and selenium	NAWS point Mugu (US Navy)	Within 2 years after the effective date of the amendment
5	Implement UWQMP	PSD	Within 1 year of approval of UWQMP by the Executive Officer
6	Develop and submit an Agricultural Water Quality Management Program (AWQMP) as described in the Conditional Waiver Program	Agricultural Dischargers	Within 2 years after the effective date of the amendment
7	Implement AWQMP	Agricultural Dischargers	Within 1 year of approval of AWQMP by the Executive Officer
8	Develop WLAs and LAs for zinc if impairment for Mugu Lagoon is maintained on the final 2006 303(d) list	Regional Board or USEPA	Within 1 year of the final 2006 303(d) list
9	Submit progress report on salinity management plan, including status of reducing WRP effluent discharges to Conejo and Calleguas Creek reaches of the watershed	POTWs	Within 3 years after the effective date of the amendment
10	If progress report identifies the effluent discharges reduction is not progressing, develop and implement source control activities for copper, mercury, nickel, and selenium	POTWs	Within 4 years after the effective date of the amendment

Item	Implementation Action[1]	Responsible Party	Completion Date
11	Re-evaluation of POTW interim waste load allocations for copper, mercury, and nickel	POTWs	Within 5 years after the effective date of the amendment
12a	Evaluate the results of the OCs TMDL, Special Study – Calculation of sediment transport rates in the Calleguas Creek watershed for applicability to the metals and selenium TMDL	Agricultural Dischargers, PSD	Within 6 months of completion of the study
12b	Include monitoring for copper, mercury, nickel, and selenium in the OC pesticides TMDL, special Study – Monitoring of sediment by source and land use type	Agricultural Dischargers, PSD	Within 2 years after the effective date of the amendment
12c	Expand scope of the OC Pesticide TMDL, Special Study – Examination of food webs and accumulation in the Calleguas Creek watershed to ensure protection of wildlife to include mercury	Interested parties	If necessary, prior to end of the implementation period
12d	Evaluate the results of the OC Pesticides TMDL, Special Study – Effects of BMPs on Sediment and Siltation to determine the impacts on metals and selenium	Agricultural Dischargers, PSD	Within 6 months of completion of the study
13a	Submit work plan for Special Study #1 (Optional) – Identification of Natural Sources Exclusion	Agricultural Dischargers, PSD	Within 1 year after the effective date of the amendment
13b	Submit results of Special Study #1 (Optional) – Identification of Natural Sources Exclusion	Agricultural Dischargers, PSD	Within 3 years of approval of workplan by Executive Officer
14a	Submit work plan for Special Study #2 – Identification of selenium Contaminated Groundwater Sources	POTWs, PSD, and Agricultural Dischargers	Within 1 year after the effective date of the amendment
14b	Submit results of Special Study #2 – Identification of selenium Contaminated Groundwater Sources	POTWs, PSD, and Agricultural Dischargers	Within 1 year of approval of workplan by Executive Officer
15a	Submit work plan for Special Study #3 – Investigation of Metals' "Hot Spot" and Natural Soil	PSD and Agricultural Discharger	Within 1 year after the effective date of the amendment
15b	Submit results of Special Study #3 – Investigation of metals' "Hot Spot" and Natural Soil	PSD and Agricultural Discharger	Within 2 years of approval of workplan by Executive Officer
16	Special Study #4 (Optional) – Determination of WER for copper in Revolon Slough	PSD and Agricultural Dischargers	If necessary, prior to end of the implementation period
17	Special Study #5 (Optional) – Determination of Site Specific Objective for Mercury and Selenium	PSD and Agricultural Dischargers	If necessary, prior to end of the implementation period
18	Evaluate effectiveness of BMPs implemented under the AWQMP and UWQMP in controlling metals and selenium discharges	PSD and Agricultural Dischargers	6 years after the effective date of the amendment
19	Evaluate the results of implementation actions 14 and 15 (Special Study #2 & #3) and implement actions identified by the studies	POTWs, PSD, and Agricultural Dischargers	Within 1 year after the completion of the studies

Item	Implementation Action[1]	Responsible Party	Completion Date
20	If needed, implement additional BMPs or revise existing BMPs to address any issues not covered by implementation efforts of related Calleguas Creek watershed TMDLs (Nutrients, Toxicity, OC Pesticides, PCBs, and Siltation) and the Conditional Waiver Program	Agricultural Dischargers	7 years after the effective date of the amendment
21	Consider nickel SSO proposed by stakeholders	Regional Board	1 years after the effective date of the amendment
22	Publicly notice tentative copper water effects ratio for Regional Board consideration, if deemed appropriate based on peer review	Regional Board Staff	Within 2 months of receipt of peer review comments
23	Based on the result from items 1-23, Regional Board will consider re-evaluation of the TMDLs, WLAs, and LAs if necessary	Regional Board	2 years from submittal of information necessary for re-evaluation
24	POTWs will be required to reduce loadings by 50%, and 100% of the difference between the current loading and the WLAs at 8 and 10 years after the effective date, respectively.	POTWs	8 and 10 years after the effective date of the amendment
25	Re-evaluation of Agricultural and Urban load and waste load allocations for copper, mercury, nickel, and selenium based on the evaluation of BMP effectiveness. Agricultural and urban dischargers will have a required 25%, 50%, and 100% reduction in the difference between the current loadings and the load allocations at 5, 10, and 15 years after the effective date, respectively.	Agricultural and PSDs	5, 10, and 15 years after the effective date of the amendment
26	Stakeholders and Regional Board staff will provide information items to the Regional Board, including: progress toward meeting TMDL load reductions, water quality data, and a summary of implementation activities completed to date	Regional Board	2 years after the effective date, and every 2 years following
27	Achievement of Final WLAs and attainment of water quality standards for copper, mercury, nickel, and selenium	POTWs	Within 10 years after the effective date of the amendment[3]
28	Achievement of Final WLAs and LAs and attainment of water quality standards for copper, nickel, mercury and selenium	Agricultural Dischargers, PSD	Within 15 years after the effective date of the amendment[3]

1 The Regional Board regulatory programs addressing all discharges in effect at the time this implementation task is due may contain requirements substantially similar to the requirements of these implementation tasks. If such requirements are in place in another regulatory program including other TMDLs, the Executive Officer may revise or eliminate this implementation task to coordinate this TMDL implementation plan with other regulatory programs.

2 Permitted Stormwater Dischargers (PSD) include MS4s, Caltrans, the Naval Air Weapons Station at Point Mugu, and general industrial and construction permittees.

3 Date of achievement of WLAs and LAs based on the estimated timeframe for educational programs, special studies, and implementation of appropriate BMPs and associated monitoring. The Conditional Waiver Program will set timeframes for the BMP management plans.

7-21 Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on June 8, 2006.

This TMDL was approved by:
The State Water Resources Control Board on November 15, 2006.
The Office of Administrative Law on February 20, 2007.
The U.S. Environmental Protection Agency on March 26, 2007.

The effective date of this TMDL is: April 27, 2007.

The following table includes all the elements of this TMDL.

Table 7-21.1. Ballona Creek, Estuary, and Tributaries Bacteria TMDL: Elements

Element	Key Findings and Regulatory Provisions
Problem Statement	Elevated bacterial indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use designated for Ballona Estuary and Sepulveda Channel, limited water contact recreation (LREC) designated for Ballona Creek Reach 2, and non-contact recreation (REC-2) beneficial uses of Ballona Creek Reach 1. Recreating in waters with elevated bacterial indicator densities has long been associated with adverse human health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacterial indicator densities.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations)	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine and fresh water to protect the contact and non-contact recreation uses. These targets are the most appropriate indicators of public health risk in recreational waters. These bacteriological objectives are set forth in Chapter 3 of the Basin Plan.[1] The objectives are based on four bacterial indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are: **In Marine Waters Designated for Water Contact Recreation (REC-1)** 1. Geometric Mean Limits a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. 2. Single Sample Limits a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Element	Key Findings and Regulatory Provisions
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations) (continued)	**In Fresh Waters Designated for Water Contact Recreation (REC-1)** 1. Geometric Mean Limits a. *E. coli* density shall not exceed 126/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. 2. Single Sample Limits a. *E. coli* density shall not exceed 235/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. In Fresh Waters Designated for Limited Water Contact Recreation (LREC-1)[2] 1. Geometric Mean Limits a. *E. coli* density shall not exceed 126/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. 2. Single Sample Limits a. *E. coli* density shall not exceed 576/100 ml. **In Fresh Waters Designated for Non-Contact Water Recreation (REC-2)** 1. Geometric Mean Limits a. Fecal coliform density shall not exceed 2000/100 ml. 2. Single Sample Limits a. Fecal coliform density shall not exceed 4000/100 ml. The targets apply throughout the year. Determination of attainment of the targets will be at in-stream monitoring sites to be specified in the compliance monitoring report. Implementation of the above REC-1 and LREC-1 bacteria objectives and the associated TMDL numeric targets is achieved using a 'reference system/anti-degradation approach' rather than the alternative 'natural sources exclusion approach subject to antidegradation policies' or strict application of the single sample objectives. As required by the CWA and Porter-Cologne Water Quality Control Act, Basin Plans include beneficial uses of waters, water quality objectives to protect those uses, an anti-degradation policy, collectively referred to as water quality standards, and other plans and policies necessary to implement water quality standards. This TMDL and its associated waste load allocations, which shall be incorporated into relevant permits, and load allocations are the vehicles for implementation of the Region's standards.

Element	Key Findings and Regulatory Provisions
Numeric Target (Interpretation of the numeric water quality objective, used to calculate the waste load allocations) (continued)	The 'reference system/anti-degradation approach' means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within Santa Monica Bay, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the single sample objectives and that it is not the intent of the Regional Board to require treatment or diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas. The geometric mean targets may not be exceeded at any time. The rolling 30-day geometric means will be calculated on each day. If weekly sampling is conducted, the weekly sample result will be assigned to the remaining days of the week in order to calculate the daily rolling 30-day geometric mean. For the single sample targets, each existing monitoring site is assigned an allowable number of exceedance days for three time periods (1) summer dry-weather (April 1 to October 31), (2) winter dry-weather (November 1 to March 31), and (3) wet-weather (defined as days with 0.1 inch of rain or greater and the three days following the rain event.) Implementation of the REC-2 target will be as specified in the Basin Plan. The REC-2 bacteria objectives allow for a 10% exceedance frequency of the single sample limit in samples collected during a 30-day period. This allowance, which is based on an acceptable level of health risk, will be applied in lieu of the allowable exceedance days discussed earlier. As with the other REC-1 and LREC-1 objectives, the geometric mean target for REC-2, which is based on a rolling 30-day period, will be strictly adhered to and may not be exceeded at any time.
Source Analysis	The major contributors of flows and associated bacteria loading to Ballona Creek and Estuary, are dry- and wet-weather urban runoff discharges from the storm water conveyance system. Run-off to Ballona Creek is regulated as a point source under the Los Angeles County MS4 Permit, the Caltrans Storm Water Permit, and the General Construction and Industrial Storm Water Permits. In addition to these regulated point sources, the Ballona Estuary receives input from the Del Rey Lagoon and Ballona Wetlands through connecting tide gates.

Element	Key Findings and Regulatory Provisions
Source Analysis (continued)	Preliminary data suggest that the Ballona Wetlands are a sink for bacteria from Ballona Creek and it is therefore not considered a source in this TMDL. Inputs to Ballona Estuary from Del Rey Lagoon, are considered non-point sources of bacterial contamination. This waterbody may be considered for a natural source exclusion if its contributing bacteria loads are determined to be as a result of wildlife in the area, as opposed to anthropogenic inputs. The TMDL will require a source identification study for the lagoon in order to apply the natural source exclusion. Other nonpoint sources in Ballona Creek and Estuary include natural sources from birds, waterfowl and other wildlife. Data do not currently exist to quantify the extent of the impact of wildlife on bacteria water quality in the Estuary.
Loading Capacity	The loading capacity is defined in terms of bacterial indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above.
Waste Load Allocations (for point sources)	The Los Angeles County MS4 and Caltrans storm water permittees and co-permittees are assigned waste load allocations (WLAs) expressed as the number of daily or weekly sample days that may exceed the single sample targets equal to the TMDLs established for the impaired reaches (see Table 7.21.2a), and Waste Load Allocations assigned to waters tributary to impaired reaches (Table 7.21.2b). Waste load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. For each monitoring site, allowable exceedance days are set on an annual basis as well as for three time periods. These three periods are: 1. summer dry-weather (April 1 to October 31) 2. winter dry-weather (November 1 to March 31) 3. wet-weather days (defined as days of 0.1 inch of rain or more plus three days following the rain event). The County of Los Angeles, Caltrans, and the Cities of Los Angeles, Culver City, Beverly Hills, Inglewood, West Hollywood, and Santa Monica are the responsible jurisdictions and responsible agencies[3] for the Ballona Creek Watershed. The responsible jurisdictions and responsible agencies within the watershed are jointly responsible for complying with the waste load allocation in each reach.

Element	Key Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	For the single sample objectives of the impaired REC-1 and LREC-1 reaches, the proposed WLA for summer dry-weather are zero (0) days of allowable exceedances, and those for winter dry-weather and wet-weather are three (3) days and seventeen (17) days of exceedance, respectively. In the instances where more than one single sample objective applies, exceedance of any one of the limits constitutes an exceedance day. The proposed waste load allocation for the rolling 30-day geometric mean for the responsible agencies and jurisdictions is zero (0) days of allowable exceedances. For the single sample objectives of the impaired REC-2 reach, the proposed WLA for all periods is a 10% exceedance frequency of the REC-2 single sample water quality objectives. The proposed waste load allocation for the rolling 30-day geometric mean for the responsible agencies and jurisdictions is zero (0) days of allowable exceedances. In addition to assigning TMDLs for the impaired reaches, Waste Load Allocations and Load Allocations are assigned to the tributaries to these impaired reaches. These WLAs and LAs are to be met at the confluence of each tributary and its downstream reach (see Table 7.21.2b).
Load Allocations (for nonpoint sources)	Load allocations are expressed as the number of daily or weekly sample days that may exceed the single sample targets identified under "Numeric Target" at a monitoring site, along with a rolling 30-day geometric mean. Load allocations are expressed as allowable exceedance days because the bacterial density and frequency of single sample exceedances are the most relevant to public health protection. Del Rey Lagoon is considered a nonpoint source and is therefore subject to load allocations. The proposed LA for summer dry-weather are zero (0) days of allowable exceedances, and those for winter dry-weather and wet-weather are three (3) days and seventeen (17) days of exceedance, respectively. In the instances where more than one single sample objective applies, exceedance of any one of the limits constitutes an exceedance day. The proposed load allocation for the rolling 30-day geometric mean for the responsible agencies and jurisdictions is zero (0) days of allowable exceedances (see Table 7.21.2a). The City of Los Angeles is the responsible jurisdiction for the Del Rey lagoon, and is responsible for complying with the assigned load allocations presented in Table 7.21.2b at the tide gate(s) between the Lagoon and the Estuary. If other unidentified nonpoint sources are directly impacting bacteriological water quality and causing an exceedance of the numeric targets, within the Estuary, the permittee(s) under the Municipal Storm Water NPDES Permits are not responsible through these permits. However, the jurisdiction or agency adjacent to the monitoring location may have further obligations to identify such sources.

Element	Key Findings and Regulatory Provisions
Implementation	The regulatory mechanisms used to implement the TMDL will include the Los Angeles County Municipal Storm Water NPDES Permit (MS4), the Caltrans Storm Water Permit, general NPDES permits, general industrial storm water permits, general construction storm water permits, and the authority contained in Sections 13263 and 13267 of the Water Code. Each NPDES permit assigned a WLA shall be reopened or amended at re-issuance, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. Each responsible jurisdictions and agency will be required to meet the storm water waste load allocations shared by the LA County MS4 and Caltrans permittees at the designated TMDL effectiveness monitoring points. An iterative implementation approach using a combination of non-structural and structural BMPs may be used to achieve compliance with the waste load allocations. The administrative record and the fact sheets for the MS4 and Caltrans storm water permits must provide reasonable assurance that the BMPs selected will be sufficient to implement the waste load allocation. Load allocations for nonpoint sources will be incorporated into Waste Discharge Requirements and MOUs with the responsible jurisdictional agencies. This TMDL will be implemented in two phases over a ten-year period (see Table 7-21.3). Within six years of the effective date of the TMDL, compliance with the allowable number of summer dry-weather (April 1 to October 31), winter dry-weather exceedance days (November 1 to March 31) and the rolling 30-day geometric mean targets for both periods must be achieved. Within ten years of the effective date of the TMDL, compliance with the allowable number of wet-weather exceedance days and rolling 30-day geometric mean targets must be achieved. In order to clearly justify an extended implementation schedule beyond 10 years and up to 14 years from the effective date of the TMDL, the responsible agencies are required to submit additional quantifiable analyses as described below to demonstrate (1) the proposed plans will meet the final WLAs and (2) the proposed implementation actions will achieve multiple water quality benefits and other public goals. The types of approaches proposed coupled with quantifiable estimates of the integrated water resources benefits of the proposed structural and non-structural BMPs included in the Implementation Plan would provide the obligatory demonstration that an integrated water resources approach is being pursued. This demonstration shall include numeric estimates of the benefits, including but not limited to reductions in other pollutants, groundwater recharged, acres of multi-use projects and water (e.g. urban runoff) beneficially reused.

Element	Key Findings and Regulatory Provisions
Implementation (continued)	The responsible jurisdictions and the responsible agencies must submit a report to the Executive Officer (see Table 7-21.3) describing how they intend to comply with the dry-weather and wet-weather WLAs. As the primary jurisdiction, the City of Los Angeles is responsible for submitting the implementation plan report described above. In addition, as the responsible agency for Del Rey Lagoon, the City of Los Angeles must submit a report detailing how it intends to comply with the load allocations assigned to this waterbody. Alternatively, the City of Los Angeles may submit data clearly demonstrating that Del Rey Lagoon is not a source, for the Regional Board's consideration.. The Regional Board intends to reconsider this TMDL, within 4 years of its effective date to incorporate modifications to the WLAs based on results of the scheduled reconsideration of the Santa Monica Bay (SMB) beaches TMDLs. The SMB beaches TMDLs are scheduled to be reconsidered in four years to re-evaluate the allowable winter dry-weather and wet-weather exceedance days based on additional data on bacterial indicator densities in the wave wash; to re-evaluate the reference system selected to set allowable exceedance levels; to re-evaluate the reference year used in the calculation of allowable exceedance days, and to re-evaluate the need for revision of the geometric mean implementation provision. The Regional Board also intends to re-asses the WLAs for Benedict Canyon Channel, Sepulveda Channel, and Centinela Creek based on results of the required compliance monitoring, and/or any voluntary beneficial use investigations.
Margin of Safety	By directly applying the numeric water quality standards and implementation procedures as Waste Load Allocations, there is little uncertainty about whether meeting the TMDLs will result in meeting the water quality standards.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for three time periods (summer dry-weather, winter-dry weather, and wet-weather) based on public health concerns and observed natural background levels of exceedance of bacterial indicators. The critical condition for bacteria loading to the Ballona Creek, Ballona Estuary, and Sepulveda Channel is during wet weather when monitoring data indicate greater exceedance probabilities of the single sample bacteria objectives than during dry-weather.

Element	Key Findings and Regulatory Provisions
Seasonal Variations and Critical Conditions (continued)	The Santa Monica Bay Beaches Bacteria TMDL identified the critical condition within wet weather more specifically, in order to set the allowable number of exceedances of the single sample limit days. The 90th percentile storm year in terms of wet days was used as the reference year. The 90th percentile year was selected for several reasons. First, selecting the 90th percentile year avoids an untenable situation where the reference system is frequently out of compliance. Second, selecting the 90th percentile year allows responsible jurisdictions and responsible agencies to plan for a 'worst-case scenario', as a critical condition is intended to do.
Monitoring	The TMDL effectiveness monitoring program will assess attainment of the allowable exceedances for Ballona Creek, Ballona Estuary, and Sepulveda Channel, and the WLAs for the tributaries. Responsible jurisdictions and responsible agencies shall conduct daily or systematic weekly sampling at a minimum of two locations within Ballona Estuary and Reach 2 of Ballona Creek, at least one location each in Reach 1 of Ballona Creek and Sepulveda Channel, and at the confluence with Centinela Creek and Benedict Canyon Channel, to determine compliance. Similar monitoring at the connecting tide gates of Del Rey Lagoon is also required. Where monitoring locations are located at or close to the boundary of two reaches, data from sampling points will also be used to assess the immediate downstream reach. This will ensure that the downstream reaches, which have more stringent water quality objectives, are adequately protected. If the number of exceedance days is greater than the allowable number of exceedance days in the REC-1 and LREC-1 waters, and/or the frequency of exceedance is greater than 10% in the REC-2 waters, the responsible jurisdictions and/or responsible agencies shall be considered not to be attaining the TMDLs and/or assigned allocations (non-attaining). Responsible jurisdictions or agencies shall not be deemed non-attaining if the investigation described in the paragraph below demonstrates that bacterial sources originating within the jurisdiction of the responsible agency have not caused or contributed to the exceedance. If an in-stream location is non-attaining as determined in the previous paragraph, the Regional Board shall require responsible agencies to initiate an investigation, which at a minimum shall include daily sampling at the existing monitoring location until all single sample events meet bacteria water quality objectives.

Element	Key Findings and Regulatory Provisions
Special Studies	Should the jurisdictional agency for Del Rey Lagoon opt for the natural source exclusion, the TMDL requires that a separate bacteria source identification study be conducted to determine its eligibility. The study should identify all probable sources of bacteria loads, their estimated contributions to the Lagoon, and a determination of the frequency of exceedances of the single sample bacteria objectives caused by the identified natural sources.

1 The bacteriological objectives were revised by a Basin Plan amendment adopted by the Regional Board on October 25, 2001, and subsequently approved by the State Water Resources Control Board, the Office of Administrative Law and finally by U.S. EPA on September 25, 2002.

2 The bacteriological objectives for the LREC-1 use designation were provided in a Basin Plan Amendment adopted by State Board on January 20, 2005, and subsequently approved by the Office of Administrative Law and finally by U.S. EPA on February 17, 2006.

3 For the purposes of this TMDL, "responsible jurisdictions and responsible agencies" are defined as (1) local agencies that are permittees or co-permittees on a municipal storm water permit, (2) local or state agencies that have jurisdiction over Ballona Creek and Estuary, and (3) the California Department of Transportation pursuant to its storm water permit.

Table 7-21.2a: Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: Final Allowable Exceedance Days by Reach

Time Period	Ballona Estuary, Ballona Creek Reach 2, and Sepulveda Channel *	Ballona Creek Reach 1**
Summer Dry-Weather (April 1 to October 31)	Zero (0) exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives
Winter Dry-Weather (November 1-March 31)	Three (3) exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives
Wet-Weather (days with ≥0.1 inch of rain + 3 days following the rain event)	17*** exceedance days based on the applicable Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives	No more than 10% of the Single Sample Bacteria Water Quality Objectives Zero (0) exceedance days based on the Rolling 30-Day Geometric Mean Bacteria Water Quality Objectives

* Exceedance days for Ballona Estuary based on REC-1 marine water numeric targets; for Ballona Creek Reach 2 based on LREC-1 freshwater numeric targets; and for Sepulveda Channel, based on fresh water REC-1 numeric targets

** Exceedance frequency for Ballona Creek Reach 1 based on freshwater REC-2 numeric targets

*** In Reach 2, the greater of the allowable exceedance days under the reference system approach or high flow suspension shall apply.

Table 7-21.2b: Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: WLAs and LAs for tributaries to the Impaired Reaches.

Tributary	Point of Application	Water Quality Objectives	Waste Load Allocation (No. exceedance days)
Ballona Creek Reach 1	At confluence with Reach 2	LREC-1 Freshwater	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17*) winter wet weather* For geometric mean objectives: *(0) for all periods*
Benedict Canyon Channel	At confluence with Reach 2	LREC-1 Freshwater	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17*) winter wet weather* For geometric mean objectives: *(0) for all periods*
Ballona Creek Reach 2	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*
Centinela Creek	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3) winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*
Del Rey Lagoon	At confluence with Ballona Estuary	REC-1 Marine water	For single sample objectives: *(0) summer dry weather,* *(3)winter dry weather* *(17) winter wet weather* For geometric mean objectives: *(0) for all periods*

* At the confluence with Reach 2, the greater of the allowable exceedance days under the reference system approach or high flow suspension shall apply.
Sepulveda Channel was not assigned a waste load allocation at its confluence with Reach 2 since the TMDL requires the more stringent REC-1 objectives to be met in this waterbody, which should lead to the attainment of the less stringent LREC-1 objectives of the downstream reach.

Table 7-21.3 Ballona Creek, Ballona Estuary and Sepulveda Channel Bacteria TMDL: Significant Dates

Date	Action
Responsible Jurisdictions for the Waste Load Allocations	
12 months after the effective date of the TMDL	Responsible jurisdictions and responsible agencies must submit, for Regional Board approval, a comprehensive bacteria water quality monitoring plan for the Ballona Creek Watershed. The plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. The plan must provide for analyses of all applicable bacteria indicators for which the Basin Plan and subsequent amendments have established objectives The plan must also include a minimum of two sampling locations (mid-stream and downstream) in Ballona Estuary, Ballona Creek (Reach 1 and 2), and their tributaries. The draft monitoring report shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days. Once the coordinated monitoring plan is approved by the Executive Officer, monitoring shall commence within 6 months.
$2^{1}/_{2}$ years after the effective date of the TMDL	Responsible jurisdictions and agencies must provide a draft Implementation Plan to the Regional Board outlining how each intends to cooperatively achieve compliance with the dry-weather and wet-weather TMDL Waste Load Allocations. The report shall include implementation methods, an implementation schedule, and proposed milestones. The description of the implementation methods and milestones shall include a technically defensible quantitative linkage to the interim and final waste load allocations (WLAs). The linkage should include target reductions in stormwater runoff and/or fecal indicator bacteria. The plan shall include quantitative estimates of the water quality benefits provided by the proposed structural and non-structural BMPs. Estimates should address reductions in exceedance days, bacteria concentration and loading, and flow in the drain and at each beach compliance monitoring location. As part of the draft plan, responsible agencies must submit results of all special studies and/or Environmental Impact Assessments, designed to determine feasibility of any strategy that requires diversion and/or reduction of Creek flows. If a responsible jurisdiction or agency is requesting a longer schedule for wet-weather compliance based on an integrated approach, the plan must include a clear demonstration that the plan meets the criteria of an IWRA, and a clear demonstration of the need for the proposed schedule. Compliance with the wet-weather allocations shall be as soon as possible but under no circumstances shall it exceed the time frame adopted in the TMDL for non-integrated approaches or for an integrated approach.

Date	Action
$2^{1}/_{2}$ years after the effective date of the TMDL (continued)	The draft Plan shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days.
3 months after receipt of Regional Board comments on the draft plan	Responsible jurisdictions and agencies submit a Final Implementation Plan to the Regional Board.
Responsible agencies for Load Allocations	
1 year after the effective date of the TMDL	Responsible agencies must submit, for Regional Board approval, separate comprehensive bacteria water quality monitoring plans for inputs from Del Rey Lagoon and the Ballona Wetlands to the Ballona Estuary. Each plan must be approved by the Executive Officer before the monitoring data can be considered during the implementation of the TMDL. The plan must provide for analyses of all applicable bacteria indicators for which the Basin Plan and subsequent amendments have established objectives The plan must also include a minimum of one sampling location at the connecting tide gate(s). The draft monitoring reports shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days. Once a coordinated monitoring plan is approved by the Executive Officer, monitoring shall commence within 6 months.
3 years after the effective date of the TMDL	If the responsible agency for the Del Rey Lagoon intends to pursue a natural source exclusion, it shall submit the results of separate natural source study for the Lagoon to the Executive Officer of the Regional Board. The study shall include a comprehensive assessment of all sources of bacteria loads to the Lagoon and estimates of their individual contributions. In addition, a determination of the number of exceedance days caused by these sources should be made. These studies shall be made available for public comment and the Executive Officer shall accept public comments for at least 30 days.

Date	Action
Responsible Agencies for WLAs and LAs* *(*Only if not eligible for natural source exclusion(s)*	
4 years after the effective date of the TMDL	The Regional Board shall reconsider this TMDL to: (1) Re-assess the allowable winter dry-weather and wet-weather exceedance days based on a re-evaluation of the selected reference watershed and consideration of other reference watersheds that may better represent reaches of Ballona Creek and Estuary, (2) Consider whether the allowable winter dry-weather and wet-weather exceedance days should be adjusted annually dependent on the rainfall conditions and an evaluation of natural variability in exceedance levels in the reference system(s), (3) Re-evaluate the reference year used in the calculation of allowable exceedance days, and (4) Re-evaluate whether there is a need for further clarification or revision of the geometric mean implementation provision. (5) Consider natural source exclusions for bacteria loading from Del Rey Lagoon and the Ballona Wetlands based on results of the source identification study. (6) Re-assess WLAs for Benedict Canyon Channel, Sepulveda Channel, and Centinela Creek based on results of the required compliance monitoring, and/or any voluntary beneficial use investigations.
6 years after the effective date of the TMDL:	Achieve compliance with the allowable exceedance days for summer and winter dry-weather as set forth in Table 6-1 and rolling 30-day geometric mean targets.
10 years after effective date of the TMDL or, if an Integrated Water Resources Approach is implemented, up to July 15, 2021.*	Achieve compliance with the allowable exceedance days as set forth in Table 6-1 and rolling 30-day geometric mean targets during wet-weather.

* July 15, 2021 is the final compliance date of the Santa Monica Bay Beaches Bacteria Wet-Weather TMDL.

7-22 Calleguas Creek Watershed Salts TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on October 4, 2007.

This TMDL was approved by:
The State Water Resources Control Board on May 20, 2008.
The Office of Administrative Law on November 6, 2008.
The U.S. Environmental Protection Agency on December 2, 2008.

The effective date of this TMDL is: December 2, 2008.

The elements of the TMDL are presented in Table 7-22.1 and the Implementation Plan in Table 7-22.2

Table 7-22.1. Calleguas Creek Watershed Salts TMDL: Elements

<table>
<tr><th>TMDL Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td>Problem Statement</td><td>Eleven of fourteen reaches in the Calleguas Creek Watershed (CCW) are identified on the 2002 Clean Water Act Section 303(d) list of water-quality limited segments as impaired due to elevated levels of boron, chloride, sulfate, or total dissolved solids (TDS) (these constitutions are commonly referred to as salts). Salts primarily impact two beneficial uses: agricultural supply and groundwater recharge. Below is 2002 303(d) list of water quality limited segments of the Calleguas Creek watershed:

<table>
<tr><th>Reach Name</th><th>Pollutant/Stressor</th></tr>
<tr><td>Calleguas Creek Reach 3</td><td>Chloride, TDS</td></tr>
<tr><td>Calleguas Creek Reach 6</td><td>Chloride, Sulfate, TDS</td></tr>
<tr><td>Calleguas Creek Reach 7</td><td>Boron, Chloride, Sulfate, TDS</td></tr>
<tr><td>Calleguas Creek Reach 8</td><td>Boron, Chloride, Sulfate, TDS</td></tr>
<tr><td>Calleguas creek Reach 9A</td><td>Sulfate, TDS</td></tr>
<tr><td>Calleguas Creek Reach 9B</td><td>Chloride, Sulfate, TDS</td></tr>
<tr><td>Calleguas Creek Reach 10</td><td>Chloride, Sulfate, TDS</td></tr>
<tr><td>Calleguas Creek Reach 11</td><td>Sulfate, TDS</td></tr>
<tr><td>Calleguas Creek Reach 12</td><td>Sulfate, TDS</td></tr>
<tr><td>Calleguas Creek Reach 13</td><td>Chloride, Sulfate, TDS</td></tr>
</table>

The list of impaired segments of the Calleguas Creek watershed in the 2002 303(d) list was maintained in the 2006 303(d) list.

The segment of Reach 4 below Laguna Road is tidally influenced and therefore not impaired for chloride, boron, sulfate, and TDS. Consequently, the waste load and load allocations developed for Reach 4 in this TMDL do not apply below Laguna Road.

The goal of this TMDL is to protect and restore the water quality in the Calleguas Creek watershed by controlling the loading and accumulation of salts.</td></tr>
</table>

TMDL Element	Key Findings and Regulatory Provisions
Numeric Targets	Numeric targets are based on the site-specific numeric water quality objectives (WQOs) provided in the Basin Plan.

1. Surface Water Quality Objectives

Site-specific surface water quality objectives for the Calleguas Creek watershed are applicable upstream of Potrero Road. Site specific objectives have not been determined for Calleguas Creek below Potrero Road because the reach is tidally influenced. Below are WQOs for Calleguas Creek upstream of Potrero Road.

Constituent	Water Quality Objective Upstream Potrero Road (mg/L)
Boron	1
Chloride	150
Sulfate	250
TDS	850

2. Groundwater Quality Objectives

Groundwater Basin[1]			Boron (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
DWR Basin No.	Groundwater Basin as Listed in the 1994 Basin Plan	Implementation Areas for Salts TMDL				
4-6	Pleasant Valley	Conejo and Calleguas/Pleasant Valley	1.0	150	300	700
4-7	Arroyo Santa Rosa	Arroyo Santa Rosa and Conejo/Arroyo Santa Rosa	1.0	150	300	900
4-8	Las Posas Valley – East of Grimes Canyon and Hitch Blvd	Arroyo Simi/South Las Posas	3.0	400	1200	2500
4-8	Las Posas Valley – South of LA Ave between Somis Rd & Hitch Blvd	Arroyo Las Posas/ South Las Posas	1.0	250	700	1500
4-8	Las Posas Valley – North Las Posas Area	Arroyo Las Posas/ North Las Posas	1.0	150	250	500
4-9	Simi Valley	Arroyo Simi/Simi Valley	1.0	150	600	1200
4-10	Conejo Valley	Arroyo Conejo/ Conejo Valley	1.0	150	250	800
4-15	Tierra Rejada	Arroyo Santa Rosa/ Tierra Rejada	0.5	100	250	700
4-19	Thousand Oaks	Arroyo Conejo/ Thousand Oaks	1.0	150	700	1400

[1]The groundwater quality objectives specified in this table are equivalent to the groundwater quality objectives in the 1994 Basin Plan. Groundwater basins are numbered in the first column according to Bulletin 118-80 (Department of Water Resources, 1980). Designated groundwater basins in the 1994 Basin Plan are specified in the second column and groundwater basin descriptions of Calleguas Creek used in this TMDL are listed in the third column of the table.

TMDL Element	Key Findings and Regulatory Provisions
Source Analysis	Sources of salts in the watershed include water supply (water imported from the State Water Project or Freeman Diversion and deep aquifer groundwater pumping), water softeners that discharge to publicly owned treatment works (POTWs), POTW treatment chemicals, atmospheric deposition, pesticides and fertilizers, and indoor water use (chemicals, cleansers, food, etc.). These salts are then transported through POTW discharges and runoff to surface water, shallow groundwater, and/or stranded on the watershed in the soils. Salts transported in the surface water to the ocean are currently the only salts that are exported from the watershed. While the concentration of salts in the introduced water is usually below the Basin Plan Objectives, the quantity of water brought into the watershed is sufficient to rank introduced water as the greatest source of salts to the watershed. Salts that are transported during dry weather to the surface water are quantified via the following mechanisms: groundwater pumping, groundwater exfiltration, POTWs, dry weather urban and agricultural runoff. Wet weather loadings from each of these sources have the potential to be significant, but tend to be lower in concentration and do not occur during the critical conditions for salts. Wet weather loads are significant from the perspective of transporting stranded salts off the watershed.
Linkage Analysis	The linkage analysis for salts focuses on the surface water concentrations of salts. However, surface water concentrations are only one component of the watershed salts issue. Because it is difficult to model other aspects of the salt problem (i.e. surface water and groundwater interactions, stranded salts), two simplified approaches have been used to demonstrate that salts will be removed from the watershed, which should have a correspondingly positive impact on surface water and groundwater salts concentrations. First, a surface water model was developed to provide a linkage between sources and surface water quality and to demonstrate the impact of projects on receiving water quality in the watershed. Second, a salt balance was developed to quantify the removal of salts from the watershed with the goal of achieving a mass balance in which the mass of boron, sulfate, TDS and chloride imported into Calleguas Creek subwatersheds is no more than the mass of boron, sulfate, TDS and chloride exported from the Calleguas Creek subwatershed. Achieving a salt balance in the watershed will prevent additional build-up of salts in any medium in the watershed and protect ground water supplies from increasing in salt concentrations. The Calleguas Creek Modeling System is a mass balance based model that was developed for the surface water to provide a linkage between sources and surface water quality. To estimate the salts balance in the watershed, a simple chloride mass balance was developed by the Camrosa Water District (Hajas, 2003a) and modified to address the other salts.

TMDL Element	Key Findings and Regulatory Provisions
Waste Load Allocations	**A. POTWs** The TMDL includes waste load allocations (WLAs) for five POTWs in the Calleguas Creek watershed: Simi Valley Water Quality Control Plant (WQCP), Hill Canyon Wastewater Treatment Plan (WWTP), Moorpark WWTP, Camarillo Water Reclamation Plant (WRP), and Camrosa Water Reclamation Facility (WRF). At the end of the implementation period, only Simi Valley WQCP and the Hill Canyon WWTP are expected to discharge to surface waters. Moorpark WWTP and Camrosa WRF currently discharge directly to ponds under dry weather conditions. As part of the TMDL implementation, the Renewable Water Resources Management Program (RWRMP) will introduce treated wastewater from the Camarillo WRP into the Camrosa recycled water storage and distribution system. Surplus treated wastewater from Camarillo WRP and Camrosa WRF will be discharged at a point downstream of Potrero Road Bridge to Calleguas Creek. Dry weather WLAs are included for the case when Camarillo WRP, Camrosa WRF, and Moorpark WWTP need to discharge to the stream (for example, if there is insufficient recycled water demand during the wet season). Including WLAs for these POTWs ensures that water quality objectives are not exceeded as a result of their discharge. POTW mass-based WLAs are calculated as the POTW effluent flow rate multiplied by the water quality objective and include a mass-based adjustment factor (AF) that is subtracted from the product of the flow-rate and the water quality objective. The adjustment factor is used to link POTW allocations to the required reductions in background loads. The adjustment factors are implemented through mechanisms that export salts out of the subwatershed, such as groundwater pumping, to meet the salt balance requirements. To ensure that the loading capacity is achieved in surface water and the reductions in background loads are achieved, minimum salt exports shown below are required for POTWs and are included in WLAs as a component of the adjustment factors. If the background load reductions are not achieved, POTWs shall be responsible for providing additional load reductions to achieve water quality standards. The AF is set equal to the difference between the minimum salts export requirement to attain a salt balance in the subject reaches and the actual salts export. If the calculated annual dry weather salt exports from the subwatershed to which the POTW discharges are less than the minimum required exports for the previous year and the annual average receiving water concentration at the base of the subwatershed to which the POTW discharges exceeds water quality objectives for the previous year, the POTW allocations will be reduced using the adjustment factor.

TMDL Element	Key Findings and Regulatory Provisions
Waste Load Allocations (continued)	The adjustment factors are also used to address unusual conditions in which the inputs to the POTWs from the water supply may challenge the POTWs ability to meet the assigned WLAs. The adjustment factor allows for the additional POTW loading only when the water quality objectives are met in the receiving waters. POTW allocations can be adjusted upwards when imported water supply chloride concentrations exceed 80 mg/L and discharges from the POTW exceed the WLA. In order to apply the AF to the assigned WLAs, the POTW is required to submit documentation of the water supply chloride concentrations, receiving water chloride concentration, the effluent mass, and evidence of increased salt exports to offset the increased discharges from the POTW to the RWQCB for approval. WLAs shown in table below apply to POTWS during dry weather when the flows in the receiving water are below the 86th percentile flow. During wet weather, the loading capacity of the stream is significantly increased by stormwater flows with very low salt concentrations. Any discharges from the POTWs during wet weather would be assimilated by these large storm flows and would not cause exceedances of water quality objectives. Boron is only listed in the Simi and Pleasant Valley (Revolon) subwatersheds and exceedances of boron do not occur in other portions of the watershed. Therefore, boron allocations are only included for the Simi Valley WQCP. Interim limits are included to allow time for dischargers to put in place implementation measures necessary to achieve final waste load allocations. The monthly average interim limits are set equal to the 95th percentile of available discharge data. **1. Minimum Salt Export Requirements for Adjustment Factor [a]** **POTW** / **Minimum Chloride Export (lb/day)** / **Minimum TDS Export (lb/day)** / **Minimum Sulfate Export (lb/day)** / **Minimum Boron Export (lb/day)** Simi Valley WQCP: 460 / 3220 / 9120 / 3.3 Moorpark WWTP: 460 / 3220 / 9120 / 3.3 Hill Canyon WWTP: 1060 / 7920 / 4610 / 0 Camrosa WRF: 1060 / 7920 / 4610 / 0 Camarillo WRP: 1060 / 7920 / 4610 / 0 [a] Minimum export requirements include a 10% Margin of Safety.

TMDL Element	Key Findings and Regulatory Provisions
Waste Load Allocations (continued)	**2. Interim Monthly Average WLAs for POTWs**

POTW	Chloride (mg/L)	TDS (mg/L)	Sulfate (mg/L)	Boron (mg/L)
Simi Valley WQCP	183	955	298	N/A
Hill Canyon WWTP	189	N/A	N/A	N/A
Moorpark WWTP	171	N/A	267	N/A
Camarillo WRP	216	1012	283	N/A
Camrosa WRF*	N/A	N/A	N/A	N/A

* Camrosa WRF has not discharged to surface water during the period under which interim limits were calculated. When effluent data are available, the Regional Board may adopt interim WLAs for Camrosa WRF.

N/A: The 95th percentile concentration is below the Basin Plan objective so interim limits are not necessary.

3. Final WLAs for POTWs[a,d]

POTW	Chloride (lb/day) [c]	TDS (lb/day) [c]	Sulfate (lb/day) [c]	Boron (lb/day) [c]
Simi Valley WQCP	150*Q-AF	850*Q-AF	250*Q-AF	1.0*Q-AF
Hill Canyon WWTP	150*Q-AF	850*Q-AF	250*Q-AF	N/A
Moorpark WWTP[b]	150*Q-AF	850*Q-AF	250*Q-AF	N/A
Camarillo WRP[b]	150*Q-AF	850*Q-AF	250*Q-AF	N/A
Camrosa WRF[b]	150*Q-AF	850*Q-AF	250*Q-AF	N/A

a. The allocations shown only apply during dry weather (as defined in this TMDL). During wet weather discharges from the POTWs do not cause exceedances of water quality objectives.

b. These POTWs are not expected to discharge after the end of the implementation period.

c. AF is the adjustment factor and equals the difference between the minimum salts export requirement and the actual salts export.

d. Q represents the POTW flow at the time the water quality measurement is collected and a conversion factor to lb/day based on the units of measurement for the flow.

N/A Boron is not listed in the reaches to which the POTW discharges. No WLA is required.

B. Urban Runoff

Permitted stormwater dischargers that are responsible parties to this TMDL include the Municipal Stormwater Dischargers (MS4s) of the Cities of Camarillo, Moorpark, Thousand Oaks, County of Ventura, Ventura County Watershed Protection District, and general industrial and construction permittees. Permitted stormwater dischargers are assigned a dry weather wasteload allocation equal to the average dry weather critical condition flow rate multiplied by the numeric target for each constituent. Waste load allocations apply in the receiving water at the base of each subwatershed. Because wet weather flows transport a large mass of salts at low concentrations, these dischargers meet water quality objectives during wet weather. Dry weather allocations apply when instream flow rates are below the 86th percentile flow and there has been no measurable precipitation in the previous 24 hours.

TMDL Element	Key Findings and Regulatory Provisions
Waste Load Allocations (continued)	Interim limits are assigned for dry weather discharges from areas covered by NPDES stormwater permits to allow time to implement appropriate actions. The interim limits are assigned as concentration based receiving water limits set to the 95th percentile of the discharger data as a monthly average limit except for chloride. The 95th percentile for chloride was 267 mg/L which is higher than the recommended criteria set forth in the Basin Plan for protection of sensitive beneficial uses including aquatic life. Therefore, the interim limit for chloride for Permitted Stormwater Dischargers is set equal to 230 mg/L to ensure protection of sensitive beneficial uses in the Calleguas Creek watershed.

1. Interim Dry Weather WLAs for Permitted Stormwater Dischargers

Constituent	Interim Limit (mg/L)
Boron Total	1.3
Chloride Total	230
Sulfate Total	1289
TDS Total	1720

2. Final Dry Weather WLAs for Permitted Stormwater Dischargers

Subwatershed	Critical Condition Flow Rate (mgd)	Chloride Allocation (lb/day)	TDS Allocation (lb/day)	Sulfate Allocation (lb/day)	Boron Allocation (lb/day)
Simi	1.39	1,738	9,849	2,897	12
Las Posas	0.13	157	887	261	N/A
Conejo	1.26	1,576	8,931	2,627	N/A
Camarillo	0.06	72	406	119	N/A
Pleasant Valley (Calleguas)	0.12	150	850	250	N/A
Pleasant Valley (Revolon)	0.25	314	1,778	523	2

C. Final WLAs for Other NPDES Dischargers

Concentration-based WLAs are assigned at the Basin Plan objectives for other NPDES dischargers.

Constituent	Allocation (mg/L)
Chloride	150
TDS	850
Sulfate	250
Boron[a]	1.0

<table>
<tr><th>TMDL Element</th><th>Key Findings and Regulatory Provisions</th></tr>
<tr><td>Waste Load Allocations (continued)</td><td>Other NPDES dischargers include, but are not limited to, permitted groundwater cleanup projects that could have significant salt concentrations as a result of the stranded salts in the shallow groundwater basins being treated. To facilitate the cleanup of the basins prior to alternative discharge methods (such as the brine line) being available, interim limits for other NPDES dischargers will be developed on a case-by-case basis and calculated as a monthly average using the 95th percentile of available discharge data.</td></tr>
<tr><td>Load Allocations</td><td>Dry weather load allocations are assigned as a group allocation to irrigated agricultural discharges. The load allocation (LA) is equal to the average dry weather critical condition flow rate multiplied by the numeric target for each constituent. Load allocations apply in the receiving water at the base of each subwatershed. Because wet weather flows transport a large mass of salts at a typically low concentration, these dischargers should meet water quality objectives during wet weather. Dry weather allocations apply when instream flow rates are below the 86th percentile flow and there has been no measurable precipitation in the previous 24 hours.

Interim limits are assigned for dry weather discharges from irrigated agricultural areas to allow time to implement appropriate actions. The interim limits are assigned as concentration based receiving water limits set to the 95th percentile of the discharger data as a monthly average limit except for chloride. The 95th percentile for chloride was 499 mg/L which is higher than the recommended criteria set forth in the Basin Plan for protection of sensitive beneficial uses including aquatic life. Therefore, the interim limit for chloride for Irrigated Agricultural Dischargers is set equal to 230 mg/L to ensure protection of sensitive beneficial uses in the Calleguas Creek watershed.

I. Interims Load Allocations for Irrigated Agricultural Dischargers

<table>
<tr><th>Constituent</th><th>Interim Limit (mg/L)</th></tr>
<tr><td>Boron Total</td><td>1.8</td></tr>
<tr><td>Chloride Total</td><td>230</td></tr>
<tr><td>Sulfate Total</td><td>1962</td></tr>
<tr><td>TDS Total</td><td>3995</td></tr>
</table>
II. Final Load Allocations for Irrigated Agricultural Dischargers

<table>
<tr><th>Subwatershed</th><th>Chloride Allocation (lb/day)</th><th>TDS Allocation (lb/day)</th><th>Sulfate Allocation (lb/day)</th><th>Boron Allocation (lb/day)</th></tr>
<tr><td>Simi</td><td>641</td><td>3,631</td><td>1,068</td><td>4</td></tr>
<tr><td>Las Posas</td><td>2,109</td><td>11,952</td><td>3,515</td><td>N/A</td></tr>
<tr><td>Conejo</td><td>743</td><td>4,212</td><td>1,239</td><td>N/A</td></tr>
<tr><td>Camarillo</td><td>59</td><td>336</td><td>99</td><td>N/A</td></tr>
<tr><td>Pleasant Valley</td><td>305</td><td>1,730</td><td>509</td><td>N/A</td></tr>
<tr><td>Revolon</td><td>7,238</td><td>41,015</td><td>12,063</td><td>48</td></tr>
</table>
</td></tr>
</table>

TMDL Element	Key Findings and Regulatory Provisions
Margin of Safety	A margin of safety (MOS) for the TMDL is designed to address uncertainties in the analysis that could result in targets not being achieved in the waterbodies. The primary uncertainties associated with this TMDL include the impact of implementing a salt balance on receiving water quality. The effect of the salt balance is estimated by the mass-balance and subject to the following uncertainties: 1) the flow rates used to determine the loading capacity may change due to TMDL implementation, 2) the use of a daily load for determining allocations and an annual mass balance to attain water quality objectives, and 3) the sources of salts may not be completely known. Both implicit and explicit MOS are included for this TMDL. The implicit MOS stems from the use of conservative assumptions made during development of the TMDL. The mass of salts transported out of the watershed during wet weather is on average over 15% of the annual mass of salts introduced to the watershed for all constituents. The salt export during wet weather ranges from 7% to 41% for TDS, 9% to 48% for chloride, and 13% to 89% for sulfate of the export required to meet a salt balance in the watershed. This mass is not used to determine compliance with the salt balance and represents a significant implicit margin of safety. The model also contains a component that serves to model the impact of "stranded" salts in the watershed. The component assumes low irrigation efficiencies and the ability of all salts applied as irrigation water anywhere in the watershed to be discharged to receiving water in critical years. This likely overestimates the impact of "stranded" salts and results in a higher concentration of salts due to irrigation in the receiving water. An explicit MOS of 10% is applied to the adjustment factors for the POTWs to account for the uncertainties in the TMDL analysis. By applying the margin of safety to the adjustment factor, more salts are required to be exported than are necessary to offset the background loads in the watershed. This additional salt export provides a margin of safety on the salt balance to address uncertainties that the salt balance will result in compliance with water quality objectives. The 10% explicit MOS is determined sufficient to address the uncertainties associated with the estimated impact of the salt balance on receiving water loadings.
Future Growth	Ventura County accounts for slightly more than 2% of the state's residents with a population of 753,197 (US Census Bureau, 2000). GIS analysis of the 2000 census data yields a population estimate of 334,000 for the CCW, which equals about 44% of the county population. According to the Southern California Association of Governments (SCAG), growth in Ventura County averaged about 51% per decade from 1900-2000; with growth exceeding 70% in the 1920s, 1950s, and 1960s. Significant population growth is expected to occur within and near present city limits until at least 2020. Increased growth requires additional water. Therefore, future growth could result in increased loads of salts being imported into the watershed. However, the TMDL implementation plan is designed to maintain a salts balance in the watershed. If additional salts are imported into the watershed, a larger volume of salts will also be exported out of the watershed to maintain the balance. Consequently, increased imports from future growth are not expected to result in higher concentrations in receiving waters.

TMDL Element	Key Findings and Regulatory Provisions
Seasonal Variations and Critical Conditions	The critical condition for salts is during dry weather periods. During wet weather, stormwater flows dilute the salt discharges and receiving water concentrations are significantly lower than water quality objectives. Dry weather, defined as days with flows lower than the 86th percentile flow and no measurable precipitation, is a critical condition regardless of the dry weather flows in the stream. The driving conditions for exceedances of water quality objectives are the concentrations in the water supply (which is driven by surface water concentrations in Northern California) and the previous year's annual precipitation and corresponding flows. Elevated salts concentrations during dry weather occur when stranded salts are discharged into the surface water after higher than average rainfall years. The elevated concentrations occur during years when the previous annual flow is greater than the 75th percentile of the annual flows for the watershed (critical year). The higher concentrations occur during the dry periods of critical years regardless of whether the annual flow for the critical year is an average flow year, higher than average year, or lower than average year. The key parameter determining a critical year is the total annual flow volume for the previous year. Based on model results, four critical years were defined based on modeled results that resulted in receiving water concentrations greater than the 99th percentile concentration during at least 10% of the dry period. The critical years identified from the model occur with conditions similar to what occurred in 1978, 1979, 1983 and 1998.
Special Studies and Monitoring Plan	**<u>Special Studies</u>** Several special studies are planned to improve understanding of key aspects related to achievement of WLAs and LAs for the Salts TMDL. ***1. Special Study #1 (Optional) – Develop Averaging Periods and Compliance Points*** The TMDL technical report has provided information that shows instantaneous salts objectives may not be required to protect groundwater recharge and agricultural beneficial uses. It is possible that the beneficial uses will be protected and a salt balance achieved without achieving instantaneous water quality objectives in all reaches of the watershed. This optional special study is included to allow an investigation of averaging periods for the salts objectives in the CCW. Additionally, this study will investigate the locations of beneficial uses and the possibility of identifying compliance points for the salts objectives at the point of beneficial use impacts. The use of compliance points would alleviate the need to develop site-specific objectives for the reaches of the watershed upstream of the POTW discharges (described in Special Study #3) while still ensuring the protection of beneficial uses. Sensitive beneficial uses are not present in the upper reaches and POTW discharges dilute the salts from the upper reaches and may allow compliance with the objectives at the point of groundwater recharge downstream. This is an optional special study to be conducted if desired by the stakeholders or determined necessary or appropriate by the Executive Officer.

TMDL Element	Key Findings and Regulatory Provisions
Special Studies and Monitoring Plan (continued)	***2. Special Study #2 (Optional) – Develop Natural Background Exclusion*** Discharges of groundwater from upstream of the Simi Valley WQCP (Reaches 7 and 8) and Hill Canyon WWTP (Reaches 12 and 13) and downstream of the Camrosa WRF (Reach 3) contain high salts concentrations. Natural marine sediments may contribute to the high concentrations in those discharges. This special study would evaluate whether or not the groundwater discharges in these areas would qualify for a natural sources exclusion. The special study could follow a 'reference system/anti-degradation approach' and/or a 'natural sources exclusion approach' for any allocations included in this TMDL that are proven unattainable due to the magnitude of natural sources. The purpose of a 'reference system/anti-degradation approach' is to ensure water quality is at least as good as an appropriate reference site and no degradation of existing water quality occurs where existing water quality is better than that of a reference site. The intention of a 'natural sources exclusion approach' is to ensure that all anthropogenic sources of salts are controlled such that they do not cause exceedances of water quality objectives. These approaches are consistent with state and federal anti-degradation policies (State Board Resolution No. 68-16 and 40 C.F.R. 131.12). This is an optional special study to be conducted if desired by the stakeholders or determined necessary for establishing a natural sources exclusion by the Executive Officer. ***3. Special Study #3 (Optional) – Develop Site-Specific Objectives*** The TMDL implementation plan provides for actions to protect the agricultural and groundwater recharge beneficial uses in the CCW. As shown in the linkage analysis, some downstream reaches may not achieve the water quality objectives through implementation of this TMDL because of the transport of salts out of the watershed through those reaches. Consequently, an optional special study is included to allow the CCW stakeholders to pursue development of site-specific objectives for salts for reaches upstream of the Hill Canyon WWTP and Simi Valley WQCP (Reaches 7, 8, 12, and 13), Calleguas Creek Reach 3, Revolon Slough (Reach 4) and Beardsley Wash (Reach 5). These alternative numeric water quality objectives would be developed based on the beneficial uses to be protected in a reach and the attainability of the current water quality objectives. This is an optional special study to be conducted if desired by the stakeholders or determined necessary or appropriate by the Executive Officer. ***4. Special Study #4 (Optional) – Develop Site-Specific Objectives for Drought Conditions*** During drought conditions, the load of salts into the watershed increases as a result of increasing concentrations in imported water. Stakeholders in the CCW cannot control the increased mass entering the watershed from the water supply. However, the stakeholders do have the ability to manage the salts within the watershed to protect beneficial uses and export the additional mass of salts out of the watershed.

TMDL Element	Key Findings and Regulatory Provisions
Special Studies and Monitoring Plan (continued)	If necessary, site-specific objectives may be developed to address situations that result in higher imported water salt concentrations to allow management of the salts and protection of beneficial uses. This special study may be combined with Special Study #3 if desired. This is an optional special study to be conducted if desired by the stakeholders or determined necessary or appropriate by the Executive Officer of the Regional Board. ***5. Special Study #5 (Optional) – Develop Site-Specific Objectives for Sulfate*** Sulfate is a necessary nutrient for plant growth and sulfate containing products are often applied to agriculture as fertilizers and pesticides. Therefore, site-specific objectives may be investigated and developed for sulfate that more accurately protects agricultural supply beneficial uses. Additionally, this study could evaluate whether or not a sulfate balance is necessary to maintain in the watershed. This special study may be combined with Special Study #3 and/or #4 if desired. This is an optional special study to be conducted if desired by the stakeholders or determined necessary or appropriate by the Executive Officer of the Regional Board. **<u>Monitoring Plan</u>** To ensure that the goal of a salts balance in the watershed is being achieved and water quality objectives are being met, a comprehensive method of tracking inputs and outputs to the watershed will be developed. A monitoring plan will be submitted to the RWQCB for Executive Officer approval within six months of the effective date of the CCW Salts TMDL. Monitoring will begin one year after Executive Officer approval of the monitoring plan to allow time for the installation of automated monitoring equipment. ***1. Input Tracking*** Inputs to the watershed are tracked through four mechanisms:1) Information on the import of State Water Project water is readily available and provides information on the mass of salts brought into the watershed; 2) Groundwater pumping records provide information on the mass of salts imported into the watershed from deep aquifer pumping; 3) Import records of water supply form the Santa Clara River can be obtained to determine the mass of salts imported through this source; 4) Monitoring data on imported water quality can be compared to monitoring of effluent quality to estimate the amount of salts added through human use of the water.

TMDL Element	Key Findings and Regulatory Provisions
Special Studies and Monitoring Plan (continued)	***2. Output Tracking and Determining Compliance with Water Quality Objectives*** Outputs from the watershed will be tracked through surface water monitoring at key locations in the watershed and monitoring of discharges to the brine line. Monitoring will include both flow and quality. Compliance with water quality objectives will be determined at key locations where beneficial uses occur in the watershed. The stations used for output tracking will also be used to determine compliance with water quality objectives. The monitoring program will determine if the TMDL compliance points are protective of the beneficial uses for the subwatershed. If the monitoring determines that the compliance points are not protective of beneficial uses, an alternative compliance point will be selected. The Executive Officer may revise the TMDL compliance point based on the result of the monitoring. Additionally, if other places in the watershed are identified where sensitive beneficial uses occur, water quality monitoring stations can be added to determine compliance with water quality objectives. For the RWRMP, three new or upgraded automated flow measuring and sample collection stations will be installed at three points on the stream system to continuously record flow and various water quality parameters during dry weather. Preliminary monitoring locations include Arroyo Conejo in Hill Canyon, Conejo Creek at Baron Brothers Nursery and Calleguas Creek at University Drive. For the NRRWMP, one new or upgraded automated flow measuring and sample collection station will be added downstream of Simi Valley at the point at which groundwater recharge begins. A preliminary monitoring location is at Hitch Blvd. where an existing flow gauging station exists. However, the amount of groundwater recharge upstream of this site will need to be evaluated to determine the exact monitoring location. For Revolon Slough, the existing monitoring station at Wood Road. will be used to monitor quality and flow on Revolon Slough to determine the outputs from the Revolon portion of the Pleasant Valley subwatershed. Additional land use monitoring will be conducted concurrently at representative agricultural and urban runoff discharge sites as well as at POTWs in each of the subwatersheds and analyzed for chloride, TDS, sulfate, and boron. The location of the land use stations will be determined before initiation of the Calleguas Creek Watershed TMDL Monitoring Program (CCWTMP). All efforts will be made to include at least two wet weather sampling events during the wet season (October through April) during a targeted storm event. ***3. Reporting and Modification of the Calleguas Creek Watershed TMDL Monitoring Program*** A monitoring report will be prepared annually within six months after completion of the final event of the sampling year. An adaptive management approach to the CCWTMP will be adopted as it may be necessary to modify aspects of the CCWTMP. Results of sampling carried out through the CCWTMP and other programs within the CCW may be used to modify this plan, as appropriate. These modifications will be summarized in the annual report. Possible modifications could include, but are not limited to the, following:

TMDL Element	Key Findings and Regulatory Provisions
Special Studies and Monitoring Plan (continued)	▪ The inclusion of additional land use stations to accurately characterize loadings; ▪ The removal of land use stations if it is determined they are duplicative (*i.e.*, a land use site in one subwatershed accurately characterize the land use in other subwatersheds); ▪ The inclusion of additional in-stream sampling stations; and ▪ The elimination of analysis for constituents no longer identified in land use and/or instream samples. If a coordinated and comprehensive monitoring plan is developed and meets the goals of this monitoring plan that plan should be considered as a replacement for the CCWTMP. ***4. Other Monitoring*** Other surface water and groundwater monitoring will be implemented as necessary to assess the impacts of the implementation actions and adjust the activities as necessary to protect beneficial uses and achieve the salts balance. Examples of additional monitoring that may be conducted include: ▪ Monitoring under Phase 2 and 3 of the RWRMP to evaluate the effects of replenishment water releases and groundwater treatment and releases. ▪ Monitoring to assess the impacts of management of the Simi Basin groundwater dewatering wells under Phase 1 of the NRRWMP.
Implementation Plan	The identified implementation actions provided in this TMDL will result in a salt balance in the stream and are expected to result in compliance with the allocations. The implementation plan is comprised of actions that directly impact discharges to the receiving water and actions that will indirectly impact discharges to receiving water. Responsible agencies and jurisdictions shall consider minimum flow requirements that may be imposed by federal or state regulatory agencies when implementing actions to comply with this TMDL. Should the proposed implementation actions not result in compliance with objectives and site-specific objective are not adopted, additional implementation actions may be required to achieve the water quality objectives. Any plans or programs for implementation of the TMDL for the Southern Reaches of the CCW upstream of the Conejo Creek Diversion and the Northern Reaches of the CCW, that would result in significant reduction in instream flow, including but not limited to, an application for Water Reclamation Requirements (WRRs) shall include an analysis of potential impacts to instream beneficial uses that could result from the reclamation of wastewater or extracted groundwater. For Phase 1 of the Southern Reaches of the CCW Renewable Water Resource Management Program (RWRMP), Water Rights Decision 1638 from SWRCB satisfies these requirements and establishes the minimum flow requirements for Conejo and Calleguas Creek downstream of the Conejo Creek Diversion Project.

TMDL Element	Key Findings and Regulatory Provisions
Implementation Plan (continued)	Any WRRs shall require that timely written notice be given to the Regional Board, and to any regulatory agency whose instream flow is at issue, if diversion or reclamation of waste water or extraction of groundwater results or threatens to result in (or contributes to) insufficient flows to maintain beneficial uses. The Executive Officer shall issue an order pursuant to Water Code section 13267, which requires responsible agencies and jurisdictions to file a technical report if reclamation of waste water or extraction of groundwater results or threatens to result in (or contributes to) insufficient flows to maintain beneficial uses. The order shall require that the technical report identify the causes of the impairments or threatened impairments, and identifies options to abate the conditions. The Regional Board shall reconsider this TMDL if adequate flows to protect instream beneficial uses are not maintained. The implementation actions described in the TMDL represent a range of activities that could be conducted to achieve a salts balance in the watershed. Future considerations may result in other actions being implemented rather than the options presented. However, any proposed actions will be reviewed using the salt balance model to ensure the action does not adversely impact other implementation actions in the watershed or the salt balance of a downstream subwatershed. Currently, the implementation plan is presented in phases with a tentative schedule for each phase. The implementation of projects may occur earlier than planned or begin during an earlier phase. Additionally, many of the implementation actions require the use of the Regional Salinity Management Conveyance (RSMC or brine line). As such, the implementation schedule for those actions will be linked the construction schedule for the RSMC. The implementation plan for the Salts TMDL includes regional and subwatershed specific implementation actions. There are four key structural elements to the regional implementation: Regional Salinity Management Conveyance (RSMC), Water Conservation, Water Softeners, and Best Management Practices for Irrigated Agriculture. Subwatershed implementation includes Renewable Water Resource Management Program (RWRMP) for the Southern Reaches and Northern Reach Renewable Water Management Plan (NRRWMP). Detailed discussion for each implementation element including description of the action, status and schedule for implementing the action, and a summary of the expected contribution to achievement of the salts balance are provided in the Staff Report and Technical Report for this TMDL. Proposed implementation actions in the watershed, responsible agencies, and the estimated completion date based on the effective date of the TMDL are summarized below.

TMDL Element	Key Findings and Regulatory Provisions
Implementation Plan (continued)	**Summary of Proposed Implementation Actions**

Action	Responsible Agency/ies	Schedule for Completion
Water Conservation	POTWs, Permitted Stormwater Dischargers, and Other NPDES Permittees	3 years
Water Softeners	POTWs and Permitted Stormwater Dischargers	10 years
Best Management Practice for Agricultural Dischargers	Agricultural Dischargers	2 years
RMSC Phase 1	Calleguas Municipal Water District	2 year
RMSC Phase 2	Calleguas Municipal Water District	5 year
RMSC Phase 3	Calleguas Municipal Water District	10 years
RWRMP Phase 1	CamrosaWater District, Camarillo Sanitation District	3 years
RWRMP Phase 2	Camrosa Water District, City of Thousand Oaks	6 years
RWRMP Phase 3	Camrosa Water District, City of Thousand Oaks	10 years
RWRMP Phase 4	To Be Determined	15 years
NRRWMP Phase 1	Calleguas Municipal Water District, City of Simi Valley, Ventura County Water Work-District No.1	3 years
NRRWMP Phase 2	Calleguas Municipal Water District, Ventura County Water Work-District No.1, City of Camarillo	7 years
NRRWMP Phase 3	City of Camarillo, City of Simi Valley	10 years
NRRWMP Phase 4	To Be Determined	15 years
Final Completion Date		15 years

The sections below provide discussion of the application of the final WLAs for POTWs, specific permitted stormwater discharges, other NPDES dischargers, and agricultural dischargers.

I. POTWs, permitted stormwater discharges, and other NPDES discharges

The final WLAs will be included for permitted stormwater discharges, POTWs, and other NPDES discharges in accordance with the compliance schedules provided in Table 7-22.2. The Regional Board may revise these WLAs based on additional information developed through special studies and/or monitoring conducted as part of this TMDL.

TMDL Element	Key Findings and Regulatory Provisions
Implementation Plan (continued)	▪ **POTWs** WLAs established for the POTWs in this TMDL will be implemented through NPDES permit limits. Compliance will be determined through monitoring of final effluent discharge as defined in the NPDES permit. The proposed permit limits will be applied as end-of-pipe mass-based monthly average effluent limits. Daily maximum effluent limit is not required because chloride is not expected to have an immediate or acute effect on the beneficial uses. Compliance with the minimum salt export requirements for POTWs will be based on the salt export from the subwatershed to which they discharge. The mechanisms for meeting the minimum salt export requirements and for monitoring progress towards meeting those requirements will be included in the monitoring program work plan and approved by the Executive Officer. At the end of each year, the amount of salt exported will be compared to the minimum required salt export. POTW allocations will be reduced using the adjustment factor if both of the following conditions occur: • The annual dry weather salt exports from the subwatershed to which the POTW discharges are below the minimum required exports for the previous year; and • The water quality objectives were exceeded in the receiving water at the base of the subwatershed The POTW allocations will be reduced for the following year by the difference between the minimum required salt export and the actual amount exported. The discharger shall be notified by the Regional Board that the assigned WLAs are reduced and the reduced effluent limits shall be applied for the next year. If the POTW allocations are reduced, the POTW will need to increase the amount of salt export or reduce the mass of salts discharged from the POTW before the end of the following year when the adjustment will be evaluated again. POTWs can only request to adjust the assigned WLAs upwards using the adjustment factor under limited conditions provided below: • Water quality objectives are met in the receiving waters; • Imported water supply chloride concentrations exceed 80 mg/L; and • Discharges from the POTW exceed the allocation.

TMDL Element	Key Findings and Regulatory Provisions
Implementation Plan (continued)	When imported water supply chloride concentrations exceed 80 mg/L, the POTW will monitor the effluent to determine if the wasteload allocation is exceeded. If the wasteload allocation is exceeded and the POTW desires an adjustment to the allocation, the POTW will submit documentation of the water supply chloride concentrations, the receiving water chloride concentration, the effluent mass, and the evidence of increased salt exports to offset the increased discharges from the POTW to the Regional Board for approval. The adjustment factor will apply for three months and the POTW must submit the evidence outlined above every three months to keep the adjustment factor active. As long as the required information is submitted, the adjustment factor will be in effect upon notification in writing from the RWQCB. ▪ **Urban Stormwater Discharger** A group mass-based dry weather WLA has been developed for all permitted stormwater discharges, including municipal separate storm sewer systems (MS4s), and general industrial and construction stormwater permits. USEPA regulation allows allocations for NPDES-regulated stormwater discharges from multiple point sources to be expressed as a single categorical WLA when the data and information are insufficient to assign each source or outfall individual WLAs (40 CFR 130). The grouped allocation will apply to all NPDES-regulated municipal stormwater discharges in the CCW. MS4 WLAs will be incorporated into the NPDES permit as receiving water limits measured in-stream at the base of each subwatershed. ▪ **Other NPDES Dischargers** WLAs established for other NPDES permitted dischargers in this TMDL, including minor non-stormwater permittees (other than Camrosa WRP) and general non-stormwater permittees, will be implemented through NPDES permit limits. The proposed permit limits will be applied as end-of-pipe concentration-based effluent limits, and compliance determined through monitoring of final effluent discharge as defined in the NPDES permit.

TMDL Element	Key Findings and Regulatory Provisions
Implementation Plan (continued)	**II. Agriculture** Load allocations for salts will be implemented through Conditional Waiver of Discharges from Irrigated Lands (Conditional Waiver Program) adopted by the LARWQCB on November 3, 2005. Compliance with LAs will be measured in-stream at the base of the subwatersheds and will be achieved through the implementation of Best Management Practices (BMPs) consistent with the Conditional Waiver Program. The Conditional Waiver Program requires the development of an agricultural water quality management plan (AWQMP) to address pollutants that are exceeding receiving water quality objectives as a result of agricultural discharges. Therefore, implementation of the load allocations will be through the development of an agricultural management plan for salts. Implementation of the load allocations will also include the coordination of BMPs being implemented under other required programs to ensure salts discharges are considered in the implementation. Additionally, agricultural dischargers will participate in educational seminars on the implementation of BMPs as required under the Conditional Program. Studies are currently being conducted to assess the extent of BMP implementation and provide information on the effectiveness of BMPs for agriculture. This information will be integrated into the AWQMP that will guide the implementation of agricultural BMPs in the Calleguas Creek watershed. After implementation of these actions, compliance with the allocations and TMDL will be evaluated and the allocations reconsidered if necessary based on the special studies and monitoring plan section of the implementation plan. As shown in Table 7-22.2, implementation of LAs will be conducted over a period of time to allow for implementation of the BMPs, as well as coordination with special studies and implementation actions resulting from other TMDL Implementation Plans (Nutrient, Historic Pesticides and PCBs, Sediment, Metals, Bacteria, etc.).

Table 7-22.2 Calleguas Creek Watershed Salts TMDL: Implementation Schedule

Item	Implementation Action	Responsible Party	Completion Date
1	Effective date of interim Salts TMDL waste load allocations (WLAs)	POTWs, Permitted Stormwater Dischargers[1] (PSD), and Other NPDES Permittees	Effective date of the amendment
2	Effective date of interim Salts TMDL load allocations (LAs)	Agricultural Dischargers	Effective date of the amendment
3	Responsible jurisdictions and agencies shall submit compliance monitoring plan to the Los Angeles Regional Board for Executive Officer approval.	POTWs, PSD, Other NPDES Permittees, and Agricultural Dischargers	6 months after effective date of the TMDL
4	Responsible jurisdictions and agencies shall begin monitoring as outlined in the approved monitoring plan.	POTWs, PSD, Other NPDES Permittees, and Agricultural Dischargers	1 year after monitoring plan approval by Executive Officer
5	Responsible jurisdictions and agencies shall submit workplans for the optional special studies.	POTWs, PSD, Other NPDES Permittees, and Agricultural Dischargers	Within 10 years of effective date of the TMDL
6	Responsible jurisdictions and agencies shall submit results of the special studies.	POTWs, PSD, Other NPDES Permittees, and Agricultural Dischargers	2 years after workplan approval by Executive Officer
7	Re-evaluation of the interim WLAs and interim LAs for boron, chloride, sulfate, and TDS based on new data. Responsible jurisdictions and agencies shall demonstrate that implementation actions have reduced the boron, sulfate, TDS, and chloride imbalance by 20%.	POTWs, PSD, Other NPDES Permittees, and Agricultural Dischargers	3 years after effective date of the TMDL
8	Re-evaluation of the interim WLAs and interim LAs for boron, chloride, sulfate, and TDS based on new data. Responsible jurisdictions and agencies shall demonstrate that implementation actions have reduced the boron, sulfate, TDS and chloride imbalance by 40%.	POTWs, PSD, Other NPDES Permittees, and Agricultural Dischargers	7 years after effective date of the TMDL
9	Re-evaluation of the interim WLAs and interim LAs for boron, chloride, sulfate, and TDS based on new data. Responsible jurisdictions and agencies shall demonstrate that implementation actions have reduced the boron, sulfate, TDS, and chloride imbalance by 70%.	POTWs, Permitted Stormwater Dischargers (PSD), Other NPDES Permittees, and Agricultural Dischargers	10 years after effective date of the TMDL
10	The Los Angeles Regional Board shall reconsider this TMDL to re-evaluate numeric targets, WLAs, LAs and the implementation schedule based on the results of the special studies and/or compliance monitoring.	The Regional Board	12 years after effective date of the TMDL
11	Responsible jurisdictions and agencies shall demonstrate that the watershed has achieved an annual boron, sulfate, TDS, and chloride balance.	POTWs, PSD, Other NPDES Permittees, and Agricultural Dischargers	15 years after effective date of the TMDL
12	The POTWs and non-storm water NPDES permits shall achieve WLAs, which shall be expressed as NPDES mass-based effluent limitation specified in accordance with federal regulations and state policy on water quality control.	POTWs and Other NPDES Permittees	15 years after effective date of the TMDL

Item	Implementation Action	Responsible Party	Completion Date
13	Irrigated agriculture shall achieve LAs, which will be implemented through the Conditional Waiver for Irrigated Lands as mass-based receiving water limits.	Agricultural Dischargers	15 years after effective date of the TMDL
14	The permitted stormwater dischargers shall achieve WLAs, which shall be expressed as NPDES mass-based limits specified in accordance with federal regulations and state policy on water quality control.	Permitted Stormwater Dischargers	15 years after effective date of the TMDL
15	Water quality objectives will be achieved at the base of the subwatersheds designated in the TMDL.	POTWs, PSD, Other NPDES Permittees, and Agricultural Dischargers	15 years after effective date of the TMDL

1 Permitted stormwater dischargers that are responsible parties to this TMDL include the Municipal Stormwater Dischargers (MS4s) of the Cities of Camarillo, Moorpark, Thousand Oaks, County of Ventura, Ventura County Watershed Protection District, and general industrial and construction permittees.

7-23 Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on June 7, 2007.

This TMDL was approved by:
The State Water Resources Control Board on December 4, 2007.
The Office of Administrative Law on February 8, 2008.
The U.S. Environmental Protection Agency on February 27, 2008.

The effective date of this TMDL is: March 6, 2008.

The elements of the TMDL are presented in Table 7-23.1 and the Implementation Plan in Tables 7-23.2a and 7-23.2b.

Table 7-23.1 Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL: Elements

Element	Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL
Problem Statement	Current levels of trash discharges into Lake Elizabeth and Lake Hughes violate water quality objectives and are impairing beneficial uses. Based on trash abatement and cleanup efforts by the local landowner in the vicinity of Munz Lake and site visits by Regional Board staff, current assessment of trash levels indicates that Munz Lake is no longer impaired by trash and the local landowner will provide date to evaluate the feasibility of delisting Munz Lake. Relevant water quality objectives include Floating Material and Solid, Suspended, or Settleable Materials. The following designated beneficial uses are impacted by trash: water contact recreation (REC 1) and non-contact water recreation (REC 2), warm freshwater habitat (WARM), and wildlife habitat (WILD); rare and threatened species (RARE), that is specific for Lake Elizabeth.
Numeric Target (interpretation of the narrative water quality objective, used to calculate the load allocations)	Zero trash in Lake Elizabeth, Munz Lake, and Lake Hughes and their shorelines. Zero is defined as (1) for nonpoint sources, no trash immediately following each assessment and collection event consistent with an established Minimum Frequency of Assessment and Collection Program (MFAC Program). The MFAC Program is established at an interval that prevents trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, and (2) for point sources, zero trash discharged into Lake Elizabeth, Munz Lake and Lake Hughes and their shorelines.
Source Analysis	Litter from adjacent land areas, roadways and direct dumping and deposition are sources of trash to Lake Elizabeth and Lake Hughes. Point sources such as storm drains are also sources of trash discharged to Lake Elizabeth and Lake Hughes.
Loading Capacity	Zero, as defined in the Numeric Target.
Waste Load Allocations (for point sources)	Waste Load Allocations (WLAs) are assigned to the Permitees under the Los Angeles County Municipal Separate Storm Sewer System (MS4) NPDES permit, including Los Angeles County and local land owners with storm drains that discharge to Lake Elizabeth and Lake Hughes. WLAs are zero trash. WLAs may be issued to additional responsible jurisdictions in the future under Phase 2 of the US EPA Stormwater Permitting Program, or other applicable regulatory programs.

Element	Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL
Load Allocations (for nonpoint sources)	Load Allocations (LAs) are assigned to the National Forest Service and local land owners. LAs are zero trash. LAs may be issued to additional responsible jurisdictions in the future under applicable regulatory programs.
Implementation	Implementation of the trash TMDL for Lake Elizabeth and Lake Hughes includes structural and non-structural best management practices (BMPs) and a program of minimum frequency of assessment and collection (MFAC) to address point and nonpoint trash sources. **Point Sources** WLAs shall be implemented through storm water permits and via the authority vested in the Executive Officer by section 13267 of the Porter-Cologne Water Quality Control Act (Water Code section 13000 et seq.). If point source dischargers comply with WLAs by implementing an Executive Officer certified full capture system on conveyances that discharge to Lake Elizabeth and Lake Hughes through a progressive implementation schedule of full capture devices, they will be deemed in compliance with the WLA. In certain circumstances (if approved by the Executive Officer), point source dischargers may alternatively comply with WLAs by implementing a program for minimum frequency of assessment and collection in conjunction with best management practices (MFAC/ BMPs). 1. Compliance with the final WLA may be achieved through an adequately sized and maintained full capture system, once the Executive Officer has certified that the system meets the following minimum criteria. A full capture system, at a minimum, consists of any device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the sub-drainage area. The rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour); and A= subdrainage area (acres).

Element	Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL
Implementation (continued)	Point sources that choose to comply via a full capture system, must demonstrate a phased implementation of full capture devices over an 8-year period until the final WLA of zero is attained. Zero will be deemed to have been met if full capture systems have been installed on all conveyances discharging to Lake Elizabeth and Lake Hughes. Irrespective of whether point sources employ a full capture system, they may comply with the WLA in any lawful manner. 2. Compliance through a MFAC program in conjunction with BMPs may be proposed to the Regional Board for incorporation into the relevant NPDES permit. The MFAC program must include requirements equivalent to those described in the Conditional Waiver set forth below. Agencies that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if a MFAC/BMP program, approved by the Executive Officer, is implemented. **Nonpoint Sources** LAs shall be implemented through either (1) a conditional waiver from waste discharge requirements, or (2) an alternative program implemented through waste discharge requirements or an individual waiver or another appropriate order of the Regional Board. Non-point source dischargers may achieve compliance with the LAs by implementing a MFAC/BMP program approved by the Executive Officer. Responsible jurisdictions that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if a MFAC/BMP program, approved by the Executive Officer, is implemented. 1) Conditional Waiver: Pursuant to Water Code section 13269, waste discharge requirements are waived for any responsible jurisdiction that implements a MFAC/BMP Program which, to the satisfaction of the Executive Officer, meets the following criteria:

Element	Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL
Implementation (continued)	a) The MFAC/BMP Program includes an initial minimum frequency of trash assessment and collection and suite of structural and/or nonstructural BMPs. The MFAC/BMP program shall include collection and disposal of all trash found in the water and shoreline. Responsible jurisdictions shall implement an initial suite of BMPs based on current trash management practices in land areas that are found to be sources of trash to Lake Elizabeth, and Lake Hughes. For Lake Elizabeth and Lake Hughes, the initial minimum frequency shall be set as follows: 1. Once per week on the water, shoreline and the adjacent land areas of Lake Elizabeth and Lake Hughes where they are publicly accessible, as defined in the Executive Officer approved Trash Monitoring and Reporting Plan (TMRP), during May 15 through October 15. Once per month for areas with limited access. 2. Once per month on the water, shoreline and the adjacent land areas for Lake Elizabeth and Lake Hughes, as defined in the Executive Officer approved TMRP, from October 15 to May 15. 3. Within one week on the water, shoreline and the adjacent land areas of Lake Elizabeth and Lake Hughes after each storm event with one inch of rain or greater, and after each wind advisory. b) The MFAC/BMP Program includes reasonable assurances that it will be implemented by the responsible jurisdiction. c) The MFAC/BMP Program includes a Trash Monitoring and Reporting Plan, as described below, and a requirement that the responsible jurisdictions will self-report any non-compliance with its provisions. The results and report of the Trash Monitoring and Reporting Plan must be submitted to Regional Board on an annual basis. d) MFAC protocols may be based on SWAMP protocols for rapid trash assessment, or alternative protocols proposed by dischargers and approved by the Executive Officer. e) Implementation of the MFAC/BMP program should include a Health and Safety Program to protect personnel. The MFAC/BMP program shall not require responsible jurisdictions to access and collect trash from areas where personnel are prohibited.

Element	Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL
Implementation (continued)	The Executive Officer may approve or require a revised assessment and collection frequency and definition of the critical conditions under the waiver: (a) To prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections; (b) To reflect the results of trash assessment and collection; (c) If the amount of trash collected does not show a decreasing trend, where necessary, such that a shorter interval between collections is warranted; or (d) If the amount of trash collected is decreasing such that a longer interval between collections is warranted. At the end of the implementation period, a revised MFAC/BMP program may be required if the Executive Officer determines that the amount of trash accumulating between collections is causing nuisance or otherwise adversely affecting beneficial uses . With regard to (a), (b) or (c), above, the Executive Officer is authorized to allow responsible jurisdictions to implement additional structural or non-structural BMPs in lieu of modifying the monitoring frequency. Any waivers implementing the TMDL shall expire pursuant to Water Code section 13269 five years after the effective date of this TMDL, unless reissued. The Regional Board may reissue this waiver through an order consistent herewith, instead of readopting these regulatory provisions. (2) Alternatively, responsible jurisdictions may propose, or the Regional Board may impose, an alternative program which would be implemented through waste discharge requirements an individual waiver, a cleanup and abatement order, or any other appropriate order or orders, provided the program is consistent with the assumptions and requirements of the reductions described in Table 7-23.2b, below. The County of Los Angeles will act as a third party through the recently enacted County Ordinance to identify private party dischargers in unincorporated County land. Within six months of the effective date of this TMDL, the Executive Officer shall require responsible jurisdictions to submit either a notice of intent to be regulated under the conditional waiver with their proposed MFAC/BMP Program and Trash Monitoring and Reporting Plan (TMRP), or a report of waste discharge.

Element	Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL
Monitoring and Reporting Plan	Responsible jurisdictions will develop a TMRP for Executive Officer approval that describes the methodologies that will be used to assess and monitor trash in Lake Elizabeth and Lake Hughes and/or within responsible jurisdiction land areas. Requirements for the TMRP shall include, but are not limited to, assessment and quantification of trash collected from the surfaces and shoreline of Lake Elizabeth and Lake Hughes or from responsible jurisdiction land areas. The monitoring plan shall provide details of the frequency, location, and reporting of trash monitoring. Responsible jurisdictions shall propose a metric (e.g., weight, volume, pieces of trash) to measure the amount of trash in Lake Elizabeth and Lake Hughes and on the land area surrounding Lake Elizabeth and Lake Hughes, as defined in the Executive Officer approved TMRP. The TMRP shall include a prioritization of areas that have the highest trash generation rates. The TMRP shall give preference to this prioritization when scheduling the installation of full capture devices, BMPs, or trash collection programs. The TMRP shall also include an evaluation of effectiveness of the MFAC/BMP program to prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, proposals to enhance BMPs, and a revised MFAC for Executive Officer review. Responsible Jurisdictions may coordinate their TMRP activities for Lake Elizabeth and Lake Hughes.
Margin of Safety	Zero is a conservative numeric target which contains an implicit margin of safety.
Seasonal Variations and Critical Conditions	Discharge of trash from the conveyances occurs primarily during or shortly after a major rain event. Discharge of trash from nonpoint sources occurs during all seasons, but can be increased during or shortly after high wind events, which are defined as periods of wind advisories issued by the National Weather Service.

Table 7-23.2a Lake Elizabeth, Munz Lake, and Lake Hughes Trash TMDL: Implementation Schedule Point Sources

Task No.	Task	Responsible Jurisdiction	Date
1	Submit Trash Monitoring and Reporting Plan, including a plan for defining the trash baseline WLA and a proposed definition of "major rain event".	Los Angeles County and local land owners with conveyances that discharge to Lake Elizabeth and Lake Hughes.	6 months from effective date of TMDL. If a plan is not approved by the Executive Officer within 9 months, the Executive Officer will establish an appropriate monitoring plan.
2	Implement Trash Monitoring and Reporting Plan.	Los Angeles County and local land owners with conveyances that discharge to Lake Elizabeth and Lake Hughes.	6 months from receipt of letter of approval from Regional Board Executive Officer, or the date a plan is established by the Executive Officer.
3	Submit results of Trash Monitoring and Reporting Plan, recommend trash baseline WLA, and propose prioritization of Full Capture System installation or implementation of other measures to attain the required trash reduction.	Los Angeles County and local land owners with conveyances that discharge to Lake Elizabeth and Lake Hughes.	2 years from receipt of letter of approval for the Trash Monitoring and Reporting Plan from Regional Board Executive Officer.
4	Installation of Full Capture Systems or other measures to achieve 20% reduction of trash from Baseline WLA*.	Los Angeles County, Los Angeles County Flood Control Districts, and local land owners with conveyances that discharge to Lake Elizabeth and Lake Hughes.	Four years from effective date of TMDL.
5	Installation of Full Capture Systems or other measures to achieve 40% reduction of trash from Baseline WLA*.	Los Angeles County and local land owners with conveyances that discharge to Lake Elizabeth and Lake Hughes.	Five years from effective date of TMDL.
6	Evaluate the effectiveness of Full Capture Systems or other measures, and reconsider the WLA*.	Regional Board.	Five years from effective date of TMDL.

Task No.	Task	Responsible Jurisdiction	Date
7	Installation of Full Capture Systems or other measures to achieve 60% reduction of trash from Baseline WLA*.	Los Angeles County and local land owners with conveyances that discharge to Lake Elizabeth and Lake Hughes	Six years from effective date of TMDL.
8	Installation of Full Capture Systems or other measures to achieve 80% reduction of trash from Baseline WLA*.	Los Angeles County and local land owners with conveyances that discharge to Lake Elizabeth and Lake Hughes.	Seven years from effective date of TMDL.
9	Installation of Full Capture Systems or other measures to achieve 100% reduction of trash from Baseline WLA*.	Los Angeles County and local land owners with conveyances that discharge to Lake Elizabeth and Lake Hughes.	Eight years from effective date of TMDL.

* Compliance with percent reductions from the Baseline WLA will be assumed wherever full capture systems are installed in corresponding percentages of the conveyance discharging to the waterbody. Installation will be prioritized based on the greatest point source loadings.

Table 7-23.2b Lake Elizabeth, Munz Lake, and Lake Hughes TMDL: Implementation Schedule Minimum Frequency of Assessment and Collection Program *

Task No.	Task	Responsible Jurisdiction	Date
1	Conditional Waiver in effect.	National Forest Service; Land owners in the vicinity of Lake Elizabeth and Lake Hughes.	Regional Board adoption of TMDL.
2	Submit Notice of Intent to Comply with Conditional Waiver of Discharge Requirements, including MFAC/ BMP Program and Trash Monitoring and Reporting Plan.	National Forest Service; Land owners in the vicinity of Lake Elizabeth and Lake Hughes.	Six months from TMDL effective date.
3	Implement MFAC/ BMP Program.	National Forest Service; Land owners in the vicinity of Lake Elizabeth and Lake Hughes.	Six months from receipt of Notice of Acceptance from Regional Board Executive Officer.
4	Submit annual TMRP reports including proposal for revising MFAC/BMP for Executive Officer approval.	National Forest Service; Land owners in the vicinity of Lake Elizabeth and Lake Hughes.	Two years from effective date of TMDL, and annually thereafter.
5	Reconsideration of Trash TMDL based on evaluation of effectiveness of MFAC/BMP program.	Regional Board.	Five years from effective date of TMDL.

* At Task 3, all Responsible Jurisdictions must be attaining the zero trash target after each required trash assessment and collection event. At Task 4, all Responsible Jurisdictions must demonstrate full compliance and attainment of the zero trash target's requirement that trash is not accumulating in deleterious amounts between the required trash assessment and collection events. Based on Responsible Jurisdiction monitoring reports, the Executive Officer may adjust the minimum frequency of assessment and collection as necessary to ensure compliance between the required trash assessment and collection events.

7-24 Revolon Slough and Beardsley Wash Trash TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on June 7, 2007.

This TMDL was approved by:
The State Water Resources Control Board on December 4, 2007.
The Office of Administrative Law on January 24, 2008.
The U.S. Environmental Protection Agency on February 27, 2008.

The effective date of this TMDL is: March 6, 2008.

The elements of the TMDL are presented in Table 7-24.1 and the Implementation Plan in Tables 7-24.2a and 7-24.2b.

Table 7-24.1 Revolon Slough and Beardsley Wash Trash TMDL: Elements

Element	Revolon Slough and Beardsley Wash Trash TMDL
Problem Statement	Current levels of trash discharges into Revolon Slough and Beardsley Wash violate water quality objectives and are impairing beneficial uses. Relevant water quality objectives include Floating Material and Solid, Suspended, or Settleable Materials. The following designated beneficial uses are impacted by trash: water contact recreation (REC1); non-contact water recreation (REC2); warm freshwater habitat (WARM); wildlife habitat (WILD); wetland habitat (WET).
Numeric Target (Interpretation of the narrative water quality objective, used to calculate the load allocations)	Zero trash in Revolon Slough and Beardsley Wash, and in the channel. Zero is defined as (1) for nonpoint sources, no trash immediately following each assessment and collection event consistent with an established Minimum Frequency of Assessment and Collection Program (MFAC Program). The MFAC Program is established at an interval that prevents trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, and (2) for point sources, zero trash discharged into Revolon Slough and Beardsley Wash, shoreline and channel.
Source Analysis	Litter from adjacent land areas, roadways and direct dumping and deposition are sources of trash to Revolon Slough and Beardsley Wash. Point sources such as storm drains are also sources of trash discharged to Revolon Slough and Beardsley Wash.
Loading Capacity	Zero, as defined in the Numeric Target.
Waste Load Allocations (for point sources)	Waste Load Allocations (WLAs) are assigned to the Department of Transportation (Caltrans) Permittees and Co-Permittees of the Ventura County Municipal Separate Storm Sewer System (MS4) Permit, including Ventura County, the Ventura County Watershed Protection District, the City of Camarillo, and the City of Oxnard, and local landowners. WLAs are zero trash. WLAs may be issued to additional responsible jurisdictions in the future under Phase 2 of the US EPA Stormwater Permitting Program, or other applicable regulatory programs.

Element	Revolon Slough and Beardsley Wash Trash TMDL
Load Allocations (for nonpoint sources)	Load Allocations (LAs) are assigned to land owners and agencies in the vicinity of Revolon Slough and Beardsley Wash, including the County of Ventura, Ventura County Watershed Protection District, City of Camarillo, City of Oxnard, and Agricultural entities in the Revolon Slough and Beardsley Wash subwatersheds. LAs are zero trash. LAs may be issued to additional responsible jurisdictions in the future under applicable regulatory programs.
Implementation	Implementation of the trash TMDL for Revolon Slough and Beardsley Wash includes structural and non-structural best management practices (BMPs) and a program of minimum frequency of assessment and collection (MFAC) to address point and nonpoint trash sources. **Point Sources** WLAs shall be implemented through storm water permits and via the authority vested in the Executive Officer by section 13267 of the Porter-Cologne Water Quality Control Act (Water Code section 13000 et seq.). If point source dischargers comply with WLAs by implementing an Executive Officer certified full capture system on conveyances that discharge to Revolon Slough and Beardsley Wash through a progressive implementation schedule of full capture devices, they will be deemed in compliance with the WLA. In certain circumstances (if approved by the Executive Officer), point source dischargers may alternatively comply with WLAs by implementing a program for minimum frequency of assessment and collection in conjunction with best management practices (MFAC/ BMPs). 1. Compliance with the final WLA may be achieved through an adequately sized and maintained full capture system, once the Executive Officer has certified that the system meets the following minimum criteria. A full capture system, at a minimum, consists of any device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the sub-drainage area. The rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour); and A= subdrainage area (acres).

Element	Revolon Slough and Beardsley Wash Trash TMDL
Implementation (continued)	Point sources that choose to comply via a full capture system, must demonstrate a phased implementation of full capture devices over an 8-year period until the final WLA of zero is attained. Zero will be deemed to have been met if full capture systems have been installed on all conveyances discharging to Revolon Slough and Beardsley Wash. Irrespective of whether point sources employ a full capture system, they may comply with the WLA in any lawful manner. 2. Compliance through a MFAC program in conjunction with BMPs may be proposed to the Regional Board for incorporation into the relevant NPDES permit. The MFAC program must include requirements equivalent to those described in the Conditional Waiver set forth below. Agencies that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if a MFAC/BMP program, approved by the Executive Officer, is implemented. **Nonpoint Sources** LAs shall be implemented through either (1) a conditional waiver from waste discharge requirements, or (2) an alternative program implemented through waste discharge requirements or an individual waiver or another appropriate order of the Regional Board. Non-point source dischargers may achieve compliance with the LAs by implementing a MFAC/BMP program approved by the Executive Officer. Responsible jurisdictions that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if an MFAC/BMP program, approved by the Executive Officer, is implemented. 1) Conditional Waiver: Pursuant to Water Code section 13269, waste discharge requirements are waived for any responsible jurisdiction that implements a MFAC/BMP Program which, to the satisfaction of the Executive Officer, meets the following criteria: a) The MFAC/BMP Program includes an initial minimum frequency of trash assessment and collection and suite of structural and/or nonstructural BMPs. The MFAC/BMP program shall include collection and disposal of all trash found in the water and on the shoreline. Responsible jurisdictions shall implement an initial suite of BMPs based on current trash management practices in land areas that are found to be sources of trash to Revolon Slough and Beardsley Wash. For Revolon Slough and Beardsley Wash, the initial minimum frequency shall be set as follows:

Element	Revolon Slough and Beardsley Wash Trash TMDL
Implementation (continued)	1. Monthly on Revolon Slough and its adjacent land areas at Wood Road (the end of the concrete-lined channel), as defined in the Executive Officer approved Trash Monitoring and Reporting Plan (TMRP). 2. Bi-monthly on the water, shoreline and channels of Beardsley Wash and Revolon Slough in areas under the jurisdiction of the County of Ventura, and agricultural lands. 3. Monthly assessment and collection at outlets on north side of Camarillo Hills Drain between Las Posas Rd. and Wood Rd. 4. Monthly on Las Posas Estate Drain between Central Ave. and the 101 Freeway. 5. Monthly at the inlet to the North Ramona Place Drain debris basin. 6. Monthly at inlet to Beardsley Wash at Wright Road and the adjacent land areas, as defined in the Executive Officer approved TMRP. 7. Monthly on a rotating basis of the following channels from the City of Oxnard (i.e. one drain cleaned per month): a. Fifth Street Drain from Del Norte Blvd. to Revolon Slough b. Sturgis Drain from Oxnard City Limits to Revolon Slough c. Nyeland Drain from Center Drive to Friedrich Rd. d. Del Norte Drain from Del Norte Blvd. to Revolon Slough 8. All Drains listed above will also be cleaned within one week of every storm event greater than 1 inch of rain. b) The MFAC/BMP Program includes reasonable assurances that it will be implemented by the responsible jurisdiction.

Element	Revolon Slough and Beardsley Wash Trash TMDL
Implementation (continued)	c) The MFAC/BMP Program includes a Trash Monitoring and Reporting Plan, as described below, and a requirement that the responsible jurisdictions will self-report any non-compliance with its provisions. The results and report of the Trash Monitoring and Reporting Plan must be submitted to Regional Board on an annual basis. d) MFAC protocols may be based on SWAMP protocols for rapid trash assessment, or alternative protocols proposed by dischargers and approved by the Executive Officer. e) Implementation of the MFAC/BMP program should include a Health and Safety Plan to protect personnel. The MFAC/BMP shall not require responsible jurisdictions to access and collect trash from areas where personnel are prohibited. Compliance for Agricultural Sources For agricultural dischargers, the Conditional Waiver for Irrigated Lands will be revised to include a MFAC/BMP program for enrollees in the Revolon Slough and Beardsley Wash subwatershed. The Executive Officer may approve or require a revised assessment and collection frequency and definition of the critical conditions under the waiver: (a) To prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections; (b) To reflect the results of trash assessment and collection; (c) If the amount of trash collected does not show a decreasing trend, where necessary, such that a shorter interval between collections is warranted; or (d) If the amount of trash collected is decreasing such that a longer interval between collections is warranted. At the end of the implementation period, a revised MFAC/BMP program may be required if the Executive Officer determines that the amount of trash accumulating between collections is causing nuisance or otherwise adversely affecting beneficial uses. With regard to (a), (b) or (c), above, the Executive Officer is authorized to allow responsible jurisdictions to implement additional structural or non-structural BMPs in lieu of modifying the monitoring frequency.

Element	Revolon Slough and Beardsley Wash Trash TMDL
Implementation (continued)	Any waivers implementing the TMDL shall expire pursuant to Water Code section 13269 five years after the effective date of this TMDL, unless reissued. The Regional Board may reissue this waiver through an order consistent herewith, instead of readopting these regulatory provisions. (2) Alternatively, responsible jurisdictions may propose, or the Regional Board may impose, an alternative program which would be implemented through waste discharge requirements, an individual waiver, a cleanup and abatement order, or any other appropriate order or orders, provided the program is consistent with the assumptions and requirements of the reductions described in Table 7-24.2b, below. Within six months of the effective date of this TMDL, the Executive Officer shall require responsible jurisdictions to submit either a notice of intent to be regulated under the conditional waiver with their proposed MFAC/BMP Program and Trash Monitoring and Reporting Plan (TMRP), or a report of waste discharge.
Monitoring and Reporting Plan	Responsible jurisdictions will develop a TMRP for Executive Officer approval that describes the methodologies that will be used to assess and monitor trash in Revolon Slough and Beardsley Wash and/or within responsible jurisdiction land areas. The TMRP shall include a plan to establish the trash Baseline WLAs for non-Caltrans entities, or an alternative to the default trash baseline for Caltrans to prioritize installation of full capture devices. The default trash baseline WLA for Caltrans is 6677.4 gallons per square mile per year. Requirements for the TMRP shall include, but are not limited to, assessment and quantification of trash collected from the surfaces and shoreline of Revolon Slough and Beardsley Wash or from responsible jurisdiction land areas. The monitoring plan shall provide details of the frequency, location, and reporting of trash monitoring. Responsible jurisdictions shall propose a metric (e.g., weight, volume, pieces of trash) to measure the amount of trash in Revolon Slough and Beardsley Wash and on the land area surrounding Revolon Slough and Beardsley Wash, as defined in the Executive Officer approved TMRP. The TMRP shall include a prioritization of areas that have the highest trash generation rates. The TMRP shall give preference to this prioritization when scheduling the installation of full capture devices, BMPs, or trash collection programs.

Element	Revolon Slough and Beardsley Wash Trash TMDL
Monitoring and Reporting Plan (continued)	The TMRP shall also include an evaluation of effectiveness of the MFAC/BMP program to prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, proposals to enhance BMPs, and a revised MFAC for Executive Officer review. Responsible Jurisdictions may coordinate their TMRP activities for Revolon Slough and Beardsley Wash.
Margin of Safety	Zero is a conservative numeric target which contains an implicit margin of safety.
Seasonal Variations and Critical Conditions	Discharge of trash from the conveyances occurs primarily during or shortly after a major rain event. Discharge of trash from nonpoint sources occurs during all seasons, but can be increased during or shortly after high wind events, which are defined as periods of wind advisories issued by the National Weather Service.

Table 7-24.2a Revolon Slough and Beardsley Wash Trash TMDL: Implementation Schedule - Point Sources

Task No.	Task	Responsible Jurisdiction	Date
1	Submit Trash Monitoring and Reporting Plan, including a plan for defining the trash baseline WLA and a proposed definition of "major rain event".	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with conveyances	6 months from effective date of TMDL. If a plan is not approved by the Executive Officer within 9 months, the Executive Officer will establish an appropriate monitoring plan.
2	Implement Trash Monitoring and Reporting Plan.	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with conveyances	6 months from receipt of letter of approval from Regional Board Executive Officer, or the date a plan is established by the Executive Officer.
3	Submit results of Trash Monitoring and Reporting Plan, recommend trash baseline WLA, and propose prioritization of Full Capture System installation or implementation of other measures to attain the required trash reduction.	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with conveyances	2 years from receipt of letter of approval for the Trash Monitoring and Reporting Plan from Regional Board Executive Officer.
4	Installation of Full Capture Systems or other measures to achieve 20% reduction of trash from Baseline WLA*.	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with conveyances	Four years from effective date of TMDL.
5	Installation of Full Capture Systems or other measures to achieve 40% reduction of trash from Baseline WLA*.	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with conveyances	Five years from effective date of TMDL.
6	Evaluate the effectiveness of Full Capture Systems or other measures, and reconsider the WLA*.	Regional Board.	Five years from effective date of TMDL.

Task No.	Task	Responsible Jurisdiction	Date
7	Installation of Full Capture Systems or other measures to achieve 60% reduction of trash from Baseline WLA*.	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with conveyances	Six years from effective date of TMDL.
8	Installation of Full Capture Systems or other measures to achieve 80% reduction of trash from Baseline WLA*.	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with conveyances	Seven years from effective date of TMDL.
9	Installation of Full Capture Systems or other measures to achieve 100% reduction of trash from Baseline WLA*.	City of Camarillo; City of Oxnard; Ventura County Watershed Protection District; Ventura County; Caltrans; Local land owners with conveyances	Eight years from effective date of TMDL.

* Compliance with percent reductions from the Baseline WLA will be assumed wherever full capture systems are installed in corresponding percentages of the conveyance discharging to Revolon Slough and Beardsley Wash. Installation will be prioritized based on the greatest point source loadings.

Table 7-24.2b Revolon Slough and Beardsley Wash Trash TMDL:
Implementation Schedule - Minimum Frequency of Assessment and Collection Program *

Task No.	Task	Responsible Jurisdiction	Date
1	Conditional Waiver in effect.	City of Camarillo; City of Oxnard; Ventura County; Agricultural dischargers; Ventura County Watershed Protection District; Caltrans; Local land owners with conveyances	Regional Board adoption of TMDL.
2	Submit Notice of Intent to Comply with Conditional Waiver of Discharge Requirements, including MFAC/BMP Program and Trash Monitoring and Reporting Plan.	City of Camarillo; City of Oxnard; Ventura County; Agricultural dischargers; Ventura County Watershed Protection District; Caltrans; Local land owners with conveyances	Six months from TMDL effective date.
3	Implement MFAC/BMP Program.	City of Camarillo; City of Oxnard; Ventura County; Agricultural dischargers; Ventura County Watershed Protection District; Caltrans; Local land owners with conveyances	Six months from receipt of Notice of Acceptance from Regional Board Executive Officer.
4	Submit annual TMRP reports including proposal for revising MFAC/BMP for Executive Officer approval.	City of Camarillo; City of Oxnard; Ventura County; Agricultural dischargers; Ventura County Watershed Protection District; Caltrans; Local land owners with conveyances	Two years from effective date of TMDL, and annually thereafter.
5	Reconsideration of Trash TMDL based on evaluation of effectiveness of MFAC/ BMP program.	Regional Board.	Five years from effective date of TMDL.

* At Task 3, all Responsible Jurisdictions must be attaining the zero trash target after each required trash assessment and collection event. At Task 4, all Responsible Jurisdictions must demonstrate full compliance and attainment of the zero trash target's requirement that trash is not accumulating in deleterious amounts between the required trash assessment and collection events. Based on Responsible Jurisdiction monitoring reports, the Executive Officer may adjust the minimum frequency of assessment and collection as necessary to ensure compliance between the required trash assessment and collection events.

7-25 Ventura River Estuary Trash TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on June 7, 2007.

This TMDL was approved by:
The State Water Resources Control Board on December 4, 2007.
The Office of Administrative Law on February 11, 2008.
The U.S. Environmental Protection Agency on February 27, 2008.

The effective date of this TMDL is: March 6, 2008.

The elements of the TMDL are presented in Table 7-25.1 and the Implementation Plan in Tables 7-25.2a and 7-25.2b.

Table 7-25.1 Ventura River Estuary Trash TMDL: Elements

Element	Ventura River Estuary Trash TMDL
Problem Statement	Current levels of trash discharges into the Ventura River Estuary violate water quality objectives and are impairing beneficial uses. Relevant water quality objectives include Floating Material and Solid, Suspended, or Settleable Materials. The following designated beneficial uses are impacted by trash: navigation (NAV), contact recreation (REC 1) and non-contact recreation (REC 2), commercial and sport fishing (COMM), warm fresh water habitat (WARM), estuarine habitat (EST), marine habitat (MAR), wildlife habitat (WILD), rare, threatened or endangered species (RARE), migration of aquatic organisms (MIGR), spawning, reproduction, and/or early development (SPWN), shellfish harvesting (SHELL), and wetland habitat (WET).
Numeric Target (Interpretation of the narrative water quality objective, used to calculate the load allocations)	Zero trash in the Ventura River Estuary, shoreline and in the channel. Zero is defined as (1) for nonpoint sources, no trash immediately following each assessment and collection event consistent with an established Minimum Frequency of Assessment and Collection Program (MFAC Program). The MFAC Program is established at an interval that prevents trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, and (2) for point sources, zero trash discharged into the Ventura River Estuary, shoreline, and channel.
Source Analysis	Litter from adjacent land areas, roadways and direct dumping and deposition are sources of trash to the Ventura River Estuary. Point sources such as storm drains are also sources of trash discharged to the Ventura River Estuary.
Loading Capacity	Zero, as defined in the Numeric Target.
Waste Load Allocations (for point sources)	Waste Load Allocations (WLAs) are assigned to the City of Ventura, County of Ventura, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans with conveyances that discharge to the Ventura River Estuary. WLAs are zero trash. WLAs may be issued to additional responsible jurisdictions in the future under Phase 2 of the US EPA Stormwater Permitting Program, or other applicable regulatory programs.

Element	Ventura River Estuary Trash TMDL
Load Allocations (for nonpoint sources)	Load Allocations (LAs) are assigned to the City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Parks and Recreation, California Department of Food and Agriculture, and Agricultural Dischargers. LAs are zero trash. LAs may be issued to additional responsible jurisdictions in the future under applicable regulatory programs.
Implementation	Implementation of the trash TMDL for the Ventura River Estuary includes structural and non-structural best management practices (BMPs) and a program of minimum frequency of assessment and collection (MFAC) to address point and nonpoint trash sources. **Point Sources** WLAs shall be implemented through storm water permits and via the authority vested in the Executive Officer by section 13267 of the Porter-Cologne Water Quality Control Act (Water Code section 13000 et seq.). If point source dischargers comply with WLAs by implementing an Executive Officer certified full capture system on conveyances that discharge to the Ventura River Estuary through a progressive implementation schedule of full capture devices, they will be deemed in compliance with the WLA. In certain circumstances (if approved by the Executive Officer), point source dischargers may alternatively comply with WLAs by implementing a program for minimum frequency of assessment and collection in conjunction with best management practices (MFAC/ BMPs). 1. Compliance with the final WLA may be achieved through an adequately sized and maintained full capture system, once the Executive Officer has certified that the system meets the following minimum criteria. A full capture system, at a minimum, consists of any device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the sub-drainage area. The rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour); and A= subdrainage area (acres). Point sources that choose to comply via a full capture system, must demonstrate a phased implementation of full capture devices over an 8-year period until the final WLA of zero is attained. Zero will be deemed to have been met if full capture systems have been installed on all conveyances discharging to the estuary.

Element	Ventura River Estuary Trash TMDL
Implementation (continued)	Irrespective of whether point sources employ a full capture system, they may comply with the WLA in any lawful manner. 2. Compliance through a MFAC program in conjunction with BMPs may be proposed to the Regional Board for incorporation into the relevant NPDES permit. The MFAC program must include requirements equivalent to those described in the Conditional Waiver set forth below. Agencies that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if an MFAC/BMP program, approved by the Executive Officer, is implemented. **Nonpoint Sources** LAs shall be implemented through either (1) a conditional waiver from waste discharge requirements, or (2) an alternative program implemented through waste discharge requirements or an individual waiver or another appropriate order of the Regional Board. Non-point source dischargers may achieve compliance with the LAs by implementing a MFAC/BMP program approved by the Executive Officer. Responsible jurisdictions that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if a MFAC/BMP program, approved by the Executive Officer, is implemented. 1) Conditional Waiver: Pursuant to Water Code section 13269, waste discharge requirements are waived for any responsible jurisdiction that implements a MFAC/BMP Program which, to the satisfaction of the Executive Officer, meets the following criteria: a) The MFAC/BMP Program includes an initial minimum frequency of trash assessment and collection and suite of structural and/or nonstructural BMPs. The MFAC/BMP program shall include collection and disposal of all trash found in the water, shoreline, and the channel. Responsible jurisdictions shall implement an initial suite of BMPs based on current trash management practices in land areas that are found to be sources of trash to the Ventura River Estuary. For the Ventura River Estuary, the initial minimum frequency shall be set as follows:

Element	Ventura River Estuary Trash TMDL
Implementation (continued)	1. Once per week for the sandy beach area between the estuary and the ocean and along the bike path between May 15 and October 15. Once per month for the rest of the year. 2. Within one week after each storm event with one inch of rain or greater at the Front Street storm drain, which discharges under the eastern levee, 50-feet north of the railroad tracks. 3. Quarterly for other areas of the estuary below the U.S. 101 Freeway. 4. After major public events that occur in the Ventura County Fairground that charge an admission price and are attended by greater than 7,000 people. b) The MFAC/BMP Program includes reasonable assurances that it will be implemented by the responsible jurisdiction. c) The MFAC/BMP Program includes a Trash Monitoring and Reporting Plan, as described below, and a requirement that the responsible jurisdictions will self-report any non-compliance with its provisions. The results and report of the Trash Monitoring and Reporting Plan must be submitted to Regional Board on an annual basis. d) MFAC protocols may be based on SWAMP protocols for rapid trash assessment, or alternative protocols proposed by dischargers and approved by the Executive Officer. e) Implementation of the MFAC/BMP program should include a Health and Safety Plan to protect personnel. The MFAC/BMP shall not require responsible jurisdictions to access and collect trash from areas where personnel are prohibited. *Compliance for Agricultural Sources* For agricultural dischargers, the Conditional Waiver for Irrigated Lands will be revised to include a MFAC/BMP program for enrollees in the Ventura River Estuary subwatershed. The Executive Officer may approve or require a revised assessment and collection frequency and definition of the critical conditions under the waiver:

Element	Ventura River Estuary Trash TMDL
Implementation (continued)	(a) To prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections; (b) To reflect the results of trash assessment and collection; (c) If the amount of trash collected does not show a decreasing trend, where necessary, such that a shorter interval between collections is warranted; or (d) If the amount of trash collected is decreasing such that a longer interval between collections is warranted. At the end of the implementation period, a revised MFAC/BMP program may be required if the Executive Officer determines that the amount of trash accumulating between collections is causing nuisance or otherwise adversely affecting beneficial uses. With regard to (a), (b) or (c), above, the Executive Officer is authorized to allow responsible jurisdictions to implement additional structural or non-structural BMPs in lieu of modifying the monitoring frequency. Any waivers implementing the TMDL shall expire pursuant to Water Code section 13269 five years after the effective date of this TMDL, unless reissued. The Regional Board may reissue this waiver through an order consistent herewith, instead of readopting these regulatory provisions. (2) Alternatively, responsible jurisdictions may propose, or the Regional Board may impose, an alternative program which would be implemented through waste discharge requirements an individual waiver, a cleanup and abatement order, or any other appropriate order or orders, provided the program is consistent with the assumptions and requirements of the reductions described in Table 7-25.2b, below. Within six months of the effective date of this TMDL, the Executive Officer shall require responsible jurisdictions to submit either a notice of intent to be regulated under the conditional waiver with their proposed MFAC/BMP Program and Trash Monitoring and Reporting Plan (TMRP), or a report of waste discharge.

Element	Ventura River Estuary Trash TMDL
Monitoring and Reporting Plan	Responsible jurisdictions will develop a TMRP for Executive Officer approval that describes the methodologies that will be used to assess and monitor trash in the Ventura River Estuary and/or within responsible jurisdiction land areas. The TMRP shall include a plan to establish the trash Baseline WLAs for non-Caltrans entities, or an alternative to the default trash baseline for Caltrans to prioritize installation of full capture devices. The default trash baseline WLA for Caltrans is 6677.4 gallons per square mile per year. Requirements for the TMRP shall include, but are not limited to, assessment and quantification of trash collected from the surfaces and shoreline of the Ventura River Estuary or from responsible jurisdiction land areas. The monitoring plan shall provide details of the frequency, location, and reporting of trash monitoring. Responsible jurisdictions shall propose a metric (e.g., weight, volume, pieces of trash) to measure the amount of trash in the estuary and on the land area surrounding the estuary, as defined in the Executive Officer approved TMRP. The TMRP shall include a prioritization of areas that have the highest trash generation rates. The TMRP shall give preference to this prioritization when scheduling the installation of full capture devices, BMPs, or trash collection programs. The TMRP shall also include an evaluation of effectiveness of the MFAC/BMP program to prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, proposals to enhance BMPs, and a revised MFAC for Executive Officer review. Responsible Jurisdictions may coordinate their TMRP activities for the Ventura River Estuary.
Margin of Safety	Zero is a conservative numeric target which contains an implicit margin of safety.
Seasonal Variations and Critical Conditions	Discharge of trash from the conveyances occurs primarily during or shortly after a major rain event. Discharge of trash from nonpoint sources occurs during all seasons, but can be increased during or shortly after high wind events, which are defined as periods of wind advisories issued by the National Weather Service, and the period from May 15 to October 15, or during and after public events that occur in the Ventura County Fairground.

Table 7-25.2a Ventura River Estuary Trash TMDL: Implementation Schedule - Point Sources

Task No.	Task	Responsible Jurisdiction	Date
1	Submit Trash Monitoring and Reporting Plan, including a plan for defining the trash baseline WLA and a proposed definition of "major rain event".	City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans.	6 months from effective date of TMDL. If a plan is not approved by the Executive Officer within 9 months, the Executive Officer will establish an appropriate monitoring plan.
2	Implement Trash Monitoring and Reporting Plan.	City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans.	6 months from receipt of letter of approval from Regional Board Executive Officer, or the date a plan is established by the Executive Officer.
3	Submit results of Trash Monitoring and Reporting Plan, recommend trash baseline WLA, and propose prioritization of Full Capture System installation or implementation of other measures to attain the required trash reduction.	City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans.	2 years from receipt of letter of approval for the Trash Monitoring and Reporting Plan from Regional Board Executive Officer.
4	Installation of Full Capture Systems or other measures to achieve 20% reduction of trash from Baseline WLA*.	City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans.	Four years from effective date of TMDL.
5	Installation of Full Capture Systems or other measures to achieve 40% reduction of trash from Baseline WLA*.	City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans.	Five years from effective date of TMDL.
6	Evaluate the effectiveness of Full Capture Systems or other measures, and reconsider the WLA*.	Regional Board.	Five years from effective date of TMDL.

Task No.	Task	Responsible Jurisdiction	Date
7	Installation of Full Capture Systems or other measures to achieve 60% reduction of trash from Baseline WLA*.	City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans.	Six years from effective date of TMDL.
8	Installation of Full Capture Systems or other measures to achieve 80% reduction of trash from Baseline WLA*.	City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans.	Seven years from effective date of TMDL.
9	Installation of Full Capture Systems or other measures to achieve 100% reduction of trash from Baseline WLA*.	City of Ventura, Ventura County, Ventura County Watershed Protection District, California Department of Food and Agriculture, and Caltrans.	Eight years from effective date of TMDL.

* Compliance with percent reductions from the Baseline WLA will be assumed wherever full capture systems are installed in corresponding percentages of the conveyance discharging to the estuary. Installation will be prioritized based on the greatest point source loadings.

Table 7-25.2b Ventura River Estuary Trash TMDL: Implementation Schedule - Minimum Frequency of Assessment and Collection Program *

Task No.	Task	Responsible Jurisdiction	Date
1	Conditional Waiver in effect.	City of Ventura, Ventura County, Ventura County Watershed Protection District, Caltrans, California Department of Parks and Recreation, California Department of Food and Agriculture, and Agricultural Dischargers.	Regional Board adoption of TMDL.
2	Submit Notice of Intent to Comply with Conditional Waiver of Discharge Requirements, including MFAC/BMP Program and Trash Monitoring and Reporting Plan.	City of Ventura, Ventura County, Ventura County Watershed Protection District, Caltrans, California Department of Parks and Recreation, California Department of Food and Agriculture, and Agricultural Dischargers.	Six months from TMDL effective date.
3	Implement MFAC/BMP Program.	City of Ventura, Ventura County, Ventura County Watershed Protection District, Caltrans, California Department of Parks and Recreation, California Department of Food and Agriculture, and Agricultural Dischargers.	Six months from receipt of Notice of Acceptance from Regional Board Executive Officer.
4	Submit annual TMRP reports including proposal for revising MFAC/BMP for Executive Officer approval.	City of Ventura, Ventura County, Ventura County Watershed Protection District, Caltrans, California Department of Parks and Recreation, California Department of Food and Agriculture, and Agricultural Dischargers.	Two years from effective date of TMDL, and annually thereafter.
5	Reconsideration of Trash TMDL based on evaluation of effectiveness of MFAC/ BMP program.	Regional Board.	Five years from effective date of TMDL.

* At Task 3, all Responsible Jurisdictions must be attaining the zero trash target after each required trash assessment and collection event. At Task 4, all Responsible Jurisdictions must demonstrate full compliance and attainment of the zero trash target's requirement that trash is not accumulating in deleterious amounts between the required trash assessment and collection events. Based on Responsible Jurisdiction monitoring reports, the Executive Officer may adjust the minimum frequency of assessment and collection as necessary to ensure compliance between the required trash assessment and collection events.

7-26 Machado Lake Trash TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on June 7, 2007.

This TMDL was approved by:
The State Water Resources Control Board on December 4, 2007.
The Office of Administrative Law on February 8, 2008.
The U.S. Environmental Protection Agency on February 27, 2008.

The effective date of this TMDL is: March 6, 2008.

The elements of the TMDL are presented in Table 7-26.1 and the Implementation Plan in Tables 7-26.2a and 7-26.2b.

Table 7-26.1 Machado Lake Trash TMDL: Elements

Element	Machado Lake Trash TMDL
Problem Statement	Current levels of trash discharges into Machado Lake violate water quality objectives and are impairing beneficial uses. Relevant water quality objectives include Floating Material and Solid, Suspended, or Settleable Materials. The following designated beneficial uses are impacted by trash: municipal and domestic supply (MUN); contact water recreation (REC-1); non-contact water recreation (REC-2); warm freshwater habitat (WARM); wildlife habitat (WILD), rare, threatened, or endangered species (RARE), and wetland habitat (WET).
Numeric Target (Interpretation of the narrative water quality objective, used to calculate the load allocations)	Zero trash in Machado Lake, and on the shoreline. Zero is defined as (1) for nonpoint sources, no trash immediately following each assessment and collection event consistent with an established Minimum Frequency of Assessment and Collection Program (MFAC Program). The MFAC Program is established at an interval that prevents trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, and (2) for point sources, zero trash discharged into Machado Lake and on the shoreline.
Source Analysis	Litter from adjacent land areas, roadways and direct dumping and deposition are sources of trash to Machado Lake. Point sources such as storm drains are also sources of trash discharged to Machado Lake.
Loading Capacity	Zero, as defined in the Numeric Target.

Element	Machado Lake Trash TMDL
Waste Load Allocations (for point sources)	Waste Load Allocations (WLAs) are assigned to the California Department of Transportation (Caltrans) and permittees under the Los Angeles County Municipal Separate Storm Sewer System (MS4) NPDES permit, including Los Angeles County, Los Angeles Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance. WLAs are zero trash. WLAs may be issued to additional responsible jurisdictions in the future under Phase 2 of the US EPA Stormwater Permitting Program, or other applicable regulatory programs.
Load Allocations (for nonpoint sources)	Load Allocations (LAs) are assigned to the City of Los Angeles. LAs are zero trash. LAs may be issued to additional responsible jurisdictions in the future under applicable regulatory programs.
Implementation	Implementation of the trash TMDL for Machado Lake includes structural and non-structural best management practices (BMPs) and a program of minimum frequency of assessment and collection (MFAC) to address point and nonpoint trash sources. **Point Sources** WLAs shall be implemented through storm water permits and via the authority vested in the Executive Officer by section 13267 of the Porter-Cologne Water Quality Control Act (Water Code section 13000 et seq.). If point source dischargers comply with WLAs by implementing an Executive Officer certified full capture system on conveyances that discharge to Machado Lake through a progressive implementation schedule of full capture devices, they will be deemed in compliance with the WLA. In certain circumstances, (if approved by the Executive Officer), point source dischargers may alternatively comply with WLAs by implementing a program for minimum frequency of assessment and collection in conjunction with best management practices (MFAC/ BMPs).

Element	Machado Lake Trash TMDL
Implementation (continued)	1. Compliance with the final WLA may be achieved through an adequately sized and maintained full capture system, once the Executive Officer has certified that the system meets the following minimum criteria. A full capture system, at a minimum, consists of any device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the sub-drainage area. The rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour); and A= subdrainage area (acres). Point sources that choose to comply via a full capture system, must demonstrate a phased implementation of full capture devices over an 8-year period until the final WLA of zero is attained. Zero will be deemed to have been met if full capture systems have been installed on all conveyances discharging to Machado Lake. Irrespective of whether point sources employ a full capture system, they may comply with the WLA in any lawful manner. 2. Compliance through an MFAC program in conjunction with BMPs may be proposed to the Regional Board for incorporation into the relevant NPDES permit. The MFAC program must include requirements equivalent to those described in the Conditional Waiver set forth below. Agencies that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if a MFAC/BMP program, approved by the Executive Officer, is implemented. **Nonpoint Sources** LAs shall be implemented through either (1) a conditional waiver from waste discharge requirements, or (2) an alternative program implemented through waste discharge requirements or an individual waiver or another appropriate order of the Regional Board. Non-point source dischargers may achieve compliance with the LAs by implementing a MFAC/BMP program approved by the Executive Officer. Responsible jurisdictions that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if an MFAC/BMP program, approved by the Executive Officer, is implemented.

Element	Machado Lake Trash TMDL
Implementation (continued)	1) Conditional Waiver: Pursuant to Water Code section 13269, waste discharge requirements are waived for any responsible jurisdiction that implements a MFAC/BMP Program which, to the satisfaction of the Executive Officer, meets the following criteria: a) The MFAC/BMP Program includes an initial minimum frequency of trash assessment and collection and suite of structural and/or nonstructural BMPs. The MFAC/BMP program shall include collection and disposal of all trash found in the water and on the shoreline. Responsible jurisdictions shall implement an initial suite of BMPs based on current trash management practices in land areas that are found to be sources of trash to Machado Lake. For Machado Lake, the initial minimum frequency shall be set as follows: 1. Five days per week on the shoreline and in the Ken Malloy Harbor Regional Park, as defined in the Executive Officer approved Trash Monitoring and Reporting Plan (TMRP). 2. Twice per week on waters of Machado Lake. b) The MFAC/BMP Program includes reasonable assurances that it will be implemented by the responsible jurisdiction. c) The MFAC/BMP Program includes a Trash Monitoring and Reporting Plan, as described below, and a requirement that the responsible jurisdictions will self-report any non-compliance with its provisions. The results and report of the Trash Monitoring and Reporting Plan must be submitted to Regional Board on an annual basis. d) MFAC protocols may be based on SWAMP protocols for rapid trash assessment, or alternative protocols proposed by dischargers and approved by the Executive Officer. e) Implementation of the MFAC/BMP program should include a Health and Safety Plan to protect personnel. The MFAC/BMP shall not require responsible jurisdictions to access and collect trash from areas where personnel are prohibited.

Element	Machado Lake Trash TMDL
Implementation (continued)	The Executive Officer may approve or require a revised assessment and collection frequency and definition of the critical conditions under the waiver: (a) To prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections; (b) To reflect the results of trash assessment and collection; (c) If the amount of trash collected does not show a decreasing trend, where necessary, such that a shorter interval between collections is warranted; or (d) If the amount of trash collected is decreasing such that a longer interval between collections is warranted. At the end of the implementation period, a revised MFAC/BMP program may be required if the Executive Officer determines that the amount of trash accumulating between collections is causing nuisance or otherwise adversely affecting beneficial uses. With regard to (a), (b) or (c), above, the Executive Officer is authorized to allow responsible jurisdictions to implement additional structural or non-structural BMPs in lieu of modifying the monitoring frequency. Any waivers implementing the TMDL shall expire pursuant to Water Code section 13269 five years after the effective date of this TMDL, unless reissued. The Regional Board may reissue this waiver through an order consistent herewith, instead of readopting these regulatory provisions. (2) Alternatively, responsible jurisdictions may propose, or the Regional Board may impose, an alternative program which would be implemented through waste discharge requirements an individual waiver, a cleanup and abatement order, or any other appropriate order or orders, provided the program is consistent with the assumptions and requirements of the reductions described in Table 7-26.2b, below. Within six months of the effective date of this TMDL, the Executive Officer shall require responsible jurisdictions to submit either a notice of intent to be regulated under the conditional waiver with their proposed MFAC/BMP Program and Trash Monitoring and Reporting Plan (TMRP), or a report of waste discharge.

Element	Machado Lake Trash TMDL
Monitoring and Reporting Plan	Responsible jurisdictions will develop a TMRP for Executive Officer approval that describes the methodologies that will be used to assess and monitor trash in Machado Lake and/or within responsible jurisdiction land areas. The TMRP shall include a plan to establish the trash Baseline WLAs for non-Caltrans entities, or an alternative to the default trash baseline for Caltrans to prioritize installation of full capture devices. The default trash baseline WLA for Caltrans is 6677.4 gallons per square mile per year. Requirements for the TMRP shall include, but are not limited to, assessment and quantification of trash collected from the surfaces and shoreline of Machado Lake or from responsible jurisdiction land areas. The monitoring plan shall provide details of the frequency, location, and reporting of trash monitoring. Responsible jurisdictions shall propose a metric (e.g., weight, volume, pieces of trash) to measure the amount of trash in Machado Lake and on the land area surrounding Machado Lake, as defined in the Executive Officer approved TMRP. The TMRP shall include a prioritization of areas that have the highest trash generation rates. The TMRP shall give preference to this prioritization when scheduling the installation of full capture devices, BMPs, or trash collection programs. The TMRP shall also include an evaluation of effectiveness of the MFAC/BMP program to prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, proposals to enhance BMPs, and a revised MFAC for Executive Officer review. Responsible Jurisdictions may coordinate their TMRP activities for Machado Lake.
Margin of Safety	Zero is a conservative numeric target which contains an implicit margin of safety.
Seasonal Variations and Critical Conditions	Discharge of trash from the conveyances occurs primarily during or shortly after a major rain event. Discharge of trash from nonpoint sources occurs during all seasons, but can be increased during or shortly after high wind events, which are defined as periods of wind advisories issued by the National Weather Service, and the period from May 15 to October 15.

Table 7-26.2a Machado Lake Trash TMDL: Implementation Schedule - Point Sources

Task No.	Task	Responsible Jurisdiction	Date
1	Submit Trash Monitoring and Reporting Plan, including a plan for defining the trash baseline WLA and a proposed definition of "major rain event".	California Department of Transportation (Caltrans) and Municipal Separate Storm Sewer System (MS4) Permittees including: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance	6 months from effective date of TMDL. If a plan is not approved by the Executive Officer within 9 months, the Executive Officer will establish an appropriate monitoring plan.
2	Implement Trash Monitoring and Reporting Plan.	California Department of Transportation (Caltrans) and Municipal Separate Storm Sewer System (MS4) Permittees including: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance	6 months from receipt of letter of approval from Regional Board Executive Officer, or the date a plan is established by the Executive Officer.
3	Submit results of Trash Monitoring and Reporting Plan, recommend trash baseline WLA, and propose prioritization of Full Capture System installation or implementation of other measures to attain the required trash reduction.	California Department of Transportation (Caltrans) and Municipal Separate Storm Sewer System (MS4) Permittees including: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance	2 years from receipt of letter of approval for the Trash Monitoring and Reporting Plan from Regional Board Executive Officer.
4	Installation of Full Capture Systems or other measures to achieve 20% reduction of trash from Baseline WLA*.	California Department of Transportation (Caltrans) and Municipal Separate Storm Sewer System (MS4) Permittees including: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance	Four years from effective date of TMDL.
5	Installation of Full Capture Systems or other measures to achieve 40% reduction of trash from Baseline WLA*.	California Department of Transportation (Caltrans) and Municipal Separate Storm Sewer System (MS4) Permittees including: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance	Five years from effective date of TMDL.

Task No.	Task	Responsible Jurisdiction	Date
6	Evaluate the effectiveness of Full Capture Systems or other measures, and reconsider the WLA*.	Regional Board.	Five years from effective date of TMDL.
7	Installation of Full Capture Systems or other measures to achieve 60% reduction of trash from Baseline WLA*.	California Department of Transportation (Caltrans) and Municipal Separate Storm Sewer System (MS4) Permittees including: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance	Six years from effective date of TMDL.
8	Installation of Full Capture Systems or other measures to achieve 80% reduction of trash from Baseline WLA*.	California Department of Transportation (Caltrans) and Municipal Separate Storm Sewer System (MS4) Permittees including: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance	Seven years from effective date of TMDL.
9	Installation of Full Capture Systems or other measures to achieve 100% reduction of trash from Baseline WLA*.	California Department of Transportation (Caltrans) and Municipal Separate Storm Sewer System (MS4) Permittees including: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance	Eight years from effective date of TMDL.

* Compliance with percent reductions from the Baseline WLA will be assumed wherever full capture systems are installed in corresponding percentages of the conveyance discharging to Machado Lake. Installation will be prioritized based on the greatest point source loadings.

Table 7-26.2b Machado Lake Trash TMDL: Implementation Schedule - Minimum Frequency of Assessment and Collection Program *

Task No.	Task	Responsible Jurisdiction	Date
1	Conditional Waiver in effect.	City of Los Angeles	Regional Board adoption of TMDL.
2	Submit Notice of Intent to Comply with Conditional Waiver of Discharge Requirements, including MFAC/ BMP Program and Trash Monitoring and Reporting Plan.	City of Los Angeles	Six months from TMDL effective date.
3	Implement MFAC/ BMP Program.	City of Los Angeles	Six months from receipt of Notice of Acceptance from Regional Board Executive Officer.
4	Submit annual TMRP reports including proposal for revising MFAC/BMP for Executive Officer approval.	City of Los Angeles	Two years from effective date of TMDL, and annually thereafter.
5	Reconsideration of Trash TMDL based on evaluation of effectiveness of MFAC/BMP program.	Regional Board.	Five years from effective date of TMDL.

* At Task 3, all Responsible Jurisdictions must be attaining the zero trash target after each required trash assessment and collection event. At Task 4, all Responsible Jurisdictions must demonstrate full compliance and attainment of the zero trash target's requirement that trash is not accumulating in deleterious amounts between the required trash assessment and collection events. Based on Responsible Jurisdiction monitoring reports, the Executive Officer may adjust the minimum frequency of assessment and collection as necessary to ensure compliance between the required trash assessment and collection events.

7-27 Legg Lake Trash TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on June 7, 2007.

This TMDL was approved by:

The State Water Resources Control Board on December 4, 2007.
The Office of Administrative Law on February 5, 2008.
The U.S. Environmental Protection Agency on February 27, 2008.

The effective date of this TMDL is: March 6, 2008.

The elements of the TMDL are presented in Table 7-27.1 and the Implementation Plan in Tables 7-27.2a and 7-27.2b.

Table 7-27.1 Legg Lake Trash TMDL: Elements

Element	Legg Lake Trash TMDL
Problem Statement	Current levels of trash discharges into Legg Lake violate water quality objectives and are impairing beneficial uses. Relevant water quality objectives include Floating Material and Solid, Suspended, or Settleable Materials. The following designated beneficial uses are impacted by trash: water contact recreation (REC 1) and non-contact water recreation (REC 2), warm freshwater habitat (WARM), cold freshwater (COLD), wildlife habitat (WILD), and wetland habitat (WET).
Numeric Target (Interpretation of the narrative water quality objective, used to calculate the load allocations)	Zero trash in Legg Lake and its shoreline. Zero is defined as (1) for nonpoint sources, no trash immediately following each assessment and collection event consistent with an established Minimum Frequency of Assessment and Collection Program (MFAC Program). The MFAC Program is established at an interval that prevents trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, and (2) for point sources, zero trash discharged into Legg Lake and its shoreline.
Source Analysis	Litter from adjacent land areas, roadways and direct dumping and deposition are sources of trash to Legg Lake. Point sources such as storm drains are also sources of trash discharged to Legg Lake.
Loading Capacity	Zero, as defined in the Numeric Target.
Waste Load Allocations (for point sources)	Waste Load Allocations (WLAs) are assigned to the California Department of Transportation, and permittees under the Los Angeles County Municipal Separate Storm Sewer System (MS4) NPDES permit, including the Los Angeles County Flood Control District, the County of Los Angeles, and the Cities of El Monte and South El Monte. WLAs are zero trash. WLAs may be issued to additional responsible jurisdictions in the future under Phase 2 of the US EPA Stormwater Permitting Program, or other applicable regulatory programs.
Load Allocations (for nonpoint sources)	Load Allocations (LAs) are assigned to the County of Los Angeles. LAs are zero trash. LAs may be issued to additional responsible jurisdictions in the future under applicable regulatory programs.

Element	Legg Lake Trash TMDL
Implementation	Implementation of the trash TMDL for Legg Lake includes structural and non-structural best management practices (BMPs) and a program of minimum frequency of assessment and collection (MFAC) to address point and nonpoint trash sources. **Point Sources** WLAs shall be implemented through storm water permits and via the authority vested in the Executive Officer by section 13267 of the Porter-Cologne Water Quality Control Act (Water Code section 13000 et seq.). If point source dischargers comply with WLAs by implementing an Executive Officer certified full capture system on conveyances that discharge to Legg Lake through a progressive implementation schedule of full capture devices, they will be deemed in compliance with the WLA. In certain circumstances (if approved by the Executive Officer), point source dischargers may alternatively comply with WLAs by implementing a program for minimum frequency of assessment and collection in conjunction with best management practices (MFAC/ BMPs). 1. Compliance with the final WLA may be achieved through an adequately sized and maintained full capture system, once the Executive Officer has certified that the system meets the following minimum criteria. A full capture system, at a minimum, consists of any device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the sub-drainage area. The rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour); and A= subdrainage area (acres). Point sources that choose to comply via a full capture system, must demonstrate a phased implementation of full capture devices over an 8-year period until the final WLA of zero is attained. Zero will be deemed to have been met if full capture systems have been installed on all conveyances discharging to Legg Lake.

Element	Legg Lake Trash TMDL
Implementation (continued)	Irrespective of whether point source dischargers employ a full capture system, they may comply with the WLA in any lawful manner. 2. Compliance through a MFAC program in conjunction with BMPs may be proposed to the Regional Board for incorporation into the relevant NPDES permit. The MFAC program must include requirements equivalent to those described in the Conditional Waiver set forth below. Agencies that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if a MFAC/BMP program, approved by the Executive Officer, is implemented. **Nonpoint Sources** LAs shall be implemented through either (1) a conditional waiver from waste discharge requirements, or (2) an alternative program implemented through waste discharge requirements or an individual waiver or another appropriate order of the Regional Board. Non-point source dischargers may achieve compliance with the LAs by implementing an MFAC/BMP program approved by the Executive Officer. Responsible jurisdictions that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if a MFAC/BMP program, approved by the Executive Officer, is implemented. 1) Conditional Waiver: Pursuant to Water Code section 13269, waste discharge requirements are waived for any responsible jurisdiction that implements a MFAC/BMP Program which, to the satisfaction of the Executive Officer, meets the following criteria: a) The MFAC/BMP Program includes an initial minimum frequency of trash assessment and collection and suite of structural and/or nonstructural BMPs. The MFAC/BMP program shall include collection and disposal of all trash found in the water and shoreline. Responsible jurisdictions shall implement an initial suite of BMPs based on current trash management practices in land areas that are found to be sources of trash to Legg Lake. For Legg Lake, the initial minimum frequency shall be set as follows: 1. Five days per week on the shoreline and in the Whittier Narrows Recreation Park Area, as defined in the Executive Officer approved Trash Monitoring and Reporting Plan (TMRP). 2. Once per week on waters of Legg Lake.

Element	Legg Lake Trash TMDL
Implementation (continued)	b) The MFAC/BMP Program includes reasonable assurances that it will be implemented by the responsible jurisdiction. c) The MFAC/BMP Program includes a Trash Monitoring and Reporting Plan, as described below, and a requirement that the responsible jurisdictions will self-report any non-compliance with its provisions. The results and report of the Trash Monitoring and Reporting Plan must be submitted to Regional Board on an annual basis. d) MFAC protocols may be based on SWAMP protocols for rapid trash assessment, or alternative protocols proposed by dischargers and approved by the Executive Officer. e) Implementation of the MFAC/BMP program should include a Health and Safety Program to protect personnel. The MFAC/BMP program shall not require responsible jurisdictions to access and collect trash from areas where personnel are prohibited. The Executive Officer may approve or require a revised assessment and collection frequency and definition of the critical conditions under the waiver: (a) To prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections; (b) To reflect the results of trash assessment and collection; (c) If the amount of trash collected does not show a decreasing trend, where necessary, such that a shorter interval between collections is warranted; or (d) If the amount of trash collected is decreasing such that a longer interval between collections is warranted. At the end of the implementation period, a revised MFAC/BMP program may be required if the Executive Officer determines that the amount of trash accumulating between collections is causing nuisance or otherwise adversely affecting beneficial uses . With regard to (a), (b) or (c), above, the Executive Officer is authorized to allow responsible jurisdictions to implement additional structural or non-structural BMPs in lieu of modifying the monitoring frequency.

Element	Legg Lake Trash TMDL
Implementation (continued)	Any waivers implementing the TMDL shall expire pursuant to Water Code section 13269 five years after the effective date of this TMDL, unless reissued. The Regional Board may reissue this waiver through an order consistent herewith, instead of readopting these regulatory provisions. (2) Alternatively, responsible jurisdictions may propose, or the Regional Board may impose, an alternative program which would be implemented through waste discharge requirements an individual waiver, a cleanup and abatement order, or any other appropriate order or orders, provided the program is consistent with the assumptions and requirements of the reductions described in Table 7-27.2b, below. Within six months of the effective date of this TMDL, the Executive Officer shall require responsible jurisdictions to submit either a notice of intent to be regulated under the conditional waiver with their proposed MFAC/BMP Program and Trash Monitoring and Reporting Plan (TMRP), or a report of waste discharge.
Monitoring and Reporting Plan	Responsible jurisdictions will develop a TMRP for Executive Officer approval that describes the methodologies that will be used to assess and monitor trash in Legg Lake and/or within responsible jurisdiction land areas. The TMRP shall include a plan to establish the trash Baseline WLAs for non-Caltrans entities, or an alternative to the default trash baseline for Caltrans to prioritize installation of full capture devices. The default trash baseline WLA for Caltrans is 6677.4 gallons per square mile per year. Requirements for the TMRP shall include, but are not limited to, assessment and quantification of trash collected from the surfaces and shoreline of Legg Lake or from responsible jurisdiction land areas. The monitoring plan shall provide details of the frequency, location, and reporting of trash monitoring. Responsible jurisdictions shall propose a metric (e.g., weight, volume, pieces of trash) to measure the amount of trash in Legg Lake and on the land area surrounding Legg Lake, as defined in the Executive Officer approved TMRP. The TMRP shall include a prioritization of areas that have the highest trash generation rates. The TMRP shall give preference to this prioritization when scheduling the installation of full capture devices, BMPs, or trash collection programs. The TMRP shall also include an evaluation of effectiveness of the MFAC/BMP program to prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, proposals to enhance BMPs, and a revised MFAC for Executive Officer review. Responsible Jurisdictions may coordinate their TMRP activities for Legg Lake.

Element	Legg Lake Trash TMDL
Margin of Safety	Zero is a conservative numeric target which contains an implicit margin of safety.
Seasonal Variations and Critical Conditions	Discharge of trash from the conveyances occurs primarily during or shortly after a major rain event. Discharge of trash from nonpoint sources occurs during all seasons, but can be increased during or shortly after high wind events, which are defined as periods of wind advisories issued by the National Weather Service.

Table 7-27.2a Legg Lake Trash TMDL: Implementation Schedule - Point Sources

Task No.	Task	Responsible Jurisdiction	Date
1	Submit Trash Monitoring and Reporting Plan, including a plan for defining the trash baseline WLA and a proposed definition of "major rain event".	Los Angeles County, Los Angeles County Flood Control Districts, the Cities of El Monte and South El Monte, and Caltrans.	6 months from effective date of TMDL. If a plan is not approved by the Executive Officer within 9 months, the Executive Officer will establish an appropriate monitoring plan.
2	Implement Trash Monitoring and Reporting Plan.	Los Angeles County, Los Angeles County Flood Control Districts, the Cities of El Monte and South El Monte, and Caltrans.	6 months from receipt of letter of approval from Regional Board Executive Officer, or the date a plan is established by the Executive Officer.
3	Submit results of Trash Monitoring and Reporting Plan, recommend trash baseline WLA, and propose prioritization of Full Capture System installation or implementation of other measures to attain the required trash reduction.	Los Angeles County, Los Angeles County Flood Control Districts, the Cities of El Monte and South El Monte, and Caltrans.	2 years from receipt of letter of approval for the Trash Monitoring and Reporting Plan from Regional Board Executive Officer.
4	Installation of Full Capture Systems or other measures to achieve 20% reduction of trash from Baseline WLA*.	Los Angeles County, Los Angeles County Flood Control Districts, the Cities of El Monte and South El Monte, and Caltrans.	Four years from effective date of TMDL.
5	Installation of Full Capture Systems or other measures to achieve 40% reduction of trash from Baseline WLA*.	Los Angeles County, Los Angeles County Flood Control Districts, the Cities of El Monte and South El Monte, and Caltrans.	Five years from effective date of TMDL.
6	Evaluate the effectiveness of Full Capture Systems or other measures, and reconsider the WLA*.	Regional Board.	Five years from effective date of TMDL.

Task No.	Task	Responsible Jurisdiction	Date
7	Installation of Full Capture Systems or other measures to achieve 60% reduction of trash from Baseline WLA*.	Los Angeles County, Los Angeles County Flood Control Districts, the Cities of El Monte and South El Monte, and Caltrans	Six years from effective date of TMDL.
8	Installation of Full Capture Systems or other measures to achieve 80% reduction of trash from Baseline WLA*.	Los Angeles County, Los Angeles County Flood Control Districts, the Cities of El Monte and South El Monte, and Caltrans	Seven years from effective date of TMDL.
9	Installation of Full Capture Systems or other measures to achieve 100% reduction of trash from Baseline WLA*.	Los Angeles County, Los Angeles County Flood Control Districts, the Cities of El Monte and South El Monte, and Caltrans.	Eight years from effective date of TMDL.

* Compliance with percent reductions from the Baseline WLA will be assumed wherever full capture systems are installed in corresponding percentages of the conveyance discharging to the waterbody. Installation will be prioritized based on the greatest point source loadings.

Table 7-27.2b Legg Lake TMDL: Implementation Schedule -

Minimum Frequency of Assessment and Collection Program *

Task No.	Task	Responsible Jurisdiction	Date
1	Conditional Waiver in effect.	Los Angeles County, City of South El Monte, City of El Monte.	Regional Board adoption of TMDL.
2	Submit Notice of Intent to Comply with Conditional Waiver of Discharge Requirements, including MFAC/ BMP Program and Trash Monitoring and Reporting Plan.	Los Angeles County, City of South El Monte, City of El Monte.	Six months from TMDL effective date.
3	Implement MFAC/ BMP Program.	Los Angeles County, City of South El Monte, City of El Monte.	Six months from receipt of Notice of Acceptance from Regional Board Executive Officer.
4	Submit annual TMRP reports including proposal for revising MFAC/BMP for Executive Officer approval.	Los Angeles County, City of South El Monte, City of El Monte.	Two years from effective date of TMDL, and annually thereafter.
5	Reconsideration of Trash TMDL based on evaluation of effectiveness of MFAC/BMP program.	Regional Board.	Five years from effective date of TMDL.

* At Task 3, all Responsible Jurisdictions must be attaining the zero trash target after each required trash assessment and collection event. At Task 4, all Responsible Jurisdictions must demonstrate full compliance and attainment of the zero trash target's requirement that trash is not accumulating in deleterious amounts between the required trash assessment and collection events. Based on Responsible Jurisdiction monitoring reports, the Executive Officer may adjust the minimum frequency of assessment and collection as necessary to ensure compliance between the required trash assessment and collection events.

7-28 Harbor Beaches of Ventura County Bacteria TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on November 1, 2007.

This TMDL was approved by:
The State Water Resources Control Board on October 7, 2008.
The Office of Administrative Law on December 9, 2008.
The U.S. Environmental Protection Agency on December 18, 2008.

The effective date of this TMDL is: December 18, 2008.

The following table includes the elements of this TMDL.

Table 7-28.1. Harbor Beaches of Ventura County Bacteria TMDL: Elements

Element	Findings and Regulatory Provisions
Problem Statement	Elevated bacteria indicator densities are causing impairment of the water contact recreation (REC-1) beneficial use at Kiddie Beach and Hobie Beach. Kiddie and Hobie Beach are referenced in the Staff Report as the Harbor Beaches of Ventura County. Swimming in marine waters with elevated bacteria indicator densities has been associated with adverse health effects. Specifically, local and national epidemiological studies compel the conclusion that there is a causal relationship between adverse health effects and recreational water quality, as measured by bacteria indicator densities.
Numeric Target (Interpretation of the numeric water quality objective, used to calculate allocations)	The TMDL has a multi-part numeric target based on the bacteriological water quality objectives for marine water to protect the water contact recreation use. These targets are the most appropriate indicators of public health risk in recreational waters. Bacteriological objectives are set forth in Chapter 3 of the Basin Plan. The objectives are based on four bacteria indicators and include both geometric mean limits and single sample limits. The Basin Plan objectives that serve as the numeric targets for this TMDL are: <u>1. Rolling 30-day Geometric Mean Limits</u> a. Total coliform density shall not exceed 1,000/100 ml. b. Fecal coliform density shall not exceed 200/100 ml. c. Enterococcus density shall not exceed 35/100 ml. <u>2. Single Sample Limits</u> a. Total coliform density shall not exceed 10,000/100 ml. b. Fecal coliform density shall not exceed 400/100 ml. c. Enterococcus density shall not exceed 104/100 ml. d. Total coliform density shall not exceed 1,000/100 ml, if the ratio of fecal-to-total coliform exceeds 0.1.

Element	Findings and Regulatory Provisions
Numeric Target (Interpretation of the numeric water quality objective, used to calculate allocations) (continued)	These objectives are based on health risk for marine recreational waters of 19 illnesses per 1,000 exposed individuals as set by the United States Environmental Protection Agency (USEPA, 1986). For the Harbor Beaches of Ventura County, the targets will apply at existing monitoring sites, with samples taken at ankle to knee-high depths. These targets apply during both dry- and wet-weather. This TMDL uses a "reference system/anti-degradation approach" which means that on the basis of historical exceedance levels at existing monitoring locations, including a local reference beach within the Los Angles Region, a certain number of daily exceedances of the single sample bacteria objectives are permitted. The allowable number of exceedance days is set such that (1) bacteriological water quality at any site is at least as good as at a designated reference site within the watershed and (2) there is no degradation of existing bacteriological water quality. This approach recognizes that there are natural sources of bacteria that may cause or contribute to exceedances of the bacteriological objectives and that it is not the intent of the Regional Board to require treatment or diversion of natural coastal creeks or to require treatment of natural sources of bacteria from undeveloped areas. The geometric mean targets may not be exceeded at any time. The rolling 30-day geometric mean will be calculated on each sample day. For the single sample targets, each existing monitoring site is assigned an allowable number of exceedance days for three time periods (1) summer dry-weather (April 1 to October 31), (2) winter dry-weather (November 1 to March 31), and (3) wet-weather (defined as days with 0.1 inch of rain or greater and the three days following the rain event.)
Source Analysis	Bacteria sources in the Harbor Beaches of Ventura County include anthropogenic and non-anthropogenic sources and point and non-point sources. Each of these sources contributes to the elevated levels of bacteria indicator densities at the Harbor Beaches of Ventura County during dry- and wet-weather. As of December 2006, there are four active, National Pollutant Discharge Elimination System (NPDES) permits or Waste Discharge Requirements (WDRs) for discharges to Channel Islands Harbor or Edison Canal. Discharges from the Statewide MS4 Permit for the California Department of Transportation (Caltrans) are a potentially significant source of bacteria loading. Discharges from general NPDES permits, individual NPDES permits, WDRs, the Statewide Industrial Storm Water General Permit, and the Statewide Construction Activity Storm Water General Permit are not expected to be a significant source of bacteria.

Element	Findings and Regulatory Provisions
Source Analysis (continued)	While a source identification study conducted at the Channel Islands Harbor indicated that local non-point sources are the majority contributor in summer dry-weather, high bacteria densities and exceedances during wet-weather may be more indicative of urban and agricultural run-off. Potential non-point sources of bacteria contamination at the Harbor Beaches of Ventura County include: marina activities such as waste disposal from boats, boat deck and slip washing, swimmer "wash-off", and restaurant washouts; natural sources including birds, waterfowl, and feral cat; and agricultural sources.
Loading Capacity	Loading capacity for the Harbor Beaches of Ventura County is defined in terms of bacteria indicator densities, which is the most appropriate for addressing public health risk, and is equivalent to the numeric targets, listed above. As the numeric targets shall be met at the specific sampling locations, which are representative of the corresponding beaches, no degradation or dilution allowance is provided.
Waste Load Allocations (for point sources)	Waste load allocations (WLAs) are expressed as allowable exceedance days. The allowable number of exceedance days for a monitoring site for each time period is based on the more stringent of two criteria (1) exceedance days in the designated reference system and (2) exceedance days based on historical bacteriological data at the monitoring site. This ensures that bacteriological water quality is at least as good as that of a largely undeveloped system and that there is no degradation of existing water quality. For each beach, allowable exceedance days are set on an annual basis as well as for three time periods. These three periods are: 1. Summer dry-weather (April 1 to October 31) 2. Winter dry-weather (November 1 to March 31) 3. Wet-weather days (defined as days of 0.1 inch of rain or more plus three days following the rain event) For the Channel Islands Harbor Beaches, the County of Ventura, the Ventura County Watershed Protection District (VCWPD) and associated Municipal Separate Storm Sewer System (MS4) permittees in the Channel Islands Harbor subwatershed, the City of Oxnard, and Caltrans are assigned WLAs. All WLAs for summer dry-weather single sample bacteria densities at the Harbor Beaches of Ventura County are zero (0) days of allowable exceedances.

Element	Findings and Regulatory Provisions
Waste Load Allocations (for point sources) (continued)	The WLA for the rolling 30-day geometric mean during any time period or monitoring site at the Harbor Beaches of Ventura County is zero (0) days of allowable exceedances. The WLA for winter dry-weather and wet-weather single sample bacteria densities for Kiddie Beach and Hobie Beach are listed in Table 7-28.2. General NPDES permits, individual NPDES permits, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, and WDR permittees in the Channel Islands Harbor subwatershed are assigned WLAs of zero (0) days of allowable exceedances for all three time periods and for the single sample limits and the rolling 30-day geometric mean. Any future enrollees under a general NPDES permit, individual NPDES permit, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, and WDR will also be subject to a WLA of zero (0) days of allowable exceedances. The Harbor Beaches of Ventura County are assigned interim WLAs upon the effective date of the TMDL. Interim WLAs for single sample and the 30-day rolling geometric mean are expressed in terms of an exceedance day and listed below. **Single Sample Exceedances:** Summer Dry-Weather Location | Daily Sampling | Weekly Sampling Kiddie Beach | 54 | 8 Hobie Beach | 40 | 6 Winter Dry-Weather Location | Daily Sampling | Weekly Sampling Kiddie Beach | 23 | 4 Hobie Beach | 25 | 4 Wet-Weather Location | Daily Sampling | Weekly Sampling Kiddie Beach | 32 | 5 Hobie Beach | 38 | 6

<table>
<tr><th>Element</th><th>Findings and Regulatory Provisions</th></tr>
<tr><td>Waste Load Allocations
(for point sources)
(continued)</td><td>
30-day Rolling Geometric Mean Exceedances:

Summer Weather
<table>
<tr><th>Location</th><th>Daily Sampling</th><th>Weekly Sampling</th></tr>
<tr><td>Kiddie Beach</td><td>55</td><td>8</td></tr>
<tr><td>Hobie Beach</td><td>80</td><td>12</td></tr>
</table>

Winter Weather
<table>
<tr><th>Location</th><th>Daily Sampling</th><th>Weekly Sampling</th></tr>
<tr><td>Kiddie Beach</td><td>92</td><td>14</td></tr>
<tr><td>Hobie Beach</td><td>91</td><td>13</td></tr>
</table>
</td></tr>
<tr><td>Load Allocations
(for non-point sources)</td><td>
Load allocations (LAs) are expressed as the number of daily or weekly sample days that may exceed the single sample targets identified under “Numeric Target” at a monitoring site.

For the Channel Islands Harbor Beaches, the County of Ventura and the City of Oxnard are assigned LAs. LAs may be assigned to agricultural lands in the Channel Islands Harbor subwatershed during Regional Board Reconsideration based on monitoring data from the Conditional Waiver for Dischargers from Irrigated Lands.

All LAs for summer dry-weather, single sample bacteria densities at the Harbor Beaches of Ventura County are zero (0) days of allowable exceedances. The LA for winter dry-weather and wet-weather single sample bacteria densities for Kiddie Beach and Hobie Beach are listed in Table 7-28.2.

The LA for the rolling 30-day geometric mean during any time period or monitoring site at the Harbor Beaches of Ventura County is zero (0) days of allowable exceedances.

The Harbor Beaches of Ventura County are assigned interim LAs upon the effective date of the TMDL. Interim LAs for single sample and the 30-day rolling geometric mean are expressed in terms of an exceedance day and listed below.
</td></tr>
</table>

<table>
<tr><th>Element</th><th>Findings and Regulatory Provisions</th></tr>
<tr><td>Load Allocations
(for non-point sources)
(continued)</td><td>
Single Sample Exceedances:

Summer Dry-Weather
<table>
<tr><th>Location</th><th>Daily Sampling</th><th>Weekly Sampling</th></tr>
<tr><td>Kiddie Beach</td><td>54</td><td>8</td></tr>
<tr><td>Hobie Beach</td><td>40</td><td>6</td></tr>
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Winter Dry-Weather
<table>
<tr><th>Location</th><th>Daily Sampling</th><th>Weekly Sampling</th></tr>
<tr><td>Kiddie Beach</td><td>23</td><td>4</td></tr>
<tr><td>Hobie Beach</td><td>25</td><td>4</td></tr>
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Wet-Weather
<table>
<tr><th>Location</th><th>Daily Sampling</th><th>Weekly Sampling</th></tr>
<tr><td>Kiddie Beach</td><td>32</td><td>5</td></tr>
<tr><td>Hobie Beach</td><td>38</td><td>6</td></tr>
</table>
30-day Rolling Geometric Mean Exceedances:

Summer Weather
<table>
<tr><th>Location</th><th>Daily Sampling</th><th>Weekly Sampling</th></tr>
<tr><td>Kiddie Beach</td><td>55</td><td>8</td></tr>
<tr><td>Hobie Beach</td><td>80</td><td>12</td></tr>
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Winter Weather
<table>
<tr><th>Location</th><th>Daily Sampling</th><th>Weekly Sampling</th></tr>
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<tr><td>Hobie Beach</td><td>91</td><td>13</td></tr>
</table>
</td></tr>
<tr><td>Implementation</td><td>The regulatory mechanisms used to implement the TMDL will include general NPDES permits, individual NPDES permits, WDRs, the Statewide Industrial Storm Water General Permit, the Statewide Construction Activity Storm Water General Permit, the Conditional Waiver for Dischargers from Irrigated Lands, the Statewide MS4 Permit for Caltrans, and the authority contained in Sections 13263 and 13267 of the Water Code. Each NPDES permit, assigned a WLA, shall be reopened or amended when the permit is reissued, in accordance with applicable laws, to incorporate the applicable WLAs as a permit requirement. LAs for non-point sources will be implemented within the context of this TMDL.</td></tr>
</table>

Element	Findings and Regulatory Provisions
Implementation (continued)	This TMDL will be implemented in accordance with the implementation schedule for the Harbor Beaches of Ventura County. The compliance and implementation schedules are detailed in Table 7-28.3. Responsible parties are not specifically required to conduct pilot projects for Best Management Practices (BMPs), though conducting pilot projects is within their discretion. The Regional Board recognizes the long duration required to conduct a pilot project. As such, time is allocated in the implementation schedule for the option of piloting structural BMPs, which include but are not limited to enhanced circulation devices. Special studies are not required for implementation of the TMDL, though conducting special studies is within the discretion of the responsible parties. The Regional Board shall reconsider this TMDL four years after the effective date of the TMDL for the Harbor Beaches of Ventura County to re-evaluate WLAs and LAs based on monitoring data; to re-evaluate allowable exceedance levels, including whether the allowable number of exceedance days maybe adjusted based on a Ventura County rainfall record; to re-evaluate the selection of the reference beach if additional, appropriate reference beach options have been developed; to consider a natural source exclusion approach, subject to the antidegradation policy, if it can be demonstrated that such an approach is warranted by demonstration of the control of all anthropogenic sources of bacteria to the beaches, and demonstration that beneficial uses are being met; and to assign LAs to agricultural lands in the Chanel Islands Harbor subwatershed based on monitoring in the Conditional Waiver for Dischargers from Irrigated Lands. Five years after the effective date of the TMDL, there shall be no allowable exceedances of the single sample limits, in excess of the allowable exceedances listed in Table 7-28.2, at any monitoring location at the Harbor Beaches of Ventura County during summer dry-weather, winter dry-weather, and the rolling 30-day geometric mean targets shall be achieved. Ten years after the effective date of the TMDL there shall be no allowable exceedances of the single sample limits, in excess of the allowable exceedances listed in Table 7-28.2, at any monitoring location during dry-weather or wet-weather at the Harbor Beaches of Ventura County, and the rolling 30-day geometric mean targets shall be achieved.

Element	Findings and Regulatory Provisions
Margin of Safety	An implicit margin of safety is included through several conservative assumptions, such as the assumption that no dilution takes place between the on-shore sources and where the effluent initially mixes with the receiving water, and that bacteria degradation rates are not sufficient to affect bacteria densities in the receiving water. In addition, an explicit margin of safety has been incorporated, as the load allocations will allow exceedances of the single sample targets no more than 5% of the time on an annual basis, based on the cumulative allocations for dry- and wet-weather. The Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List concludes that there are water quality impairments using a binomial distribution method which lists waterbodies when the exceedances are between approximately 8 and 10 percent.
Seasonal Variations and Critical Conditions	Seasonal variations are addressed by developing separate waste load allocations for summer dry-weather, winter dry-weather, and wet-weather based on public health concerns and observed natural background levels of exceedance of bacteria indicators. Historic monitoring data for the Harbor Beaches of Ventura County and the reference beach indicate that the critical condition for bacteria loading is during wet-weather due to greater exceedance probabilities of the single sample bacteria objectives then during dry-weather. To more specifically identify a critical condition within wet-weather, in order to set the allowable exceedance days shown in Table 7-28.2, the 90th percentile 'storm year'[1] in terms of wet days[2] is used as the reference year for the reference system. Selecting the 90th percentile year avoids a situation where the reference system is frequently out of compliance. Selecting the 90th percentile year is a more conservative approach that will accommodate a 'worst-case' scenario resulting in fewer exceedance days than the maximum allowed in drier years. Conversely, in the 10% of wetter years, there may be more than the allowable number of exceedance days.
Compliance Monitoring	Compliance and monitoring for Harbor Beaches of Ventura County is based on existing monitoring protocols and locations. Monitoring shall continue at sampling locations (VCEHD 36000 and VCEHD 37000) and at the current weekly monitoring frequency, consistent with AB411 compliance monitoring. Monitoring shall be conducted on a year-round basis at the current monitoring locations including the summer months (i.e., April to October) and winter months (i.e., November to March). Bacteria sampling shall be conducted in ankle- to knee-high water, consistent with AB411. However, if additional monitoring stations are added or if changes are made to the sampling frequencies or existing monitoring locations, then submittal of a monitoring plan is required for Executive Officer approval.

Element	Findings and Regulatory Provisions
Compliance Monitoring (continued)	For agricultural dischargers, the Conditional Waiver for Dischargers from Irrigated Lands shall be revised to include monitoring for enrollees in the Channel Islands Harbor subwatershed.

1 For purposes of this TMDL, a 'storm year' means November 1 to October 31. The 90th percentile storm year was 1993 with 75 wet days at the LAX meteorological station.

2 A wet day is defined as a day with rainfall of 0.1 inch or more plus the 3 days following the rain event.

Table 7-28.2. Harbor Beaches of Ventura County Bacteria TMDL: Final Allowable Exceedance Days by Location

Location	Summer dry-weather*		Compliance Deadline	Winter dry-weather		Compliance Deadline	Wet-weather**		Compliance Deadline
	Daily sampling (No. days)	Weekly sampling (No. days)		Daily sampling (No. days)	Weekly sampling (No. days)		Daily sampling (No. days)	Weekly sampling (No. days)	
Hobie Beach	0	0	Five years after effective date of the TMDL	3	1	Five years after effective date of the TMDL	17	3	Ten years after effective date of the TMDL
Kiddie Beach	0	0	Five years after effective date of the TMDL	3	1	Five years after effective date of the TMDL	17	3	Ten years after effective date of the TMDL

*A dry day is defined as a non-wet day.
**A wet day is defined as a day with 0.1-inch or more of rain and the three days following the rain event.

Table 7-28.3 Harbor Beaches of Ventura County Bacteria TMDL: Implementation Table		
Implementation Action	**Responsible Parties**	**Date**
Compliance (WLAs): There shall be no exceedances of the interim WLAs (see the WLAs section in Table 7-28.1).	1. County of Ventura 2. Ventura County Watershed Protection District (VCWPD) and associated MS4 Co-permittees in the Channel Islands Harbor (CIH) subwatershed[3] 3. City of Oxnard 4. Caltrans	Effective date of the TMDL.
Compliance (LAs): There shall be no exceedances of the interim LAs (see the LAs section in Table 7-28.1).	1. County of Ventura 2. City of Oxnard	Effective date of the TMDL.
Monitoring: Continue monitoring at stations VCEHD 36000 and VCEHD 37000, at a weekly monitoring frequency, and on a year-round basis. Extend the monitoring period for Hobie Beach to include winter months.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Effective date of the TMDL.
Monitoring[4]: Submit a monitoring plan for the Harbor Beaches of Ventura County (HBVC) for approval by the Executive Officer.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Prior to the modification of existing monitoring locations or frequencies.
Implementation: Submit draft work plan to implement source control and BMPs, including but not limited to structural and non-structural BMPs, at the HBVC during dry-weather for Executive Officer approval.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Six months after the effective date of the TMDL.
Monitoring: Submit monitoring plan for agricultural discharges into the Channel Islands Harbor subwatershed for approval by the Executive Officer.	1. Agricultural Dischargers	One year after the effective date of the TMDL.
Monitoring: Monitor agricultural discharges at the frequency and monitoring locations approved by the Executive Officer in the monitoring plan.	1. Agricultural Dischargers	Six months after Executive Officer approval of the monitoring plan for agricultural discharges.
Pilot Project: Submit a work plan piloting Structural BMPs, including but not limited to enhanced circulation devices, for Executive Officer approval (optional).	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	One year and six months after the effective date of the TMDL.

Table 7-28.3 Harbor Beaches of Ventura County Bacteria TMDL: Implementation Table		
Implementation Action	**Responsible Parties**	**Date**
Implementation: Submit draft work plan to implement source control and BMPs, including but not limited to structural and non-structural BMPs, at the HBVC during wet-weather for Executive Officer approval.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	One year and six months after the effective date of the TMDL.
Pilot Project: Completion of Structural BMP pilot projects, including but not limited to enhanced circulation devices (optional).	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Two years and six months after the effective date of the TMDL.
Implementation: Submit final work plan; to implement source control and BMPs, including but not limited to structural and non-structural BMPs, at the HBVC during dry-weather for Executive Officer approval.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Three years and six months after the effective date of the TMDL.
Regional Board Reconsideration: a. Re-evaluate WLAs and LAs based on data. b. Re-evaluate the implementation schedule based on results from pilot projects. c. Re-evaluate allowable exceedance levels, including whether the allowable number of exceedance days maybe adjusted based on a Ventura County rainfall record. d. Re-evaluate the selection of the reference beach if additional, appropriate reference beach options have been developed and if an appropriate reference system cannot be identified for this enclosed harbor, evaluate using the 'natural sources exclusion' approach subject to antidegradation policies rather than the 'reference system/antidegradation' approach. e. Assign LAs to agricultural lands in the Channel Islands Harbor subwatershed based on monitoring in the Conditional Waiver for Dischargers from Irrigated Lands.	Regional Board	Four years after effective date of the TMDL.
Implementation: Submit final work plan to implement source control and BMPs, including but not limited to structural and non-structural BMPs, at the HBVC during wet-weather for Executive Officer approval.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Four years after the effective date of the TMDL.

Table 7-28.3 Harbor Beaches of Ventura County Bacteria TMDL: Implementation Table		
Implementation Action	**Responsible Parties**	**Date**
Compliance (WLAs): There shall be no exceedances in excess of the numbers in Table 7-28.2 of the single sample limits at any location during dry-weather, and the rolling 30-day geometric mean targets shall be achieved.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Five years after the effective date of the TMDL.
Compliance (LAs): There shall be no exceedances in excess of the numbers in Table 7-28.2 of the single sample limits at any location during dry-weather, and the rolling 30-day geometric mean targets shall be achieved.	1. County of Ventura 2. City of Oxnard	Five years after the effective date of the TMDL.
Compliance: Submit Compliance Report for Executive Officer approval. The Compliance Report shall include an evaluation of compliance with dry-weather allocations, interim wet-weather allocations, and rolling 30-day geometric mean targets.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Six and Eight years after the effective date of the TMDL.
Compliance: Submit Final Compliance Report for Executive Officer approval. The Compliance Report shall include an evaluation of compliance with dry-weather allocations, wet-weather allocations, and the rolling 30-day geometric mean targets.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Ten years after the effective date of the TMDL.
Final Compliance (WLAs): There shall be no allowable exceedances of single sample limits in excess of the numbers listed in Table 7-28.2 of the single sample limits at any location during any periods and the rolling 30-day geometric mean targets shall be achieved.	1. County of Ventura 2. VCWPD and associated MS4 Co-permittees in the CIH subwatershed 3. City of Oxnard 4. Caltrans	Ten years after the effective date of the TMDL.
Final Compliance (LAs): There shall be no allowable exceedances of single sample limits in excess of the numbers listed in Table 7-28.2 of the single sample limits at any location during any periods and the rolling 30-day geometric mean targets shall be achieved.	1. County of Ventura 2. City of Oxnard	Ten years after the effective date of the TMDL.

3 Co-permittees of Municipal Separate Storm Sewer System (MS4) permit for Channel Islands Harbor subwatershed include the County of Ventura and incorporated cities therein. The incorporated cities for Channel Islands Harbor subwatershed include the City of Oxnard.

4 Submittal of a monitoring plan is required if additional monitoring stations are added or if changes are made to the sampling frequencies or existing monitoring locations (VCEHD 36000 and VCEHD 37000).

7-29 Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on May 1, 2008**.**

This TMDL was approved by:

The State Water Resources Control Board on December 2, 2008.
The Office of Administrative Law on February 19, 2009.
The U.S. Environmental Protection Agency on March 11, 2009.

The effective date of this TMDL is: March 11, 2009.

The elements of the TMDL are presented in Table 7-29.1 and the Implementation Plan in Table 7-29.2

Table 7-29.1. Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) TMDL: Elements

TMDL Element	Regulatory Provisions
Problem Statement	Excessive loadings of nutrients, in particular nitrogen (including ammonia) and phosphorus, cause eutrophic effects, including algae and odors, which impair the beneficial uses of Machado Lake. The nutrient enrichment results in high algal productivity; algal blooms have been observed in the lake during summer months. In addition, high nutrient concentrations contribute to excessive and nuisance macrophyte growth. Algae respiration and decay depletes oxygen from the water column creating an adverse aquatic environment. Machado Lake was placed on the Clean Water Act 303(d) list of impaired waterbodies in 1998, 2002, and 2006 for ammonia, algae, odors, and eutrophic. Applicable Water Quality Objectives for this TMDL are narrative objectives for Biostimulatory Substances and Taste and Odor; and numeric objectives for Dissolved Oxygen and Ammonia. The beneficial uses of Machado Lake include beneficial uses associated with recreation (REC 1 and REC 2), aquatic life (WARM, WILD, RARE, and WET) and water supply (MUN). This TMDL addresses the eutrophic, algae, ammonia, and odor listings which impair these uses.

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td>Numeric Targets</td><td>The total phosphorus target for Machado Lake is 0.1 mg/L as a monthly average concentration in the water column, which is based upon US EPA Nutrient Criteria Technical Guidance Manual for Lakes and Reservoirs. A ratio of total nitrogen to total phosphorus of 10 is the basis for the total nitrogen (TKN + NO_3-N + NO_2 –N) numeric target of 1.0 mg/L as a monthly average concentration in the water column. The total nitrogen target incorporates all forms of nitrogen including TKN, which is the sum of organic nitrogen and ammonia nitrogen, nitrate nitrogen (NO_3-N), and nitrite nitrogen (NO_2-N). The total nitrogen target expressed as a monthly average is protective of chronic aquatic life exposure for ammonia. There is a separate numeric target for ammonia of 5.95 mg/L as an hourly average to be protective of acute aquatic life exposure. The chlorophyll a target is 20 ug/L based on EPA guidance and the Carlson Trophic Status Index. The dissolved oxygen target is a single sample concentration of no less than 5 mg/L measured at 0.3 meter above the sediments based on the Basin Plan objective. The following table provides the numeric targets for the Machado Lake TMDL.

<table>
<tr><th>Indicator</th><th>Numeric Target</th></tr>
<tr><td>Total Phosphorus</td><td>0.1 mg/L monthly average</td></tr>
<tr><td>Total Nitrogen
(TKN + NO_3-N + NO_2 –N)</td><td>1.0 mg/L monthly average</td></tr>
<tr><td>Ammonia - N</td><td>5.95 mg/L one-hour average</td></tr>
<tr><td>Ammonia - N</td><td>2.15 mg/L 30 day average</td></tr>
<tr><td>Dissolved Oxygen</td><td>5 mg/L single sample minimum measured 0.3 meter above the sediments.</td></tr>
<tr><td>Chlorophyll a</td><td>20 µg/L monthly average</td></tr>
</table>
</td></tr>
<tr><td>Source Analysis</td><td>The point sources of nutrients into Machado Lake are stormwater discharges from the municipal separate storm sewer system (MS4), California Department of Transportation (Caltrans), and general construction and industrial discharges. Stormwater discharges to Machado Lake occur through the following subdrainage systems: Drain 553, Wilmington Drain, Project 77/510, and Walteria Lake. Discharges from Walteria Lake and Drain 553 are tributary to the Wilmington Drain, which then directly discharges in the northern portion of Machado Lake. Approximately, 88 % of the discharge into the lake enters through the Wilmington Drain.

The major nonpoint source of nutrients to Machado Lake is internal nutrient loading (nutrient flux from sediments). Atmospheric deposition is also a nonpoint source of total nitrogen. Nutrient loads from wind resuspension, bioturbation, birds, and general surface runoff are minor sources. Special studies may be conducted to further evaluate sources.</td></tr>
</table>

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td>Linkage Analysis</td><td>The linkage analysis focuses on the relationship between the nutrient loading to the lake and the numeric targets established to measure attainment of beneficial uses. The Nutrient Numeric Endpoints BATHTUB Spreadsheet Model, which was developed by Tetra Tech for US EPA, was used to establish the linkage between nutrient loading to Machado Lake and the predicted water quality response. The model performs water and nutrient balance calculations under steady-state conditions. Eutrophication related water quality conditions are expressed in terms of total phosphorus, ortho-phosphourus, total nitrogen, inorganic nitrogen, chlorophyll a, transparency (Secchi depth), and hypolimnetic oxygen depletion rates. The linkage analysis demonstrates that assigning waste load and load allocations for total nitrogen and total phosphorus will address eutrophication related water quality conditions.</td></tr>
<tr><td>Waste Load Allocations</td><td>Waste load allocations are assigned to urban stormwater dischargers (MS4, Caltrans, general construction and general industrial) in both wet and dry weather. The final waste load allocations are assigned as concentration based allocations of 0.1 mg/L and 1.0 mg/L as monthly averages for total phosphorus and total nitrogen (TKN + NO_3-N + NO_2 –N), respectively.

Interim WLAs are based on current in-lake concentrations. The effective date interim total nitrogen and total phosphorus waste load allocations are set as the 95th percentile of current concentrations in the lake. The 5 year interim total nitrogen WLAs are established as a 30 percent reduction from current in-lake concentrations. Concentration-based interim and final WLAs will be included in stormwater permits in accordance with NPDES guidance and requirements. The tables below present the interim and final waste load allocations for the stormwater discharges.

<table>
<tr><th>Waste Load Allocations</th><th>Total Phosphorus</th><th>Total Nitrogen (TKN + NO_3-N + NO_2-N)</th></tr>
<tr><th></th><th>Final WLA (mg/L)</th><th>Final WLA (mg/L)</th></tr>
<tr><td>MS4 Permittees[1] Caltrans, General Construction and Industrial stormwater permits</td><td>0.1</td><td>1.0</td></tr>
</table>
[1] Municipal Separate Storm Sewer System (MS4) Permittees that are responsible for discharges to Machado Lake include: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance.</td></tr>
</table>

TMDL Element	Regulatory Provisions
Waste Load Allocations (continued)	

Waste Load Allocations	Years After Effective Date	Interim Total Phosphorus WLAs (mg/L)	Interim Total Nitrogen (TKN + NO3-N + NO2-N) WLAs (mg/L)
MS4 Permittees, Caltrans, General Construction and Industrial Stormwater permits	At Effective Date[1]	1.25	3.50
	5[2]	1.25	2.45
	9.5 (Final WLAs[3])	0.10	1.00

[1] The compliance point for all effective date interim WLAs is measured in the lake.
[2] The compliance point for all year 5 interim WLAs is measured as specified in Implementation Plan Section II of Table 7-29.1
[3] The compliance point for all final WLAs is measured as specified in Implementation Plan Section II of Table 7-29-.1

Load Allocations

Load allocations are assigned for nonpoint source discharges to the lake, primarily internal loading from the lake. The final load allocations for internal loading are concentration based allocations of 0.1 mg/L and 1.0 mg/L as monthly averages for total phosphorus and total nitrogen (TKN + NO_3-N + NO_2 –N), respectively. Concentration based load allocations are appropriate and can be evaluated by monitoring the nutrient concentrations in the water column.

Interim LAs are based on current in-lake concentrations. The effective date interim total nitrogen and phosphorus load allocations are set at the 95th percentile of current concentrations in the lake. The 5 year interim total nitrogen LAs are established as a 30 percent reduction from current in-lake concentrations. The tables below present the final and interim load allocations for the nonpoint sources.

Load Allocations	Total Phosphorus	Total Nitrogen (TKN + NO_3-N + NO_2-N)
	Final LA (mg/L)	Final LA (mg/L)
Internal Nutrient Load (City of Los Angeles Department of Recreation and Parks)	0.1	1.0

Load Allocations	Years After Effective Date	Interim Total Phosphorus LAs (mg/L)	Interim Total Nitrogen (TKN + NO3-N + NO2-N) LAs (mg/L)
Internal Nutrient Load (City of Los Angeles Department of Recreation and Parks)	At Effective Date	1.25	3.50
	5	1.25	2.45
	9.5 (Final LAs)	0.10	1.00

TMDL Element	Regulatory Provisions
Margin of Safety	The uncertainties associated with this TMDL are due to limited data from the stormdrains entering the lake and the inherent seasonal and annual variability in delivery of phosphorus and nitrogen for external sources and nutrient cycling within the lake. To address these uncertainties, conservative numeric targets were selected by establishing the targets under a critical lake volume. Likewise, the waste load and load allocations are based on a constant value for internal loading. Moreover, the lake conditions under which the load capacity was developed were based on dry weather critical conditions when the lake level is reduced and therefore loading capacity is reduced. These conservative approaches provide an implicit margin of safety.
Seasonal Variations and Critical Conditions	The external nutrient loading to Machado Lake generally occurs during winter and spring months, in conjunction with storm events. During the dry season the lake receives minimal external loading. In the summer there is the release of nutrients from the sediments. At the same time there is very little water inflow and a decreased lake level due to evaporation. These seasonal variations cause increased nutrient concentrations. Moreover, the reduced lake volume during the summer months provides less assimilative capacity. The critical condition for the attainment of beneficial uses at Machado Lake occurs during the summer months. Also, the critical conditions for dissolved oxygen impairments related to algae growth are during the warm dry summer months when algal respiration is highest. The Machado Lake nutrient TMDL accounts for seasonal and critical conditions of the summer months by assigning a load allocation to the lake sediments and requiring a reduction in this source of nutrients to the lake, and by assigning WLAs to urban stormwater dischargers year-round.
Special Studies and Monitoring Plan	**<u>Special Studies</u>** Additional monitoring and special studies may be undertaken by dischargers and responsible agencies to evaluate the uncertainties and assumptions made in the development of this TMDL. (The results of special studies may be used to reevaluate waste load allocations and load allocations when the Machado Lake Nutrient TMDL is reconsidered.) ***Optional Study #1:*** Core flux study to estimate the nutrient flux from sediments under equilibrium conditions. Results from this study would be beneficial to gauge the success of implementation measures such as aeration. ***Optional Study #2:*** A study to understand factors such as nitrogen and phosphorus sedimentation rates (particulate settling velocities), the overall lake sedimentation rate, and sediment resuspension rate. These factors would be important for a Machado Lake nutrient budget and gauging the potential need for periodic hydraulic dredging.

TMDL Element	Regulatory Provisions
Special Studies and Monitoring Plan (continued)	***Optional Study #3***: A work plan for permittees to assess compliance with TMDL WLAs on a mass basis for total nitrogen and total phosphorous. The work plan should detail testing methodologies, BMPs, and treatments to be implemented to attain and demonstrate a reduction of total nitrogen and phosphorous loading on a mass basis. A final report including the results shall be submitted to the Regional Board for Executive Officer approval. Additional special studies proposed by stakeholders are optional and will be considered at the 7.5 year TMDL reconsideration. All proposed special study work plans and documents shall be submitted to the Regional Board for Executive Officer approval prior to special studies being initiated. **<u>Monitoring Plan</u>** A Monitoring and Reporting Program (MRP) plan to assess compliance with LAs and WLAs measured in lake must be submitted to the Executive Officer for approval within one year of the effective date. Monitoring will begin 60 days after the Executive Officer has approved the monitoring plan. This MRP plan will be required as part of the Lake Water Quality Management Plan as discussed in the Implementation Section. The MRP plan will be designed to monitor and implement this TMDL. The monitoring plan is required to measure the progress of pollutant load reductions and improvements in water quality. The monitoring plan shall ▪ Determine attainment of total phosphorus, total nitrogen, ammonia, dissolved oxygen, and chlorophyll *a* numeric targets. ▪ Determine compliance with the waste load and load allocations for total phosphorus, and total nitrogen. ▪ Monitor the effect of implementation actions on lake water quality Responsible jurisdictions shall be required to begin monitoring sixty days after the Executive Officer approves the MRP. Field samples and water samples shall be collected bi-weekly on a year-round basis. The lake sampling sites will be located in the open water portion of the lake with one in the northern portion and one in the southern portion of the lake. *In situ* measurements of water quality shall be made. The water quality probes will be calibrated immediately prior to departure to the field against known pH, EC, and DO solutions. Secchi depth, a measurement of transparency, will also be measured with a standard Secchi disk or other approved method. Additionally, a staff gauge shall be placed in an appropriate location at the lake to measure changes in lake elevation.

TMDL Element	Regulatory Provisions
Special Studies and Monitoring Plan (continued)	The monitoring plan shall consider stratification for the collection of water samples. Water samples shall be analyzed for constituents including but not limited to the following. ▪ Total nitrogen ▪ Total phosphorus ▪ Nitrate (NO_3-N) ▪ Total ammonia (NH_3-N) ▪ Ortho-phosphorus (PO_4) ▪ Total Dissolved Solids ▪ Total Suspended Solids ▪ Chlorophyll a ▪ Turbidity Detection limits shall be less than the numeric targets in this TMDL. A monitoring report shall be prepared and submitted to the Regional Board annually within six months after the completion of the final sampling event of the year. If an alternative WLA compliance option is selected, an appropriate separate TMDL compliance MRP Plan and TMDL Implementation Plan must be submitted for Executive Officer approval. Annual monitoring reports demonstrating compliance or non-compliance with WLAs shall be submitted for Executive Officer approval. All compliance monitoring must be conducted in conjunction with a Regional Board approved Quality Assurance Project Plan (QAPP). The QAPP shall include protocols for sample collection, standard analytical procedures, and laboratory certification.
Implementation Plan	Compliance with the TMDL is based on the assigned WLAs and LAs. Compliance with this TMDL will require the implementation of NPDES stormwater permit limits and lake management activities to reduce nutrient loading to the lake, reduce nutrient concentrations in the lake, prevent excessive algal biomass growth, and maintain an adequate dissolved oxygen concentration. Table 7-29.2 contains a schedule for responsible jurisdictions to implement BMPs and a Lake Water Quality Management Plan to comply with the TMDL. I. Implementation and Determination of Compliance with LAs Compliance with the LAs will be measured in the lake and will be achieved through a combination of implementation of lake management projects and BMPs to reduce external and internal nutrient loading to the lake and to reduce and manage internal nutrient sources.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	Load allocations will be implemented through the following: (1) Memorandum of Agreement (MOA), or (2) Clean Up and Abatement Order or Other Regulatory Order The responsible jurisdictions for the load allocations shall be allowed one year from the effective date of this TMDL to enter into a Memorandum of Agreement (MOA) with the Executive Officer, detailing the voluntary efforts that will be undertaken to attain the load allocations. The MOA shall comply with the Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options ("Policy"), including part II, section 2 c ii and related provisions, and shall be consistent the requirements of this TMDL. If the MOA is timely adopted, and so long as it is implemented, the program described in the MOA shall be deemed "certified", pursuant to the Policy, subject to the conditions of Policy section 2 e. The MOA shall include development of a Lake Water Quality Management Plan (LWQMP), must be approved by the Executive Officer, and may be amended with Executive Officer approval, as necessary. If a MOA is not established with responsible jurisdictions within one year or if responsible jurisdictions do not comply with the terms of the MOA, a cleanup and abatement order pursuant to Water Code section 13304, or another appropriate regulatory order, shall be issued to implement the load allocations. Furthermore, the implementation of the MOA must result in attainment of the TMDL load allocations. If the MOA and LWQMP are not implemented or otherwise do not result in attainment of load allocations, the certification shall be revoked, the MOA rescinded, and the load allocations shall be implemented through a cleanup and abatement order, or other order, as described above. Implementation of the MOA shall be reviewed annually by the Executive Officer as part of the Monitoring and Reporting Program (MRP) annual reports. To the satisfaction of the Executive Officer the LWQMP shall meet the following criteria: ▪ One and one half years from the effective date of the TMDL responsible jurisdictions shall submit a LWQMP, MRP Plan and QAPP for approval by the Executive Officer. ▪ The LWQMP shall include a list of cooperating parties.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	▪ The LWQMP shall address appropriate water quality monitoring and a timeline for the implementation of management practices to reduce and manage nutrient loading to the lake. The timeline shall ensure that the implementation actions are underway prior to Regional Board reconsideration of the TMDL. The LWQMP shall present a comprehensive management plan and strategy for achieving the LAs at Machado Lake and attaining numeric targets and beneficial uses. The LWQMP shall include a schedule for implementation actions. ▪ The LWQMP shall achieve compliance with the load allocations through the implementation of lake management strategies to reduce and manage internal nutrient sources. The lake management implementation actions may include, but are not limited to the following: ▪ Wetland restoration ▪ Aeration system ▪ Hydraulic Lake dredging ▪ Hydroponic Islands ▪ Alum treatment ▪ Fisheries Management ▪ Macrophyte Management and Harvesting ▪ Maintain Lake Level – Supplemental Water ▪ The LWQMP shall include a MRP Plan. The MRP shall include a requirement that the responsible jurisdictions report compliance and non-compliance with load allocations as part of annual reports submitted to the Regional Board. Compliance with the load allocations shall be measured in the lake at two locations, one in the north portion and one in the south. The average of these two sampling locations shall determine compliance with the load allocations. MRP protocols may be based on Surface Water Ambient Monitoring Program (SWAMP) protocols for water quality monitoring or alternative protocols proposed by dischargers and approved by the Executive Officer. ▪ A QAPP shall also be submitted to the Regional Board for approval by the Executive Officer to ensure data quality. The QAPP shall include protocols for sample collection, standard analytical procedures, and laboratory certification. The QAPP may be based on SWAMP protocols for water quality monitoring and quality assurance or alternative protocols proposed by dischargers and approved by the Executive Officer. ▪ The MOA and LWQMP program shall include assurances that it will be implemented by the responsible jurisdiction.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	▪ Implementation of the LWQMP program should include a Health and Safety Plan to protect personnel. The Executive Officer may require a revised assessment under the MOA and LWQMP: (a) To prevent nutrients from accumulating or recycling in the lake in deleterious amounts that impair water quality, contribute to negative eutrophic conditions or adversely affect beneficial uses; (b) To reflect the results of nutrient assessment or special studies Cleanup and Abatement Order or Other Regulatory Order: Alternatively, responsible jurisdictions may propose, or the Regional Board may impose, an alternative program which would be implemented through a cleanup and abatement order, or any other appropriate order or orders, provided the program is consistent with the allocations, reductions, and schedule described in Table 7-29.2. ❖ Determination of Compliance with Interim LAs Responsible parties shall comply with numeric interim LAs or may be deemed in compliance with the interim LAs through implementation of lake sediment removal and/or lake management implementation actions in accordance with the LWQMP schedule as approved by the Regional Board Executive Officer. II. Implementation and Determination of Compliance with WLAs WLAs will be incorporated into NPDES stormwater permits. Stormwater permittees may be deemed in compliance with waste load allocations by actively participating in a LWQMP and attaining the waste load allocations for Machado Lake. Stormwater permittees and the responsible party for the lake may work together to implement the LWQMP and reduce external nutrient loading to attain the TMDL waste load allocations measured in the lake. Alternatively, MS4 Permittees may be deemed in compliance with waste load allocations by demonstrating reduction of total nitrogen and total phosphorous on an annual mass basis measured at the stormdrain outfall of the permittee's drainage area. The annual mass based allocation shall be equal to a monthly average concentration of 0.1 mg/L TP and 1.0 mg/L TN based on approved flow conditions. Permittees must demonstrate total nitrogen and total phosphorous load reductions to be achieved in accordance with a special study workplan approved by the Executive Officer. Compliance may also be demonstrated as concentration based monthly averages for TP and TN measured at the stormdrain outfall of the permittee's drainage area.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	MS4 Permittees shall be required to develop and implement a MRP plan and TMDL Implementation Plan. The MRP plan shall include a requirement that the responsible jurisdictions report compliance and non-compliance with waste load allocations as part of annual reports submitted to the Regional Board. ❖ Determination of Compliance with Interim WLAs Responsible parties may comply with the numeric interim WLAs or may be deemed in compliance with the interim WLAs through implementation of external nutrient source reduction projects in accordance with the TMDL Implementation Plan schedule as approved by the Regional Board Executive Officer. The Regional Board may revise these WLAs and the compliance point based on the collection of additional information developed through special studies or monitoring conducted as part of this TMDL. The Regional Board will reconsider the TMDL at 7.5 years from the effective date based on water quality monitoring and special studies. III. APPLICATION OF ALLOCATIONS TO RESPONSIBLE JURISDICTIONS Responsible jurisdictions to attain WLAs for this TMDL include but are not limited to: • Caltrans • General Stormwater Permit Enrollees • MS4 Permittees including: ➢ Los Angeles County ➢ Los Angeles County Flood Control District ➢ Cities of Carson, ➢ City of Lomita, ➢ City of Los Angeles, ➢ City of Palos Verdes Estates, ➢ City of Rancho Palos Verdes, ➢ City of Redondo Beach, ➢ City of Rolling Hills, ➢ City of Rolling Hills Estates, ➢ City of Torrance. The City of Los Angeles, Department of Recreation and Parks is responsible jurisdiction to implement the assigned Load Allocations for this TMDL.

Table 7-29.2 Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) TMDL: Implementation Schedule

Task Number	Task	Responsible Jurisdiction	Date
1	Effective date interim waste load (WLA) and load allocations (LA) for total nitrogen and total phosphorus apply.	California Department of Transportation (Caltrans), Municipal Separate Storm Sewer System Permittees[4] (MS4 Permittees), City of Los Angeles – Department of Recreation and Parks	Effective Date of TMDL
2	Responsible jurisdictions shall enter into a Memorandum of Agreement (MOA) with the Regional Board to implement the load allocations.	City of Los Angeles – Department of Recreation and Parks	1 year from effective date of TMDL
3	Regional Board staff shall begin development of a Clean Up and Abatement Order or other regulatory order to implement the load allocations if an MOA is not established with responsible jurisdictions.	Regional Board Staff	1 year from effective date of TMDL
4	Clean Up and Abatement Order or other regulatory order adopted by the Regional Board if an MOA is not established with responsible jurisdictions. The Clean Up and Abatement Order or other regulatory order shall reflect the TMDL Implementation Schedule.	Regional Board Staff	1.5 years from effective date of TMDL
5	Responsible jurisdictions whose compliance is determined as concentration based WLAs measured at end of pipe shall submit a Monitoring and Reporting Program (MRP) Plan to the Executive Officer for approval.	Caltrans, MS4 Permittees	One year from effective date of TMDL
6	Responsible jurisdictions shall submit a Lake Water Quality Management Plan, MRP Plan and Quality Assurance Project Plan for approval by the Executive Officer to comply with MOA.	City of Los Angeles – Department of Recreation and Parks	1.5 years from effective date of TMDL
7	Responsible jurisdictions shall submit a work plan for optional special study #3 (if responsible jurisdictions choose to conduct this special study) for approval by the Executive Officer.	Caltrans, MS4 Permittees	One year from effective date of TMDL
8	Responsible jurisdictions shall submit work plans for optional special studies #1 and #2 (if responsible jurisdictions choose to conduct special studies) for approval by the Executive Officer.	Caltrans, MS4 Permittees, City of Los Angeles – Department of Recreation and Parks	1.5 years from effective date of TMDL

Task Number	Task	Responsible Jurisdiction	Date
9	Responsible jurisdictions shall begin monitoring as outlined in the approved MRP plan.	Caltrans, MS4 Permittees, City of Los Angeles – Department of Recreation and Parks	Sixty days from date of MRP Plan approval
10	Responsible jurisdictions shall begin implementation of Lake Water Quality Management Plan.	City of Los Angeles – Department of Recreation and Parks	Sixty days from date of Lake Water Quality Management Plan approval
11	Responsible jurisdictions whose compliance is determined as concentration based WLAs measured at end of pipe shall submit a TMDL Implementation Plan including BMPs to address discharges from storm drains.	Caltrans, MS4 Permittees	Two years from effective date of TMDL
12	Responsible jurisdictions whose compliance is determined as concentration based WLAs measured at end of pipe shall begin implementation of BMPs to address discharges from stormdrains	Caltrans, MS4 Permittees	Sixty days from date of Implementation Plan approval
13	Responsible jurisdictions shall submit annual monitoring reports. The monitoring reports shall include a requirement that the responsible jurisdictions demonstrate compliance with the MOA. If the MOA and Lake Water Quality Management Plan are not implemented or otherwise do not result in attainment of load allocations, the Regional Board shall revoke the MOA and the load allocations shall be implemented through a Clean Up and Abatement Order or other regulatory order.	City of Los Angeles – Department of Recreation and Parks	Annually – from date of Lake Water Quality Management Plan approval
14	Responsible jurisdictions whose compliance is determined as concentration based WLAs measured at end of pipe shall submit annual monitoring reports.	Caltrans, MS4 Permittees	Annually – from date of MPR Plan approval
15	Optional Special Study #3 completed and final report submitted for Executive Officer approval.	Caltrans, MS4 Permittees	Within 2.5 years of effective date of TMDL
16	Responsible jurisdictions shall submit a MRP Plan and TMDL Implementation Plan for the alternative mass based WLA compliance option (if selected), to the Executive Officer for approval.	Caltrans, MS4 Permittees	Within 2.5 years of effective date of TMDL

Task Number	Task	Responsible Jurisdiction	Date
17	Responsible jurisdictions shall begin monitoring and implementing projects/ programs as outlined in the approved MRP and TMDL Implementation Plan for the alternative mass based WLA compliance option.	Caltrans, MS4 Permittees	Sixty days from date of MRP/ Implementation Plan approval
18	Responsible jurisdictions whose compliance is determined as mass based WLAs measured at end of pipe shall submit annual monitoring reports.	Caltrans, MS4 Permittees	Annually – from date of MPR/ Implementation Plan approval
19	Optional Special Studies completed and Special Study final reports submitted for Executive Officer approval.	Caltrans, MS4 Permittees, City of Los Angeles – Department of Recreation and Parks	Within 6 years of effective date of TMDL
20	Regional Board staff and responsible jurisdictions will present an Information Item to the Regional Board on the progress of TMDL implementation efforts and compliance with implementation schedules.	Regional Board staff and responsible jurisdictions	4 years from effective date of TMDL
21	5 Year interim total nitrogen WLA and LA apply.	Caltrans, MS4 permittees, City of Los Angeles – Department Recreation and Parks	Within 5 years of effective date of TMDL
22	Regional Board will reconsider the TMDL to include results of optional special studies and water quality monitoring data completed by the responsible jurisdictions and revise numeric targets, WLAs, LAs, and the implementation schedule as needed.	Regional Board	7.5 years from effective date of TMDL
23	Responsible jurisdictions shall achieve Final WLAs and LAs for total nitrogen (including ammonia) and total phosphorus and demonstrate attainment of numeric targets for total nitrogen, ammonia, total phosphorus, dissolved oxygen, and chlorophyll a. Responsible parties shall demonstrate attainment of water quality standards for total nitrogen, ammonia, total phosphorus, dissolved oxygen, and biostimulatory substances in accordance with federal regulations and state policy on water quality control.	Caltrans, MS4 Permittees, City of Los Angeles – Department of Recreation and Parks	Within 9.5 years of effective date of TMDL

[4] Municipal Separate Storm Sewer System (MS4) Permittees that are responsible for discharges to Machado Lake include: Los Angeles County, Los Angeles County Flood Control District, and the Cities of Carson, Lomita, Los Angeles, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance.

7-30 Colorado Lagoon OC Pesticides, PCBs, Sediment Toxicity, PAHs, and Metals TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on October 1, 2009**.**

This TMDL was approved by:

The State Water Resources Control Board on November 16, 2010.
The Office of Administrative Law on May 6, 2011.
The U.S. Environmental Protection Agency on June 14, 2011.

The effective date of this TMDL is: June 14, 2011.

The elements of the TMDL are presented in Table 7-30.1 and the Implementation Plan in Table 7-30.2

Table 7-30.1. Colorado Lagoon OC Pesticides, PCBs, Sediment Toxicity, PAHs, and Metals TMDL: Elements

TMDL Element	Regulatory Provisions
Problem Statement	Colorado Lagoon is identified on the 1998, 2002, and 2006 Clean Water Act Section 303(d) lists of water-quality limited segments as impaired due to elevated levels of OC pesticides, PCBs, sediment toxicity, PAHs, and metals in fish tissue and sediment. Applicable fish tissue, sediment, and water quality objectives for this TMDL are narrative objectives for chemical constituents, bioaccumulation, pesticides, and toxicity; and numeric objectives for metals and organic compounds. The beneficial uses of Colorado Lagoon include water contact recreation (REC-1) and non-contact water recreation (REC-2), commercial and sport fishing (COMM), warm freshwater habitat (WARM), wildlife habitat (WILD), and shellfish harvesting (SHELL). The goal of this TMDL is to protect and restore fish tissue and sediment quality in Colorado Lagoon by controlling the contaminated sediment loading and accumulation of contaminated sediment in the lagoon.

TMDL Element	Regulatory Provisions
Numeric Targets	Colorado Lagoon is listed on the 303(d) list for sediment toxicity, PAHs, lead, and zinc in sediment; DDT, Dieldrin, and PCBs in fish tissue; and chlordane in fish tissue and sediment. In order to address these listings, water column, fish tissue and sediment targets are selected. The following table provides the numeric targets for the Colorado Lagoon OC Pesticides, PCBs, Sediment Toxicity, PAHs, and Metals TMDL.

Numeric targets for water, fish tissue, and sediment for OC Pesticides, PCBs, PAHs, and metals

Constituents	Water Quality Target[1] (ug/L)	Fish Tissue Target[2] (ug/kg)	ERL Sediment Target[3] (ug/dry Kg)
Chlordane	0.00059	5.60	0.50
DDTs	0.00059	21.00	1.58[4]
Dieldrin	0.00014	0.46	0.02
PCBs	0.00017[5]	3.60[6]	22.70
Total PAHs[7]	0.049[8]	5.47	4,022.00
Total LPAHs[9]	NA	NA	552.00
Total HPAHs[10]	NA	NA	1,700.00
Lead	8.10[11]	NA	46,700.00
Zinc	81.00[11]	NA	150,000.00

1 The California Toxics Rule (CTR) water quality criteria for consumption of organisms only are applied as the numeric targets for Chlordane, 4,4' DDT, Dieldrin, and PCBs for protection of human health. The CTR aquatic life criteria for saltwater are applied as the numeric targets for protection of aquatic life for lead and zinc.

2 Office of Environmental Health Hazard Assessment (OEHHA) Fish Contaminant Goals are applied as numeric targets for Chlordane, DDTs, Dieldrin, and PCBs. The U.S. Environmental Protection Agency (USEPA) screening value is applied as the numeric target for total PAHs.

3 Effect Range Low (ERL) sediment criteria from National Oceanic and Atmospheric Administration (NOAA) Sediment Quality Guidelines are applied as numeric targets.

4 DDTs in sediment are measured as the sum of DDT, DDE, and DDD.

5 PCBs in water are measured as the sum of all congener or isomer or homolog or aroclor.

6 PCBs in fish tissue and sediment are measured as sum of all congeners.

7 PAHs: Polycyclic aromatic hydrocarbons (sum of acenaphthylene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, fluorene, indeno(1,2,3-c,d)pyrene, phenanthrene, and pyrene).

8 CTR human health criteria were not established for total PAHs, Therefore, the lowest CTR criteria for individual PAHs of 0.049 ug/L is applied to the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene. Other PAHs compounds in the CTR shall be screened as part of the TMDL monitoring plan.

9 LPAHs: Low molecular weight PAHs.

10 HPAHs: High molecular weight PAHs.

11 Saltwater criteria for metals are expressed in terms of the dissolved fraction of metals in water column.

TMDL Element	Regulatory Provisions
Source Analysis	**Point sources** The point sources of OC pesticides, PCBs, PAHs, and metals discharged to Colorado Lagoon are urban runoff and stormwater discharges from the municipal separate storm sewer systems (MS4s) and California Department of Transportation (Caltrans). The Colorado Lagoon watershed is divided into five sub-basins that discharge stormwater and urban dry weather runoff to Colorado Lagoon. Each of the sub-basins is served by a major storm sewer trunk line and supporting appurtenances that collect and transport stormwater and urban dry weather runoff to Colorado Lagoon**.** The sub-basins are as follows: **Sub-basin A.** Discharges to Colorado Lagoon via a 63-inch reinforced concrete pipe owned and operated by the Los Angeles County Flood Control District (Project 452 Drain) discharging into the north part of the west arm. The drainage pattern is generally to the south and east. Sub-basin A contains the most commercial activities mainly along Anaheim Street and the northern part of Redondo Avenue. **Sub-basin B.** Discharges to Colorado Lagoon via a 54-inch reinforced concrete pipe (Line I Storm Drain) discharging into the north part of the north arm. The drainage pattern is generally to the south and west. Sub-basin B is predominately park/golf course open space with some residential areas on the north east corner. **Sub-basin C.** Discharges to Colorado Lagoon via a 48-inch reinforced concrete pipe (Line K Storm Drain) discharging into the mid-point of the north arm. The drainage pattern is generally to the south and west. Sub-basin C is almost entirely residential with a few commercial activities at the eastern boundary. **Sub-basin D.** Discharges to Colorado Lagoon via a 24-inch reinforced concrete pipe (Line M Storm Drain) discharging into the south part of the west arm. The drainage pattern is generally to the north and east. Sub-basin D is almost entirely residential with schools and other public facilities. **Sub-basin E.** Discharges to Colorado Lagoon via a 48-inch reinforced concrete pipe (Termino Avenue Drain) discharging into the west arm. The drainage pattern is generally to the south and east. Sub-basin E is mainly residential with commercial activities located along 7th Street, Coronado and Redondo Avenues to the west, and public facilities to the north. Several other smaller storm drains serve the areas immediately adjacent to the lagoon. These smaller storm drains contribute small amounts of contaminants relative to the five sub-basin discharges described above.

TMDL Element	Regulatory Provisions
Source Analysis (continued)	**Non-point Sources** Sediment loading from non-point sources to Colorado Lagoon is mainly runoff from urban, recreational park areas including two golf courses and adjacent park areas, a right-of-way greenbelt, and the picnic and park areas surrounding Colorado Lagoon, and atmospheric deposition.
Linkage Analysis	This TMDL analysis makes a simplifying assumption that the relationship between OC pesticides and PCBs concentrations in fish tissue and sediments is linear, with the slope of the line being the overall sediment–organism bioaccumulation factor (BAF). The impairing contaminants in sediment are associated with fine-grained particles that are primarily delivered to the sediments through suspended solids in stormwater and urban runoff. It is expected that reductions in loadings of these pollutants will lead to reductions in sediment concentrations over time. The existing contaminants in surface sediments will be removed by dredging operations and reduced as sediments are scoured during storms. For the legacy pollutants (chlordane and PCBs), some losses will also occur through the slow decay and breakdown of these organic compounds. Concentrations in surface sediments will be reduced through mixing with cleaner sediments. Attenuation of pollutant concentration levels in sediment is expected to translate to reductions in fish tissue contaminant levels. The linkage analysis focuses on the relationship between source contributions and in-lagoon water and sediment response. The Environmental Fluid Dynamics Code (EFDC) model was selected to simulate source loadings and transport of the listed pollutants in the Colorado Lagoon. This model estimates the metals, PAHs, PCBs, and DDT concentrations in the receiving water to evaluate potential management scenarios and to identify waste load allocations to support water and sediment quality management decisions for Colorado Lagoon. Hydrodynamic, water quality, and sediment transport was developed to simulate the dynamic interaction between Marine Stadium and Colorado Lagoon.
Waste Load Allocations	**Sediment Waste Load Allocations (WLAs) for MS4 Discharges:** <u>Mass-based WLAs for MS4 Discharges</u> Mass-based waste load allocations for MS4 permittees including the City of Long Beach, Los Angeles County Flood Control District, and Caltrans are allocated to the five major storm drain outfalls that currently discharge to the lagoon. Because Colorado Lagoon is located completely within the jurisdictional boundaries of the City of Long Beach and land areas serviced by storm drains that currently discharge to the lagoon are under the jurisdiction of the City of Long Beach, the WLAs are assigned to the City of Long Beach. Caltrans and the City of Long Beach shall each be responsible for achieving the WLAs assigned to the Line I Storm Drain as it conveys stormwater from both Caltrans' facilities and the City of Long Beach. The Los Angeles County Flood Control District (District) owns and operates the Project 452 Storm Drain; therefore, the District and the City of Long Beach shall each be responsible for achieving the WLAs assigned to the Project 452 Storm Drain. Mass-based WLAs are applied as annual limits and compliance with the mass-based WLAs for sediment will be determined at the storm drain outfalls to the lagoon.

TMDL Element	Regulatory Provisions
Waste Load Allocations (continued)	

Constituent	Final Mass-based WLAs (mg/yr)				
	Project 452	**Line I**	**Termino Ave**	**Line K**	**Line M**
Chlordane	5.10	3.65	12.15	1.94	0.73
Dieldrin	0.20	0.15	0.49	0.08	0.03
Lead	476,646.68	340,455.99	1,134,867.12	181,573.76	68,116.09
Zinc	1,530,985.05	1,093,541.72	3,645,183.47	583,213.37	218,788.29
PAHs	41,050.81	29,321.50	97,739.52	15,637.89	5,866.44
PCBs	231.69	165.49	551.64	88.26	33.11
DDT	16.13	11.52	38.40	6.14	2.30

Concentration-based WLAs for MS4 Discharges

Concentration-based WLAs for sediment are assigned to MS4 permittees including the City of Long Beach, Los Angeles County Flood Control District, and Caltrans. Concentration-based WLAs for sediment are applied as average monthly limits. Compliance with the concentration-based WLAs for sediment shall be determined by pollutant concentrations in the sediment in the lagoon at points in the West Arm, North Arm, and Central Arm that represent the cumulative inputs from the MS4 drainage system to the lagoon. Concentration-based WLAs for sediment are also assigned to all other minor storm drains discharging from the MS4 to the lagoon.

Concentration-based interim WLAs for sediment are set to allow time for removal of contaminated sediment through proposed implementation actions. Interim WLAs are based on the 95th percentile value of sediment data collected from 2000 to 2008. The use of 95th percentile values to develop interim limits is consistent with current NPDES permitting methodology. If the 95th percentile is equal to or lower than the numeric target, the interim limit is equal to the final WLAs. Interim and final WLAs will be included in MS4 permits in accordance with NPDES guidance and requirements.

Constituent	Concentration-based WLAs	
	Interim WLAs (ug/dry kg)	**Final WLAs (ug/dry kg)**
Chlordane	129.65	0.50
Dieldrin	26.20	0.02
Lead	399,500.00	46,700.00
Zinc	565,000.00	150,000.00
PAHs	4,022.00	4,022.00
PCBs	89.90	22.7
DDT	149.80	1.58

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td>Waste Load Allocations (continued)</td><td>
Sediment Waste Load Allocations for Other Point Sources

Concentration-based waste load allocations are assigned to minor NPDES permits, other stormwater, and non-stormwater permittees. Any future minor NPDES permits or enrollees under a general non-stormwater NPDES permit, general industrial stormwater permit or general construction permit will also be subject to the concentration-based waste load allocations.

<table>
<tr><th>Constituents</th><th>Waste Load Allocation (ug/dry kg)</th></tr>
<tr><td>Chlordane</td><td>0.50</td></tr>
<tr><td>Dieldrin</td><td>0.02</td></tr>
<tr><td>Lead</td><td>46,700.00</td></tr>
<tr><td>Zinc</td><td>150,000.00</td></tr>
<tr><td>PAHs</td><td>4,022.00</td></tr>
<tr><td>PCBs</td><td>22.70</td></tr>
<tr><td>DDT</td><td>1.58</td></tr>
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</td></tr>
<tr><td>Load Allocations</td><td>
A mass-based load allocation is developed for direct atmospheric deposition. An estimate of direct atmospheric deposition was developed based on the percent area of surface water within the watershed, which is approximately 15 acres or 1.3% of the total watershed area. The load allocation for atmospheric deposition is calculated by multiplying this percentage by the total loading capacity.

<table>
<tr><th>Constituent</th><th>Load Allocation (mg/year)</th></tr>
<tr><td>Chlordane</td><td>0.36</td></tr>
<tr><td>Dieldrin</td><td>0.014</td></tr>
<tr><td>Lead</td><td>33,217.48</td></tr>
<tr><td>Zinc</td><td>106,694.25</td></tr>
<tr><td>PAHs</td><td>2,860.83</td></tr>
<tr><td>PCBs</td><td>16.15</td></tr>
<tr><td>DDT</td><td>0.71</td></tr>
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</td></tr>
<tr><td>Margin of Safety</td><td>
An implicit margin of safety exists in the final WLAs. The implicit margin of safety is based on the selection of multiple numeric targets, including targets for water, fish tissue and sediment to protect human health, and the selection of ERLs as numeric targets for sediment, which are the most protective of the potentially applicable sediment guidelines available.

Additionally, to address sources of uncertainty in the analysis, particularly the assumption of natural removal of contaminated sediment at the northern arm of the lagoon, an explicit 10% margin of safety is also included.
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TMDL Element	Regulatory Provisions
Seasonal Variations and Critical Conditions	No correlation with flow or seasonality (wet vs. dry season) was found to exist in sediment or tissue data. Given that allocations for this TMDL are expressed in terms of OC pesticides, PCBs, PAHs, and metals concentrations in sediment, a critical condition is not identified based upon flow or seasonality. Because the adverse effects of OC pesticides, PCBs, PAHs, and metals are related to sediment accumulation and bioaccumulation in the food chain over long periods of time, short term variations in concentrations are less likely to cause significant impacts upon beneficial uses.
Monitoring Plan	The Colorado Lagoon TMDL Monitoring Plan (CLTMP) is designed to monitor and evaluate implementation of this TMDL, and refine the understanding of current sediment loadings. The goals of the CLTMP are: To determine compliance with OC pesticides, PCBs, metals, and PAHs waste load and load allocations, To monitor the effectiveness of implementation actions proposed by Los Angeles County Flood Control District and the City of Long Beach on water and sediment quality, including the potential impacts of redirecting discharges from the Termino Ave. Drain and from cleaning the culvert on Marine Stadium and Colorado Lagoon, To monitor contaminated sediment levels in the Lagoon especially in the North Arm of the Lagoon and determine if additional implementation action such as dredging are necessary to achieve the TMDL, and To implement the CLTMP in a manner consistent with other TMDL implementation plans and regulatory actions within the Colorado Lagoon watershed. Monitoring shall begin six months after the monitoring plan is approved by the Executive Officer. Water column and sediment samples will be collected at the outlet of the storm drains discharging to the lagoon, while water column, sediment, and fish tissue samples will be collected in the West Arm, Central Arm, North Arm, at the outlet of the lagoon to Marine Stadium during an incoming tide, and at the outfall of Termino Ave. Drain to Marine Stadium. The number and location of monitoring sites shall be specified in the monitoring plan to be approved by the Executive Officer. The City of Long Beach, the Los Angeles County Flood Control District, and Caltrans are each responsible for conducting water, sediment, and fish tissue monitoring. However, they are encouraged to collaborate or coordinate their efforts to avoid duplication and reduce associated costs. Water quality samples and total suspended solids samples shall be collected quarterly in the first year and semi-annually thereafter and analyzed for chlordane, dieldrin, OC pesticides, and total PCBs at detection limits that are at or below the minimum levels. The minimum levels are those published by the State Water Resources Control Board in Appendix 4 of the Policy for the Implementation of Toxic Standards for Inland Surface Water, Enclosed Bays, and Estuaries of California, 2005.

TMDL Element	Regulatory Provisions
Monitoring Plan (continued)	Water quality samples shall also be collected quarterly in the first year and semi-annually thereafter and analyzed for general water quality constituents (GWQC), total recoverable and dissolved PAHs, lead, and zinc. If water quality objectives are exceeded at any time, sampling frequency shall be accelerated to quarterly thereafter until water quality objectives are not exceeded. Total suspended solid samples shall also be collected to analyze for PAHs, lead, and zinc. For metal analysis, methods that allow for (1) the removal of salt matrix to reduce interference and avoid inaccurate results prior to the analysis; and (2) the use of trace metal clean sampling techniques, must be applied. Examples of such methods include EPA Method 1669 for sample collection and handling, and EPA Method 1640 for sample preparation and analysis. Sediment samples will be collected annually for analysis of general sediment quality constituents (GSQC), OC pesticides, PCBs, PAHs, and metals. Lead, zinc, chlordane, dieldrin, and total PCBs shall be analyzed at detection limits that are lower than the ERLs. The sediment toxicity testing shall include testing a minimum of three species for lethal and non-lethal endpoints. Toxicity testing may include: the 28-day and 10-day amphipod mortality test, the sea urchin fertilization testing using sediment pore water, and the bivalve embryo testing of the sediment/water interface. The chronic 28-day and shorter-term 10-day amphipod tests may be conducted in the first year. If there is no significant difference in the tests, then the less expensive 10-day test can be used throughout the rest of the monitoring, with some periodic 28-day tests. Sediment toxicity monitoring shall be conducted annually to provide sufficient data over the implementation timeframe to evaluate changes in sediment quality due to implementation actions. If sediment objectives are exceeded or sediment toxicity is observed at any time, sampling frequency for both sediment and sediment toxicity shall be accelerated to semi-annually thereafter until sediment objectives are not exceeded and sediment toxicity is not observed. Fish tissue samples will be collected annually and analyzed for chlordane, dieldrin, DDT, and PCBs to assess changes in concentrations of target organic constituents. The same rationale used for establishing sampling frequency for sediments is used to establish fish tissue sample collection frequency. For Colorado Lagoon, species with the potential for human and wildlife consumption will be targeted. Fish targeted to evaluate potential impacts to human health will be limited to species more commonly consumed by humans. Tissues analyzed will be based on the most appropriate and common preparation for the selected fish species. Tissues from resident California or bay mussels shall be collected annually and analyzed to further assess and track impairment. Monitoring reports shall be prepared and submitted to the Regional Board annually within six months after the completion of the final sampling event of the year. All compliance monitoring must be conducted in conjunction with a Regional Board approved Quality Assurance Project Plan (QAPP). The QAPP shall include protocols for sample collection, standard analytical procedures, and laboratory certification.

TMDL Element	Regulatory Provisions
Implementation Plan	The City of Long Beach, Los Angeles County Flood Control District, and California Department of Transportation (Caltrans) are each responsible for meeting the waste load allocations. However, to the extent their effluent discharges are commingled, they will be held jointly liable for abating the pollutants in the commingled discharge to the extent any of them are unable to disprove their own contribution of pollutants. Compliance with the TMDL is determined based on the assigned WLAs. NPDES permits will be amended to be consistent with the assumptions and requirements of the WLAs. Responsible agencies are required to implement the proposed actions to remove contaminated sediment; control the discharges of pollutants in urban runoff, stormwater and contaminated sediments to Colorado Lagoon; attain water, fish tissue, and sediment quality standards; and protect beneficial uses. Table 7-30.2 contains a schedule for responsible agencies to implement BMPs and proposed implementation actions to comply with the TMDL. Responsible agencies may employ a variety of implementation strategies such as non-structural and structural best management practices (BMPs) to meet the required waste load allocations. The implementation actions described in this section represent a range of activities that are proposed by the Los Angeles County Flood Control District and City of Long Beach in the *Los Angeles County Termino Avenue Drain Project* and *Colorado Lagoon Restoration Project*, respectively. **Implementation and Determination of Compliance with the WLAs** The WLAs will apply to all NPDES dischargers in the Colorado Lagoon watershed. The regulatory mechanisms used to implement the TMDL include the Los Angeles County MS4 permit, the City of Long Beach MS4 permit, the Caltrans stormwater permit, and any future general industrial stormwater permits, general construction stormwater permits, minor NPDES permits, and general NPDES permits as well as any other appropriate regulatory mechanism, including Board orders, where required. Each NPDES permit may be reopened immediately after the TMDL becomes effective, or amended at re-issuance, in accordance with applicable laws, to incorporate the waste load allocations and other provisions of this TMDL. Compliance with the WLAs will be measured at the storm drain outlets and in the lagoon and will be achieved through BMPs and a combination of proposed implementation actions provided in the Proposed Implementation section below to remove contaminated sediment and reduce loadings of contaminated sediment through the control of stormwater and contaminated sediments to Colorado Lagoon. The final WLAs will be included for permitted MS4 discharges and other NPDES discharges in accordance with the compliance schedules provided in Table 7-30.2. The Regional Board may revise these WLAs based on additional information developed through monitoring or special studies.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	The WLAs for the minor NPDES permits and general non-stormwater NPDES permits will be implemented through effluent limitations consistent with the assumptions and requirements of the WLAs. Permit writers for the non-stormwater permits may translate applicable waste load allocations into effluent limitations for the minor and general NPDES permits by applying applicable engineering practices. **Proposed Implementation Actions** <u>Non-Structural Best Management Practices</u> The non-structural BMPs are based on the premise that specific land uses or critical sources can be targeted to achieve the TMDL waste load allocations. Available non-structural BMPs include better sediment control at construction sites and improved street cleaning by upgrading to vacuum type sweepers, storm drain cleaning, and public education and out reach. The lagoon is also impacted by irrigation runoff from the golf course located adjacent to the lagoon in the dry season. Improvements to the golf course operation should also be considered to protect lagoon resources by reducing watering needs and eliminating pesticide and herbicide use. <u>Site-Specific Implementation Actions:</u> The Regional Board does not prescribe the methods of achieving compliance with the TMDL allocations. However, described below are several implementation actions proposed by the responsible agencies. *Relocation of the Termino Avenue Drain.* One of the major system outfalls, the Termino Avenue Drain, has been proposed by the Los Angeles County Flood Control District to be modified, which will no longer discharge into the Lagoon. As proposed in the Los Angeles County Flood Control District Termino Avenue Drain Project (TADP) the drain would bypass the Lagoon and discharge stormwater flows into Marine Stadium. Dry weather flows will be diverted into the sanitary sewer system. This project would also redirect flows from three other storm drains located on the south shore of the Lagoon that currently discharge into the Lagoon. *Low Flow Diversion and Trash Separation Device.* The City of Long Beach proposed in the Colorado Lagoon Restoration Project to divert low storm drain flows from other three major storm drain system outfalls and install trash separation devices to trap trash and debris prior to entering the wet well for the diverted runoff. The Colorado Lagoon Restoration Project would redirect or treat low flows from these drains to minimize contamination to water and sediment.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	*Vegetated Bioswale Installation.* The flows from the remaining four local storm drains would be treated via a vegetated bioswale as proposed in the Colorado Lagoon Restoration Project. A bioswale would also be developed on the north shore between the Lagoon and Recreation Park Golf Course. The vegetated bioswale would treat stormwater and dry weather runoff through filtration to remove sediment and pollutants prior to discharging into the Lagoon. *Clean Culvert, Repair Tidal Gates, and Remove Sill/Structural Impedances.* The Colorado Lagoon is connected to Alamitos Bay and the Pacific Ocean through an underground tidal culvert to Marine Stadium. The existing culvert has not been cleaned since it was built in the 1960s. The flow in the culvert is impeded by sediment that has accumulated on the bottom, extensive marine growth that has accumulated on the sides and ceiling, and debris that is trapped within the trash racks on the tide gate screens at both ends of the culvert. These existing conditions limit the Lagoon's tidal range and tidal flushing, which results in increased degradation of water quality. As proposed in the Colorado Lagoon Restoration Project, the City of Long Beach plans to clean the existing culvert and trash racks, repair the tidal gates, and remove the sill and structural impedances within and around the existing culvert. Implementation of this component of the Colorado Lagoon Restoration Project would result in increased tidal range, tidal flushing, and water circulation, and improvement of water and sediment quality. *Remove Contaminated Sediment in the Western Arm of the Lagoon.* OC pesticides, PCBs, PAHs, and metals were deposited over time from the particulates in the runoff brought to the Lagoon through the existing storm drains. It is estimated that the layer of contaminated sediment reaches 4 to 5 ft deep. The City of Long Beach proposes to remove sediment to a depth of 6 ft to provide a safeguard that only clean sediment remains. The excavation depth gradually decreases toward the footbridge. This component of the Colorado Lagoon Restoration Project would remove approximately 16,000 cubic yards (cy) of contaminated sediment within the western arm of the Lagoon. *Remove Contaminated Sediment in the Central Lagoon.* Similar to the sediment removal project above, the Colorado Lagoon Restoration Project would remove sediment and sand that has eroded and been deposited into the Lagoon over years, and create a larger subtidal area. Approximately 5,500 cy of sediment would be removed from the central Lagoon. Sediment removal from the central area of the lagoon would create a channel through the center of the central Lagoon to connect the dredge areas in the western arm to the outlet at the existing culvert or proposed open channel. Removal of this sediment would also provide additional space for water circulation and tidal flushing.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	As proposed in the Colorado Lagoon Restoration Project, only the Western Arm and the Central Lagoon are planned to be dredged based on the recommendation from the Sediment Testing and Disposal Report. The TMDL monitoring program will determine if additional implementation actions such as dredging in the North Arm will be required to remove contaminated sediment in the Lagoon. *Build Alternate Channel or Underground Culvert between Lagoon and Marine Stadium.* City is considering an open channel or parallel underground culvert option to further improve water quality at the Colorado Lagoon. However, this project was not included in the certified EIR. This proposed project consists of replacing the existing concrete box culvert with an open channel or new underground culvert that would run from the Lagoon through Marina Vista Park to Marine Stadium in a location generally parallel to the existing culvert. Creating an open channel or underground culvert would improve tidal flushing by an increase in the tidal range, and result in a corresponding improvement of water and sediment quality. In addition, it would provide improved flood flow conveyance. Implementation of the proposed actions should result in attainment of the TMDL allocations. If the proposed actions are not implemented or otherwise do not result in attainment of allocations, additional implementation actions shall be required.

Table 7-30.2 Colorado Lagoon OC Pesticides, PCBs, Sediment Toxicity, PAHs, and Metals TMDL: Implementation Schedule

Item	Implementation Action	Responsible Party	Date
1	Effective date of interim waste load allocations (WLAs).	The City of Long Beach, the Los Angeles County Flood Control District, and Caltrans	Effective date of the TMDL
2	Responsible agencies shall submit a monitoring plan to the Los Angeles Regional Board for Executive Officer approval.	The City of Long Beach, the Los Angeles County Flood Control District, and Caltrans	6 months after effective date of the TMDL
3	Responsible agencies shall begin monitoring as outlined in the approved monitoring plan.	The City of Long Beach, the Los Angeles County Flood Control District, and Caltrans	6 months after monitoring plan approved by E.O.
4	Responsible agencies shall submit annual reports to the Los Angeles Regional Board for review.	The City of Long Beach, the Los Angeles County Flood Control District, and Caltrans	15 months after monitoring starts and annually thereafter
5	Responsible agencies shall submit bi-annual progress reports to provide updates on the status of implementation actions performed under the TMDL. The plan shall contain mechanisms for demonstrating progress toward meeting the assigned WLAs.	The City of Long Beach, the Los Angeles County Flood Control District, and Caltrans	Every 2 years after effective date of the TMDL
6	Responsible agencies shall achieve WLAs.	The City of Long Beach, the Los Angeles County Flood Control District, and Caltrans	7 years after effective date of the TMDL

7-31 Malibu Creek Watershed Trash TMDL

This TMDL was adopted by:
The Regional Water Quality Control Board on May 1, 2008.

This TMDL was approved by:
The State Water Resources Control Board on March 17, 2009.
The Office of Administrative Law on June 16, 2009.
The U.S. Environmental Protection Agency on June 26, 2009.

The effective date of this TMDL is: July 7, 2009.

The elements of the TMDL are presented in Table 7-31.1 and the Implementation Plan in Tables 7-31.2a and 7-31.2b.

Table 7-31.1 Malibu Creek Watershed Trash TMDL: Elements

Element	Malibu Creek Watershed Trash TMDL
Problem Statement	Discharges of trash into Malibu Creek, Malibu Lagoon, Malibou Lake, Medea Creek (Reach 1 and Reach 2), Lindero Creek (Reach 1 and Reach 2), Lake Lindero, and Las Virgenes Creek violate water quality objectives and impair beneficial uses. The waterbodies above were listed in the 1998, 2002, 2004, and 2006 303(d) lists of impaired waterbodies for trash. Relevant water quality objectives in the Water Quality Control Plan Los Angeles Region include Floating Material and Solid, Suspended, or Settleable Materials. The following designated beneficial uses are impaired by trash: municipal and domestic supply (MUN), ground water recharge (GWR), contact water recreation (REC-1), non-contact water recreation (REC-2), warm freshwater habitat (WARM), cold freshwater habitat (COLD), migration of aquatic organisms (MIGR), wildlife habitat (WILD), rare, threatened, or endangered species (RARE), spawning, reproduction, and or early development (SPWN), and wetland habitat (WET).
Numeric Target (Interpretation of the narrative water quality objective, used to calculate the load allocations)	Zero trash in the above listed subwatersheds of the Malibu Creek Watershed, and on the shorelines of those waterbodies. Zero is defined for nonpoint sources as no trash immediately following each assessment and collection event consistent with an established Minimum Frequency of Assessment and Collection Program (MFAC Program). The MFAC Program is established at an interval that prevents trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections. For point sources, zero is defined as no trash discharged into the listed waterbodies of the Malibu Creek Watershed and on the shoreline of those waterbodies.
Source Analysis	Litter from adjacent land areas, roadways and direct dumping and deposition are sources of trash to Malibu Creek Watershed. Point sources such as storm drains are also sources of trash discharged to Malibu Creek Watershed.
Loading Capacity	Zero, as defined in the Numeric Target.

Element	Malibu Creek Watershed Trash TMDL
Waste Load Allocations (for point sources)	Waste Load Allocations (WLAs) are assigned to the California Department of Transportation (Caltrans, permittee for Statewide National Pollutant Discharge Elimination System (NPDES) Storm Water Permit, No. 99-06-DWQ), Los Angeles County (principal permittee for NPDES Los Angeles County Municipal Separate Strom Sewer System (MS4) permit, No. CAS004001), and the Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, and Westlake Village (co-permittees for NPDES Los Angeles County MS4 permit) under the NPDES Los Angeles County MS4 permit, and to Ventura County Watershed Protection District (principal permittee for NPDES Ventura County MS4 permit, No. 004002), County of Ventura, and City of Thousand Oaks (co-permittees for NPDES Ventura County MS4 permit) under the NPDES Ventura County MS4 permit. WLAs are zero trash. WLAs may be issued to additional responsible jurisdictions in the future under Phase 2 of the USEPA Stormwater Permitting Program, or other applicable regulatory programs.
Load Allocations (for nonpoint sources)	Load Allocations (LAs) are assigned to the National Park Service, California Department of Parks and Recreation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Santa Monica Mountains Conservancy, Cities of Malibu, Agoura Hills, Hidden Hills, Thousand Oaks, Westlake Village, and Calabasas, and land owners in the vicinity of listed waterbodies in the Malibu Creek Watershed. LAs are zero trash. LAs may be issued to additional responsible jurisdictions in the future under applicable regulatory programs.
Implementation	Implementation of the trash TMDL for Malibu Creek Watershed includes structural and non-structural best management practices (BMPs) and a program of minimum frequency of assessment and collection (MFAC) to address point and nonpoint trash sources. **Point Sources** WLAs shall be implemented through storm water permits and via the authority vested in the Executive Officer by section 13267 of the Porter-Cologne Water Quality Control Act (Water Code section 13000 et seq.). If point source dischargers comply with WLAs by implementing an Executive Officer certified full capture system on conveyances that discharge to the listed subwatersheds of the Malibu Creek Watershed through a progressive implementation schedule of full capture devices, they will be deemed in compliance with the WLA.

Element	Malibu Creek Watershed Trash TMDL
Implementation (continued)	In certain circumstances, (if approved by the Executive Officer), point source dischargers may alternatively comply with WLAs by implementing a program for installing partial capture systems (PCS) in conjunction with best management practices. Compliance through implementation of a PCS/BMP program must demonstrate attainment of WLAs through trash monitoring in accordance with the Trash Monitoring and Reporting Plan (TMRP) approved by the Executive Officer. 1. Compliance with the final WLA may be achieved through an adequately sized and maintained full capture system, once the Executive Officer has certified that the system meets the following minimum criteria. A full capture system, at a minimum, consists of any device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the sub-drainage area. The rational equation is used to compute the peak flow rate: $Q = C \times I \times A$, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour); and A= subdrainage area (acres). Point sources discharges that choose to comply via a full capture system must demonstrate a phased implementation of full capture devices over an 8-year period until the final WLA of zero is attained. Zero will be deemed to have been met if full capture systems have been installed on all conveyances discharging to the listed subwatersheds of the Malibu Creek Watershed. Irrespective of whether point sources employ a full capture system, they may comply with the WLA in any lawful manner. 2. Compliance through a PCS/BMP program may be proposed to the Regional Board for incorporation into the relevant NPDES permit. **Nonpoint Sources** LAs shall be implemented through either (1) a conditional waiver from waste discharge requirements, (2) an alternative program implemented through waste discharge requirements, or (3) an individual waiver or another appropriate order of the Regional Board.

Element	Malibu Creek Watershed Trash TMDL
Implementation (continued)	Non-point source dischargers may achieve compliance with the LAs by implementing a MFAC/BMP program approved by the Executive Officer. Responsible jurisdictions that are responsible for both point and nonpoint sources will be deemed in compliance with both the WLAs and LAs if an MFAC/BMP program, approved by the Executive Officer, is implemented. 1) Conditional Waiver: Pursuant to Water Code section 13269, waste discharge requirements are waived for any responsible jurisdiction that implements a MFAC/BMP Program which, to the satisfaction of the Executive Officer, meets the following criteria: a) The MFAC/BMP Program includes an initial minimum frequency of trash assessment and collection and suite of structural and/or nonstructural BMPs. The MFAC/BMP program shall include collection and disposal of all trash found in the water and on the shoreline. Responsible jurisdictions shall implement an initial suite of BMPs based on current trash management practices in land areas that are found to be sources of trash to Malibu Creek Watershed. For individual subwatershed in the Malibu Creek Watershed, the initial minimum frequency shall be set as follows: <u>Malibu Creek (from Malibu Lagoon to Malibou Lake)</u> 1. Within City of Malibu, the waterbody, shorelines and areas adjacent to Malibu Creek: once per week and within 72 hours after critical conditions. 2. Within the County of Los Angeles and in the State Parks: once per month, and within 72 hours after critical conditions. <u>Malibu Lagoon</u> 1. The waterbody, shorelines, beach and areas adjacent to Malibu Lagoon: twice per week during high visitation seasons from May 15 through October 15. 2. The waterbody, shorelines, beach and areas adjacent to Malibu Lagoon: once per week from October 15 through May 15, and within 72 hours after critical conditions. <u>Malibou Lake</u> Once per month for the waterbody, shorelines and the adjacent lands, and within 72 hours after critical conditions.

Element	Malibu Creek Watershed Trash TMDL
Implementation (continued)	Medea Creek Reach 1 (Malibou Lake to confluence with Lindero Creek) Twice per month for the waterbody, shorelines and the adjacent areas, and within 72 hours after critical conditions. Medea Creek Reach 2 (above confluence) 1. Once per week on the waterbody, shorelines and the adjacent areas from the confluence with Lindero Creek to the intersection with Thousand Oaks Blvd., and within 72 hours after critical conditions. 2. Twice per month above the intersection with Thousand Oaks Blvd., and within 72 hours after critical conditions. Lindero Creek Reach 1 (Confluence with Medea Creek to Lake Lindero) Twice per month for Lindero Creek Reach 1 including the waterbody, shorelines and the adjacent areas, and within 72 hours after critical conditions. Lindero Creek Reach 2 (Above Lake Lindero) Twice per month for Lindero Creek Reach 2 including the waterbody, shorelines and the adjacent areas, and within 72 hours after critical conditions. Lake Lindero Twice per month for the waterbody, shorelines and the adjacent land, and within 72 hours after critical conditions. Las Virgenes Creek 1. Within the State Parks northerly to the intersection with Mulholland Highway: once per month, and within 72 hours after critical conditions. 2. Once per week for the waterbody, shorelines and the adjacent areas between Mulholland Highway and Juan Bautista De Anza Park at Los Hills Road in the City of Calabasas, and within 72 hours after critical conditions. 3. Twice per week for the waterbody, shorelines and the adjacent areas for the rest of City of Calabasas. 4. Once per month for section in Los Angeles County along Ventura Freeway and within 72 hours after critical conditions. 5. Within Ventura County, once every two months for the waterbody, shorelines and the adjacent areas, and within 72 hours after critical conditions.

Element	Malibu Creek Watershed Trash TMDL
Implementation (continued)	b) The MFAC/BMP Program includes reasonable assurances that it will be implemented by the responsible jurisdiction. c) The MFAC/BMP Program includes a Trash Monitoring and Reporting Plan, as described below, and a requirement that the responsible jurisdictions will self-report any non-compliance with its provisions. The results and report of the Trash Monitoring and Reporting Plan must be submitted to Regional Board on an annual basis. d) MFAC protocols may be based on SWAMP protocols for rapid trash assessment, or alternative protocols proposed by dischargers and approved by the Executive Officer. e) Implementation of the MFAC/BMP program should include a Health and Safety Plan to protect personnel. The MFAC/BMP shall not require responsible jurisdictions to access and collect trash from areas where personnel are prohibited. The Executive Officer may approve or require a revised assessment and collection frequency, location, and definition of the critical conditions under the waiver: (a) To prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections; (b) To reflect the results of trash assessment and collection; (c) If the amount of trash collected does not show a decreasing trend, where necessary to prevent nuisance or adverse effects on beneficial uses, such that a shorter interval between collections is warranted; or (d) If the amount of trash collected is decreasing such that a longer interval between collections is warranted. At the end of the implementation period, a revised MFAC/BMP program may be required if the Executive Officer determines that the amount of trash accumulating between collections is causing nuisance or otherwise adversely affecting beneficial uses. With regard to (a), (b) or (c), above, the Executive Officer is authorized to allow responsible jurisdictions to implement additional structural or non-structural BMPs in lieu of modifying the monitoring frequency. Any waivers implementing the TMDL shall expire pursuant to Water Code section 13269 five years after the effective date of this TMDL, unless reissued. The Regional Board may reissue this waiver through an order consistent herewith, instead of readopting these regulatory provisions.

Element	Malibu Creek Watershed Trash TMDL
Implementation (continued)	(2) Alternatively, responsible jurisdictions may propose, or the Regional Board may impose, an alternative program which would be implemented through waste discharge requirements, an individual waiver, a cleanup and abatement order, or any other appropriate order or orders, provided the program is consistent with the assumptions and requirements of the reductions described in Table 7-31.2b, below. Within six months of the effective date of this TMDL, the Executive Officer shall require responsible jurisdictions to submit either a notice of intent to be regulated under the conditional waiver with their proposed MFAC/BMP Program and Trash Monitoring and Reporting Plan (TMRP), or a report of waste discharge.
Monitoring and Reporting Plan	Responsible jurisdictions will develop a TMRP for Executive Officer approval that describes the methodologies that will be used to assess and monitor trash in the listed subwatersheds of the Malibu Creek Watershed and/or within responsible jurisdiction land areas. The TMRP shall include a plan to establish the trash Baseline WLAs for non-Caltrans entities, or an alternative to the default trash baseline for Caltrans to prioritize installation of full capture devices. The default trash baseline WLA for Caltrans is 2136 gallons per year. Requirements for the TMRP shall include, but are not limited to, assessment and quantification of trash collected from the surfaces and shoreline of the listed waterbodies in the Malibu Creek Watershed or from responsible jurisdiction land areas. The monitoring plan shall provide details of the frequency, location, and reporting of trash monitoring. Responsible jurisdictions shall propose a metric (e.g., weight, volume, pieces of trash) to measure the amount of trash in the listed subwatersheds of the Malibu Creek Watershed and on the land area surrounding these subwatersheds, as defined in the Executive Officer approved TMRP. The TMRP shall include a prioritization of areas that have the highest trash generation rates. The TMRP shall give preference to this prioritization when scheduling the installation of full capture devices, BMPs, or trash collection programs. The TMRP shall also include an evaluation of effectiveness of the MFAC/BMP program to prevent trash from accumulating in deleterious amounts that cause nuisance or adversely affect beneficial uses between collections, proposals to enhance BMPs, and a revised MFAC for Executive Officer review. Responsible Jurisdictions in Table 7-31.2a and 7-31.2b may cooperate and coordinate their TMRP activities for Malibu Creek Watershed.
Margin of Safety	Zero is a conservative numeric target which contains an implicit margin of safety.

Element	Malibu Creek Watershed Trash TMDL
Seasonal Variations and Critical Conditions	Discharge of trash from the conveyances occurs primarily during or shortly after a major rain event. Discharge of trash from nonpoint sources occurs during all seasons, but can be increased during or shortly after high wind events, which are defined as periods of wind advisories issued by the National Weather Service.

Table 7-31.2a Malibu Creek Watershed Trash TMDL: Implementation Schedule - Point Sources

Task No.	Task	Responsible Jurisdiction	Date
1	Submit Trash Monitoring and Reporting Plan, including a plan for defining the trash baseline WLA and a proposed definition of "major rain event".	California Department of Transportation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village and Thousand Oaks.	6 months from effective date of TMDL. If a plan is not approved by the Executive Officer within 9 months, the Executive Officer will establish an appropriate monitoring plan.
2	Implement Trash Monitoring and Reporting Plan.	California Department of Transportation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village and Thousand Oaks.	6 months from receipt of letter of approval from Regional Board Executive Officer, or the date a plan is established by the Executive Officer.
3	Submit results of Trash Monitoring and Reporting Plan, recommend trash baseline WLA, and propose prioritization of Full Capture System installation or implementation of other measures to attain the required trash reduction.	California Department of Transportation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village and Thousand Oaks.	One year from receipt of letter of approval for the Trash Monitoring and Reporting Plan from Regional Board Executive Officer, and annually thereafter.
4	Installation of Full Capture Systems or other measures to achieve 20% reduction of trash from Baseline WLA*.	California Department of Transportation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village and Thousand Oaks.	Four years from effective date of TMDL.
5	Installation of Full Capture Systems or other measures to achieve 40% reduction of trash from Baseline WLA*.	California Department of Transportation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village and Thousand Oaks.	Five years from effective date of TMDL.
6	Evaluate the effectiveness of Full Capture Systems or other measures, and reconsider the WLA*.	Regional Board.	Five years from effective date of TMDL.

Task No.	Task	Responsible Jurisdiction	Date
7	Installation of Full Capture Systems or other measures to achieve 60% reduction of trash from Baseline WLA*.	California Department of Transportation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village and Thousand Oaks.	Six years from effective date of TMDL.
8	Installation of Full Capture Systems or other measures to achieve 80% reduction of trash from Baseline WLA*.	California Department of Transportation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village and Thousand Oaks.	Seven years from effective date of TMDL.
9	Installation of Full Capture Systems or other measures to achieve 100% reduction of trash from Baseline WLA*.	California Department of Transportation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village and Thousand Oaks.	Eight years from effective date of TMDL.

* Compliance with percent reductions from the Baseline WLA will be assumed wherever full capture systems are installed in corresponding percentages of the conveyance discharging to Malibu Creek Watershed. Installation will be prioritized based on the greatest point source loadings.

Table 7-31.2b Malibu Creek Watershed Trash TMDL: Implementation Schedule

Minimum Frequency of Assessment and Collection Program * - Nonpoint Sources

Task No.	Task	Responsible Jurisdiction	Date
1	Conditional Waiver in effect.	National Park Service, California Department of Parks and Recreation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Santa Monica Mountains Conservancy, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village, and Thousand Oaks, and land owners in the vicinity of the waterbodies addressed in the Nonpoint Source Implementation Section of this Basin Plan Amendment.	Regional Board adoption of TMDL.
2	Submit Notice of Intent to Comply with Conditional Waiver of Discharge Requirements, including MFAC/BMP Program and Trash Monitoring and Reporting Plan.	National Park Service, California Department of Parks and Recreation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Santa Monica Mountains Conservancy, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village, and Thousand Oaks, and land owners in the vicinity of the waterbodies addressed in the Nonpoint Source Implementation Section of this Basin Plan Amendment.	Six months from TMDL effective date. If a plan is not approved by the Executive Officer within 9 months, the Executive Officer will establish an appropriate monitoring plan.
3	Implement MFAC/BMP Program.	National Park Service, California Department of Parks and Recreation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Santa Monica Mountains Conservancy, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village, and Thousand Oaks, and land owners in the vicinity of the waterbodies addressed in the Nonpoint Source Implementation Section of this Basin Plan Amendment.	6 months from receipt of letter of approval from Regional Board Executive Officer, or the date a plan is established by the Executive Officer.

Task No.	Task	Responsible Jurisdiction	Date
4	Submit annual TMRP reports including proposal for revising MFAC/BMP for Executive Officer approval.	National Park Service, California Department of Parks and Recreation, County of Los Angeles, County of Ventura, Ventura County Watershed Protection District, Santa Monica Mountains Conservancy, Cities of Agoura Hills, Calabasas, Hidden Hills, Malibu, Westlake Village, and Thousand Oaks, and land owners in the vicinity of the waterbodies addressed in the Nonpoint Source Implementation Section of this Basin Plan Amendment.	One year from receipt of letter of approval for the Trash Monitoring and Reporting Plan from Regional Board Executive Officer, and annually thereafter.
5	Reconsideration of Trash TMDL based on evaluation of effectiveness of MFAC/ BMP program.	Regional Board.	Five years from effective date of TMDL.

* At Task 3, all Responsible Jurisdictions must be attaining the zero trash target after each required trash assessment and collection event. At Task 4, all Responsible Jurisdictions must demonstrate full compliance and attainment of the zero trash target's requirement that trash is not accumulating in deleterious amounts between the required trash assessment and collection events. Based on Responsible Jurisdiction monitoring reports, the Executive Officer may adjust the minimum frequency of assessment and collection as necessary to ensure compliance between the required trash assessment and collection events.

7-37 McGrath Lake PCBs, Pesticides and Sediment Toxicity TMDL

This TMDL was adopted by:

The Regional Water Quality Control Board on October 1, 2009.

This TMDL was approved by:

The State Water Resources Control Board on December 14, 2010.
The Office of Administrative Law on May 31, 2011.
The U.S. Environmental Protection Agency on June 30, 2011.

The effective date of this TMDL is: June 30, 2011.

The elements of the TMDL are presented in Table 7-37.1 and the Implementation Plan in Table 7-37.2.

Table 7-37.1. McGrath Lake PCBs, Pesticides and Sediment Toxicity TMDL: Elements

TMDL Element	Regulatory Provisions
Problem Statement	McGrath Lake was placed on the Clean Water Act Section 303(d) list in 1998, 2002, and 2006 as impaired for organochlorine pesticides (chlordane, dieldrin, DDT and derivatives) and polychlorinated biphenyls (PCBs) in sediment and for sediment toxicity. These toxic organic chemicals bind to soil particles, are stored in the fat tissue of exposed organisms, and create long term environmental impairments. Past studies concluded that sediment toxicity in McGrath Lake was likely due to the elevated concentrations of pesticides and PCBs in sediment. Applicable Water Quality Objectives for this TMDL are narrative water quality objectives for Chemical Constituents, Bioaccumulation, Pesticides and Toxicity contained in Chapter 3, the numeric water quality objective for PCBs contained in Chapter 3 and the numeric water quality criteria promulgated in 40 CFR 131 (California Toxics Rule (CTR)). The exposure of the McGrath Lake ecosystem to chlordane, DDT, dieldrin, and PCBs in amounts exceeding the objectives and criteria has impaired the beneficial uses of the lake, including aquatic life uses (rare, threatened or endangered species and estuarine, wildlife, and wetland habitat) and recreation uses (contact and non-contact recreation and commercial and sport fishing).

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td>Numeric Targets</td><td>Water column targets for PCBs, chlordane, DDT, and dieldrin are based on the CTR water quality criteria for protection of human health (organisms only). These criteria are more stringent than those for the protection of aquatic life and thus will protect both aquatic life and fish consumption beneficial uses. The sediment numeric targets are derived from the Effects Range-Low (ER-Ls) guidelines compiled by the National Oceanographic and Atmospheric Administration (NOAA). The sediment toxicity impairment is addressed by these numeric targets, which are protective of aquatic life in sediment.

<table>
<tr><th>Pollutant</th><th>Water Column Targets (µg/L)</th><th>Sediment Targets (ng/dry g)</th></tr>
<tr><td>Chlordane</td><td>0.00059</td><td>0.5</td></tr>
<tr><td>Dieldrin</td><td>0.00014</td><td>0.02</td></tr>
<tr><td>4,4’-DDT</td><td>0.00059</td><td>1</td></tr>
<tr><td>4,4’-DDE</td><td>0.00059</td><td>2.2</td></tr>
<tr><td>4,4’-DDD</td><td>0.00084</td><td>2</td></tr>
<tr><td>Total DDT</td><td>--</td><td>1.58</td></tr>
<tr><td>Total PCBs</td><td>0.00017</td><td>22.7</td></tr>
</table></td></tr>
<tr><td>Source Analysis</td><td>A source of the pesticide and PCB loading is contaminated surface water and sediments flushing into McGrath Lake from the Central Ditch, which drains agriculture and other lands. All of the contaminants included in this TMDL are legacy pollutants. While they are no longer legally sold or used, they remain ubiquitous in the environment, bound to fine-grained particles. Irrigation and rainfall in the watershed mobilize these particles, which are loaded to McGrath Lake. Surface water (stormwater and agricultural drainage) accounts for almost half of the total recharge of the lake, while groundwater accounts for the rest of the recharge. Pesticides and PCBs have been detected in the surface water inlet to the lake (Central Ditch) but not in the groundwater from local monitoring wells. There are no point sources of pesticides or PCBs to McGrath Lake. Atmospheric deposition may be contributing PCBs.

In addition to external loading, the in-situ sediments are likely a source of contaminants to the lake water column due to the high concentrations of contaminants in the sediment.</td></tr>
<tr><td>Linkage Analysis</td><td>A conceptual model identifies the assimilative capacity of McGrath Lake and links the source loading information to the numeric targets. The chemical properties of the pesticides and PCBs result in strong binding to particulate matter, therefore most of the incoming contaminants from the Central Ditch to the lake are bound to suspended solids. However, pesticide exceedances are observed in the Central Ditch even in low-flow conditions, indicating that some of the contaminants are transported to the lake in the water fraction. Therefore, there are water column and suspended sediment allocations for the Central Ditch.

Once the suspended sediment settles to the lake bottom, desorption is possible due to the high contaminant concentrations, favorable environmental conditions and extended contact time (between the sediment and water). The contaminated lake sediments are toxic to benthic organisms and may also be taken up through bioturbation and feeding processes. Therefore, both external loading sources from the lake subwatershed and internal loading from contaminated lake sediments are assigned load allocations.</td></tr>
</table>

<table>
<tr><th>TMDL Element</th><th>Regulatory Provisions</th></tr>
<tr><td>Load Allocations</td><td>Load allocations (LAs) addressing non-point sources of pesticides and PCBs are assigned to discharges from the Central Ditch to the lake and internal sources from the lake sediments. The lake sediments are defined as bed sediments in the main body of the lake and the riparian corridor west of Harbor Boulevard.

The in-lake LAs are for concentrations in sediment only.

<table>
<tr><th>Pollutant</th><th>Load Allocation for Concentration in Lake Sediment (µg/dry kg)</th></tr>
<tr><td>Chlordane</td><td>0.5</td></tr>
<tr><td>Dieldrin</td><td>0.02</td></tr>
<tr><td>4,4’-DDT</td><td>1</td></tr>
<tr><td>4,4’-DDE</td><td>2.2</td></tr>
<tr><td>4,4’-DDD</td><td>2</td></tr>
<tr><td>Total DDT</td><td>1.58</td></tr>
<tr><td>Total PCBs</td><td>22.7</td></tr>
</table>

The Central Ditch LAs are for concentrations in both suspended sediment and water.

<table>
<tr><th>Pollutant</th><th>Water Column Load Allocation (µg/L)</th><th>Load Allocation for Concentration in Suspended Sediment (µg/dry kg)</th></tr>
<tr><td>Chlordane</td><td>0.00059</td><td>0.5</td></tr>
<tr><td>Dieldrin</td><td>0.00014</td><td>0.02</td></tr>
<tr><td>4,4’-DDT</td><td>0.00059</td><td>1</td></tr>
<tr><td>4,4’-DDE</td><td>0.00059</td><td>2.2</td></tr>
<tr><td>4,4’-DDD</td><td>0.00084</td><td>2</td></tr>
<tr><td>Total DDT</td><td>--</td><td>1.58</td></tr>
<tr><td>Total PCBs</td><td>0.00017</td><td>22.7</td></tr>
</table>
</td></tr>
<tr><td>Margin of Safety</td><td>The uncertainties associated with this TMDL are due to limited data on the amount and media by which PCBs and pesticides are entering the lake and the extent to which these contaminants are already in the lake. The seasonal and annual variability in the hydrologic budget also creates uncertainty. To address these uncertainties, an implicit margin of safety is applied. Conservative assumptions were used to calculate the loading to the lake and more the protective ER-L sediment quality guidelines were used for the sediment numeric targets.</td></tr>
</table>

TMDL Element	Regulatory Provisions
Seasonal Variations and Critical Conditions	As the contaminants of concern for this TMDL are transported to the lake by the mobilization of sediment, it is expected that the greatest influx of PCBs and pesticides occurs during periods of increased runoff from the watershed. Due to the artificial interference in the watershed hydrologic cycle due to agricultural activities, peak runoff may not correspond to the southern California wet season. Seasonal variations and critical conditions are addressed by the use of concentration-based load allocations. However, due to the bioaccumulative properties of the pollutants, effects occur over extended time periods, which minimizes the importance of seasonal variations.
Monitoring	**<u>Monitoring Program</u>** The monitoring program shall measure the progress of pollutant load reductions and improvements in water and sediment quality. The monitoring program shall: • Determine attainment of numeric targets for PCBs and pesticides; • Determine compliance with the load allocations for PCBs and pesticides; and • Monitor the effect of implementation actions on lake water and sediment quality. The monitoring program shall consist of two phases. The first phase will focus on sampling the Central Ditch (for the first 10 years of the TMDL implementation schedule) and will be conducted by the responsible parties for the Central Ditch LAs. For the remaining portion of the TMDL implementation schedule, required water and sediment samples will be collected from the Central Ditch by "responsible parties" for the Central Ditch LAs, while required water and sediment samples will be collected from the lake as prescribed by the McGrath Lake Work Plan (MLWP) developed pursuant to a Memorandum of Agreement (MOA) entered into by and between "cooperative parties" and the Regional Board. The "responsible parties" and "cooperative parties" are defined in the implementation section below. <u>Phase 1</u> Phase 1 requires the development of a monitoring and reporting plan (MRP) to comply with the TMDL requirements. The MRP shall propose a monitoring frequency for water and sediment sampling that will characterize the variability in water and sediment quality observed in the Central Ditch. Water samples will be analyzed for the following constituents: • Total Organic Carbon • Total Suspended Solids • Total PCBs • DDT and Derivatives • Dieldrin • Total Chlordane

TMDL Element	Regulatory Provisions
Monitoring (continued)	Sediment samples will be analyzed for the following constituents: • Total Organic Carbon • Total PCBs • DDT and Derivatives • Dieldrin • Total Chlordane The annual monitoring reports will summarize proposed changes to the MRP based on the results of the previous year's monitoring. Sampling frequency may be reduced during future years once characterization of the variability in water and sediment quality has been achieved. In addition to the constituents above, general water chemistry (temperature, dissolved oxygen, pH and electrical conductivity) and a flow measurement will be required at each sampling event. Responsible parties for phase 1 monitoring shall submit a MRP plan to assess compliance with LAs and a Quality Assurance Project Plan (QAPP). The MRP and QAPP must be submitted to the Executive Officer for approval within six months of the effective date of the TMDL. The QAPP shall include protocols for sample collection, standard analytical procedures, and laboratory certification. All samples shall be collected in accordance with Surface Water Ambient Monitoring Program (SWAMP) protocols, where available or alternative protocols proposed by dischargers and approved by the Executive Officer. Monitoring shall begin 90 days after the Executive Officer has approved the MRP and QAPP. At the time of TMDL adoption, several of the constituents of concern had numeric targets lower than the laboratory detection limits. As analytical methods and detection limits continue to improve (i.e. development of lower detection limits) and become more environmentally relevant, responsible parties shall incorporate new analytical methods with lower detection limits in the MRP and the QAPP. A monitoring report shall be prepared and submitted to the Regional Board annually within three months after the completion of the final sampling event of the year. <u>Phase 2</u> The sampling, analysis and flow measurements begun in Phase 1 will continue. Additionally, samples will be collected from within the lake. Water column and surficial sediment (top 2 cm) samples will be collected at the northern end of the lake and from the deepest portion of the lake. All samples will be collected in accordance with SWAMP protocols. Cooperative parties shall only commence, participate or fund the Phase 2 monitoring as provided in the MLWP.

TMDL Element	Regulatory Provisions
Monitoring (continued)	Water samples will be analyzed for the following constituents: • Total Organic Carbon • Total Suspended Solids • Total PCBs • DDT and Derivatives • Dieldrin • Total Chlordane Sediment samples will be analyzed for the following constituents: • Total Organic Carbon • Total PCBs • DDT and Derivatives • Dieldrin • Total Chlordane • Toxicity (if toxicity is determined, a TIE shall be completed to elucidate the cause of the toxicity) Samples from the lake will be collected annually. The annual reports required for Phase 1 will continue during Phase 2. Additional monitoring may be required depending on which implementation option is chosen. Three years from the effective date of the TMDL, cooperative parties must submit the MLWP as discussed in the implementation section below. At the time of TMDL adoption, several of the constituents of concern had numeric targets lower than the laboratory detection limits. All required monitoring under Phase 1 and Phase 2 shall incorporate new analytical methods, once commercially available with lower detection limits, in the MRP and the QAPP. A monitoring report shall be prepared and submitted to the Regional Board annually within three months after the completion of the final sampling event of the year.
Implementation Plan	Compliance with this TMDL will require the elimination of pollutant loads in toxic amounts from the Central Ditch to the lake and identification and implementation of strategies to remediate the contaminated sediments at the bottom of the lake. Table 7-37.2 contains a schedule for cooperative parties to implement a MOA to jointly develop the MLWP to implement strategies to remediate the contaminated lake sediments and achieve lake sediment load allocations. I. Implementation and Determination of Compliance with the Central Ditch LAs for Agricultural Non-point Source Discharges The Central Ditch load allocations assigned to agriculture non-point source dischargers will be implemented through the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Conditional Waiver) or other appropriate Regional Board Orders. The load allocations for the Central Ditch shall be incorporated into the Conditional Waiver or other appropriate Regional Board Orders.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	It is likely that a combination of implementation measures will be needed to achieve the LAs. The Central Ditch implementation actions may include, but are not limited to the following: • On-Farm BMPs • Regional Sub-Watershed BMPs • Regional Treatment System • Redirect Agriculture Discharge The estimated costs for on-farm BMPs such as buffer crops, filter strips, and sedimentation basins are approximately $373/acre of BMP, $1002/acre of BMP, and $10,000/acre of BMP, respectively. The estimated costs for regional sub-watershed BMPs, such as converting the Central Ditch to a grassed waterway or converting the dirt road that runs along the Central Ditch into a filter strip, are approximately $1,288/ per acre of BMP and $1002/per acre of BMP, respectively. The estimated cost of a regional treatment system to address the Central Ditch water is about $151,536/year. The estimated costs to redirect the agriculture discharge toward a nearby canal are $612,611 (open ditch) to $1,287,402 (piped diversion). Potential sources of financing for these implementation alternatives, such as Clean Water Act section 319(h) grant funding, are discussed in Chapter 4. As discussed in Chapter 4, the U.S. Department of Agriculture Soil Conservation Service and the Resource Conservation Districts provide information on, and assistance in, implementing BMPs. Agricultural Dischargers will be considered in compliance with the TMDL LAs if they comply with all provisions of the Conditional Waiver established to implement the LAs , or those of any alternative regulatory order, if any, that may be established to implement the LAs in lieu of the Conditional Waiver. II. Implementation of Memorandum of Agreement to Develop McGrath Lake Work Plan and Determination of Compliance with LAs for Contaminated Lake Sediments The contaminated lake sediment LAs may be implemented through a MOA, which the Executive Officer is authorized to negotiate and execute, provided it is consistent with the following: The MOA shall detail the voluntary efforts that will be undertaken to attain the load allocations. The MOA shall comply with the Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options ("Policy"), including part II, section 2 (c)(ii) and related provisions, and shall be consistent with the requirements of this TMDL. If the MOA is timely adopted in accordance with the implementation schedule below, the program described in the MOA shall be deemed "certified", pursuant to the Policy, subject to the conditions of Policy section 2 (e). The MOA shall include development of the MLWP, which must be approved by the Executive Officer, and may be amended with Executive Officer approval, as necessary. Implementation of the MOA shall be reviewed annually by the Executive Officer as part of the MRP annual reports.

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	The purpose of the MOA is not to create evidence of responsibility or ascertain legal liability for subsequent remediation of the lake sediments, but rather to organize stakeholders who have an interest in the remediation of the lake sediments. To be a valid non-regulatory implementation program adopted by the Regional Board, the MOA shall include the following requirements and conditions: • The MOA shall direct development of a MLWP that addresses the impaired waterbody as approved by the Executive Officer. • The MOA shall outline the roles and responsibilities of the Regional Board and each cooperative party. • The MOA shall contain conditions that require trackable progress on attaining load allocations and numeric targets. A timeline shall be included that identifies the point(s) at which Regional Board regulatory intervention and oversight will be triggered if the pace of work lags or fails. • The MOA shall contain a provision that it shall be revoked based upon findings that the program has not been adequately implemented, is not achieving its goals, or is no longer adequate to restore water quality. • The MOA shall be consistent with the California Policy for Implementation and Enforcement of the Non-point Source Pollution Control Program, including but not limited to, the "Key Elements of a Non-point Source Pollution Control Implementation Program". Pursuant to the terms of the MOA, the cooperative parties and the Regional Board will work jointly to develop the MLWP and remediate the lake sediments. The purpose of the MLWP is to set forth strategies to achieve lake sediment load allocations in a manner that is beneficial to subwatershed landowners and the public in general. To the satisfaction of the Executive Officer, the MLWP shall meet the following criteria: • Three years from the effective date of the TMDL cooperative parties shall submit a MLWP for approval by the Executive Officer. • The MLWP shall include identification of implementation measures that will achieve lake sediment LAs. • The MLWP shall include any additional monitoring needed to assess the effectiveness of the MLWP's chosen implementation strategies. • The MLWP shall include a MRP and QAPP for phase 2 monitoring. • The MLWP shall include a strategy to secure funds necessary to remediate the lake sediments and achieve lake sediment allocations.

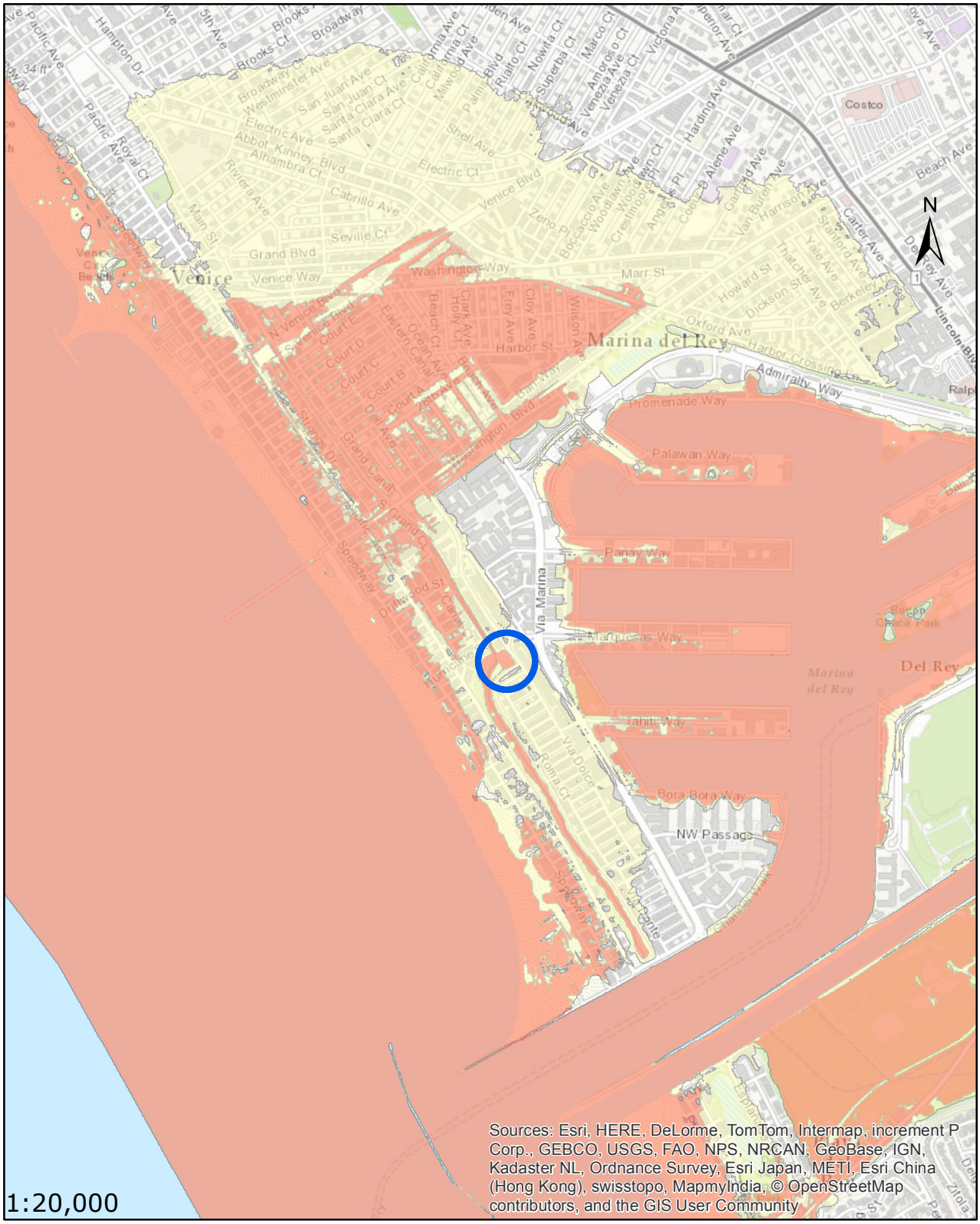
TMDL Element	Regulatory Provisions
Implementation Plan (continued)	• The MLWP shall include tasks and a clear timeline for task completion leading to attainment of lake sediment LAs. The roles and responsibilities of each cooperative party shall also be outlined in the MLWP. • The MLWP shall consider and address the potential impacts of lake sediment remediation strategies on the implementation of the McGrath Beach Bacteria TMDL and ongoing restoration efforts at McGrath State Beach. • The MLWP shall achieve compliance with the load allocations through the implementation of lake management strategies to reduce and manage internal pesticide and PCBs sources from lake bed sediments. The lake management implementation actions may include: • Sediment Capping; • Dredging/Hydraulic Dredging; • Monitored Natural Attenuation; or • Other appropriate means of implementation. The Executive Officer may require a revised MLWP to reflect the results of data obtained through TMDL implementation. III. APPLICATION OF ALLOCATIONS A. Responsible parties for the Central Ditch LAs are the agricultural dischargers in the McGrath Lake sub-watershed. B. Responsible parties for the lake sediment LAs have not yet been identified. Instead, cooperative parties for the lake sediment LAs are identified, not as responsible parties or as dischargers, but as landowners in the subwatershed who may execute a MOA jointly with the Regional Board for the development of the MLWP so that lake sediment allocations can be achieved in a manner that is in the best interest of both the subwatershed landowners and the public in general. Cooperative parties for the lake sediment LAs include: • State of California Department of Parks and Recreation • McGrath Family (owners of the Central Ditch west of Harbor Blvd and the northern end of the lake) • Agricultural Landowners in the McGrath Lake sub-watershed • Ventura Regional Sanitation District (Bailard Landfill)

TMDL Element	Regulatory Provisions
Implementation Plan (continued)	If a MOA is not established by and between cooperative parties and the Regional Board within two years of the effective date of the TMDL, or the cooperative parties do not comply with the terms of the MOA, or if the MOA and MLWP are not implemented or otherwise do not result in attainment of load allocations consistent with the provisions and schedule of the TMDL, the Executive Officer shall initiate an investigation, with input from current landowners, to (1) identify the responsible parties, whether named in this TMDL or not, whose discharges of the legacy pollutants have caused or contributed to the impairment of the lake; (2) ascertain the whereabouts and capacities of those responsible parties and/or their successors; (3) determine the parties to whom responsibility for remediation of sediments should be assigned; and (4) issue appropriate regulatory orders to those responsible parties. In addition, a comprehensive review of the MOA by the Executive Officer shall take place five years from the effective date of the MOA. The purpose of this review is to ensure adequate progress pursuant to the timeline established in the MOA on development of the MLWP and ultimately attainment of the lake sediment load allocations. If the Executive Officer determines that adequate progress has not been made, the Regional Board shall initiate the investigation described above. If the Executive Officer is unable to identify the responsible parties per the investigations above, then the TMDL shall be reconsidered.

Table 7-37.2 McGrath Lake PCBs and Pesticides TMDL: Implementation Schedule

Task Number	Task	Deadline
1	Responsible parties assigned Central Ditch LAs shall submit a Monitoring and Reporting Plan (MRP) to the Executive Officer for review and approval to address Phase 1 monitoring.	6 months from the effective date of the TMDL
2	Responsible parties assigned Central Ditch LAs shall begin monitoring as outlined in the approved MRP.	90 days from the date of MRP approval
3	Responsible parties assigned Central Ditch LAs shall submit annual monitoring reports. Reports shall be submitted within three months after the completion of the final sampling event of the year.	Annually
4	Cooperative parties shall enter into a Memorandum of Agreement (MOA) with the Regional Board to implement the lake sediment LAs.	Two years from the effective date of the TMDL
5	Parties subject to the MOA shall submit a McGrath Lake Work Plan (MLWP) for review and approval by the Executive Officer.	Three years from the effective date of the TMDL
6	Parties subject to the MOA shall submit annual progress reports.	Annually from the date of MLWP approval
7	Responsible parties shall attain Central Ditch LAs.	10 years from the effective date of the TMDL
8	Begin implementation of McGrath Lake sediment remediation actions based on MLWP.	As soon as possible, but no later than 10 years from the effective date of the TMDL
9	Phase 2 monitoring shall begin as outlined in the MLWP. The results shall be included as part of the annual progress reports initiated in Task 6.	To be determined based on MLWP.
10	Lake sediment LAs shall be achieved.	14 years from the effective date of the TMDL

APPENDIX S
UNITED STATES GEOLOGICAL SURVEY SEA LEVEL RISE INUNDATION MAPS

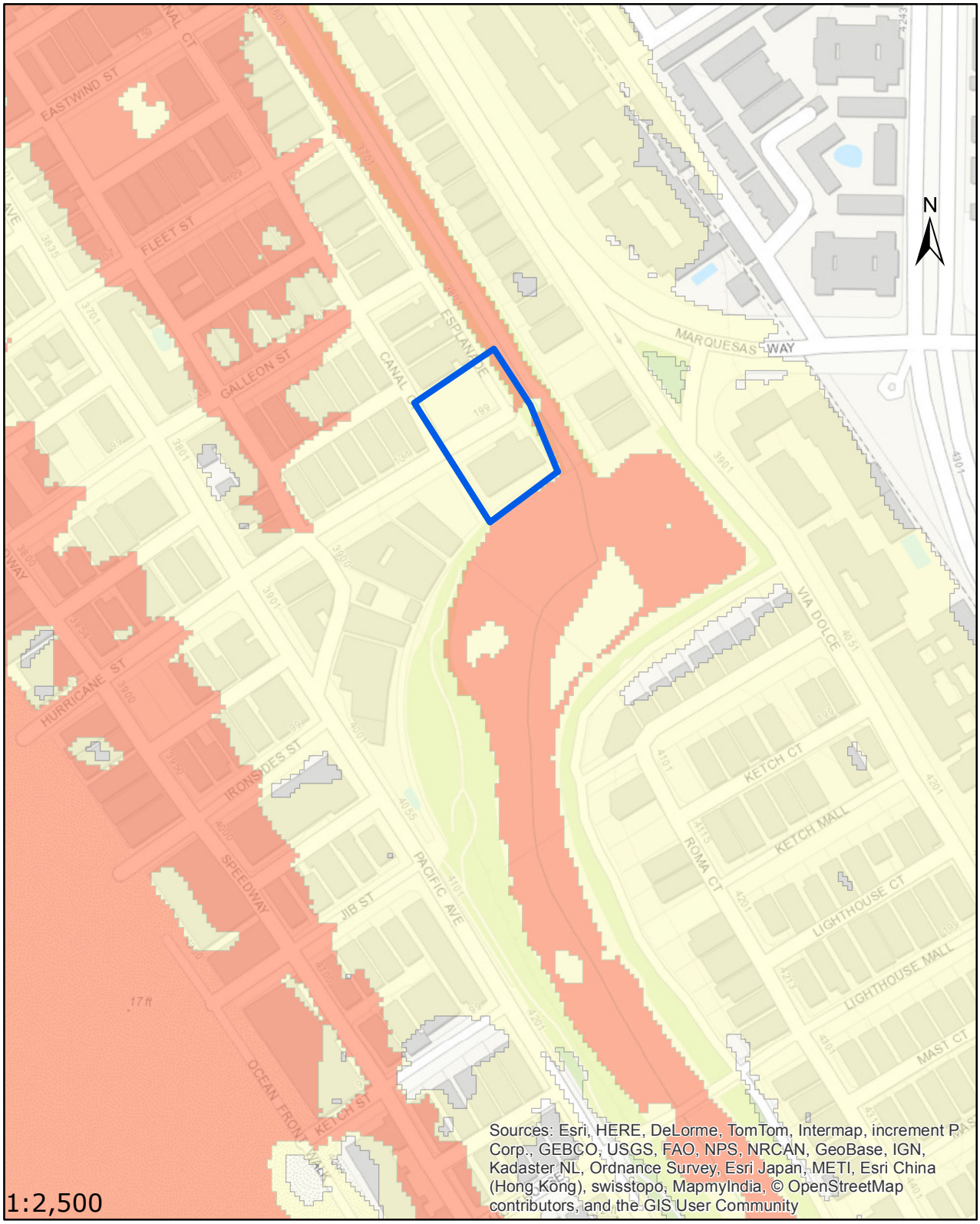


SEA LEVEL RISE AND 100 YEAR FLOODING IN VENICE CA

Inundation area at SLR 150 cm

Inundation area at SLR 200 cm

Project Area



SEA LEVEL RISE AND 100 YEAR FLOODING IN THE VAPP AREA

Inundation area at SLR 150 cm

Inundation area at SLR 200 cm

Project Area

Watearth™
Water Resources + Green Infrastructure

APPENDIX T
VEGETATED BUFFER STRIP

Vegetated Buffer Strip TC-31



Design Considerations

- Tributary Area
- Slope
- Water Availability
- Aesthetics

Description

Grassed buffer strips (vegetated filter strips, filter strips, and grassed filters) are vegetated surfaces that are designed to treat sheet flow from adjacent surfaces. Filter strips function by slowing runoff velocities and allowing sediment and other pollutants to settle and by providing some infiltration into underlying soils. Filter strips were originally used as an agricultural treatment practice and have more recently evolved into an urban practice. With proper design and maintenance, filter strips can provide relatively high pollutant removal. In addition, the public views them as landscaped amenities and not as stormwater infrastructure. Consequently, there is little resistance to their use.

Targeted Constituents

☑	Sediment	■
☑	Nutrients	●
☑	Trash	▲
☑	Metals	■
☑	Bacteria	●
☑	Oil and Grease	■
☑	Organics	▲

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored three vegetated buffer strips in southern California and is currently evaluating their performance at eight additional sites statewide. These strips were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the southern California sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- Buffers require minimal maintenance activity (generally just erosion prevention and mowing).
- If properly designed, vegetated, and operated, buffer strips can provide reliable water quality benefits in conjunction with high aesthetic appeal.

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- Flow characteristics and vegetation type and density can be closely controlled to maximize BMP effectiveness.
- Roadside shoulders act as effective buffer strips when slope and length meet criteria described below.

Limitations

- May not be appropriate for industrial sites or locations where spills may occur.
- Buffer strips cannot treat a very large drainage area.
- A thick vegetative cover is needed for these practices to function properly.
- Buffer or vegetative filter length must be adequate and flow characteristics acceptable or water quality performance can be severely limited.
- Vegetative buffers may not provide treatment for dissolved constituents except to the extent that flows across the vegetated surface are infiltrated into the soil profile.
- This technology does not provide significant attenuation of the increased volume and flow rate of runoff during intense rain events.

Design and Sizing Guidelines

- Maximum length (in the direction of flow towards the buffer) of the tributary area should be 60 feet.
- Slopes should not exceed 15%.
- Minimum length (in direction of flow) is 15 feet.
- Width should be the same as the tributary area.
- Either grass or a diverse selection of other low growing, drought tolerant, native vegetation should be specified. Vegetation whose growing season corresponds to the wet season is preferred.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install strips at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be required.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.

- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

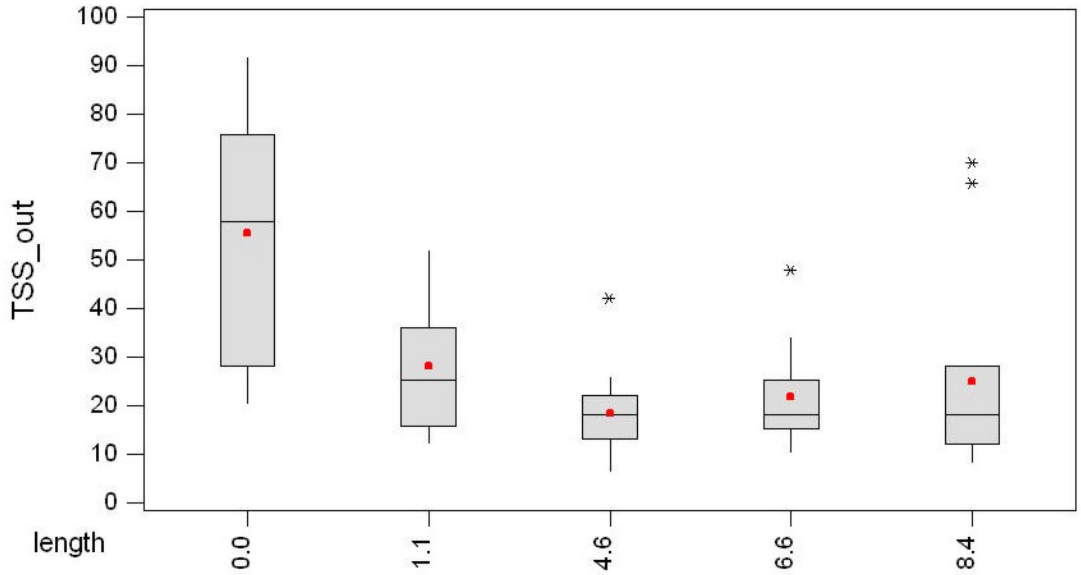
Vegetated buffer strips tend to provide somewhat better treatment of stormwater runoff than swales and have fewer tendencies for channelization or erosion. Table 1 documents the pollutant removal observed in a recent study by Caltrans (2002) based on three sites in southern California. The column labeled "Significance" is the probability that the mean influent and effluent EMCs are not significantly different based on an analysis of variance.

The removal of sediment and dissolved metals was comparable to that observed in much more complex controls. Reduction in nitrogen was not significant and all of the sites exported phosphorus for the entire study period. This may have been the result of using salt grass, a warm weather species that is dormant during the wet season, and which leaches phosphorus when dormant.

Another Caltrans study (unpublished) of vegetated highway shoulders as buffer strips also found substantial reductions often within a very short distance of the edge of pavement. Figure 1 presents a box and whisker plot of the concentrations of TSS in highway runoff after traveling various distances (shown in meters) through a vegetated filter strip with a slope of about 10%. One can see that the TSS median concentration reaches an irreducible minimum concentration of about 20 mg/L within 5 meters of the pavement edge.

Table 1 Pollutant Reduction in a Vegetated Buffer Strip

Constituent	Mean EMC		Removal %	Significance
	Influent (mg/L)	Effluent (mg/L)		P
TSS	119	31	74	<0.000
NO_3-N	0.67	0.58	13	0.367
TKN-N	2.50	2.10	16	0.542
Total N[a]	3.17	2.68	15	-
Dissolved P	0.15	0.46	-206	0.047
Total P	0.42	0.62	-52	0.035
Total Cu	0.058	0.009	84	<0.000
Total Pb	0.046	0.006	88	<0.000
Total Zn	0.245	0.055	78	<0.000
Dissolved Cu	0.029	0.007	77	0.004
Dissolved Pb	0.004	0.002	66	0.006
Dissolved Zn	0.099	0.035	65	<0.000



Filter strips also exhibit good removal of litter and other floatables because the water depth in these systems is well below the vegetation height and consequently these materials are not easily transported through them. Unfortunately little attenuation of peak runoff rates and volumes (particularly for larger events) is normally observed, depending on the soil properties. Therefore it may be prudent to follow the strips with another practice than can reduce flooding and channel erosion downstream.

Siting Criteria

The use of buffer strips is limited to gently sloping areas where the vegetative cover is robust and diffuse, and where shallow flow characteristics are possible. The practical water quality benefits can be effectively eliminated with the occurrence of significant erosion or when flow concentration occurs across the vegetated surface. Slopes should not exceed 15 percent or be less than 1 percent. The vegetative surface should extend across the full width of the area being drained. The upstream boundary of the filter should be located contiguous to the developed area. Use of a level spreading device (vegetated berm, sawtooth concrete border, rock trench, etc) to facilitate overland sheet flow is not normally recommended because of maintenance considerations and the potential for standing water.

Filter strips are applicable in most regions, but are restricted in some situations because they consume a large amount of space relative to other practices. Filter strips are best suited to treating runoff from roads and highways, roof downspouts, small parking lots, and pervious surfaces. They are also ideal components of the "outer zone" of a stream buffer or as pretreatment to a structural practice. In arid areas, however, the cost of irrigating the grass on the practice will most likely outweigh its water quality benefits, although aesthetic considerations may be sufficient to overcome this constraint. Filter strips are generally impractical in ultra-urban areas where little pervious surface exists.

Some cold water species, such as trout, are sensitive to changes in temperature. While some treatment practices, such as wet ponds, can warm stormwater substantially, filter strips do not

are not expected to increase stormwater temperatures. Thus, these practices are good for protection of cold-water streams.

Filter strips should be separated from the ground water by between 2 and 4 ft to prevent contamination and to ensure that the filter strip does not remain wet between storms.

Additional Design Guidelines

Filter strips appear to be a minimal design practice because they are basically no more than a grassed slope. In general the slope of the strip should not exceed 15fc% and the strip should be at least 15 feet long to provide water quality treatment. Both the top and toe of the slope should be as flat as possible to encourage sheet flow and prevent erosion. The top of the strip should be installed 2-5 inches below the adjacent pavement, so that vegetation and sediment accumulation at the edge of the strip does not prevent runoff from entering.

A major question that remains unresolved is how large the drainage area to a strip can be. Research has conclusively demonstrated that these are effective on roadside shoulders, where the contributing area is about twice the buffer area. They have also been installed on the perimeter of large parking lots where they performed fairly effectively; however much lower slopes may be needed to provide adequate water quality treatment.

The filter area should be densely vegetated with a mix of erosion-resistant plant species that effectively bind the soil. Native or adapted grasses, shrubs, and trees are preferred because they generally require less fertilizer and are more drought resistant than exotic plants. Runoff flow velocities should not exceed about 1 fps across the vegetated surface.

For engineered vegetative strips, the facility surface should be graded flat prior to placement of vegetation. Initial establishment of vegetation requires attentive care including appropriate watering, fertilization, and prevention of excessive flow across the facility until vegetation completely covers the area and is well established. Use of a permanent irrigation system may help provide maximal water quality performance.

In cold climates, filter strips provide a convenient area for snow storage and treatment. If used for this purpose, vegetation in the filter strip should be salt-tolerant (e.g., creeping bentgrass), and a maintenance schedule should include the removal of sand built up at the bottom of the slope. In arid or semi-arid climates, designers should specify drought-tolerant grasses to minimize irrigation requirements.

Maintenance

Filter strips require mainly vegetation management; therefore little special training is needed for maintenance crews. Typical maintenance activities and frequencies include:

- Inspect strips at least twice annually for erosion or damage to vegetation, preferably at the end of the wet season to schedule summer maintenance and before major fall run-off to be sure the strip is ready for winter. However, additional inspection after periods of heavy run-off is most desirable. The strip should be checked for debris and litter and areas of sediment accumulation.

- Recent research on biofiltration swales, but likely applicable to strips (Colwell et al., 2000), indicates that grass height and mowing frequency have little impact on pollutant removal;

consequently, mowing may only be necessary once or twice a year for safety and aesthetics or to suppress weeds and woody vegetation.

- Trash tends to accumulate in strip areas, particularly along highways. The need for litter removal should be determined through periodic inspection but litter should always be removed prior to mowing.

- Regularly inspect vegetated buffer strips for pools of standing water. Vegetated buffer strips can become a nuisance due to mosquito breeding in level spreaders (unless designed to dewater completely in 48-72 hours), in pools of standing water if obstructions develop (e.g. debris accumulation, invasive vegetation), and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available on the actual construction costs of filter strips. One rough estimate can be the cost of seed or sod, which is approximately 30¢ per ft^2 for seed or 70¢ per ft^2 for sod. This amounts to between $13,000 and $30,000 per acre of filter strip. This cost is relatively high compared with other treatment practices. However, the grassed area used as a filter strip may have been seeded or sodded even if it were not used for treatment. In these cases, the only additional cost is the design. Typical maintenance costs are about $350/acre/year (adapted from SWRPC, 1991). This cost is relatively inexpensive and, again, might overlap with regular landscape maintenance costs.

The true cost of filter strips is the land they consume. In some situations this land is available as wasted space beyond back yards or adjacent to roadsides, but this practice is cost-prohibitive when land prices are high and land could be used for other purposes.

Maintenance Cost

Maintenance of vegetated buffer strips consists mainly of vegetation management (mowing, irrigation if needed, weeding) and litter removal. Consequently the costs are quite variable depending on the frequency of these activities and the local labor rate.

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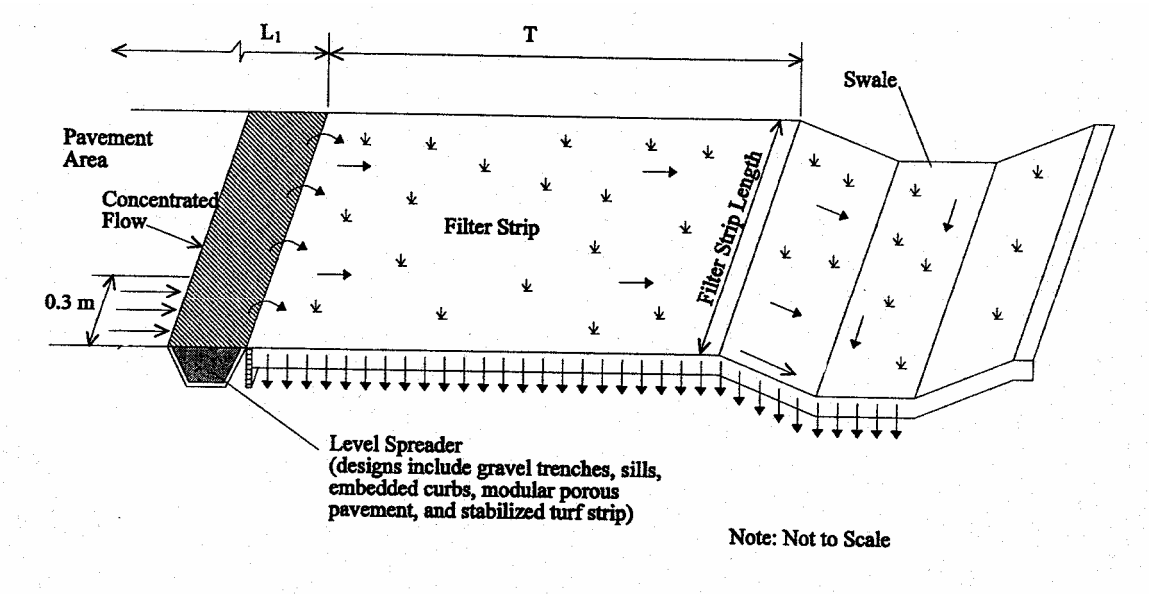
L1
T
Swale
Pavement Area
Concentrated Flow
Filter Strip
Filter Strip Length
0.3 m
Level Spreader
(designs include gravel trenches, sills, embedded curbs, modular porous pavement, and stabilized turf strip)
Note: Not to Scale

APPENDIX U
GEOTECHNICAL REPORT,
VENICE AUXILIARY PUMPING PLANT

CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

GEOTECHNICAL ENGINEERING GROUP (GEO)

GEOTECHNICAL REPORT
VENICE AUXILIARY PUMPING PLANT
133 EAST HURRICANE STREET
VENICE AREA OF LOS ANGELES

W.O. SZC12923
GEO FILE NO.: 14-103
December 14, 2015

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APPENDIX A

Geotechnical Data Report, Venice Auxiliary Pump Plant, Los Angeles, CA prepared by Geotechnical Professionals Inc. dated September 29, 2015.

APPENDIX B

Logs of Borings and laboratory test results from exploratory borings G-1A and G-1B from Geotechnical Data Report, Venice Dual Force Main, Los Angeles, CA prepared by Amec dated March 26, 2009.

Log of Boring and laboratory test results from exploratory boring 8 from Report of Subsurface Investigation, Lab No 140-4360, prepared by Department of General Sevicecs Standards dated October 17, 1994 (GEO File No. 94-072).

Log of Test Boring 2 from Report of Subsurface Investigation, Lab No 140-3609, prepared by Department of General Sevicecs Standards dated April 4, 1990 (GEO File No. 89-305.)

APPENDIX C

Preliminary Subsruface Methane Gas Investigation at Venice Auxiliary Pump Station, 133 East Hurricane Street, Los Angeles, CA prepared by GeoKinetics dated August 20, 2015.

1.0 INTRODUCTION

This Geotechnical Report presents the results of a geotechnical investigation conducted for the Venice Auxiliary Pumping Plant to be located at 133 East Hurricane Street in the Venice area of Los Angeles. This report was prepared in response to a request received from the Wastewater Conveyance Engineering Division dated September 10, 2014. This investigation was performed to evaluate subsurface characteristics and to provide geotechnical recommendations for design and construction of the proposed project.

This report is based on visual observation, subsurface investigation and laboratory testing. At the request of the Geotechnical Engineering Group (GEO), Geotechnical Professionals Inc. (GPI) performed subsurface exploration at the site and laboratory testing of samples collected from the site. The results of their field work and laboratory tests are included in their Data Report, dated September 29, 2015, presented in Appendix A of this report.

In addition, Amec previously prepared a Geotechnical Data Report as part of a geotechnical investigation for the Venice Dual Force Main project. Their scope of work included two exploratory borings (G-1A and G-1B) in the southeast portion of the Venice Auxiliary Pumping Plant site. Logs of these exploratory borings and laboratory test results of samples retrieved from these borings are presented in Appendix B of this report.

Also, the Department of General Services Standards Division previously advanced two exploratory borings on the site in support of previous projects. Logs of these exploratory borings and laboratory test results of samples retrieved from these borings are presented in Appendix B of this report.

GEO has reviewed the above referenced reports and concurs with the findings and accepts responsibility for the use of the contents as described herein.

2.0 SITE DESCRIPTION

The Venice Auxiliary Pumping Plant site consists of an approximately 7,800 square foot piece of land bounded by private property to the northwest, the Grand Canal to the northeast, Hurricane Street to the southeast and Canal Street to the southwest. The site is across Hurricane Street from the existing Venice Pump Plant. At the time this report was prepared, the site was unoccupied. The site was recently used to facilitate construction of the Venice Manifold Replacement project. Site ground surface elevations are on the order of 5 to 6 feet above sea level. Figure 1, "Vicinity Map", illustrates the site location.

3.0 PROJECT SCOPE

In preparation of this report we have reviewed an October 2105 draft of the Preliminary Design Report for the project, prepared by Arcadis. Appendix B of the draft Preliminary Design Report includes several preliminary design drawings. Drawing C-03A illustrates a proposed layout of the planned construction. As shown on this drawing, the project is planned to consist of an auxiliary pumping plant (wetwell/valve vault), an electrical building, a diversion structure, a new 66-inch diameter sewer between the diversion structure and the new auxiliary pumping plant wetwell, and a new 42-inch discharge line to connect to the existing force main. Drawing C-03A has been reproduced herein as Figure 2, "Proposed Construction".

Preliminary Design Drawing C-03A indicates the auxiliary pumping plant (wetwell/valve vault) will be located in the east central portion of the site and that this structure is anticipated to have plan dimensions on the order of 55 feet by 32 feet. Preliminary Design Drawing S-2 indicates the wetwell will be founded on a mat foundation with a bearing elevation on the order of -26 feet (below sea level) and the valve vault at an elevation on the order of -9 feet (below sea level).

Preliminary Design Drawing C-03A indicates the new electrical building will be located in the west central portion of the site and will have plan dimensions on the order of 25 feet by 50 feet. Preliminary Design Drawing A-04 indicates this building will be an at-grade, two-story structure with an overall height on the order of 30 feet. The finish floor elevation of the ground level floor is expected to be on the order of 6 feet above sea level.

Preliminary Design Drawing C-03A indicates the diversion structure will encompass an existing 66-inch reinforced concrete sewer pipe that extends along the east side of the site. This structure is anticipated to have plan dimensions on the order of 21 feet by 21 feet and is expected to be founded on a mat foundation bearing at an elevation of approximately -20 feet (below sea level).

Approximately 23 feet of new 66-inch diameter reinforced concrete sewer pipe will be constructed between the new diversion structure and the auxiliary pumping plant wetwell. Preliminary Design Drawing S-3 indicates this sewer will have an invert elevation of -7.37 feet (below sea level).

A new 42-inch diameter pipe header is shown on Preliminary Design Drawing C-03A to extend from the new valve vault to the west end of the new manifold within Hurricane Street. Preliminary Design Drawing M-02 indicates this pipe header will have an invert elevation on the order of -4.75 feet (below sea level).

Construction will also include new equipment pads and possibly sidewalks, planters, landscaping, and other minor improvements. Final site grades are expected to be within one to two feet of the current site grades.

The analyses and recommendations of this report reflect the layout of major improvements provided in Figure 2, but are also intended to be flexible to allow minor changes in the scope. GEO shall review the final project scope and grading plans to confirm that the recommendations contain within this report are appropriate. If the final scope includes significant changes from those described herein, a supplemental report will be necessary.

4.0 EXPLORATION PROGRAM

4.1 Subsurface investigation 2015

Five Cone Penetrometer tests (CPT's) were performed for the project on July 31, 2015. The CPT's were advanced to approximate depths of 40 to 80 feet below ground surface (bgs). In addition, three rotary wash boring were drilled on August 6 and 7, 2015 to depths of 49 feet to 79-1/2 feet bgs. Approximate locations of the CPTs and exploratory borings are shown in Figure 3, "Exploration Locations Map" and in the data report presented in Appendix A.

Relatively undisturbed geotechnical samples were obtained from the rotary wash borings by driving a modified California-type split spoon sampler lined with 1-inch high brass rings. Standard Penetration Tests (SPT) were also performed in these borings. Starting began at a depth of 2.5 feet and was performed every 2.5 feet thereafter to the final depth of the borings. The samplers were driven with successive drops of a 140-pound automatic-trip hammer falling 30 inches.

Each collected sample was inspected and described in general conformance with the Unified Soil Classification System (USCS). All samples were sealed and packaged for transportation to GPI's laboratory. After completion of drilling and sampling, the borings were backfilled with cement slurry.

Although GEO has no record of contamination at the project site, the samples obtained from the borings were screened in the field for volatile organic compounds (VOCs) to determine if the site may have been contaminated in the past by petroleum distillates or other types of contamination. Soil samples were screened in the field with a photo-ionization detector. No organic vapors were detected. No odor, staining, or other evidence of contamination was observed in the borings.

The site is located within a Methane Study Zone and a Methane Study has been performed for the project. The requirements of the Methane Study report shall be incorporated into the design and construction of the project. A copy of the methane report is presented in Appendix C of this report.

4.2 Subsurface investigation 2008

In 2008, Amec drilled two exploratory borings (G-1A and G-1B) within the southeastern portion of the site as part of a subsurface investigation for the Venice Dual Force Main project. Ring, Standard Penetration Test (SPT) and shelby tube samples were collected from exploratory boring G-1A at depth intervals of 2-1/2 to 5 feet to the explored depth of approximately 71.5 feet below the ground surface. Ring and SPT samples were collected from exploratory boring G-1B at depth intervals of 2-1/2 to 5 feet to the explored depth of approximately 25.5 feet below the ground surface. Ring and SPT samplers were driven into the bottom of the borings with successive drops of a 140-pound Automatic trip hammer falling 30 inches. Approximate locations of these borings are shown on Figure 3.

Each collected sample was inspected and described in general conformance with the Unified Soil Classification System (USCS). All samples were sealed and packaged for transportation to Amec's laboratory. After completion of drilling and sampling, the borings were converted to monitoring wells.

Soil samples obtained from the borings during exploration were field-screened for the presence of organic vapors using a MiniRAE 2000, a portable photo-ionization detector (PID). Results of the PID screening are presented in the boring logs (Appendix B).

A portable combustible gas meter (CGM), RAE QRAE Plus 4, capable of measuring the Lower Explosive Limit (LEL) of potential gases, the percent of oxygen, carbon monoxide (CO), and hydrogen sulfide gases (H_2S), was used to measure the LEL at the ground surface. For these borings, only zero readings were recorded, and thus the values are not shown on the boring logs.

4.3 Subsurface investigation 1994

In 1994, the Department of General Services Standards Division drilled one exploratory boring (94-072 B-8) within the eastern portion of the site as part of a subsurface investigation for the Venice Area Relief sewer project. Standard Penetration Test (SPT) samples were collected from this exploratory boring at depths of 5 feet, 10 feet and every 5 feet thereafter to the explored depth of approximately 31 feet below the ground surface. The SPT samplers were driven into the bottom of the borings with successive drops of a 140-pound hammer falling 30 inches. The approximate location of this boring is shown on Figure 3.

Each collected sample was inspected and described in general conformance with the Unified Soil Classification System (USCS). All samples were sealed and packaged for transportation to the Standards laboratory. After completion of drilling, the exploratory boring was backfilled with soil cuttings. An exploratory boring log and laboratory test results of samples retrieved from this boring are presented in Appendix B.

4.4 Subsurface investigation 1990

In 1990, the Department of General Services Standards Division drilled one exploratory boring (89-305 B-2) within the western portion of the site as part of a subsurface investigation for a seismic evaluation of the existing Venice Pumping Plant. Standard Penetration Test (SPT) samples were collected from this exploratory boring at depths of 5 feet, 10 feet and every 5 feet thereafter to the explored depth of approximately 41 feet below the ground surface. The SPT samplers were driven into the bottom of the borings with successive drops of a 140-pound hammer falling 30 inches. The approximate location of this boring is shown on Figure 3.

Each collected sample was inspected and described in general conformance with the Unified Soil Classification System (USCS). All samples were sealed and packaged for transportation to the Standards laboratory. After completion of drilling, the exploratory boring was backfilled with soil cuttings. An exploratory boring log for this boring is presented in Appendix B.

5.0 GEOLOGIC CONDITIONS

5.1 Regional Geology

The Venice Auxiliary Pumping Plant site is located within the Los Angeles Basin part of the Peninsular Ranges geomorphic province, which extends from Southern California to the southern tip of Baja California. This province is characterized by elongate northwest-trending mountain ridges separated by straight-sided sediment-filled valleys. The northwest trend is further displayed in the dominant structural features of the province, which are northwest to west-northwest trending folds and faults, such as the nearby Newport-Inglewood fault zone.

The site is located in an alluviated lowland area in the west portion of the Los Angeles Basin, a northwest trending alluviated plain about 50 miles long and 20 miles wide. The Basin is bound on the north by the Santa Monica Mountains and the Elysian, Repetto, and Puente Hills, and on the east and southeast by the Santa Ana Mountains and San Joaquin Hills. The aerially extensive alluviated plain slopes southward and seaward however in the vicinity of the project the plain is interrupted by the Baldwin Hills and Beverly Hills. The Baldwin Hills are the northern extension of the Newport-Inglewood structural block which has uplifted the Baldwin Hills, Dominquez Hills, and Signal Hill located to the south.

The Los Angeles Basin is underlain by a deep structural depression. Parts of this depression have been filled with sediments discontinuously since the Late Cretaceous (starting about 85 million years ago). Starting in the middle Miocene (about 20 million years ago) the basin (which extended to the Ventura Basin) continuously subsided as sediments were deposited. The buried basement surface has relief of as much as 4.5 miles in a distance of 8 miles (Yerkes, et al, 1965).

5.2 Local Geologic Setting

The Marina Del Rey and Venice areas were once a large wetland marsh fed by the meandering Ballona Creek, which drained into the Santa Monica Bay near the current location. The 1924 United States Geological Survey Map of the Venice Quadrangle shows the project site is adjacent to a large lowland marsh area northeast of the Grand Canal. The elevation of the site was approximately 5 feet above sea level. Surficial geologic exposures are all Quaternary Age sedimentary units.

5.3 Stratigraphy

5.3.1 Fill (af)

Artificial fill soils exist within the site as the result of previous construction and/or previous construction activities on the site. In general, the depth of fill is expected to be on the order of three to four feet within the site. Fill depths may be deeper in some areas. The fill materials generally consist of silty sand and sand with some construction debris.

5.3.2 Alluvium (Qa)

Alluvial sediments encountered in the borings were primarily coarse grained soils consisting of gravels, sands, and silty sands with interlayered fine grained soils consisting of silts and clays.

Coarse-grained alluvial materials range widely in type and consistency from poorly graded sands and gravels to silty and clayey sands. Generally, the coarse alluvium soils are typically brown or light brown in color though they may be gray or olive with high fine contents in the case of silty or clayey sands. The coarse grained materials are moist to wet, loose to very dense with varying amounts of silt, clay, gravel, and cobbles.

The fine-grained materials are typically moist to wet. Fine-grained alluvium consists of lean and fat (low to high plasticity) silts and clays of very soft to hard consistency. Generally, the fine grained alluvial soils are brown, dark brown, dark gray or greenish gray in color.

Seashells and seashell fragments were observed in many of the samples collected from the borings. These materials were observed to be interspersed anywhere within the matrix of the soil and as concentrated lenses and layers of several inches in thickness.

More detailed descriptions of the alluvium can be found in the boring logs in Appendices A and B.

5.4 Groundwater

The Grand Canal and the Venice Canals convey surface water runoff from nearby areas to the Marina Del Rey entrance channel. The Marina Del Rey harbor and entrance channel are also unlined, and was constructed via dredging in the 1950's. In order to reduce the chance of flooding low lying areas along the Grand Canal, the County of Los Angeles maintains tide gates that control flow into and out of the Grand Canal from the Marina Del Rey entrance channel. County personnel report that when a high tide in excess of 5.7 feet above sea level is forecast, the tide gates are closed. In the past, when tide gates were not closed, water levels in the Grand Canal increased and local flooding resulted. Historically, groundwater levels have been measured near the ground surface in the project area.

Measured groundwater levels in the project area have generally varied between elevations of -2 to +4 feet of sea level. Groundwater levels beneath the site fluctuate as the result of seasonal variations and tidal fluctuations. Based on the available geotechnical data, a baseline groundwater elevation of one foot above sea level has been selected for the project.

6.0 FAULTING AND SEISMICITY

The site lies within Seismic Zone 4 of the 2010 California Building Code (CBC). Primary seismic hazards that could affect the site include ground motion or shaking, ground surface rupture along faults, liquefaction, and earthquake-induced landslides.

6.1 Ground Motion

Based on the current understanding of the geologic framework of the site area, the seismic hazard which is expected to have the highest probability of affecting the site is ground shaking or motion resulting from an earthquake occurring along any of several major active and potentially active faults in Southern California. Known regional faults that could produce significant ground shaking at the site include the Malibu Coast, Santa Monica, Palos Verdes, Newport-Inglewood, among others.

Ground motion parameters were determined for the site using the United States Geological Survey (USGS) 2008 Probabilistic Seismic Hazard Analysis Interactive Deaggregation web tool. The site longitude and latitude, a 10% probability of

exceedance in 50 years and an average shear wave velocity of 230 meters per second for the upper 100 feet of subsurface were input into the program. Using these parameters a peak ground acceleration of 0.4g was determined for the site. The program also calculated a mean earthquake magnitude of 6.7 at a distance of 20.5 kilometers from the site.

6.2 Ground Rupture and Deformation

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 (Act) requires that "Earthquake Fault Zones" be established along the trace of active faults. The purpose of the Act is to regulate development near active faults so as to mitigate the hazard of surface fault rupture. Earthquake faults that are "sufficiently active" (have evidence of surface displacement within Holocene time or the last 11,000 years) and "well-defined" (a fault whose trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface) are subject to zoning. Under the Act, the State Geologist is required to delineate Earthquake Fault Zones along all sufficiently active and well-defined faults that constitute a hazard to structures from surface displacement. Maps depicting the Earthquake Fault Zones are issued by the California Geological Survey (CGS). According to the CGS, the site is not located within an Alquist-Priolo Earthquake Fault Zone and no faults are known to be in close proximity of the site.

6.3 Liquefaction

According to the State of California Seismic Hazard Zones Map (Figure 4), the site is located within an area that has potential for liquefaction. Liquefaction is a process that occurs when saturated sediments are subjected to repeated strain reversals during a seismic event. The strain reversals cause an increase in pore water pressure such that the internal pore pressure approaches the overburden pressure and the shear strength approaches a low residual value. Liquefied soils are subject to flow, consolidation, or excessive strain. Liquefaction typically occurs in loose to medium dense sand and silty sand soils below the groundwater table. Predominately fine-grained soils, such as silts and clays are less susceptible to liquefaction.

Liquefaction analyses were performed for a ground acceleration of 0.43g (2/3 of the Maximum Considered Earthquake-Geometric Mean ground acceleration of 0.642g). The analyses were performed for the deepest rotary wash boring, RW-2, located near the center of the site. The analyses were performed with consideration to the soil particle size and plasticity information obtained through laboratory testing, and the measured and anticipated high groundwater levels. Potential liquefaction induced settlements on the order of 1-3/4 inches were calculated for the project site.

6.4 Earthquake-Induced Landslides

As shown by the State of California Seismic Hazard Zones Map (Figure 4), the site is not within a zone of earthquake-induced landslide potential.

6.5 Seismic Design Parameters

Table 1613.5.2 of 2013 California Building Code - "Site Class Definitions" list six Site Classes (A through F). The Site Class is based on the average properties of the upper 100 feet of the soil and/or bedrock beneath the site. The appropriate Site Class is chosen by referencing the average shear wave velocity, average Standard Penetration Test blow counts, and/or average undrained shear strength. Based on data obtained from the deepest boring, Site Class D is recommended for this site.

The mapped acceleration parameters Ss and S_1, 0.2 and 1-second spectral response accelerations, were determined and used along with the Site Class to obtain the site coefficients Fa and Fv. The maximum considered earthquake spectral response acceleration for short periods, S_{MS}, and at the 1.0-second period, S_{M1}, adjusted for Site Class effects were then calculated followed by the calculation of the design spectral response acceleration for short periods, S_{DS}, and at the 1.0-second period, S_{D1}. The values of T_O and T_S, in seconds, were then determined using the equations presented in the code to represent the beginning and end of the design response spectra peak.

The seismic parameter values for the site are summarized in Table 1, Seismic Design Parameters.

Table 1 – Seismic Design Parameters

Parameter	Value	2008 LABC Reference
Site Class	D	Table 1613.5.2
S_s	1.661	Figure 1613.5(3)
S_1	0.660	Figure 1613.5(4)
S_{MS}	1.661	Equation 16-37
S_{M1}	0.990	Equation 16-38
S_{DS}	1.107	Equation 16-39
S_{D1}	0.660	Equation 16-40
T_O (seconds)	0.119	Chapter 16
T_S (seconds)	0.596	Chapter 16

7.0 LABORATORY TESTING

Selected soil samples were tested for the following properties:

- In-Place Dry Density and Field Moisture (D2937)
- Laboratory Maximum Dry Density and Optimum Moisture Content (ASTM D1557)
- Consolidation (ASTM D 2435)
- Direct Shear (ASTM D 3080)
- Unconfined Compression Strength (ASTM D 2166)
- Triaxial Compresion Strength (ASTM D2850)
- Sieve and Hydrometer Analysis (ASTM D422)
- Liquid Limit and Plasticity Index (ASTM D4318)
- Conductivity (EPA 120.1)
- Chlorides (EPA 300.0)
- pH (SM 4500-H+B)
- Sulfates (EPA 300.0)

Laboratory test results are presented in Appendices A and B.

8.0 SITE RECOMMENDATIONS

8.1 General

Our primary geotechnical consideration with respect to the proposed construction is the existing uncertified fill soils and compressible shallow soils within the site, the potential for liquefaction at the site, and the potential for methane gas. Remedial earthwork is recommended in the area of the electrical building to provide suitable foundation support. To mitigate the potential effects of soil liquefaction, we recommend the project structures be supported on concrete mat foundations. Mat foundations should be designed and constructed to accommodate the estimated potential total and differential seismic induced settlements presented herein. The requirements of the Methane Study report shall be incorporated into the design and construction of the project. A copy of the methane report is presented in Appendix C of this report.

Detailed geotechnical engineering recommendations addressing the surficial soils, site preparation, site earthwork, foundations and retaining walls are presented in the remaining portions of this report. The following opinions, conclusions, and recommendations are based on the properties of materials encountered in the geotechnical field investigations and laboratory test results.

A representative of GEO will need to provide observation and testing services during site earthwork and construction of foundations. This will allow us the opportunity to compare actual conditions with those encountered in the exploratory borings and, if necessary, to expedite supplemental recommendations if warranted by the exposed subsurface conditions. We shall also review the preliminary foundation and earthwork plans and specifications. Specifications for groundwater control and discharge, shoring and jet grouting shall also be reviewed by our office. These reviews will provide us an opportunity to detect misinterpretation or misunderstandings of our recommendations prior to advertising the project for construction.

8.2 Site Clearing

Prior to construction, all organic or inorganic materials shall be removed from the construction area and disposed of outside the site. Any existing structural or landscape elements within these areas, including any foundation elements, shall be demolished and removed from the site. Any utilities, whether active or inactive, shall be identified and removed from the site or relocated per project plans and specifications. Any cavities resulting from removal of any existing foundations or utility lines shall be properly backfilled and compacted in accordance with the following sections.

8.3 Groundwater Control During Construction

Dewatering from outside of excavations is not allowed. Continuous, solid impervious shoring extending below planned excavation depths, to act as a groundwater cut-off, is required for all excavations that extend more than 3 feet below the baseline groundwater level. Acceptable methods of impervious shoring include sheet piles, secant piles or diaphragm walls.

In addition, Jet grouting shall be performed to create a structural and watertight bottom seal beneath the wetwell/vault structure and diversion structure. Jet grouting can also be used to create a bottom seal for the sewer pipe that will be constructed between the new diversion structure and the auxiliary pumping plant wetwell and the 42-inch header pipe. The zones of jet grouting shall extend from the bottom of proposed excavation to an elevation of at least -35 feet (below sea level). Jetted grouted bottom seals shall be in-place prior to excavating below the baseline groundwater level.

Actual plan dimensions and depths of the jetted grouted bottom seals shall be designed by a specialty geotechnical contractor and endorsed by a Geotechnical Engineer or Engineering Geologist with at least five years of experience in groundwater control applications in excavations. Calculations supporting the design dimensions of the treatment areas shall be provided to demonstrate that the goals of the treatment will be fulfilled and that the treated areas will have adequate factors of safety against bottom heave and piping.

Carefully controlled dewatering, in combination with continuous impervious shoring functioning as a groundwater cut-off, may be used to control groundwater to facilitate construction of the 66-inch diameter reinforced concrete sewer pipe as an alternative to jet grouting. This method of dewatering can also be used to facilitate construction of the 42-inch header pipe. For this method, impervious shoring shall be installed to extend from the ground surface to an elevation of -25 feet (below sea level) or deeper. Dewatering wells shall be located within the shored excavations and shall be constructed with the well points above the bottom of the shoring. The dewatering system shall be designed, constructed and operated to lower the ground water level within the excavation to at least 3 feet below the bottom of the excavation without drawing down groundwater levels outside the excavations. Dewatering to below the planned depth of excavation shall be completed prior to excavating below the baseline ground water level. The drawn down groundwater level should be maintained at least three (3) feet below the bottom of excavations until construction has progressed above the surrounding static groundwater level and sufficient structural dead-load and backfill have been placed to counteract hydrostatic uplift pressures. Backfill may be assumed to have a unit weight of 105 (pcf) above groundwater. Submerged backfill may be assumed to have a buoyant unit weight of 42 pcf. Monitoring wells shall be installed outside of the excavations. The locations shall be approved by GEO. Groundwater recharge shall be performed as necessary to maintain groundwater levels outside of excavations at their natural levels.

Sump pumps shall be provided at the base of excavations which extend below the baseline groundwater level to facilitate removal of any water that seeps into the excavations through the shoring system.

Any groundwater pumped from excavations shall be discharged into nearby sanitary sewers and discharge rates into the sewers shall not exceed those allowed by the Bureau of Sanitation.

8.4 Temporary Sloped Excavations

Based on our observations during subsurface investigation and results of laboratory tests, the materials at the site should be readily excavated by conventional earthmoving equipment in good operating condition. All temporary excavations shall conform to the State of California Construction Safety Orders (CAL/OSHA).

In level areas, unsurcharged, temporary vertical excavations can be a maximum depth of four feet. Unsurcharged excavations greater than 4 feet, to a maximum of 8 feet, in level areas shall be sloped at a 1:1 (H:V) or flatter inclination from the ground surface to the bottom of the excavation or should be shored. Excavations greater than 8 feet should be shored.

Any excavation that enters the influence zone (imaginary plane extending downward at a 1:1 inclination) of an adjacent structure, private property or right-of-way subject to vehicle loading shall utilize shoring.

8.5 Excavation Support

8.5.1 Excavation Methods

Based on the available geotechnical data and construction experience in similar materials, it is anticipated that excavations can be achieved using heavy excavation equipment. The artificial fill and alluvium can be excavated with backhoes, clam shells, excavators, dozers, and other hydraulic equipment.

In sizing and laying out excavations, the Contractor must consider allowable construction limits shown on the Contract Drawings, requirements for construction of permanent structures (indicated on the Contract Drawings), as well as requirements for construction methods selected for the work. The following sections address excavation methods and support requirements.

8.5.2 Excavation Support Requirements

Excavations will require continuous support unless the soils are strengthened or stabilized by implementing an effective ground improvement technique. Acceptable excavation support systems for excavations that extend more than three feet below the baseline groundwater level include water-tight interlocking sheet piling, secant piles or diaphragm walls or other approved water tight shoring.

Dewatering or bottom seals placed "in the wet" are not permitted. The relatively water-tight excavation support systems shall extend a sufficient depth below the bottom of the planned excavations to prevent heave and/or piping of excavation bottoms. Design of the embedment depth of the water tight shoring below the base of excavations shall be based on the assumption that the extension is embedded in pervious granular soils with seashell lenses and layers. Ground treatment consisting of jet grouting below the excavation bottom is also required for the wetwell/valve vault structure and the diversion structure to further reduce groundwater in-flow and the potential for bottom instability. As an alternative to jet grouting, impervious shoring and dewatering in accordance with the recommendations of section 8.3 can be used to facilitate construction of the 66-inch diameter reinforced concrete sewer pipe and 42-inch header pipe. Calculations supporting the design of the shoring cut-off depth and depth of jet grouting below the excavation bottoms shall be included in the shoring submittal.

Shoring for excavations shall be installed in accordance with the General Requirements, the project specifications and Section 306-1.1.6 of the Standard Specifications for Public Works Construction (SSPWC), most current edition adopted by the Board of Public Works. Design of shoring shall be in accordance with Title 8, Division 1, Chapter

4, Subchapter 4 of the California Code of Regulations: CAL/OSHA Construction Safety Orders or the lateral earth pressure distributions recommended in the following section of this report. Based on the soil classification system presented in the Construction Safety Orders, the site soils shall be considered as Type C soils. All shoring systems shall be designed for maximum deflections of ½-inch.

Where bracing is used, each excavation sequence must be designed to allow removals of struts during construction of permanent facilities within excavations and as excavations are backfilled.

Sheet piles, if used shall be installed and extracted using vibration- and percussive-free methods. Coating should be applied to the sheet piles to prevent the soils from adhering to the sheet piles to facilitate removal of the sheet piles at the end of construction.

For secant pile shoring, casing or other methods approved by the geotechnical engineer of record shall be used to support the sides of pile excavations in the artificial fill and alluvial materials. The inside diameter of casing shall be at least as large as the diameter of the pile as indicated on the plans. Drilling shall be accomplished within the casing. Drilling fluids shall not be used to support the sides of the excavation without the review and approval of GEO.

All proposed shoring system designs including supporting documentation and calculations shall be submitted to GEO for review and approval in reference to existing soil conditions. All shoring systems must meet the following minimum requirements to be considered for review.

- Shoring shall directly support the sides of the excavation. Shoring shall be designed to minimize the development and presence of voids behind shoring support.
- Shoring installation procedures shall be designed so that no person is required to enter an unsupported excavation greater than 5 feet in depth at any time.

Trench box and shield systems are not allowed as shoring for the project. Trench box or shield systems do not adequately support the adjacent soil and utilities. Also, voids can occur between the outside of the box and the firm soil.

8.5.3 Design Earth Pressures

Temporary internally braced shoring shall be designed using a lateral soil equivalent fluid pressure of 48 pounds per cubic foot (pcf) above groundwater. Below groundwater, the design soil lateral earth pressure can be assumed to increase at a rate of 24 pcf for braced shoring. Cantilevered shoring shall be designed using an effective fluid pressure (EFP) of 36 pounds per cubic foot (pcf). Cantilevered shoring shall not be allowed in areas where existing utilities and structures are located within a 1:1 projection upward from the bottom of the planned excavation. Hydrostatic pressures shall be added to the

lateral earth pressures for the portions of shoring that extend below the baseline groundwater level. These design pressures assume level backslopes.

A surcharge load equivalent to an additional 2 feet of retained soil shall be applied to the upper 10 feet of shoring. The minimum surcharge load shall be 100 psf. Heavy construction equipment wheel or outrigger loads shall not be located within a distance equal to 0.7H feet the face of the shoring unless considered as surcharge loads in the Contractor's shoring calculations.

Allowable passive earth pressures equal to 150 pounds per square foot (psf) per foot of depth below groundwater and 300 psf per foot of depth above groundwater, measured below the base on the planned excavation, to a maximum value of 3,000 psf can be used for resistance in the alluvium materials.

8.6 Over-excavation

All existing fill materials shall be removed from the area of the proposed electrical building. This area shall be further excavated as necessary to a depth of seven feet below the existing ground surface or to three feet below the bottom of the proposed mat foundation, whichever is deeper. Over-excavation depths may have to be greater in some areas to remove unsuitable soils. Removal excavations should extend a horizontal distance beyond the edges of the foundations equal to the depth of over excavation below the foundations or a minimum of 5 feet, whichever is greater. All exposed subgrade soil surfaces shall be observed by a representative of the GEO and the City of Los Angeles Grading Inspector prior to placement of fill.

Shallow sump pumps may be necessary to control groundwater within the over-excavation area. The exposed soils in the over-excavation bottom may be susceptible to pumping. The contractor should take precautionary measures to avoid disturbance of the over-excavation bottom. Heavy construction equipment, such as trucks or rubber tired equipment should not be allowed to operate within the over-excavation area. Over-excavation should be accomplished with excavation equipment operating from outside the over-excavation area to the extent possible. With-in the over-excavation area, only low ground pressure equipment should be used to excavate, place and compact materials over the over-excavation bottom. Track-mounted equipment will lessen the softening of wet soils as a result of the "pumping" action of moving heavy wheel loads.

After over-excavating for the foundation of the electrical building, the following shall be performed;

- The exposed over-excavation bottom shall be observed by a representative of the GEO and the City of Los Angeles Grading Inspector. The bottom shall be smooth and uniform (free of ruts). If necessary, additional over-excavation shall be performed as directed by the GEO. If additional over-excavation isn't

necessary, the subgrade shall be prepared as directed by the GEO.

- Place a Geotextile fabric over the over-excavation bottom. The geotextile shall be placed in accordance with manufacturer's recommendations. The geotextile fabric shall be temporary extended up the excavation slopes. The geofabric shall comply with following minimum requirements: Density of 6 ounces per square yard or more, Grab Tensile Strength (ASTM D-4632) of 120 pounds, Grab Tensile Elongation (ASTM D-4632) of 50%, Trapezoidal Tear Strength (ASTM D-4533) of 50 pounds. No equipment should operate directly over the geotextile fabric.

- Place a 24-inch layer of 1-inch crushed rock over the entire over-excavated area. Densify the crushed rock using vibration and track walking. Cover the crushed rock with the geotextile fabric that was temporary extended up the slopes of the excavation. Use additional geotextile fabric to completely cover the crushed rock. Overlap all seams per the geotextile manufacturer's recommendations.

- Place an 8-inch layer of Crushed Miscellaneous Base (CMB) over the geofabric. The CMB shall be moisture conditioned and compacted to at least 95-percent relative compaction.

- If pumping is observed, additional base shall be placed in 6-inch lifts until pumping ceases.

- Once pumping ceases, place a geotextile fabric over the compacted base and place suitable fill materials in lifts of 8 inches or less in thickness (before compaction) to finish subgrade elevation (base on the methane mitigation system). Each lift shall be moisture conditioned and compacted as specified section 8.9 of this report.

Exterior slab-on-grade and any pavement areas, should be over-excavated to a depth of at least 12 inches below existing grade or the finish subgrade elevation, whichever is lower, and replaced with properly compacted fill. Removal excavations should extend a horizontal distance of at least 2 feet beyond the plan dimensions of slabs-on-grade or pavements.

8.7 Subgrade Preparation

All exposed subgrade soil surfaces shall be observed by a representative of the GEO and the City of Los Angeles Grading Inspector prior to placement of fill. If soft, yielding, or unsuitable soils are exposed at the subgrade surface, then the unsuitable soils should be removed and replaced with properly compacted fill soils. Due to the nature of the site soils and shallow groundwater levels, unsuitable soft wet soils will be encountered below the ground surface in some areas. If a suitable bottom is not

obtainable within a reasonable depth of the excavation subgrade elevation, supplemental recommendations will be provided during construction to stabilize areas of soft soils.

Subgrade surfaces suitable for fill placement should be scarified to a depth of 6 inches, moisture-conditioned and compacted. Subgrade soils shall be moisture conditioned to between optimum moisture content and 2 percent above the optimum moisture content, at the time of compaction, and compacted to a minimum of 95 percent of the ASTM Test Method D1557-91 laboratory maximum density to a depth of 6 inches. After the completion and acceptance of the subgrade preparation, fill material may be placed in accordance with Section 8.9 of this report. Subgrade soils shall be kept moist (between 0 and 2 percent above the optimum moisture content) but not flooded until covered with subsequent fill or construction.

8.8 Fill Materials

Fill soils shall consist of select on-site soils or approved import material. The on-site soils encountered during the geotechnical investigation are generally acceptable for use as fill material for this project. On-site clayey and silty soils (such as elastic silt encountered in boring RW-1 between 4 and 6 feet) may not be used as fill within the electrical building footprint, below slabs or behind retaining walls. Before being used as fill, on-site soils shall be cleaned of all organic or inorganic debris and all materials with any dimension larger than 3 inches. Drying of wet site soils or mixing of these soils with dryer soils may be required prior to being used as compacted fill. Import material for use as fill for this project shall be predominantly granular (minimum 80% passing number 4 sieve and 25% or less passing the number 200 sieve), non-expansive (EI less than 20), and shall be free of organic or inorganic debris, contamination and materials with any dimension larger than 3 inches. Import material shall be tested and approved by GEO prior to importing to the job site. GEO shall be notified a minimum of five working days prior to scheduled importing of soil to the project site.

8.9 Fill and Backfill Placement

Structural fill shall only be placed on approved surfaces/subgrades prepared in accordance with Section 8.7 of this report. Fill material shall be placed in loose lifts not exceeding 8 inches in thickness, moisture-conditioned between 0 to 2 percent over the optimum moisture content and mechanically compacted. Fill soils placed below building foundations or slabs-on-grade shall be compacted to a minimum of 95 percent relative compaction, as determined by ASTM Test Method D1557.

Fill soils placed in non-structural areas such as paved areas, sidewalks, and landscaped areas shall be compacted to a minimum of 90 percent relative compaction, as determined by ASTM Test Method D1557. Any aggregate base should be moisture-conditioned between optimum and two percent above optimum-moisture and compacted to a minimum of 95 percent relative compaction.

Fill compaction shall be tested and recorded by a certified compaction testing agency working under the direct supervision of GEO. Densification by flooding or jetting is not allowed. Compacted fill soils shall be kept moist, (at or slightly above the specified moisture content at the time of compaction) but not flooded, until covered with subsequent construction. If fill soils are softened or eroded by excessive moisture or construction disturbance, they shall be replaced or recompacted at the discretion of the Geotechnical Engineer before additional fill or construction is placed. Certification and inspection approvals for compromised soils are void and invalid.

8.10 Trench Backfill

Trench excavations for utility pipes may be backfilled with on-site soils under the observation of a representative of GEO. After utility pipes have been laid, properly bedded, and covered per the project specifications, they shall be backfilled to the ground surface or design subgrade with controlled backfill. Controlled backfill shall be moisture conditioned, placed and compacted in accordance with the recommendations presented in Section 8.9 of this report.

8.11 Liquefaction Considerations

Based on the data presented in Section 3 of this report and the results of the liquefaction calculations, potential liquefaction induced settlements on the order of 1-3/4 inches are estimated for the site. A potential liquefaction induced differential settlement of 1 inch is estimated between the proposed structures and the pipe header. These potential liquefaction induced settlements shall be considered and accounted for in the design and construction of the project.

8.12 Mat Foundations

Mat foundations are recommended for support of the project structures with the understanding that the foundations will be susceptible to liquefaction induced settlements. Mat foundations for the wetwell/valve structure and diversion structures shall be founded on natural soils that have been jet grouted to create an excavation bottom seal. The mat foundation for the electrical building shall be founded on compacted fill soil. Mat foundations shall be designed and constructed to bear at a depth of at least 24 inches below the lowest adjacent grade. Mat foundations can be designed for an allowable bearing capacity of 1,500 pounds per square foot. A coefficient of vertical subgrade reaction, for a 1-foot-square loaded area, of 100 kips per cubic foot (kcf) may be used for design of the mats.

Total static settlement of the proposed foundations, designed and constructed in accordance with the recommendations presented herein, should not exceed 1-inch. Differential static settlement should not exceed one-half of the total settlement. The majority of these settlements are expected to occur within a year of construction. In

addition, the foundation will also be potentially susceptible to seismically induced settlements. Potential total and differential seismically induced settlements of 1-3/4 inches or less and 1 inch have been estimated for the project structures. The structural design of the proposed structures should consider the possibility that the estimated magnitudes of seismically induced settlement could occur during the life of the structures. The actual magnitude of total and differential static settlements of the mat foundations will be a function of the structural design and stiffness of the mats.

Resistance to lateral loads can be provided by friction acting at the base of the foundation and by passive earth pressure. A coefficient of friction of 0.35 may be assumed with dead-load forces. An allowable passive lateral earth pressure of 250 psf per foot of depth up to a maximum of 2,500 psf may be used for sides of the foundation poured against undisturbed natural soil or properly compacted fill. The allowable passive pressure may be increased by 33 percent of lateral loading due to wind or seismic forces.

8.13 Retaining Walls

Cantilevered retaining walls that retain a level granular (sand equivalent of 30 or greater) non-expansive backfill for a horizontal distance equal to or greater than the height of the wall may be designed for an active equivalent fluid pressure of 30 pcf. Walls that are fixed against rotation (no movement allowed) supporting a level ground surface and retaining native soils or granular (sand equivalent of 30 or greater) non-expansive backfill for a horizontal distance equal to or greater than the height of the wall can be designed using at-rest uniform pressure of 27H psf. Hydrostatic pressures shall be added to the lateral earth pressures for the portions of retaining walls that extend below the baseline groundwater level. A lateral seismic load of 24 psf per foot of height starting from 0 at the base of the retaining walls and increasing to a maximum at the top of the retaining walls can be considered for seismic conditions.

In addition to the above lateral pressures from retained earth, lateral pressures from other superimposed loads, such as those from vehicle traffic and adjacent structures, should be added, if the loads fall within a 1:1 projection of wall foundations. The effects of any surcharge loads should be added to the above recommended lateral earth pressures.

Backfill behind retaining walls should consist of free-draining granular soil as described in Section 8.8. Backfill should be placed in 8-inch or thinner loose lifts and compacted to a minimum of 90 percent of the ASTM Test Method D1557 maximum density. Compaction should be performed by mechanical means only and monitored by testing during construction. Care should be taken not to damage walls during backfill operations. Concrete should attain the strength specified by the structural designer prior to placement of large quantities of backfill.

Earth pressures presented herein also assume that only hand operated compaction equipment will be used within five feet of walls to limit compaction lateral stresses. The operation of compaction equipment behind retaining walls can induce horizontal pressures in excess of the at-rest pressures on the wall. To help reduce the development of excessive horizontal pressures over-compaction should be avoided.

Earth pressures used in the design of the walls should be indicated on the retaining wall plans. All retaining wall designs and plans should be reviewed by the project geotechnical consultant to confirm that the appropriate soil parameters are used.

Final surface grades should be sloped at a gradient such that surface water drains away from structures and retaining walls.

8.14 Cement Type and Corrosion Measures

Based on the results of soluble sulfate content testing of near-surface soils and our understanding of the proposed improvements, GEO recommends that Type II or Type V cement be used. Based on other test results including pH, chloride content, acidity, and conductivity, the site soils are moderately to severely corrosive. A corrosion expert should make the final determination of what corrosion measures are necessary for the project.

9.0 SUPPLEMENTAL GEOTECHNICAL SERVICES

9.1 Review of Plans and Specifications

The grading and foundation plans and specifications should implement the recommendations presented in this report and should be reviewed by GEO to ensure proper interpretation and application of our recommendations.

9.2 Geotechnical Observation and Testing During Construction

All grading, excavation, and construction of foundations should be performed under the observation and testing of the Geotechnical Engineer at the following stages:

- Upon completion of site clearing;
- During shoring installation;
- During jet grouting;
- During site excavation;
- During subgrade preparation;
- During fill placement;

- After excavation of foundations and immediately prior to placement of foundation concrete;
- During excavation and backfilling of all utility trenches; and
- When any unusual or unexpected geotechnical conditions are encountered

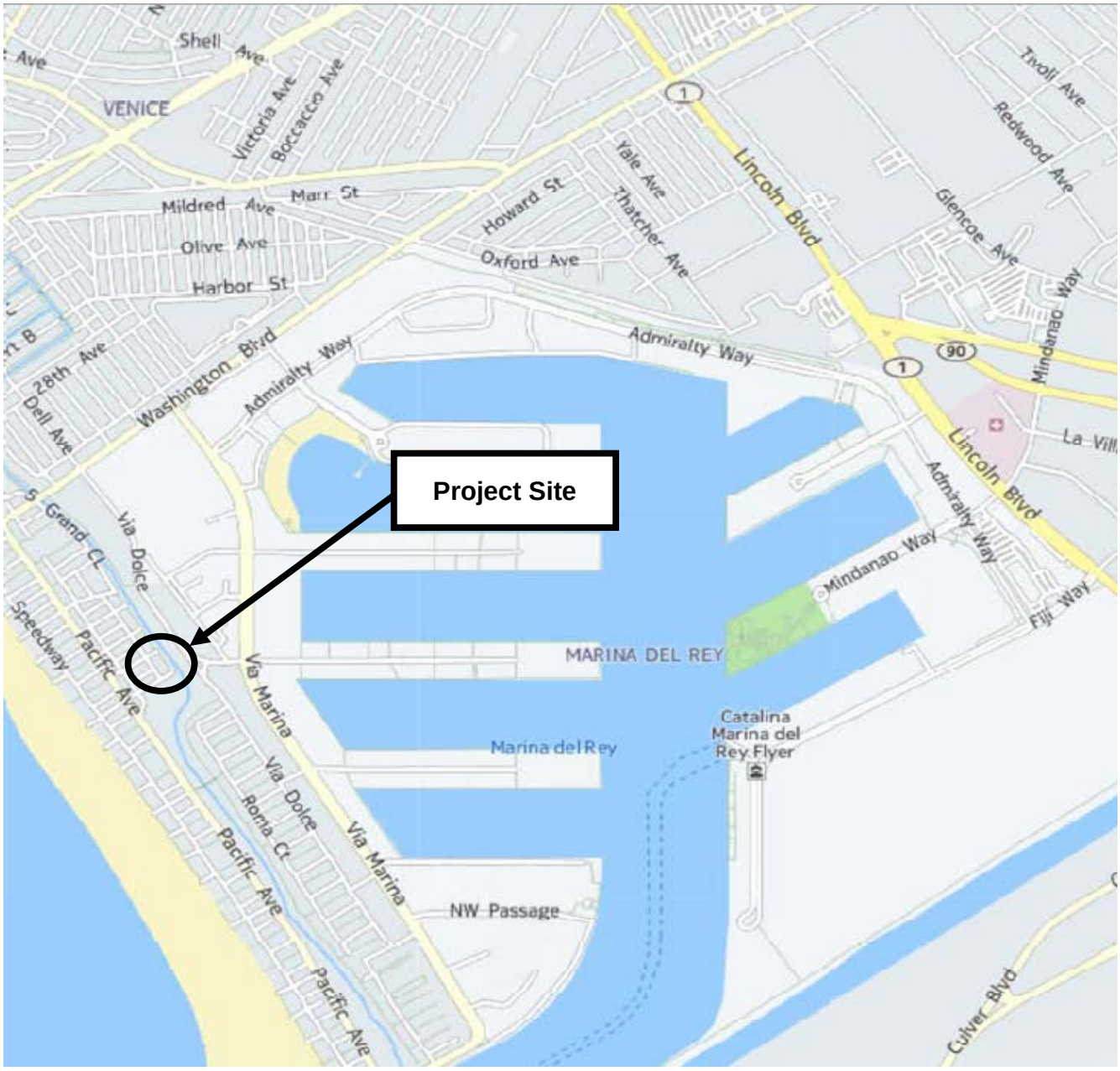
10.0 Closure

If there are any questions regarding this report, please contact Patrick Schmidt at (213) 847-0535 or Fred Burnett at (213) 847-0523.



Patrick J. Schmidt, GE 2260
Geotechnical Engineer II

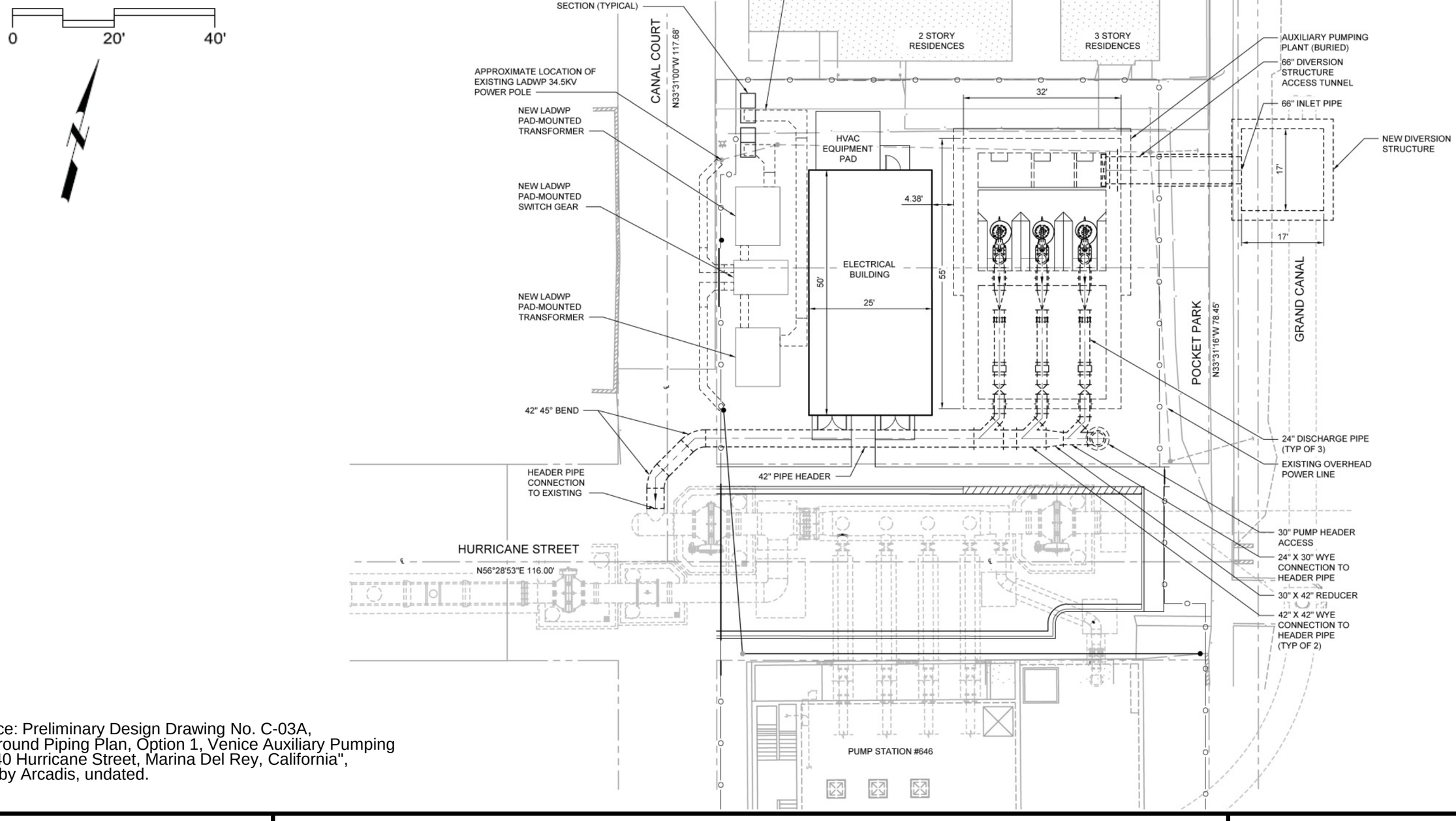
Fred W. Burnett, CEG 2052
Engineering Geologist I



N

VICINITY MAP

VENICE AUXILIARY PUMPING PLANT **133 East Hurricane Street** **Venice Area of Los Angeles, CA**	BUREAU OF ENGINEERING GEOTECHNICAL ENGINEERING GROUP (GEO) FILE No.: 14-103 DATE: December 2015	**FIGURE 1**



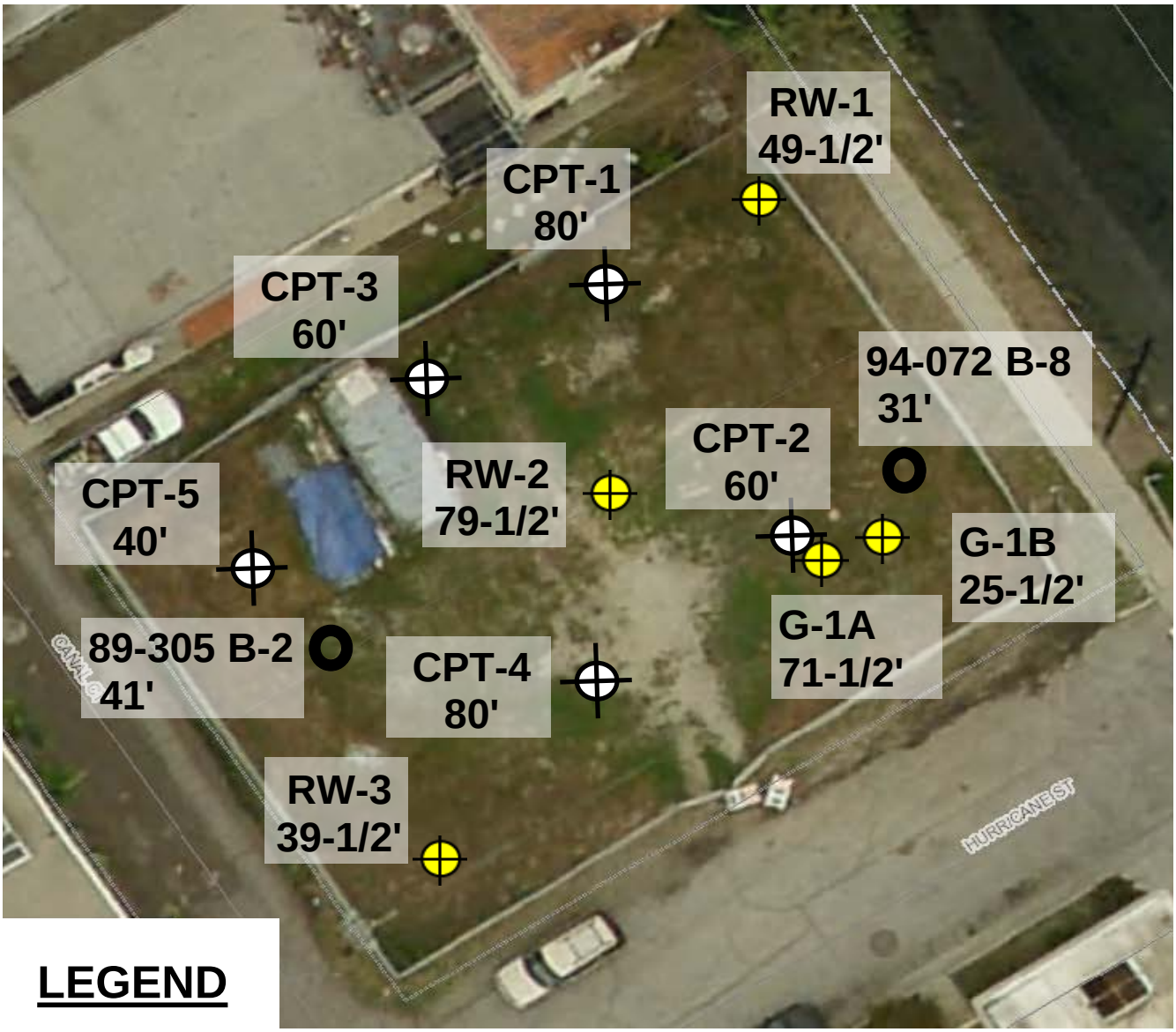
Reference: Preliminary Design Drawing No. C-03A, "Underground Piping Plan, Option 1, Venice Auxiliary Pumping Plant, 140 Hurricane Street, Marina Del Rey, California", prepard by Arcadis, undated.

VENICE AUXILIARY PUMPING PLANT

133 East Hurricane Street
Venice Area of Los Angeles, CA

PROPOSED CONSTRUCTION
BUREAU OF ENGINEERING
GEOTECHNICAL ENGINEERING GROUP
File No. 14-103 Date December 2015

FIGURE NO. 2



LEGEND

RW-2 — Rotary Wash Boring Number, Location, and Depth in feet

CPT-2 — Cone Penetration Test Number, Location, and Depth in feet

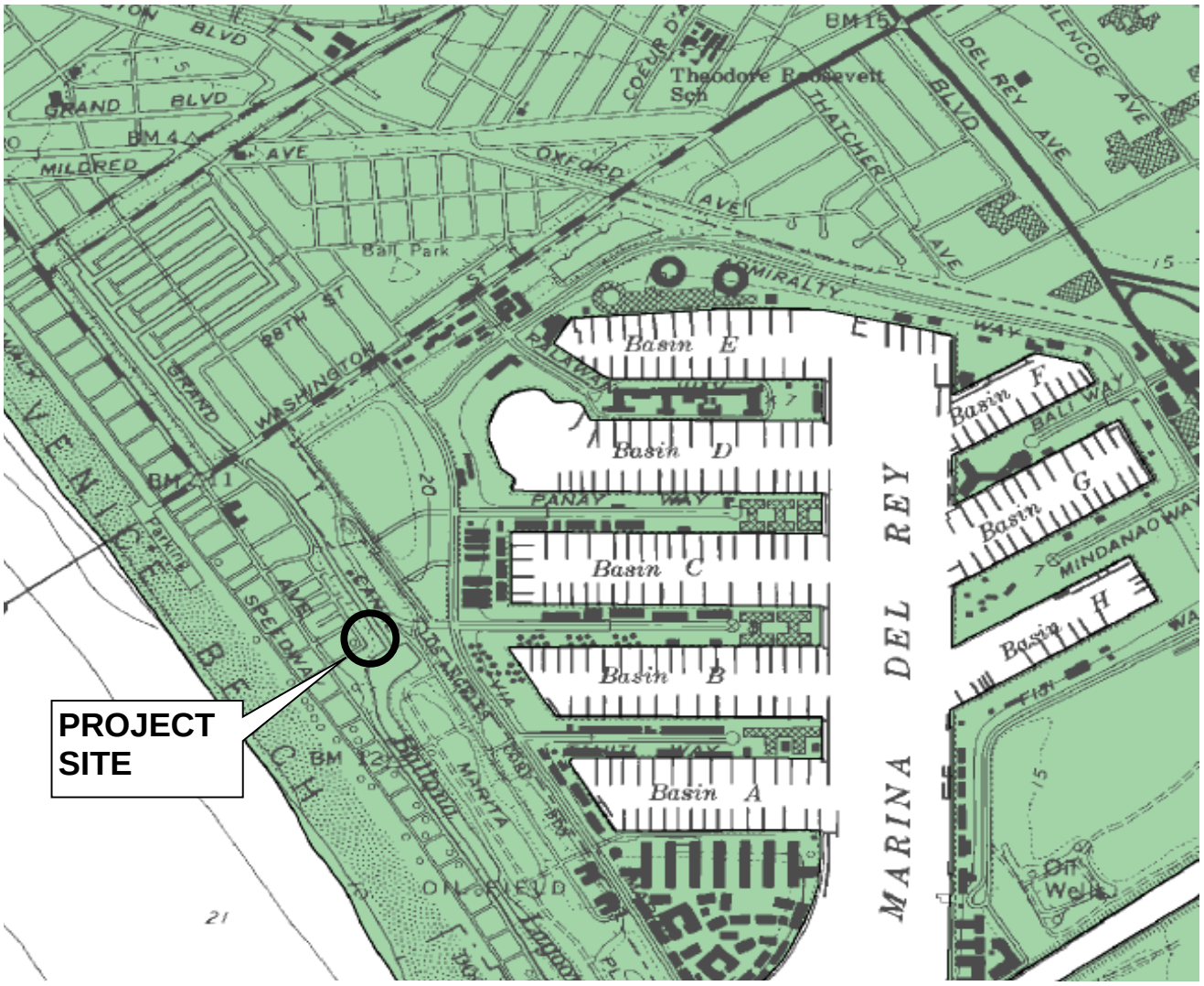
B-2 — Hollowstem Auger Boring Number, Location, and Depth in feet

N

APPROXIMATE SCALE
1 Inch = 20 Feet

EXPLORATION LOCATIONS MAP

VENICE AUXILIARY PUMPING PLANT **133 East Hurricane Street** **Venice Area of Los Angeles, CA**	BUREAU OF ENGINEERING GEOTECHNICAL ENGINEERING GROUP (GEO) FILE No.: 14-103 DATE: December 2015	**FIGURE 3**



Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

SCALE

N

Reference: "Official Map of Seismic Hazard Zones,"Venice", March 25, 1999, California, Department of Conservation, Division of Mines and Geology.

SEISMIC HAZARD ZONES

VENICE AUXILIARY PUMPING PLANT **133 East Hurricane Street** **Venice Area of Los Angeles, CA**	BUREAU OF ENGINEERING GEOTECHNICAL ENGINEERING GROUP (GEO) FILE No.: 14-103 DATE: December 2015	**FIGURE 4**

APPENDIX A

GPI GEOTECHNICAL PROFESSIONALS INC

September 29, 2015

City of Los Angeles
Department of Public Works Bureau of Engineering
Geotechnical Engineering Group
1149 South Broadway, Suite 120
Los Angeles, California 90015

Attention: Mr. Christopher F. Johnson
Manager, Geotechnical Engineering Group

Subject: Data Report
Geotechnical Investigation for
Venice Auxiliary Pump Plant (VAPP)
133 E. Hurricane Street
Venice Area of Los Angeles, California
Contract No. C-121601, Work Order No. SZC 12923
GPI Project No. 2500.06I

Dear Mr. Johnson:

This report presents geotechnical data from a subsurface field investigation and laboratory testing performed by Geotechnical Professionals Inc. (GPI) for the subject project. The site location is presented in Figure 1.

SCOPE OF WORK

The scope of the geotechnical investigation presented in this report was developed by the Geotechnical Engineering Group (GEO) of the City of Los Angeles Department of Public Works, as outlined in Task Order Solicitation No. 14-103 and further updated by GEO staff. We understand that GEO will review the data from this investigation and will be responsible for geotechnical recommendations for the subject project, as the Geotechnical Engineer of Record.

The full scope of work under the subject task order included a geotechnical investigation and a methane investigation. This report presents the results of the geotechnical investigation only. A separate methane investigation was performed by GeoKinetics under subcontract with GPI. Their report was submitted on August 20, 2015.

The geotechnical field investigation included five cone penetration tests to depths ranging from 40 to 80 feet and three rotary wash borings to depths ranging from 40 to 80 feet. The locations of the subsurface explorations were selected by GEO and marked in the field with GPI on July 28, 2015. The approximate locations are presented in Figure 2. A detailed description of CPT field procedures and results, including graphical CPT logs with site-specific soil descriptions, tabular data summaries and shearwave velocity measurements are presented in Appendix A. Field procedures and logs of the rotary wash borings are presented in Appendix B.

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Geotechnical laboratory testing, as requested by GEO, included the following types and number of tests:

- 19 Moisture and Density (ASTM D 2216)
- 8 Percent Passing No. 200 Sieve (ASTM D 1140)
- 16 Full Sieve Analyses (ASTM D 6913)
- 5 Atterberg Limits (ASTM D 4318)
- 1 Compaction (ASTM D 1557)
- 3 Consolidation Tests (ASTM D 2435)
- 8 sets Direct Shear Tests (ASTM D 3080)
- 2 Unconfined Compression (ASTM D 2166)
- 2 Unconsolidated Undrained Triaxial Test (ASTM D 2850)
- 1 Expansion Index (ASTM D 4829)
- 2 sets Corrosivity (California Test Methods 417, 422, 643)

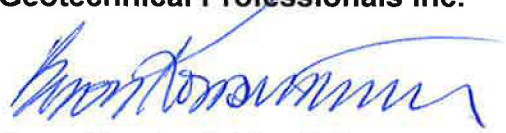
A detailed description of laboratory test procedures and results are presented in Appendix C.

CONCLUDING REMARKS

GPI warrants that the services covered by this report were performed as requested by GEO, in accordance with the standard procedures indicated, and with the standard of care of the geotechnical engineering profession in Southern California at this time. No other warranty or representation is included or intended in this report.

We appreciate the opportunity of offering our services on this project. Do not hesitate to call us if you have any questions on the contents of this report.

Respectfully submitted by,
Geotechnical Professionals Inc.



Byron Konstantinidis, G.E.
Principal



SEP 29 2015

BK:sph

Attachments:
Figure 1 - Site Location Map
Figure 2 - Site Plan
Appendix A - Cone Penetration Test Results
Appendix B - Exploratory Borings
Appendix C - Laboratory Test Results



BASE MAP REPRODUCED FROM MICROSOFT STREETS AND TRIPS (C. 2008)

GPI GEOTECHNICAL PROFESSIONALS, INC.

VENICE AUXILLARY PUMP PLANTS

GPI PROJECT NO. 2500.061 | SCALE: 1" = 2000'

SITE LOCATION MAP

FIGURE 1



EXPLANATION

RW-1 — APPROXIMATE LOCATION AND NUMBER OF EXPLORATORY BORING

C-2 — APPROXIMATE LOCATION AND NUMBER OF CONE PENETRATION TEST

0 30 60 FEET

N

BASE MAP REPRODUCED FROM NAVIGATE LA MAP: (UNDATED)

GPI GEOTECHNICAL PROFESSIONALS, INC.

VENICE AUXILLARY PUMP PLANTS

GPI PROJECT NO.: 2500.061 | SCALE: 1" = 30'

SITE PLAN

FIGURE 2

APPENDIX A

APPENDIX A

CONE PENETRATION TESTS

The subsurface conditions were investigated by performing five Cone Penetration Tests (CPT's) at the site. The soundings were advanced to depths ranging from 40.5 to 80.5 feet below existing grades. The locations of the CPT's are shown on the Site Plan, Figure 2. The latitude and longitude of each CPT location and distances from the northeastern and northwestern fences at the site are presented below:

CPT No.	Latitude	Longitude	Distance (feet)	
			from NE Fence	from NW Fence
C-1	33° 58' 34.44"	-118° 27' 40.62"	32	8
C-2	34.03"	40.33"	22	48
C-3	34.29"	40.89"	48	9
C-4	33.98"	40.67"	51	48
C-5	34.12"	41.13"	75	16

The Cone Penetration Test consists of pushing a cone-tipped probe into the soil deposit while simultaneously recording the cone tip resistance and side friction resistance of the soil to penetration (refer to Figure A-1). The CPT's described in this report were conducted in general accordance with ASTM specifications (ASTM D 5778) using an electric cone penetrometer.

The CPT equipment consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to push the cone and rods into the soil while a continuous record of cone and friction resistance versus depth is obtained in both analog and digital form at the ground surface. A specially designed truck is used to transport and house the test equipment and to provide a 30-ton reaction to the thrust of the hydraulic rams.

Standard data obtained during a CPT consists of continuous stratigraphic information with close vertical resolution. Stratigraphic interpretation is based on relationships between cone tip resistance and friction resistance. The calculated friction ratio (CPT friction sleeve resistance divided by cone tip resistance) is used as an indicator of soil type. Granular soils typically have low friction ratios and high cone resistance, while cohesive or organic soils have high friction ratios and low cone resistance. These stratigraphic material categories form the basis for all subsequent calculations which utilize the CPT data.

Computer plots of the reduced CPT data acquired for this investigation are presented in Figures A-2 to A-6 of this appendix. The field testing and computer processing was performed by Kehoe Testing and Engineering under subcontract to Geotechnical Professionals Inc. (GPI). The interpreted soil descriptions were prepared by GPI.

The CPT locations were laid out in the field by measuring from existing site features. Upon completion, the uncaved portions of the CPT holes were backfilled with bentonite chips.

Ground surface elevations at the CPT locations were estimated from Google Earth and should be considered very approximate.

The cone penetrometer used for the project was equipped with a pore pressure transducer to measure both transient and stabilized pore pressures. At selected depths in sandy soils, the penetration was stopped until stabilized pore pressures were obtained as an indication of the static piezometric groundwater levels. The piezometric measurements are summarized below.

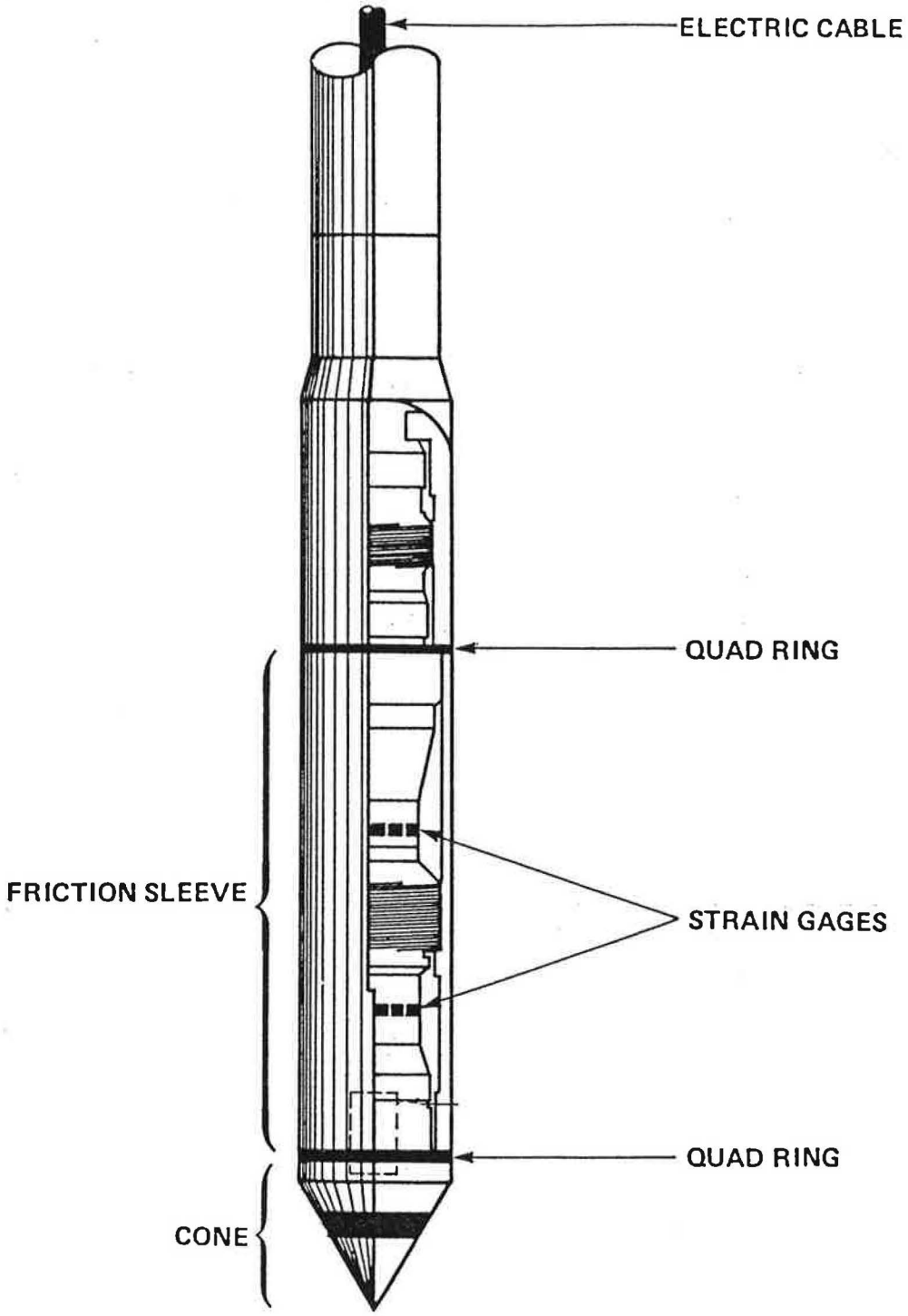
CPT NO.	Depth (ft)	Static Pore Pressure (psi)	Piezometric Groundwater Depth (ft)
C-2	18.8	6.2±	4.5
C-2	37.7	13.9	5.6
C-3	21.5	7.0±	5.3
C-3	37.8	13.7	6.1

The cone penetrometer was also equipped with a tri-axial geophone set and impact source for obtaining shear wave velocity measurements versus depth in accordance with ASTM D 7400-08. Such measurements were obtained at 5-foot depth intervals in CPT C-4. The results of the measurements are summarized below:

Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
5.16	4.16	6.50	9.76	666.42	
10.05	9.05	10.34	16.54	625.11	565.65
15.07	14.07	14.93	25.47	586.26	514.29
20.10	19.10	19.74	34.62	570.29	525.86
25.22	24.22	24.73	41.43	596.93	732.32
30.13	29.13	29.56	54.58	541.52	366.94
35.14	34014	34.50	62.96	548.03	590.48
40.12	39.12	39.44	67.44	584.79	1101.35
45.06	44.06	44.34	71.58	619.49	1184.68
50.08	49.08	49.33	76.05	648.71	1116.61
55.01	54.01	54.24	81.35	666.76	925.83
60.04	59.04	59.25	86.39	685.86	994.13
64.98	63.98	64.18	90.14	711.95	1313.00
70.14	69.14	69.32	95.61	725.03	940.67
75.04	74.04	74.21	99.75	743.95	1180.70
80.11	79.11	79.27	103.41	766.54	1382.30

Notes:

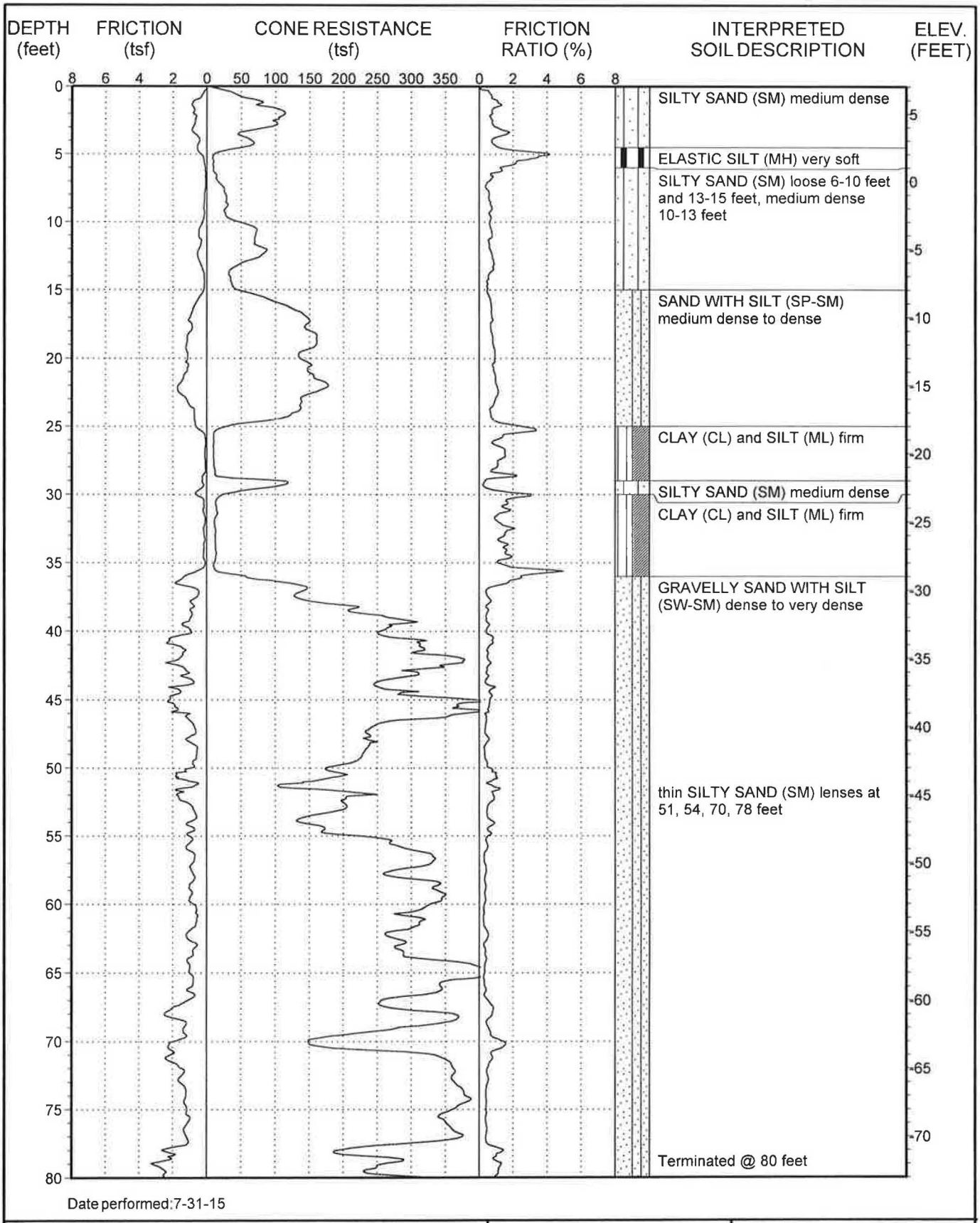
1. Shear Wave Source Offset = 5 ft
2. S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
3. Interval S-Wave Velocity = (Travel Dist2-Travel Dist1) / (Time2-Time1)



GPI GEOTECHNICAL PROFESSIONALS INC.

CONE PENETROMETER

FIGURE A-1



Date performed:7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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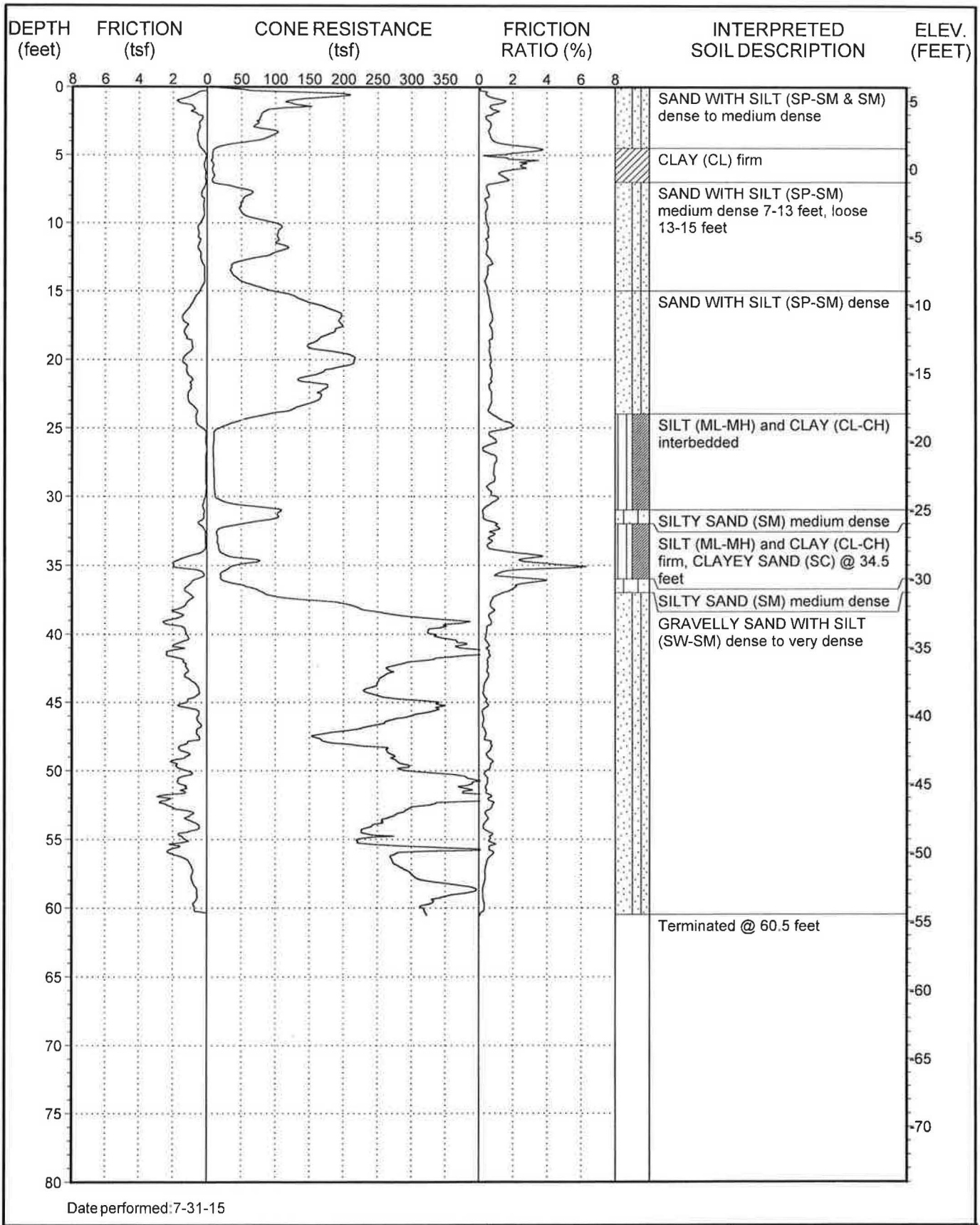
LOG OF CPT NO. C-1

FIGURE A-2



Date performed: 7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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PROJECT NO.: 2500.06I
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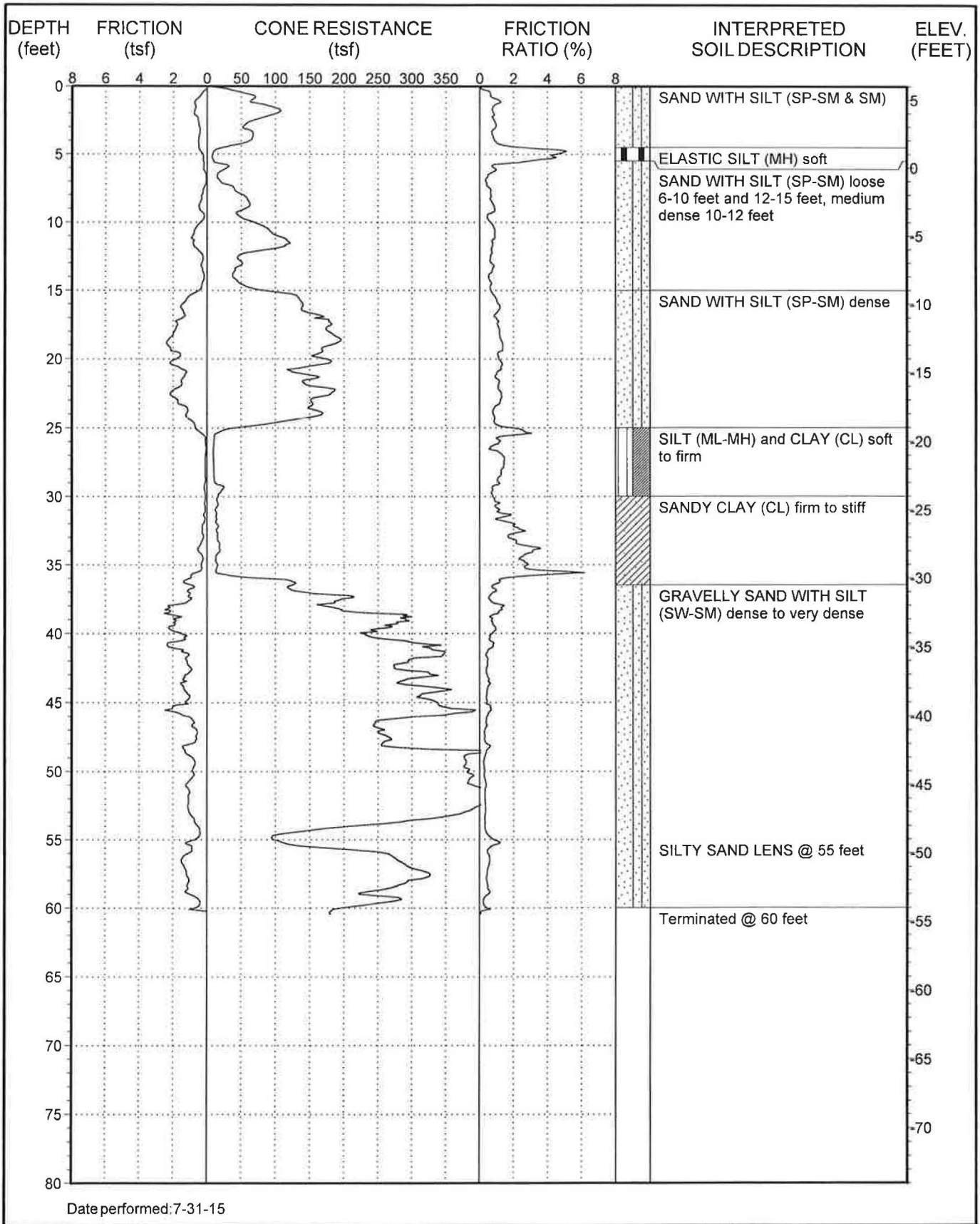
LOG OF CPT NO. C-2

FIGURE A-3



Date performed:7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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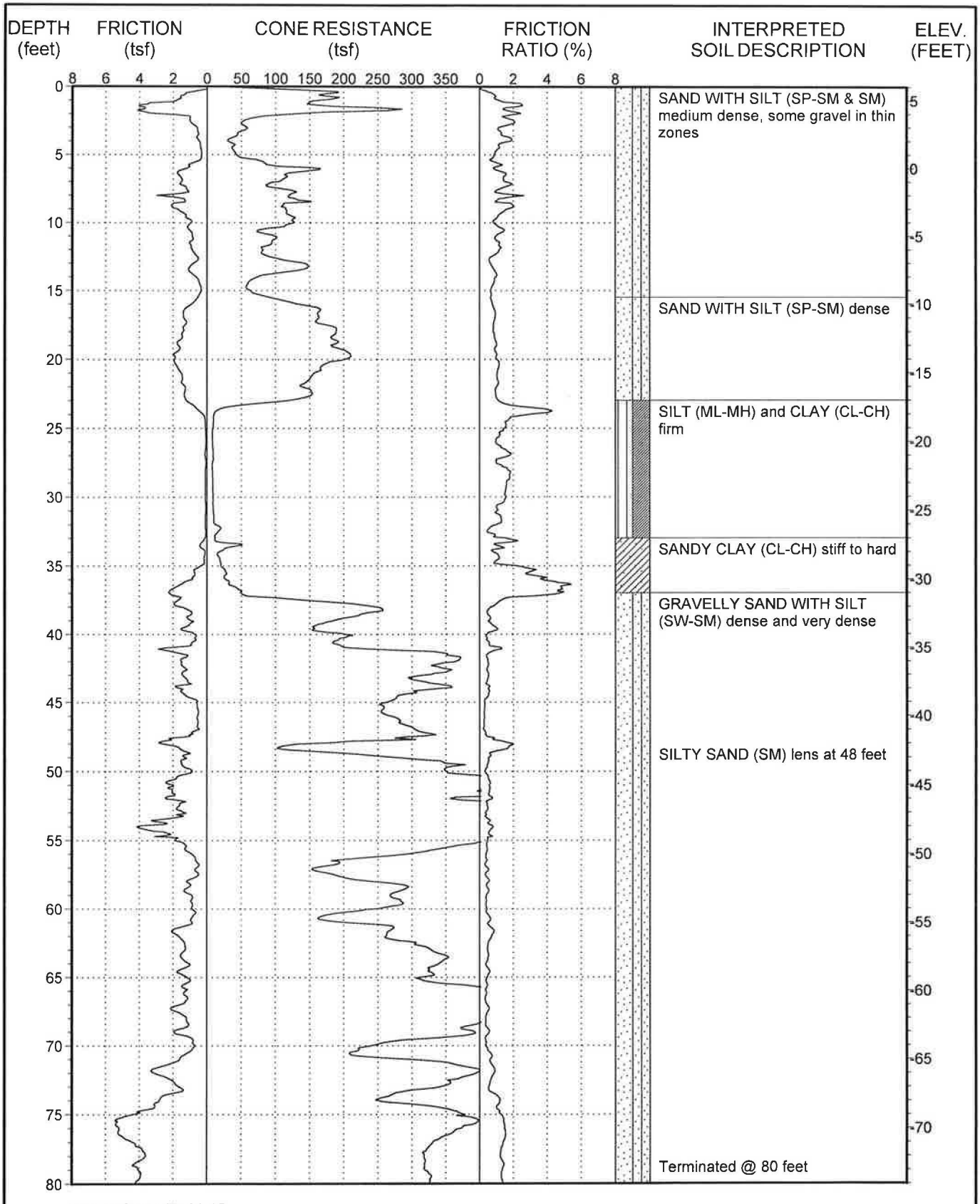
PROJECT NO.: 2500.06I
VENICE AUXILARY PUMP PLANT

LOG OF CPT NO. C-3

FIGURE A-4



Date performed:7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

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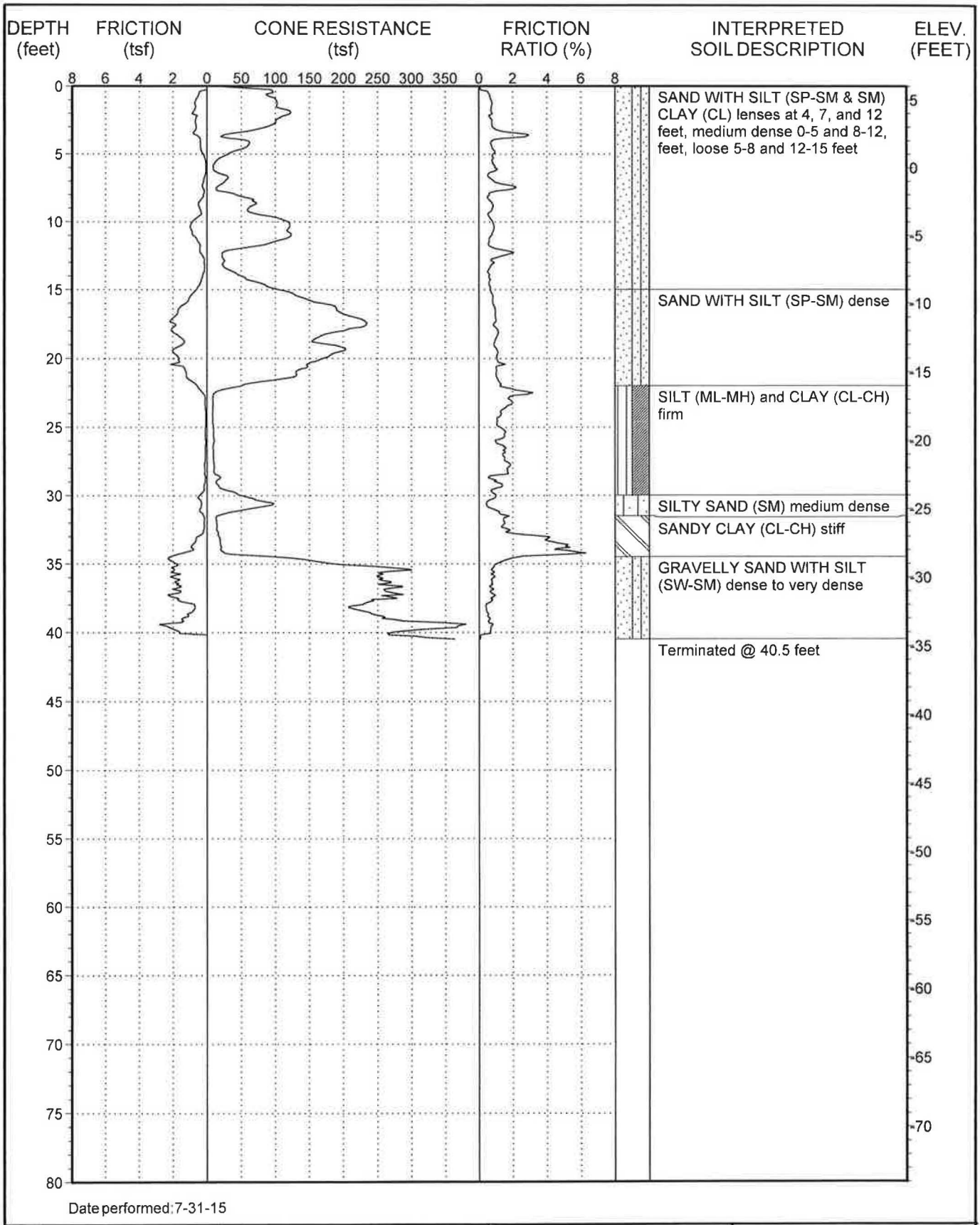
VENICE AUXILARY PUMP PLANT

LOG OF CPT NO. C-4

FIGURE A-5



Date performed: 7-31-15

This summary applies only at the location of this cone penetration test and at the time of the exploration. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The interpreted soil description is derived from the friction ratio and cone resistance and is a simplification of actual conditions encountered.

GPI

PROJECT NO.: 2500.06I
VENICE AUXILARY PUMP PLANT

LOG OF CPT NO. C-5

FIGURE A-6

APPENDIX B

APPENDIX B

EXPLORATORY BORINGS

The subsurface conditions at the site were investigated by drilling and sampling three rotary wash borings. The borings were advanced to depths ranging from 39.5 to 79.5 feet below the existing ground surface. The locations of the explorations are shown on the Site Plan, Figure 2. The latitude and longitude of each boring location and distances from the northeastern and northwestern fences at the site are as follows:

Boring No.	Latitude	Longitude	Distance (feet)	
			from NE Fence	from NW Fence
RW-1	33° 58' 34.48"	-118 27' 40.44"	7	11
RW-2	34.12"	40.71"	49	25
RW-3	33.73"	40.83"	75	68

Relatively undisturbed soil samples were obtained using two types of samplers. Thin walled Shelby tubes were used to obtain samples of relatively compressible silts and clays, in accordance with ASTM D 1587-08. The tubes were 30 inches long, had an inside diameter of 2.87 inches and an outside diameter of 3.00 inches. The Shelby tubes were pushed into the soils by hydraulic pressure. Thicker-walled, brass-ring lined samplers were used to sample mainly more granular soils and some cohesive soils, in accordance with ASTM D 3550-01. The sampler had an inside diameter of 2.42 inches and outside diameter of 3.25 inches. The sampler was driven into the soil using an automatic trip hammer weighing 140 pounds and dropping 30 inches. After seating the sampler into the soil 4 inches, the number of blows needed to drive the sampler 12 inches was recorded as the penetration resistance.

Relatively disturbed samples were also obtained using a split-spoon sampler by means of the Standard Penetration Test (SPT, ASTM D 1586-11). The spoon sampler was driven into the soil by a 140-pound hammer dropping 30 inches, employing the automatic trip hammer described above. The number of blows for each 6 inches of penetration was recorded and is presented on the logs. The blowcount for the first increment should be considered the seating blows while the sum of blows for the last 12 inches of penetration is considered the Standard Penetration Test blowcount. These values are the raw uncorrected blowcounts.

Bulk samples of the soils within the upper 4 feet were obtained with an auger at all boring locations.

The field explorations for the investigation were performed under the continuous technical supervision of GPI's representative, who visually inspected the site, maintained detailed logs of the borings, classified the soils encountered, and obtained relatively undisturbed samples for examination and laboratory testing. The soils encountered in the borings were classified in the field and through further examination in the laboratory in accordance with the Unified Soils Classification System. Detailed logs of the borings are presented in Figures B-1 to B-3 in this appendix. Laboratory test results of moisture content, density,

fines content (fraction passing No. 200 sieve) and Atterberg Limits are presented on the logs. For other laboratory tests, the type of test performed is shown with the following abbreviations:

CON – Consolidation Test
DS – Direct Shear Test
UC – Unconfined Compression Test
UU – Unconsolidated Undrained Triaxial Test

At selected depth intervals, soils were screened for organic vapors using a photo-ionization detector (Multi-Rae E-033). Organic vapors were not detected for any of the samples.

Upon completion of the borings, the boreholes were bailed (drilling mud removed) and groundwater level was measured. The boreholes were then backfilled with cement-bentonite grout to within approximately 2 feet from the ground surface and the balance was filled with soil. The grout was pumped from the bottom of the borehole up. Excess soil cuttings were placed in 55-gallon drums and hauled off site. The ground surface elevations at the exploration locations were estimated from a Google Earth and should be considered to be very approximate.

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	**SILTY SAND (SM)** brown, slightly moist, trace gravel, medium dense	5
		5 10 14	S			
48.9		0 1	D	5	**ELASTIC SILT (MH)** grey, wet, very soft LL=62, PI=33, PI=29, CON	
27.1	91	5 7	D		**SILTY SAND (SM)** grey, wet, loose to medium dense @ 7 feet, DS	0
		2 5 8	S	10	@ 10 feet, fines content 15.6%	
23.5	96	8 10	D		**SAND (SP)** grey, wet, medium dense @ 13 feet, fines content 2%	-5
		8 10 12	S	15	**SAND WITH SILT (SP-SM)** grey, wet, medium dense	-10
23.8	99	15 29	D			
		9 14 14	S	20	@ 20 feet, fines content 7.7%	-15
24.4	95	14 20	D		@ 23 feet, DS	
42.6	79		T	25	**LEAN CLAY WITH SAND (CL)** grey, wet, firm LL=40, PL=23, PI=17, CON, UC	-20
34.1	89					
18.3	100				**SANDY SILT (ML)** grey, wet, firm	
					LEAN CLAY (CL) grey, wet, firm	
25.5	103	2 4	D	30	**SANDY SILT (ML)** grey, wet, firm	
17.3	110					
			T		**SANDY CLAY (CL)** grey, wet, firm with CLAYEY SAND (SC) @ 32 feet, fines content 49.8%	-25
10.6	126	17 25	D	35	**GRAVELLY SAND WITH SILT (SW-SM)** grey, wet, dense	-30
		20 22 45	S		@ 38 feet, fines content 10.0%	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-7-15

EQUIPMENT USED: 5 " Rotary Wash

GROUNDWATER LEVEL (ft): 8

GPI

PROJECT NO.: 2500.061

VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-1

FIGURE B-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
13.6	120	22 30	D	40	@ 40 feet, DS **SAND WITH SILT (SP-SM)** grey, wet, dense with variable gravel content	-35
		21 23 25	S			
		29 40	D	45		-40
		16 20 24	S			
					Total depth 49 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-7-15
EQUIPMENT USED: 5 " Rotary Wash
GROUNDWATER LEVEL (ft): 8

GPI

PROJECT NO.: 2500.06I
VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-1

FIGURE B-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
				0	**SILTY SAND (SM)** brown, moist, medium dense, with gravel	5
		6 7 5	S			
		8 9 14	S	5	@ 5 feet, fines content 25.1% grey below 5 feet	0
19.2	93	11 12	D		wet below 7 feet	
		3 5 9	S	10	@ 10 feet, fines content 17.7%	-5
22.0	103	14 19	D		@ 13 feet, DS, sea shells	
		8 12 12	S	15	**SAND WITH SILT (SP-SM)** grey wet, medium dense to dense @ 15 feet, fines content 6.8%	-10
23.6	100	15 25	D			
		5 6 11	S	20	@ 20 feet, fines content 11.8%	-15
24.3	96	11 19	D		@ 23 feet, DS	
76.2	56		T	25	**FAT CLAY (CH)** grey, wet, firm LL=72, PL=30, PI=43, CON, UU	-20
			T		**CLAY WITH SAND (CL)** grey, wet, firm	
40.1	80			30	@ 29 feet, UC	
					CLAYEY SAND (SC) grey, wet, trace gravel	-25
17.0	120		T		**CLAY WITH SAND (CL)** grey, wet, firm @ 33 feet, fines content 27.9%	
15.9	121			35	**SILTY SAND (SM)** grey, wet	-30
					SAND WITH SILT (SW-SM) grey, wet, medium dense to dense, with gravel	
		15 18	S		@ 39 feet, fines content 9.2 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-6-15
EQUIPMENT USED: 5 " Rotary Wash
GROUNDWATER LEVEL (ft): 9

GPI

PROJECT NO.: 2500.06I
VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-2

FIGURE B-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
		17		40	**SAND WITH SILT AND GRAVEL (SW-SM to SP-SM)** variable silt and gravel content, grey, wet, dense	-35
8.7	128	28 52	D			
		25 29 20	S	45	@ 45 feet, fines content 9.7%	-40
7.7		24 29	D			
		18 21 22	S	50	**SAND WITH SILT (SP-SM)** no gravel, grey, wet, dense to very dense, hard sandy silt lens at 51 feet @ 50 feet, fines content 7.0%	-45
20.2	105	22 36	D		@ 53 feet, DS	
		15 25 27	S	55	@ 56 feet, fines content, 10.5%	-50
18.2	107	26 29	D			
		29 34 43	S	60	variable silt and gravel content with silty fine sand layers below 60 feet @ 61 feet, fines content 7.9%	-55
18.5	108	32 45	D			
		21 35 25	S	65		-60
12.7	110	40 50/5"	D	70		-65
		18 50 33	S			
25.9	100	30 39	D	75		-70
		17 30 38	S		Boring Terminated at 79.5 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-6-15

EQUIPMENT USED: 5 " Rotary Wash

GROUNDWATER LEVEL (ft): 9

GPI

PROJECT NO.: 2500.06I

VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-2

FIGURE B-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
			B	0	**SILTY SAND (SM)** brown, slightly moist, loose to medium dense, with gravel	5
		3 5 4	S			
		7 12 9	S	5	@ 5 feet, fines content 19.9% grey, wet, below 5 feet, variable silt content	0
8.4	118	9 17	D		interlayered sand with silt (SP-SM) @ 8 feet, fiens content 8.5%, DS	
		3 4 6	S	10	@ 10 feet, fines content 20%	-5
23.0	100	4 7	D			
		10 8 7	S	15	**SAND WITH SILT (SP-SM)** grey, wet, medium dense @ 15 feet, fines content 7.5%	-10
25.4	97	15 23	D			
		8 7 7	S	20	@ 20 feet, fines content 5.3%	-15
46.2	75		T		**LEAN CLAY (CL)** grey, wet, firm, with trace of sand @ 23 feet, UU @ 23.6 feet, LL=45, PL=26, PI=19	
43.8	73		T	25		-20
25.2	100			30	**CLAYEY SAND (SC)** grey, wet, firm/loose	-25
14.2	118		T		**CLAY WITH SAND (CL)** grey, wet, firm	
12.7	117				**CLAYEY SAND (SC)** grey, wet @ 34 feet, fines content 46.5%	
10.0	128	15 29	D	35	**SAND WITH SILT AND GRAVEL (SW-SM)** grey, wet, dense	-30
		19 29 27	S		Total Depth 39.5 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 8-6-15

EQUIPMENT USED: 5 " Rotary Wash

GROUNDWATER LEVEL (ft): 8

GPI

PROJECT NO.: 2500.06I

VENICE AUXILARY PUMP PLANT

LOG OF BORING NO. RW-3

FIGURE B-3

APPENDIX C

APPENDIX C

LABORATORY TESTS

INTRODUCTION

Representative undisturbed soil samples and bulk samples were carefully packaged in the field and sealed to prevent moisture loss. The samples were then transported to our Cypress office for examination and testing assignments. Laboratory tests were performed on selected representative samples as an aid in classifying the soils and to evaluate the physical properties of the soils affecting foundation design and construction procedures. Detailed descriptions of the laboratory tests are presented below under the appropriate test headings. Test results are presented on the boring logs and in the figures that follow.

MOISTURE CONTENT AND DRY DENSITY

Moisture content and dry density were determined from a number of the ring and Shelby tube samples. The samples were first trimmed to obtain volume and wet weight and then were dried in accordance with ASTM D 2216. After drying, the weight of each sample was measured, and moisture content and dry density were calculated. Moisture content and dry density values are presented on the boring logs in Appendix B.

COMPACTION TEST

A maximum dry density/optimum moisture test was performed in accordance with ASTM D 1557 on a representative bulk composite sample of the upper 4 feet of the on-site soils. The test results are graphically presented in Figure C-1 and summarized below.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	OPTIMUM MOISTURE* (%)	MAXIMUM DRY DENSITY* (pcf)
RW-1, -2, -3	0-4	Silty Sand with Gravel (SM)	9.0	125

Note: * includes rock correction

EXPANSION INDEX

One expansion index test was performed in accordance with D 4829 on a composite bulk sample, representative of the soils in the upper 4 feet of the site. The test results are presented below:

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	EXPANSION INDEX
Composite RW-1, 2,3	0-4	Silty Sand with gravel (SM)	0

ATTERBERG LIMITS

Liquid and plastic limits were determined for selected samples in accordance with ASTM D 4318. The results of the Atterberg Limits tests are presented in Figure C-2.

GRAIN SIZE DISTRIBUTION

A total of 24 soil samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve. For 16 of the samples, the retained material was run through a standard set of sieves in accordance with ASTM D 422. The weight of soil retained on each sieve was recorded and the total dry weight was calculated. The grain size distribution data from the full sieve analyses is presented in Figures C-3 through C-8. A summary of the percentages passing the No. 200 sieve (ASTM D1140) is presented below.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
RW-1	32	Clayey Sand (SC)	49.8
	38	Gravelly Sand with Silt (SP-SM)	10.0
	43	Sand with Silt and Gravel (SW-SM)	9.8
RW-2	61	Sand with Silt and Gravel (SW-SM)	7.9
RW-3	8	Sand with Silt (SP-SM)	8.5
	10	Silty Sand (SM)	20.0
	15	Sand with Silt (SP-SM)	7.5
	20	Sand with Silt (SP-SM)	5.3

CONSOLIDATION

One-dimensional consolidation testing was performed on several undisturbed samples in accordance with ASTM D 2435. After trimming the ends, the samples were placed in the consolidometer and loaded to 0.25 or 0.4ksf. Thereafter, the samples were incrementally loaded to a maximum load of either 12.8 or 16 ksf. The samples were inundated at 0.4, or 0.5 ksf. Sample deformation was measured to 0.0001 inch. Rebound behavior was investigated by unloading the samples back to either 0.4 or 0.8 ksf. Results of the consolidation tests, in the form of percent consolidation versus log pressure, are presented in Figures C-9 to C-11.

DIRECT SHEAR

Direct shear tests were performed on remolded bulk samples and undisturbed samples in accordance with ASTM D 3080. The bulk sample was remolded to approximately 95 percent of maximum density (ASTM D1557). The samples were placed in the shear machine, and a normal load was applied. The samples were inundated, allowed to consolidate, and then were sheared to failure. The tests were repeated on additional test

specimens under increased normal loads. Shear stress and sample deformation were monitored throughout the test. The results of the direct shear tests are presented in Figures C-12 to C-19.

UNCOFINED COMPRESSION TESTS

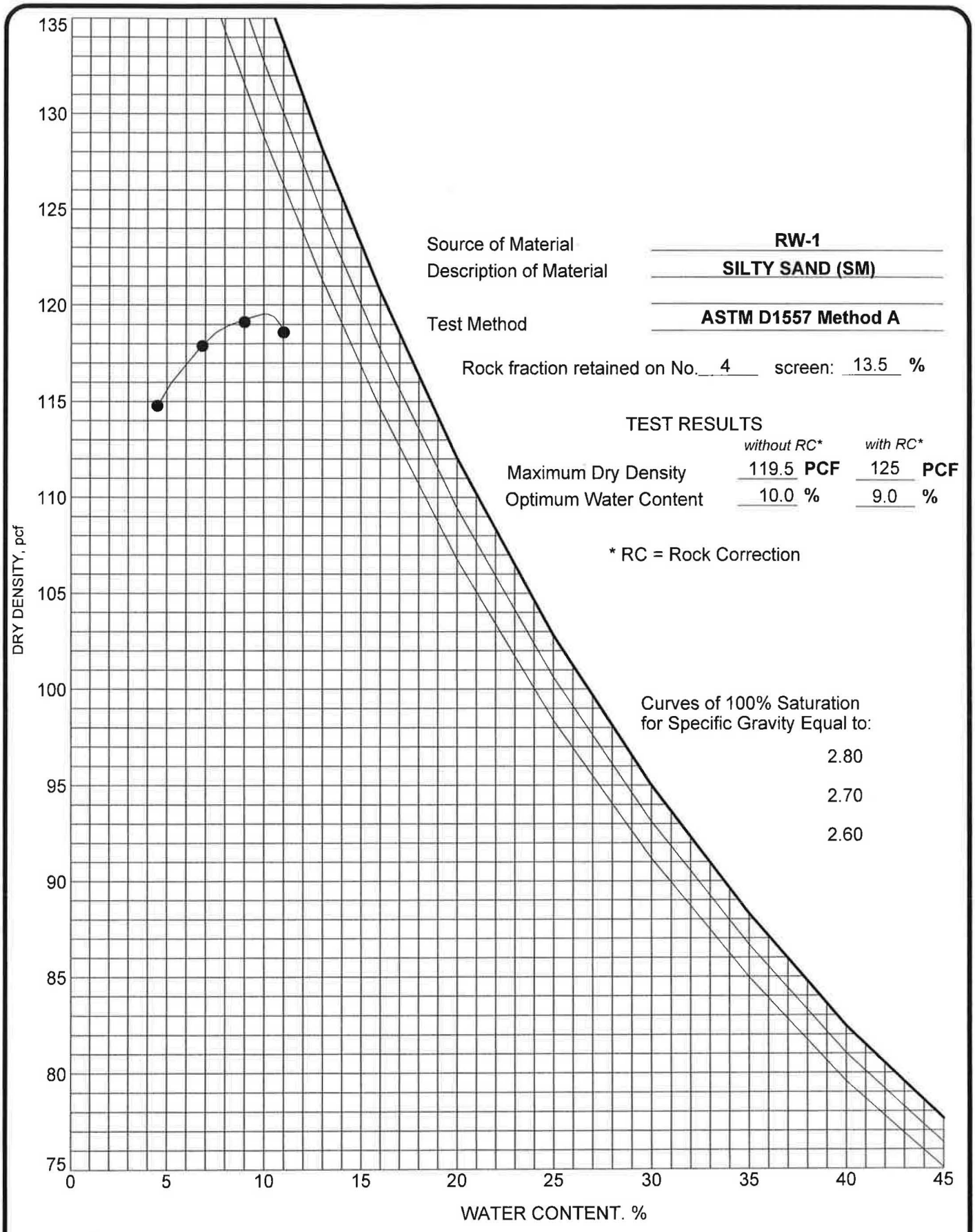
Unconfined compression tests were performed on two samples of cohesive soils in accordance with ASTM D 2166. Detailed test results are presented in Figures C-20 and C-21.

UNCONSOLIDATED UNDRAINED TRIAXIAL TESTS

Unconsolidated undrained triaxial tests were performed on two samples of cohesive soils in accordance with ASTM D 2850. Detailed test results are presented in Figures C-22 and C-23.

SOIL CORROSIVITY

Soil corrosivity testing on samples from shallow depths was performed by AP Engineering and Testing. Test results are presented in Figure C-24 at the end of this appendix.



Source of Material: **RW-1**

Description of Material: **SILTY SAND (SM)**

Test Method: **ASTM D1557 Method A**

Rock fraction retained on No. 4 screen: 13.5 %

TEST RESULTS

	*without RC**	*with RC**
Maximum Dry Density	119.5 **PCF**	125 **PCF**
Optimum Water Content	10.0 %	9.0 %

* RC = Rock Correction

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

PROJECT: VENICE AUXILARY PUMP PLANT

PROJECT NO.2500.06I

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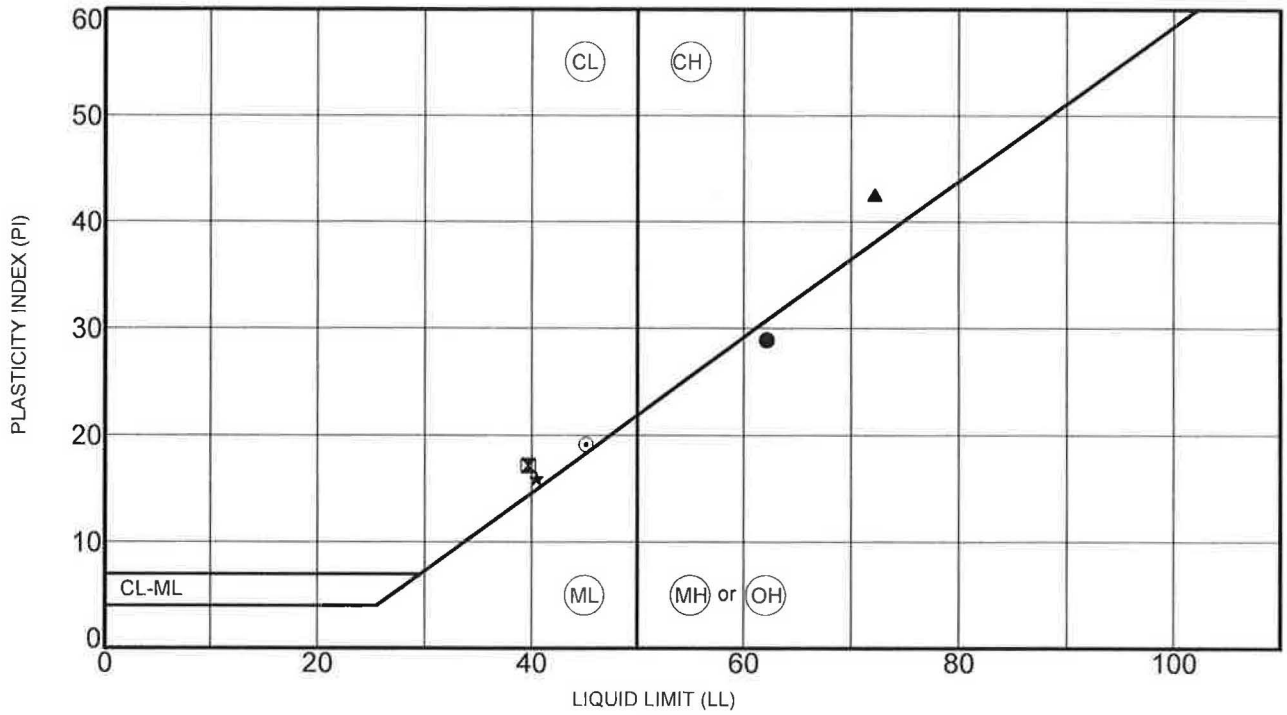
MAXIMUM DENSITY - OPTIMUM MOISTURE TEST

FIGURE C1



	SAMPLE LOCATION		LL	PL	PI	Fines, %	Classification
●	RW-1	5-6	62	33	29		ELASTIC SILT (MH)
⊠	RW-1	26.1	40	23	17		LEAN CLAY WITH SAND (CL)
▲	RW-2	26.8	72	30	43		FAT CLAY (CH)
★	RW-2	29.6	40	25	16		SANDY CLAY (CL)
⊙	RW-3	23.6	45	26	19		LEAND CLAY WITH SAND (CL)

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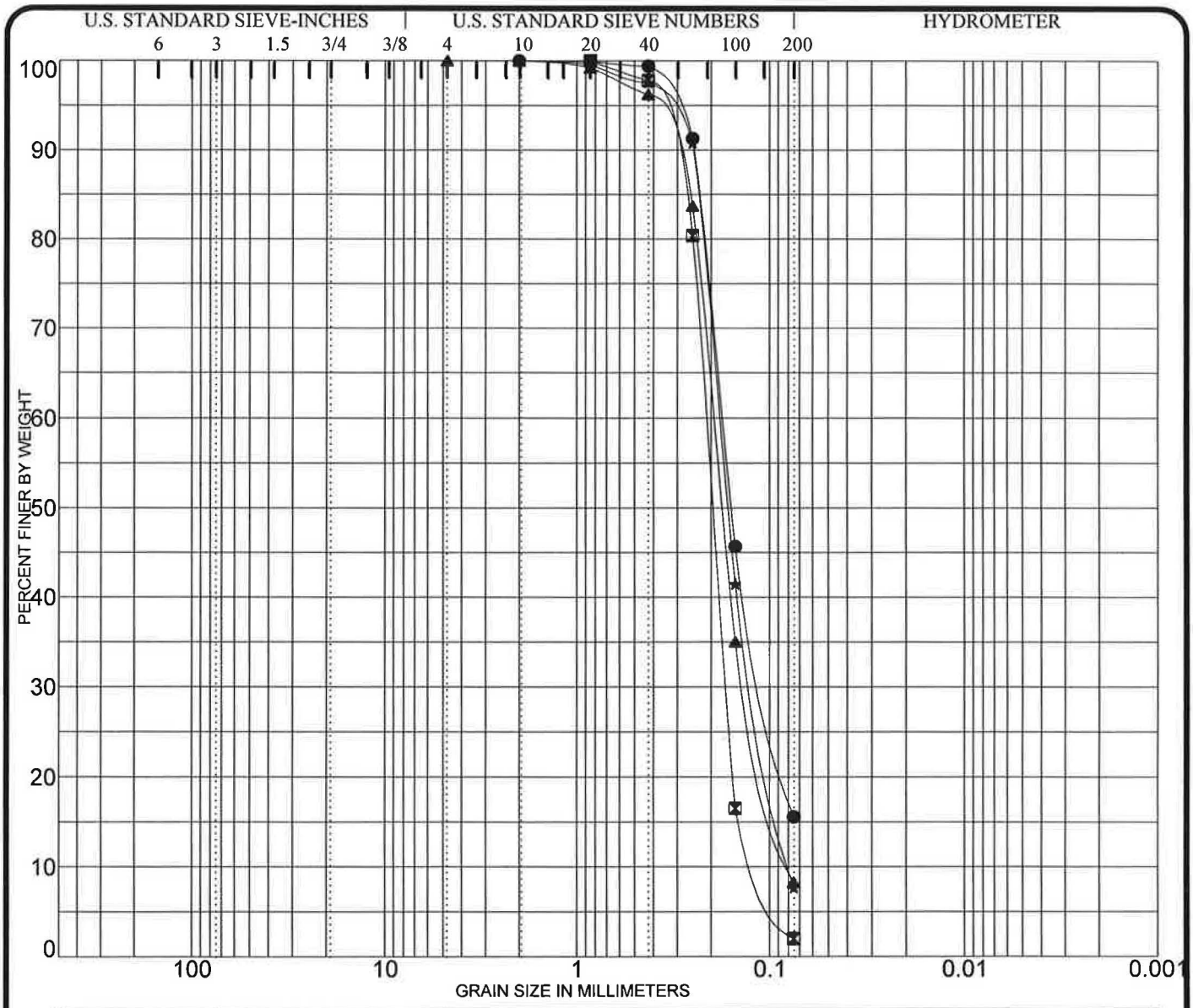
ATTERBERG LIMITS TEST RESULTS

FIGURE C-2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-1	10.0	SILTY SAND (SM)						
⊠	RW-1	12-13	SAND (SP)					1.20	1.9
▲	RW-1	15.0	SAND WITH SILT (SP-SM)					1.13	2.5
★	RW-1	20-21	SAND WITH SILT (SP-SM)					0.98	2.3

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-1	10.0	2.00	0.18	0.105		0.0	84.4	15.6	
⊠	RW-1	12-13	0.85	0.21	0.167	0.1099	0.0	98.0	2.0	
▲	RW-1	15.0	4.75	0.19	0.132	0.0784	0.0	91.7	8.3	
★	RW-1	20-21	2.00	0.18	0.118	0.0786	0.0	92.3	7.7	

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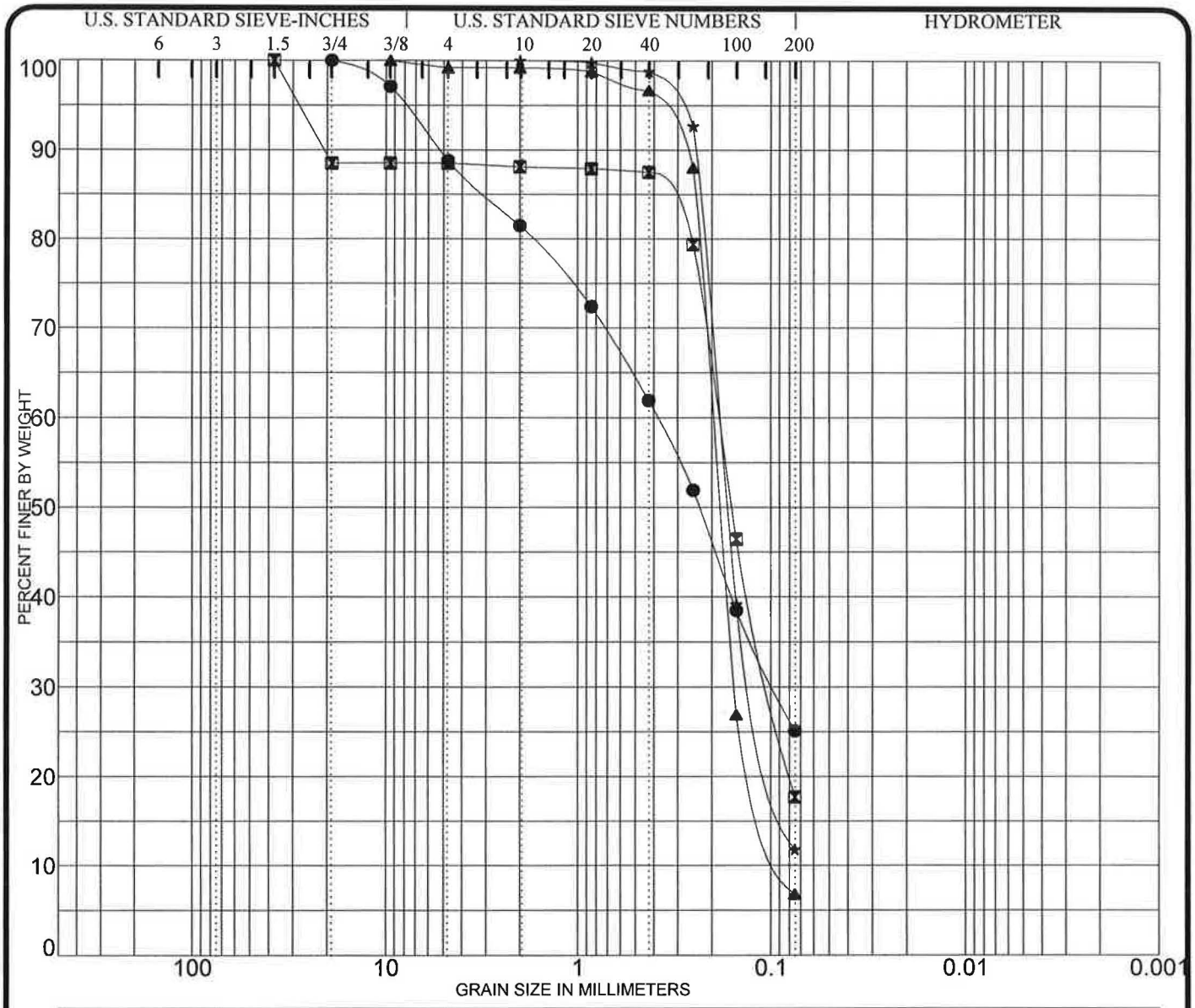
GRAIN SIZE DISTRIBUTION

FIGURE C-3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-2	5-6	SILTY SAND (SM) WITH GRAVEL						
⊠	RW-2	10-11	SILTY SAND (SM) WITH GRAVEL						
▲	RW-2	15-16	SAND WITH SILT (SP-SM)					1.43	2.4
★	RW-2	20-21	SAND WITH SILT (SP-SM)					1.08	2.6

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-2	5-6	19.00	0.38	0.097		11.2	63.7	25.1	
⊠	RW-2	10-11	37.50	0.19	0.101		11.5	70.8	17.7	
▲	RW-2	15-16	9.50	0.20	0.154	0.0838	0.8	92.4	6.8	
★	RW-2	20-21	2.00	0.18	0.119		0.0	88.2	11.8	

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO. 2500.06I

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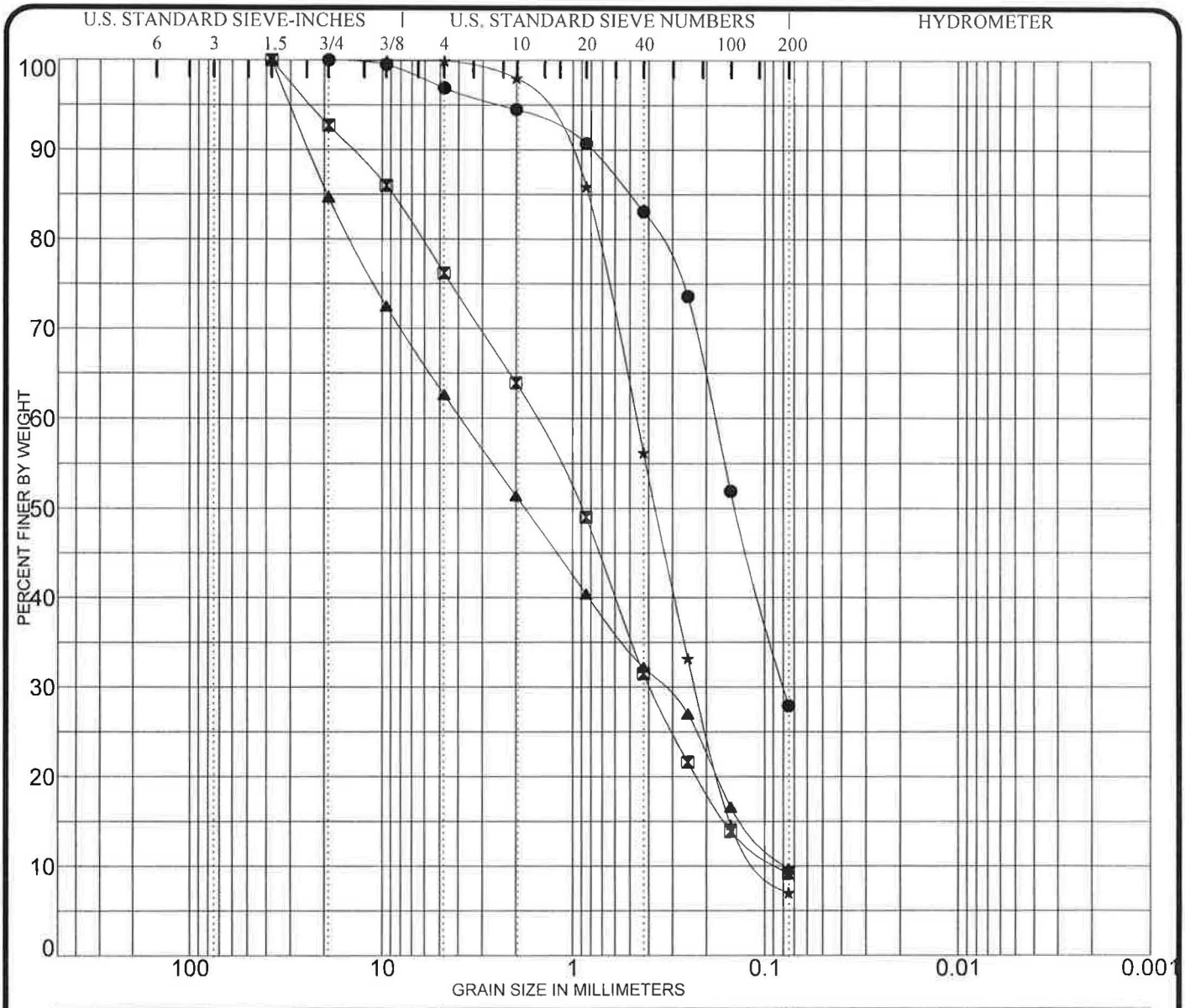
GRAIN SIZE DISTRIBUTION

FIGURE C-4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-2	33-34	SILTY SAND (SM)						
⊠	RW-2	39-40	SAND WITH SILT (SW-SM)					1.14	18.9
▲	RW-2	45-46	SAND WITH SILT (SP-SM)					0.38	50.3
★	RW-2	50-51	SAND WITH SILT (SP-SM)					1.14	4.7

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-2	33-34	19.00	0.18	0.080		3.1	69.0	27.9	
⊠	RW-2	39-40	37.50	1.60	0.392	0.0844	23.8	67.0	9.2	
▲	RW-2	45-46	37.50	3.89	0.340	0.0773	37.4	52.9	9.7	
★	RW-2	50-51	19.00	0.46	0.229	0.0986	0.1	92.9	7.0	

PROJECT: VENICE AUXILARY PUMP PLANT

PROJECT NO. 2500.06I

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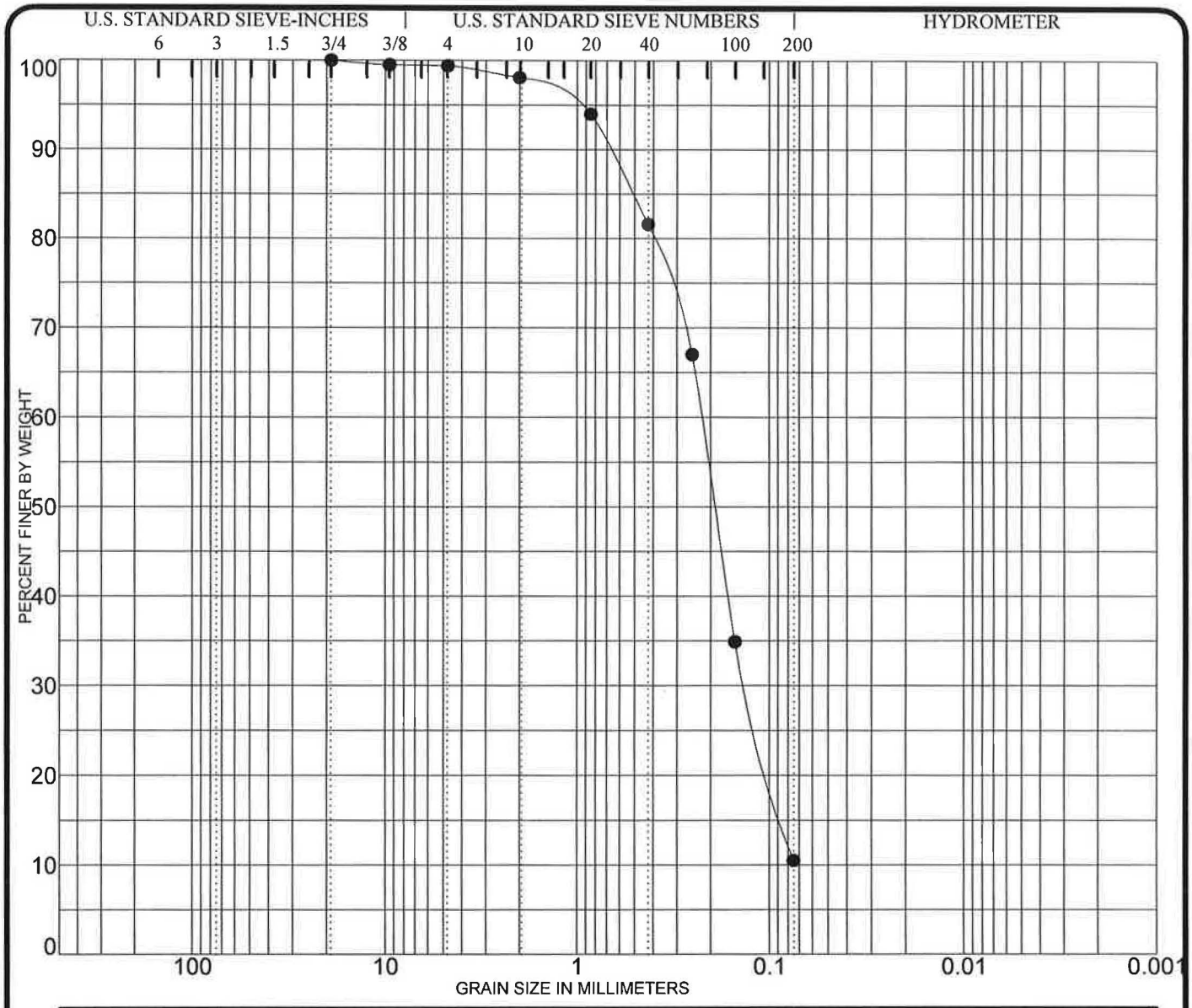
GRAIN SIZE DISTRIBUTION

FIGURE C-5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-2	56-57	SAND WITH SILT (SP-SM)					1.03	3.0

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-2	56-57	19.00	0.22	0.131		0.6	88.9	10.5	

PROJECT: VENICE AUXILARY PUMP PLANT

PROJECT NO. 2500.06I

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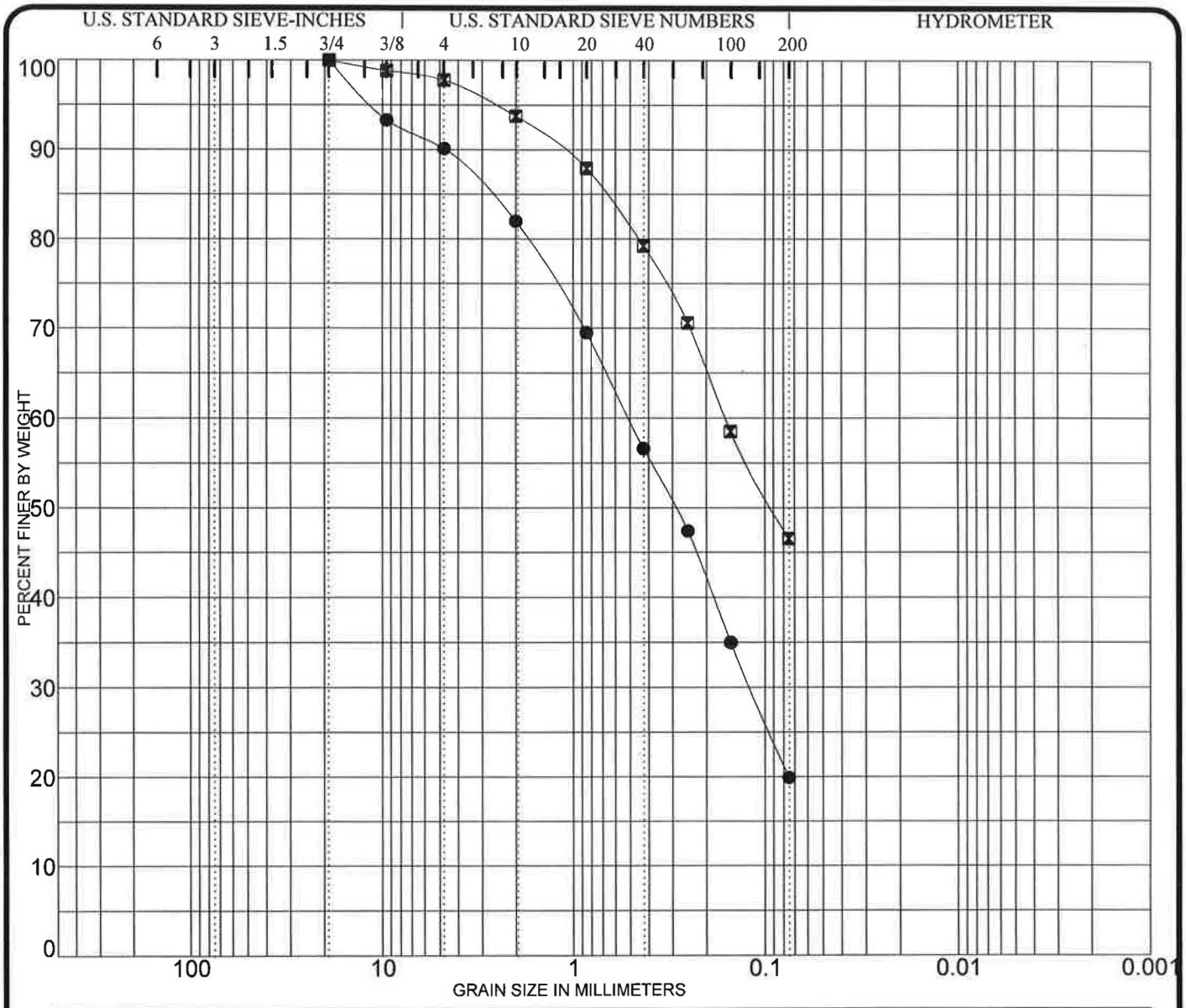
GRAIN SIZE DISTRIBUTION

FIGURE C-6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-3	5-6	SILTY SAND (SM)						
⊠	RW-3	34.0	CLAYEY SAND (SC)						

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-3	5-6	19.00	0.51	0.119		9.9	70.2	19.9	
⊠	RW-3	34.0	19.00	0.16			2.2	51.2	46.5	

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO. 2500.06I

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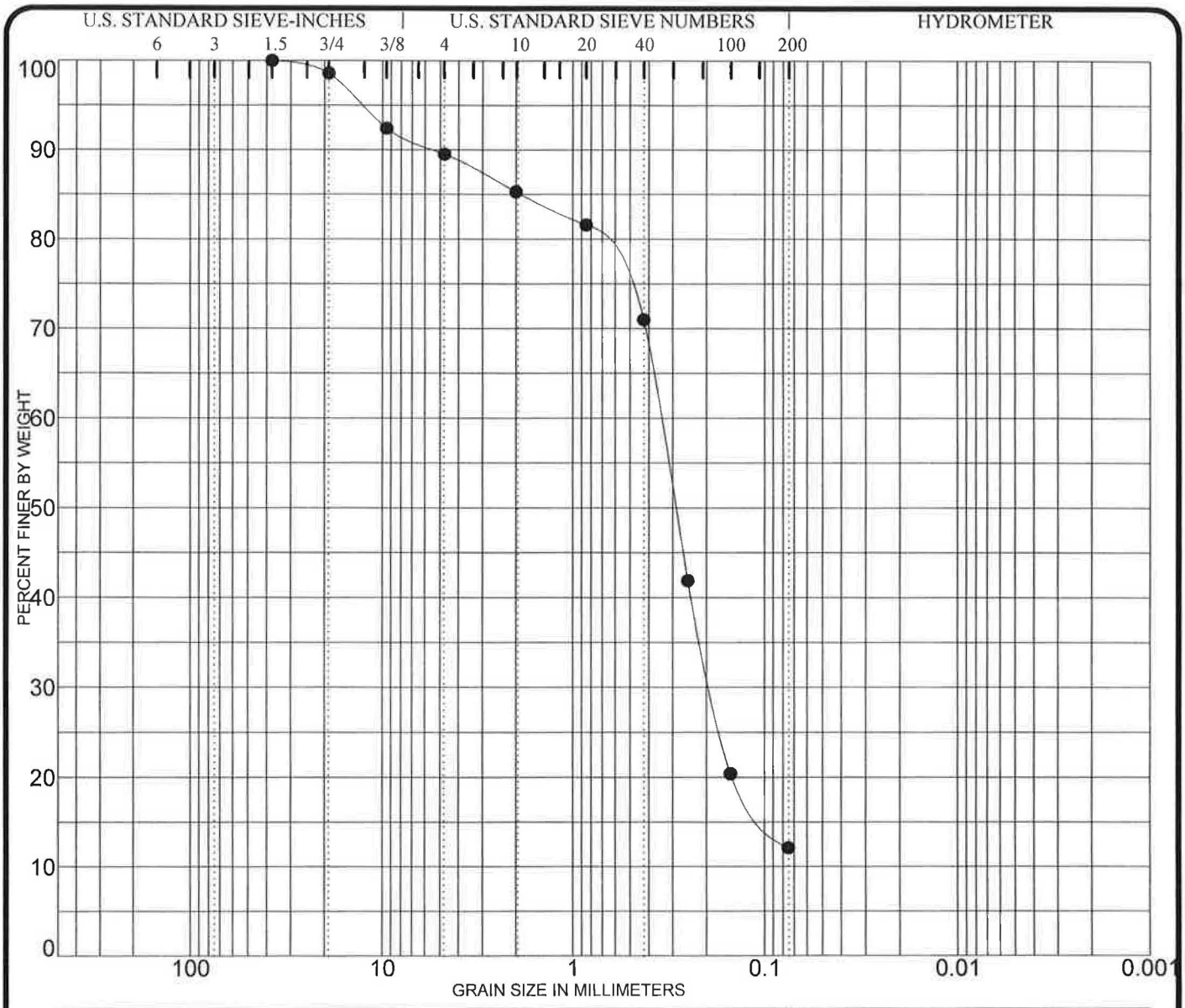
GRAIN SIZE DISTRIBUTION

FIGURE C-7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location	Classification	MC%	LL	PL	PI	Cc	Cu
●	RW-1,2,3 0-4	SILTY SAND WITH GRAVEL (SM)					1.62	5.5

	Sample Location	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	RW-1,2,3 0-4	37.50	0.35	0.188		10.5	77.4	12.1	

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO. 2500.06I

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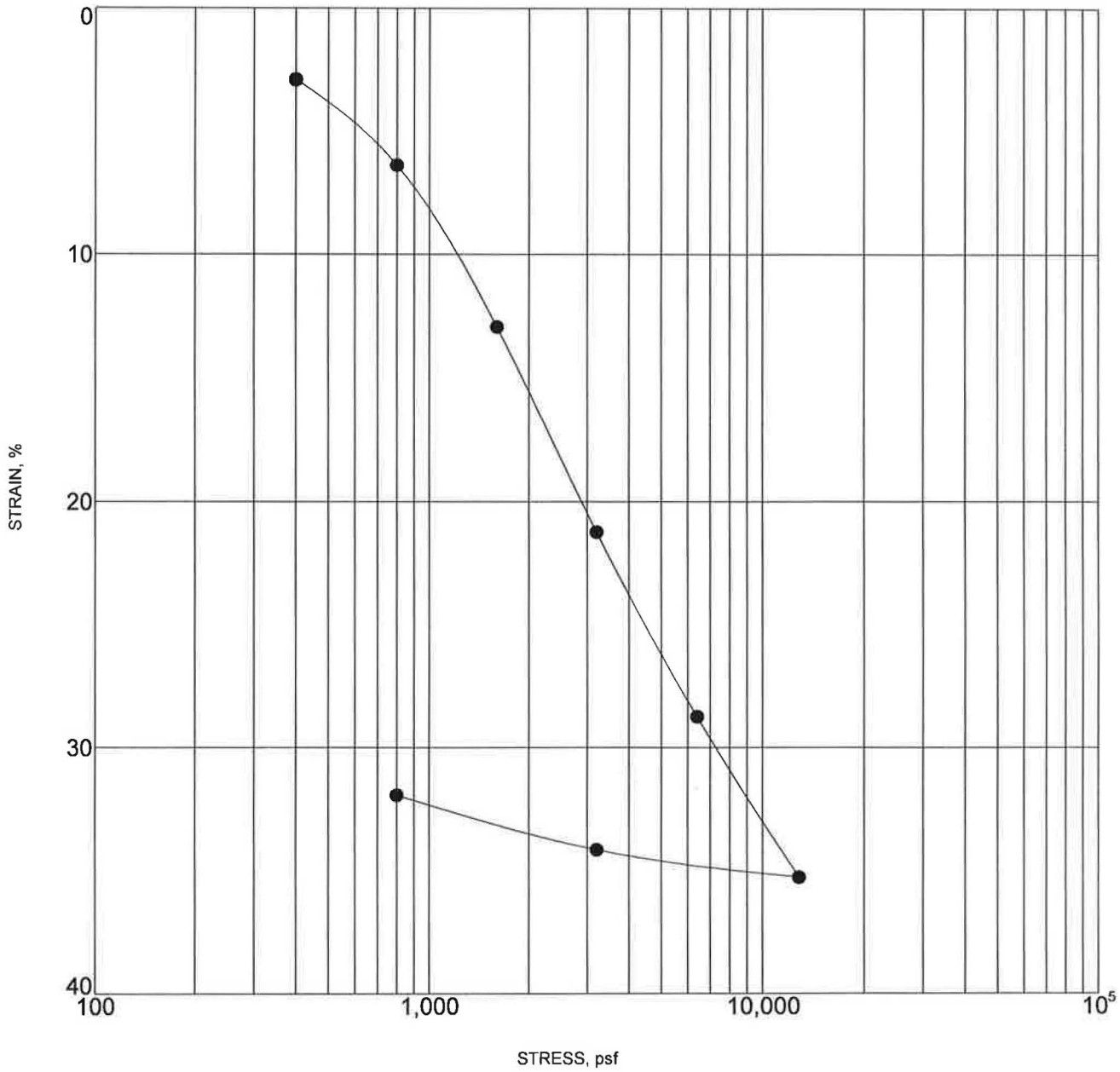
GRAIN SIZE DISTRIBUTION

FIGURE C-8



Sample inundated at 400 psf

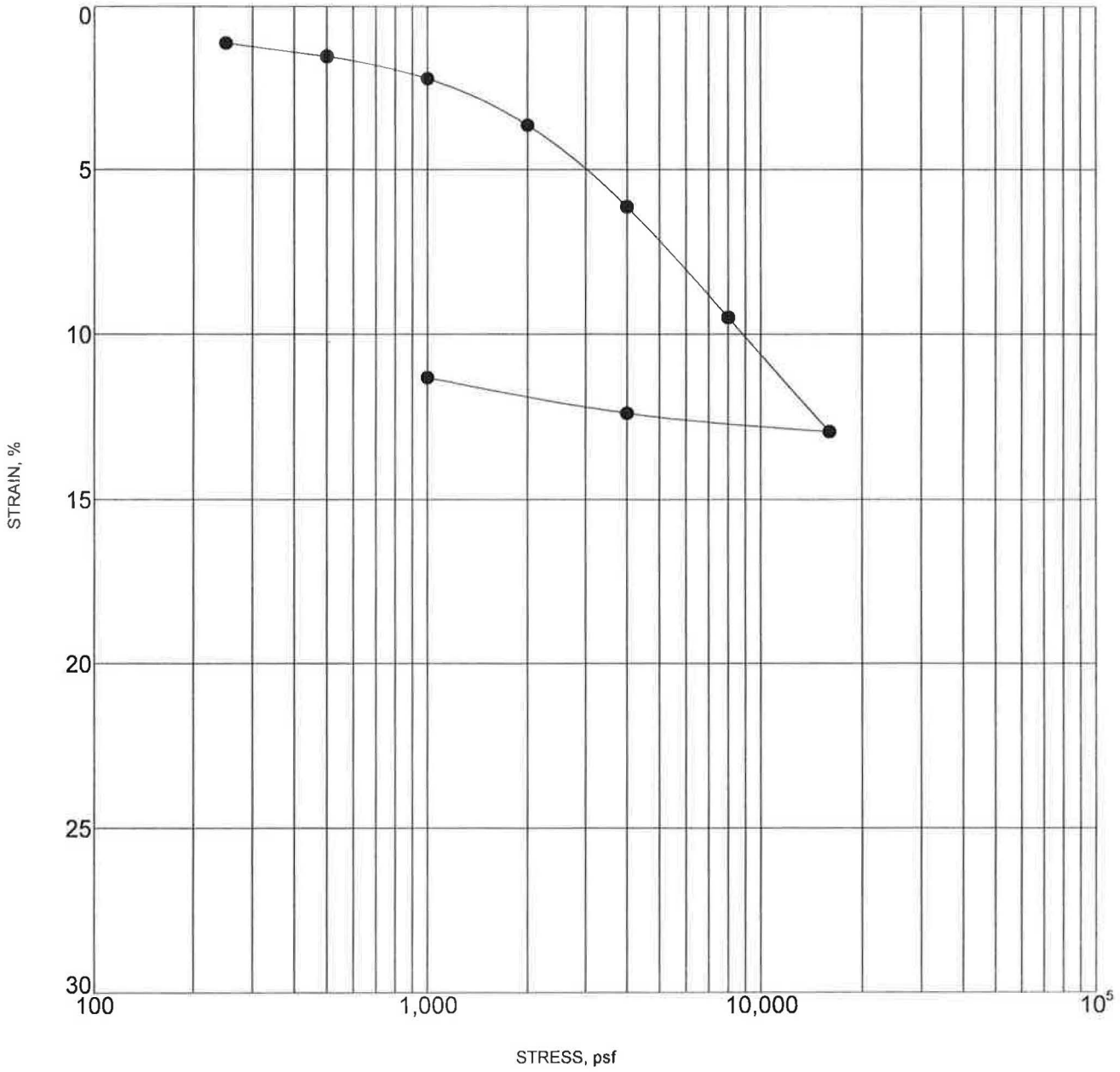
	Sample Location		Classification	DD,pcf	MC,%
●	RW-1	5-6	ELASTIC SILT (MH)		

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.: 2500.06I

GPI

CONSOLIDATION TEST RESULTS

FIGURE C-9



Sample inundated at 500 psf

	Sample Location		Classification	DD,pcf	MC,%
●	RW-1	26.1	LEAN CLAY WITH SAND (CL)		

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.: 2500.06I

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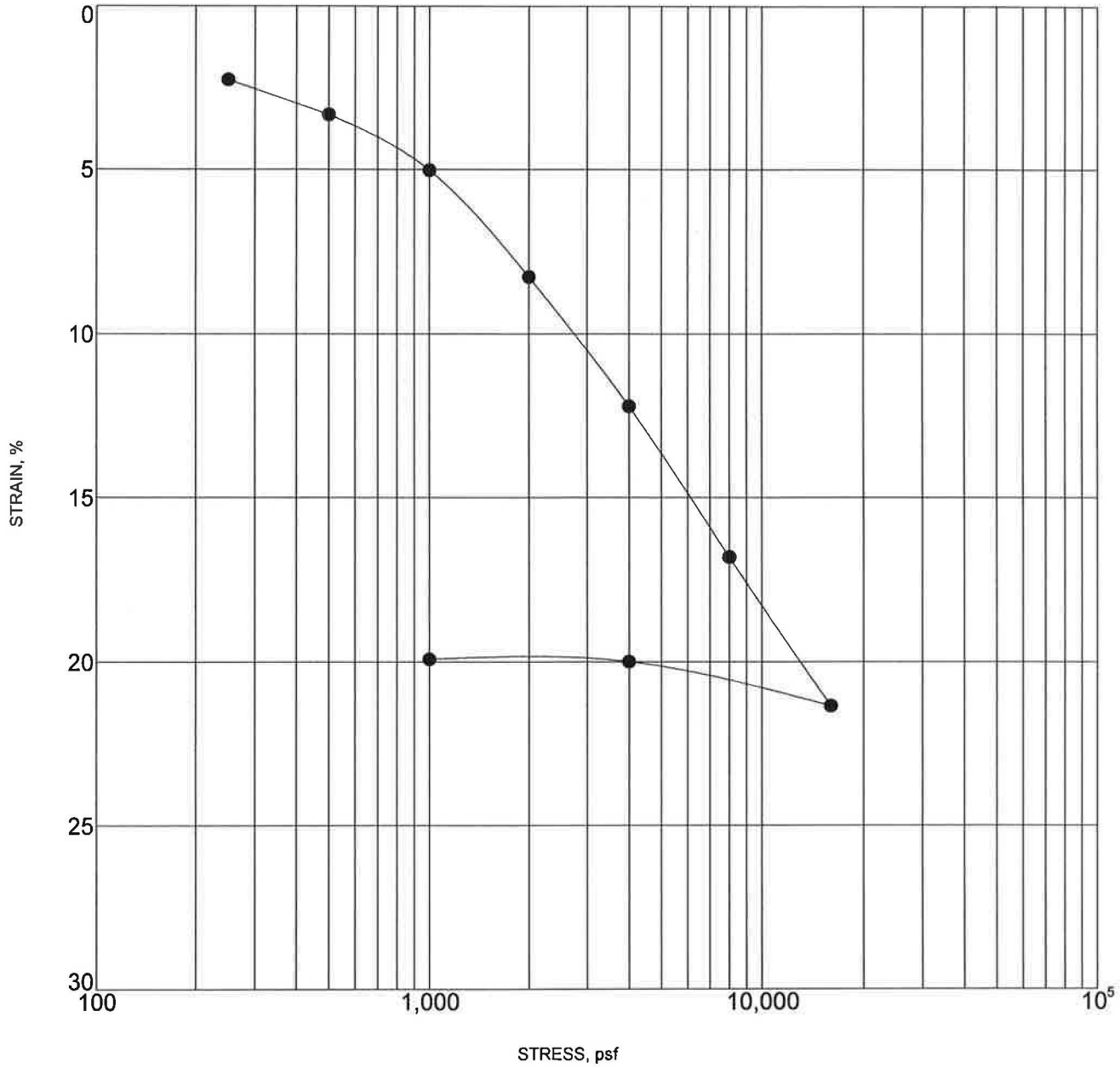
CONSOLIDATION TEST RESULTS

FIGURE C-10



Sample inundated at 500 psf

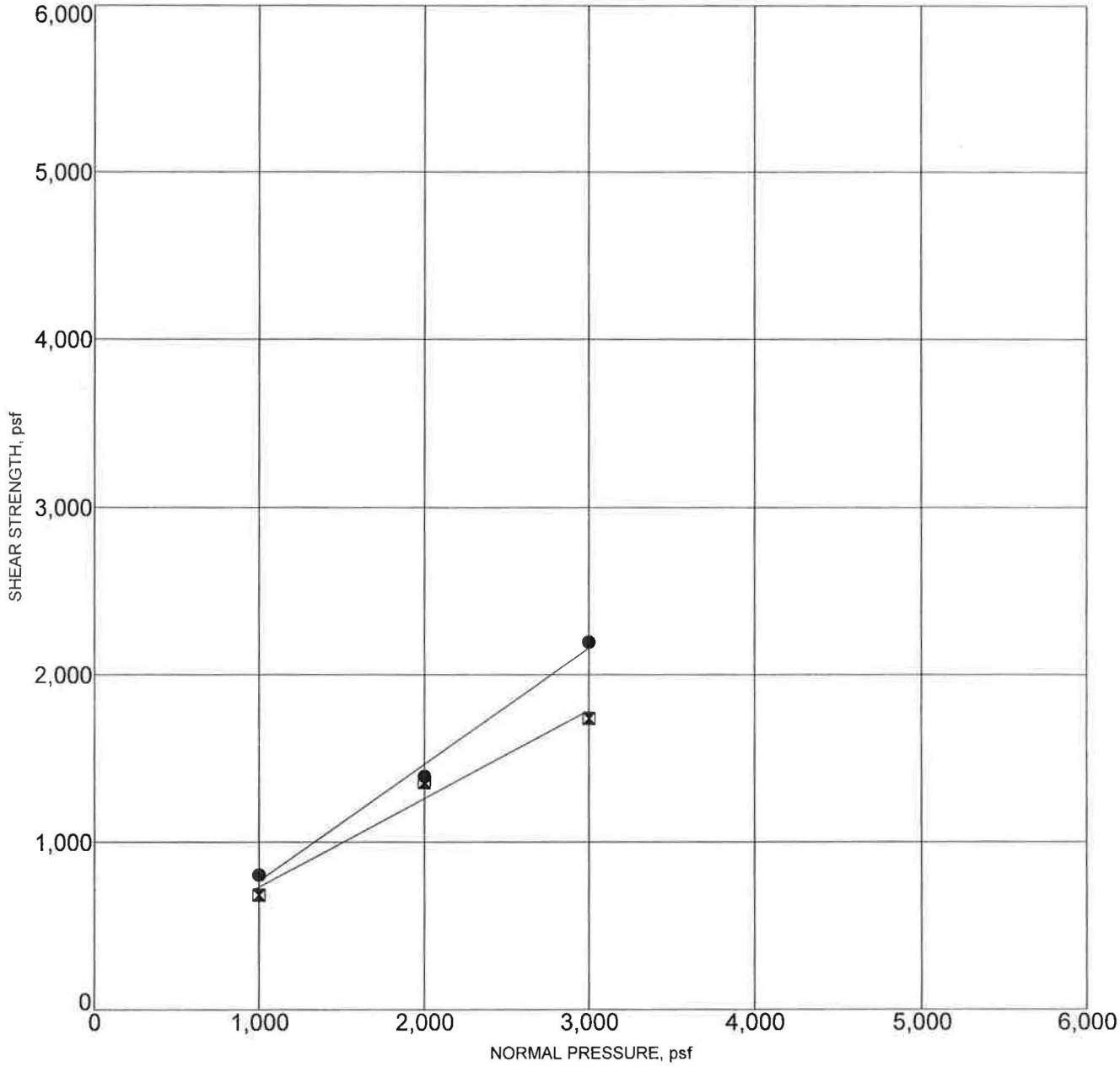
	Sample Location		Classification	DD,pcf	MC,%
●	RW-2	26.8	FAT CLAY (CH)		

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.: 2500.06I

GPI

CONSOLIDATION TEST RESULTS

FIGURE C-11



● **PEAK STRENGTH**
Friction Angle= 35 degrees
Cohesion= 72 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 28 degrees
Cohesion= 204 psf

Sample Location		Classification	DD,pcf	MC,%
RW-1	7-8	SILTY SAND (SM)	91	27.1

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

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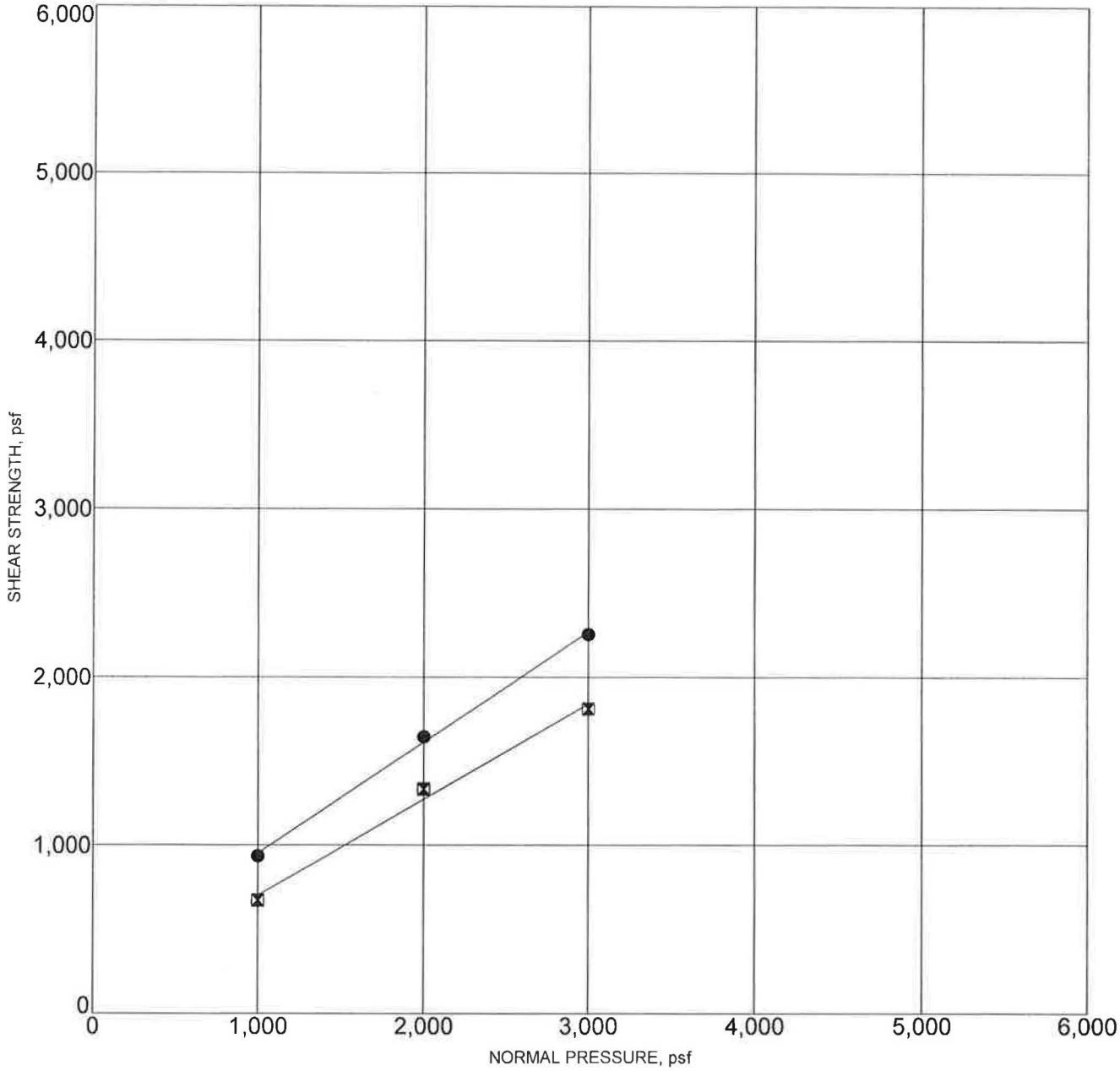
DIRECT SHEAR TEST RESULTS

FIGURE C-12



● **PEAK STRENGTH**
Friction Angle= 33 degrees
Cohesion= 292 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 30 degrees
Cohesion= 132 psf

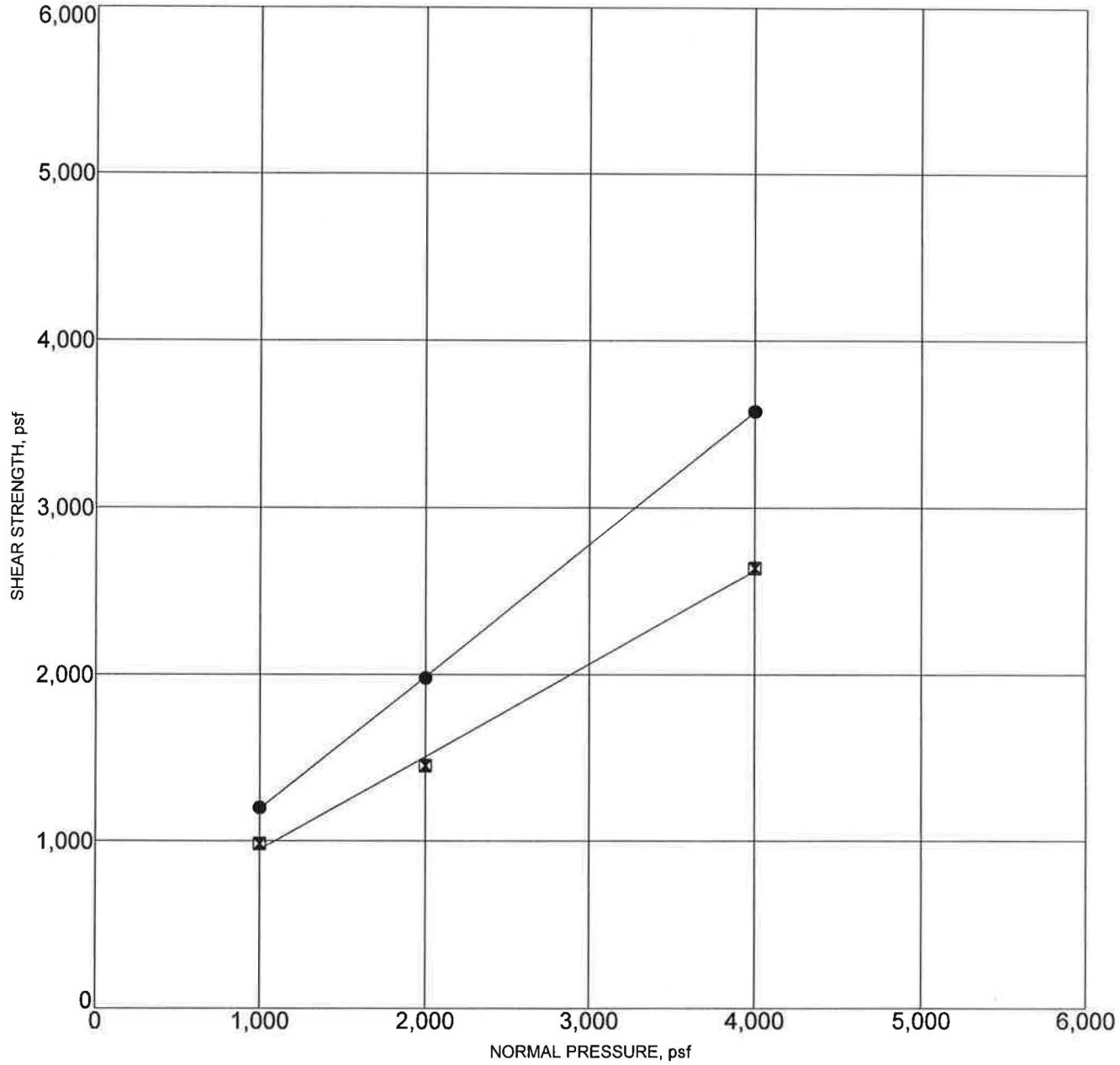
Sample Location		Classification	DD,pcf	MC,%
RW-1	23-24	SAND WITH SILT (SP-SM)	95	24.4

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-13



● **PEAK STRENGTH**
Friction Angle= 38 degrees
Cohesion= 402 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 29 degrees
Cohesion= 390 psf

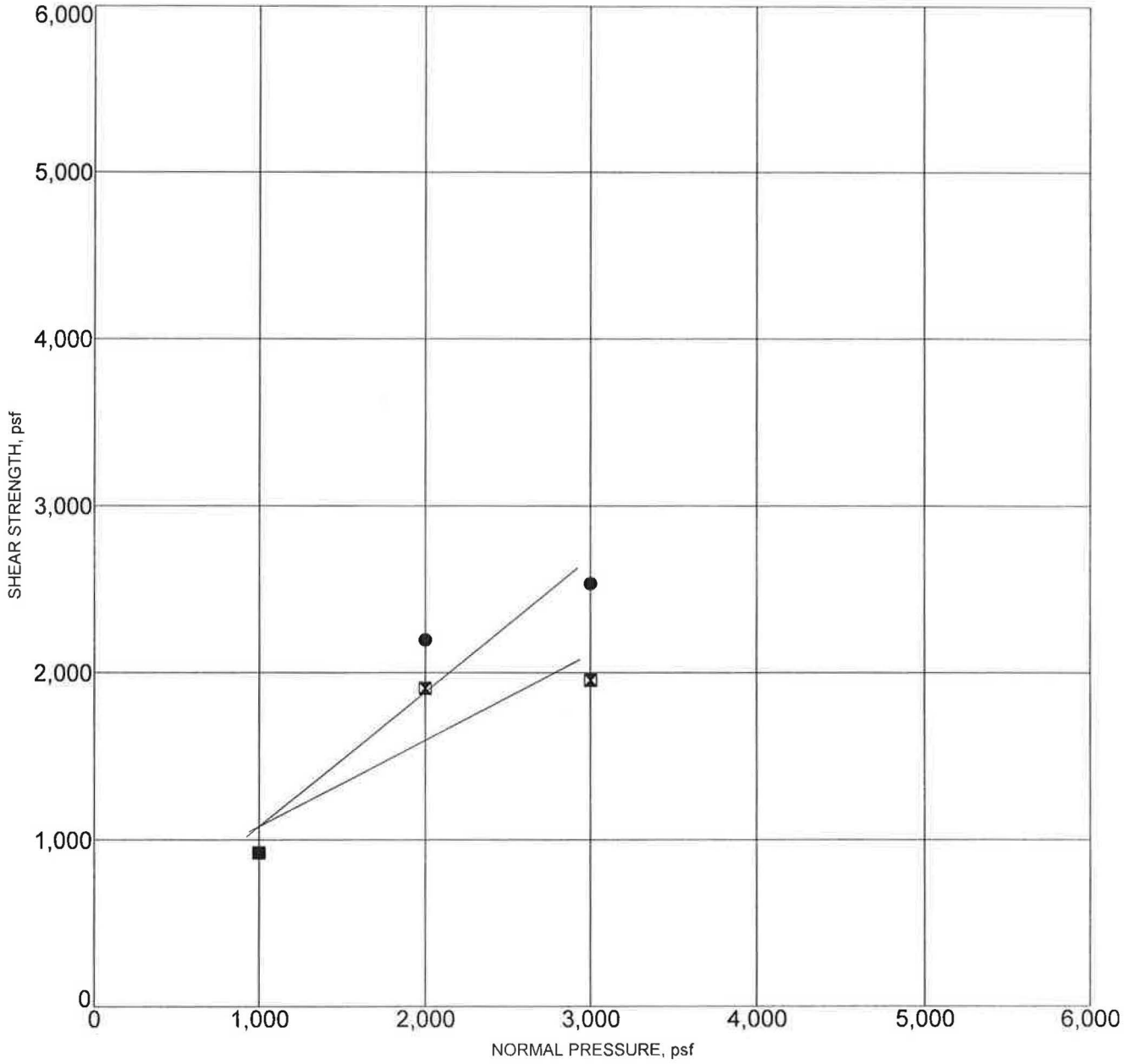
Sample Location		Classification	DD,pcf	MC,%
RW-1	40.0	SAND WITH SILT AND GRAVEL (SP-SM)	120	13.6

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-14



● **PEAK STRENGTH**
Friction Angle= 39 degrees
Cohesion= 276 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 27 degrees
Cohesion= 564 psf

Note: Sample contains sea shells (may have impacted results)

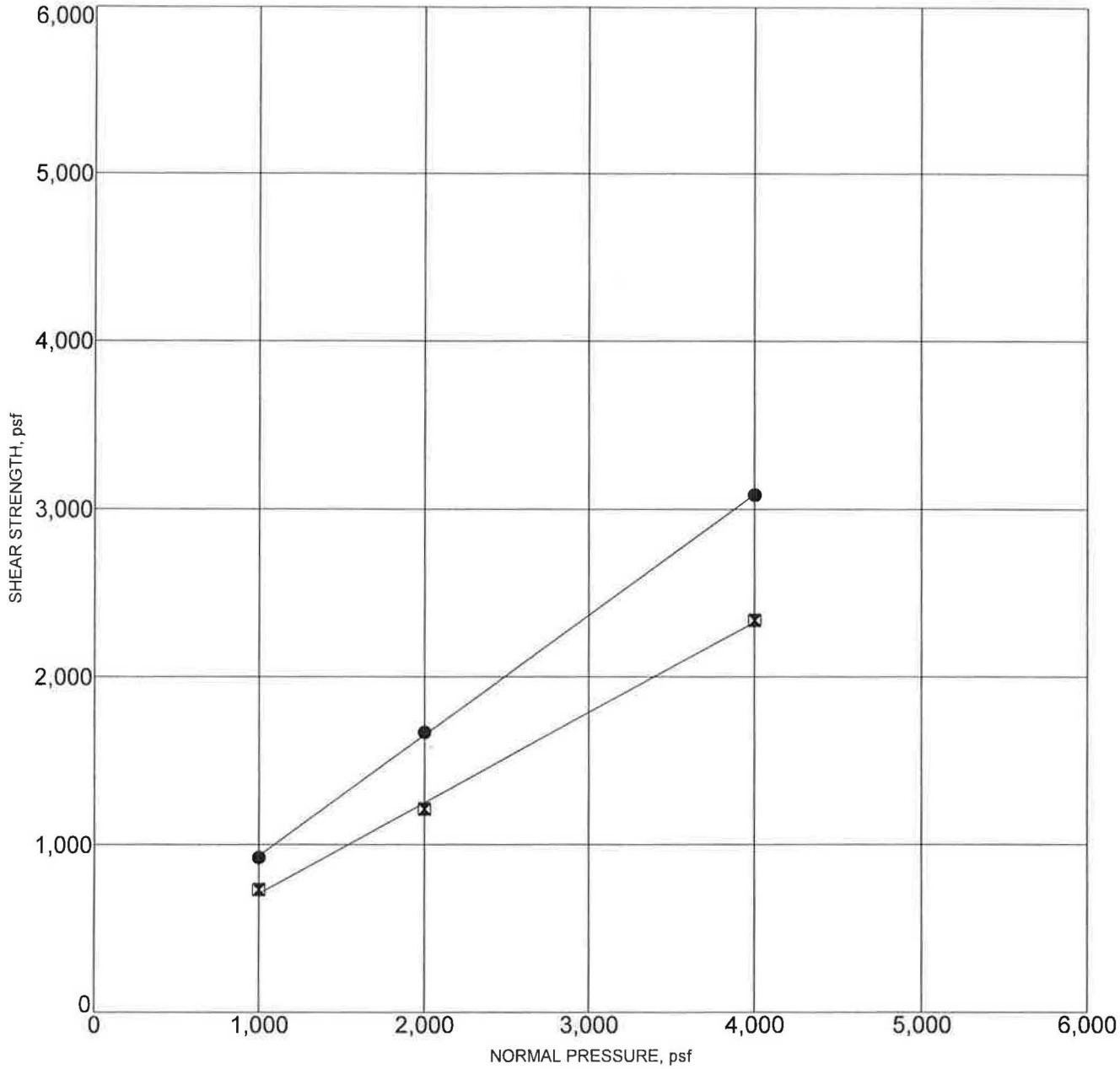
Sample Location		Classification	DD,pcf	MC,%
RW-2	13-14	SILTY SAND (SM)	103	22.0

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-15



● **PEAK STRENGTH**
Friction Angle= 36 degrees
Cohesion= 216 psf

⧗ **ULTIMATE STRENGTH**
Friction Angle= 28 degrees
Cohesion= 168 psf

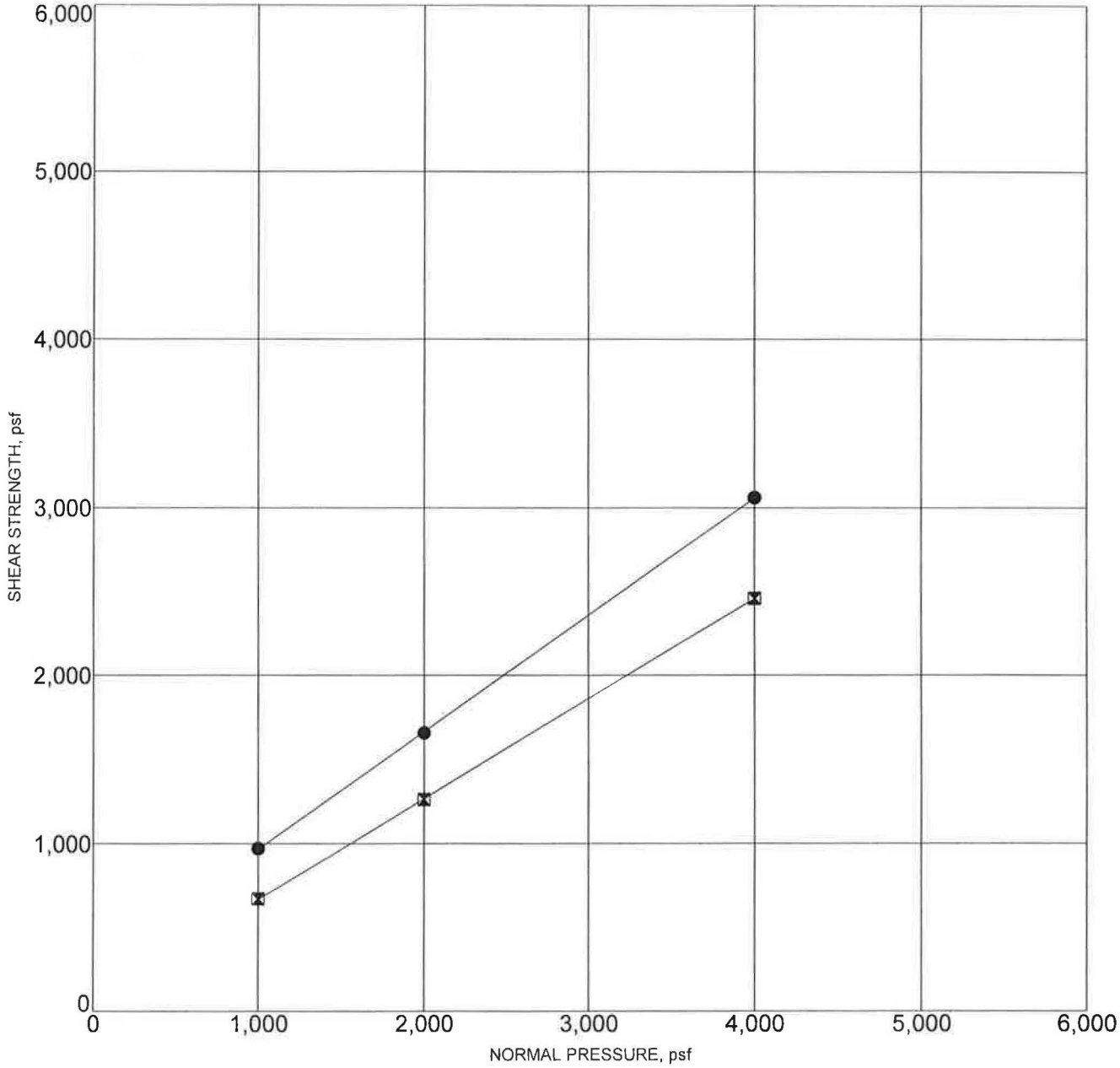
Sample Location		Classification	DD,pcf	MC,%
RW-2	23-24	SAND WITH SILT (SP-SM)	96	24.3

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-16



● **PEAK STRENGTH**
Friction Angle= 35 degrees
Cohesion= 270 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 31 degrees
Cohesion= 72 psf

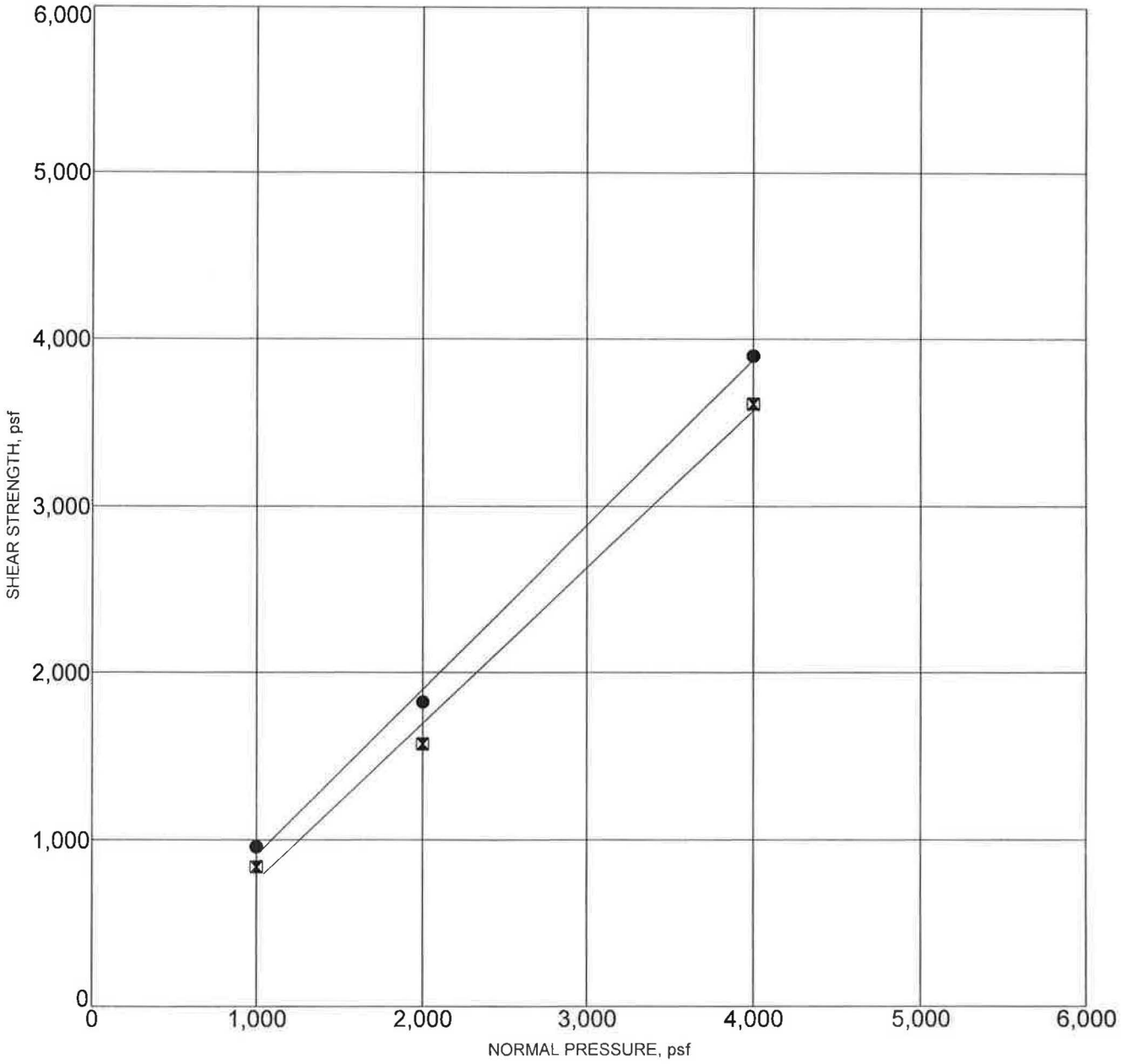
Sample Location		Classification	DD,pcf	MC,%
RW-2	53-54	SAND WITH SILT (SP-SM)	105	20.2

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

GPI

DIRECT SHEAR TEST RESULTS

FIGURE C-17



● **PEAK STRENGTH**
Friction Angle= 44 degrees
Cohesion= 0 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 41 degrees
Cohesion= 0 psf

Sample Location		Classification	DD,pcf	MC,%
RW-3	8-9	SAND WITH SILT AND GRAVEL (SP-SM)	118	8.4

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.061

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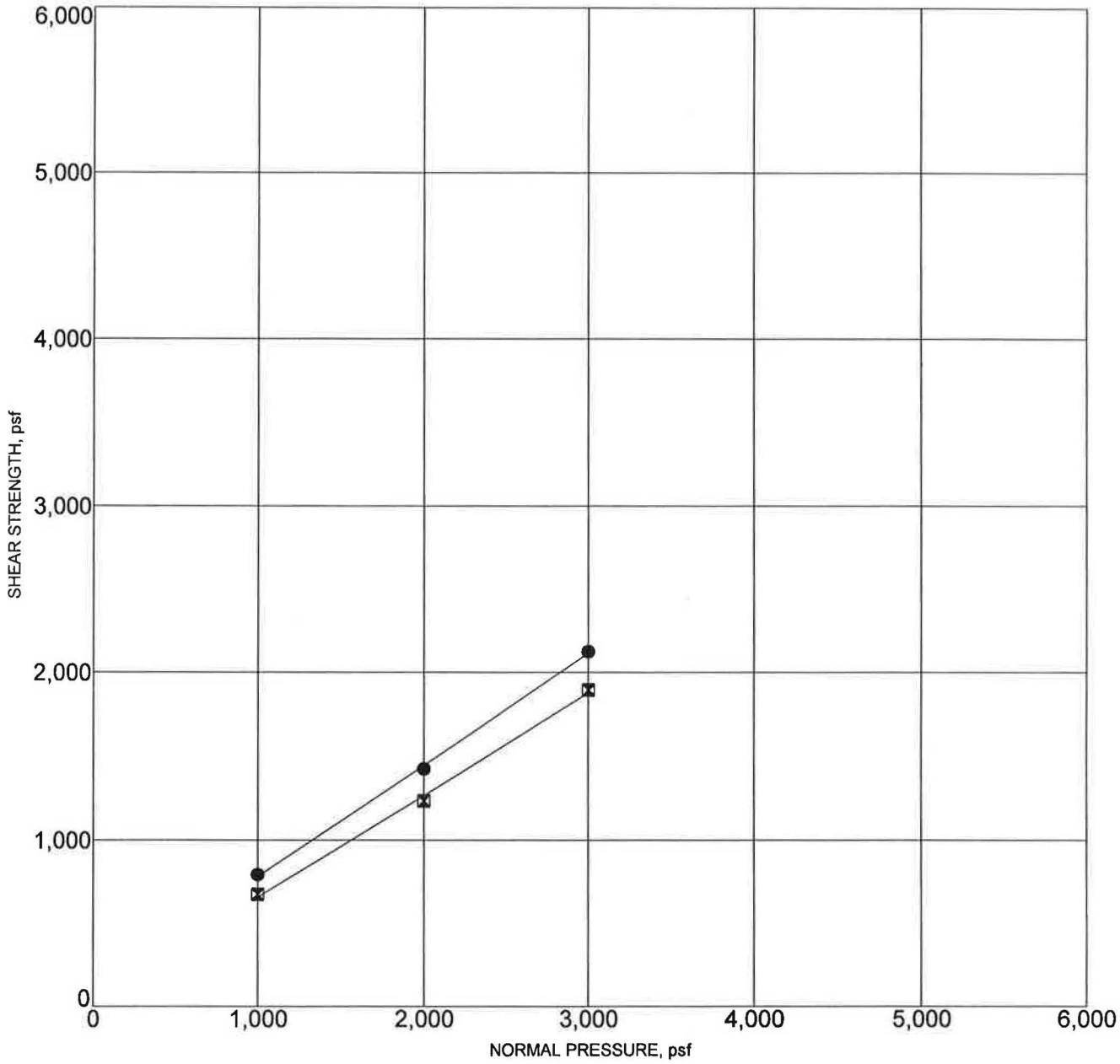
DIRECT SHEAR TEST RESULTS

FIGURE C-18



● **PEAK STRENGTH**
Friction Angle= 34 degrees
Cohesion= 116 psf

⊠ **ULTIMATE STRENGTH**
Friction Angle= 31 degrees
Cohesion= 44 psf

Note: Sample remolded to 95% of the maximum dry density

Sample Location		Classification	DD,pcf	MC,%
RW-1,2,3	0-4	SILTY SAND (SM)	114	10.0

PROJECT: VENICE AUXILARY PUMP PLANT PROJECT NO.2500.06I

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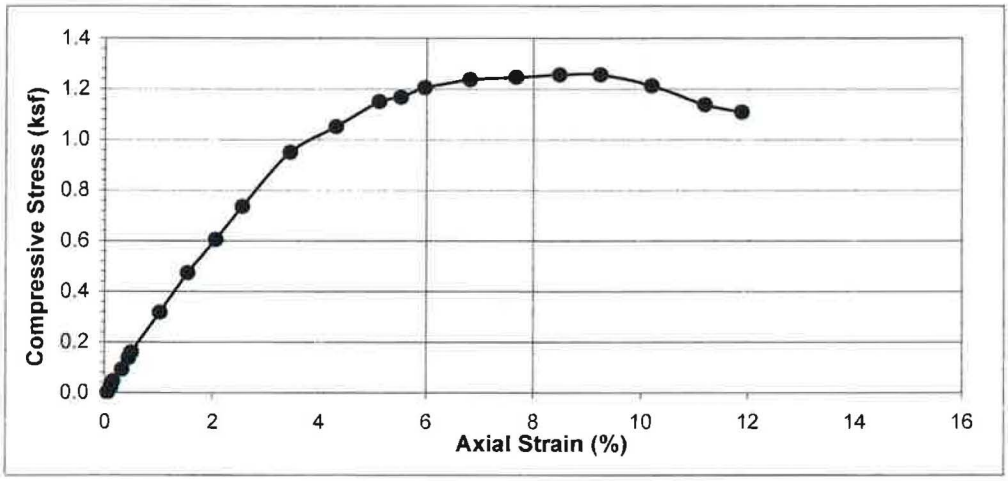
DIRECT SHEAR TEST RESULTS

FIGURE C-19

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

UNCONFINED COMPRESSION TEST RESULTS
ASTM D 2166

Project Name:	VAPP	Sample Type:	Shelby Tube
Project No.:	2500.06I	Soil Description	Clay
Boring No.:	RW-1	Dry Density (pcf):	78.5
Sample No.:	-	Moisture Content (%)	42.6
Depth (feet):	25-25.6	Test Date:	08/26/15
Sample Diameter (inch):	2.831	Wt. Wet Soil+Container(gms)	575.37
Sample Height (inch):	5.884	Wt. Dry Soil+Container(gms)	447.46
Sample Weight (gms):	1088.17	Wt. Container (gms)	147.13





Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.003	6.30	0.00	0.05
1	0.007	6.30	0.02	0.12
2	0.009	6.30	0.05	0.15
4	0.019	6.32	0.09	0.32
6	0.026	6.32	0.14	0.44
7	0.029	6.33	0.16	0.49
14	0.060	6.36	0.32	1.02
21	0.090	6.39	0.47	1.53
27	0.121	6.43	0.60	2.06
33	0.150	6.46	0.74	2.55
43	0.203	6.52	0.95	3.45
48	0.254	6.58	1.05	4.32
53	0.301	6.63	1.15	5.12
54	0.325	6.66	1.17	5.52
56	0.351	6.69	1.20	5.97
58	0.401	6.75	1.24	6.82
59	0.452	6.82	1.25	7.68
60	0.500	6.88	1.26	8.50
61	0.544	6.94	1.26	9.25
59	0.600	7.01	1.21	10.20
56	0.658	7.09	1.14	11.18
55	0.699	7.14	1.11	11.88

FIGURE C-20

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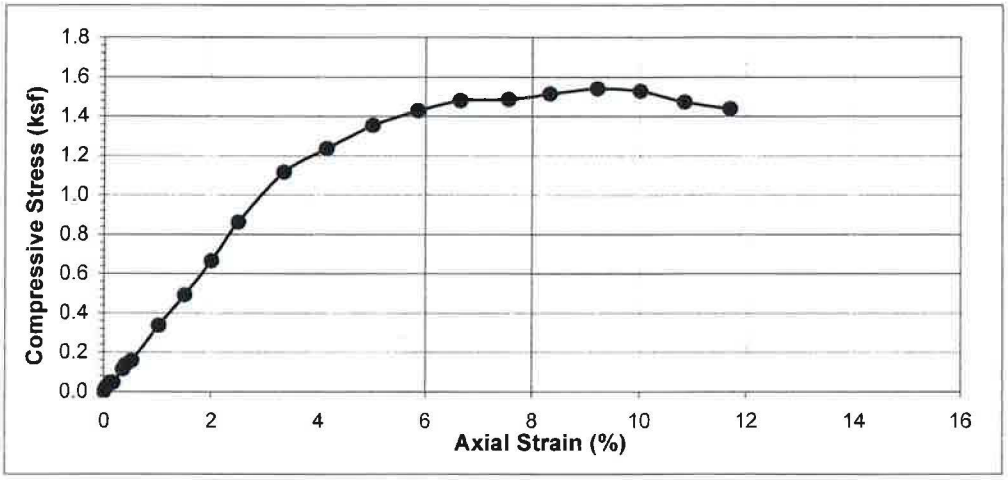
UNCONFINED COMPRESSION TEST RESULTS
ASTM D 2166

Project Name:	VAPP	Sample Type:	Shelby Tube
Project No.:	2500.06I	Soil Description	Clay
Boring No.:	RW-2	Dry Density (pcf):	79.9
Sample No.:	-	Moisture Content (%)	40.1
Depth (feet):	29-29.6	Test Date:	08/26/15
Sample Diameter (inch):	2.847	Wt. Wet Soil+Container(gms)	626.18
Sample Height (inch):	5.994	Wt. Dry Soil+Container(gms)	489.4
Sample Weight (gms):	1120.80	Wt. Container (gms)	148.08





Load (lbs)	Deformation (inch)	Area (sq.in)	Compressive Stress (ksf)	Axial Strain (%)
0	0.000	6.37	0.00	0.00
1	0.003	6.37	0.02	0.05
2	0.007	6.37	0.05	0.12
2	0.010	6.38	0.05	0.17
5	0.021	6.39	0.11	0.35
6	0.024	6.39	0.14	0.40
7	0.031	6.40	0.16	0.52
15	0.061	6.43	0.34	1.02
22	0.090	6.46	0.49	1.50
30	0.120	6.50	0.67	2.00
39	0.150	6.53	0.86	2.50
51	0.201	6.59	1.11	3.35
57	0.249	6.64	1.24	4.15
63	0.300	6.70	1.35	5.01
67	0.351	6.76	1.43	5.86
70	0.399	6.82	1.48	6.66
71	0.453	6.89	1.48	7.56
73	0.499	6.94	1.51	8.32
75	0.552	7.01	1.54	9.21
75	0.600	7.07	1.53	10.01
73	0.650	7.14	1.47	10.84
72	0.701	7.21	1.44	11.70

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UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (UU,Q)
ASTM D 2850

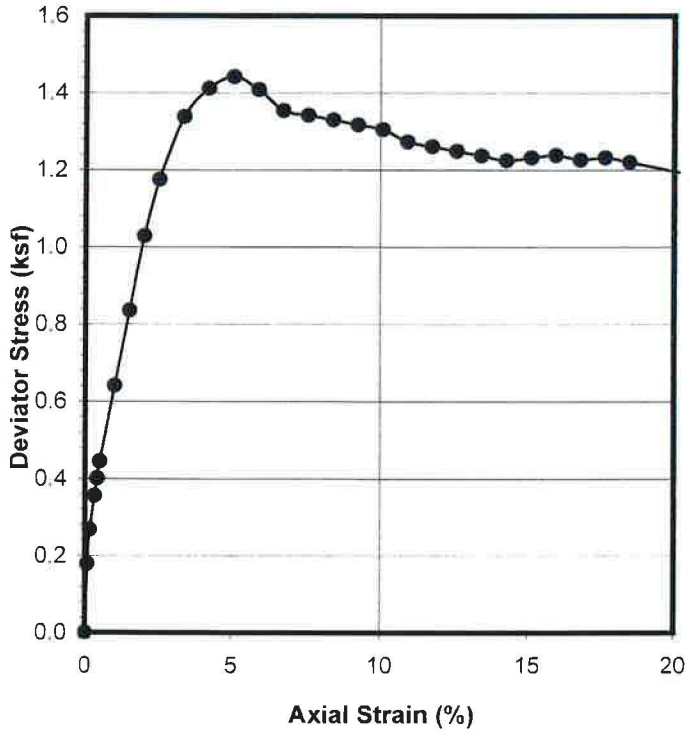
Client Name:	Geotechnical Professionals, Inc.		Tested By:	ST	Date: 08/25/15
Project Name:	VAPP		Checked by:	AP	Date: 08/26/15
Project No.:	2500.06I				
Boring No.:	RW-2				
Sample No.:	-	Depth (feet): 25-25.6			
Soil Description	Clay		Sample Type:	Shelby Tube	

Sample Diameter (inch):	2.866	Wet Unit Weight (pcf):	98.3
Sample Hieght (inch):	5.954	Dry Unit Weight (pcf):	55.8
Sample Weight (gms):	991.76	Moisture Content (%):	76.2
Wt. Wet Soil+Container(gms)	1135.32	Void Ratio for Gs=2.7:	2.02
Wt. Dry Soil+Container(gms)	708.23	% Saturation:	101.8
Wt. Container (gms)	147.65		

TEST DATA

Cell Pressure (ksf):	1.00
Back Pressure (ksf):	0.0
Eff. Confining Pressure (ksf):	1.00
Shear Rate (%/min):	0.3
Maximum Deviator Stress (ksf):	1.44
Ultimate Deviator Stress (ksf):	1.19
Ultimate Undrained Shear Strength (ksf):	0.60
Axial Strain @ Maximum Stress (%)	5.04





Load (lbs)	Def. (inch)	Area (sq.in)	Deviator Stress (ksf)	Axial Strain (%)
0	0.000	6.45	0.00	0.00
8	0.005	6.46	0.18	0.08
12	0.010	6.46	0.27	0.17
16	0.020	6.47	0.36	0.34
18	0.025	6.48	0.40	0.42
20	0.030	6.48	0.44	0.50
29	0.060	6.52	0.64	1.01
38	0.090	6.55	0.84	1.51
47	0.120	6.58	1.03	2.02
54	0.150	6.62	1.17	2.52
62	0.200	6.68	1.34	3.36
66	0.250	6.73	1.41	4.20
68	0.300	6.79	1.44	5.04
67	0.350	6.85	1.41	5.88
65	0.400	6.92	1.35	6.72
65	0.450	6.98	1.34	7.56
65	0.500	7.04	1.33	8.40
65	0.550	7.11	1.32	9.24
65	0.600	7.17	1.30	10.08
64	0.650	7.24	1.27	10.92
64	0.700	7.31	1.26	11.76
64	0.750	7.38	1.25	12.60
64	0.800	7.45	1.24	13.44
64	0.850	7.53	1.22	14.28
65	0.900	7.60	1.23	15.12
66	0.950	7.68	1.24	15.96
66	1.000	7.75	1.23	16.80
67	1.050	7.83	1.23	17.64
67	1.100	7.91	1.22	18.47
67	1.200	8.08	1.19	20.15

FIGURE C-22

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UNCONSOLIDATED UNDRAINED TRIAXIAL TEST (UU,Q)
ASTM D 2850

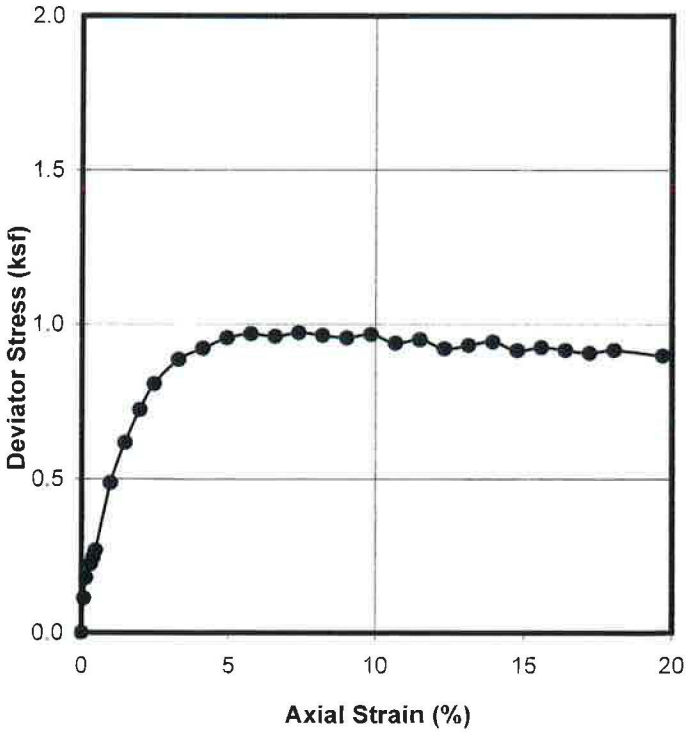
Client Name:	Geotechnical Professionals, Inc.		Tested By:	ST	Date: 08/25/15
Project Name:	VAPP		Checked by:	AP	Date: 08/26/15
Project No.:	2500.06				
Boring No.:	RW-3				
Sample No.:	-	Depth (feet): 23-23.6			
Soil Description	Clay		Sample Type:	Shelby Tube	

Sample Diameter (inch):	2.864	Wet Unit Weight (pcf):	110.0
Sample Hieght (inch):	6.095	Dry Unit Weight (pcf):	75.2
Sample Weight (gms):	1134.67	Moisture Content (%):	46.2
Wt. Wet Soil+Container(gms)	1280.03	Void Ratio for Gs=2.7:	1.24
Wt. Dry Soil+Container(gms)	922.39	% Saturation:	100.7
Wt. Container (gms)	148.60		

TEST DATA

Cell Pressure (ksf):	1.00
Back Pressure (ksf):	0.0
Eff. Confining Pressure (ksf):	1.00
Shear Rate (%/min):	0.3
Maximum Deviator Stress (ksf):	0.97
Ultimate Deviator Stress (ksf):	0.90
Ultimate Undrained Shear Strength (ksf):	0.45
Axial Strain @ Maximum Stress (%)	7.38





Load (lbs)	Def. (inch)	Area (sq.in)	Deviator Stress (ksf)	Axial Strain (%)
0	0.000	6.44	0.00	0.00
5	0.005	6.45	0.11	0.08
8	0.010	6.45	0.18	0.16
10	0.020	6.46	0.22	0.33
11	0.025	6.47	0.24	0.41
12	0.030	6.47	0.27	0.49
22	0.060	6.51	0.49	0.98
28	0.090	6.54	0.62	1.48
33	0.120	6.57	0.72	1.97
37	0.150	6.60	0.81	2.46
41	0.200	6.66	0.89	3.28
43	0.250	6.72	0.92	4.10
45	0.300	6.78	0.96	4.92
46	0.350	6.83	0.97	5.74
46	0.400	6.89	0.96	6.56
47	0.450	6.96	0.97	7.38
47	0.500	7.02	0.96	8.20
47	0.550	7.08	0.96	9.02
48	0.600	7.15	0.97	9.84
47	0.650	7.21	0.94	10.66
48	0.700	7.28	0.95	11.48
47	0.750	7.35	0.92	12.31
48	0.800	7.42	0.93	13.13
49	0.850	7.49	0.94	13.95
48	0.900	7.56	0.91	14.77
49	0.950	7.63	0.92	15.59
49	1.000	7.71	0.92	16.41
49	1.050	7.78	0.91	17.23
50	1.100	7.86	0.92	18.05
50	1.200	8.02	0.90	19.69

FIGURE C-23

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CORROSION TEST RESULTS

Client Name: Geotechnical Professionals, Inc.
Project Name: VAPP
Project No.: 2500.06I

AP Job No.: 15-0845
Date 08/26/15

Boring No.	Sample Type	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
Composite	Bag	0-4	SM	1067	7.7	919	667
RW-2	Bag	26-26.3	CH	93	7.4	1691	10192

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

APPENDIX B

EXPLANATION OF BORING LOGS

VENICE DUAL FORCE MAIN
Los Angeles, California

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL	GW	Well-graded gravels or gravel-sand mixtures, little or no fines	FINE GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic silts and very fine sand, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
		GP	Poorly-graded gravels or gravel-sand mixture, little or no fines			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		GM	Silty gravels, gravel-sand-silt mixtures			OL	Organic silts and organic silt-clays of low plasticity
		GC	Clayey gravels, gravel-sand-clay mixtures				
	SAND	SW	Well-graded sands or sand with gravel, little or no fines		SILTS AND CLAYS LL>50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		SP	Poorly-graded sands or sand with gravel, little or no fines			CH	Inorganic clays of hogh plasticity, fat clays
		SM	Silty sands, sand-silt mixtures			OH	Organic clays of medium to high plasticity
		SC	Clayey sands, sand-clay mixtures	HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

SAMPLE COLUMN SYMBOLS

- Standard penetration test (SPT) sample
- Shelby tube sample
- Modified California split spoon sample
- Bulk sample
- P — Piston sample
- Continuous soil or rock core
- NR — No recovery

BLOWS/FOOT - Summation of blow counts for deepest 12 inches is sampling interval
RQD% - Rock quality designation in percent

DESCRIPTION COLUMN SYMBOLS

- Dashed lines separating soil strata represent inferred boundaries between sampled intervals or no recovery intervals and may be distinct or gradual transitions
- Solid lines represent distinct or gradual boundaries observed within sampled intervals
- Description right of bracket symbol represents soil conditions within the depth interval defined by the bracket length
- Description right of arrow symbol represents soil conditions to the next deeper boundary line unless otherwise noted
- Water level at time of drilling
- Water level after at least 12 hours from time of drilling

LABORATORY TEST ABBREVIATIONS

ATT	Atterberg Limits	CORR	Corrosion	S	Grain Size Analysis
COLL	Collapse Potential	DS	Direct Shear	SE	Sand Equivalent
COMP	Compaction	EI	Expansion Index	SG	Specific Gravity
CON	Consolidation	OC	Organic Content	TX	Triaxial Test
R	R-Value	PERM	Permeability	UC	Unconfined Compression Test
H	Hydrometer Test			#200	No. 200 Wash Sieve Analysis

NOTES

1. Soil descriptions are in accordance with the USCS as set forth by ASTM D2488 "Standard Practice for Description and Identification Soil (Visual-Manual Procedure)."
2. Soil color described according to Munsell Soil Color Chart. Rock color described according to Munsell Rock-Color Chart
3. Soil descriptions in these borings are generalized representations and based upon visual classification of cuttings and/or samples during drilling. Descriptions and related information in these borings depict subsurface conditions at the specific location and at the time of drilling only. Soil conditions at other locations may differ from conditions observed at the boring locations. Also, soil and groundwater conditions may change with time at these locations.

P:\12075.000.0\12075.006.0\GINT\12075.006.0 LOGS.GPJ

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A

BORING LOCATION: Northing 1814021.085, Easting 6421835.287

DATE STARTED: 8/15/08 | DATE FINISHED: 8/15/08

DRILLING METHOD: Mud Rotary

HAMMER WEIGHT: 140 lbs | DROP: 30 in

SAMPLER: SPT, CA Modified, Shelby Tube

NOTES:
Drilling Contractor: SoCal Drilling Company
Drilling Equipment: Mayhew-1000
Logged By: T. Naing

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
					Surface Elevation: 4.84' datum is ground surface				
	1	1		Bulk	SILTY SAND (SM): light brownish gray (10YR 6/2), dry, ~70% fine to coarse sand, ~20% fines, ~10% fine gravel				COMP
	3	2		4 5 5	POORLY GRADED SAND (SP): olive brown (2.5Y 4/2), moist, ~95% fine sand, ~5% fines	0			
	5	3		0 0 0	SANDY SILT (ML): dark gray (2.5Y 4/1), wet, ~55% low plasticity fines, ~45% fine sand (pushed)	0			<#200= 56%
	8	4		3 5 7	SILTY SAND (SM): dark gray (2.5Y 4/1), ~70% fine sand, ~30% low plasticity fines, with seashells large shell fragments	0	25.1	90.5	
	10	5		4 8 9	POORLY GRADED SAND with SILT (SP-SM): dark gray (2.5Y 4/1), ~90% fine sand, ~10% low plasticity fines, with seashells	0			
	12	6		5 3 2		0	20.8	99.0	
	14				SILTY SAND (SM): dark gray (2.5Y 4/1), ~70% fine sand, ~30% low plasticity fines, with seashells				

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	16	7		8 10 10	SILTY SAND (SM): continued	0.1			
	17								
	18								
	19								
	20	8		10 16 18		0	24.7	97.9	
	21								
	22								
	23				LEAN CLAY with SAND (CL): greenish black (5GY 2.5/1), moist, ~85% fines, ~15% fine sand, medium plasticity, soft				
	24								
	25	9		0 0 0	(pushed)	3.5			ATT S H <#200 =84% CORR COMPOSITE 25-40' CON TX CORR
	26								
	27								
	28	10					30.8	88.1	
	29				SILTY SAND (SM): dark gray (2.5Y 4/1), wet, ~55% fine to medium sand, ~45% low plasticity fines, abundant shell fragments				
	30			5	fine sand				
	31	11		1 1	medium sand	0			S H <#200=
	32								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
									44%
	33	12		2 5 8	SILTY SAND (SM)/SANDY SILT (ML): very dark grayish brown (2.5Y 3/2), moist, ~50% fine to medium sand, ~50% nonplastic to low plasticity fines, trace coarse sand	0	14.9	121.0	ATT S H <#200= 50%
	34								
	35			7	SILTY SAND (SM): very dark greenish gray (GLEY 3/1), wet, ~85% fine to medium sand, ~15% low plasticity fines, trace fine subrounded gravel				
	36	13		7 9		0			CON S <#200= 16%
	37								
	38	14		12 25 25	POORLY GRADED SAND with SILT (SP-SM): very dark greenish gray (10Y 3/1), wet, ~80% fine to coarse sand, ~10% fine subangular to subrounded gravel, ~10% fines	0	8.5	121.9	DS
	39								
	40			20	fine to coarse gravel				
	41	15		26 24		0			<#200= 11%
	42								
	43				POORLY GRADED SAND with SILT and GRAVEL (SP-SM): very dark greenish gray (10Y 3/1), wet, ~65% fine to coarse sand, ~30% fine to coarse gravel, ~5% fines, hard drilling				
	44								
	45	16		39 48		0	12.1	126.2	
	46								
	47								
	48								
	49								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS Moisture Content (%)	LABORATORY TESTS Dry Density (pcf)	LABORATORY TESTS Other Tests
	50			16	POORLY GRADED SAND with SILT and GRAVEL (SP-SM): continued				
		17		18		0			S <#200= 6%
	51			22					
	52								
	53				POORLY GRADED SAND with SILT (SP-SM): very dark greenish gray (10Y 3/1), wet, ~80% fine to coarse sand, ~10% fine subrounded gravel, ~10% fines				
	54								
	55			24					
		18		60/6"		0	14.3	116.5	DS
	56								
	57								
	58								
	59								
	60			16	interbedded with fine sand and silt layers of ~1" thick				
		19		19		0			<#200= 11%
	61			23					
	62								
	63								
	64								
	65			29					
		20		50/5"		0	23.8	101.3	
	66								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1A (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	67				POORLY GRADED SAND with SILT (SP-SM): continued				
	68								
	69								
	70			24					
		21		30					
	71			36		5.2			
	72				Bottom of boring at 71.5 feet bgs. Sample at 10 feet was missed in this boring. Sample #5 (SPT: 10-11.5) was collected from stepout boring G-1B, drilled a few feet away for shallower monitoring well. Sample at 12.5 feet was collected using SPT in G-1A and CA Modified in G-1B. Boring converted into monitoring well. Boring is ~12' north of Hurricane Street and ~12' west of northeast fence.				
	73								
	74								
	75								
	76								
	77								
	78								
	79								
	80								
	81								
	82								
	83								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1B

BORING LOCATION: Northing 1814023.456; Easting 6421840.813

DATE STARTED: 8/18/08 | DATE FINISHED: 8/18/08

DRILLING METHOD: Mud Rotary

HAMMER WEIGHT: 140 lbs | DROP: 30 in

SAMPLER: SPT, CA Modified, Shelby Tube

NOTES:
Drilling Contractor: SoCal Drilling Company
Drilling Equipment: Mayhew-1000
Logged By: T. Naing

Surface Elevation: 4.94'

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	1			Bulk	SILTY SAND (SM): light brownish gray (10YR 6/2), dry, ~70% fine to coarse sand, ~20% fines, ~10% fine gravel				
	2								
	3	2		4 5 5	POORLY GRADED SAND (SP): olive brown (2.5Y 4/2), moist, ~95% fine sand, ~5% fines	0			
	4								
	5			0	SANDY SILT (ML): dark gray (2.5Y 4/1), wet, ~55% low plasticity fines, ~45% fine sand				
	6	3		0 0	(pushed)	0			
	7				SILTY SAND (SM): dark gray (2.5Y 4/1), ~70% fine sand, ~30% low plasticity fines				
	8	4		3 5	large shell fragments	0			
	9		NR	7					
	10			4	POORLY GRADED SAND with SILT (SP-SM): dark gray (2.5Y 4/1), ~90% fine sand, ~10% low plasticity fines with seashells				
	11	5		8 9		0			
	12			10					
	13	6		11 11		0			
	14				SILTY SAND (SM): dark gray (2.5Y 4/1), ~70% fine sand, ~30% low plasticity fines with seashells				
	15								

GEO3 PID 6 INCH

PROJECT: VENICE DUAL FORCE MAIN
Los Angeles, California

Log of Boring No. G-1B (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION	PID Reading (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	16	7		8 10 10	SILTY SAND (SM): continued	0			
	17								
	18								
	19								
	20			10					
	21	8		16 18		0			
	22								
	23								
	24				LEAN CLAY with SAND (CL): greenish black (5GY 2.5/1), moist, ~85% fines, ~15% fine sand, medium plasticity, soft				
	25								
	26				Bottom of boring at 25.5 feet bgs. Boring converted into monitoring well. Boring is ~13' north of Hurricane Street and ~10' west of the northeast fence.				
	27								
	28								
	29								
	30								
	31								
	32								

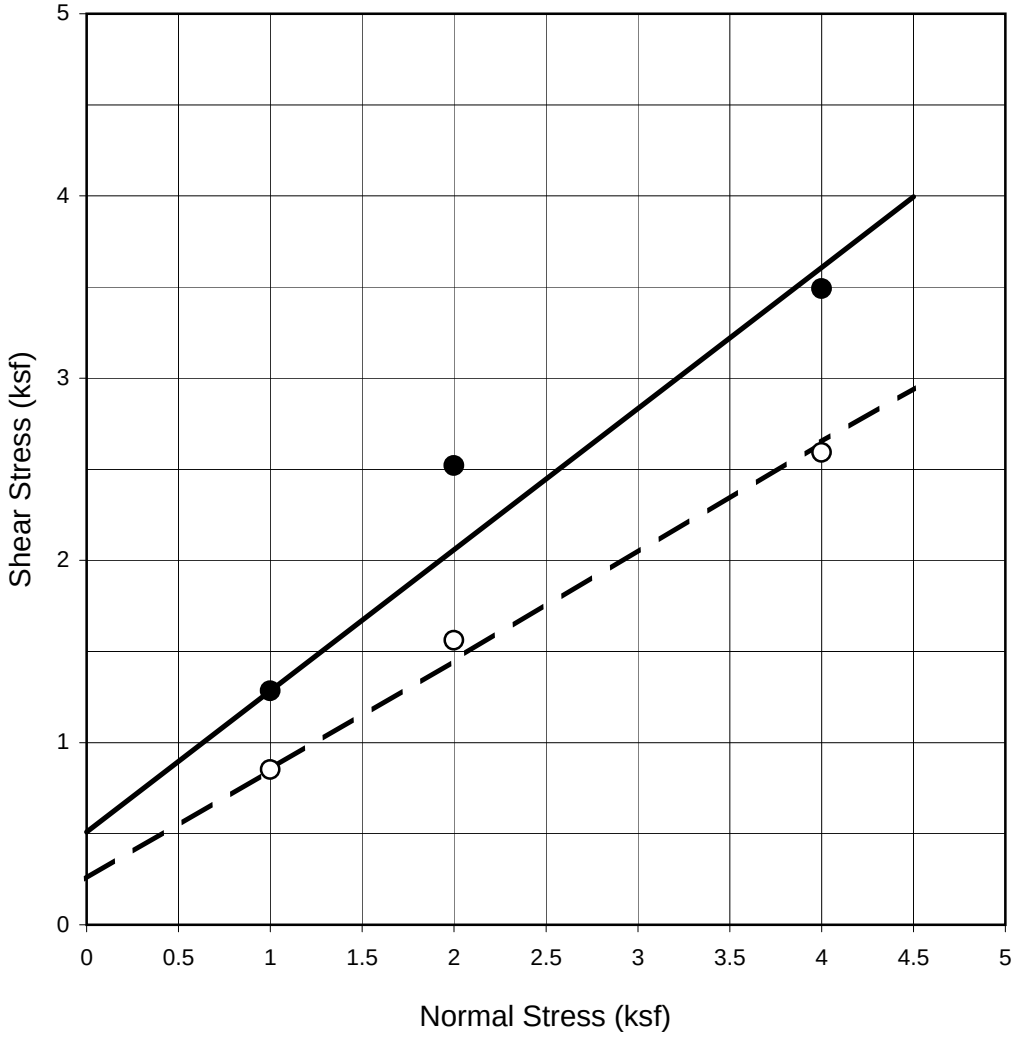
GEO3 PID 6 INCH

AP Engineering & Testing, Inc.

PERCENT PASSING NO. 200 SIEVE

Client:	AMEC Geomatrix	AP Lab No.:	28-0929
Project Name:	Venice Dual Force Main	Date:	09/22/08
Project Number:	14403.000		

Boring No.	Sample No.	Sample Depth (ft)	Percent Fine (%)
G-1	3	6-6.5	56.4
G-1	15	40-41.5	11.0
G-1	19	60-61.5	10.8
G-7	14	45-46.5	14.2
G-8	9	25-26.5	39.2
G-8	13	40-41.5	4.7
G-8	15	45-46	18.1
G-8	18	55-56.5	22.7
G-9	6	15-16.5	3.3
G-9	11	37-37.5	6.6
G-9	14	45-46.5	10.3
G-9	15	47.5-48	3.8
G-9	16	50-51.5	7.0
G-10	11	35-36.5	4.7
G-10	13	40-41.5	2.6
G-10	15	45-46.5	2.8
G-10	19	60-61.5	31.6
G-10	21	70-71	48.6
G-11	2	5-6.5	6.7
G-11	8	25-26.5	10.0
G-11	10	32.5-34	11.1
G-11	17	50	6.8
G-12	8	21-21.5	8.6
G-12	10	30-33	9.6
G-12	12	31.9	9.5
G-12	20	55-56.5	10.3



Project Name:	:	Venice Dual Force Main
Project No.	:	14403.000
Boring No.	:	G-1
Sample No.	:	14
Depth (ft)	:	38.5-38.9
Sample Type	:	Mod. Cal.
Soil Type	:	Poorly Graded Sand with silt
Test Condition	:	Saturated Drained
Initial Dry Density	:	121.9 pcf
Moisture Content (before)	:	8.5 %
Moisture Content (after)	:	15.3 %

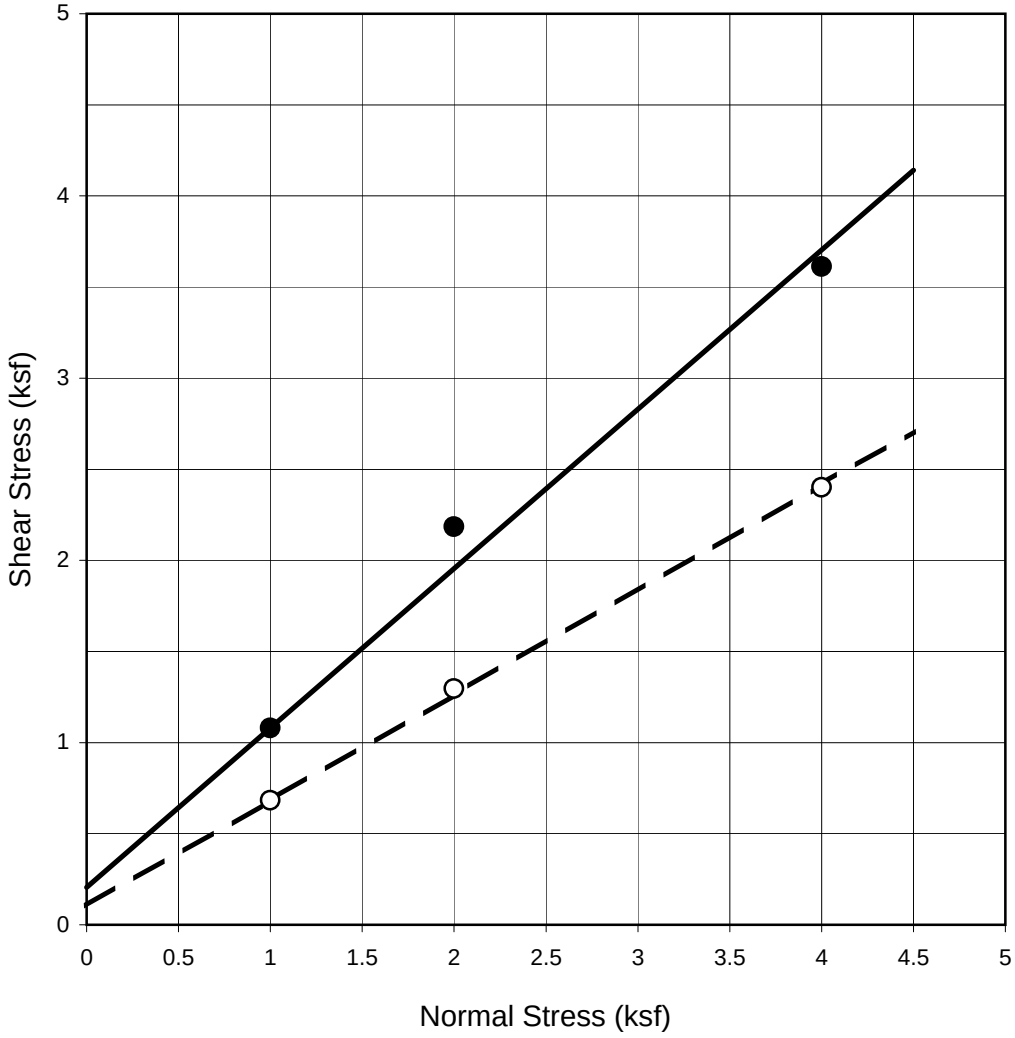
	Peak	Ultimate
Cohesion (psf) :	500	250
Friction Angle :	38 °	31 °

Normal Stress (ksf)	Shear Stress Peak (ksf)	Shear Stress Ultimate (ksf)
1	1.284	0.852
2	2.520	1.562
4	3.492	2.592

AP Engineering & Testing, Inc.

DIRECT SHEAR
TEST RESULTS
(ASTM D 3080)

Mar-09 Figure No.



Project Name:	:	Venice Dual Force Main
Project No.	:	14403.000
Boring No.	:	G-1
Sample No.	:	18
Depth (ft)	:	55-56
Sample Type	:	Mod. Cal.
Soil Type	:	Poorly Graded Sand with silt
Test Condition	:	Saturated Drained
Initial Dry Density	:	116.5 pcf
Moisture Content (before)	:	14.3 %
Moisture Content (after)	:	16.5 %

	Peak	Ultimate
Cohesion (psf) :	200	100
Friction Angle :	41 °	30 °

Normal Stress (ksf)	Shear Stress Peak (ksf)	Shear Stress Ultimate (ksf)
1	1.080	0.684
2	2.184	1.296
4	3.612	2.400

AP Engineering & Testing, Inc.

DIRECT SHEAR
TEST RESULTS
(ASTM D 3080)

Mar-09 Figure No.

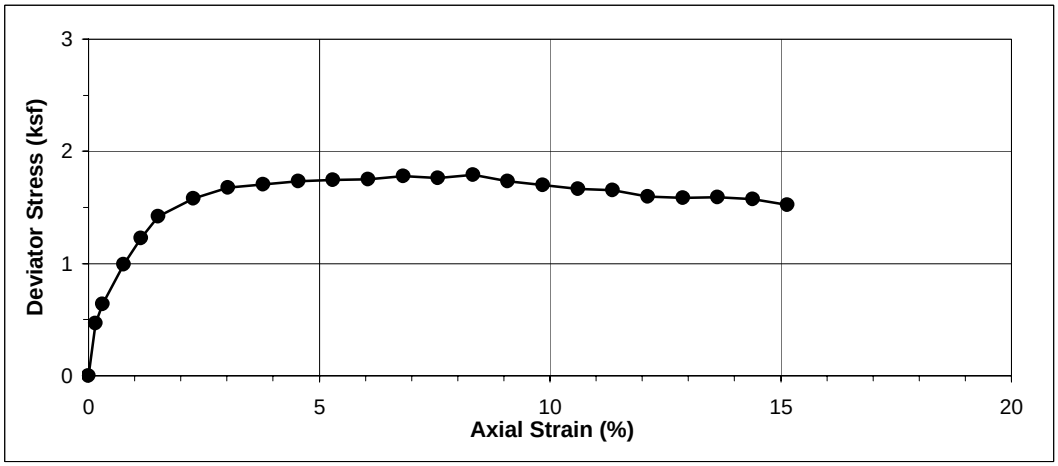
AP Engineering & Testing, Inc.

GEOTECHNICAL TESTING LABORATORY

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Project Name:	Venice Dual Force Main	Sample Type:	Shelby Tube
Work Order:	14403.000	Soil Description	Gray Silty Clay
Boring No.:	G-1	Dry Density (pcf):	77.0
Sample No.:	10	Moisture Content (%)	43.4
Depth (feet):	27.5-29.5	Test Date:	9/18/2008

Sample Diameter (inch):	2.875	Wt. Wet Soil+Container(gms)	733.54
Sample Hieght (inch):	6.60	Wt. Dry Soil+Container(gms)	570.46
Sample Weight (gms):	1242.28	Wt. Container (gms)	194.91



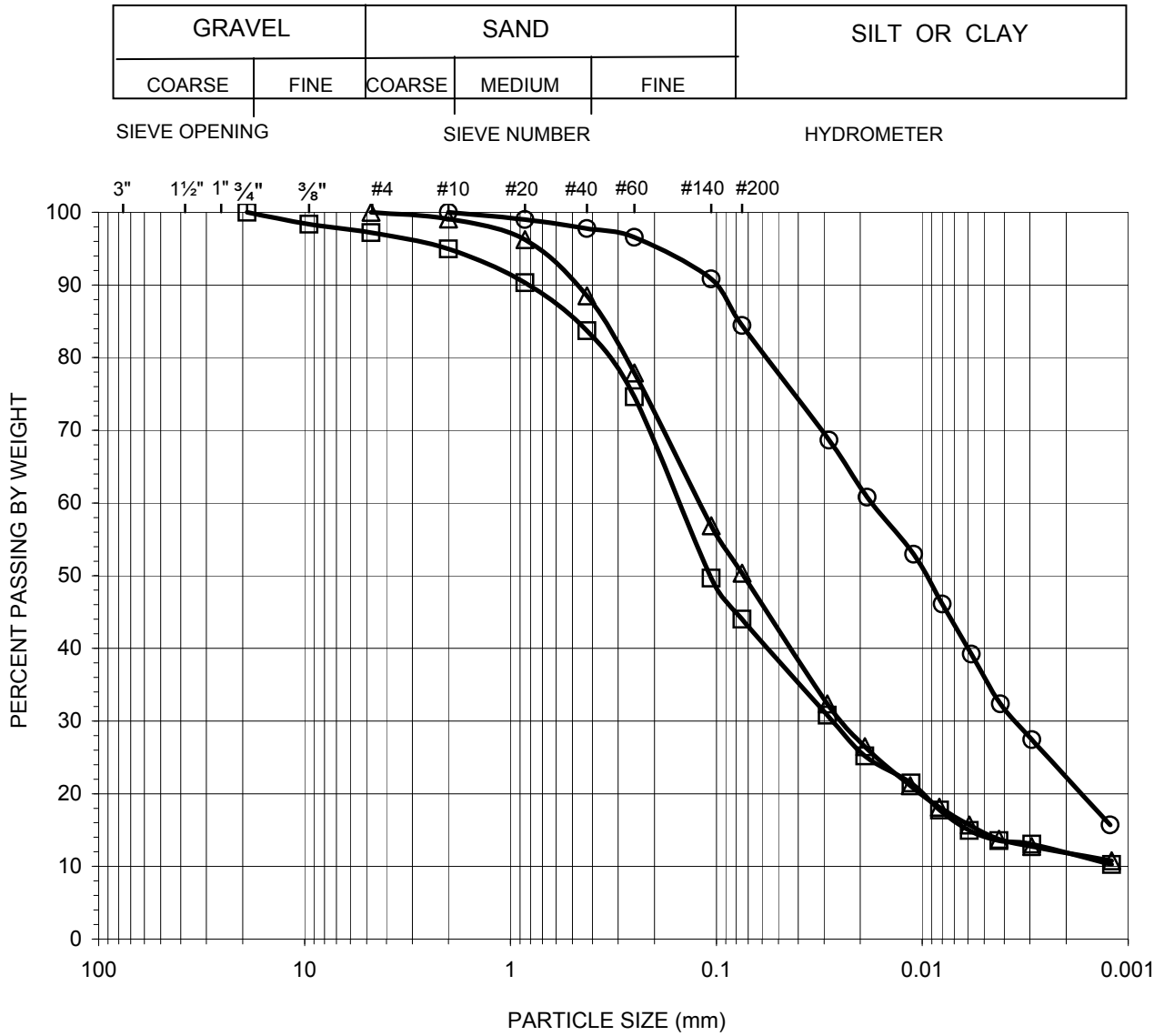
Confining Pressure : 1.20 ksf

Load (lbs)	Deformation (inch)	Area (sq.in)	Deviator Stress (ksf)	Axial Strain (%)
0	0.00	6.49	0.00	0.00
21	0.01	6.50	0.47	0.15
29	0.02	6.51	0.64	0.30
45	0.05	6.54	0.99	0.76
56	0.075	6.57	1.23	1.14
65	0.10	6.59	1.42	1.52
73	0.15	6.64	1.58	2.27
78	0.20	6.69	1.68	3.03
80	0.25	6.75	1.71	3.79
82	0.30	6.80	1.74	4.55
83	0.35	6.86	1.74	5.30
84	0.40	6.91	1.75	6.06
86	0.45	6.97	1.78	6.82
86	0.50	7.02	1.76	7.58
88	0.55	7.08	1.79	8.33
86	0.60	7.14	1.73	9.09
85	0.65	7.20	1.70	9.85
84	0.70	7.26	1.67	10.61
84	0.75	7.32	1.65	11.36
82	0.80	7.39	1.60	12.12
82	0.85	7.45	1.58	12.88
83	0.90	7.52	1.59	13.64
83	0.95	7.58	1.58	14.39
81	1.00	7.65	1.52	15.15

AP Engineering & Testing, Inc.

GRAIN SIZE DISTRIBUTION CURVE
ASTM D 422

Project Name: Venice Dual Force Main Tested by: DK Date: 09/17/08
Project Number: 14403.000 Checked by: AP Date: 10/08/08

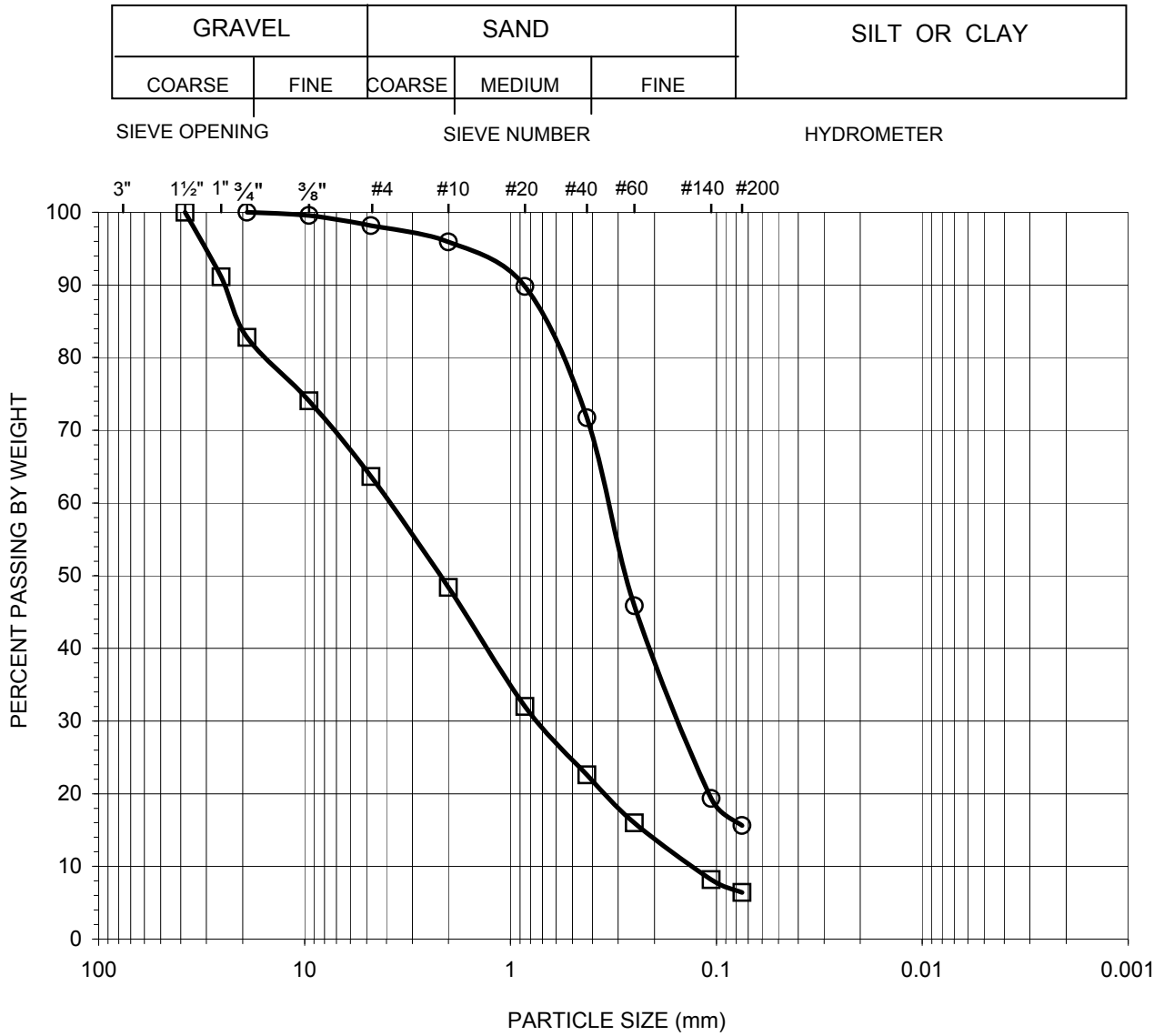


Symbol	Boring No.	Sample No.	Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Fines		
○	G-1	9	25-26.5	0.00	15.57	84.43	N/A	CL
□	G-1	11	30-31.5	2.79	53.21	44.00	N/A	SM
△	G-1	12	33.5-33.9	0.00	49.65	50.35	N/A	ML

AP Engineering & Testing, Inc.

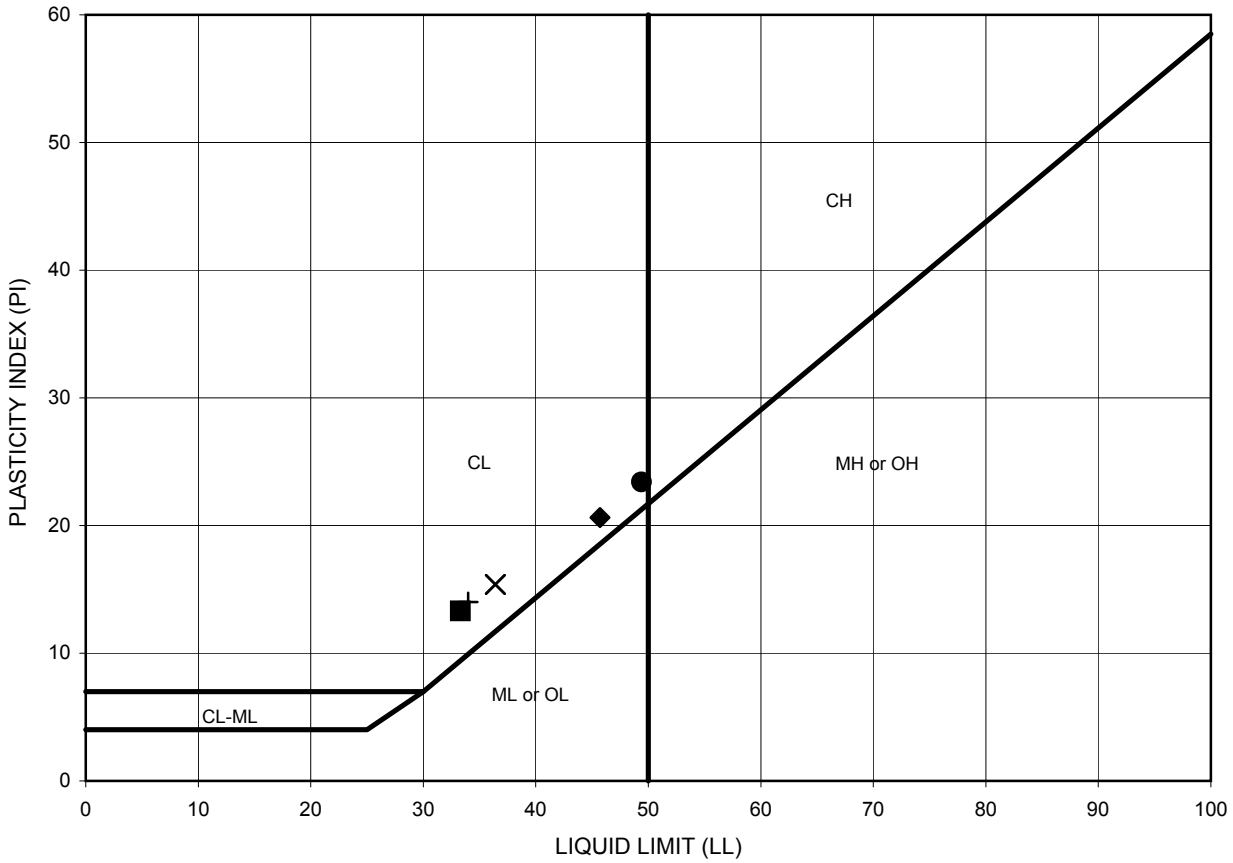
GRAIN SIZE DISTRIBUTION CURVE
ASTM D 422

Project Name: Venice Dual Force Main Tested by: DK Date: 09/17/08
Project Number: 14403.000 Checked by: AP Date: 10/08/08



Symbol	Boring No.	Sample No.	Depth (feet)	Percent			Atterberg Limits LL:PL:PI	Soil Type U.S.C.S
				Gravel	Sand	Fines		
○	G-1	13	35-36.5	1.84	82.54	15.62	N/A	SM
□	G-1	17	50-51.5	36.35	57.24	6.41	N/A	SW-SM

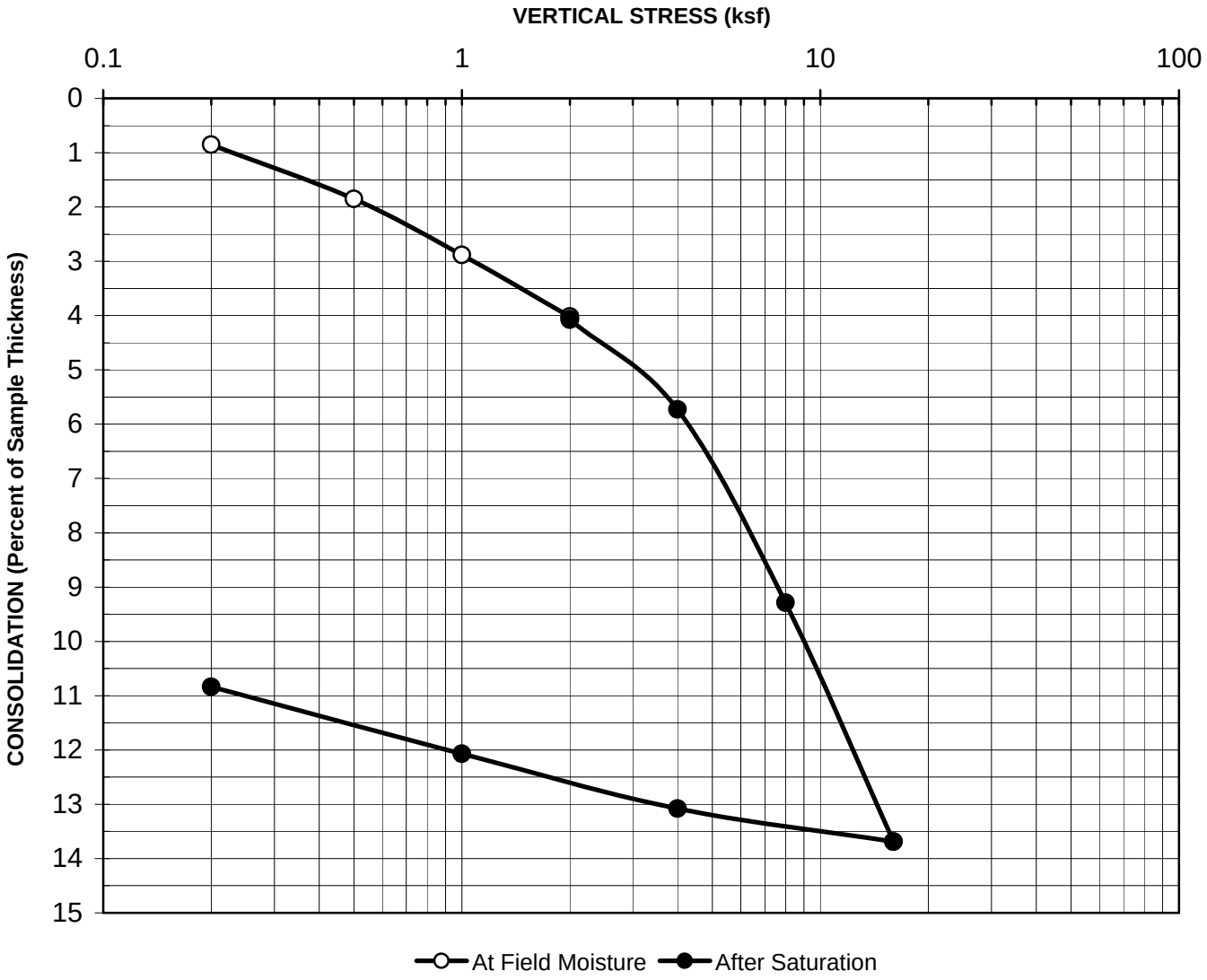
AP Engineering & Testing, Inc.



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	U.S.C.S Symbol
♦	G-1	9	25-26.5	46	25	21	CL
	G-1	12	33.5-33.9	NP	NP	NP	ML
■	G-7	7	20-21.5	33	20	13	CL
●	G-7	18	60-61.5	49	26	23	CL
X	G-8	19	60-61.5	36	21	15	CL
+	G-9	18	60-61.5	34	20	14	CL

ATTERBERG LIMITS
ASTM D 4318-93

Project Name: Venice Dual Force Main
Project No.: 14403.000
Date: 09/17/08
AP No: 28-0929 **Figure No.:**



Boring No. :	G-1	Initial Dry Unit Weight (pcf):	88.1
Sample No.:	10	Initial Moisture Content (%):	30.8
Depth (feet):	27.5-29.5	Final Moisture Content (%):	28.4
Sample Type:	Mod. Cal	Assumed Specific Gravity:	2.7
Soil Description:	Gray Silty Clay	Initial Void Ratio:	0.91

AP Engineering & Testing, Inc.

PROJECT NAME: Venice Dual Force Main

PROJECT NO.: 14403.000

AP LAB NO.: 28-0929

CONSOLIDATION TEST RESULTS
ASTM D 2435

Sep-08

AP Engineering & Testing, Inc.

COMPACTION TEST

Client: AMEC Geomatrix
Project Name: Venice Dual Force Main
Project No. : 14403.000
Location: G-1
Sample No. : 1
Visual Sample Description: Brown Silty Sand w/gravel

AP Number: 28-0929
Tested By: JT Date: 09/26/08
Calculated By: KM Date: 10/09/08
Checked By: AP Date: 10/09/08
Depth (ft): 0-2

Compaction Method: [X] ASTM D1557 [ ] ASTM D698
Preparation Method: [ ] Moist [X] Dry

METHOD: C
MOLD VOLUME (CU.FT): 0.0752

Trial No.	1	2	3	4	5	6
Wt. Comp. Soil + Mold (gm.)	7230	7042	7245	7322		
Wt. of Mold (gm.)	2647	2647	2647	2647		
Net Wt. of Soil (gm.)	4583	4395	4598	4675		
Container No.						
Wt. of Container (gm.)	154.50	196.30	193.50	154.10		
Wet Wt. of Soil + Cont. (gm.)	939.90	912.70	1229.20	1135.10		
Dry Wt. of Soil + Cont. (gm.)	854.75	871.68	1151.31	1043.93		
Moisture Content (%)	12.16	6.07	8.13	10.25		
Wet Density (pcf)	134.37	128.85	134.80	137.05		
Dry Density (pcf)	119.80	121.47	124.66	124.32		

Maximum Dry Density (pcf): **126.0**
Optimum Moisture Content (%): **9.0**

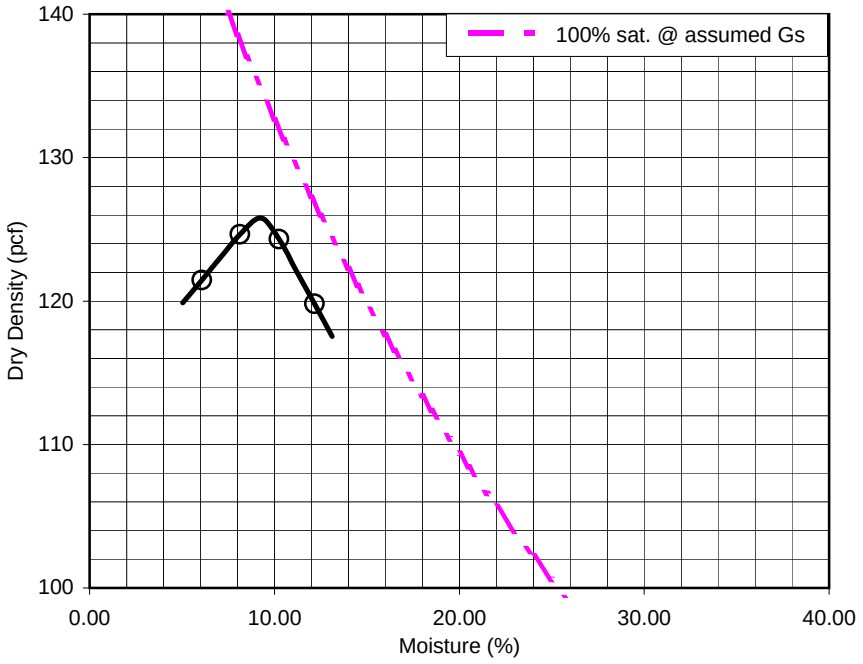
Assumed Specific Gravity = 2.7

PROCEDURE USED

[ ] Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if No.4 retained < 20%

[ ] Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if + No.4 > 20% and - 3/8 " < 20%

[X] Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if + 3/8 in >20% and + 3/4 in <30%



AP Engineering & Testing, Inc.

CORROSION TEST RESULTS

Client Name: AMEC Geomatrix
Project Name: Venice Dual Force Main
Project No.: 14403.000

AP Job No.: 28-0929
Date 09/17/08

Boring No.	Sample No.	Depth (ft)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
G-1	10	27.5-29.5	CL	92	7.2	190	1805
G-1	Mixed	25-40	SM/ML	200	7.1	88	1459
G-9	8	25-27.3	CL	230	9.4	37	1587
G-9	Mixed	35-50	SM	1000	7.1	58	205

NOTES: Resistivity Test and pH: California Test Methods 532 and 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

2607 Pomona Boulevard, Pomona, CA 91768
Tel. (909) 869-6316 Fax. (909)869-6318

LOG OF TEST BORING

CORRECTED COPY: 03-27-96

LAB NO. : 140- 4360 PROJECT: VENICE AREA RELIEF SEWER

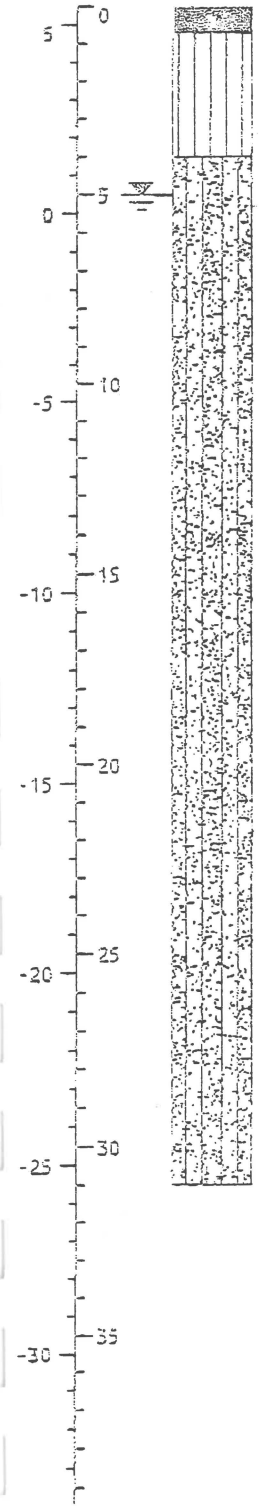
BORING NO.: 8 ELEVATION: 5.5' DRILLING DATE: 08-11-94

BORING LOCATION: 21' N/o NCF Hurricane St. and 92' E/o C/L Canal Ct.

DRILL RIG TYPE: CME-75 using 8" hollow stem augers

DEPTH TO STANDING WATER: 5' DEPTH TO WATER SEEPAGE: none

DRILLER: Ramirez LOGGER: Roth ENGINEER: James



ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/FOOT	USCS	Field Description	Standard Penetration Readings 1st 6"	2nd 6"	3rd 6"
			8" AC pavement in fair condition.			
		ML	Brown sandy silt with a trace of gravel. Moist and soft.			
		SP-SM	Brown poorly graded sand with some silt. Moist and dense. Color changed to dark gray at 5'. Encountered groundwater at 5'.	1	3	7
				2	3	4
				3	6	7
				4	5	7
			Encountered a 2' fat clay lense at 25' depth.	2	2	2
				3	4	3
			Encountered groundwater at 5' depth.			
			OVA = 0 for all sample depths.			

LOG OF TEST BORING

CORRECTED COPY: 03-27-96

LAB NO. : 140- 4360 PROJECT: VENICE AREA RELIEF SEWER

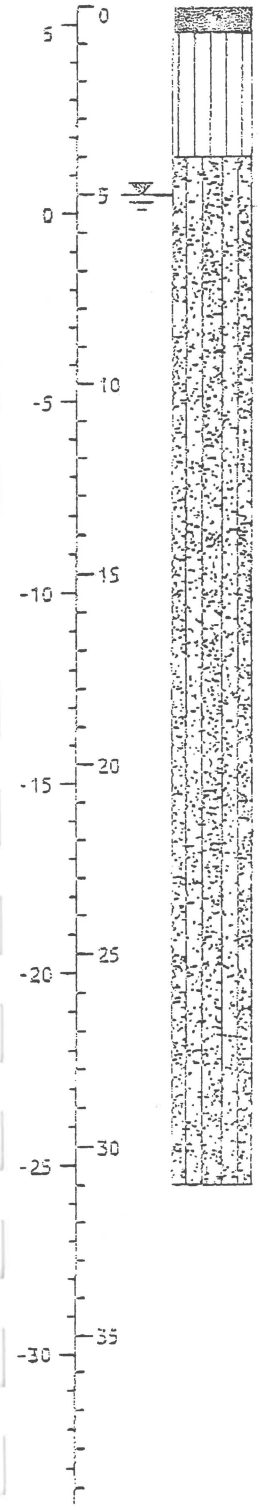
BORING NO.: 8 ELEVATION: 5.5' DRILLING DATE: 08-11-94

BORING LOCATION: 21' N/o NCF Hurricane St. and 92' E/o C/L Canal Ct.

DRILL RIG TYPE: CME-75 using 8" hollow stem augers

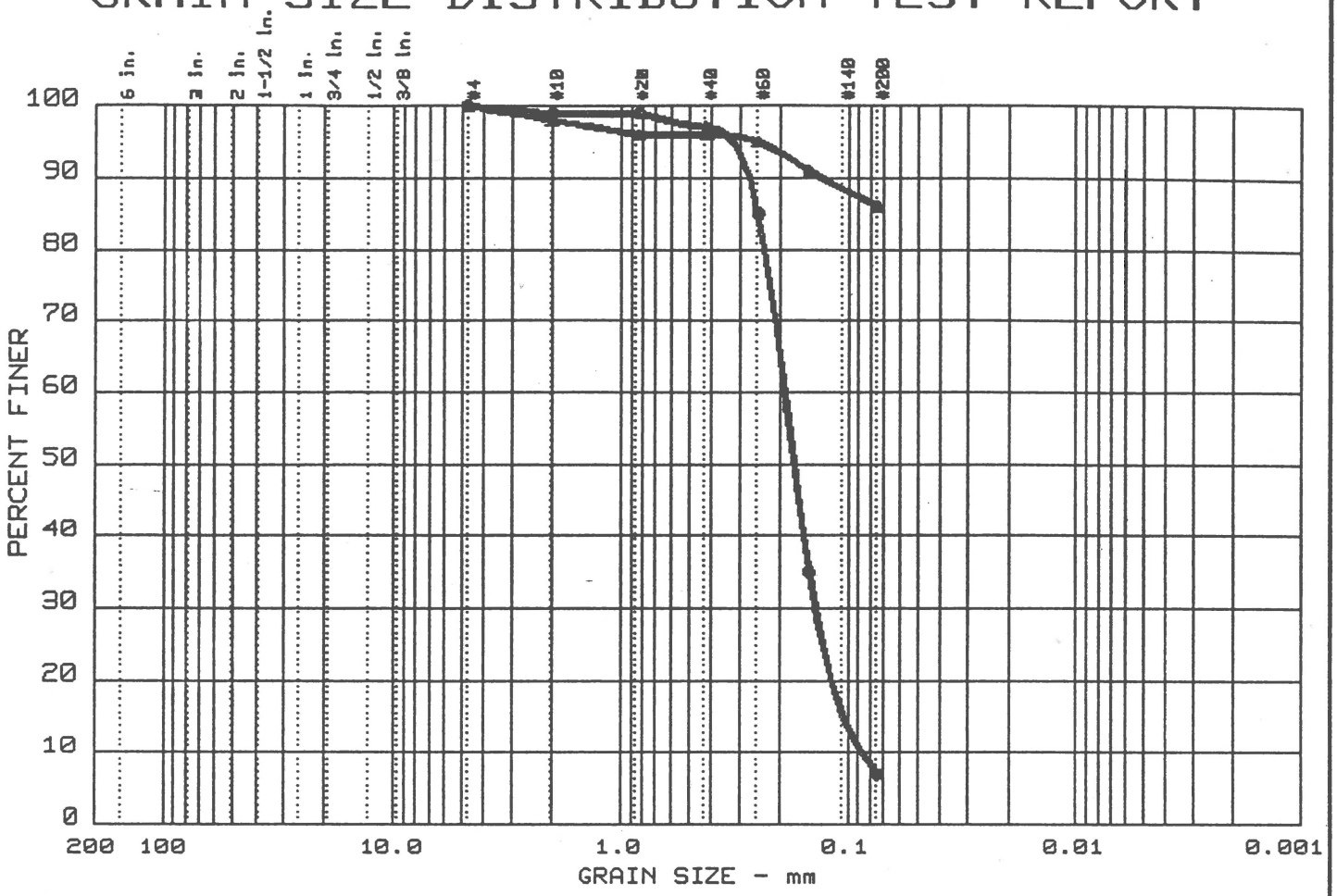
DEPTH TO STANDING WATER: 5' DEPTH TO WATER SEEPAGE: none

DRILLER: Ramirez LOGGER: Roth ENGINEER: James



ELEVATION / DEPTH (ft)	SOIL SYMBOLS, SAMPLER SYMBOLS AND BLOWS/FOOT	USCS	Field Description	Standard Penetration Readings 1st 6"	2nd 6"	3rd 6"
			8" AC pavement in fair condition.			
		ML	Brown sandy silt with a trace of gravel. Moist and soft.			
		SP-SM	Brown poorly graded sand with some silt. Moist and dense. Color changed to dark gray at 5'. Encountered groundwater at 5'.	1	3	7
				2	3	4
				3	6	7
				4	5	7
			Encountered a 2' fat clay lense at 25' depth.	2	2	2
				3	4	3
			Encountered groundwater at 5' depth.			
			OVA = 0 for all sample depths.			

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	93.0	7.0	
▲	0.0	0.0	14.0	86.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	-	N/P	0.25	0.19	0.17	0.140	0.1047	0.0870	1.17	2.2
▲	52	25								

MATERIAL DESCRIPTION	USCS	AASHTO
● POORLY GRADED SAND WITH SILT	SP-SM	A-3
▲ FAT CLAY	CH	A-7-6(23.9)

Project No.: 140-4360
Project: VENICE AREA RELIEF SEWER (PHASE I)
● Location: B-8 @ 20' DEPTH
▲ Location: B-8 @ 25' DEPTH

Date: 10-03-94 BY: JV/PTF

GRAIN SIZE DISTRIBUTION TEST REPORT

CITY OF LOS ANGELES - STANDARDS DIVISION

Remarks:
-
-
-
-

Figure No. -

Lab. No.: 140-4360

CITY OF LOS ANGELES
DEPARTMENT OF GENERAL SERVICES
STANDARDS DIVISION
2319 DORRIS PLACE
LOS ANGELES, CA 90031
(213) 485-2242

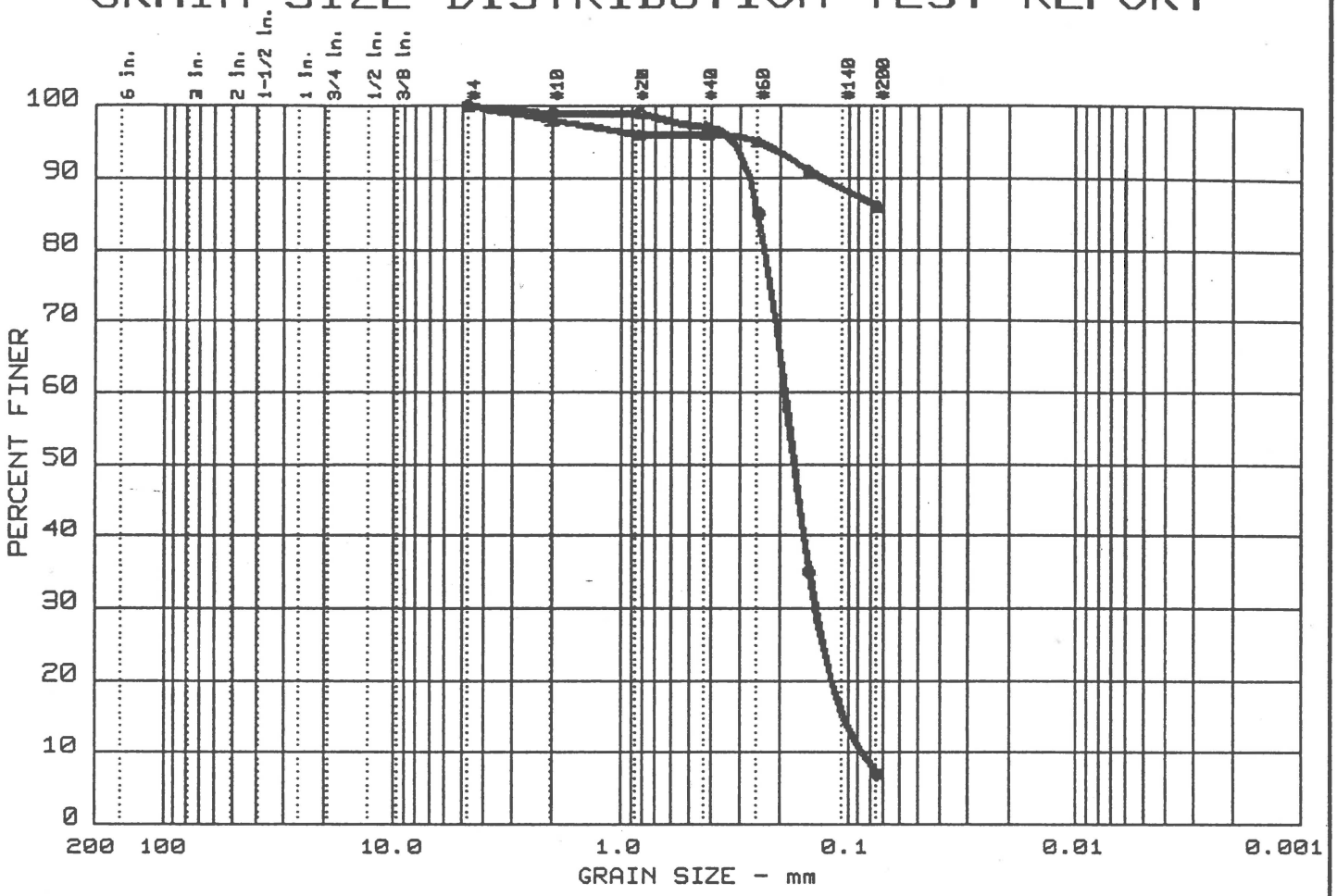
TEST BORING DATA

Job Title: VENICE AREA RELIEF SEWER (PHASE I) W.O. No.: E2000461

Test Boring No.	7						8					
Sample Depth, ft.	5	10	15	20	25	30	5	10	15	20	25	30
In Place Dry Density, pcf	124		100	107		99						
Field Moisture, %	9.9		23.0	21.3		25.7						
Lab. Max. Dry Density, pcf	125											
Lab. Optimum Moisture, %	9											
Relative Compaction, %	99											
Mechanical Analysis (% Passing)												
3/4"												
No. 4						100				100	100	
No. 10						99				99	98	
No. 20			100			98				99	96	
No. 40			99			98				97	96	
No. 60			83			97				85	95	
No. 100			33			95				35	91	
No. 200			6			86				7	86	
5 μ (Micron), %												
Liquid Limit			--			33				--	52	
Plasticity Index			N/P			14				N/P	25	
Sand Equivalent									41			
Expansion Index												
Unconfined Compression				132								

SOIL COMPACTION FAX TEL:213-847-3761 Apr 02'96 13:56 No.008 P.12

GRAIN SIZE DISTRIBUTION TEST REPORT



	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	93.0	7.0	
▲	0.0	0.0	14.0	86.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	-	N/P	0.25	0.19	0.17	0.140	0.1047	0.0870	1.17	2.2
▲	52	25								

MATERIAL DESCRIPTION	USCS	AASHTO
● POORLY GRADED SAND WITH SILT	SP-SM	A-3
▲ FAT CLAY	CH	A-7-6(23.9)

Project No.: 140-4360
Project: VENICE AREA RELIEF SEWER (PHASE I)
● Location: B-8 @ 20' DEPTH
▲ Location: B-8 @ 25' DEPTH

Date: 10-03-94 BY: JV/PTF

GRAIN SIZE DISTRIBUTION TEST REPORT

CITY OF LOS ANGELES - STANDARDS DIVISION

Remarks:
-
-
-
-

Figure No. -

Lab. No.: 140-4360

CITY OF LOS ANGELES
DEPARTMENT OF GENERAL SERVICES
STANDARDS DIVISION
2319 DORRIS PLACE
LOS ANGELES, CA 90031
(213) 485-2242

TEST BORING DATA

Job Title: VENICE AREA RELIEF SEWER (PHASE I) W.O. No.: E2000461

Test Boring No.	7						8					
Sample Depth, ft.	5	10	15	20	25	30	5	10	15	20	25	30
In Place Dry Density, pcf	124		100	107		99						
Field Moisture, %	9.9		23.0	21.3		25.7						
Lab. Max. Dry Density, pcf	125											
Lab. Optimum Moisture, %	9											
Relative Compaction, %	99											
Mechanical Analysis (% Passing)												
3/4"												
No. 4						100				100	100	
No. 10						99				99	98	
No. 20			100			98				99	96	
No. 40			99			98				97	96	
No. 60			83			97				85	95	
No. 100			33			95				35	91	
No. 200			6			86				7	86	
5 μ (Micron), %												
Liquid Limit			--			33				--	52	
Plasticity Index			N/P			14				N/P	25	
Sand Equivalent									41			
Expansion Index												
Unconfined Compression				132								

SOIL COMPACTION FAX TEL:213-847-3761 Apr 02'96 13:56 No.008 P.12

APPENDIX C



GeoKinetics
Geotechnical & Environmental Engineers

Preliminary Subsurface Methane Gas Investigation at Venice Auxiliary Pumping Station 133 East Hurricane Street Los Angeles, California

Prepared by

GeoKinetics

77 Bunsen
Irvine, CA 92618
Tel 949.502.5353, Fax 949.502.5354

Prepared for

Geotechnical Engineering Group
Mr. Christoper F. Johnson
1149 South Broadway
Los Angeles, California 90015

August 20, 2015

1.0 Introduction: GeoKinetics has completed a subsurface methane gas investigation at the proposed Venice Auxiliary Pumping Plant located at 133 Hurricane Street, in the City of Los Angeles. The location of the subject property is shown in Figure 1 while a recent aerial photograph of the site is provided as Figure 2. We understand that the proposed auxiliary pumping plant will consist of a wet well / valve vault, an electrical building and a diversion structure on the approximate 7,850 square foot property. The subject property is located in the Playa Del Rey Oil Field as it has been mapped by the California Department of Conservation, Division of Oil, Gas & Geothermal Resources (DOGGR). No oil wells are shown to exist at the property based upon our review of the DOGGR oil field map. The closest mapped oil well (Allied Petroleum Corp., "Rawco – Woodford", #1) is located approximately 55 feet southwest of the subject property. As a result, it is within a Methane Zone designated by LADBS. It will therefore be necessary to incorporate methane gas mitigation measures into the design of the proposed structures in accordance with LADBS requirements

Under the current building code, the nature and extent of the required mitigation measures are partially dependent upon the concentration and pressure of any methane gas that may be present at the site. The current investigation has been performed for the purpose of documenting the concentration and pressure of methane gas in the subsurface of the subject property such that appropriate mitigative improvements can be specified. This report presents the results of the subsurface gas investigation as well as associated methane mitigation recommendations in accordance with typical LADBS requirements.

2.0 Background: The presence of methane gas in the subsurface is common within former oil production areas and other locations where organic material - such as grass, leaves, wood, manure, etc. - are present in the soil. Biogenic methane is generated by the bacteriological digestion, or biodegradation, of organic matter in the absence of oxygen. Methane of thermogenic or petrogenic origin may also be present in surficial soils as a result of its upward migration from deeper oil and gas bearing zones. Our experience indicates methane gas is common and can be found in the soil at a relatively high percentage of building sites in southern California. Methane is not toxic, however it is combustible and potentially explosive at concentrations above 55,000 ppm in the presence of oxygen. This concentration is referred to as its Lower Explosive Level or LEL. Methane is lighter than air and therefore has a natural tendency to rise to the ground surface where it typically dissipates into the atmosphere. The presence of non-pressurized methane at shallow depths beneath the ground surface is normally not problematic. The rates at which the methane is generated and/or migrates towards the ground surface are slow enough such that the gas dissipates naturally under normal circumstances. However, as methane migrates to the ground surface, the

potential exists for its accumulation beneath slab-on-grade foundation systems or other relatively impermeable ground coverings. If the gas accumulates to high concentrations, and becomes pressurized, and a crack or other penetration is present in the floor slab of the structure, detectable levels of methane may enter the interior of the building. Improvements - such as sub-slab vent lines or gas membranes - are generally required by LADBS as a precautionary measure for new structures at Methane Zone sites.

3.0 Field Investigation: The field work associated with the methane gas investigation at the subject property included the installation and monitoring of five (5) multi-stage subsurface gas probes. The locations of these gas probes are shown in Figure 2. The subsurface gas probes were installed on August 6th, 2015 and they were subsequently monitored on August 7th and 11th, 2015. The gas probes were installed using 6" hollow stem auger drilling equipment. A schematic illustrating the general configuration of the gas probes is provided as Figure 3. The LADBS guidelines require that individual sampling tips be installed at depths of 5, 10, and 20 feet below the lowest floor level of the proposed structures. However, based on the known groundwater depth of approximately 8 feet bgs, probes were proposed to be installed on site at depths of 2, 5 and 7 feet bgs. Per LADBS guidelines, five shallow probes would be installed at a depth of 5' bgs and then two deeper probes would be installed at the two locations with the highest methane readings. However, in order to save time and reduce costs, all five borings were advanced to 8' bgs and probe tips were installed at 2, 5 and 7' bgs in each of the five borings. All five borings were logged in the field under the supervision of a registered engineering geologist. Copies of the boring logs for this project are included as Attachment A for your reference. As indicated, the upper four to five feet primarily consisted of moist fine grained sands. Clay, silty-clay and sandy estuarine deposits were noted just below the fine grain sands in each boring.

The sampling tips of the current installation were embedded within a 12-inch interval of washed Monterey #3 sand. Bentonite clay seals were placed above and below each sand interval in order to isolate the gas sampling tips. Gas tight quick connect fittings were installed on the ends of the polyethylene tubing at the ground surface in order to seal the probes between monitoring events. Flush-mounted vaults were installed at the ground surface to protect the installations.

As discussed previously, the installations were monitored on August 7th and 11th, 2015. All monitoring was performed during periods of falling barometric pressure. The subsurface gas pressure relative to atmospheric, and the concentrations of methane, oxygen, and carbon dioxide, were measured in the subsurface probes during each monitoring event. The monitoring equipment that was utilized and the associated detection limits, or resolutions, are summarized in Table 1. As indicated, subsurface gas pressures were

measured to the nearest 0.05 inches of water prior to each sampling event using a Magnahelic gauge while the barometric pressure was measured and recorded to the nearest 0.1 inches of mercury using a digital barometer. The gas probe methane, oxygen, and carbon dioxide concentrations were measured in the field using a portable, methane specific, LandTec GEM2000-Plus infra-red gas analyzer. A volume of gas equivalent to approximately ten times that of the ¼-inch diameter polyethylene gas probe tube was extracted through the LandTec GEM2000-Plus during the monitoring process. Steady state readings were generally obtained after approximately two tubing volumes of gas had been extracted. The highest methane reading displayed in each instance was recorded. The LandTec GEM2000-Plus was calibrated at the beginning and the end of each day of monitoring using a certified mixture of 15% methane, 15% carbon dioxide, and 70% nitrogen calibration gas (Note: all gas concentrations referred to in this report are on a volumetric basis). A Photovac Flame Ionization Detector (FID) was used to confirm combustible gas levels at selected probes where sufficient oxygen was present in the probe to operate the FID. The gas levels measured with both detectors were found to be consistent. Combustible gas concentrations in excess of 450 ppm were not detected with the FID.

Ambient gas levels in the air four feet above the ground surface were recorded at the site periodically during the monitoring. In each instance, the measured gas level fell within the following range:

Gas	Measured Range
Methane	<0.1%
Carbon Dioxide	<0.1%
Oxygen	20.8% – 20.9%

4.0 Results: The pressures and concentrations measured in each of the subsurface gas probes during the monitoring events are summarized in Table 2. As indicated, three of the 7' deep probe tips were flooded with water during the monitoring events. Also as indicated, the highest methane gas detection on site was 1,000 ppm (0.1%) at 5 feet bgs at probe P-5. Methane gas was not detected at any of the other gas probe installations. The site FID readings ranged from 0 to 449 ppm for the probes with enough oxygen to record a reading. This is consistent with the LandTec GEM2000-Plus readings.

The soil gas pressures measured in the gas probes range from 0.00 to 0.50 inches of water. This pressure range is normal and consistent with normal

barometric variations. There was no indication of elevated soil gas pressures associated with methane generation or migration.

The concentration of oxygen in the atmosphere at sea level is approximately 21%. The subsurface oxygen levels were found to be slightly to moderately depressed below typical atmospheric levels at each of the gas probe installations. The lowest subsurface oxygen level recorded at the site was 2.5% while the average oxygen concentration measured in the gas probes was approximately 14.6%. The average concentration of carbon dioxide in the atmosphere at sea level is approximately 0.03%. Subsurface carbon dioxide levels were slightly to moderately elevated above typical atmospheric levels in each of the gas probes. The highest carbon dioxide concentration measured at the site was 3.2% while the average carbon dioxide concentration measured in the gas probes was approximately 1.3%. The slightly to moderately depressed subsurface oxygen levels and slightly to moderately elevated carbon dioxide levels suggest residual organic matter entrained within the near surface soils is being biodegraded under aerobic conditions.

Based upon the measured methane levels and the corresponding soil gas pressures, we conclude the property should be classified as a Level II site with a Design Methane Pressure of #2" of water in accordance with LADBS guidelines. A copy of the LADBS methane testing compliance form for this project is included as Attachment B for your reference.

As discussed previously, the property is shown to be located within a Methane Zone. The following primary methane mitigation measures are typically required by LADBS for new Level II slab-on-grade structures within the methane zone:

1. **Sub-Slab Vent System:** A series of perforated vent lines and an associated 2" thick gravel blanket must be installed beneath the floor slab of the proposed structure. The perforated vent lines are connected to solid vent piping that extends through the walls or pipe chases of the building to outlets above the roof line. A dewatering system (sump and pump) must be installed if the design high groundwater level for the project is not at least one foot below the lowest vent piping elevation. A dewatering system is not necessary for on-grade structures for this project. However, structures that extend below approximately 5’ bgs will likely need either a dewatering system, or be constructed hydrostatically. If the hydrostatic option is selected, a modification from LADBS will likely be required in order to remove the sub-slab venting system requirement.

2. **Impervious Membrane:** A continuous gas membrane is required below the floor slab of the structures. This membrane must be sealed against footings, pilings, and utilities to form a gas-tight barrier beneath the buildings.

3. **Utility Trench Dams:** A section of impervious backfill consisting of compacted native soil or sand / cement slurry must be installed in utility trenches that extend beneath the perimeter of the buildings in order to prevent methane gas from migrating beneath the structure through sand bedding or backfill.

4. **Conduit Seals:** Gas tight seals must be installed on all conduits (e.g. electrical, cable T.V., telephone, etc.) that extend to the interior of the structure. The purpose of these seals is to prevent methane gas from entering subsurface cracks or discontinuities in the conduits and subsequently migrating to the interior of the buildings.

There are exceptions in the City Methane Ordinance (Ordinance No. 175790) that allow some of the requirements outlined above to be omitted, or modified, under certain conditions. These possible exceptions should be considered as the building plans are developed in order to determine the specific mitigative measures that will be required for the project.

5.0 Closing: This investigation has been performed with the degree of skill and care ordinarily exercised by engineers practicing in this, and similar, localities. No other warranty, expressed or implied, is given regarding the conclusions or professional opinions presented in this report. The scope of this report is limited to the matters expressly covered herein. This report is presented for the sole use of the Geotechnical Engineering Group and may not be relied upon by any other party without written authorization from GeoKinetics. All recommendations, findings, and conclusions presented in this report are based upon facts and circumstances as they existed at the time this report was prepared. A change in any fact or circumstance upon which this report is based may necessitate re-evaluation and/or modification of the recommendations, findings, and conclusions presented herein. Due to the nature of this type of investigation, uncertainty exists with respect to the subsurface conditions that are present between boring / sampling locations. The subsurface methane concentrations at the site could vary over time and may change in response to site modifications. The methane levels identified in this report represent the concentrations that were measured at the time of the

current investigation. Higher or lower concentrations could occur in the future. If the level of inherent uncertainty is unacceptable, additional sampling and/or testing should be considered.

We hope this information is helpful to you. Please do not hesitate to contact the undersigned if you have any questions or comments.

Sincerely,
GEOKINETICS, INC.

Kevin J. Lea, RCE
Senior Engineer

attachments

REGISTERED PROFESSIONAL ENGINEER
KEVIN J. LEA
NO. C- 67844
EXP. 6-30-17
CIVIL
STATE OF CALIFORNIA

Geoffrey Stokes, CEG / PG
Senior Geologist

PROFESSIONAL GEOLOGIST
Geoffrey Daniel Stokes
NO. 2266
CERTIFIED
ENGINEERING
GEOLOGIST
Exp. 7-31-17
STATE OF CALIFORNIA

Table 1. Gas Probe Monitoring Equipment & Parameters

Parameter	Equipment	Detection Limit or Resolution	Range
Barometric Pressure	Digital Barometer	0.1" of Hg	25 to 36 in Hg
Gas Probe Pressure	Pressure Gauge	0.1" of H_2O	-5 to +5 in H_2O
Methane Concentration	LandTec GEM2000-Plus Infrared Gas Analyzer	0.1%	0.1% to 100%
	FID	0.1 ppm	0.1 to 1,000 ppm
		1 ppm	1 to 10,000 ppm
Carbon Dioxide Concentration	LandTec GEM2000-Plus Infrared Gas Analyzer	0.1%	0.1% to 50%
Oxygen Concentrations	LandTec GEM2000-Plus Infrared Gas Analyzer	0.1%	0.1% to 25%

133 Hurricane Street - Methane Investigation
Los Angeles, California
Multi-Stage Gas Probe Monitoring Results

GAS PROBE #	MONITORING DATE	PROBE DEPTH (feet)	GAS CONCENTRATION (%)			GAS PROBE PRESSURE (IN H_20)	BAROMETRIC PRESSURE (IN Hg)	FID (ppm)
			CH_4	CO_2	O_2			
P-1	8/7/2015	2	0.00	1.4	18.7	0.00	29.9	0.0
	8/11/2015		0.00	1.5	19.0	0.00	29.9	0.0
	8/7/2015	5	0.00	1.6	17.7	0.00	29.9	6.6
	8/11/2015		0.00	2.1	17.8	0.00	29.9	0.8
	8/7/2015	7	0.00	0.1	15.9	0.00	29.9	200.0
	8/11/2015		flooded				29.9	-
P-2	8/7/2015	2	0.00	0.8	18.8	0.00	29.9	0.0
	8/11/2015		0.00	1.1	18.7	0.00	29.9	0.2
	8/7/2015	5	0.00	2.2	14.9	0.00	29.9	9.6
	8/11/2015		0.00	3.2	14.8	0.00	29.9	4.6
	8/7/2015	7	0.00	0.4	16.7	0.50	29.9	449.0
	8/11/2015		0.00	1.6	6.9	0.00	29.9	flameout
P-3	8/7/2015	2	0.00	0.8	17.6	0.00	29.9	0.9
	8/11/2015		0.00	1.2	17.7	0.00	29.9	0.3
	8/7/2015	5	0.00	3.7	9.2	0.00	29.9	flameout
	8/11/2015		0.00	3.9	10.0	0.00	29.9	flameout
	8/7/2015	7	0.00	0.2	9.9	0.00	29.9	flameout
	8/11/2015		0.00	0.6	2.5	0.00	29.9	flameout
P-4	8/7/2015	2	0.00	0.6	19.9	0.00	29.9	0.0
	8/11/2015		0.00	0.3	19.8	0.00	29.9	0.0
	8/7/2015	5	0.00	0.5	7.7	0.00	29.9	flameout
	8/11/2015		0.00	0.8	8.2	0.00	29.9	flameout
	8/7/2015	7	flooded				29.9	-
	8/11/2015		flooded				29.9	-
P-5	8/7/2015	2	0.00	0.5	18.4	0.00	29.9	10.6
	8/11/2015		0.00	0.9	18.1	0.00	29.9	0.7
	8/7/2015	5	0.10	0.4	13.2	0.00	29.9	flameout
	8/11/2015		0.00	2.0	13.7	0.00	29.9	flameout
	8/7/2015	7	flooded				29.9	-
	8/11/2015		flooded				29.9	-

Background	8/7/2015	Pre-Monitoring	0.00	0.0	20.9	-	29.9	1.4
	8/11/2015		0.00	0.0	20.8	-	29.9	0.0
	8/7/2015	Post-Monitoring	0.00	0.0	20.9	-	29.9	1.6
	8/11/2015		0.00	0.0	20.8	-	29.9	1.3

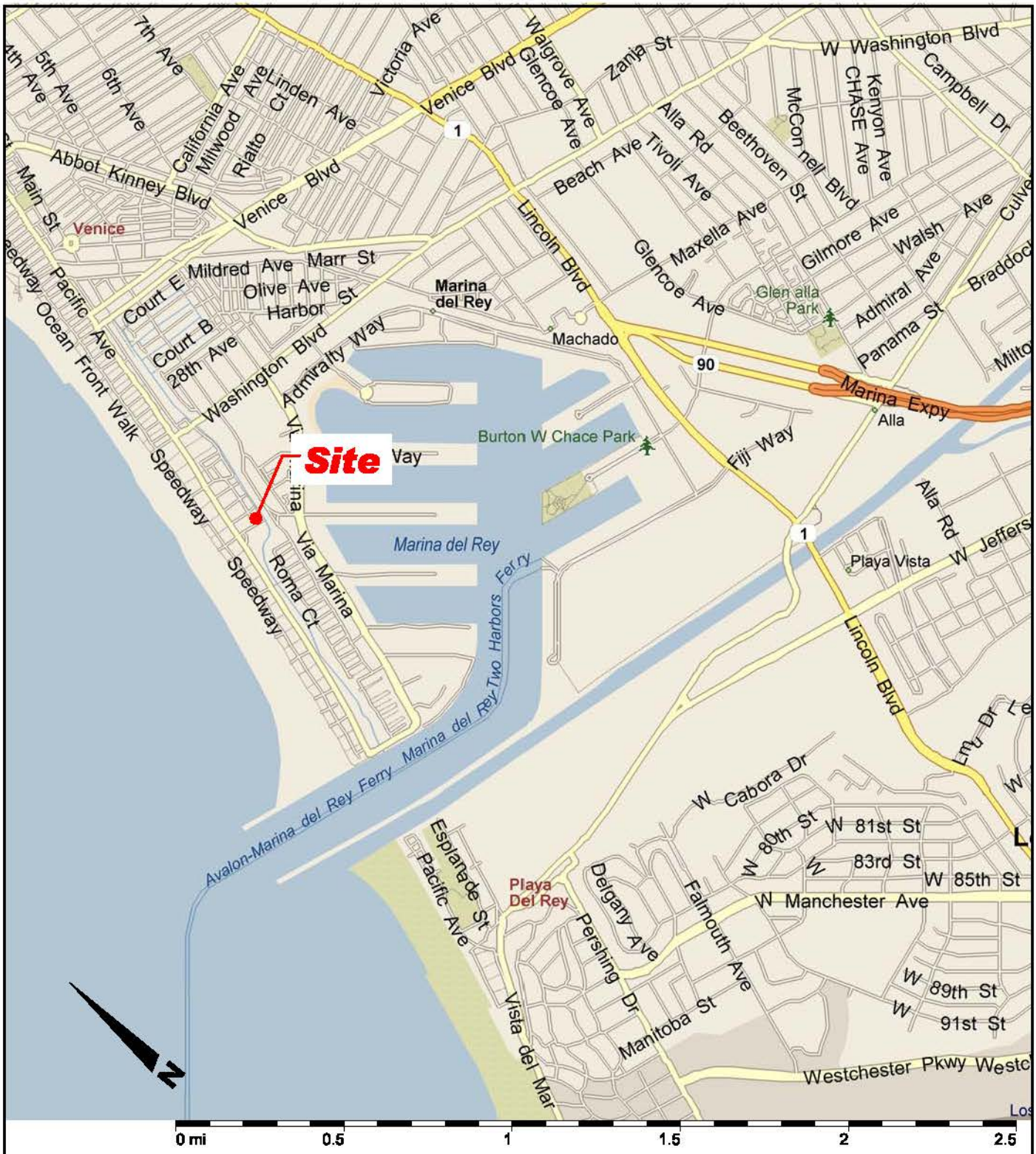
Level I: 0 - 100 ppm (0% to 0.01%)

Level II: 101 - 1,000 ppm (>0.01% to 0.1%)

Level III: 1,001 - 5,000 ppm (>01% to 0.5%)

Level IV: 5,001 to 12,500 ppm (>0.5% to 1.25%)

Level V: Greater than 12,500 ppm (>1.25%)



GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI - Venice

Date: August 2015

Site Location Map

133 East Hurricane Street
Venice, California

Figure 1



Legend

P-5 Approximate Location of Multi-Stage Gas Probe Location & Designation

1,000 Methane Concentration in Parts per Million (ppm)

ND Methane Concentration Below Detection Limit in Parts per Million (ppm)

0 25 50 ft

Approximate Scale

GeoKinetics
Geotechnical & Environmental Engineers

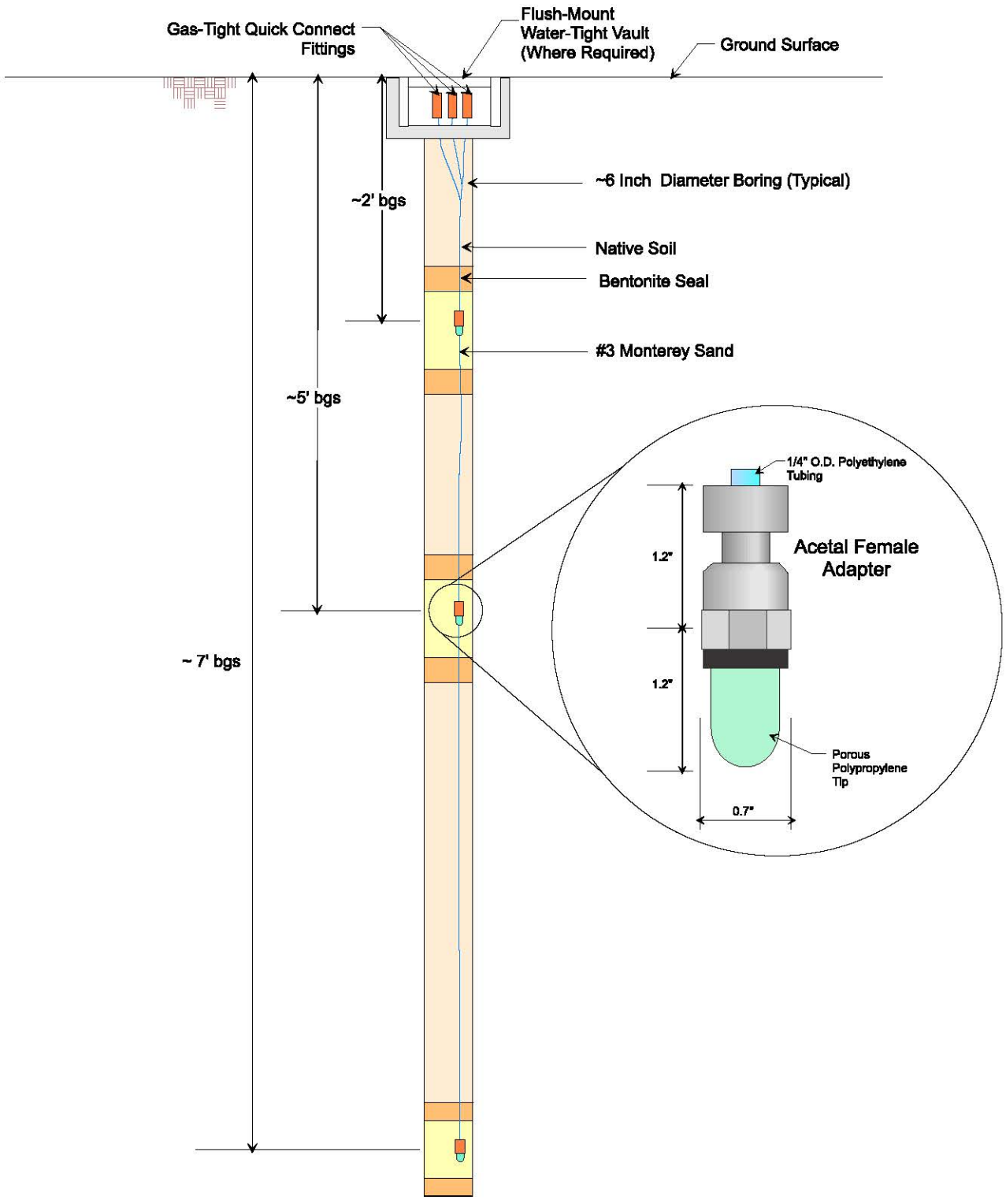
Project Name: GPI - Venice

Date: August 2015

Aerial Photograph

133 East Hurricane Street
Venice, California

Figure 1



Note: Probe Depths May Vary From One Installation to Another Due to sub-surface Conditions.

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Project Name: GPI - Venice

Date: August 2015

Gas Probe Schematic

Figure 3

Attachment A

Boring Logs

BORING LOG NO.: P-1

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
					SP-SM	Fill: SAND with silt (SP-SM), fine-grained, trace gravel, slightly moist, medium dense, brown.				
				2	SP	@1' SAND (SP), fine-grained, moist, medium dense, brown.				
				4	SP	@4' SAND (SP), fine-grained, moist, medium dense, light brown.				
				6	CL	Estuarine Deposits: @5' Silty CLAY (CL), elastic, very moist, soft, dark gray.				
				8		Total Depth = 8 ft bgs Groundwater not encountered. Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: P-2

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
				2	SP-SM	Fill: SAND with silt (SP-SM), fine-grained, trace gravel, slightly moist, medium dense, brown. Cobble at 18"				
				4	SP	@2.5' SAND (SP), fine-grained, moist, medium dense, brown reddish-brown; contains trace clay pods (gray). @4 SAND (SP), fine-grained, moist, medium dense, light brown.				
				6	CL	Estuarine Deposits: @5' Silty CLAY (CL), elastic, very moist, soft, bluish-gray.				
				8	ML-SM	@6' Sandy SILT (ML) to silty SAND (SM), fine grained sand, very moist, soft/loose, bluish-gray. Total Depth = 8 ft bgs Seepage at 8 ft Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: P-3

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
				0	SP-SM	Fill: SAND with silt (SP-SM), fine-grained, trace gravel, slightly moist, medium dense, brown.				
				2	SP	@2' SAND (SP), fine-grained, moist, medium dense, brown.				
						@3' SAND (SP), fine-grained, moist, medium dense, light brown, contains pods of Clay (gray).				
				4						
				6	SM	Estuarine Deposits: @6' Silty SAND (SM), fine-grained, very moist, medium dense, bluish-gray.				
				8		Total Depth = 8 ft bgs Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: P-4

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
				0	SP	Fill: SAND (SP) fine-grained, slightly moist, loose to medium dense, mottled reddish-brown and grayish-brown.				
						@1' SAND (SP), fine-grained, moist, medium dense, light brown.				
				2		@3.5' contains pods of clay (gray)				
				4	CL	Estuarine Deposits: @4' CLAY (CL), very moist, soft, dark gray, contains some organics (decomposing plant material).				
				6	ML+ SM	@5.5' Sandy SILT (ML) to Silty SAND (SM), fine-grained sand, very moist, soft/loose, bluish gray.				
				8		Total Depth = 8 ft bgs Seepage at 8 ft Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

BORING LOG NO.: P-5

Moisture (%)	Dry Density (pcf)	Penetration Resistance (Blows/6 inch)	Sample Type	Depth (Feet)	Lithology	Description of Subsurface Materials: Classification, (USCS) color, mixture, consistency, etc.	% Comp	% Saturation	Void Ratio	Elevation (Feet)
				0	SP-SM	Fill: SAND with Silt (SP-SM) trace gravel, trace brick and metal debris, slightly moist, loose to medium dense, brown.				
						@1' cobble (concrete debris)				
				2						
						@2.5' SAND (SP), fine grained, moist, medium dense, light brown.				
				4	CL	Estuarine Deposits: @4.5' CLAY (CL), very moist, soft, dark gray, contains some organics (decomposing plant material).				
						@5' Sandy SILT (ML) to Silty SAND (SM) fine grained sand, very moist, soft/loose, bluish gray.				
				6	ML+SM					
				8		Total Depth = 8 ft bgs Slight seepage at 8 ft Staged soil vapor probes set at 2', 5' & 7' per work plan.				
				10						
				12						
				14						

GeoKinetics
Geotechnical & Environmental Engineers

Project Name: GPI -Venice

Project No.:

Sample Types:
- B Bulk Sample
- C Rock Core
- R Ring Sample
- S Standard Split Spoon
- T Tube Sample

Location: 133 Hurricane Street, Venice Logged by: GDS

Date Drilled: 8/6/15 Equipment Used: CME-75 Ring Type:

Ground Elevation: Notes:

Attachment B

Methane Gas Investigation Compliance Certificate

FORM 1 - CERTIFICATE OF COMPLIANCE FOR METHANE TEST DATA

Part 1: Certification Sheet

Site: Venice Auxiliary Pumping Station Project

Address: 133 East Hurricane Street, Los Angeles, California.

Legal Description: APN # 4225008904

Building Use: Auxiliary Pump Station

Name of Engineer:	Kevin J. Lea GeoKinetics	**Registered Civil / Soil Engineer Stamp:**
Mailing Address:	77 Bunsen Irvine, CA 92618	
Telephone:	(949) 502-5353	
Testing Laboratory:	GeoKinetics License # 10234	

REGISTERED PROFESSIONAL ENGINEER
KEVIN J. LEA
NO. C- 67844
EXP. 6-30-17
CIVIL
STATE OF CALIFORNIA

I hereby certify that I have tested the above site for the purpose of methane mitigation, and that all procedures were conducted by a City of Los Angeles licensed testing agency in conformity with the requirements of the LADBS Information Bulletin P/BC 2002-101. Where the inspection and testing of all or part of the work above is delegated, full responsibility shall be assumed by the licensed engineer or geologist whose signature is affixed thereon.

Signed: _____ **Date:** 8-20-15

Required Data:

- Project is in a *METHANE ZONE*
- Depth to ground water observed during testing was: 7-8 feet below existing ground surface.
- Depth of Historical High Ground Water Table Elevation* is ~5 ft below existing ground surface.
- Design Methane Concentration**: 1,000 parts per million in volume (ppmv).
- Design Methane Pressure***: ≤ 2 inches of water column.
- Methane Design Level: II

De-watering:

- De-watering is Required for all construction below approximately 5' bgs. This condition can be potentially removed using a hydrostatic design under LADBS modification.
- Pump discharge rate N/A gallons per minute.
- Reference geology or soil report: N/A

Additional Investigation:

- Additional investigation was Not conducted.

Latest Grading on Site:

- Date of last grading on site was: Years ago
- Explanation of the effect on soil gas survey results by grading operations: N/A
- Building Excavation: Not Yet Initiated

Notes:

* Historical High Ground Water Table Elevation Shall mean the highest recorded elevation of ground water based on historical records and field investigations as determined by the engineer for the methane mitigation system.

** Design Methane Concentration shall mean the highest recorded measured methane concentration from either shallow soil gas test or any gas probe set on the site.

*** Design Methane Pressure shall mean the highest total pressure measured from any Gas Probe Set on the site.

As a covered entity under Title II of the Americans with Disabilities Act, the City of Los Angeles does not discriminate on the basis of disability and, upon request, will provide reasonable accommodation to ensure equal access to its programs, services and activities. For efficient handling of information internally and in the internet, conversion to this new format of code related and administrative information bulletins including MGD and RGA that were previously issued will allow flexibility and timely distribution of information to the public.

APPENDIX V
NOAA ATLAS 14

Santa Monica Station (97-0651)

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.142** (0.119-0.172)	**0.186** (0.156-0.225)	**0.246** (0.205-0.297)	**0.295** (0.244-0.361)	**0.365** (0.291-0.462)	**0.420** (0.327-0.544)	**0.477** (0.362-0.634)	**0.537** (0.396-0.736)	**0.622** (0.438-0.890)	**0.689** (0.468-1.02)
10-min	**0.204** (0.171-0.246)	**0.267** (0.223-0.322)	**0.352** (0.294-0.426)	**0.423** (0.350-0.517)	**0.523** (0.417-0.662)	**0.602** (0.469-0.779)	**0.684** (0.520-0.909)	**0.770** (0.568-1.06)	**0.891** (0.628-1.28)	**0.987** (0.671-1.47)
15-min	**0.247** (0.207-0.297)	**0.323** (0.270-0.390)	**0.426** (0.355-0.516)	**0.512** (0.423-0.626)	**0.633** (0.505-0.801)	**0.728** (0.568-0.943)	**0.827** (0.628-1.10)	**0.932** (0.687-1.28)	**1.08** (0.760-1.54)	**1.19** (0.811-1.77)
30-min	**0.334** (0.280-0.403)	**0.438** (0.366-0.529)	**0.577** (0.482-0.699)	**0.694** (0.574-0.848)	**0.858** (0.684-1.09)	**0.987** (0.770-1.28)	**1.12** (0.852-1.49)	**1.26** (0.931-1.73)	**1.46** (1.03-2.09)	**1.62** (1.10-2.41)
60-min	**0.483** (0.405-0.583)	**0.633** (0.530-0.764)	**0.835** (0.696-1.01)	**1.00** (0.830-1.23)	**1.24** (0.989-1.57)	**1.43** (1.11-1.85)	**1.62** (1.23-2.16)	**1.83** (1.35-2.50)	**2.11** (1.49-3.03)	**2.34** (1.59-3.48)
2-hr	**0.707** (0.592-0.852)	**0.926** (0.775-1.12)	**1.22** (1.02-1.48)	**1.47** (1.21-1.79)	**1.81** (1.45-2.30)	**2.09** (1.63-2.70)	**2.37** (1.80-3.15)	**2.67** (1.97-3.66)	**3.09** (2.18-4.43)	**3.43** (2.33-5.09)
3-hr	**0.874** (0.732-1.05)	**1.15** (0.958-1.38)	**1.51** (1.26-1.83)	**1.82** (1.50-2.22)	**2.24** (1.79-2.84)	**2.58** (2.01-3.34)	**2.93** (2.23-3.90)	**3.31** (2.44-4.53)	**3.82** (2.70-5.48)	**4.24** (2.88-6.30)
6-hr	**1.24** (1.04-1.49)	**1.62** (1.36-1.96)	**2.14** (1.79-2.60)	**2.58** (2.13-3.15)	**3.19** (2.54-4.03)	**3.67** (2.86-4.75)	**4.17** (3.17-5.54)	**4.70** (3.46-6.44)	**5.44** (3.83-7.79)	**6.02** (4.09-8.95)
12-hr	**1.62** (1.36-1.95)	**2.13** (1.78-2.57)	**2.81** (2.34-3.40)	**3.38** (2.79-4.13)	**4.18** (3.33-5.29)	**4.81** (3.75-6.23)	**5.47** (4.16-7.27)	**6.16** (4.54-8.45)	**7.13** (5.03-10.2)	**7.91** (5.38-11.8)

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24-hr	**2.10** (1.86-2.42)	**2.77** (2.45-3.20)	**3.67** (3.23-4.25)	**4.42** (3.86-5.16)	**5.47** (4.63-6.60)	**6.31** (5.23-7.76)	**7.17** (5.80-9.05)	**8.09** (6.37-10.5)	**9.37** (7.08-12.6)	**10.4** (7.59-14.5)
2-day	**2.53** (2.24-2.92)	**3.37** (2.98-3.89)	**4.50** (3.97-5.22)	**5.46** (4.77-6.37)	**6.80** (5.75-8.20)	**7.86** (6.51-9.68)	**8.97** (7.26-11.3)	**10.1** (7.98-13.2)	**11.8** (8.91-15.9)	**13.1** (9.57-18.3)
3-day	**2.80** (2.48-3.23)	**3.78** (3.34-4.36)	**5.11** (4.50-5.91)	**6.23** (5.44-7.27)	**7.81** (6.61-9.42)	**9.08** (7.53-11.2)	**10.4** (8.42-13.1)	**11.8** (9.31-15.3)	**13.8** (10.4-18.6)	**15.4** (11.3-21.5)
4-day	**3.02** (2.67-3.48)	**4.09** (3.62-4.73)	**5.57** (4.91-6.45)	**6.82** (5.96-7.96)	**8.58** (7.26-10.4)	**10.0** (8.29-12.3)	**11.5** (9.30-14.5)	**13.1** (10.3-17.0)	**15.3** (11.6-20.7)	**17.2** (12.5-24.0)
7-day	**3.44** (3.05-3.97)	**4.68** (4.14-5.41)	**6.37** (5.62-7.38)	**7.81** (6.83-9.12)	**9.86** (8.34-11.9)	**11.5** (9.53-14.2)	**13.2** (10.7-16.7)	**15.1** (11.9-19.6)	**17.7** (13.4-23.9)	**19.8** (14.5-27.7)
10-day	**3.77** (3.34-4.35)	**5.13** (4.54-5.93)	**7.00** (6.17-8.11)	**8.59** (7.51-10.0)	**10.8** (9.18-13.1)	**12.7** (10.5-15.6)	**14.6** (11.8-18.4)	**16.7** (13.1-21.6)	**19.6** (14.8-26.5)	**22.0** (16.1-30.7)
20-day	**4.50** (3.98-5.19)	**6.13** (5.41-7.07)	**8.38** (7.38-9.70)	**10.3** (9.01-12.0)	**13.1** (11.1-15.8)	**15.3** (12.7-18.8)	**17.7** (14.3-22.3)	**20.2** (15.9-26.2)	**23.9** (18.1-32.3)	**26.9** (19.6-37.6)
30-day	**5.33** (4.72-6.15)	**7.27** (6.42-8.40)	**9.96** (8.77-11.5)	**12.3** (10.7-14.3)	**15.6** (13.2-18.8)	**18.3** (15.2-22.5)	**21.2** (17.1-26.7)	**24.3** (19.1-31.5)	**28.8** (21.7-38.9)	**32.4** (23.7-45.3)
45-day	**6.18** (5.47-7.13)	**8.43** (7.44-9.73)	**11.6** (10.2-13.4)	**14.2** (12.5-16.6)	**18.1** (15.3-21.9)	**21.3** (17.7-26.3)	**24.7** (20.0-31.2)	**28.4** (22.4-36.8)	**33.7** (25.5-45.5)	**38.1** (27.8-53.2)
60-day	**6.99** (6.18-8.06)	**9.53** (8.42-11.0)	**13.1** (11.5-15.1)	**16.1** (14.1-18.8)	**20.5** (17.4-24.7)	**24.1** (20.0-29.7)	**28.0** (22.6-35.3)	**32.2** (25.3-41.7)	**38.2** (28.9-51.6)	**43.2** (31.5-60.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound

(or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.140** (0.117-0.169)	**0.184** (0.154-0.222)	**0.242** (0.202-0.293)	**0.291** (0.240-0.355)	**0.359** (0.286-0.455)	**0.413** (0.322-0.535)	**0.469** (0.357-0.624)	**0.529** (0.390-0.725)	**0.612** (0.431-0.876)	**0.678** (0.461-1.01)
10-min	**0.201** (0.168-0.242)	**0.263** (0.220-0.318)	**0.347** (0.289-0.420)	**0.417** (0.345-0.509)	**0.515** (0.411-0.652)	**0.592** (0.462-0.767)	**0.673** (0.511-0.895)	**0.758** (0.559-1.04)	**0.877** (0.618-1.26)	**0.971** (0.660-1.44)
15-min	**0.243** (0.204-0.293)	**0.318** (0.266-0.384)	**0.419** (0.350-0.508)	**0.504** (0.417-0.616)	**0.623** (0.497-0.788)	**0.716** (0.559-0.928)	**0.814** (0.618-1.08)	**0.917** (0.676-1.26)	**1.06** (0.748-1.52)	**1.18** (0.799-1.75)
30-min	**0.329** (0.276-0.397)	**0.431** (0.360-0.520)	**0.568** (0.474-0.687)	**0.682** (0.564-0.833)	**0.843** (0.672-1.07)	**0.969** (0.756-1.26)	**1.10** (0.837-1.46)	**1.24** (0.915-1.70)	**1.44** (1.01-2.06)	**1.59** (1.08-2.36)
60-min	**0.474** (0.397-0.571)	**0.620** (0.519-0.749)	**0.817** (0.682-0.990)	**0.983** (0.813-1.20)	**1.21** (0.968-1.54)	**1.40** (1.09-1.81)	**1.59** (1.21-2.11)	**1.79** (1.32-2.45)	**2.07** (1.46-2.96)	**2.29** (1.56-3.40)
2-hr	**0.690** (0.578-0.832)	**0.903** (0.756-1.09)	**1.19** (0.994-1.44)	**1.43** (1.18-1.75)	**1.77** (1.41-2.24)	**2.03** (1.59-2.63)	**2.31** (1.76-3.07)	**2.60** (1.92-3.57)	**3.01** (2.12-4.31)	**3.34** (2.27-4.96)
3-hr	**0.850** (0.713-1.03)	**1.11** (0.932-1.34)	**1.47** (1.23-1.78)	**1.77** (1.46-2.16)	**2.18** (1.74-2.76)	**2.51** (1.96-3.25)	**2.85** (2.17-3.79)	**3.21** (2.37-4.40)	**3.71** (2.62-5.32)	**4.11** (2.79-6.11)
6-hr	**1.20** (1.00-1.44)	**1.57** (1.31-1.89)	**2.07** (1.73-2.51)	**2.49** (2.06-3.04)	**3.07** (2.45-3.89)	**3.54** (2.76-4.58)	**4.02** (3.05-5.34)	**4.53** (3.34-6.20)	**5.24** (3.69-7.50)	**5.80** (3.94-8.62)
12-hr	**1.55** (1.30-1.87)	**2.03** (1.70-2.45)	**2.68** (2.24-3.25)	**3.23** (2.67-3.95)	**3.99** (3.19-5.06)	**4.60** (3.59-5.95)	**5.22** (3.97-6.95)	**5.89** (4.34-8.07)	**6.81** (4.80-9.76)	**7.55** (5.13-11.2)
24-hr	**2.00** (1.77-2.30)	**2.63** (2.32-3.04)	**3.48** (3.07-4.03)	**4.20** (3.67-4.90)	**5.19** (4.39-6.27)	**5.98** (4.96-7.37)	**6.81** (5.51-8.58)	**7.67** (6.04-9.95)	**8.88** (6.71-12.0)	**9.84** (7.19-13.8)
2-day	**2.45** (2.16-2.82)	**3.26** (2.88-3.76)	**4.35** (3.84-5.04)	**5.27** (4.61-6.16)	**6.56** (5.55-7.92)	**7.59** (6.29-9.34)	**8.66** (7.00-10.9)	**9.79** (7.70-12.7)	**11.4** (8.59-15.3)	**12.6** (9.22-17.6)
3-day	**2.73** (2.41-3.14)	**3.67** (3.25-4.24)	**4.97** (4.38-5.75)	**6.05** (5.29-7.07)	**7.59** (6.42-9.15)	**8.81** (7.31-10.9)	**10.1** (8.17-12.7)	**11.5** (9.02-14.9)	**13.4** (10.1-18.1)	**14.9** (10.9-20.9)
4-day	**2.93** (2.59-3.38)	**3.98** (3.52-4.60)	**5.41** (4.76-6.26)	**6.61** (5.78-7.72)	**8.32** (7.04-10.0)	**9.69** (8.03-11.9)	**11.1** (9.01-14.0)	**12.7** (9.97-16.4)	**14.8** (11.2-20.0)	**16.6** (12.1-23.2)
7-day	**3.34** (2.95-3.85)	**4.53** (4.00-5.23)	**6.16** (5.43-7.14)	**7.55** (6.60-8.81)	**9.51** (8.05-11.5)	**11.1** (9.19-13.7)	**12.8** (10.3-16.1)	**14.5** (11.4-18.8)	**17.0** (12.9-23.0)	**19.1** (13.9-26.6)
10-day	**3.66** (3.24-4.2	**4.98** (4.40-5.7	**6.78** (5.97-7.8	**8.31** (7.26-9.7	**10.5** (8.87-12.	**12.2** (10.1-15.	**14.1** (11.4-17.	**16.1** (12.6-20.	**18.9** (14.3-25.	**21.1** (15.4-29

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	3)	5)	5)	0)	6)	1)	8)	8)	5)	.5)
20-day	**4.33** (3.83-5.00)	**5.90** (5.21-6.81)	**8.05** (7.09-9.33)	**9.89** (8.65-11.6)	**12.5** (10.6-15.1)	**14.7** (12.2-18.1)	**16.9** (13.7-21.4)	**19.4** (15.2-25.1)	**22.8** (17.3-30.8)	**25.7** (18.8-35.9)
30-day	**5.14** (4.54-5.92)	**6.99** (6.18-8.08)	**9.57** (8.43-11.1)	**11.8** (10.3-13.7)	**14.9** (12.6-18.0)	**17.5** (14.5-21.6)	**20.3** (16.4-25.6)	**23.2** (18.3-30.1)	**27.5** (20.8-37.1)	**31.0** (22.6-43.2)
45-day	**5.93** (5.25-6.84)	**8.08** (7.14-9.33)	**11.1** (9.75-12.8)	**13.6** (11.9-15.9)	**17.3** (14.7-20.9)	**20.4** (16.9-25.1)	**23.6** (19.1-29.8)	**27.1** (21.3-35.1)	**32.1** (24.3-43.4)	**36.2** (26.5-50.6)
60-day	**6.72** (5.95-7.76)	**9.16** (8.09-10.6)	**12.5** (11.1-14.5)	**15.5** (13.5-18.1)	**19.7** (16.6-23.7)	**23.1** (19.2-28.5)	**26.8** (21.7-33.8)	**30.8** (24.2-39.9)	**36.5** (27.6-49.3)	**41.2** (30.1-57.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

APPENDIX W
THE GREEN VISIONS PLAN FOR 21ST CENTURY SOUTHERN CALIFORNIA
(TABLE 7)

Table 7: Average Pollutant Concentrations from Eight Major Land Use Classes (LADPW 2005)

Constituent	High Density Single Family Residential	Light Industrial	Vacant	Retail/ Commercial	Multi-family Residential	Transport-ation	Education	Mixed Residential
Total Suspended Solids (mg/L)	104.7	229.4	164.7	67.4	46.4	75.4	103.0	69.1
Nitrate-N (mg/L)	1.0	0.9	1.1	0.6	1.7	0.8	0.6	0.7
Kjeldahl-N (mg/L)	2.8	3.1	0.8	3.4	1.9	1.8	1.6	2.7
Total Phosphorus (mg/L)	0.4	0.4	0.1	0.4	0.2	0.4	0.3	0.3
Dissolved Copper (ug/L)	8.4	20.2	n/m	14.6	6.8	32.7	12.8	11.5
Dissolved Lead (ug/L)	n/m	n/m	n/m	n/m	n/m	n/m	n/m	n/m
Dissolved Zinc (ug/L)	39.1	460.2	n/m	164.1	75.4	203.9	66.0	125.8
Total Copper (ug/L)	15.3	31.0	9.1	34.8	12.2	51.9	21.5	17.3
Total Lead (ug/L)	9.6	14.9	n/m	11.5	5.1	9.1	4.5	8.7
Total Zinc (ug/L)	80.4	565.6	38.8	238.5	134.9	279.5	123.7	184.9
Fecal Coliform (MPN/100 mL)	1085353.7	653070.4	2174.8	1071656.5	n/m	1340166.7	n/m	n/m

APPENDIX X
EPA GUIDE TO URBAN STORMWATER POLLUTION CONCENTRATIONS
(TABLES 4-1 AND 4-3)

Table 4-1. Median Event Mean Concentrations for Urban Land Uses

Pollutant	Units	Residential		Mixed		Commercial		Open/ Non-Urban	
		Median	COV	Median	COV	Median	COV	Median	COV
BOD	mg/l	10	0.41	7.8	0.52	9.3	0.31	--	--
COD	mg/l	73	0.55	65	0.58	57	0.39	40	0.78
TSS	mg/l	101	0.96	67	1.14	69	0.85	70	2.92
Total Lead	µg/l	144	0.75	114	1.35	104	0.68	30	1.52
Total Copper	µg/l	33	0.99	27	1.32	29	0.81	--	--
Total Zinc	µg/l	135	0.84	154	0.78	226	1.07	195	0.66
Total Kjeldahl Nitrogen	µg/l	1900	0.73	1288	0.50	1179	0.43	965	1.00
Nitrate + Nitrite	µg/l	736	0.83	558	0.67	572	0.48	543	0.91
Total Phosphorus	µg/l	383	0.69	263	0.75	201	0.67	121	1.66
Soluble Phosphorus	µg/l	143	0.46	56	0.75	80	0.71	26	2.11

COV: Coefficient of variation
Source: Nationwide Urban Runoff Program (US EPA 1983)

Results from NURP indicate that there is not a significant difference in pollutant concentrations in runoff from different urban land use categories. There is a significant difference, however, in pollutant concentrations in runoff from urban sources than that produced from non-urban areas.

The pollutants that are found in urban storm water runoff originate from a variety of sources. The major sources include contaminants from residential and commercial areas, industrial activities, construction, streets and parking lots, and atmospheric deposition. Contaminants commonly found in storm water runoff and their likely sources are summarized in Table 4-2.

Table 4-3. Typical Pollutant Loadings from Runoff by Urban Land Use (lbs/acre-yr)

Land Use	TSS	TP	TKN	NH_3-N	NO_2+NO_3-N	BOD	COD	Pb	Zn	Cu
Commercial	1000	1.5	6.7	1.9	3.1	62	420	2.7	2.1	0.4
Parking Lot	400	0.7	5.1	2	2.9	47	270	0.8	0.8	0.04
HDR	420	1	4.2	0.8	2	27	170	0.8	0.7	0.03
MDR	190	0.5	2.5	0.5	1.4	13	72	0.2	0.2	0.14
LDR	10	0.04	0.03	0.02	0.1	NA	NA	0.01	0.04	0.01
Freeway	880	0.9	7.9	1.5	4.2	NA	NA	4.5	2.1	0.37
Industrial	860	1.3	3.8	0.2	1.3	NA	NA	2.4	7.3	0.5
Park	3	0.03	1.5	NA	0.3	NA	2	0	NA	NA
Construction	6000	80	NA	NA	NA	NA	NA	NA	NA	NA

HDR: High Density Residential, MDR: Medium Density Residential, LDR: Low Density Residential
NA: Not available; insufficient data to characterize loadings
Source: Horner et al, 1994

As indicated in Table 4-3, urban storm water runoff can contain significant concentrations of solids, nutrients, organics and metals. A comparison of the concentration of water quality parameters in urban runoff with the concentrations in domestic wastewater is shown in Table 4-4.

APPENDIX Y
LOCAL COASTAL LAND USE PROGRAM-VENICE
(EXHIBIT 1 VICINITY)

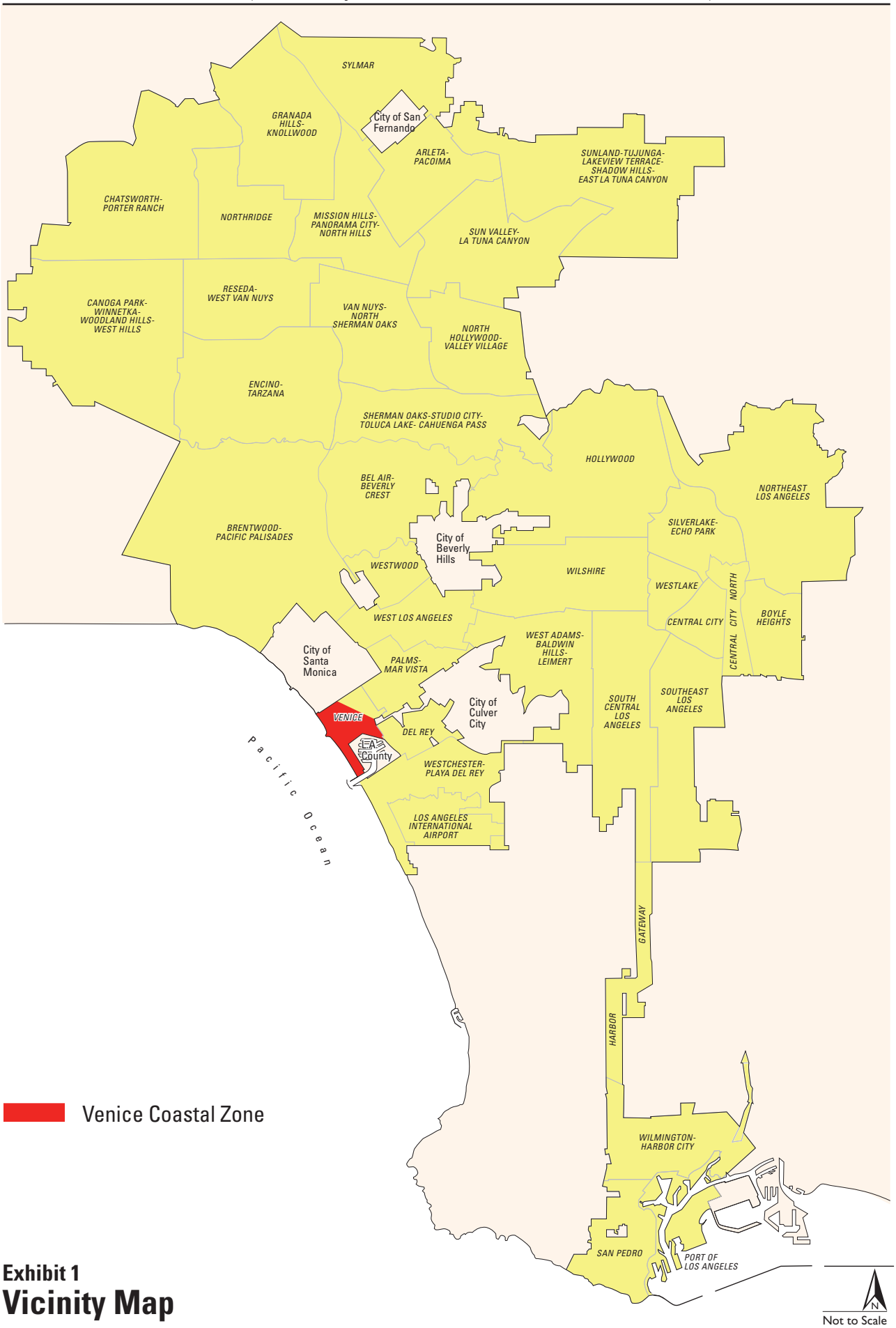


Exhibit 1

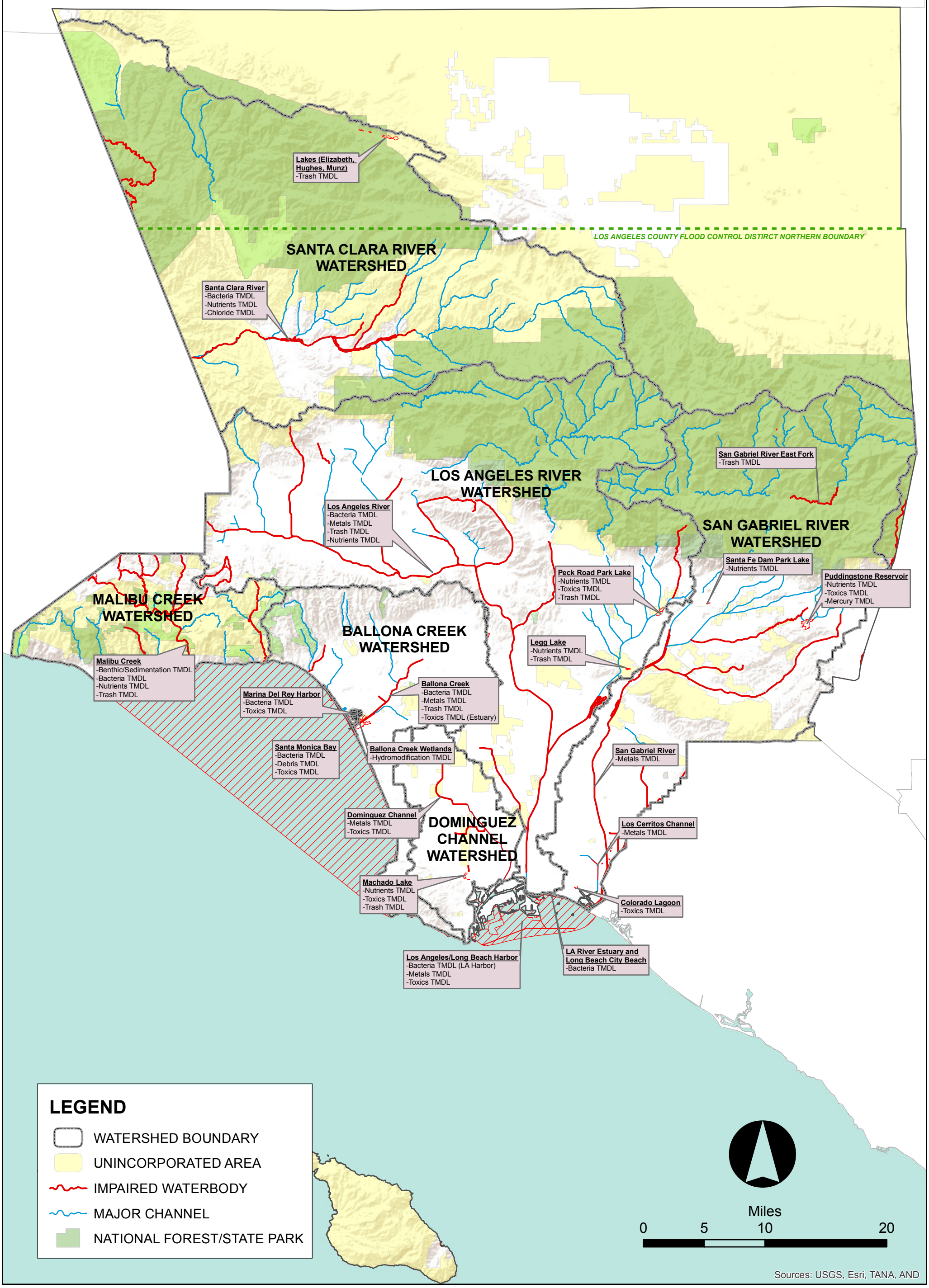
Vicinity Map

APPENDIX Z
COUNTY OF LOS ANGELES LOW IMPACT DEVELOPMENT HANDBOOK

COUNTY OF LOS ANGELES

MAJOR WATERSHEDS and EFFECTIVE TOTAL MAXIMUM DAILY LOADS

(as of October 2013)



APPENDIX B

Tier 3 Pollutants of Concern

BALLONA CREEK WATERSHED MANAGEMENT AREA

Parameter	Parameter
pH	Cyanide, Total Recoverable
E. coli Bacteria	Copper, Total Recoverable
Total Coliform Bacteria[1]	Lead, Total Recoverable
Fecal Coliform Bacteria[1]	Mercury, Total Recoverable
Enterococcus Bacteria[1]	Selenium, Total Recoverable

[1] Apply only to discharges to the estuary and the ocean

DOMINGUEZ CHANNEL WATERSHED MANAGEMENT AREA

Parameter	Parameter
pH	Cyanide, Total Recoverable
E. coli Bacteria	Copper, Total Recoverable
Total Coliform Bacteria[1]	Lead, Total Recoverable
Fecal Coliform Bacteria[1]	Mercury, Total Recoverable
Enterococcus Bacteria[1]	Selenium, Total Recoverable

[1] Apply only to discharges to the estuary and the ocean

LOS ANGELES RIVER WATERSHED MANAGEMENT AREA

Parameter	Parameter
pH	Total Dissolved Solids
E. coli Bacteria	Turbidity
Total Coliform Bacteria[1]	Aluminum, Total Recoverable
Fecal Coliform Bacteria[1]	Cyanide, Total Recoverable
Enterococcus Bacteria[1]	Copper, Total Recoverable
Chloride	Mercury, Total Recoverable
Nitrite Nitrogen, Total (as N)	Selenium, Total Recoverable
Sulfate	

[1] Apply only to discharges to the estuary and the ocean

MALIBU CREEK WATERSHED MANAGEMENT AREA

Parameter	Parameter
E. coli Bacteria	Total Dissolved Solids
Cyanide, Total Recoverable	
Mercury, Total Recoverable	
Selenium, Total Recoverable	
Sulfate	

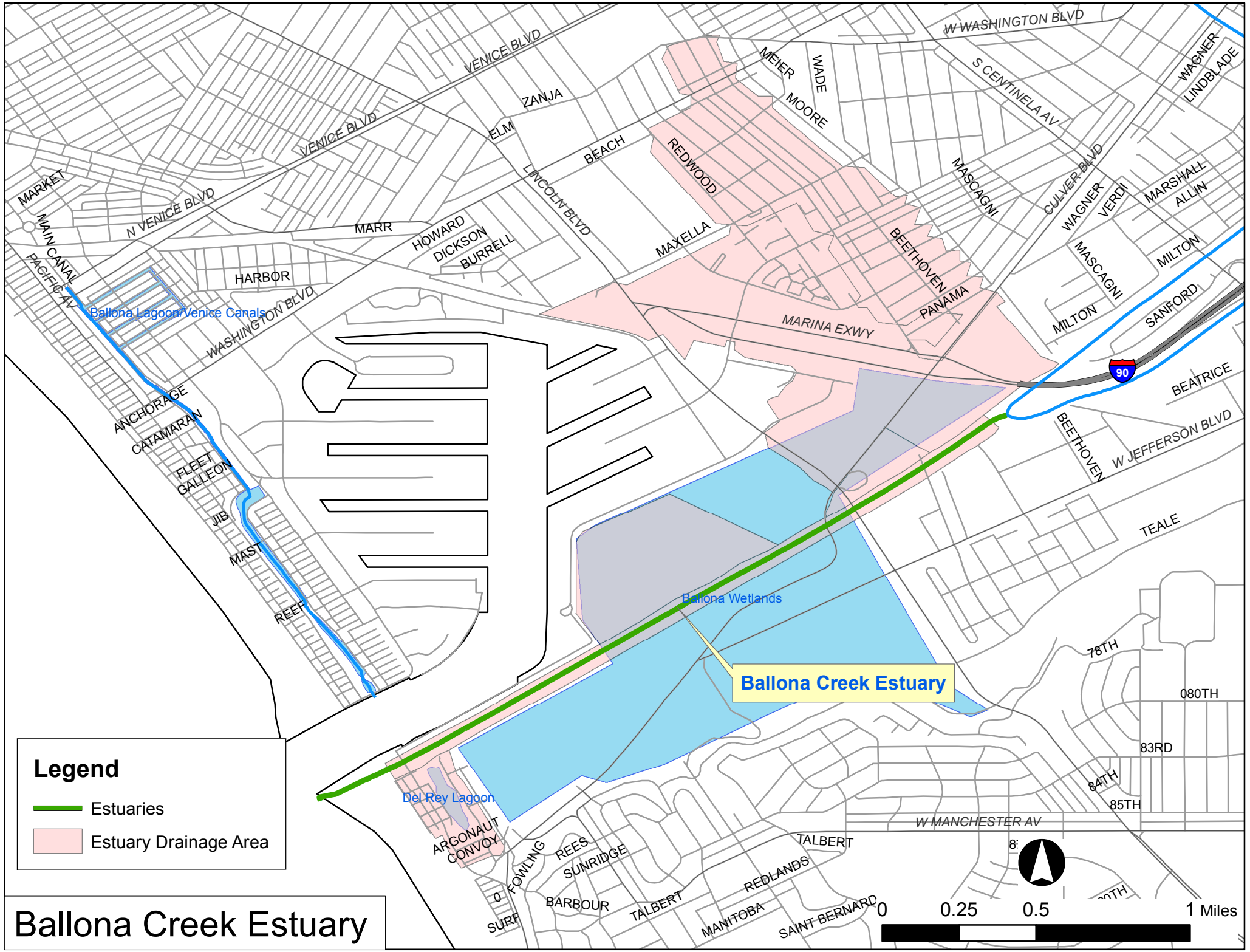
SAN GABRIEL RIVER WATERSHED MANAGEMENT AREA

Parameter	Parameter
pH	Cyanide, Total Recoverable
E. coli Bacteria	Cadmium, Total Recoverable
Total Coliform Bacteria[1]	Copper, Total Recoverable
Fecal Coliform Bacteria[1]	Lead, Total Recoverable
Enterococcus Bacteria[1]	Mercury, Total Recoverable
Chloride	Nickel, Total Recoverable
Nitrate Nitrogen, Total (as N)	Selenium, Total Recoverable
Sulfate	Silver, Total Recoverable
Total Dissolved Solids	Zinc, Total Recoverable
Aluminum, Total Recoverable	

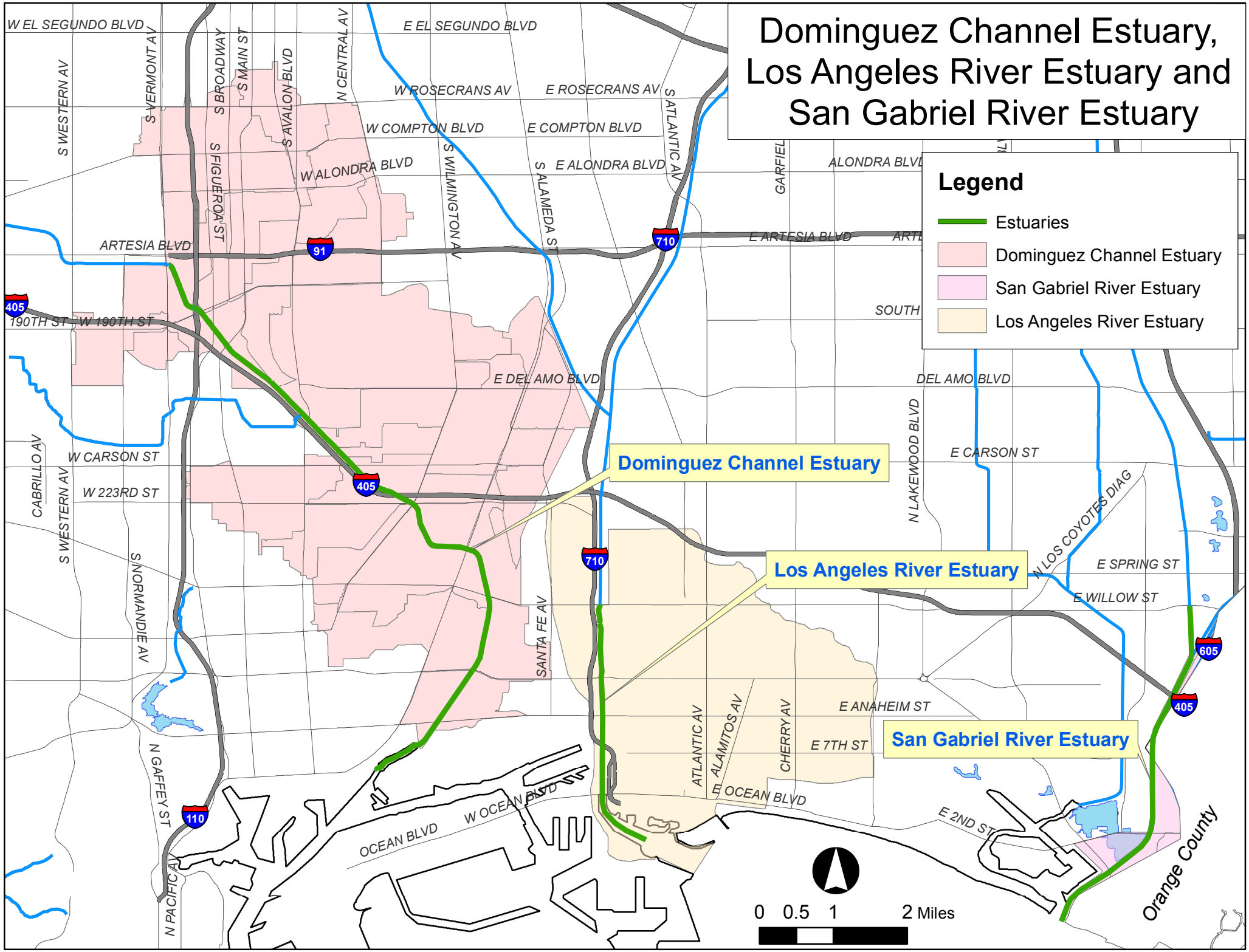
[1] Apply only to discharges to the estuary and the ocean

SANTA CLARA RIVER WATERSHED AREA (LA County portion only)

Parameter	Parameter
E. coli Bacteria	Aluminum, Total Recoverable
Chloride	Cyanide, Total Recoverable
Sulfate	Copper, Total Recoverable
Total Dissolved Solids	Mercury, Total Recoverable
Methylene Blue Active Substances	Selenium, Total Recoverable



Ballona Creek Estuary



Document Name: Basin Plan_LAR-DC

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APPENDIX AA
MODELS
(ELECTRONIC)

APPENDIX AB
GRAND CANAL WEST BANK EROSION CONTROL PROJECT

Table 1. Water Quality Data

Date	Location	DO (mg/L)	pH	Temp (^{0}F)	TSS (mg/L)	Turbidity (NTU)	Floatables (ug/L)
5/1/2015	Anchorage (A)	5.6	7.8	67	19.1	1.7	None Visible
5/8/2015	Driftwood (D)	5	8	67	31.2	2.8	None Visible
5/15/2015	Eastwind (E)	6.5	8	64	13.1	1.1	None Visible
5/21/2015	Fleet (F)	4.5	8.2	70	22.6	2.8	None Visible
5/29/2015	Galleon (G)[1]	9	8.2	74	4	39.2	None Visible
6/5/2015	Ballona/Grand (BG)[1]	6.3	8	70	42.5	2.4	None Visible
6/12/2015	Anchorage (A)	5.6	7.9	71	10.4	0.91	None Visible
6/19/2015	Driftwood (D)	8.4	8.2	75	67.5	2.3	None Visible
6/26/2015	Eastwind (E)	5.4	7.9	76	20.1	1.7	None Visible
7/2/2015	Fleet (F)	5.1	8	76	18.2	3	None Visible
7/10/2015	Galleon (G)[1]	8.7	8.2	80	17.8	3.8	None Visible
7/17/2015	Ballona/Grand (BG)[1]	5	8.1	78	14.3	3.6	None Visible

[1] Stations near the Project Site

APPENDIX AC
GRAND CANAL WEST BANK EROSION CONTROL PROJECT

COUNTY CLERK'S USE | **CITY OF LOS ANGELES** | **CITY CLERK'S USE**

OFFICE OF THE CITY CLERK
ROOM 395, CITY HALL
LOS ANGELES, CALIFORNIA 90012
CALIFORNIA ENVIRONMENTAL QUALITY ACT

NOTICE OF EXEMPTION

(Articles II and III – City CEQA Guidelines)

Submission of this form is optional. The form shall be filed with the County Clerk, 12400 E. Imperial Highway, Norwalk, California, 90650, pursuant to Public Resources Code Section 21152(b). Pursuant to Public Resources Code Section 21167(d), the filing of this notice starts a 35-day statute of limitations on court challenges to the approval of the project.

LEAD CITY AGENCY AND ADDRESS: Bureau of Engineering
1149 South Broadway, Suite 600, Los Angeles, CA 90015.

COUNCIL DISTRICT
11

PROJECT TITLE:
GRAND CANAL WEST BANK EROSION CONTROL PROJECT (SZS11485)

LOG REFERENCE
T.G. P.671, H7 TO J7; p.701, J1.

PROJECT LOCATION: Within the public right-of-way at selected street-ends along the western bank of Grand Canal (Esplanade)--Anchorage, Driftwood, Eastwind, Fleet, and Galleon Streets, along with the terminus of Grand Canal Esplanade at Ballona Lagoon (B/G). All six sites lie upstream of and to the north-northwest from Ballona Lagoon, in the community of Venice, City of Los Angeles, California 90292.

DESCRIPTION OF NATURE, PURPOSE, AND BENEFICIARIES OF PROJECT: This project will restore eroded slopes and gullies at six locations along the west bank of Grand Canal (Esplanade), five street ends and the terminus at Ballona Lagoon. At each of the repair sites, non-native vegetation will be removed and then replaced with native, intertidal and coastal strand vegetation. Native vegetation will be planted to help restore intertidal coastal wetland habitat along the canal at the impacted sites. Work scope also includes the repair/reconstruction of the storm drainpipes and outlets, curbs and gutters, street resurfacing, the installation of new catch basins, and the re-installation of the street end, barrier fences. At the southern end of Grand Canal Esplanade, work will also include reconstruction of protective riprap and re-filling of the washed-out void under the existing sidewalk foundation structure. This project will protect the adjacent street and improve public safety for residents, recreational users of the canal walkways (Grand Canal Esplanade), as well as students of a nearby public, magnet school, and their parents.

CONTACT PERSON
William Jones

TELEPHONE NUMBER
(213) 485-5760

EXEMPT STATUS: (Check One)

	CITY CEQA GUIDELINES	STATE CEQA GUIDELINES
☐ MINISTERIAL	Art. II, Sec. 2.b	Sec. 15268
☐ DECLARED EMERGENCY	Art. II, Sec. 2.a(1)	Sec. 15269(a)
☐ EMERGENCY PROJECT	Art. II, Sec. 2.a(2)(3)	Sec. 15269(b)(c)
☐ GENERAL EXEMPTION	Art. II, Sec. 1	Sec. 15061(b)(3)
☒ CATEGORICAL EXEMPTION*	Art. III, Sec. 1 Class 2	Sec. 15302
☒ CATEGORICAL EXEMPTION*		Sec. 15333
☐ STATUTORY*	Art. _____	Sec. _____

* See Public Resources Code Sec. 21080 and set forth state and city guidelines provisions.

JUSTIFICATION FOR PROJECT EXEMPTION: The project involves repair or reconstruction of an existing facility, or topographical feature, necessary to maintain service essential to the public health, safety or welfare. The reconstructed canal bank will be constructed of like materials, and be located in the same place as the original. The structure will also have substantially the same purpose, capacity and height as the structure being replaced. In addition, the structure abuts an existing officially designated environmentally sensitive habitat area. The project will maintain protection of wildlife habitat, or wildlife resources through removal of debris from sensitive habitat. There will be negligible or no expansion of use. Moreover, this project also serves as a small-scale habitat restoration project of less than 5 acres, designed to restore intertidal habitat along the Grand Canal. No exceptions to this categorical exemption were found (Section 15300.2).

IF FILED BY APPLICANT, ATTACH CERTIFIED DOCUMENT OF EXEMPTION FINDING

SIGNATURE:	TITLE:	DATE:
James E. Doty	Environmental Affairs Officer, Environmental Management Group	

FEE:	RECEIPT NO.	REC'D BY	DATE
$75.00_____			

ofDISTRIBUTION: (1) County Clerk (2) City Clerk (3) Agency Record
Form Gen. 153 (9/91) (Appendix A)

CATEGORICAL EXEMPTION NARRATIVE

I. PROJECT DESCRIPTION

This project will restore eroded slopes and gullies at six locations along the west bank of Grand Canal (Esplanade), five street ends and the terminus at Ballona Lagoon (Photos 1 to 4). Native vegetation will be planted to restore intertidal coastal wetland habitat along the canal at the impacted sites. Work scope also includes the repair/reconstruction of the storm drainpipes and outlets, curbs and gutters, street resurfacing, the installation of new catch basins, and the re-installation of the street end, barrier fences. At the southern end of Grand Canal Esplanade, work will also include reconstruction of protective riprap and re-filling of the washed-out void under the existing sidewalk foundation structure. At each of the repair locations, non-native vegetation will be removed and then replaced with native, intertidal and coastal strand vegetation. This project will protect the adjacent street and improve public safety for residents, recreational users of the canal walkways (Grand Canal Esplanade), as well as students of a nearby public, magnet school, and their parents.

II. PROJECT HISTORY

Previous CEQA and Coastal Act Findings: There have been no CEQA action or Coastal Permit applications for this particular project. However, there have been previous plans and projects, designed to rehabilitate, or restore the banks of the Grand Canal.

The Grand Canal is part of a designated, Environmentally Sensitive Habitat Area (ESHA); the Venice Canals (North) and Ballona Lagoon (South) are also included within this designated area. The Grand Canal and its banks was also the object of an ecological restoration plan (PSOMAS 2007); south of Washington Street, a small portion of the east bank of Grand Canal has also been restored based upon that restoration plan (Ferren, 2008). Habitat restoration projects along the east and west banks of Ballona Lagoon have been completed. The southerly portion of Ballona Lagoon's west bank will be restored as part of a future, separate project.

Prior to preparation of the ecological restoration plan, the City proposed a project in 2001, designed to remediate erosion problems along Grand Canal (CDP 5-01-289 and CDP A-5-VEN 01-279). The entire canal was to be temporarily drained during construction, including extensive dredging of sediments and planting of native vegetation. A Mitigated Negative Declaration was prepared (BE-097-01), and a Mitigation Monitoring Program was approved. The project was delayed, then eventually cancelled, based upon a court injunction, filed against the California Coastal Commission and the City (500524, June 25, 2002).

A project to repair sluice gates at the Venice Pumping Plant would have involved construction of a temporary bypass pipeline along the Grand Canal Esplanade (A5-VEN-07-397). A Mitigated negative Declaration and Mitigation Monitoring Program (BE 033-07) was prepared. The Mitigation Program included habitat restoration work along the

Grand Canal, between Driftwood Street and Hurricane Street. This project was later cancelled, but subsequent projects were completed.

A project to rehabilitate a portion of the Grand Canal along the East bank, from Washington Street to Driftwood Street was completed in 2009 (CDP VEN 5-09-035). At the end of Hurricane Street, similar (catch basin, restoration, curb and gutter) work was recently completed; within the Grand Canal, a seawall, outlet and reconstruction of an existing sewer maintenance-hole structure were part of the project (CDP waiver VEN 5-12-068-W. Both projects were exempt from CEQA as the projects involved reconstruction of existing facilities, or restoration of habitat components.

This project has been evaluated for compliance with the *Environmental Quality Act.*

III. ENVIRONMENTAL REVIEW: Replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced is Categorically Exempt under Class 2 (CCR 15302). However, State CEQA Guidelines (CCR Sec 15300.2) limit the use of Categorical Exemptions in special circumstances. The applicability of Guidelines Section 15300.2 is discussed in the following:

1. Location: Categorical Exemption Classes 3, 4, 5, 6, and 11 are qualified by consideration of where the project is to be located – a project that is ordinarily insignificant in its impact on the environment may be significant in a particularly sensitive environment. Therefore, these classes are considered to apply to all instances, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.

The proposed project is exempt under Class 2 and 33. Therefore, this exception has no application here.

2. Cumulative Impact: This exception applies when, although a particular project may not have a significant impact, the cumulative impact of successive projects of the same type in the same place, over time is significant.

Other nearby facility improvement projects have been recently constructed, are under construction as of October 2013, or are planned for the future:

- Ballona Lagoon Phase IIIa, West Bank Restoration (recently constructed).
- Ballona Lagoon Phase IIIb, West Bank (planned).
- Ballona Lagoon, East Bank, Fencing (recently constructed).
- Grand Canal Maintenance Access Hole at Hurricane Street (recently constructed).
- Marina Channel Tide Gate Rehabilitation (post construction).
- Venice Dual Force Main (planned).

- Venice Pumping Plant Manifold (under construction).
- Via Dolce Park (planned).
- Washington Boulevard at Venice Canals, Culvert Rehabilitation (planned).

The cumulative impacts of these projects are to protect and enhance sensitive habitat, as well as to improve public health and safety. Thus, this exception has no application here.

3. Significant Effect: This exception applies when, although the project may otherwise be exempt, there is a reasonable possibility that the project will have a significant effect due to unusual circumstances. Examples include projects that may affect scenic or historical resources.

The City CEQA Thresholds Guide provides that project would normally have a significant impact on biological resources if it could result in (among other things) the loss of individuals, or the reduction of existing habitat, of a state or federal listed endangered, threatened, rare, protected, or candidate species, or a Species of Special Concern or federally listed critical habitat.

Eight state or federal listed endangered, threatened, rare, protected animal species have been recorded in the vicinity of the Grand Canal and the nearby Ballona Lagoon. Listed animals included six avian, one mammal and one insect species.

Two avian species- California brown pelican (*Pelecanus occidentalis californicus*) and California least tern (*Sterna antillarum browni*) - have been observed foraging at Ballona Lagoon. Brown pelicans also forage in the Grand Canal. The least tern nests within a protected (fenced) nesting site, located on Venice Beach, 1.5 km (0.95) miles to the southwest.

Four other listed avian species- the western snowy plover (*Charadrius alexandrinus nivosus*), Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), California black rail (*Laterailus jamaicensis coturniculus*), and coastal California gnatcatcher (*Polioptila californica californica*) have not been recently observed in the vicinity at Ballona Lagoon. The coastal California gnatcatcher is associated with the coastal sage scrub community, which is not present within the project area. The Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) is present in the Ballona Wetlands, south of the Marina Channel and Ballona Creek. The wetlands are located about 1.1 miles to the south of the Project Site. However, the Belding's savannah sparrow is not known to occur at or near the project site.

Two other species are listed: a mammal and an insect. The Pacific pocket mouse (*Perognathus longimembris pacificus*) has been historically collected in narrow coastal sites, such as Playa Del Rey and Pacific Palisades, but not the Ballona Lagoon area. The El Segundo Blue Butterfly (*Euphilotites battoides allyni*) has not been recorded at Ballona Lagoon, and its host plant, sea-cliff buckwheat (*Eriogonum parvifolium* Swith.) is not present at or near the project site.

No state or federal listed endangered, threatened, rare, protected plant species are present within the project boundaries. However, four California Native Plant Society-listed sensitive species have been found within, or recorded in the vicinity, of project. These include wooly sea-blight (*Suaeda taxifolia* (Standley) Standley), red sand verbena (*Abronia maritima* S. Watson), and south coast saltbush (At*riplex pacifica* Nelson). Wooly sea-blight is found in the intertidal zone, and is scattered along the margin of both the Grand Canal and Ballona Lagoon, the nearest being 50 feet south of the MH. Red sand verbena was previously recorded along Ballona Lagoon's eastern bank, but has not been observed since 2003. South coast salt bush was observed along the Grand Canal in 2002, but also has not been observed since the previous survey. The fourth sensitive species is a dune plant, Orcutt's Pincushion (*Chaenactis glabriuscula* DC var. *orcuttiana* (E. Greene) H. Hall), which occurs on the west bank of Ballona Lagoon. Yet, no dune habitat occurs within the project area.

With the bank susceptible to severe erosion at the street ends, intertidal habitat is currently open to disturbance, thus potentially causing the loss of individual plants and animals, and subsequently leading to the degradation of sensitive habitat. The project will restore protection of sensitive habitat. Therefore, this exception has no application here.

4. Scenic Highway: This exception applies when a project may result in damage to scenic resources within a duly designated state scenic highway.

The proposed project is not within sight of any designated scenic highway, and will not affect any resource within sight of any designated scenic highway. Thus, this exception has no application here.

5. Hazardous Waste Site: This exception applies when a project is located on a site listed as a hazardous waste site under Government Code Section 65962.5.

As of October 31, 2013, the State Department of Toxic Substances Control has not listed any site within one mile of the project area. So this exception has no application ere. (Ref. Envirostor at www.envirostor.dtsc.ca.gov)

6. Historical Resources: This exception applies when a project may cause a substantial adverse change in the significance of a historical resource.

The Venice Canal system is part of the Venice Canal Historic District (Federal Monument No. 2370), and the Grand Canal itself (City Monument No. 270) to north of Washington Boulevard is also considered an historic resource. However, the proposed project is located south of Washington Boulevard, and is within neither the historic district, nor the historic monument. This project will restore the sidewalk and bank along parts of the the Grand Canal, and add will add run-off control measures to protect them from damage in the future. The sidewalks and bank are not contributing features to any historic resource. Therefore, this exception has no application here.

Photos 1-4: Project Site locations along Grand Canal Esplanade- (1) Anchorage Street; (2) Driftwood Street; (3) Fleet Street; and, (4) Ballona Lagoon at Grand Canal Esplanade.



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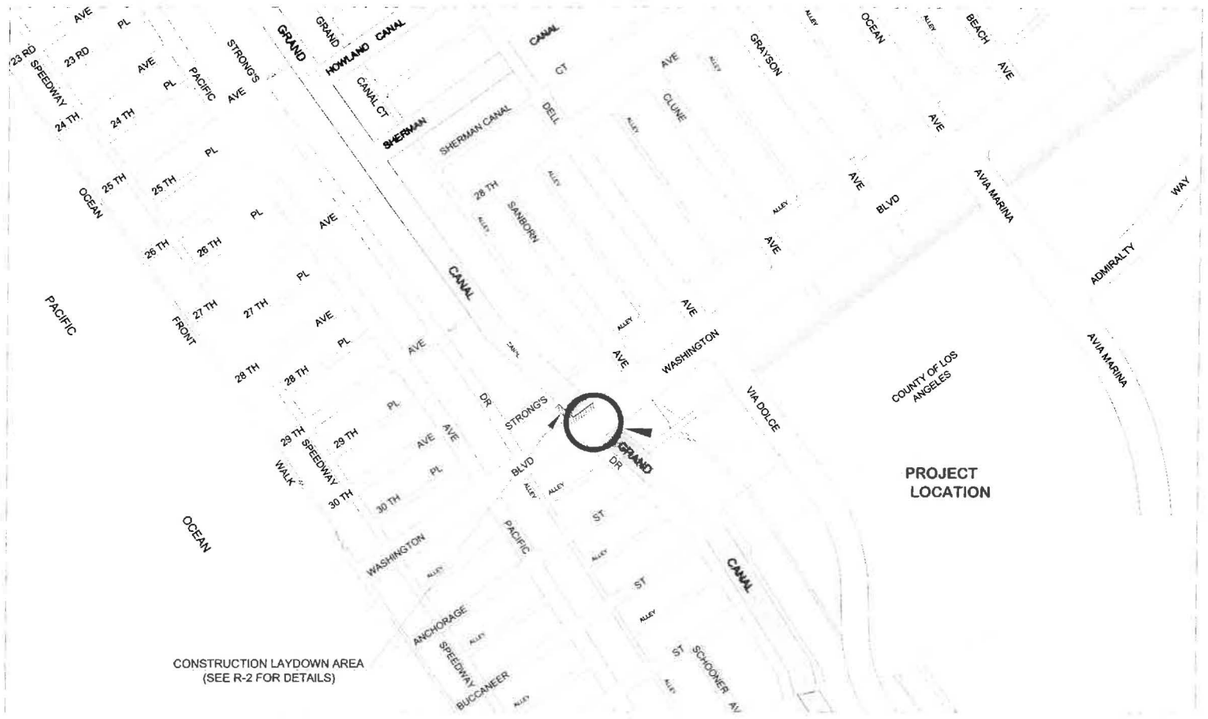
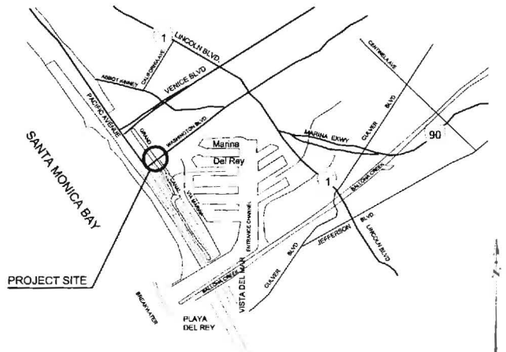
APPENDIX AD
VENICE TIDE GATES EMERGENCY REPLACEMENT DRAWINGS

BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

VENICE TIDEGATES EMERGENCY REPLACEMENT

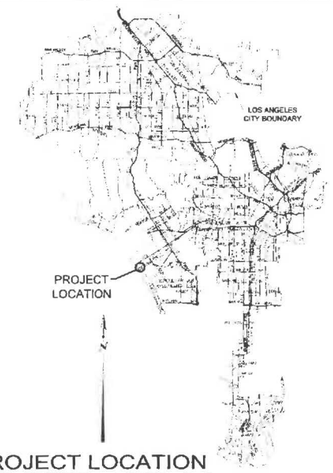


KEY MAP
NOT TO SCALE



(THOMAS GUIDE PAGE 701, GRID J-1,2)

VICINITY MAP
NOT TO SCALE



PROJECT LOCATION
NOT TO SCALE

PROJECT TEAM

PROJECT MANAGEMENT:
STREET IMPROVEMENT AND STORMWATER DIVISION
MICHAEL BROWN, P.E.
DIVISION MANAGER
SUSAN SHU
GROUP MANAGER
DING LEE
PROJECT MANAGER
YI BING SUN
PROJECT ENGINEER

CONSTRUCTION MANAGEMENT:
STREET IMPROVEMENT AND STORMWATER DIVISION
MICHAEL BROWN, P.E.
DIVISION MANAGER
SUSAN SHU
GROUP MANAGER
HANS CHANG
CONSTRUCTION MANAGER

BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS
CITY OF LOS ANGELES

LA DPW ENGINEERING
DESIGNING THE FUTURE

NO. REVISIONS: DATE: BY:

SERIAL NO.

STRUCTURE NO.

WORK ACCEPTED

INDEX NO.

* THIS PLAN WAS ELECTRONICALLY SIGNED AND STAMPED.

GARY LEE MOORE, P.E. CITY ENGINEER
ACCEPTED BY:
DEPUTY CITY ENGINEER / PROGRAM MANAGER — DATE 10-29-08
CITY ENGINEER — DATE 10-29-08

VERTICAL CONTROL:
HORIZONTAL CONTROL:

SHEET TITLE: COVER SHEET

PROJECT: VENICE TIDEGATES EMERGENCY REPLACEMENT

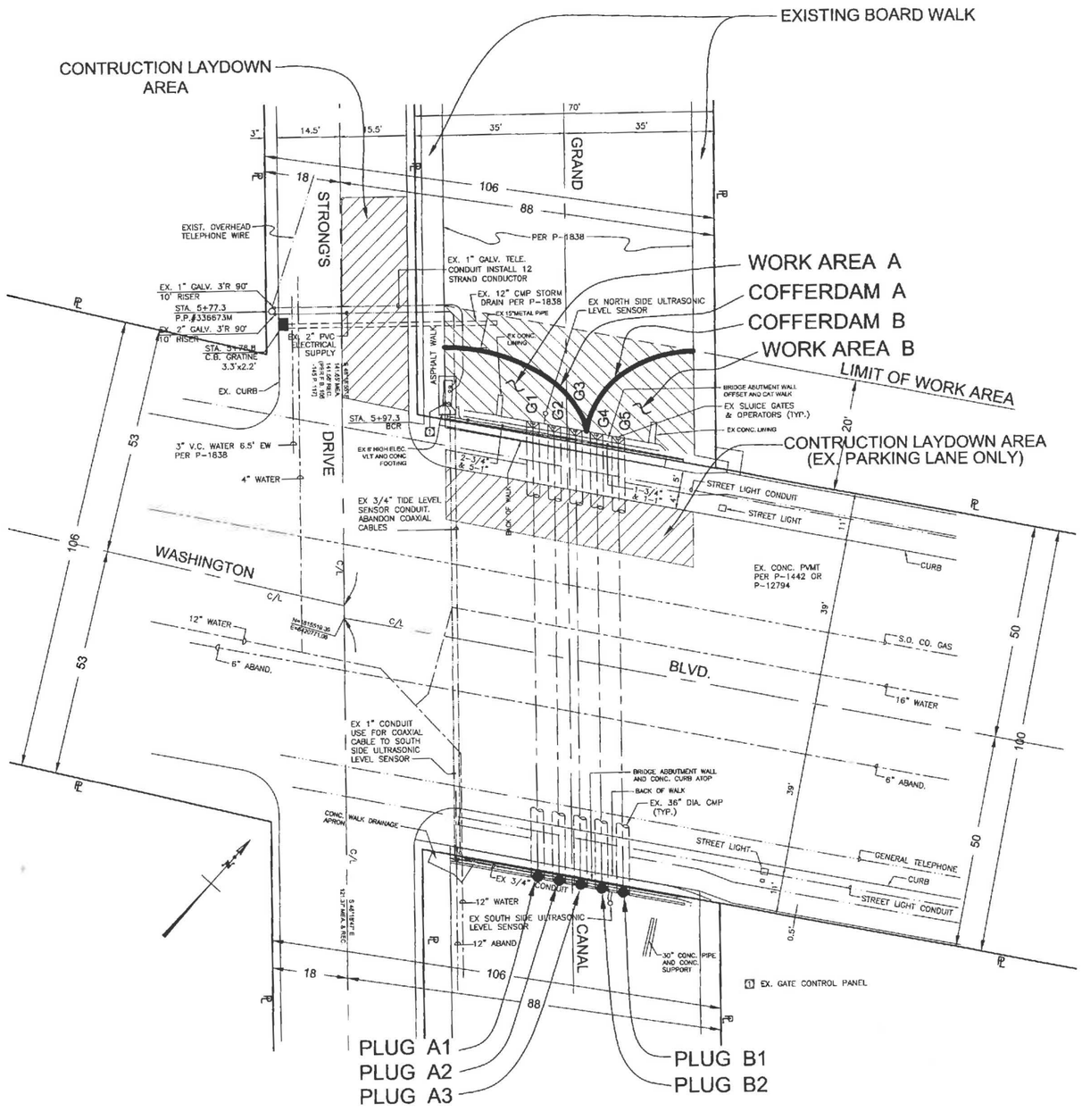
ADDRESS: LOS ANGELES, CA. 90292

WORK ORDER NO.
E6000907
DRAWING NO.
R-1
SHEET 1 OF 4 SHEETS

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 2.2



PLAN

NOT TO SCALE

WORK SCOPE AND CONSTRUCTION SEQUENCE

PHASE I:

1. INSTALL FOR HIGH TIDE WATER COFFERDAM B
2. INSTALL THE PLUGS B1 AND B2
3. DEWATERING THE WORK AREA B
4. DISCONNECT AND CAP THE EXISTING ELECTRICAL CONDUITS FOR GATES G4 & G5
5. REMOVE THE EXISTING No.4 AND No.5 GATES AND OPERATORS
6. REPAIR THE HEADWALL IN WORK AREA B PER CRACK REPAIR DETAIL ON SHT C-2
7. INSTALL THE NEW GATES AND OPERATORS FOR GATES G4 & G5
8. RECONNECT THE ELECTRICAL CONDUITS FOR GATES G4 & G5
9. REMOVE THE PLUGS B1 AND B2
10. REMOVE THE COFFERDAM B

PHASE II:

11. INSTALL FOR HIGH TIDE WATER COFFERDAM A
12. INSTALL THE PLUGS A1 , A2 , AND A3
13. DEWATERING THE WORK AREA A
14. DISCONNECT AND CAP THE EXISTING ELECTRICAL CONDUITS FOR GATES G1, G2 & G3
15. REMOVE THE EXISTING GATES G1, G2 & G3 AND OPERATORS
16. REPAIR THE HEADWALL IN WORK AREA A PER CRACK REPAIR DETAIL ON SHT C-2
17. INSTALL THE NEW GATES AND OPERATORS FOR GATES G1, G2 & G3
18. RECONNECT THE ELECTRICAL CONDUITS FOR GATES G1, G2 & G3
19. REMOVE THE PLUGS A1, A2 AND A3
20. REMOVE THE COFFERDAM A

NEW GATES AND OPERATORS:

SEE SPECIAL PROVISION FOR DETAILS.

NOTICE TO CONTRACTORS

1. SPECIFICATIONS : ALL WORK SHALL CONFORM TO THE LATEST EDITION AND SUPPLEMENTS OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION ADOPTED BY THE BOARD OF PUBLIC WORKS OF THE CITY OF LOS ANGELES AS MODIFIED BY THE CORRESPONDING ISSUE OF THE CITY OF LOS ANGELES, DEPARTMENT OF PUBLIC WORKS ADDITIONS AND AMENDMENTS TO THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS AND THE "BROWN BOOK".
2. THIS IMPROVEMENT CONSISTS OF WORK CALLED FOR ON THESE PLANS ONLY.
3. ADVANCE CONSTRUCTION NOTICE SIGNS:
   SIGNS FOR GIVING ADVANCE NOTICE TO MOTORISTS OF TRAFFIC DISRUPTION SHALL BE FURNISHED AND PLACED AS A PART OF THIS PROJECT IN ACCORDANCE WITH STANDARD PLANS S-610 AND S-791-1. INFORMATION TO BE PLACED ON SIGNS TO BE PROVIDED AT PRE-CONSTRUCTION MEETING.
4. INSPECTION: ALL WORK AND MATERIALS ARE SUBJECT TO INSPECTION PURSUANT TO SECTION 2-11 OF THE STANDARD SPECIFICATIONS. CALL (213) 580-5080 BEFORE NOON OF THE WORKING DAY BEFORE THE DAY INSPECTION IS REQUIRED.
5. THE CONTRACTOR IN CONFORMANCE WITH LOS ANGELES CITY ORDINANCE NO. 150478 SHALL POTHOLE EXISTING SUBSURFACE INSTALLATIONS CARRYING UNSTABLE SUBSTANCES TO DETERMINE THEIR LOCATIONS AND ELEVATIONS PRIOR TO COMMENCING EXCAVATION.
6. THE CONTRACTOR IS REMINDED TO GIVE REASONABLE NOTICE TO THE OWNERS OR OCCUPANTS OF THE PROPOSED IMPROVEMENT FRONTING THEIR PROPERTY, PER SECTION 7-10 OF THE STANDARD SPECIFICATIONS AND STANDARD PLAN S-610. NOTICE CONTENTS WILL BE PROVIDED BY THE ENGINEER.
7. THE CONTRACTOR SHALL PREPARE AND SUBMIT SHOP DRAWINGS IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, SUBSECTION 2-5.3, "SHOP DRAWINGS AND SUBMITTALS". THESE SHOP DRAWINGS AND SUBMITTALS SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:
   A. TEMPORARY COFFERDAM.
   B. TRAFFIC CONTROL PLAN.
   C. UTILITIES SUPPORT PLAN.
   D. TEMPORARY PLUG.
   E. NEW GATE & OPERATOR.
   F. SEE SPECIAL PROVISIONS FOR OTHERS.
8. ANY ASPHALT OR CONCRETE PAVEMENT, CURB, GUTTER OR OTHER STRUCTURES, INCLUDING UTILITIES THAT WERE REMOVED TO ACCOMMODATE CONSTRUCTION SHALL BE REPLACED OR RELOCATED IN A CONDITION EQUAL TO OR BETTER THAN THAT REMOVED TO THE SATISFACTION OF THE ENGINEER AT NO ADDITIONAL COST TO THE CITY.
9. THE CONTRACTOR SHALL COMPLY WITH CONSTRUCTION SAFETY ORDER OF CAL/OSHA.

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING

LA DPW ENGINEERING Connect. Innovate. Improve the Future

NO	REVISIONS	DATE	BY

STRUCTURE NO.

INDEX NO.

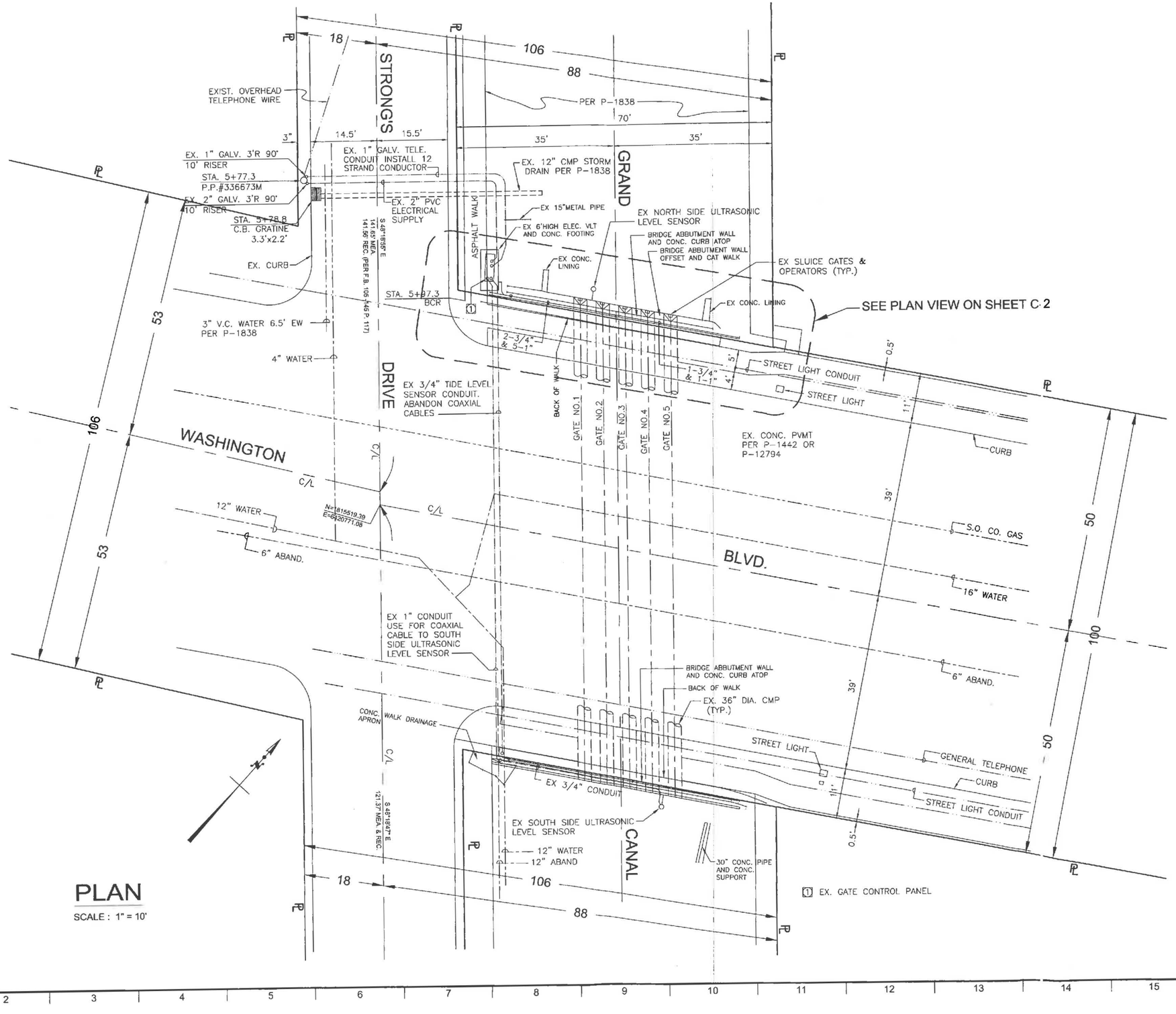
REGISTERED PROFESSIONAL ENGINEER * GARY LEE MOORE * No. 10453 * CIVIL * STATE OF CALIFORNIA

CITY ENGINEER: GARY LEE MOORE, P.E. DATE: 10/31/08
DESIGN GROUP:
ENGINEER: YI BING SUN
DESIGNED BY: HANS CHANG
DRAWN BY: TAI DUONG
CHECKED BY: DING LEE
APPROVED BY: SUSAN SHU
UC NO. C-40453 10/31/08

VERTICAL CONTROL:
HORIZONTAL CONTROL:

SHEET TITLE: WORK SCOPE AND CONSTRUCTION SEQUENCE
PROJECT: VENICE TIDEGATES EMERGENCY REPLACEMENT
ADDRESS: LOS ANGELES, CA. 90292

WORK ORDER NO. E6000907
DRAWING NO. R-2
SHEET 2 OF SHEETS



PLAN

SCALE : 1" = 10'

THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

BUREAU OF ENGINEERING

NO | REVISIONS: | DATE: | BY:

STRUCTURE NO.

INDEX NO.

LA DPW ENGINEERING

REGISTERED PROFESSIONAL ENGINEER YI BING SUN No. 60453 STATE OF CALIFORNIA

CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS

CITY ENGINEER:	GARY LEE MOORE, P.E.	DESIGN GROUP:	
ENGINEER:	YI BING SUN	LIC. NO. C-60453	DATE: 09/04
DESIGNED BY:	HANS CHANG		
DRAWN BY:	TAI DUONG		10/31/08
CHECKED BY:	DING LEE		11/3/11
APPROVED BY:	SUSAN SHU		

VERTICAL CONTROL:
HORIZONTAL CONTROL:

SHEET TITLE: PLAN

PROJECT: VENICE TIDEGATES EMERGENCY REPLACEMENT

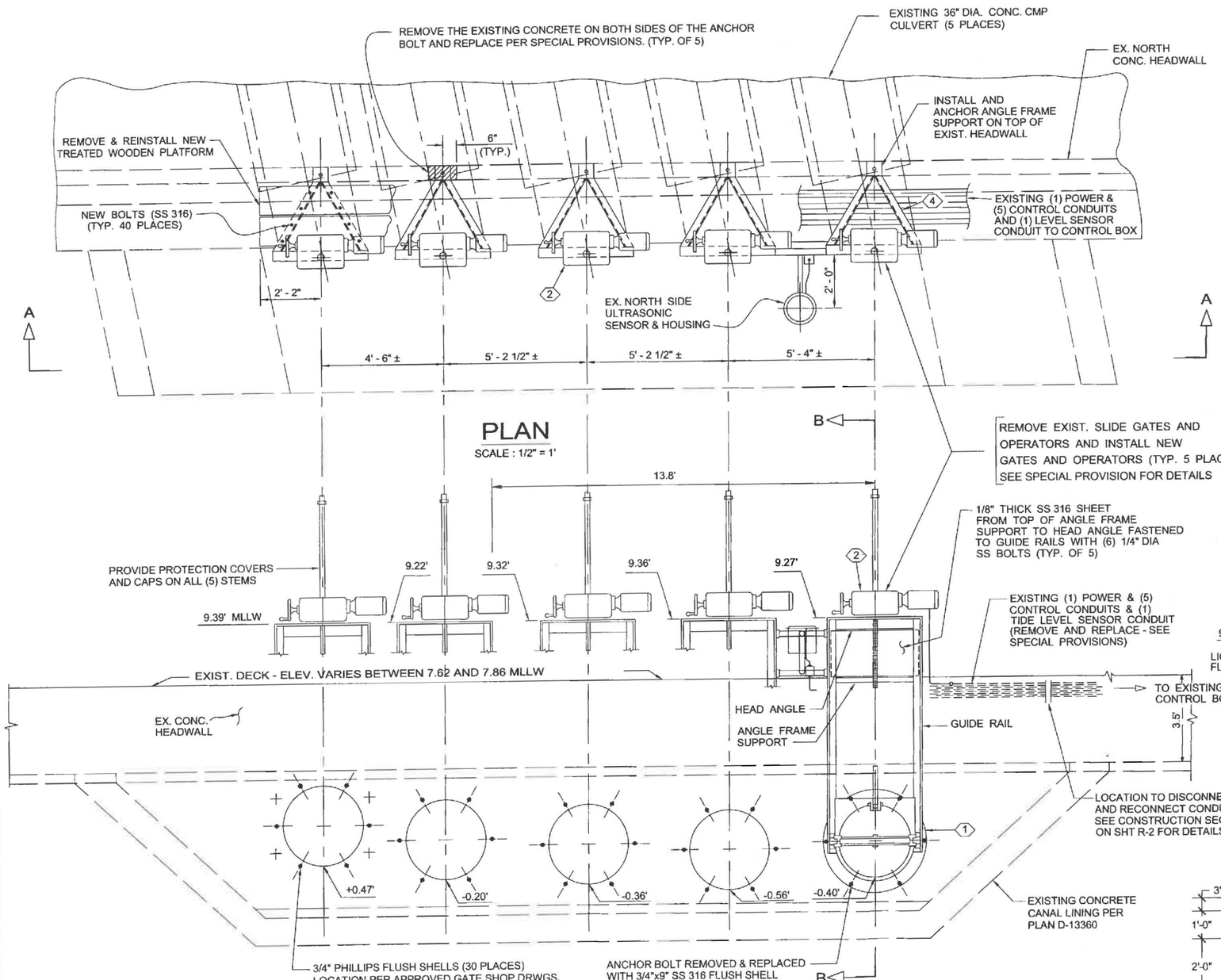
ADDRESS: LOS ANGELES, CA. 90292

WORK ORDER NO. E6000907

DRAWING NO. C-1

SHEET 3 OF SHEETS

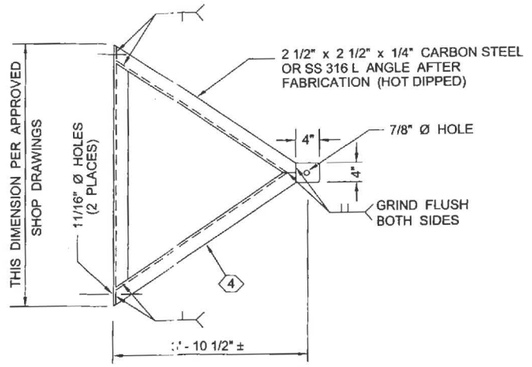
THE CITY OF LOS ANGELES OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.



SECTION A-A

SCALE : 1/2" = 1'

CRACK REPAIR DETAIL

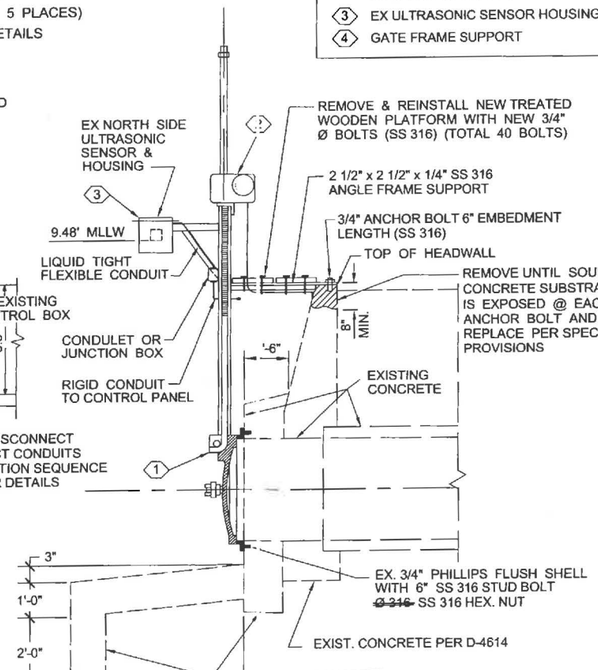


FRAME SUPPORT

NOT TO SCALE

NOTES :

1. CANAL GATE 36" DIA. OPENING WATERMAN INDUSTRIES MODEL C-20 OR EQUAL
2. ELECTRIC MOTOR OPERATED GATE OPERATOR . LIMITORGUE MODEL L120 OR EQUAL
3. EX ULTRASONIC SENSOR HOUSING
4. GATE FRAME SUPPORT



SECTION B-B

SCALE : 1/2" = 1'

CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING
GARY LEE MOORE, P.E. CITY ENGINEER
DESIGN GROUP
ENGINEER: YI BING SUN LIC NO. C-44463 DATE: 10/31/08
DESIGNED BY: HANS CHANG
DRAWN BY: TAI DUONG
CHECKED BY: DING LEE
APPROVED BY: SUSAN SHU
LA DPW ENGINEERING Civic Pride | Building the Future
NO REVISIONS DATE
STRUCTURE NO.
INDEX NO.
REGISTERED PROFESSIONAL ENGINEER * YI BING SUN * No. 44463 * STATE OF CALIFORNIA

VERTICAL CONTROL:
HORIZONTAL CONTROL:
SHEET TITLE: CANAL GATE LAYOUT PLAN
PROJECT: VENICE TIDEGATES EMERGENCY REPLACEMENT
ADDRESS: LOS ANGELES, CA. 90292

WORK ORDER NO.
E6000907
DRAWING NO.
C-2
SHEET 4 OF 4 SHEETS

REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 3.0

Appendix I

Noise Modeling Calculations

ARCADIS U.S., Inc.
1525 Faraday Avenue
Suite 290
Carlsbad
California 92008
Tel 760 602 3800
Fax 760 602 3838

MEMO

To:
Brian Leto

Copies:
Michael Burrill
Manuel Alvarez

From:
Kevin Fowler

Date:
July 10, 2015

ARCADIS Project No.:
06332002.0000

Subject:
VAPP – Baseline Noise Measurements

Introduction

ARCADIS has completed a baseline noise measurement study for the VAPP Preliminary Design Project. This memo represents a summary of the community ambient noise levels surrounding the proposed project site during non-construction hours. For measurement locations, please refer to Figure 1: Aerial Image Showing Noise Measurement Locations.

Noise Measurement Equipment

The following equipment was used in the field to measure existing ambient baseline noise levels:

- Larson Davis – Model 831 Sound Level Meter with Pre-Amp and Microphone
- Larson Davis – Model CA200 Microphone Calibrator
- Windscreen and Tripod

The sound level meter was field-calibrated prior to and following each noise measurement to ensure accuracy. In accordance with industry standards, the sound level measurements were made with a sound

level meter that conforms to the American National Standards Institute (ANSI) specifications for sound level meters ANSI SI.4 1983 (R2006). All instruments are maintained with the National Bureau of Standards traceable calibrations.

Noise Measurement Methodology

To document the existing ambient noise conditions within the vicinity of the project site during non-construction hours, noise monitoring was conducted with a sound level meter at four separate locations. At each location, data was collected for a continuous 30-minute time period. The noise measurements were conducted during the quiet evening hours between 4:00 p.m. to 6:00 p.m. on Thursday, April 23rd, 2015. For a summary listing of the baseline noise measurement results, please refer to Table 1 below. For a complete set of the raw baseline noise measurement data, please refer to Attachment 1.

Table 1. Summary Results of Baseline Noise Measurements

Location	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L_{90} (dBA)
1	47.9	63.8	41.2	44.2
2	48.6	65.6	42.2	44.1
3	50.1	73.9	44.2	46.0
4	53.0	66.5	44.4	51.2

Please review this memo at your earliest convenience. If you have any questions concerning this project, please contact Kevin Fowler at kevin.fowler@arcadis-us.com.

Sincerely,

Kevin Fowler, INCE
Project Acoustical Scientist

Figure 1: Aerial Image Showing Noise Measurement Locations

Attachment 1: VAPP Raw Baseline Noise Measurement Data

Figure 1


Location 4
Location 2
Location 1
Location 3
© 2015 Google
Google earth
1994
33°58'33.25" N 118°27'40.32" W elev 15 ft eye alt 760 ft

Attachment 1

SUMMARY DATA

	LAeq	LAFmax	LAFmin	LAF90.00
Location 1	47.9	63.8	41.2	44.2
Location 2	48.6	65.6	42.2	44.1
Location 3	50.1	73.9	44.2	46.0
Location 4	53.0	66.5	44.4	51.2

NOISE MEASUREMENT LOCATION 1

Date	Time	LAeq	LASmax	LASmin	LAF90.00
2015/04/23	16:43:19	0.0	0.0	0.0	0.0
2015/04/23	16:43:19	46.8	45.8	45.7	46.9
2015/04/23	16:43:20	45.2	45.8	45.4	45.0
2015/04/23	16:43:21	47.5	47.1	45.3	44.8
2015/04/23	16:43:22	46.1	47.1	46.4	45.5
2015/04/23	16:43:23	47.7	47.4	46.5	45.9
2015/04/23	16:43:24	47.8	48.0	47.2	46.7
2015/04/23	16:43:25	47.6	47.9	47.2	46.3
2015/04/23	16:43:26	48.1	48.1	47.4	46.5
2015/04/23	16:43:27	45.4	47.8	46.3	44.3
2015/04/23	16:43:28	45.5	46.3	45.3	43.7
2015/04/23	16:43:29	48.3	48.2	46.1	43.9
2015/04/23	16:43:30	45.8	47.0	45.9	43.7
2015/04/23	16:43:31	50.5	49.9	45.6	43.6
2015/04/23	16:43:32	47.2	49.8	48.4	44.9
2015/04/23	16:43:33	46.9	48.4	47.6	44.7
2015/04/23	16:43:34	45.2	47.6	46.1	43.4
2015/04/23	16:43:35	44.9	46.2	45.4	43.8
2015/04/23	16:43:36	46.5	46.6	44.8	43.4
2015/04/23	16:43:37	45.1	46.3	45.5	43.6
2015/04/23	16:43:38	47.3	46.9	45.1	43.8
2015/04/23	16:43:39	47.8	47.8	46.8	45.9
2015/04/23	16:43:40	46.0	47.1	46.4	44.8
2015/04/23	16:43:41	47.9	47.8	46.5	46.0
2015/04/23	16:43:42	48.3	48.1	46.6	45.2
2015/04/23	16:43:43	49.3	49.4	48.1	47.7
2015/04/23	16:43:44	51.0	50.4	48.8	48.5
2015/04/23	16:43:45	48.0	50.4	49.0	47.2
2015/04/23	16:43:46	50.2	49.9	48.7	47.5
2015/04/23	16:43:47	51.2	51.0	50.0	48.9
2015/04/23	16:43:48	55.3	54.5	50.7	52.1
2015/04/23	16:43:49	56.3	55.9	53.9	53.4
2015/04/23	16:43:50	55.0	55.6	54.9	52.5
2015/04/23	16:43:51	51.5	54.9	52.8	48.4
2015/04/23	16:43:52	46.8	52.8	50.0	45.4
2015/04/23	16:43:53	48.6	50.0	49.1	47.4
2015/04/23	16:43:54	49.4	49.8	48.5	46.3
2015/04/23	16:43:55	48.0	49.3	48.3	46.1
2015/04/23	16:43:56	49.3	49.7	48.5	47.4
2015/04/23	16:43:57	49.4	49.8	48.9	47.4
2015/04/23	16:43:58	47.4	49.0	48.1	46.7
2015/04/23	16:43:59	47.5	48.1	47.6	47.0
2015/04/23	16:44:00	49.8	49.2	47.8	47.5
2015/04/23	16:44:01	49.9	50.0	49.0	48.6
2015/04/23	16:44:02	49.5	50.4	49.3	47.3
2015/04/23	16:44:03	48.4	49.3	48.6	47.3
2015/04/23	16:44:04	49.5	49.4	48.8	48.6

2015/04/23	16:44:05	49.8	49.8	49.1	48.5
2015/04/23	16:44:06	50.4	50.4	49.6	49.1
2015/04/23	16:44:07	49.2	50.5	49.4	47.5
2015/04/23	16:44:08	48.3	49.4	48.8	47.6
2015/04/23	16:44:09	47.8	48.7	48.0	46.5
2015/04/23	16:44:10	48.7	48.7	48.4	48.1
2015/04/23	16:44:11	47.7	48.5	47.9	46.7
2015/04/23	16:44:12	49.5	49.1	48.2	48.7
2015/04/23	16:44:13	49.3	49.4	48.7	47.6
2015/04/23	16:44:14	50.1	50.0	49.3	48.7
2015/04/23	16:44:15	50.4	50.3	49.8	49.4
2015/04/23	16:44:16	51.3	51.1	50.3	50.8
2015/04/23	16:44:17	51.6	51.5	50.9	50.4
2015/04/23	16:44:18	51.3	51.9	51.3	50.6
2015/04/23	16:44:19	51.2	51.5	50.5	49.1
2015/04/23	16:44:20	51.1	51.5	50.8	49.2
2015/04/23	16:44:21	51.4	51.5	51.3	51.2
2015/04/23	16:44:22	51.7	51.7	51.3	51.1
2015/04/23	16:44:23	50.3	51.5	50.9	49.6
2015/04/23	16:44:24	52.2	51.8	50.8	51.1
2015/04/23	16:44:25	53.2	52.8	51.8	51.9
2015/04/23	16:44:26	52.2	52.8	52.3	51.4
2015/04/23	16:44:27	52.2	52.5	51.6	49.7
2015/04/23	16:44:28	53.3	53.1	52.5	52.1
2015/04/23	16:44:29	54.7	54.1	53.1	54.0
2015/04/23	16:44:30	55.3	54.9	54.1	54.8
2015/04/23	16:44:31	53.6	54.9	54.0	53.0
2015/04/23	16:44:32	54.7	54.5	54.1	54.3
2015/04/23	16:44:33	54.4	54.6	54.4	54.1
2015/04/23	16:44:34	55.5	55.2	54.4	54.5
2015/04/23	16:44:35	56.0	55.8	55.2	55.4
2015/04/23	16:44:36	56.3	56.1	55.8	55.8
2015/04/23	16:44:37	54.8	56.0	55.2	54.2
2015/04/23	16:44:38	53.5	55.2	54.1	52.1
2015/04/23	16:44:39	52.1	54.1	52.9	51.8
2015/04/23	16:44:40	52.2	53.0	52.3	51.1
2015/04/23	16:44:41	49.3	52.3	50.7	48.7
2015/04/23	16:44:42	49.8	50.7	50.1	49.1
2015/04/23	16:44:43	49.1	50.6	49.3	47.5
2015/04/23	16:44:44	50.5	50.2	49.2	48.7
2015/04/23	16:44:45	48.2	50.4	48.9	46.7
2015/04/23	16:44:46	48.3	49.0	48.5	47.8
2015/04/23	16:44:47	48.2	48.6	48.3	47.6
2015/04/23	16:44:48	46.6	48.4	47.3	45.9
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2015/04/23	16:44:51	47.0	46.9	46.3	46.4

2015/04/23	16:44:52	46.9	47.1	46.7	46.3
2015/04/23	16:44:53	48.7	48.5	46.8	46.1
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2015/04/23	16:46:27	45.6	46.5	45.9	44.7
2015/04/23	16:46:28	46.0	46.0	45.7	45.1
2015/04/23	16:46:29	45.2	46.0	45.5	44.9
2015/04/23	16:46:30	47.3	46.9	45.4	45.1
2015/04/23	16:46:31	48.0	47.7	46.6	46.1
2015/04/23	16:46:32	46.5	47.4	46.4	44.9
2015/04/23	16:46:33	47.8	47.8	46.6	45.3
2015/04/23	16:46:34	46.5	47.7	46.8	45.6
2015/04/23	16:46:35	46.3	47.5	46.4	44.9
2015/04/23	16:46:36	46.1	46.4	46.0	44.8
2015/04/23	16:46:37	46.2	46.4	46.2	45.8
2015/04/23	16:46:38	46.5	46.5	46.2	45.9
2015/04/23	16:46:39	46.4	46.5	46.3	46.0
2015/04/23	16:46:40	45.4	46.3	45.5	44.3
2015/04/23	16:46:41	44.3	45.8	44.9	44.1
2015/04/23	16:46:42	45.8	45.9	44.5	43.6
2015/04/23	16:46:43	46.1	46.4	45.9	45.3
2015/04/23	16:46:44	44.8	45.9	45.2	44.4
2015/04/23	16:46:45	44.7	45.2	45.0	44.4
2015/04/23	16:46:46	45.2	45.3	44.8	44.3
2015/04/23	16:46:47	45.3	45.3	45.1	45.0
2015/04/23	16:46:48	45.4	45.4	45.1	45.0
2015/04/23	16:46:49	46.5	46.1	45.3	45.3
2015/04/23	16:46:50	47.8	47.3	46.1	46.5
2015/04/23	16:46:51	46.5	47.3	46.7	46.1
2015/04/23	16:46:52	48.0	47.8	46.6	46.1
2015/04/23	16:46:53	47.1	47.9	47.2	46.1
2015/04/23	16:46:54	47.0	47.3	47.0	46.5
2015/04/23	16:46:55	45.4	47.1	46.0	44.9
2015/04/23	16:46:56	46.2	46.4	45.8	44.8
2015/04/23	16:46:57	48.0	47.5	46.0	45.7
2015/04/23	16:46:58	48.9	48.5	47.4	47.5
2015/04/23	16:46:59	48.7	48.8	48.2	47.9
2015/04/23	16:47:00	48.8	49.1	48.7	47.9
2015/04/23	16:47:01	47.0	48.6	47.7	46.2
2015/04/23	16:47:02	46.8	47.8	47.1	45.4
2015/04/23	16:47:03	45.8	47.1	46.3	45.2
2015/04/23	16:47:04	45.7	46.3	45.5	44.1
2015/04/23	16:47:05	46.6	46.6	46.1	45.8
2015/04/23	16:47:06	46.0	46.3	45.9	44.9
2015/04/23	16:47:07	45.3	46.3	45.4	43.9
2015/04/23	16:47:08	43.5	45.8	44.4	42.7
2015/04/23	16:47:09	42.7	44.4	43.4	42.2
2015/04/23	16:47:10	42.6	43.3	42.8	42.0
2015/04/23	16:47:11	42.8	43.0	42.7	42.0
2015/04/23	16:47:12	42.1	42.8	42.3	41.9

2015/04/23	16:47:13	42.1	42.3	42.2	41.9
2015/04/23	16:47:14	42.3	42.3	42.2	42.0
2015/04/23	16:47:15	42.8	42.7	42.3	42.4
2015/04/23	16:47:16	42.8	42.8	42.5	42.3
2015/04/23	16:47:17	44.0	43.6	42.8	43.4
2015/04/23	16:47:18	43.6	43.7	43.6	43.4
2015/04/23	16:47:19	43.1	43.6	43.3	42.7
2015/04/23	16:47:20	42.7	43.3	42.9	42.2
2015/04/23	16:47:21	42.5	42.9	42.6	42.3
2015/04/23	16:47:22	42.3	42.6	42.4	42.1
2015/04/23	16:47:23	42.6	42.6	42.5	42.4
2015/04/23	16:47:24	42.3	42.5	42.4	42.1
2015/04/23	16:47:25	42.3	42.4	42.2	41.7
2015/04/23	16:47:26	42.4	42.4	42.3	42.1
2015/04/23	16:47:27	41.8	42.4	42.0	41.5
2015/04/23	16:47:28	42.0	42.1	41.8	41.4
2015/04/23	16:47:29	42.7	42.7	42.1	41.8
2015/04/23	16:47:30	41.7	42.3	41.9	41.5
2015/04/23	16:47:31	42.1	42.1	41.8	41.6
2015/04/23	16:47:32	42.2	42.2	42.1	42.0
2015/04/23	16:47:33	42.7	42.6	42.2	42.2
2015/04/23	16:47:34	43.4	43.3	42.5	42.1
2015/04/23	16:47:35	43.6	43.7	43.3	42.8
2015/04/23	16:47:36	42.7	43.4	42.9	42.3
2015/04/23	16:47:37	43.2	43.2	43.0	42.8
2015/04/23	16:47:38	43.7	43.7	42.9	42.6
2015/04/23	16:47:39	43.5	43.8	43.5	43.1
2015/04/23	16:47:40	43.3	43.6	43.3	43.1
2015/04/23	16:47:41	42.6	43.3	42.9	42.3
2015/04/23	16:47:42	43.7	43.5	42.8	42.6
2015/04/23	16:47:43	44.4	44.1	43.4	43.8
2015/04/23	16:47:44	45.8	45.4	44.1	44.8
2015/04/23	16:47:45	48.7	48.0	45.4	46.7
2015/04/23	16:47:46	51.5	50.7	48.0	50.1
2015/04/23	16:47:47	53.4	53.1	50.8	49.4
2015/04/23	16:47:48	47.7	52.1	49.8	46.3
2015/04/23	16:47:49	47.9	49.8	48.8	47.1
2015/04/23	16:47:50	50.5	50.1	48.8	49.1
2015/04/23	16:47:51	53.9	53.3	50.1	51.2
2015/04/23	16:47:52	57.2	56.1	53.3	56.4
2015/04/23	16:47:53	60.1	59.1	56.2	58.9
2015/04/23	16:47:54	60.4	60.2	59.0	58.7
2015/04/23	16:47:55	61.4	61.0	60.2	60.9
2015/04/23	16:47:56	59.7	61.5	59.8	55.2
2015/04/23	16:47:57	50.7	59.7	56.3	50.3
2015/04/23	16:47:58	51.3	56.3	53.8	50.2
2015/04/23	16:47:59	50.0	53.8	51.7	49.0

2015/04/23	16:48:00	49.1	51.7	50.3	48.5
2015/04/23	16:48:01	52.6	52.0	50.3	49.4
2015/04/23	16:48:02	50.2	51.8	50.8	48.8
2015/04/23	16:48:03	47.7	51.1	49.1	46.5
2015/04/23	16:48:04	48.6	49.1	48.5	46.7
2015/04/23	16:48:05	50.3	50.0	49.0	49.1
2015/04/23	16:48:06	50.1	50.0	49.7	49.3
2015/04/23	16:48:07	57.5	56.4	50.0	52.2
2015/04/23	16:48:08	56.3	56.9	56.0	54.1
2015/04/23	16:48:09	52.6	56.0	54.1	51.8
2015/04/23	16:48:10	51.4	54.1	52.6	50.6
2015/04/23	16:48:11	51.4	52.5	51.9	50.8
2015/04/23	16:48:12	51.2	52.1	51.3	49.8
2015/04/23	16:48:13	51.0	51.3	50.8	49.3
2015/04/23	16:48:14	51.6	51.9	51.2	49.5
2015/04/23	16:48:15	48.6	51.2	49.7	47.6
2015/04/23	16:48:16	47.2	49.7	48.3	46.6
2015/04/23	16:48:17	48.5	48.9	48.4	47.3
2015/04/23	16:48:18	49.8	49.6	48.2	47.7
2015/04/23	16:48:19	49.3	49.6	49.3	48.8
2015/04/23	16:48:20	48.8	49.4	49.0	48.4
2015/04/23	16:48:21	49.4	49.4	49.0	48.8
2015/04/23	16:48:22	48.9	49.4	49.0	48.5
2015/04/23	16:48:23	49.2	49.3	49.0	48.7
2015/04/23	16:48:24	50.1	49.8	49.1	48.9
2015/04/23	16:48:25	49.2	49.9	49.4	48.6
2015/04/23	16:48:26	49.5	49.6	49.3	48.7
2015/04/23	16:48:27	51.5	51.0	49.5	49.9
2015/04/23	16:48:28	49.8	50.8	50.1	48.8
2015/04/23	16:48:29	51.8	51.3	50.0	49.6
2015/04/23	16:48:30	47.1	51.1	49.1	46.7
2015/04/23	16:48:31	47.3	49.1	47.9	45.8
2015/04/23	16:48:32	48.1	48.3	47.7	47.1
2015/04/23	16:48:33	47.9	48.1	47.9	47.4
2015/04/23	16:48:34	47.3	48.0	47.4	45.9
2015/04/23	16:48:35	45.1	47.4	46.1	44.4
2015/04/23	16:48:36	44.6	46.0	45.2	44.4
2015/04/23	16:48:37	44.5	45.2	44.8	44.2
2015/04/23	16:48:38	46.8	46.4	44.8	44.8
2015/04/23	16:48:39	47.4	47.1	46.5	46.1
2015/04/23	16:48:40	47.3	47.8	46.8	45.3
2015/04/23	16:48:41	50.2	49.5	46.6	44.8
2015/04/23	16:48:42	44.9	49.0	46.9	44.3
2015/04/23	16:48:43	45.7	46.9	46.2	44.2
2015/04/23	16:48:44	44.9	46.4	45.3	43.8
2015/04/23	16:48:45	44.6	45.3	44.7	43.7
2015/04/23	16:48:46	54.0	53.1	45.1	47.3

2015/04/23	16:48:47	59.4	58.1	53.3	55.2
2015/04/23	16:48:48	59.8	59.8	57.6	56.0
2015/04/23	16:48:49	59.8	60.3	58.5	55.6
2015/04/23	16:48:50	51.9	59.3	56.0	46.9
2015/04/23	16:48:51	46.3	55.9	52.4	45.2
2015/04/23	16:48:52	43.6	52.4	49.0	43.3
2015/04/23	16:48:53	43.6	49.0	46.4	43.0
2015/04/23	16:48:54	43.8	46.4	45.0	42.6
2015/04/23	16:48:55	46.3	46.4	44.2	43.0
2015/04/23	16:48:56	47.2	47.5	46.4	44.4
2015/04/23	16:48:57	44.5	46.5	45.3	43.6
2015/04/23	16:48:58	44.4	45.3	44.7	43.8
2015/04/23	16:48:59	47.4	46.7	44.6	44.0
2015/04/23	16:49:00	45.4	46.8	45.8	44.6
2015/04/23	16:49:01	45.2	45.9	45.4	44.3
2015/04/23	16:49:02	45.5	45.6	45.1	44.2
2015/04/23	16:49:03	48.0	47.7	45.5	45.6
2015/04/23	16:49:04	45.7	47.1	46.4	45.0
2015/04/23	16:49:05	49.8	49.2	46.1	45.4
2015/04/23	16:49:06	48.1	48.9	48.0	46.2
2015/04/23	16:49:07	48.9	49.1	48.6	48.4
2015/04/23	16:49:08	48.8	48.9	48.6	47.9
2015/04/23	16:49:09	47.1	48.8	47.7	46.2
2015/04/23	16:49:10	45.2	47.7	46.3	44.8
2015/04/23	16:49:11	46.8	46.8	46.2	45.6
2015/04/23	16:49:12	47.6	47.4	46.5	46.3
2015/04/23	16:49:13	50.6	49.6	47.4	49.5
2015/04/23	16:49:14	48.9	49.5	49.1	48.2
2015/04/23	16:49:15	47.8	49.2	48.3	47.0
2015/04/23	16:49:16	49.3	49.3	47.8	46.7
2015/04/23	16:49:17	46.7	49.0	47.7	46.0
2015/04/23	16:49:18	49.4	49.2	47.8	47.6
2015/04/23	16:49:19	45.5	48.5	47.0	44.9
2015/04/23	16:49:20	48.8	48.4	47.0	46.7
2015/04/23	16:49:21	47.6	48.4	47.7	46.2
2015/04/23	16:49:22	48.2	48.5	47.5	46.6
2015/04/23	16:49:23	47.2	48.0	47.4	45.5
2015/04/23	16:49:24	47.1	47.6	47.2	46.3
2015/04/23	16:49:25	45.8	47.3	46.3	45.1
2015/04/23	16:49:26	45.9	46.6	45.9	44.5
2015/04/23	16:49:27	44.9	46.0	45.0	43.3
2015/04/23	16:49:28	46.3	46.4	45.5	45.1
2015/04/23	16:49:29	46.1	46.5	45.9	44.5
2015/04/23	16:49:30	48.8	48.3	45.6	44.6
2015/04/23	16:49:31	48.0	48.3	47.9	47.3
2015/04/23	16:49:32	47.9	48.2	47.9	47.1
2015/04/23	16:49:33	46.4	47.9	46.9	45.1

2015/04/23	16:49:34	47.0	47.6	46.8	44.9
2015/04/23	16:49:35	47.8	47.8	46.0	43.4
2015/04/23	16:49:36	47.4	48.0	47.3	46.4
2015/04/23	16:49:37	44.9	47.5	46.0	44.4
2015/04/23	16:49:38	45.2	46.0	45.4	43.5
2015/04/23	16:49:39	46.4	46.5	44.8	43.4
2015/04/23	16:49:40	45.4	46.7	45.6	43.8
2015/04/23	16:49:41	47.1	47.0	45.6	45.1
2015/04/23	16:49:42	44.9	46.3	45.4	43.8
2015/04/23	16:49:43	45.3	45.8	44.8	43.1
2015/04/23	16:49:44	43.4	45.5	43.9	42.0
2015/04/23	16:49:45	47.3	46.9	44.5	44.0
2015/04/23	16:49:46	44.2	45.9	45.0	43.4
2015/04/23	16:49:47	45.0	45.1	44.7	43.8
2015/04/23	16:49:48	44.3	45.1	44.6	43.6
2015/04/23	16:49:49	46.7	46.5	44.6	44.2
2015/04/23	16:49:50	45.7	46.5	46.0	45.3
2015/04/23	16:49:51	44.2	46.0	45.0	43.7
2015/04/23	16:49:52	46.7	46.6	44.7	43.8
2015/04/23	16:49:53	45.8	46.5	45.8	44.6
2015/04/23	16:49:54	44.8	46.2	45.2	43.5
2015/04/23	16:49:55	46.1	45.9	45.0	43.6
2015/04/23	16:49:56	44.5	45.9	44.9	43.4
2015/04/23	16:49:57	46.1	45.8	44.9	44.3
2015/04/23	16:49:58	45.0	46.1	45.1	43.7
2015/04/23	16:49:59	43.7	45.2	44.3	42.8
2015/04/23	16:50:00	43.4	44.2	43.5	42.4
2015/04/23	16:50:01	43.4	44.0	43.5	42.6
2015/04/23	16:50:02	43.7	43.8	43.1	42.5
2015/04/23	16:50:03	44.1	44.1	43.7	43.6
2015/04/23	16:50:04	44.3	44.4	43.7	43.3
2015/04/23	16:50:05	44.4	44.6	44.0	43.1
2015/04/23	16:50:06	44.0	44.7	44.1	43.0
2015/04/23	16:50:07	44.3	44.3	43.9	42.8
2015/04/23	16:50:08	46.6	46.1	44.4	44.7
2015/04/23	16:50:09	44.7	45.6	45.0	43.4
2015/04/23	16:50:10	44.4	45.3	44.6	43.9
2015/04/23	16:50:11	45.6	45.4	44.6	44.1
2015/04/23	16:50:12	46.2	46.1	45.4	45.3
2015/04/23	16:50:13	44.8	45.7	45.2	44.3
2015/04/23	16:50:14	44.9	45.2	44.9	44.5
2015/04/23	16:50:15	45.5	45.5	44.8	44.4
2015/04/23	16:50:16	44.9	45.6	45.0	44.4
2015/04/23	16:50:17	46.5	46.1	44.9	44.0
2015/04/23	16:50:18	44.9	46.0	45.2	43.6
2015/04/23	16:50:19	45.1	45.6	45.0	44.0
2015/04/23	16:50:20	44.6	45.2	44.7	44.1

2015/04/23	16:50:21	45.4	45.3	44.7	44.4
2015/04/23	16:50:22	47.3	46.8	45.1	44.8
2015/04/23	16:50:23	50.1	49.6	46.9	46.5
2015/04/23	16:50:24	49.2	50.5	48.9	45.0
2015/04/23	16:50:25	49.5	50.2	48.9	45.7
2015/04/23	16:50:26	48.1	49.3	48.1	45.8
2015/04/23	16:50:27	46.0	48.1	46.8	44.3
2015/04/23	16:50:28	45.5	47.0	46.1	45.0
2015/04/23	16:50:29	45.9	46.3	45.9	45.2
2015/04/23	16:50:30	46.2	46.3	46.0	45.7
2015/04/23	16:50:31	47.4	47.1	46.0	45.9
2015/04/23	16:50:32	46.5	47.1	46.4	44.8
2015/04/23	16:50:33	46.1	46.8	46.2	45.1
2015/04/23	16:50:34	46.0	46.5	45.9	45.1
2015/04/23	16:50:35	47.1	47.1	45.5	44.6
2015/04/23	16:50:36	48.3	48.2	46.8	46.1
2015/04/23	16:50:37	48.2	48.4	47.5	46.3
2015/04/23	16:50:38	48.2	48.5	48.2	47.7
2015/04/23	16:50:39	47.2	48.3	47.5	45.5
2015/04/23	16:50:40	47.1	47.5	47.1	45.1
2015/04/23	16:50:41	48.7	48.5	46.9	46.3
2015/04/23	16:50:42	46.6	48.5	47.3	46.1
2015/04/23	16:50:43	46.3	47.3	46.6	45.0
2015/04/23	16:50:44	47.5	47.4	46.5	45.6
2015/04/23	16:50:45	46.2	47.4	46.6	45.6
2015/04/23	16:50:46	47.7	47.4	46.7	46.7
2015/04/23	16:50:47	48.7	48.4	47.3	47.2
2015/04/23	16:50:48	46.6	48.5	47.3	46.1
2015/04/23	16:50:49	48.9	48.7	47.2	46.6
2015/04/23	16:50:50	48.1	48.5	47.9	46.8
2015/04/23	16:50:51	47.4	48.6	47.6	46.0
2015/04/23	16:50:52	46.2	47.6	46.8	45.8
2015/04/23	16:50:53	47.0	47.0	46.6	46.0
2015/04/23	16:50:54	47.6	47.4	46.9	46.9
2015/04/23	16:50:55	47.7	47.7	47.2	46.7
2015/04/23	16:50:56	49.3	48.7	47.7	48.2
2015/04/23	16:50:57	47.9	48.9	48.0	46.9
2015/04/23	16:50:58	46.9	48.0	47.3	46.0
2015/04/23	16:50:59	46.2	47.3	46.6	45.7
2015/04/23	16:51:00	47.5	47.4	46.3	45.2
2015/04/23	16:51:01	47.1	47.5	46.9	46.1
2015/04/23	16:51:02	46.2	47.4	46.4	44.3
2015/04/23	16:51:03	45.3	46.5	45.7	44.7
2015/04/23	16:51:04	44.6	45.7	45.1	44.2
2015/04/23	16:51:05	45.3	45.3	45.0	44.5
2015/04/23	16:51:06	46.4	46.1	45.2	45.4
2015/04/23	16:51:07	46.9	46.6	46.1	46.1

2015/04/23	16:51:08	46.7	46.9	46.6	46.1
2015/04/23	16:51:09	46.6	47.1	46.4	45.2
2015/04/23	16:51:10	46.1	46.4	46.2	44.8
2015/04/23	16:51:11	46.4	46.7	46.2	45.4
2015/04/23	16:51:12	45.5	46.3	45.7	44.7
2015/04/23	16:51:13	45.3	45.7	45.3	44.7
2015/04/23	16:51:14	45.5	45.7	45.4	44.9
2015/04/23	16:51:15	46.0	45.9	45.5	45.6
2015/04/23	16:51:16	45.3	45.8	45.4	44.8
2015/04/23	16:51:17	45.8	45.8	45.3	44.6
2015/04/23	16:51:18	44.9	45.9	45.2	44.5
2015/04/23	16:51:19	44.3	45.2	44.7	44.1
2015/04/23	16:51:20	45.2	45.1	44.6	44.2
2015/04/23	16:51:21	45.9	46.0	45.0	44.4
2015/04/23	16:51:22	44.9	45.5	45.1	44.4
2015/04/23	16:51:23	44.7	45.1	44.5	43.7
2015/04/23	16:51:24	44.5	45.0	44.6	44.0
2015/04/23	16:51:25	45.2	45.2	44.9	44.5
2015/04/23	16:51:26	45.3	45.2	45.0	44.9
2015/04/23	16:51:27	46.4	46.0	45.2	45.3
2015/04/23	16:51:28	46.0	46.3	45.9	45.3
2015/04/23	16:51:29	46.1	46.2	45.7	45.1
2015/04/23	16:51:30	49.0	48.3	46.3	46.8
2015/04/23	16:51:31	46.4	47.7	46.9	46.2
2015/04/23	16:51:32	46.3	46.9	46.5	45.7
2015/04/23	16:51:33	44.9	46.7	45.6	44.5
2015/04/23	16:51:34	45.4	45.7	45.4	44.7
2015/04/23	16:51:35	48.8	47.8	45.4	47.8
2015/04/23	16:51:36	48.8	48.7	47.6	47.3
2015/04/23	16:51:37	48.8	48.8	48.5	48.1
2015/04/23	16:51:38	48.2	49.2	48.2	46.7
2015/04/23	16:51:39	46.1	48.2	47.0	45.7
2015/04/23	16:51:40	46.7	47.1	46.6	45.9
2015/04/23	16:51:41	46.3	46.9	46.5	45.5
2015/04/23	16:51:42	45.9	46.5	46.1	45.6
2015/04/23	16:51:43	46.1	46.1	46.0	45.7
2015/04/23	16:51:44	45.9	46.2	45.6	44.9
2015/04/23	16:51:45	46.9	46.7	46.0	46.2
2015/04/23	16:51:46	45.9	46.5	46.1	45.5
2015/04/23	16:51:47	47.2	47.2	46.1	45.2
2015/04/23	16:51:48	47.6	47.7	46.5	45.9
2015/04/23	16:51:49	46.4	47.1	46.6	45.6
2015/04/23	16:51:50	47.2	47.0	46.6	46.5
2015/04/23	16:51:51	46.6	47.0	46.6	46.0
2015/04/23	16:51:52	46.3	47.2	46.3	44.6
2015/04/23	16:51:53	46.5	46.7	46.3	45.8
2015/04/23	16:51:54	45.7	46.3	45.8	44.9

2015/04/23	16:51:55	44.8	46.0	45.2	44.0
2015/04/23	16:51:56	45.6	45.7	45.3	44.7
2015/04/23	16:51:57	48.1	47.6	45.5	45.5
2015/04/23	16:51:58	47.2	47.8	47.2	46.4
2015/04/23	16:51:59	47.9	47.8	47.0	46.3
2015/04/23	16:52:00	47.5	47.8	47.4	46.7
2015/04/23	16:52:01	46.9	47.8	47.2	46.6
2015/04/23	16:52:02	47.6	47.6	47.1	46.9
2015/04/23	16:52:03	47.1	47.5	47.1	46.4
2015/04/23	16:52:04	46.9	47.4	47.0	46.4
2015/04/23	16:52:05	46.1	47.1	46.3	45.1
2015/04/23	16:52:06	48.0	47.6	46.4	46.2
2015/04/23	16:52:07	48.2	48.1	47.6	47.7
2015/04/23	16:52:08	46.8	48.0	47.2	46.3
2015/04/23	16:52:09	49.0	48.7	47.3	47.5
2015/04/23	16:52:10	48.3	48.6	48.1	47.1
2015/04/23	16:52:11	46.2	48.1	47.1	45.7
2015/04/23	16:52:12	49.5	49.1	46.9	46.5
2015/04/23	16:52:13	46.3	49.1	47.5	45.9
2015/04/23	16:52:14	45.0	47.5	46.1	44.7
2015/04/23	16:52:15	45.4	46.1	45.7	44.8
2015/04/23	16:52:16	46.2	46.2	45.4	44.7
2015/04/23	16:52:17	45.1	46.0	45.4	44.6
2015/04/23	16:52:18	46.3	46.2	45.5	45.4
2015/04/23	16:52:19	44.8	45.9	45.2	44.3
2015/04/23	16:52:20	44.9	45.4	44.9	44.1
2015/04/23	16:52:21	45.8	45.6	44.9	44.6
2015/04/23	16:52:22	45.2	45.8	45.3	44.5
2015/04/23	16:52:23	45.6	45.6	45.3	45.3
2015/04/23	16:52:24	45.4	45.7	45.3	44.9
2015/04/23	16:52:25	44.7	45.3	45.0	44.3
2015/04/23	16:52:26	44.2	45.0	44.5	43.8
2015/04/23	16:52:27	44.1	44.5	44.3	44.0
2015/04/23	16:52:28	44.1	44.5	44.1	43.4
2015/04/23	16:52:29	43.9	44.1	43.9	43.3
2015/04/23	16:52:30	44.5	44.3	43.9	43.7
2015/04/23	16:52:31	43.8	44.3	43.9	43.4
2015/04/23	16:52:32	44.2	44.4	44.0	43.4
2015/04/23	16:52:33	43.3	44.0	43.6	42.9
2015/04/23	16:52:34	43.9	43.9	43.4	43.1
2015/04/23	16:52:35	44.7	44.6	43.9	43.9
2015/04/23	16:52:36	45.6	45.2	44.5	44.7
2015/04/23	16:52:37	46.6	46.2	45.2	45.6
2015/04/23	16:52:38	45.4	46.2	45.7	45.1
2015/04/23	16:52:39	46.5	46.5	45.7	45.2
2015/04/23	16:52:40	45.0	46.0	45.4	44.3
2015/04/23	16:52:41	46.7	46.5	45.4	45.0

2015/04/23	16:52:42	47.0	47.1	46.5	45.3
2015/04/23	16:52:43	47.9	47.7	46.4	45.9
2015/04/23	16:52:44	46.7	47.7	46.9	45.4
2015/04/23	16:52:45	44.4	46.9	45.5	44.1
2015/04/23	16:52:46	45.2	45.6	45.2	44.1
2015/04/23	16:52:47	46.4	46.2	45.2	45.0
2015/04/23	16:52:48	46.0	46.3	45.6	44.8
2015/04/23	16:52:49	45.4	46.2	45.7	45.1
2015/04/23	16:52:50	44.6	45.7	45.1	44.3
2015/04/23	16:52:51	46.4	46.1	45.1	45.1
2015/04/23	16:52:52	45.9	46.1	45.8	45.4
2015/04/23	16:52:53	45.7	45.9	45.6	45.0
2015/04/23	16:52:54	46.1	46.1	45.8	45.6
2015/04/23	16:52:55	47.6	47.2	46.0	45.8
2015/04/23	16:52:56	48.3	48.3	47.0	46.7
2015/04/23	16:52:57	47.5	48.1	47.5	46.9
2015/04/23	16:52:58	46.8	47.5	47.0	46.2
2015/04/23	16:52:59	46.8	47.1	46.8	46.1
2015/04/23	16:53:00	47.3	47.3	46.5	45.9
2015/04/23	16:53:01	46.4	47.3	46.7	45.9
2015/04/23	16:53:02	48.2	48.0	46.8	46.8
2015/04/23	16:53:03	47.9	48.0	47.7	47.2
2015/04/23	16:53:04	47.9	48.3	47.9	47.5
2015/04/23	16:53:05	46.9	47.9	47.3	46.6
2015/04/23	16:53:06	49.0	48.5	47.3	47.7
2015/04/23	16:53:07	48.3	48.6	48.2	47.8
2015/04/23	16:53:08	49.6	49.5	48.5	48.0
2015/04/23	16:53:09	49.0	49.2	48.9	48.1
2015/04/23	16:53:10	49.6	49.5	48.7	47.9
2015/04/23	16:53:11	49.7	50.4	49.4	47.9
2015/04/23	16:53:12	48.1	49.3	48.6	47.5
2015/04/23	16:53:13	49.2	49.0	48.6	47.9
2015/04/23	16:53:14	50.4	49.9	49.0	49.5
2015/04/23	16:53:15	51.5	51.1	49.8	50.1
2015/04/23	16:53:16	50.4	51.1	50.5	49.6
2015/04/23	16:53:17	50.6	50.8	50.4	50.0
2015/04/23	16:53:18	50.3	50.7	50.4	49.7
2015/04/23	16:53:19	50.0	50.5	50.1	49.4
2015/04/23	16:53:20	48.6	50.2	49.2	48.3
2015/04/23	16:53:21	49.1	49.4	49.1	48.3
2015/04/23	16:53:22	48.6	49.1	48.8	48.2
2015/04/23	16:53:23	47.3	48.8	47.9	46.8
2015/04/23	16:53:24	47.2	47.9	47.3	46.5
2015/04/23	16:53:25	48.1	48.1	47.3	46.7
2015/04/23	16:53:26	46.4	48.0	46.9	45.5
2015/04/23	16:53:27	45.8	46.9	46.3	45.2
2015/04/23	16:53:28	46.3	46.3	46.1	45.6

2015/04/23	16:53:29	45.8	46.3	45.9	45.4
2015/04/23	16:53:30	46.3	46.3	45.8	45.4
2015/04/23	16:53:31	46.9	46.7	46.3	46.6
2015/04/23	16:53:32	48.9	48.4	46.7	47.4
2015/04/23	16:53:33	50.3	49.6	48.4	49.5
2015/04/23	16:53:34	50.5	50.2	49.6	50.0
2015/04/23	16:53:35	49.9	50.2	49.8	49.1
2015/04/23	16:53:36	52.1	51.4	50.1	51.6
2015/04/23	16:53:37	51.5	51.5	51.3	50.8
2015/04/23	16:53:38	51.3	51.5	51.2	50.3
2015/04/23	16:53:39	51.1	51.6	51.0	49.2
2015/04/23	16:53:40	50.6	51.0	50.7	49.7
2015/04/23	16:53:41	49.5	50.8	50.0	48.9
2015/04/23	16:53:42	49.9	50.2	49.8	49.4
2015/04/23	16:53:43	48.4	49.8	48.8	47.1
2015/04/23	16:53:44	49.2	49.2	48.5	46.8
2015/04/23	16:53:45	50.2	50.0	49.2	49.3
2015/04/23	16:53:46	48.8	49.7	49.1	48.2
2015/04/23	16:53:47	47.8	49.2	48.3	47.2
2015/04/23	16:53:48	48.5	48.8	47.9	46.9
2015/04/23	16:53:49	47.7	48.6	48.0	46.9
2015/04/23	16:53:50	48.2	48.5	47.5	46.1
2015/04/23	16:53:51	46.1	48.1	46.9	45.5
2015/04/23	16:53:52	46.8	47.2	46.4	45.4
2015/04/23	16:53:53	48.2	48.3	46.5	45.2
2015/04/23	16:53:54	47.7	48.1	46.7	44.2
2015/04/23	16:53:55	47.6	48.1	47.3	45.9
2015/04/23	16:53:56	47.8	48.2	46.9	44.6
2015/04/23	16:53:57	47.8	48.6	47.8	45.9
2015/04/23	16:53:58	45.3	47.8	46.5	44.1
2015/04/23	16:53:59	49.0	48.6	46.3	44.8
2015/04/23	16:54:00	46.7	48.1	47.3	45.5
2015/04/23	16:54:01	47.1	47.5	46.6	45.3
2015/04/23	16:54:02	44.5	47.3	45.8	44.5
2015/04/23	16:54:03	46.7	46.7	45.5	44.8
2015/04/23	16:54:04	45.5	46.5	45.6	44.2
2015/04/23	16:54:05	45.8	46.4	45.7	44.8
2015/04/23	16:54:06	45.0	45.8	45.3	44.3
2015/04/23	16:54:07	46.4	46.2	45.3	45.1
2015/04/23	16:54:08	44.7	45.8	45.1	44.3
2015/04/23	16:54:09	45.0	45.3	44.9	44.3
2015/04/23	16:54:10	44.7	45.1	44.7	44.0
2015/04/23	16:54:11	44.9	45.6	44.7	43.6
2015/04/23	16:54:12	45.5	45.4	44.6	44.1
2015/04/23	16:54:13	45.1	45.4	45.0	44.4
2015/04/23	16:54:14	44.8	45.0	44.6	44.0
2015/04/23	16:54:15	44.2	45.1	44.5	43.7

2015/04/23	16:54:16	44.9	45.0	44.2	43.4
2015/04/23	16:54:17	44.6	45.2	44.6	43.9
2015/04/23	16:54:18	43.5	44.6	44.0	43.2
2015/04/23	16:54:19	44.5	44.4	43.8	43.2
2015/04/23	16:54:20	43.7	44.3	43.9	43.4
2015/04/23	16:54:21	43.6	43.9	43.7	43.1
2015/04/23	16:54:22	43.7	43.8	43.6	43.4
2015/04/23	16:54:23	44.2	44.3	43.6	43.2
2015/04/23	16:54:24	44.3	44.3	44.1	43.7
2015/04/23	16:54:25	45.2	45.0	44.2	44.1
2015/04/23	16:54:26	47.1	46.5	44.9	46.0
2015/04/23	16:54:27	46.7	46.7	46.4	45.9
2015/04/23	16:54:28	45.8	46.6	46.0	45.3
2015/04/23	16:54:29	44.8	46.1	45.3	44.2
2015/04/23	16:54:30	44.1	45.2	44.5	43.6
2015/04/23	16:54:31	44.2	44.6	44.3	43.6
2015/04/23	16:54:32	43.7	44.3	43.9	43.4
2015/04/23	16:54:33	43.6	43.9	43.6	43.1
2015/04/23	16:54:34	45.1	44.6	43.8	44.0
2015/04/23	16:54:35	44.1	44.6	44.2	43.8
2015/04/23	16:54:36	44.5	44.5	44.2	43.9
2015/04/23	16:54:37	44.8	44.6	44.3	43.8
2015/04/23	16:54:38	45.6	45.3	44.6	44.9
2015/04/23	16:54:39	45.5	45.5	45.3	44.9
2015/04/23	16:54:40	44.9	45.4	45.0	44.5
2015/04/23	16:54:41	44.3	45.1	44.6	44.0
2015/04/23	16:54:42	44.7	44.8	44.4	44.2
2015/04/23	16:54:43	45.6	45.3	44.8	45.0
2015/04/23	16:54:44	45.1	45.3	45.1	44.8
2015/04/23	16:54:45	44.6	45.2	44.8	44.4
2015/04/23	16:54:46	45.5	45.3	44.8	44.9
2015/04/23	16:54:47	45.8	45.6	45.4	45.4
2015/04/23	16:54:48	47.2	46.8	45.6	45.7
2015/04/23	16:54:49	48.4	47.9	46.8	48.0
2015/04/23	16:54:50	47.7	48.0	47.8	47.4
2015/04/23	16:54:51	48.0	48.1	47.6	47.2
2015/04/23	16:54:52	47.6	47.9	47.7	47.2
2015/04/23	16:54:53	46.0	47.7	46.7	45.7
2015/04/23	16:54:54	44.8	46.7	45.7	44.5
2015/04/23	16:54:55	46.7	46.7	45.5	45.1
2015/04/23	16:54:56	47.0	47.4	46.6	45.5
2015/04/23	16:54:57	45.4	46.6	45.9	44.9
2015/04/23	16:54:58	45.2	45.8	45.5	44.8
2015/04/23	16:54:59	46.1	45.9	45.4	44.7
2015/04/23	16:55:00	46.1	46.1	45.9	45.9
2015/04/23	16:55:01	46.3	46.3	45.9	45.4
2015/04/23	16:55:02	45.5	46.3	45.7	44.8

2015/04/23	16:55:03	44.7	45.7	45.1	44.1
2015/04/23	16:55:04	45.2	45.9	44.9	43.9
2015/04/23	16:55:05	43.5	44.9	44.1	42.9
2015/04/23	16:55:06	43.3	44.2	43.6	42.6
2015/04/23	16:55:07	43.4	43.8	43.4	42.9
2015/04/23	16:55:08	44.0	43.9	43.4	43.0
2015/04/23	16:55:09	45.0	44.7	43.7	44.2
2015/04/23	16:55:10	45.6	45.3	44.5	44.5
2015/04/23	16:55:11	43.5	45.3	44.2	42.9
2015/04/23	16:55:12	47.3	46.6	44.0	43.1
2015/04/23	16:55:13	44.8	46.5	45.4	43.3
2015/04/23	16:55:14	43.0	45.5	44.1	42.4
2015/04/23	16:55:15	44.5	44.5	44.0	43.2
2015/04/23	16:55:16	44.9	45.0	44.1	43.4
2015/04/23	16:55:17	44.3	44.7	44.3	43.9
2015/04/23	16:55:18	45.8	45.7	44.5	44.7
2015/04/23	16:55:19	44.0	45.3	44.5	43.1
2015/04/23	16:55:20	43.6	44.6	44.0	43.4
2015/04/23	16:55:21	45.3	45.1	44.1	43.9
2015/04/23	16:55:22	43.6	44.7	44.0	42.8
2015/04/23	16:55:23	43.6	44.0	43.6	43.1
2015/04/23	16:55:24	44.2	44.2	43.7	43.4
2015/04/23	16:55:25	45.3	44.9	44.2	45.0
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2015/04/23	16:55:27	43.9	44.5	44.1	43.5
2015/04/23	16:55:28	44.8	44.6	44.1	43.9
2015/04/23	16:55:29	44.1	44.8	44.1	43.2
2015/04/23	16:55:30	44.0	44.2	43.9	43.3
2015/04/23	16:55:31	45.7	45.2	44.1	44.5
2015/04/23	16:55:32	44.8	45.4	44.9	44.1
2015/04/23	16:55:33	44.7	44.9	44.7	44.3
2015/04/23	16:55:34	44.7	44.8	44.6	44.3
2015/04/23	16:55:35	45.0	45.0	44.7	44.5
2015/04/23	16:55:36	45.6	45.4	45.0	45.4
2015/04/23	16:55:37	45.2	45.5	45.2	44.8
2015/04/23	16:55:38	45.0	45.4	45.0	44.5
2015/04/23	16:55:39	47.0	46.6	45.0	44.7
2015/04/23	16:55:40	46.9	47.0	46.3	45.6
2015/04/23	16:55:41	47.2	47.4	46.6	45.8
2015/04/23	16:55:42	44.7	46.9	45.7	44.3
2015/04/23	16:55:43	50.9	50.5	45.2	44.1
2015/04/23	16:55:44	47.4	50.7	48.5	44.9
2015/04/23	16:55:45	45.0	48.4	46.7	44.3
2015/04/23	16:55:46	44.7	46.7	45.5	44.0
2015/04/23	16:55:47	44.2	45.4	44.7	43.8
2015/04/23	16:55:48	43.8	44.7	44.1	43.3
2015/04/23	16:55:49	47.3	46.4	44.2	45.8

2015/04/23	16:55:50	44.6	46.3	45.4	43.8
2015/04/23	16:55:51	45.4	45.9	45.2	44.2
2015/04/23	16:55:52	43.7	45.2	44.3	43.3
2015/04/23	16:55:53	44.2	44.4	43.9	43.2
2015/04/23	16:55:54	44.6	44.6	44.3	44.1
2015/04/23	16:55:55	44.8	44.8	44.3	44.0
2015/04/23	16:55:56	44.8	45.4	44.5	43.6
2015/04/23	16:55:57	44.2	44.5	44.0	42.9
2015/04/23	16:55:58	44.3	44.5	44.3	43.9
2015/04/23	16:55:59	44.4	44.5	44.2	43.8
2015/04/23	16:56:00	44.3	44.5	44.3	43.9
2015/04/23	16:56:01	44.0	44.3	44.2	43.7
2015/04/23	16:56:02	44.1	44.2	44.1	43.7
2015/04/23	16:56:03	44.7	44.5	44.1	44.2
2015/04/23	16:56:04	44.9	44.7	44.5	44.3
2015/04/23	16:56:05	44.8	45.0	44.7	44.2
2015/04/23	16:56:06	44.3	44.8	44.4	43.6
2015/04/23	16:56:07	43.7	44.4	43.9	43.1
2015/04/23	16:56:08	43.8	43.9	43.7	43.2
2015/04/23	16:56:09	44.2	44.1	43.8	43.6
2015/04/23	16:56:10	46.3	45.9	44.1	44.3
2015/04/23	16:56:11	44.7	45.6	45.0	44.2
2015/04/23	16:56:12	46.5	46.0	45.0	45.2
2015/04/23	16:56:13	44.6	45.9	45.1	44.0
2015/04/23	16:56:14	43.4	45.1	44.1	42.9
2015/04/23	16:56:15	43.5	44.1	43.7	43.2
2015/04/23	16:56:16	44.6	44.4	43.7	43.7
2015/04/23	16:56:17	44.4	44.5	44.0	43.6
2015/04/23	16:56:18	45.4	45.3	44.4	44.5
2015/04/23	16:56:19	43.4	45.1	44.0	42.9
2015/04/23	16:56:20	43.3	44.0	43.5	42.5
2015/04/23	16:56:21	44.4	44.5	43.7	42.6
2015/04/23	16:56:22	43.3	44.0	43.4	42.6
2015/04/23	16:56:23	43.6	43.7	43.5	43.1
2015/04/23	16:56:24	45.2	44.9	43.4	43.3
2015/04/23	16:56:25	46.8	46.2	44.9	45.9
2015/04/23	16:56:26	47.7	47.4	45.9	45.6
2015/04/23	16:56:27	46.2	47.3	46.5	44.7
2015/04/23	16:56:28	43.5	46.5	44.9	43.1
2015/04/23	16:56:29	44.0	44.9	44.2	43.1
2015/04/23	16:56:30	44.1	44.5	44.1	43.7
2015/04/23	16:56:31	45.1	44.9	44.2	44.2
2015/04/23	16:56:32	44.0	44.9	44.3	43.7
2015/04/23	16:56:33	44.5	44.5	44.2	43.8
2015/04/23	16:56:34	44.4	44.5	44.4	44.1
2015/04/23	16:56:35	44.4	44.5	44.3	44.1
2015/04/23	16:56:36	44.5	44.6	44.4	44.0

2015/04/23	16:56:37	44.3	44.5	44.3	43.8
2015/04/23	16:56:38	44.5	44.5	44.1	43.6
2015/04/23	16:56:39	45.1	45.0	44.5	44.6
2015/04/23	16:56:40	46.7	46.3	45.0	46.0
2015/04/23	16:56:41	47.3	47.0	46.3	46.9
2015/04/23	16:56:42	46.4	47.0	46.5	45.9
2015/04/23	16:56:43	45.1	46.5	45.7	44.7
2015/04/23	16:56:44	45.1	45.7	45.3	44.5
2015/04/23	16:56:45	44.2	45.3	44.6	43.9
2015/04/23	16:56:46	44.8	44.8	44.6	44.4
2015/04/23	16:56:47	45.0	44.9	44.7	44.6
2015/04/23	16:56:48	45.1	45.1	44.9	44.7
2015/04/23	16:56:49	45.7	45.4	45.0	45.4
2015/04/23	16:56:50	46.2	46.0	45.4	45.7
2015/04/23	16:56:51	46.6	46.4	46.0	46.4
2015/04/23	16:56:52	47.0	46.8	46.4	46.5
2015/04/23	16:56:53	49.1	48.4	46.8	47.9
2015/04/23	16:56:54	49.3	49.0	48.4	48.6
2015/04/23	16:56:55	49.3	49.3	48.8	48.5
2015/04/23	16:56:56	49.2	49.4	49.0	48.5
2015/04/23	16:56:57	48.4	49.0	48.7	48.0
2015/04/23	16:56:58	48.5	49.0	48.4	47.3
2015/04/23	16:56:59	47.6	48.4	47.8	46.9
2015/04/23	16:57:00	48.5	48.3	47.9	48.2
2015/04/23	16:57:01	48.5	48.5	48.2	47.9
2015/04/23	16:57:02	46.6	48.3	47.3	46.0
2015/04/23	16:57:03	48.6	48.2	47.3	47.5
2015/04/23	16:57:04	46.3	48.0	46.9	45.6
2015/04/23	16:57:05	45.9	46.9	46.3	45.2
2015/04/23	16:57:06	45.9	46.3	46.0	45.2
2015/04/23	16:57:07	46.3	46.4	46.2	45.8
2015/04/23	16:57:08	46.3	46.3	46.1	45.9
2015/04/23	16:57:09	47.1	46.9	46.3	46.4
2015/04/23	16:57:10	49.9	49.0	47.0	48.6
2015/04/23	16:57:11	49.1	49.1	48.8	48.3
2015/04/23	16:57:12	47.8	49.1	48.3	47.1
2015/04/23	16:57:13	49.4	49.2	48.2	48.0
2015/04/23	16:57:14	47.4	49.2	48.1	46.6
2015/04/23	16:57:15	47.1	48.1	47.5	46.4
2015/04/23	16:57:16	46.9	47.6	47.0	46.2
2015/04/23	16:57:17	46.4	47.0	46.5	45.5
2015/04/23	16:57:18	47.0	47.0	46.5	46.2
2015/04/23	16:57:19	47.6	47.5	46.9	46.9
2015/04/23	16:57:20	48.0	47.9	47.3	47.0
2015/04/23	16:57:21	47.2	47.9	47.3	46.3
2015/04/23	16:57:22	47.2	47.6	47.1	46.4
2015/04/23	16:57:23	47.6	47.6	47.1	46.6

2015/04/23	16:57:24	47.3	47.7	47.1	46.4
2015/04/23	16:57:25	48.0	47.9	47.1	46.6
2015/04/23	16:57:26	48.3	48.3	47.9	47.9
2015/04/23	16:57:27	46.9	48.1	47.3	46.3
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2015/04/23	16:57:29	45.7	46.5	46.0	45.3
2015/04/23	16:57:30	46.9	46.7	46.1	46.0
2015/04/23	16:57:31	46.3	46.7	46.4	45.9
2015/04/23	16:57:32	46.0	46.5	46.1	45.6
2015/04/23	16:57:33	45.4	46.2	45.7	45.1
2015/04/23	16:57:34	46.3	46.2	45.8	45.8
2015/04/23	16:57:35	46.4	46.4	46.1	46.1
2015/04/23	16:57:36	45.7	46.3	45.9	45.2
2015/04/23	16:57:37	45.7	45.9	45.7	45.3
2015/04/23	16:57:38	46.5	46.3	45.8	46.1
2015/04/23	16:57:39	46.8	46.7	46.2	46.2
2015/04/23	16:57:40	45.9	46.6	46.1	45.2
2015/04/23	16:57:41	45.0	46.1	45.4	44.7
2015/04/23	16:57:42	46.3	46.2	45.4	45.0
2015/04/23	16:57:43	46.2	46.2	45.8	45.1
2015/04/23	16:57:44	47.3	46.9	46.2	46.8
2015/04/23	16:57:45	46.3	46.9	46.4	45.5
2015/04/23	16:57:46	44.6	46.4	45.4	44.3
2015/04/23	16:57:47	44.6	45.3	44.8	44.2
2015/04/23	16:57:48	44.9	45.2	44.9	44.5
2015/04/23	16:57:49	45.1	45.1	44.8	44.6
2015/04/23	16:57:50	44.8	45.0	44.8	44.4
2015/04/23	16:57:51	45.6	45.4	44.9	45.0
2015/04/23	16:57:52	45.5	45.5	45.2	45.1
2015/04/23	16:57:53	45.6	45.6	45.4	45.1
2015/04/23	16:57:54	46.0	45.9	45.6	45.7
2015/04/23	16:57:55	45.9	46.2	45.8	44.9
2015/04/23	16:57:56	46.6	46.5	45.7	45.5
2015/04/23	16:57:57	47.7	47.3	46.0	45.3
2015/04/23	16:57:58	47.3	47.7	47.0	45.6
2015/04/23	16:57:59	46.2	47.2	46.6	45.4
2015/04/23	16:58:00	48.0	47.9	46.6	46.0
2015/04/23	16:58:01	46.0	47.3	46.5	45.7
2015/04/23	16:58:02	46.2	46.5	46.0	45.0
2015/04/23	16:58:03	48.2	47.6	46.5	47.1
2015/04/23	16:58:04	47.0	47.5	47.1	46.5
2015/04/23	16:58:05	47.1	47.4	46.9	46.0
2015/04/23	16:58:06	46.1	46.9	46.4	45.5
2015/04/23	16:58:07	45.1	46.4	45.6	44.9
2015/04/23	16:58:08	49.1	48.3	45.6	45.1
2015/04/23	16:58:09	45.6	47.9	46.7	44.8
2015/04/23	16:58:10	47.5	47.5	46.5	45.9

2015/04/23	16:58:11	46.8	47.2	46.8	46.2
2015/04/23	16:58:12	47.3	47.6	46.8	45.8
2015/04/23	16:58:13	47.3	47.3	46.9	46.4
2015/04/23	16:58:14	46.4	47.3	46.6	45.5
2015/04/23	16:58:15	46.7	46.9	46.6	46.0
2015/04/23	16:58:16	48.9	48.5	46.5	45.5
2015/04/23	16:58:17	49.2	49.1	48.4	48.7
2015/04/23	16:58:18	49.2	49.4	48.9	48.5
2015/04/23	16:58:19	47.3	49.0	48.0	46.9
2015/04/23	16:58:20	46.1	48.0	47.0	45.9
2015/04/23	16:58:21	46.4	47.2	46.5	45.4
2015/04/23	16:58:22	47.0	47.1	46.1	45.6
2015/04/23	16:58:23	47.3	47.3	47.0	46.6
2015/04/23	16:58:24	47.7	47.7	47.1	46.9
2015/04/23	16:58:25	49.5	49.0	47.7	47.9
2015/04/23	16:58:26	48.8	49.1	48.7	47.8
2015/04/23	16:58:27	47.4	48.8	47.9	46.9
2015/04/23	16:58:28	47.4	47.9	47.5	46.6
2015/04/23	16:58:29	47.5	47.8	47.3	46.5
2015/04/23	16:58:30	47.2	47.4	47.2	46.8
2015/04/23	16:58:31	46.8	47.3	46.8	46.1
2015/04/23	16:58:32	46.3	47.0	46.6	45.7
2015/04/23	16:58:33	46.2	46.5	46.3	45.5
2015/04/23	16:58:34	46.3	46.4	46.3	45.9
2015/04/23	16:58:35	46.5	46.5	46.3	46.0
2015/04/23	16:58:36	47.3	47.2	46.5	46.3
2015/04/23	16:58:37	45.5	46.9	46.1	45.1
2015/04/23	16:58:38	45.4	46.1	45.6	45.1
2015/04/23	16:58:39	45.6	45.9	45.5	44.8
2015/04/23	16:58:40	45.7	45.8	45.3	44.6
2015/04/23	16:58:41	48.0	47.5	45.8	46.4
2015/04/23	16:58:42	46.3	47.5	46.7	45.9
2015/04/23	16:58:43	45.8	46.7	46.1	45.6
2015/04/23	16:58:44	45.2	46.1	45.6	44.9
2015/04/23	16:58:45	45.6	45.9	45.5	45.0
2015/04/23	16:58:46	44.6	45.5	45.0	44.4
2015/04/23	16:58:47	45.1	45.2	44.8	44.3
2015/04/23	16:58:48	44.9	45.1	44.9	44.6
2015/04/23	16:58:49	44.9	44.9	44.8	44.4
2015/04/23	16:58:50	43.8	44.9	44.3	43.4
2015/04/23	16:58:51	44.4	44.4	44.2	43.9
2015/04/23	16:58:52	44.3	44.4	44.2	44.0
2015/04/23	16:58:53	45.8	45.3	44.3	44.5
2015/04/23	16:58:54	45.3	45.4	45.2	44.9
2015/04/23	16:58:55	45.4	45.4	45.2	45.1
2015/04/23	16:58:56	46.6	46.2	45.4	45.8
2015/04/23	16:58:57	46.9	46.7	46.2	46.4

2015/04/23	16:58:58	46.3	46.6	46.4	46.0
2015/04/23	16:58:59	45.8	46.4	46.0	45.6
2015/04/23	16:59:00	45.8	46.1	45.8	45.4
2015/04/23	16:59:01	45.9	46.0	45.7	45.3
2015/04/23	16:59:02	45.4	46.0	45.6	45.3
2015/04/23	16:59:03	45.7	45.8	45.5	45.0
2015/04/23	16:59:04	46.3	46.2	45.8	45.8
2015/04/23	16:59:05	45.5	46.1	45.6	45.0
2015/04/23	16:59:06	45.1	45.6	45.3	44.8
2015/04/23	16:59:07	44.6	45.4	44.8	44.2
2015/04/23	16:59:08	44.0	44.8	44.3	43.7
2015/04/23	16:59:09	43.8	44.3	44.0	43.5
2015/04/23	16:59:10	44.3	44.3	44.0	43.9
2015/04/23	16:59:11	45.5	45.2	44.1	43.8
2015/04/23	16:59:12	44.4	45.4	44.6	43.6
2015/04/23	16:59:13	43.5	44.6	43.9	43.1
2015/04/23	16:59:14	44.0	44.1	43.8	43.3
2015/04/23	16:59:15	44.1	44.1	43.9	43.6
2015/04/23	16:59:16	44.6	44.5	44.1	44.0
2015/04/23	16:59:17	43.9	44.3	44.0	43.7
2015/04/23	16:59:18	44.2	44.3	43.9	43.7
2015/04/23	16:59:19	46.9	46.2	44.3	45.7
2015/04/23	16:59:20	48.2	48.1	46.0	45.5
2015/04/23	16:59:21	46.0	47.2	46.5	45.0
2015/04/23	16:59:22	44.8	46.5	45.5	44.6
2015/04/23	16:59:23	44.9	45.5	45.0	44.1
2015/04/23	16:59:24	45.6	45.5	45.2	45.3
2015/04/23	16:59:25	46.0	45.9	45.4	45.2
2015/04/23	16:59:26	45.8	46.0	45.8	45.6
2015/04/23	16:59:27	46.1	46.2	45.6	45.2
2015/04/23	16:59:28	44.8	46.1	45.1	44.0
2015/04/23	16:59:29	44.1	45.1	44.5	43.2
2015/04/23	16:59:30	44.6	44.9	44.4	43.6
2015/04/23	16:59:31	45.1	45.2	44.1	43.5
2015/04/23	16:59:32	45.9	46.1	45.0	44.7
2015/04/23	16:59:33	44.8	45.6	45.1	44.4
2015/04/23	16:59:34	45.0	45.2	44.7	44.2
2015/04/23	16:59:35	45.9	45.9	45.0	44.5
2015/04/23	16:59:36	44.6	45.9	45.0	43.6
2015/04/23	16:59:37	45.2	45.2	44.9	44.6
2015/04/23	16:59:38	46.6	46.4	45.2	45.6
2015/04/23	16:59:39	46.2	46.3	46.0	45.6
2015/04/23	16:59:40	48.7	48.4	46.0	45.7
2015/04/23	16:59:41	47.0	48.4	47.4	46.0
2015/04/23	16:59:42	45.7	47.3	46.3	44.6
2015/04/23	16:59:43	46.7	46.7	46.1	45.0
2015/04/23	16:59:44	45.2	46.8	45.8	44.5

2015/04/23	16:59:45	45.6	45.8	45.5	45.0
2015/04/23	16:59:46	44.8	45.8	45.0	44.0
2015/04/23	16:59:47	45.1	45.1	44.9	44.2
2015/04/23	16:59:48	45.5	45.5	45.0	44.9
2015/04/23	16:59:49	48.0	47.5	45.4	45.6
2015/04/23	16:59:50	46.3	47.5	46.7	45.5
2015/04/23	16:59:51	45.6	46.6	46.0	45.2
2015/04/23	16:59:52	45.4	46.0	45.6	44.9
2015/04/23	16:59:53	46.6	46.5	45.6	45.2
2015/04/23	16:59:54	47.2	47.2	46.4	46.5
2015/04/23	16:59:55	47.3	47.5	47.0	46.8
2015/04/23	16:59:56	49.3	48.7	47.0	46.1
2015/04/23	16:59:57	47.6	48.5	48.0	46.8
2015/04/23	16:59:58	47.7	48.1	47.6	46.9
2015/04/23	16:59:59	48.8	48.6	47.7	48.1
2015/04/23	17:00:00	48.6	48.6	48.2	47.5
2015/04/23	17:00:01	49.7	49.6	48.5	48.0
2015/04/23	17:00:02	49.0	49.2	49.0	48.5
2015/04/23	17:00:03	48.6	49.1	48.7	47.9
2015/04/23	17:00:04	47.7	48.7	48.0	46.5
2015/04/23	17:00:05	48.3	48.3	47.9	46.9
2015/04/23	17:00:06	48.0	48.7	48.0	46.5
2015/04/23	17:00:07	47.0	48.1	47.5	46.6
2015/04/23	17:00:08	46.3	47.5	46.6	45.0
2015/04/23	17:00:09	45.6	46.8	46.1	45.1
2015/04/23	17:00:10	48.0	47.5	46.2	46.5
2015/04/23	17:00:11	46.2	47.1	46.6	45.9
2015/04/23	17:00:12	47.0	46.9	46.5	46.0
2015/04/23	17:00:13	47.3	47.2	46.9	46.7
2015/04/23	17:00:14	47.1	47.2	47.1	46.8
2015/04/23	17:00:15	46.6	47.1	46.8	46.3
2015/04/23	17:00:16	47.6	47.5	46.8	46.8
2015/04/23	17:00:17	46.7	47.4	47.0	46.4
2015/04/23	17:00:18	47.2	47.3	46.9	46.5
2015/04/23	17:00:19	47.4	47.5	46.9	46.4
2015/04/23	17:00:20	45.9	47.3	46.5	45.4
2015/04/23	17:00:21	46.3	46.7	46.2	45.5
2015/04/23	17:00:22	46.8	46.9	45.8	45.2
2015/04/23	17:00:23	46.5	46.7	46.3	45.6
2015/04/23	17:00:24	47.2	47.2	46.6	46.3
2015/04/23	17:00:25	47.8	47.7	47.1	46.5
2015/04/23	17:00:26	47.5	47.9	47.5	46.6
2015/04/23	17:00:27	46.0	47.4	46.6	45.6
2015/04/23	17:00:28	45.9	46.6	46.2	45.4
2015/04/23	17:00:29	45.4	46.2	45.7	45.2
2015/04/23	17:00:30	46.7	46.4	45.7	46.2
2015/04/23	17:00:31	47.1	47.0	46.2	46.1

2015/04/23	17:00:32	47.9	47.7	47.0	47.2
2015/04/23	17:00:33	46.7	47.6	47.0	46.3
2015/04/23	17:00:34	46.1	47.0	46.4	45.2
2015/04/23	17:00:35	46.0	46.4	45.7	44.5
2015/04/23	17:00:36	46.3	46.7	46.2	45.3
2015/04/23	17:00:37	44.4	46.1	45.1	43.8
2015/04/23	17:00:38	43.9	45.0	44.4	43.6
2015/04/23	17:00:39	45.8	45.5	44.4	44.2
2015/04/23	17:00:40	45.8	45.8	45.3	44.9
2015/04/23	17:00:41	45.1	45.7	45.3	44.8
2015/04/23	17:00:42	46.1	46.1	45.2	44.9
2015/04/23	17:00:43	47.2	46.8	46.1	46.2
2015/04/23	17:00:44	45.8	46.7	46.1	45.6
2015/04/23	17:00:45	45.9	46.2	45.9	45.4
2015/04/23	17:00:46	45.6	46.2	45.6	44.9
2015/04/23	17:00:47	45.7	45.8	45.6	45.2
2015/04/23	17:00:48	46.3	46.3	45.6	45.2
2015/04/23	17:00:49	46.1	46.3	46.1	45.6
2015/04/23	17:00:50	45.2	46.3	45.5	44.6
2015/04/23	17:00:51	45.7	45.8	45.5	44.8
2015/04/23	17:00:52	46.3	46.2	45.6	45.5
2015/04/23	17:00:53	45.1	46.1	45.4	44.4
2015/04/23	17:00:54	44.8	45.4	44.9	43.7
2015/04/23	17:00:55	45.3	45.4	45.1	44.9
2015/04/23	17:00:56	45.6	45.6	45.2	44.8
2015/04/23	17:00:57	45.4	45.6	45.4	45.0
2015/04/23	17:00:58	47.0	46.6	45.4	45.0
2015/04/23	17:00:59	47.2	47.2	46.3	45.7
2015/04/23	17:01:00	46.9	47.2	46.9	46.3
2015/04/23	17:01:01	46.3	46.9	46.4	45.6
2015/04/23	17:01:02	47.4	47.2	46.6	46.5
2015/04/23	17:01:03	47.6	47.6	47.2	46.9
2015/04/23	17:01:04	47.2	47.5	47.2	46.5
2015/04/23	17:01:05	45.8	47.2	46.3	45.3
2015/04/23	17:01:06	45.8	46.3	46.0	45.3
2015/04/23	17:01:07	45.1	46.0	45.4	44.5
2015/04/23	17:01:08	44.3	45.4	44.8	43.9
2015/04/23	17:01:09	44.5	44.8	44.5	44.1
2015/04/23	17:01:10	44.8	44.8	44.6	44.5
2015/04/23	17:01:11	45.8	45.5	44.7	45.0
2015/04/23	17:01:12	45.0	45.4	45.1	44.7
2015/04/23	17:01:13	45.6	45.5	45.2	45.0
2015/04/23	17:01:14	45.6	45.6	45.4	45.3
2015/04/23	17:01:15	45.5	45.8	45.4	44.9
2015/04/23	17:01:16	45.7	45.7	45.4	44.9
2015/04/23	17:01:17	45.6	45.8	45.4	44.9
2015/04/23	17:01:18	45.7	45.9	45.6	45.1

2015/04/23	17:01:19	45.1	45.6	45.2	44.5
2015/04/23	17:01:20	46.5	46.1	45.4	46.1
2015/04/23	17:01:21	47.2	46.8	46.2	46.6
2015/04/23	17:01:22	46.1	47.0	46.3	45.3
2015/04/23	17:01:23	45.8	46.2	45.9	45.3
2015/04/23	17:01:24	46.0	46.3	45.9	45.1
2015/04/23	17:01:25	46.2	46.2	45.7	45.0
2015/04/23	17:01:26	46.1	46.2	45.9	45.3
2015/04/23	17:01:27	47.9	47.4	46.2	46.7
2015/04/23	17:01:28	47.8	48.0	47.4	46.8
2015/04/23	17:01:29	48.6	48.4	47.5	47.2
2015/04/23	17:01:30	47.8	48.5	47.9	46.9
2015/04/23	17:01:31	46.6	47.8	47.1	46.4
2015/04/23	17:01:32	45.8	47.1	46.3	45.6
2015/04/23	17:01:33	47.9	47.6	46.3	46.6
2015/04/23	17:01:34	47.0	47.6	47.2	46.5
2015/04/23	17:01:35	47.3	47.5	47.1	46.4
2015/04/23	17:01:36	47.2	47.3	47.0	46.5
2015/04/23	17:01:37	46.3	47.2	46.6	45.9
2015/04/23	17:01:38	46.0	46.6	46.2	45.7
2015/04/23	17:01:39	47.0	46.7	46.2	46.7
2015/04/23	17:01:40	46.5	46.8	46.5	45.8
2015/04/23	17:01:41	47.4	47.1	46.5	46.6
2015/04/23	17:01:42	48.5	48.0	47.1	47.6
2015/04/23	17:01:43	48.3	48.6	47.9	46.5
2015/04/23	17:01:44	48.1	48.1	47.8	46.7
2015/04/23	17:01:45	47.7	48.2	47.6	46.6
2015/04/23	17:01:46	49.8	49.4	48.0	48.7
2015/04/23	17:01:47	48.3	49.0	48.1	46.1
2015/04/23	17:01:48	49.5	49.4	48.9	47.9
2015/04/23	17:01:49	49.3	49.9	49.0	47.9
2015/04/23	17:01:50	48.5	49.1	48.6	47.2
2015/04/23	17:01:51	49.3	49.8	48.6	46.2
2015/04/23	17:01:52	46.3	48.6	47.4	45.6
2015/04/23	17:01:53	48.3	48.4	47.1	45.9
2015/04/23	17:01:54	46.5	47.8	47.0	46.1
2015/04/23	17:01:55	47.7	47.6	47.0	46.6
2015/04/23	17:01:56	47.5	47.6	47.0	46.0
2015/04/23	17:01:57	47.2	47.7	47.2	46.7
2015/04/23	17:01:58	46.6	47.2	46.6	45.7
2015/04/23	17:01:59	45.3	47.1	46.0	44.8
2015/04/23	17:02:00	46.2	46.3	45.6	44.9
2015/04/23	17:02:01	44.9	46.2	45.5	44.2
2015/04/23	17:02:02	45.1	45.6	45.2	44.7
2015/04/23	17:02:03	44.9	45.3	44.9	44.3
2015/04/23	17:02:04	47.2	46.6	45.0	45.3
2015/04/23	17:02:05	46.4	46.6	46.0	45.3

2015/04/23	17:02:06	47.3	47.1	46.6	47.1
2015/04/23	17:02:07	45.5	47.1	46.0	44.6
2015/04/23	17:02:08	46.7	46.6	45.9	45.1
2015/04/23	17:02:09	50.4	49.3	46.6	48.1
2015/04/23	17:02:10	47.3	49.0	48.0	46.6
2015/04/23	17:02:11	46.6	48.0	47.2	46.3
2015/04/23	17:02:12	46.9	47.3	47.0	46.6
2015/04/23	17:02:13	46.9	47.0	46.8	46.3
2015/04/23	17:02:14	49.3	48.6	47.0	48.0
2015/04/23	17:02:15	51.3	50.7	48.6	49.5
2015/04/23	17:02:16	51.9	51.4	50.6	51.5
2015/04/23	17:02:17	49.6	51.4	50.2	48.5
2015/04/23	17:02:18	49.7	50.2	49.8	48.6
2015/04/23	17:02:19	52.1	51.6	50.0	50.5
2015/04/23	17:02:20	51.6	51.8	51.4	50.5
2015/04/23	17:02:21	48.9	51.4	50.0	48.5
2015/04/23	17:02:22	48.7	50.0	49.2	48.3
2015/04/23	17:02:23	49.1	49.2	49.0	48.6
2015/04/23	17:02:24	51.3	50.7	49.2	49.9
2015/04/23	17:02:25	50.5	50.8	50.5	49.9
2015/04/23	17:02:26	52.4	51.9	50.5	50.2
2015/04/23	17:02:27	52.8	52.5	51.9	52.2
2015/04/23	17:02:28	53.2	53.0	52.5	52.8
2015/04/23	17:02:29	54.2	53.9	52.9	53.3
2015/04/23	17:02:30	52.5	53.8	53.0	51.6
2015/04/23	17:02:31	51.5	53.0	52.1	50.5
2015/04/23	17:02:32	53.4	53.4	51.6	50.7
2015/04/23	17:02:33	51.8	53.3	52.2	50.8
2015/04/23	17:02:34	50.4	52.3	51.1	49.3
2015/04/23	17:02:35	49.8	51.1	50.2	48.4
2015/04/23	17:02:36	48.0	50.2	48.8	46.6
2015/04/23	17:02:37	49.2	49.5	48.7	47.7
2015/04/23	17:02:38	47.5	49.0	48.1	47.2
2015/04/23	17:02:39	47.1	48.1	47.3	46.2
2015/04/23	17:02:40	52.3	51.9	47.2	46.4
2015/04/23	17:02:41	50.1	51.4	50.7	49.7
2015/04/23	17:02:42	52.0	51.8	50.6	50.2
2015/04/23	17:02:43	50.9	51.9	51.1	49.8
2015/04/23	17:02:44	50.9	51.5	50.9	49.9
2015/04/23	17:02:45	49.2	50.9	49.9	48.8
2015/04/23	17:02:46	50.4	50.3	50.0	49.9
2015/04/23	17:02:47	51.4	51.1	50.2	50.5
2015/04/23	17:02:48	52.9	52.7	50.8	50.0
2015/04/23	17:02:49	56.6	55.7	52.7	54.7
2015/04/23	17:02:50	53.1	55.7	54.1	51.5
2015/04/23	17:02:51	50.9	54.1	52.3	50.2
2015/04/23	17:02:52	50.4	52.3	51.3	49.6

2015/04/23	17:02:53	51.5	51.7	51.2	50.1
2015/04/23	17:02:54	47.2	51.2	49.1	46.5
2015/04/23	17:02:55	47.5	49.1	48.1	46.9
2015/04/23	17:02:56	48.4	48.4	48.1	47.8
2015/04/23	17:02:57	47.8	48.3	48.0	47.6
2015/04/23	17:02:58	46.7	48.0	47.2	46.4
2015/04/23	17:02:59	47.3	47.3	47.1	46.8
2015/04/23	17:03:00	48.1	47.9	47.3	47.8
2015/04/23	17:03:01	48.7	48.5	47.8	47.9
2015/04/23	17:03:02	48.2	48.5	48.3	47.8
2015/04/23	17:03:03	48.8	48.7	48.1	47.6
2015/04/23	17:03:04	48.7	48.8	48.6	48.3
2015/04/23	17:03:05	49.4	49.2	48.7	48.9
2015/04/23	17:03:06	50.1	49.8	49.1	49.4
2015/04/23	17:03:07	48.5	49.8	48.9	47.7
2015/04/23	17:03:08	47.4	49.1	47.9	46.1
2015/04/23	17:03:09	47.3	47.9	47.5	46.4
2015/04/23	17:03:10	47.3	47.8	47.3	46.3
2015/04/23	17:03:11	47.6	47.7	47.0	46.2
2015/04/23	17:03:12	48.5	48.4	47.7	46.7
2015/04/23	17:03:13	47.0	47.9	47.2	46.0
2015/04/23	17:03:14	48.7	48.5	47.5	47.3
2015/04/23	17:03:15	48.6	48.5	48.2	48.1
2015/04/23	17:03:16	47.8	48.4	47.9	47.0
2015/04/23	17:03:17	48.8	48.7	48.1	48.0
2015/04/23	17:03:18	50.9	50.5	48.7	49.4
2015/04/23	17:03:19	48.8	50.0	49.3	48.1
2015/04/23	17:03:20	46.6	49.3	47.7	45.9
2015/04/23	17:03:21	46.6	47.8	46.9	45.8
2015/04/23	17:03:22	46.5	46.9	46.6	45.8
2015/04/23	17:03:23	48.0	47.8	46.6	46.3
2015/04/23	17:03:24	48.4	48.1	47.8	48.0
2015/04/23	17:03:25	48.3	48.3	47.9	47.6
2015/04/23	17:03:26	48.2	48.5	48.1	47.6
2015/04/23	17:03:27	49.0	48.8	48.0	47.6
2015/04/23	17:03:28	48.3	48.8	48.4	47.5
2015/04/23	17:03:29	47.8	48.4	48.0	47.6
2015/04/23	17:03:30	48.6	48.5	47.9	47.5
2015/04/23	17:03:31	49.8	49.4	48.6	49.0
2015/04/23	17:03:32	48.7	49.4	48.8	47.8
2015/04/23	17:03:33	47.1	48.8	47.8	46.6
2015/04/23	17:03:34	47.7	47.9	47.6	46.7
2015/04/23	17:03:35	47.9	48.0	47.6	46.9
2015/04/23	17:03:36	47.9	48.2	47.8	47.2
2015/04/23	17:03:37	48.4	48.3	47.9	48.1
2015/04/23	17:03:38	48.9	48.8	48.3	48.2
2015/04/23	17:03:39	48.4	48.6	48.2	47.5

2015/04/23	17:03:40	48.4	48.7	48.4	48.0
2015/04/23	17:03:41	47.6	48.4	47.9	47.3
2015/04/23	17:03:42	48.4	48.3	47.8	47.6
2015/04/23	17:03:43	47.4	48.4	47.6	46.6
2015/04/23	17:03:44	46.5	47.7	46.9	46.2
2015/04/23	17:03:45	46.1	47.1	46.3	45.0
2015/04/23	17:03:46	45.4	46.3	45.7	44.7
2015/04/23	17:03:47	44.3	45.7	44.8	44.0
2015/04/23	17:03:48	44.6	44.8	44.6	44.0
2015/04/23	17:03:49	45.2	45.2	44.6	44.5
2015/04/23	17:03:50	45.3	45.2	45.1	44.9
2015/04/23	17:03:51	46.3	46.0	45.2	45.3
2015/04/23	17:03:52	46.1	46.1	45.9	45.9
2015/04/23	17:03:53	46.2	46.3	46.1	45.7
2015/04/23	17:03:54	46.4	46.4	46.0	45.7
2015/04/23	17:03:55	46.7	46.6	46.4	46.4
2015/04/23	17:03:56	47.1	47.2	46.5	46.4
2015/04/23	17:03:57	46.3	46.8	46.5	46.0
2015/04/23	17:03:58	46.9	46.8	46.5	46.3
2015/04/23	17:03:59	47.5	47.3	46.9	47.1
2015/04/23	17:04:00	46.6	47.2	46.8	46.3
2015/04/23	17:04:01	46.6	46.9	46.6	45.8
2015/04/23	17:04:02	45.3	46.6	45.9	45.0
2015/04/23	17:04:03	45.6	45.9	45.6	45.1
2015/04/23	17:04:04	47.0	47.1	45.7	44.9
2015/04/23	17:04:05	44.4	46.2	45.2	43.9
2015/04/23	17:04:06	44.4	45.2	44.7	43.7
2015/04/23	17:04:07	44.5	44.9	44.5	43.8
2015/04/23	17:04:08	44.1	44.7	44.2	43.5
2015/04/23	17:04:09	43.6	44.2	43.8	43.4
2015/04/23	17:04:10	44.0	44.1	43.7	43.4
2015/04/23	17:04:11	43.9	44.0	43.8	43.5
2015/04/23	17:04:12	43.8	44.1	43.8	43.3
2015/04/23	17:04:13	44.4	44.2	43.8	43.6
2015/04/23	17:04:14	43.9	44.4	43.8	43.0
2015/04/23	17:04:15	43.9	43.9	43.7	43.2
2015/04/23	17:04:16	46.5	45.8	43.9	44.8
2015/04/23	17:04:17	44.9	45.8	45.2	44.3
2015/04/23	17:04:18	46.6	46.3	45.0	44.3
2015/04/23	17:04:19	46.5	46.7	46.3	45.5
2015/04/23	17:04:20	47.7	47.5	46.3	45.8
2015/04/23	17:04:21	49.0	48.5	47.6	48.2
2015/04/23	17:04:22	47.6	48.4	47.6	46.3
2015/04/23	17:04:23	47.8	48.1	47.8	47.2
2015/04/23	17:04:24	50.6	49.9	47.9	48.9
2015/04/23	17:04:25	50.1	50.2	49.8	49.2
2015/04/23	17:04:26	51.1	50.7	50.0	50.2

2015/04/23	17:04:27	50.5	51.0	50.4	49.2
2015/04/23	17:04:28	49.4	50.7	49.7	48.7
2015/04/23	17:04:29	51.0	50.7	49.7	49.6
2015/04/23	17:04:30	50.5	50.9	50.4	49.4
2015/04/23	17:04:31	47.5	50.3	48.8	46.9
2015/04/23	17:04:32	48.4	48.8	48.5	47.5
2015/04/23	17:04:33	49.4	49.3	48.4	47.9
2015/04/23	17:04:34	50.0	49.9	49.3	49.2
2015/04/23	17:04:35	48.2	49.6	48.7	47.3
2015/04/23	17:04:36	49.5	49.4	48.9	49.0
2015/04/23	17:04:37	51.0	50.6	49.1	48.6
2015/04/23	17:04:38	49.2	50.3	49.6	48.6
2015/04/23	17:04:39	48.8	49.8	49.1	48.3
2015/04/23	17:04:40	48.5	49.2	48.7	47.7
2015/04/23	17:04:41	49.4	49.3	48.5	47.8
2015/04/23	17:04:42	48.7	49.3	48.9	48.3
2015/04/23	17:04:43	48.3	48.9	48.4	47.7
2015/04/23	17:04:44	48.9	49.0	48.2	47.7
2015/04/23	17:04:45	50.3	49.8	49.0	48.8
2015/04/23	17:04:46	49.9	50.1	49.6	49.2
2015/04/23	17:04:47	47.0	49.7	48.2	46.4
2015/04/23	17:04:48	46.6	48.2	47.2	45.7
2015/04/23	17:04:49	45.9	47.2	46.4	45.5
2015/04/23	17:04:50	47.0	46.9	46.3	45.7
2015/04/23	17:04:51	46.3	46.8	46.5	46.0
2015/04/23	17:04:52	45.5	46.4	45.9	45.0
2015/04/23	17:04:53	45.4	45.9	45.5	44.5
2015/04/23	17:04:54	45.4	45.6	45.4	44.9
2015/04/23	17:04:55	46.3	46.1	45.3	45.1
2015/04/23	17:04:56	47.7	47.2	46.1	46.9
2015/04/23	17:04:57	46.7	47.1	46.8	46.2
2015/04/23	17:04:58	46.4	47.1	46.4	45.2
2015/04/23	17:04:59	44.8	46.4	45.4	44.5
2015/04/23	17:05:00	44.0	45.4	44.6	43.6
2015/04/23	17:05:01	45.1	45.0	44.6	44.2
2015/04/23	17:05:02	45.0	45.1	44.9	44.8
2015/04/23	17:05:03	45.4	45.3	45.0	44.9
2015/04/23	17:05:04	45.8	45.6	45.3	45.3
2015/04/23	17:05:05	45.2	45.7	45.3	44.4
2015/04/23	17:05:06	45.2	45.4	45.2	44.8
2015/04/23	17:05:07	45.1	45.2	45.0	44.5
2015/04/23	17:05:08	45.9	45.7	45.2	45.2
2015/04/23	17:05:09	46.0	46.0	45.7	45.6
2015/04/23	17:05:10	45.5	45.8	45.4	44.7
2015/04/23	17:05:11	45.7	45.9	45.6	45.3
2015/04/23	17:05:12	46.8	46.4	45.6	45.7
2015/04/23	17:05:13	46.6	46.7	46.2	45.9

2015/04/23	17:05:14	46.3	46.5	46.2	45.5
2015/04/23	17:05:15	48.0	47.5	46.5	47.3
2015/04/23	17:05:16	45.8	47.4	46.4	45.3
2015/04/23	17:05:17	45.5	46.4	45.8	45.3
2015/04/23	17:05:18	45.4	45.8	45.5	44.8
2015/04/23	17:05:19	46.5	46.2	45.6	45.9
2015/04/23	17:05:20	46.8	46.6	46.2	46.5
2015/04/23	17:05:21	46.0	46.6	46.2	45.7
2015/04/23	17:05:22	46.0	46.2	46.0	45.6
2015/04/23	17:05:23	46.0	46.2	45.8	45.4
2015/04/23	17:05:24	45.9	46.0	45.9	45.4
2015/04/23	17:05:25	45.9	46.0	45.7	45.4
2015/04/23	17:05:26	46.3	46.3	45.7	45.2
2015/04/23	17:05:27	47.1	46.9	46.3	46.7
2015/04/23	17:05:28	47.1	47.1	46.8	46.7
2015/04/23	17:05:29	48.7	48.2	47.1	47.9
2015/04/23	17:05:30	47.8	48.2	47.8	47.1
2015/04/23	17:05:31	48.1	48.2	48.0	47.8
2015/04/23	17:05:32	48.1	48.2	48.0	47.8
2015/04/23	17:05:33	48.0	48.1	48.0	47.7
2015/04/23	17:05:34	47.7	48.1	47.8	47.5
2015/04/23	17:05:35	48.3	48.2	47.8	47.7
2015/04/23	17:05:36	48.6	48.5	48.2	48.3
2015/04/23	17:05:37	49.3	49.1	48.5	48.7
2015/04/23	17:05:38	50.8	50.3	49.1	49.5
2015/04/23	17:05:39	51.8	51.3	50.4	51.5
2015/04/23	17:05:40	51.9	51.7	51.3	51.5
2015/04/23	17:05:41	50.8	51.6	51.1	50.4
2015/04/23	17:05:42	49.7	51.1	50.2	48.8
2015/04/23	17:05:43	50.1	50.8	50.0	49.0
2015/04/23	17:05:44	49.1	50.0	49.4	48.8
2015/04/23	17:05:45	48.4	49.4	48.8	48.0
2015/04/23	17:05:46	48.8	48.9	48.6	48.1
2015/04/23	17:05:47	48.0	48.8	48.3	47.6
2015/04/23	17:05:48	47.1	48.3	47.5	46.8
2015/04/23	17:05:49	46.7	47.6	47.0	46.2
2015/04/23	17:05:50	47.0	47.0	46.9	46.5
2015/04/23	17:05:51	47.4	47.3	47.0	47.0
2015/04/23	17:05:52	47.6	47.5	47.3	47.3
2015/04/23	17:05:53	48.2	48.0	47.4	47.4
2015/04/23	17:05:54	49.2	48.9	48.0	48.2
2015/04/23	17:05:55	49.2	49.1	48.7	48.7
2015/04/23	17:05:56	48.4	49.0	48.6	47.9
2015/04/23	17:05:57	48.1	48.7	48.4	47.9
2015/04/23	17:05:58	49.0	48.9	48.4	48.2
2015/04/23	17:05:59	47.0	48.7	47.7	46.6
2015/04/23	17:06:00	45.9	47.7	46.6	45.6

2015/04/23	17:06:01	46.4	46.6	46.4	45.7
2015/04/23	17:06:02	45.4	46.5	45.8	45.1
2015/04/23	17:06:03	46.0	46.0	45.7	45.3
2015/04/23	17:06:04	45.4	46.0	45.5	45.1
2015/04/23	17:06:05	45.2	45.5	45.3	44.7
2015/04/23	17:06:06	45.5	45.5	45.3	45.0
2015/04/23	17:06:07	46.3	46.1	45.3	45.4
2015/04/23	17:06:08	46.8	46.8	45.9	45.7
2015/04/23	17:06:09	45.8	46.6	45.9	45.0
2015/04/23	17:06:10	45.4	46.2	45.7	45.0
2015/04/23	17:06:11	44.8	45.7	45.1	44.5
2015/04/23	17:06:12	45.6	45.4	45.1	45.1
2015/04/23	17:06:13	46.3	46.3	45.4	44.9
2015/04/23	17:06:14	46.3	46.3	45.7	45.3
2015/04/23	17:06:15	47.2	47.7	46.0	44.8
2015/04/23	17:06:16	46.3	46.5	46.0	44.5
2015/04/23	17:06:17	46.8	46.9	46.4	46.0
2015/04/23	17:06:18	47.0	47.3	46.6	45.1
2015/04/23	17:06:19	44.7	46.6	45.5	44.3
2015/04/23	17:06:20	44.3	45.5	44.8	43.9
2015/04/23	17:06:21	45.2	45.2	44.6	44.2
2015/04/23	17:06:22	44.4	45.0	44.5	43.7
2015/04/23	17:06:23	49.6	49.4	44.6	44.0
2015/04/23	17:06:24	46.0	49.1	47.4	44.5
2015/04/23	17:06:25	47.1	48.2	47.2	46.1
2015/04/23	17:06:26	46.9	47.4	46.9	46.4
2015/04/23	17:06:27	45.7	46.9	46.2	45.2
2015/04/23	17:06:28	45.5	46.2	45.7	45.1
2015/04/23	17:06:29	44.8	45.7	45.1	44.0
2015/04/23	17:06:30	44.6	45.1	44.8	44.1
2015/04/23	17:06:31	44.6	44.8	44.6	44.2
2015/04/23	17:06:32	45.4	45.2	44.7	44.4
2015/04/23	17:06:33	47.0	46.5	45.2	45.5
2015/04/23	17:06:34	45.6	46.5	45.7	44.4
2015/04/23	17:06:35	46.4	46.6	46.1	45.6
2015/04/23	17:06:36	45.2	46.1	45.5	44.5
2015/04/23	17:06:37	47.8	47.1	45.6	47.0
2015/04/23	17:06:38	47.5	47.5	46.7	46.0
2015/04/23	17:06:39	49.0	48.5	47.5	48.3
2015/04/23	17:06:40	47.0	48.4	47.5	46.3
2015/04/23	17:06:41	46.5	47.5	46.9	45.8
2015/04/23	17:06:42	46.2	46.9	46.4	45.7
2015/04/23	17:06:43	45.6	46.4	45.9	45.4
2015/04/23	17:06:44	45.7	46.0	45.8	45.4
2015/04/23	17:06:45	48.6	48.0	45.7	45.3
2015/04/23	17:06:46	45.5	47.7	46.5	45.1
2015/04/23	17:06:47	46.3	46.5	46.3	45.7

2015/04/23	17:06:48	47.3	47.2	46.5	45.9
2015/04/23	17:06:49	46.0	46.8	46.2	44.4
2015/04/23	17:06:50	46.6	46.9	45.3	43.7
2015/04/23	17:06:51	47.0	47.9	46.6	44.9
2015/04/23	17:06:52	46.3	46.7	45.9	44.8
2015/04/23	17:06:53	49.0	48.5	46.7	47.2
2015/04/23	17:06:54	50.2	49.6	47.9	47.2
2015/04/23	17:06:55	50.0	50.0	49.3	49.1
2015/04/23	17:06:56	51.5	51.0	49.6	49.8
2015/04/23	17:06:57	50.7	51.0	50.1	49.2
2015/04/23	17:06:58	51.4	51.6	50.5	49.3
2015/04/23	17:06:59	48.2	51.1	49.4	47.4
2015/04/23	17:07:00	49.5	49.8	49.0	47.1
2015/04/23	17:07:01	51.1	50.7	49.8	50.4
2015/04/23	17:07:02	53.0	52.6	50.4	49.8
2015/04/23	17:07:03	52.4	52.7	52.2	51.6
2015/04/23	17:07:04	51.3	52.5	51.7	50.1
2015/04/23	17:07:05	52.7	52.3	51.9	52.0
2015/04/23	17:07:06	54.0	53.6	52.3	52.9
2015/04/23	17:07:07	51.2	53.4	52.1	50.2
2015/04/23	17:07:08	47.4	52.1	49.7	46.1
2015/04/23	17:07:09	46.2	49.7	47.9	45.6
2015/04/23	17:07:10	47.1	47.9	47.4	46.3
2015/04/23	17:07:11	46.0	47.5	46.5	45.3
2015/04/23	17:07:12	46.0	46.7	46.0	45.0
2015/04/23	17:07:13	47.2	47.2	46.2	45.5
2015/04/23	17:07:14	46.6	46.9	46.3	45.2
2015/04/23	17:07:15	46.1	46.4	46.1	45.1
2015/04/23	17:07:16	48.7	48.1	46.3	46.9
2015/04/23	17:07:17	50.1	49.4	48.1	49.2
2015/04/23	17:07:18	50.2	50.1	49.1	48.1
2015/04/23	17:07:19	47.8	49.9	48.5	46.1
2015/04/23	17:07:20	45.7	48.5	47.0	44.9
2015/04/23	17:07:21	47.9	47.7	46.9	46.4
2015/04/23	17:07:22	48.3	48.2	47.6	47.6
2015/04/23	17:07:23	47.6	48.5	47.8	46.8
2015/04/23	17:07:24	48.7	48.5	47.7	47.4
2015/04/23	17:07:25	49.1	48.9	48.5	48.8
2015/04/23	17:07:26	49.3	49.6	48.8	47.8
2015/04/23	17:07:27	48.4	48.8	48.6	48.1
2015/04/23	17:07:28	47.2	48.6	47.7	46.5
2015/04/23	17:07:29	46.6	47.7	47.0	46.4
2015/04/23	17:07:30	46.5	47.3	46.6	45.9
2015/04/23	17:07:31	48.1	47.9	46.4	45.5
2015/04/23	17:07:32	47.7	48.0	47.3	46.0
2015/04/23	17:07:33	45.9	47.6	46.4	45.0
2015/04/23	17:07:34	46.9	47.0	46.4	46.0

2015/04/23	17:07:35	49.5	49.9	46.9	45.6
2015/04/23	17:07:36	44.6	48.0	46.1	43.6
2015/04/23	17:07:37	44.4	46.1	45.1	43.9
2015/04/23	17:07:38	45.1	45.2	45.0	44.7
2015/04/23	17:07:39	45.0	45.3	44.7	44.1
2015/04/23	17:07:40	46.0	45.8	45.3	45.1
2015/04/23	17:07:41	45.4	45.8	45.4	44.4
2015/04/23	17:07:42	48.1	47.3	45.6	46.9
2015/04/23	17:07:43	45.4	47.1	46.1	44.9
2015/04/23	17:07:44	47.3	47.3	46.0	45.1
2015/04/23	17:07:45	45.5	46.9	45.9	44.3
2015/04/23	17:07:46	45.0	45.8	45.4	44.4
2015/04/23	17:07:47	44.7	45.4	45.0	44.4
2015/04/23	17:07:48	45.9	45.9	45.0	44.4
2015/04/23	17:07:49	45.8	45.8	45.3	44.6
2015/04/23	17:07:50	50.0	49.1	45.8	47.7
2015/04/23	17:07:51	50.2	50.6	49.2	46.7
2015/04/23	17:07:52	49.0	50.2	48.9	46.3
2015/04/23	17:07:53	44.0	48.8	46.5	43.8
2015/04/23	17:07:54	44.4	46.5	45.4	44.0
2015/04/23	17:07:55	44.1	45.4	44.5	43.7
2015/04/23	17:07:56	44.7	44.7	44.4	43.7
2015/04/23	17:07:57	45.1	45.2	44.6	44.0
2015/04/23	17:07:58	43.5	44.9	44.0	43.1
2015/04/23	17:07:59	43.5	44.0	43.7	43.1
2015/04/23	17:08:00	45.1	45.0	43.5	42.9
2015/04/23	17:08:01	47.0	46.7	44.3	44.0
2015/04/23	17:08:02	48.8	48.7	46.6	46.0
2015/04/23	17:08:03	46.4	47.9	46.8	45.2
2015/04/23	17:08:04	47.4	47.6	47.2	46.6
2015/04/23	17:08:05	47.5	47.7	46.9	45.6
2015/04/23	17:08:06	48.7	48.7	47.8	45.9
2015/04/23	17:08:07	47.1	48.3	47.3	45.6
2015/04/23	17:08:08	45.2	47.3	46.1	44.6
2015/04/23	17:08:09	44.5	46.3	45.1	43.6
2015/04/23	17:08:10	45.6	45.6	44.8	44.0
2015/04/23	17:08:11	45.8	45.8	45.5	45.1
2015/04/23	17:08:12	46.2	46.6	45.8	44.8
2015/04/23	17:08:13	45.4	45.8	45.5	44.3
2015/04/23	17:08:14	46.9	46.6	45.6	45.7
2015/04/23	17:08:15	48.3	48.0	46.2	45.6
2015/04/23	17:08:16	47.5	48.2	47.6	47.1
2015/04/23	17:08:17	45.4	47.6	46.3	45.2
2015/04/23	17:08:18	46.6	46.6	46.3	46.0
2015/04/23	17:08:19	48.8	48.1	46.6	47.7
2015/04/23	17:08:20	48.2	48.3	47.9	47.4
2015/04/23	17:08:21	49.2	48.9	48.3	48.7

2015/04/23	17:08:22	47.6	49.0	47.9	46.6
2015/04/23	17:08:23	47.8	48.3	47.8	46.7
2015/04/23	17:08:24	46.3	48.0	46.8	45.1
2015/04/23	17:08:25	46.4	46.9	46.5	45.6
2015/04/23	17:08:26	45.1	46.5	45.6	44.3
2015/04/23	17:08:27	44.4	45.6	44.9	43.9
2015/04/23	17:08:28	45.1	45.5	44.8	44.2
2015/04/23	17:08:29	44.7	44.9	44.6	44.0
2015/04/23	17:08:30	45.9	45.8	44.8	44.8
2015/04/23	17:08:31	45.8	45.9	45.4	45.0
2015/04/23	17:08:32	45.4	45.6	45.4	45.1
2015/04/23	17:08:33	45.3	45.6	45.3	44.8
2015/04/23	17:08:34	44.5	45.3	44.8	44.2
2015/04/23	17:08:35	44.1	44.8	44.4	43.9
2015/04/23	17:08:36	45.3	45.0	44.4	44.8
2015/04/23	17:08:37	44.3	44.9	44.4	43.7
2015/04/23	17:08:38	44.6	45.0	44.5	43.9
2015/04/23	17:08:39	45.9	45.6	44.3	43.5
2015/04/23	17:08:40	43.8	45.5	44.4	43.3
2015/04/23	17:08:41	43.4	44.4	43.8	43.0
2015/04/23	17:08:42	51.4	50.8	43.8	44.1
2015/04/23	17:08:43	54.3	53.5	50.2	47.9
2015/04/23	17:08:44	47.0	53.6	50.4	43.7
2015/04/23	17:08:45	46.6	50.4	48.3	43.8
2015/04/23	17:08:46	45.7	48.3	46.8	44.7
2015/04/23	17:08:47	45.4	47.1	45.8	44.4
2015/04/23	17:08:48	45.7	45.9	45.6	44.1
2015/04/23	17:08:49	46.3	46.5	45.9	45.1
2015/04/23	17:08:50	47.4	47.1	45.9	45.2
2015/04/23	17:08:51	46.8	47.1	46.7	45.9
2015/04/23	17:08:52	48.2	48.2	46.9	46.4
2015/04/23	17:08:53	47.0	48.0	47.4	46.7
2015/04/23	17:08:54	46.2	47.4	46.6	45.9
2015/04/23	17:08:55	46.0	46.7	46.2	45.6
2015/04/23	17:08:56	45.0	46.3	45.4	44.3
2015/04/23	17:08:57	44.4	45.5	44.8	44.1
2015/04/23	17:08:58	44.2	44.8	44.4	43.9
2015/04/23	17:08:59	44.8	44.8	44.3	43.8
2015/04/23	17:09:00	45.4	45.3	44.5	44.4
2015/04/23	17:09:01	45.2	45.4	45.1	44.8
2015/04/23	17:09:02	44.9	45.3	44.9	44.1
2015/04/23	17:09:03	44.9	45.1	44.8	44.3
2015/04/23	17:09:04	45.4	45.5	45.0	44.6
2015/04/23	17:09:05	45.0	45.2	45.0	44.5
2015/04/23	17:09:06	46.1	45.9	45.1	45.2
2015/04/23	17:09:07	46.7	47.0	45.9	45.1
2015/04/23	17:09:08	47.7	47.2	46.2	46.6

2015/04/23	17:09:09	45.7	47.2	46.3	45.4
2015/04/23	17:09:10	45.1	46.4	45.5	44.7
2015/04/23	17:09:11	45.8	45.9	45.3	44.3
2015/04/23	17:09:12	46.2	46.4	45.9	45.1
2015/04/23	17:09:13	47.2	46.9	45.9	45.4
2015/04/23	17:09:14	47.1	47.5	46.2	45.1
2015/04/23	17:09:15	46.1	47.0	46.2	44.8
2015/04/23	17:09:16	46.3	46.6	46.2	45.5
2015/04/23	17:09:17	46.1	46.6	46.2	45.4
2015/04/23	17:09:18	47.3	47.2	46.1	45.8
2015/04/23	17:09:19	46.1	46.7	46.3	45.5
2015/04/23	17:09:20	45.9	46.3	46.0	45.5
2015/04/23	17:09:21	45.7	46.0	45.7	45.4
2015/04/23	17:09:22	45.4	45.9	45.5	45.2
2015/04/23	17:09:23	46.4	46.2	45.4	44.5
2015/04/23	17:09:24	44.7	46.3	45.3	44.7
2015/04/23	17:09:25	44.5	45.3	44.8	44.0
2015/04/23	17:09:26	44.4	45.0	44.5	43.4
2015/04/23	17:09:27	44.5	44.6	44.3	43.7
2015/04/23	17:09:28	45.6	45.3	44.6	44.7
2015/04/23	17:09:29	45.4	45.7	45.2	44.6
2015/04/23	17:09:30	43.9	45.2	44.4	43.7
2015/04/23	17:09:31	44.0	44.5	44.1	43.4
2015/04/23	17:09:32	44.0	44.3	44.0	43.6
2015/04/23	17:09:33	43.9	44.0	43.9	43.6
2015/04/23	17:09:34	44.0	44.0	43.8	43.6
2015/04/23	17:09:35	45.3	45.0	44.0	44.2
2015/04/23	17:09:36	46.5	46.1	44.9	45.0
2015/04/23	17:09:37	46.9	46.8	46.0	46.0
2015/04/23	17:09:38	46.4	46.7	46.4	45.8
2015/04/23	17:09:39	46.9	46.8	46.5	46.6
2015/04/23	17:09:40	46.6	46.9	46.5	46.0
2015/04/23	17:09:41	46.3	46.7	45.9	44.9
2015/04/23	17:09:42	46.9	47.0	46.7	46.1
2015/04/23	17:09:43	47.5	47.4	46.7	46.4
2015/04/23	17:09:44	46.3	47.2	46.3	45.0
2015/04/23	17:09:45	47.4	47.3	46.9	46.7
2015/04/23	17:09:46	46.8	47.4	46.9	46.2
2015/04/23	17:09:47	47.1	47.3	46.8	45.7
2015/04/23	17:09:48	46.3	46.9	46.5	45.6
2015/04/23	17:09:49	47.8	47.5	46.5	46.6
2015/04/23	17:09:50	46.3	47.4	46.6	45.7
2015/04/23	17:09:51	48.5	48.0	46.6	45.7
2015/04/23	17:09:52	47.5	48.1	47.6	46.7
2015/04/23	17:09:53	45.8	47.7	46.5	45.2
2015/04/23	17:09:54	47.5	47.2	46.5	45.7
2015/04/23	17:09:55	47.6	47.6	47.2	46.7

2015/04/23	17:09:56	49.5	48.8	47.4	48.5
2015/04/23	17:09:57	47.4	48.7	47.9	46.7
2015/04/23	17:09:58	47.3	47.9	47.5	46.9
2015/04/23	17:09:59	48.7	48.5	47.5	47.4
2015/04/23	17:10:00	48.3	48.5	47.8	46.7
2015/04/23	17:10:01	46.6	48.2	47.3	45.6
2015/04/23	17:10:02	47.3	47.4	47.2	46.8
2015/04/23	17:10:03	46.4	47.5	46.7	45.3
2015/04/23	17:10:04	46.4	47.0	46.3	45.5
2015/04/23	17:10:05	45.4	46.4	45.7	44.7
2015/04/23	17:10:06	50.3	48.9	45.7	46.9
2015/04/23	17:10:07	51.4	51.1	49.0	48.7
2015/04/23	17:10:08	48.8	50.9	49.3	47.2
2015/04/23	17:10:09	46.3	49.2	47.6	45.8
2015/04/23	17:10:10	46.8	47.6	47.1	45.3
2015/04/23	17:10:11	47.5	47.7	47.1	46.7
2015/04/23	17:10:12	46.9	47.2	46.9	46.3
2015/04/23	17:10:13	48.0	47.9	47.1	47.1
2015/04/23	17:10:14	47.7	48.0	47.5	46.7
2015/04/23	17:10:15	46.7	47.5	47.0	45.9
2015/04/23	17:10:16	44.3	47.0	45.5	44.0
2015/04/23	17:10:17	45.6	45.7	45.2	44.1
2015/04/23	17:10:18	47.0	46.9	45.7	45.5
2015/04/23	17:10:19	44.8	46.4	45.5	44.0
2015/04/23	17:10:20	45.5	45.6	45.4	45.1
2015/04/23	17:10:21	46.7	46.5	45.5	45.7
2015/04/23	17:10:22	47.1	47.0	46.5	46.2
2015/04/23	17:10:23	46.6	46.9	46.6	46.0
2015/04/23	17:10:24	46.3	46.6	46.3	45.4
2015/04/23	17:10:25	45.7	46.4	46.0	45.1
2015/04/23	17:10:26	47.1	46.9	46.1	46.0
2015/04/23	17:10:27	47.0	47.1	46.7	46.0
2015/04/23	17:10:28	48.1	47.8	47.1	47.3
2015/04/23	17:10:29	46.8	47.6	47.1	45.9
2015/04/23	17:10:30	45.6	47.1	46.2	45.2
2015/04/23	17:10:31	47.3	47.0	46.3	46.6
2015/04/23	17:10:32	50.4	49.6	47.1	47.8
2015/04/23	17:10:33	50.4	50.1	48.9	47.8
2015/04/23	17:10:34	46.0	49.9	47.8	45.7
2015/04/23	17:10:35	45.8	47.8	46.8	44.9
2015/04/23	17:10:36	46.5	47.0	46.5	45.6
2015/04/23	17:10:37	46.7	46.7	46.3	45.4
2015/04/23	17:10:38	48.9	48.3	46.8	47.8
2015/04/23	17:10:39	47.3	48.1	47.4	46.4
2015/04/23	17:10:40	50.3	49.7	47.7	48.3
2015/04/23	17:10:41	51.7	51.1	49.7	50.4
2015/04/23	17:10:42	50.7	51.2	50.8	49.8

2015/04/23	17:10:43	49.0	50.8	49.7	48.2
2015/04/23	17:10:44	50.0	50.1	49.4	48.6
2015/04/23	17:10:45	50.0	50.3	49.9	49.3
2015/04/23	17:10:46	52.4	52.1	49.8	49.0
2015/04/23	17:10:47	49.5	51.6	50.2	48.3
2015/04/23	17:10:48	48.6	50.1	49.3	47.4
2015/04/23	17:10:49	48.1	49.3	48.4	47.2
2015/04/23	17:10:50	47.3	48.4	47.8	46.8
2015/04/23	17:10:51	50.7	50.2	47.9	48.3
2015/04/23	17:10:52	50.1	50.2	49.7	48.9
2015/04/23	17:10:53	49.9	50.2	49.7	49.0
2015/04/23	17:10:54	51.6	51.1	50.2	51.0
2015/04/23	17:10:55	50.5	51.2	50.6	49.3
2015/04/23	17:10:56	47.4	50.6	48.8	46.2
2015/04/23	17:10:57	46.1	48.8	47.4	45.5
2015/04/23	17:10:58	47.5	47.5	47.3	47.0
2015/04/23	17:10:59	47.0	47.5	47.1	46.5
2015/04/23	17:11:00	49.1	48.7	47.1	47.4
2015/04/23	17:11:01	49.1	49.0	48.7	48.3
2015/04/23	17:11:02	50.7	50.2	48.9	48.9
2015/04/23	17:11:03	50.5	50.7	50.2	49.6
2015/04/23	17:11:04	48.9	50.3	49.4	48.2
2015/04/23	17:11:05	48.2	49.3	48.6	47.7
2015/04/23	17:11:06	48.3	48.6	48.3	47.1
2015/04/23	17:11:07	50.5	49.9	48.5	48.8
2015/04/23	17:11:08	49.3	50.0	49.4	48.6
2015/04/23	17:11:09	50.2	50.1	49.4	49.1
2015/04/23	17:11:10	49.4	50.0	49.6	49.1
2015/04/23	17:11:11	48.3	49.6	48.9	47.8
2015/04/23	17:11:12	49.0	49.2	48.5	47.8
2015/04/23	17:11:13	47.7	49.0	48.3	47.0
2015/04/23	17:11:14	50.3	49.8	48.4	48.8
2015/04/23	17:11:15	51.6	51.1	49.8	50.6
2015/04/23	17:11:16	50.5	51.2	50.7	49.9
2015/04/23	17:11:17	49.9	50.7	50.2	49.5
2015/04/23	17:11:18	49.5	50.2	49.7	49.1
2015/04/23	17:11:19	51.0	50.6	49.7	49.8
2015/04/23	17:11:20	50.1	50.5	50.1	49.0
2015/04/23	17:11:21	49.5	50.4	49.8	49.2
2015/04/23	17:11:22	49.5	49.8	49.4	48.4
2015/04/23	17:11:23	49.6	49.7	49.4	48.8
2015/04/23	17:11:24	50.6	50.3	49.7	50.3
2015/04/23	17:11:25	51.3	51.0	50.2	50.1
2015/04/23	17:11:26	53.1	52.4	51.1	52.2
2015/04/23	17:11:27	50.7	52.4	51.3	49.6
2015/04/23	17:11:28	52.0	51.9	51.0	50.2
2015/04/23	17:11:29	51.4	51.9	51.5	51.0

2015/04/23	17:11:30	50.9	51.7	51.0	49.8
2015/04/23	17:11:31	50.7	51.2	50.8	49.6
2015/04/23	17:11:32	50.4	51.0	50.5	49.8
2015/04/23	17:11:33	49.7	50.5	49.9	48.8
2015/04/23	17:11:34	48.8	50.2	49.2	47.7
2015/04/23	17:11:35	47.4	49.2	48.2	47.0
2015/04/23	17:11:36	46.4	48.2	47.2	46.1
2015/04/23	17:11:37	47.2	47.5	47.1	46.4
2015/04/23	17:11:38	46.3	47.1	46.5	45.3
2015/04/23	17:11:39	46.4	46.9	46.4	45.3
2015/04/23	17:11:40	45.7	46.3	45.9	45.0
2015/04/23	17:11:41	47.2	47.0	46.1	46.2
2015/04/23	17:11:42	46.4	46.7	46.4	45.5
2015/04/23	17:11:43	46.4	46.9	46.3	45.1
2015/04/23	17:11:44	46.9	46.9	46.1	45.5
2015/04/23	17:11:45	45.8	46.9	46.2	45.1
2015/04/23	17:11:46	47.2	47.0	46.2	46.4
2015/04/23	17:11:47	46.3	46.8	46.5	45.8
2015/04/23	17:11:48	46.0	46.6	46.1	45.1
2015/04/23	17:11:49	46.9	46.7	46.1	45.7
2015/04/23	17:11:50	46.0	46.7	46.3	45.4
2015/04/23	17:11:51	45.7	46.5	45.8	44.5
2015/04/23	17:11:52	45.4	45.8	45.5	44.9
2015/04/23	17:11:53	45.4	45.5	45.2	44.6
2015/04/23	17:11:54	46.0	46.0	45.5	45.4
2015/04/23	17:11:55	46.0	46.0	45.7	45.4
2015/04/23	17:11:56	46.1	46.2	46.0	45.9
2015/04/23	17:11:57	45.4	46.0	45.6	44.9
2015/04/23	17:11:58	46.2	46.1	45.5	44.8
2015/04/23	17:11:59	45.5	46.1	45.7	44.9
2015/04/23	17:12:00	45.5	45.9	45.4	44.8
2015/04/23	17:12:01	45.5	45.8	45.3	44.4
2015/04/23	17:12:02	45.9	46.0	45.6	45.4
2015/04/23	17:12:03	47.0	46.5	45.8	45.5
2015/04/23	17:12:04	46.3	46.6	46.2	45.4
2015/04/23	17:12:05	45.7	46.5	45.9	44.9
2015/04/23	17:12:06	46.4	46.3	45.8	45.6
2015/04/23	17:12:07	47.1	46.8	46.4	46.6
2015/04/23	17:12:08	47.7	47.4	46.7	46.5
2015/04/23	17:12:09	48.8	48.4	47.4	47.8
2015/04/23	17:12:10	49.2	48.9	48.4	48.8
2015/04/23	17:12:11	48.6	48.9	48.7	48.1
2015/04/23	17:12:12	49.0	49.1	48.6	48.0
2015/04/23	17:12:13	47.3	48.8	48.0	46.4
2015/04/23	17:12:14	47.4	48.0	47.5	46.6
2015/04/23	17:12:15	46.1	47.8	46.7	45.3
2015/04/23	17:12:16	44.7	46.7	45.5	44.3

2015/04/23	17:12:17	46.6	46.4	45.4	44.6
2015/04/23	17:12:18	48.1	47.5	46.4	47.5
2015/04/23	17:12:19	46.1	47.4	46.6	45.4
2015/04/23	17:12:20	45.5	46.6	46.0	44.9
2015/04/23	17:12:21	45.1	46.0	45.4	44.8
2015/04/23	17:12:22	46.0	45.9	45.3	44.7
2015/04/23	17:12:23	45.6	45.9	45.6	45.3
2015/04/23	17:12:24	46.0	45.9	45.6	45.5
2015/04/23	17:12:25	46.8	46.6	46.0	46.2
2015/04/23	17:12:26	47.6	47.3	46.6	47.1
2015/04/23	17:12:27	46.8	47.4	46.9	46.3
2015/04/23	17:12:28	46.7	47.0	46.7	46.3
2015/04/23	17:12:29	48.1	47.7	46.8	46.9
2015/04/23	17:12:30	48.0	48.0	47.7	47.6
2015/04/23	17:12:31	47.9	48.0	47.7	47.1
2015/04/23	17:12:32	49.3	48.8	47.9	48.3
2015/04/23	17:12:33	48.3	48.9	48.5	47.9
2015/04/23	17:12:34	50.5	50.0	48.4	47.8
2015/04/23	17:12:35	50.9	50.7	50.0	50.2
2015/04/23	17:12:36	49.8	50.9	49.9	48.3
2015/04/23	17:12:37	48.4	49.9	49.0	48.0
2015/04/23	17:12:38	49.2	49.2	48.8	48.4
2015/04/23	17:12:39	50.8	50.4	49.2	50.1
2015/04/23	17:12:40	48.1	50.3	49.1	47.6
2015/04/23	17:12:41	48.5	49.1	48.6	47.7
2015/04/23	17:12:42	48.8	48.9	48.8	48.4
2015/04/23	17:12:43	49.5	49.3	48.8	48.9
2015/04/23	17:12:44	50.2	50.0	49.3	49.7
2015/04/23	17:12:45	48.1	49.8	48.8	47.7
2015/04/23	17:12:46	48.6	48.8	48.5	48.1
2015/04/23	17:12:47	48.6	48.8	48.6	48.2
2015/04/23	17:12:48	46.3	48.6	47.2	45.4
2015/04/23	17:12:49	45.9	47.2	46.4	45.4
2015/04/23	17:12:50	45.5	46.4	45.8	44.7
2015/04/23	17:12:51	44.6	45.9	45.0	43.9
2015/04/23	17:12:52	44.8	45.3	44.9	44.3
2015/04/23	17:12:53	46.3	45.9	45.0	45.2
2015/04/23	17:12:54	45.5	45.9	45.6	44.9
2015/04/23	17:12:55	45.6	45.7	45.3	44.8
2015/04/23	17:12:56	44.9	45.7	45.2	44.5
2015/04/23	17:12:57	45.2	45.3	45.0	44.5
2015/04/23	17:12:58	44.7	45.3	44.9	44.5
2015/04/23	17:12:59	44.5	44.9	44.6	43.9
2015/04/23	17:13:00	44.6	44.8	44.5	44.0
2015/04/23	17:13:01	44.9	45.1	44.1	43.5
2015/04/23	17:13:02	44.0	45.0	44.4	43.8
2015/04/23	17:13:03	45.4	45.4	44.3	44.0

2015/04/23	17:13:04	44.7	45.0	44.8	44.2
2015/04/23	17:13:05	45.3	45.1	44.8	44.7
2015/04/23	17:13:06	45.8	45.6	45.1	45.2
2015/04/23	17:13:07	46.4	46.2	45.5	45.6
2015/04/23	17:13:08	46.6	46.5	46.1	46.1
2015/04/23	17:13:09	46.3	46.6	46.3	45.9
2015/04/23	17:13:10	45.5	46.5	45.7	44.7
2015/04/23	17:13:11	45.4	45.8	45.4	44.8
2015/04/23	17:13:12	45.2	45.4	45.1	44.5
2015/04/23	17:13:13	44.4	45.4	44.8	44.0
2015/04/23	17:13:14	44.6	44.8	44.5	44.0
2015/04/23	17:13:15	45.0	45.0	44.7	44.6
2015/04/23	17:13:16	45.5	45.3	44.9	44.9
2015/04/23	17:13:17	44.9	45.3	45.0	44.4
2015/04/23	17:13:18	44.9	45.3	44.8	44.4
2015/04/23	17:13:19	45.3	45.2	44.8	44.8
2015/04/23	17:13:20	44.5	45.1	44.7	44.4
2015/04/23	17:13:21	45.0	45.0	44.7	44.5
2015/04/23	17:13:22	45.3	45.3	45.0	44.8
2015/04/23	17:13:23	44.7	45.1	44.9	44.5
2015/04/24	17:13:24	45.4	45.3	44.8	44.6
2015/04/25	17:13:25	45.5	45.5	45.1	44.9
2015/04/26	17:13:26	45.2	45.5	45.3	45.0
2015/04/27	17:13:27	44.9	45.3	44.9	44.4
2015/04/28	17:13:28	44.8	45.1	44.8	44.4
2015/04/29	17:13:29	44.7	44.9	44.6	44.2
2015/04/30	17:13:30	45.5	45.3	45.0	44.7
2015/05/01	17:13:31	46.3	45.9	45.2	45.7
2015/05/02	17:13:31	0.0	0.0	0.0	0.0

NOISE MEASUREMENT LOCATION 2

Date	Time	LAeq	LASmax	LASmin	LAF90.00
2015/04/23	15:57:36	0.0	0.0	0.0	0.0
2015/04/23	16:09:41	0.0	0.0	0.0	0.0
2015/04/23	16:09:41	45.2	45.9	45.7	45.1
2015/04/23	16:09:42	45.0	45.8	45.3	44.7
2015/04/23	16:09:43	44.5	45.3	44.8	44.3
2015/04/23	16:09:44	45.2	45.1	44.8	44.8
2015/04/23	16:09:45	45.5	45.5	44.7	44.2
2015/04/23	16:09:46	46.1	45.9	45.6	45.1
2015/04/23	16:09:47	45.7	46.0	45.7	45.4
2015/04/23	16:09:48	45.9	46.0	45.7	45.2
2015/04/23	16:09:49	45.6	46.0	45.6	45.0
2015/04/23	16:09:50	47.8	47.2	45.6	45.4
2015/04/23	16:09:51	48.3	48.4	46.7	46.0
2015/04/23	16:09:52	47.3	47.8	47.4	46.7
2015/04/23	16:09:53	47.0	47.4	46.9	45.8
2015/04/23	16:09:54	46.0	47.3	46.5	45.4
2015/04/23	16:09:55	46.6	46.7	46.2	45.1
2015/04/23	16:09:56	48.2	47.8	46.8	47.4
2015/04/23	16:09:57	50.9	50.1	47.9	50.1
2015/04/23	16:09:58	50.5	50.6	50.1	48.8
2015/04/23	16:09:59	49.4	50.1	49.6	48.6
2015/04/23	16:10:00	49.2	49.8	49.4	48.7
2015/04/23	16:10:01	49.0	49.5	49.1	48.6
2015/04/23	16:10:02	48.5	49.1	48.6	47.9
2015/04/23	16:10:03	53.1	52.2	48.8	49.8
2015/04/23	16:10:04	52.3	52.7	52.0	50.0
2015/04/23	16:10:05	48.6	52.0	50.2	48.3
2015/04/23	16:10:06	46.9	50.1	48.4	46.6
2015/04/23	16:10:07	49.1	48.9	48.4	47.6
2015/04/23	16:10:08	48.6	48.9	48.3	47.4
2015/04/23	16:10:09	53.5	52.7	48.9	50.1
2015/04/23	16:10:10	48.9	52.6	50.7	48.2
2015/04/23	16:10:11	54.7	54.2	50.6	49.6
2015/04/23	16:10:12	55.0	55.4	54.2	51.6
2015/04/23	16:10:13	51.3	54.3	52.8	50.3
2015/04/23	16:10:14	55.0	54.6	52.6	52.2
2015/04/23	16:10:15	53.8	54.8	54.0	52.7
2015/04/23	16:10:16	50.4	53.9	52.0	49.6
2015/04/23	16:10:17	48.4	52.0	50.1	48.0
2015/04/23	16:10:18	46.6	50.1	48.2	45.8
2015/04/23	16:10:19	46.0	48.2	47.0	45.7
2015/04/23	16:10:20	46.2	46.9	46.5	45.8
2015/04/23	16:10:21	48.2	47.9	46.4	45.8
2015/04/23	16:10:22	49.4	49.0	48.0	48.9
2015/04/23	16:10:23	47.3	48.9	47.9	46.6
2015/04/23	16:10:24	46.2	47.9	46.9	45.8
2015/04/23	16:10:25	45.5	47.0	46.1	44.9

2015/04/23	16:10:26	44.7	46.0	45.2	44.3
2015/04/23	16:10:27	44.4	45.2	44.7	44.0
2015/04/23	16:10:28	43.9	44.8	44.2	43.6
2015/04/23	16:10:29	44.3	44.3	44.2	43.9
2015/04/23	16:10:30	44.8	44.7	44.2	44.2
2015/04/23	16:10:31	46.7	46.1	44.7	45.7
2015/04/23	16:10:32	45.7	46.0	45.8	45.5
2015/04/23	16:10:33	45.7	46.0	45.7	45.4
2015/04/23	16:10:34	47.0	46.8	45.6	45.3
2015/04/23	16:10:35	47.6	47.4	46.8	46.9
2015/04/23	16:10:36	45.4	47.2	46.1	44.9
2015/04/23	16:10:37	45.6	46.2	45.8	45.2
2015/04/23	16:10:38	51.4	50.9	45.5	44.8
2015/04/23	16:10:39	47.6	50.6	48.9	46.1
2015/04/23	16:10:40	47.2	49.2	47.8	46.1
2015/04/23	16:10:41	46.2	47.7	46.7	45.1
2015/04/23	16:10:42	44.9	47.0	45.7	44.5
2015/04/23	16:10:43	44.7	45.7	45.1	44.2
2015/04/23	16:10:44	45.3	45.3	45.1	44.8
2015/04/23	16:10:45	45.1	45.4	45.2	44.9
2015/04/23	16:10:46	45.5	45.4	45.1	44.9
2015/04/23	16:10:47	45.9	45.9	45.4	45.1
2015/04/23	16:10:48	45.0	45.7	45.2	44.4
2015/04/23	16:10:49	44.6	45.2	44.8	44.4
2015/04/23	16:10:50	44.6	44.8	44.6	44.0
2015/04/23	16:10:51	45.4	45.2	44.7	45.0
2015/04/23	16:10:52	45.5	45.4	45.2	44.9
2015/04/23	16:10:53	45.6	45.5	45.3	45.3
2015/04/23	16:10:54	46.8	46.3	45.5	46.3
2015/04/23	16:10:55	46.8	46.9	46.1	45.9
2015/04/23	16:10:56	49.0	49.0	46.2	44.9
2015/04/23	16:10:57	46.1	48.0	46.8	44.5
2015/04/23	16:10:58	44.1	46.9	45.4	44.0
2015/04/23	16:10:59	44.0	45.4	44.6	43.8
2015/04/23	16:11:00	44.3	44.6	44.4	44.0
2015/04/23	16:11:01	45.9	45.5	44.4	44.6
2015/04/23	16:11:02	46.7	46.3	45.5	46.3
2015/04/23	16:11:03	46.7	46.6	46.3	46.4
2015/04/23	16:11:04	45.8	46.6	46.0	45.3
2015/04/23	16:11:05	45.2	46.0	45.5	44.9
2015/04/23	16:11:06	45.3	45.5	45.2	44.5
2015/04/23	16:11:07	45.2	45.5	45.2	44.6
2015/04/23	16:11:08	45.1	45.3	45.1	44.6
2015/04/23	16:11:09	44.8	45.2	44.9	44.6
2015/04/23	16:11:10	44.8	44.9	44.8	44.6
2015/04/23	16:11:11	44.7	44.9	44.7	44.4
2015/04/23	16:11:12	44.5	44.8	44.5	44.2

2015/04/23	16:11:13	44.0	44.6	44.2	43.8
2015/04/23	16:11:14	43.8	44.2	43.9	43.5
2015/04/23	16:11:15	43.8	44.0	43.9	43.6
2015/04/23	16:11:16	44.2	44.1	43.8	43.7
2015/04/23	16:11:17	44.0	44.1	43.9	43.7
2015/04/23	16:11:18	43.9	44.1	43.9	43.7
2015/04/23	16:11:19	43.7	43.9	43.8	43.5
2015/04/23	16:11:20	43.7	43.8	43.7	43.5
2015/04/23	16:11:21	44.1	44.0	43.7	43.7
2015/04/23	16:11:22	45.2	44.8	44.0	44.6
2015/04/23	16:11:23	45.4	45.2	44.8	45.1
2015/04/23	16:11:24	45.7	45.5	45.2	45.5
2015/04/23	16:11:25	45.9	45.8	45.5	45.6
2015/04/23	16:11:26	45.4	45.7	45.5	45.1
2015/04/23	16:11:27	45.2	45.5	45.3	44.9
2015/04/23	16:11:28	47.5	47.0	45.4	45.4
2015/04/23	16:11:29	45.7	47.0	46.1	45.0
2015/04/23	16:11:30	45.0	46.1	45.5	44.8
2015/04/23	16:11:31	44.9	45.5	45.0	44.4
2015/04/23	16:11:32	44.9	45.2	44.9	44.5
2015/04/23	16:11:33	44.8	45.1	44.9	44.5
2015/04/23	16:11:34	45.0	45.0	44.9	44.7
2015/04/23	16:11:35	45.0	45.0	44.9	44.7
2015/04/23	16:11:36	45.0	45.1	44.9	44.6
2015/04/23	16:11:37	44.7	45.0	44.8	44.3
2015/04/23	16:11:38	45.2	45.1	44.8	44.9
2015/04/23	16:11:39	45.5	45.4	45.0	45.0
2015/04/23	16:11:40	45.2	45.5	45.2	44.6
2015/04/23	16:11:41	44.9	45.2	44.9	44.4
2015/04/23	16:11:42	44.8	45.0	44.8	44.3
2015/04/23	16:11:43	44.9	45.0	44.8	44.5
2015/04/23	16:11:44	45.1	45.1	44.8	44.6
2015/04/23	16:11:45	45.1	45.2	45.0	44.7
2015/04/23	16:11:46	45.0	45.1	44.9	44.5
2015/04/23	16:11:47	45.4	45.3	45.0	45.1
2015/04/23	16:11:48	46.1	45.9	45.3	45.4
2015/04/23	16:11:49	46.1	46.0	45.9	45.8
2015/04/23	16:11:50	46.2	46.2	46.0	46.0
2015/04/23	16:11:51	46.1	46.2	46.1	45.9
2015/04/23	16:11:52	45.9	46.2	45.9	45.6
2015/04/23	16:11:53	45.9	46.0	45.9	45.7
2015/04/23	16:11:54	46.6	46.4	45.9	46.0
2015/04/23	16:11:55	46.4	46.4	46.3	46.1
2015/04/23	16:11:56	46.9	46.7	46.4	46.6
2015/04/23	16:11:57	46.7	46.8	46.7	46.5
2015/04/23	16:11:58	46.6	46.7	46.6	46.4
2015/04/23	16:11:59	46.3	46.6	46.3	46.0

2015/04/23	16:12:00	47.0	46.9	46.4	46.5
2015/04/23	16:12:01	46.2	46.8	46.4	45.7
2015/04/23	16:12:02	46.4	46.7	46.4	45.8
2015/04/23	16:12:03	46.2	46.4	46.1	45.7
2015/04/23	16:12:04	46.9	46.7	46.4	46.5
2015/04/23	16:12:05	46.4	46.7	46.5	46.1
2015/04/23	16:12:06	46.6	46.7	46.4	45.9
2015/04/23	16:12:07	46.1	46.5	46.3	45.8
2015/04/23	16:12:08	46.3	46.5	46.0	45.4
2015/04/23	16:12:09	46.6	46.7	46.5	46.3
2015/04/23	16:12:10	45.9	46.6	46.1	45.5
2015/04/23	16:12:11	46.3	46.3	46.1	45.8
2015/04/23	16:12:12	46.8	46.7	46.2	46.1
2015/04/23	16:12:13	46.4	46.6	46.4	46.0
2015/04/23	16:12:14	48.6	48.1	46.5	47.0
2015/04/23	16:12:15	48.2	48.3	48.0	47.5
2015/04/23	16:12:16	50.6	50.1	48.0	48.1
2015/04/23	16:12:17	51.3	51.5	49.6	47.6
2015/04/23	16:12:18	50.6	50.7	49.6	47.7
2015/04/23	16:12:19	48.8	51.2	49.4	47.1
2015/04/23	16:12:20	46.9	49.3	48.1	46.1
2015/04/23	16:12:21	47.3	48.1	47.5	46.5
2015/04/23	16:12:22	46.1	47.5	46.7	45.8
2015/04/23	16:12:23	45.5	46.7	46.0	45.2
2015/04/23	16:12:24	45.5	46.0	45.7	45.1
2015/04/23	16:12:25	46.7	46.5	45.6	45.2
2015/04/23	16:12:26	46.1	46.3	46.0	45.3
2015/04/23	16:12:27	46.1	46.3	46.1	45.7
2015/04/23	16:12:28	44.8	46.1	45.3	44.3
2015/04/23	16:12:29	45.2	45.3	45.2	44.8
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2015/04/23	16:12:32	45.8	45.9	45.6	45.0
2015/04/23	16:12:33	47.4	47.1	45.8	46.0
2015/04/23	16:12:34	45.4	47.0	46.0	44.7
2015/04/23	16:12:35	45.6	46.0	45.5	44.6
2015/04/23	16:12:36	46.0	46.1	45.8	45.5
2015/04/23	16:12:37	46.5	46.4	45.8	45.6
2015/04/23	16:12:38	47.6	47.3	46.4	47.1
2015/04/23	16:12:39	46.5	47.4	46.7	45.5
2015/04/23	16:12:40	45.5	46.7	46.0	45.2
2015/04/23	16:12:41	46.9	46.7	46.0	46.2
2015/04/23	16:12:42	46.5	46.6	46.2	45.7
2015/04/23	16:12:43	47.5	47.2	46.6	46.8
2015/04/23	16:12:44	47.4	47.4	46.9	46.4
2015/04/23	16:12:45	46.6	47.3	46.8	46.1
2015/04/23	16:12:46	46.9	47.0	46.7	46.1

2015/04/23	16:12:47	48.1	47.7	47.0	47.7
2015/04/23	16:12:48	48.0	48.4	47.7	46.7
2015/04/23	16:12:49	45.9	47.7	46.7	45.7
2015/04/23	16:12:50	47.2	47.1	46.6	46.2
2015/04/23	16:12:51	46.3	47.1	46.5	45.8
2015/04/23	16:12:52	47.4	47.3	46.4	46.2
2015/04/23	16:12:53	46.7	47.5	46.8	46.0
2015/04/23	16:12:54	45.9	46.8	46.3	45.6
2015/04/23	16:12:55	45.2	46.3	45.6	44.9
2015/04/23	16:12:56	45.6	45.6	45.5	45.2
2015/04/23	16:12:57	45.1	45.7	45.2	44.9
2015/04/23	16:12:58	44.6	45.2	44.8	44.2
2015/04/23	16:12:59	44.5	44.8	44.6	43.9
2015/04/23	16:13:00	44.3	44.7	44.4	44.1
2015/04/23	16:13:01	44.4	44.5	44.3	44.1
2015/04/23	16:13:02	45.2	44.9	44.5	45.0
2015/04/23	16:13:03	44.9	45.0	44.8	44.6
2015/04/23	16:13:04	45.2	45.1	44.9	45.0
2015/04/23	16:13:05	44.3	45.1	44.6	44.0
2015/04/23	16:13:06	44.0	44.6	44.2	43.8
2015/04/23	16:13:07	43.9	44.2	43.9	43.6
2015/04/23	16:13:08	44.2	44.2	44.0	43.7
2015/04/23	16:13:09	44.2	44.2	44.1	44.0
2015/04/23	16:13:10	44.5	44.4	44.2	44.2
2015/04/23	16:13:11	44.8	44.6	44.4	44.4
2015/04/23	16:13:12	45.1	45.0	44.6	44.9
2015/04/23	16:13:13	45.2	45.3	44.9	44.6
2015/04/23	16:13:14	44.6	45.0	44.7	44.0
2015/04/23	16:13:15	45.2	45.1	44.8	44.9
2015/04/23	16:13:16	45.9	45.6	45.1	45.4
2015/04/23	16:13:17	46.7	46.4	45.6	45.7
2015/04/23	16:13:18	47.1	46.9	46.4	46.7
2015/04/23	16:13:19	46.7	46.8	46.5	46.2
2015/04/23	16:13:20	47.0	47.3	46.8	45.7
2015/04/23	16:13:21	45.6	46.8	46.1	45.4
2015/04/23	16:13:22	45.8	46.1	45.9	45.5
2015/04/23	16:13:23	46.8	46.8	45.6	44.9
2015/04/23	16:13:24	46.4	47.0	46.5	45.8
2015/04/23	16:13:25	46.0	46.5	46.1	45.2
2015/04/23	16:13:26	45.1	46.1	45.6	44.8
2015/04/23	16:13:27	49.9	49.4	45.3	44.7
2015/04/23	16:13:28	46.5	49.4	47.7	45.4
2015/04/23	16:13:29	46.1	47.7	46.8	45.6
2015/04/23	16:13:30	45.1	46.8	45.7	44.4
2015/04/23	16:13:31	47.1	46.7	45.7	45.4
2015/04/23	16:13:32	46.1	46.7	46.3	45.9
2015/04/23	16:13:33	45.8	46.3	46.0	45.5

2015/04/23	16:13:34	45.7	46.0	45.8	45.4
2015/04/23	16:13:35	45.0	45.8	45.4	44.9
2015/04/23	16:13:36	45.8	45.7	45.3	45.0
2015/04/23	16:13:37	46.7	46.4	45.7	46.2
2015/04/23	16:13:38	46.2	46.5	46.2	45.8
2015/04/23	16:13:39	45.0	46.2	45.4	44.5
2015/04/23	16:13:40	44.5	45.4	44.8	44.1
2015/04/23	16:13:41	44.2	44.8	44.4	43.9
2015/04/23	16:13:42	45.0	44.9	44.5	44.8
2015/04/23	16:13:43	45.0	45.0	44.7	44.4
2015/04/23	16:13:44	43.7	45.0	44.2	43.3
2015/04/23	16:13:45	44.1	44.3	43.9	43.1
2015/04/23	16:13:46	43.7	44.2	43.9	43.4
2015/04/23	16:13:47	43.8	43.9	43.8	43.5
2015/04/23	16:13:48	43.7	43.9	43.7	43.6
2015/04/23	16:13:49	43.9	43.9	43.8	43.7
2015/04/23	16:13:50	43.9	43.9	43.8	43.6
2015/04/23	16:13:51	44.0	44.0	43.9	43.8
2015/04/23	16:13:52	45.9	45.2	43.9	44.5
2015/04/23	16:13:53	43.9	45.1	44.4	43.8
2015/04/23	16:13:54	44.0	44.3	44.1	43.7
2015/04/23	16:13:55	43.9	44.1	43.9	43.6
2015/04/23	16:13:56	44.3	44.2	44.0	44.1
2015/04/23	16:13:57	44.0	44.3	44.1	43.6
2015/04/23	16:13:58	44.3	44.2	44.0	43.9
2015/04/23	16:13:59	45.2	44.9	44.2	44.8
2015/04/23	16:14:00	45.5	45.3	44.9	45.2
2015/04/23	16:14:01	45.7	45.8	45.3	45.1
2015/04/23	16:14:02	45.2	45.5	45.3	44.9
2015/04/23	16:14:03	45.8	45.7	45.3	45.4
2015/04/23	16:14:04	45.7	45.8	45.4	44.9
2015/04/23	16:14:05	47.2	46.8	45.8	46.5
2015/04/23	16:14:06	49.9	49.3	46.8	47.4
2015/04/23	16:14:07	47.8	49.4	48.4	47.6
2015/04/23	16:14:08	48.6	48.7	48.0	46.9
2015/04/23	16:14:09	49.7	49.4	48.8	48.5
2015/04/23	16:14:10	49.4	49.8	49.1	47.9
2015/04/23	16:14:11	48.6	49.4	48.6	47.7
2015/04/23	16:14:12	47.3	48.6	47.8	46.6
2015/04/23	16:14:13	49.2	48.8	47.9	48.2
2015/04/23	16:14:14	48.3	48.8	48.5	48.0
2015/04/23	16:14:15	49.8	49.4	48.5	48.7
2015/04/23	16:14:16	52.2	51.6	49.4	50.2
2015/04/23	16:14:17	49.8	51.4	50.4	49.3
2015/04/23	16:14:18	54.8	54.1	50.6	51.2
2015/04/23	16:14:19	56.2	55.7	54.1	55.5
2015/04/23	16:14:20	51.9	55.5	53.6	51.6

2015/04/23	16:14:21	49.5	53.6	51.5	49.0
2015/04/23	16:14:22	47.7	51.5	49.5	47.2
2015/04/23	16:14:23	48.7	49.5	49.0	47.7
2015/04/23	16:14:24	46.0	49.0	47.3	45.2
2015/04/23	16:14:25	46.4	47.3	46.8	45.7
2015/04/23	16:14:26	45.9	46.8	46.2	45.5
2015/04/23	16:14:27	45.1	46.3	45.5	44.6
2015/04/23	16:14:28	44.4	45.5	44.8	44.2
2015/04/23	16:14:29	44.6	44.8	44.6	44.1
2015/04/23	16:14:30	44.6	44.8	44.5	44.1
2015/04/23	16:14:31	46.1	45.6	44.7	45.1
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2015/04/23	16:14:33	45.7	46.5	45.9	45.0
2015/04/23	16:14:34	46.3	46.4	46.0	45.6
2015/04/23	16:14:35	45.5	46.2	45.6	44.8
2015/04/23	16:14:36	45.0	45.8	45.3	44.8
2015/04/23	16:14:37	45.4	45.5	45.2	44.7
2015/04/23	16:14:38	44.8	45.7	44.9	44.0
2015/04/23	16:14:39	44.2	44.9	44.5	44.0
2015/04/23	16:14:40	44.6	44.8	44.5	44.1
2015/04/23	16:14:41	43.9	44.5	44.1	43.7
2015/04/23	16:14:42	43.7	44.1	43.8	43.5
2015/04/23	16:14:43	43.9	43.9	43.8	43.6
2015/04/23	16:14:44	43.9	43.9	43.8	43.7
2015/04/23	16:14:45	44.3	44.1	43.9	43.8
2015/04/23	16:14:46	44.6	44.5	44.1	44.1
2015/04/23	16:14:47	45.4	45.1	44.5	45.1
2015/04/23	16:14:48	45.5	45.4	45.1	45.1
2015/04/23	16:14:49	46.0	45.8	45.3	45.4
2015/04/23	16:14:50	46.2	46.2	45.8	45.8
2015/04/23	16:14:51	45.1	45.9	45.5	44.9
2015/04/23	16:14:52	44.5	45.5	44.9	44.1
2015/04/23	16:14:53	45.1	45.1	44.9	44.8
2015/04/23	16:14:54	44.0	45.0	44.4	43.8
2015/04/23	16:14:55	44.1	44.4	44.2	43.7
2015/04/23	16:14:56	44.8	44.7	44.2	44.2
2015/04/23	16:14:57	44.3	44.6	44.4	43.9
2015/04/23	16:14:58	43.4	44.4	43.7	42.6
2015/04/23	16:14:59	43.8	43.9	43.7	43.2
2015/04/23	16:15:00	43.5	43.7	43.5	43.0
2015/04/23	16:15:01	43.6	43.7	43.6	43.4
2015/04/23	16:15:02	43.9	43.8	43.6	43.5
2015/04/23	16:15:03	43.9	43.9	43.8	43.7
2015/04/23	16:15:04	43.9	44.0	43.8	43.7
2015/04/23	16:15:05	44.2	44.2	43.9	43.9
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2015/04/23	16:15:10	47.2	47.4	47.1	46.6
2015/04/23	16:15:11	47.3	47.3	47.2	47.0
2015/04/23	16:15:12	46.1	47.2	46.6	45.8
2015/04/23	16:15:13	45.1	46.6	45.7	44.8
2015/04/23	16:15:14	44.4	45.7	44.9	43.8
2015/04/23	16:15:15	43.9	44.8	44.3	43.7
2015/04/23	16:15:16	44.4	44.4	44.1	43.6
2015/04/23	16:15:17	44.8	44.7	44.3	44.3
2015/04/23	16:15:18	44.8	44.8	44.6	44.5
2015/04/23	16:15:19	46.2	45.7	44.8	45.4
2015/04/23	16:15:20	45.5	45.8	45.6	45.4
2015/04/23	16:15:21	45.6	45.7	45.5	45.4
2015/04/23	16:15:22	45.1	45.6	45.2	44.9
2015/04/23	16:15:23	44.8	45.3	45.0	44.4
2015/04/23	16:15:24	44.3	45.0	44.5	44.0
2015/04/23	16:15:25	44.0	44.6	44.2	43.8
2015/04/23	16:15:26	43.6	44.2	43.8	43.4
2015/04/23	16:15:27	43.9	43.9	43.8	43.4
2015/04/23	16:15:28	44.8	44.6	43.9	44.1
2015/04/23	16:15:29	47.4	46.5	44.5	45.9
2015/04/23	16:15:30	45.0	46.6	45.5	43.8
2015/04/23	16:15:31	45.2	45.4	45.2	44.6
2015/04/23	16:15:32	44.8	45.4	45.0	44.5
2015/04/23	16:15:33	44.6	45.0	44.7	44.4
2015/04/23	16:15:34	46.2	45.9	44.8	44.9
2015/04/23	16:15:35	46.9	46.5	45.9	46.5
2015/04/23	16:15:36	47.4	47.2	46.4	46.3
2015/04/23	16:15:37	50.2	49.5	47.2	48.0
2015/04/23	16:15:38	47.6	49.5	48.4	47.3
2015/04/23	16:15:39	46.4	48.5	47.2	45.6
2015/04/23	16:15:40	45.8	47.1	46.4	45.4
2015/04/23	16:15:41	46.6	46.7	46.2	45.8
2015/04/23	16:15:42	47.5	47.3	46.6	46.6
2015/04/23	16:15:43	47.4	47.6	47.2	46.6
2015/04/23	16:15:44	47.7	47.7	47.3	47.2
2015/04/23	16:15:45	47.1	47.5	46.8	45.5
2015/04/23	16:15:46	47.6	47.9	47.4	46.5
2015/04/23	16:15:47	46.1	47.5	46.6	45.8
2015/04/23	16:15:48	47.6	47.3	46.6	47.0
2015/04/23	16:15:49	47.7	47.7	47.0	46.5
2015/04/23	16:15:50	48.2	48.1	47.5	47.4
2015/04/23	16:15:51	49.8	49.4	48.0	48.1
2015/04/23	16:15:52	50.5	50.3	49.4	49.0
2015/04/23	16:15:53	49.7	49.9	49.7	49.1
2015/04/23	16:15:54	50.7	50.3	49.9	50.2

2015/04/23	16:15:55	49.5	50.4	49.8	48.9
2015/04/23	16:15:56	50.3	50.3	49.7	49.4
2015/04/23	16:15:57	51.7	51.2	49.9	49.8
2015/04/23	16:15:58	49.8	51.2	50.3	49.3
2015/04/23	16:15:59	47.6	50.3	48.8	47.4
2015/04/23	16:16:00	47.4	48.8	48.0	46.8
2015/04/23	16:16:01	47.8	48.1	47.8	47.1
2015/04/23	16:16:02	46.4	47.8	47.0	46.0
2015/04/23	16:16:03	47.2	47.2	46.8	46.2
2015/04/23	16:16:04	47.5	47.7	47.2	46.5
2015/04/23	16:16:05	47.3	47.3	47.2	46.9
2015/04/23	16:16:06	47.2	47.4	47.1	46.6
2015/04/23	16:16:07	48.9	48.5	47.1	46.6
2015/04/23	16:16:08	47.9	48.4	48.1	47.5
2015/04/23	16:16:09	47.6	48.1	47.8	47.3
2015/04/23	16:16:10	47.3	47.8	47.4	46.9
2015/04/23	16:16:11	47.6	47.7	47.4	47.0
2015/04/23	16:16:12	46.7	47.5	47.0	46.5
2015/04/23	16:16:13	47.2	47.2	47.0	46.9
2015/04/23	16:16:14	47.1	47.3	46.9	46.4
2015/04/23	16:16:15	46.6	47.2	46.8	46.3
2015/04/23	16:16:16	47.1	47.1	46.8	46.5
2015/04/23	16:16:17	46.7	47.0	46.7	46.3
2015/04/23	16:16:18	46.1	46.8	46.3	45.7
2015/04/23	16:16:19	46.2	46.3	46.2	45.8
2015/04/23	16:16:20	45.7	46.3	45.8	45.1
2015/04/23	16:16:21	46.4	46.3	45.9	46.0
2015/04/23	16:16:22	47.5	47.1	46.3	46.7
2015/04/23	16:16:23	47.4	47.4	47.0	46.8
2015/04/23	16:16:24	47.9	47.8	47.4	47.5
2015/04/23	16:16:25	46.3	47.7	46.8	46.0
2015/04/23	16:16:26	45.8	46.8	46.2	45.5
2015/04/23	16:16:27	46.8	46.7	46.2	45.8
2015/04/23	16:16:28	48.2	47.7	46.7	47.8
2015/04/23	16:16:29	48.7	48.4	47.7	48.2
2015/04/23	16:16:30	51.6	50.8	48.4	49.4
2015/04/23	16:16:31	48.8	50.8	49.6	47.9
2015/04/23	16:16:32	48.4	49.6	48.9	48.1
2015/04/23	16:16:33	47.5	48.9	48.1	47.0
2015/04/23	16:16:34	49.7	49.2	48.1	48.6
2015/04/23	16:16:35	51.2	50.9	48.8	48.1
2015/04/23	16:16:36	48.1	50.7	49.3	47.9
2015/04/23	16:16:37	48.8	49.3	48.9	48.0
2015/04/23	16:16:38	51.1	50.9	48.5	47.1
2015/04/23	16:16:39	56.3	54.8	51.0	55.2
2015/04/23	16:16:40	56.0	55.7	54.8	55.3
2015/04/23	16:16:41	56.2	56.2	55.5	55.2

2015/04/23	16:16:42	51.5	55.9	53.6	50.3
2015/04/23	16:16:43	51.9	53.6	52.7	49.9
2015/04/23	16:16:44	51.0	52.9	51.5	49.5
2015/04/23	16:16:45	49.1	51.5	50.1	48.2
2015/04/23	16:16:46	51.9	51.6	50.2	50.3
2015/04/23	16:16:47	55.3	54.1	51.7	54.5
2015/04/23	16:16:48	54.3	54.6	53.8	53.0
2015/04/23	16:16:49	53.1	54.2	53.4	52.2
2015/04/23	16:16:50	54.8	54.6	53.7	53.5
2015/04/23	16:16:51	53.2	54.2	53.6	51.9
2015/04/23	16:16:52	56.5	55.9	53.7	54.4
2015/04/23	16:16:53	52.6	55.9	53.9	50.1
2015/04/23	16:16:54	53.3	53.9	53.5	51.7
2015/04/23	16:16:55	48.8	53.5	51.0	47.1
2015/04/23	16:16:56	47.2	51.0	49.1	46.6
2015/04/23	16:16:57	46.6	49.1	47.6	46.0
2015/04/23	16:16:58	49.9	49.4	47.5	46.1
2015/04/23	16:16:59	50.5	50.2	49.4	50.1
2015/04/23	16:17:00	51.3	51.0	50.1	50.6
2015/04/23	16:17:01	49.5	51.0	49.8	48.1
2015/04/23	16:17:02	52.4	52.4	50.4	47.9
2015/04/23	16:17:03	48.1	51.1	49.5	47.2
2015/04/23	16:17:04	46.5	49.5	47.8	46.0
2015/04/23	16:17:05	46.8	47.8	47.1	45.9
2015/04/23	16:17:06	47.1	47.5	47.0	46.1
2015/04/23	16:17:07	45.5	47.0	46.2	45.2
2015/04/23	16:17:08	47.1	46.9	46.1	45.9
2015/04/23	16:17:09	47.2	47.1	46.7	46.5
2015/04/23	16:17:10	47.8	47.6	47.1	47.2
2015/04/23	16:17:11	49.3	48.7	47.7	48.7
2015/04/23	16:17:12	48.8	48.8	48.6	48.4
2015/04/23	16:17:13	48.6	48.8	48.6	48.2
2015/04/23	16:17:14	50.4	49.9	48.7	49.6
2015/04/23	16:17:15	48.6	50.1	49.0	47.7
2015/04/23	16:17:16	48.3	49.0	48.5	47.7
2015/04/23	16:17:17	49.4	49.2	48.7	49.0
2015/04/23	16:17:18	48.9	49.2	49.0	48.7
2015/04/23	16:17:19	48.8	49.0	48.7	48.2
2015/04/23	16:17:20	48.5	48.9	48.6	47.9
2015/04/23	16:17:21	47.1	48.6	47.7	46.8
2015/04/23	16:17:22	46.9	47.7	47.2	46.5
2015/04/23	16:17:23	46.6	47.2	46.8	46.3
2015/04/23	16:17:24	46.3	46.8	46.5	46.2
2015/04/23	16:17:25	46.9	46.7	46.5	46.5
2015/04/23	16:17:26	47.2	47.1	46.7	46.8
2015/04/23	16:17:27	47.2	47.3	46.8	46.4
2015/04/23	16:17:28	47.5	47.5	47.3	47.1

2015/04/23	16:17:29	47.4	47.5	47.3	47.0
2015/04/23	16:17:30	47.4	47.4	47.2	47.0
2015/04/23	16:17:31	50.3	49.6	47.4	48.1
2015/04/23	16:17:32	53.1	51.9	49.7	51.9
2015/04/23	16:17:33	50.9	51.8	51.2	50.4
2015/04/23	16:17:34	52.8	52.4	51.3	51.6
2015/04/23	16:17:35	54.4	53.8	52.3	52.6
2015/04/23	16:17:36	54.3	54.2	53.7	53.6
2015/04/23	16:17:37	52.6	54.1	53.2	52.4
2015/04/23	16:17:38	53.1	53.2	52.9	52.0
2015/04/23	16:17:39	53.6	53.5	53.1	53.0
2015/04/23	16:17:40	55.8	55.2	53.5	53.9
2015/04/23	16:17:41	55.2	55.2	55.0	54.8
2015/04/23	16:17:42	56.9	56.4	55.3	56.3
2015/04/23	16:17:43	56.4	56.6	56.3	56.0
2015/04/23	16:17:44	57.0	57.0	55.9	54.9
2015/04/23	16:17:45	57.8	57.6	57.0	56.7
2015/04/23	16:17:46	56.7	57.4	56.9	56.3
2015/04/23	16:17:47	57.0	57.1	56.8	56.3
2015/04/23	16:17:48	59.2	59.1	56.6	55.4
2015/04/23	16:17:49	61.2	61.2	59.3	58.4
2015/04/23	16:17:50	60.0	60.3	59.4	57.3
2015/04/23	16:17:51	54.0	60.0	57.2	51.9
2015/04/23	16:17:52	51.4	57.1	54.5	51.1
2015/04/23	16:17:53	51.3	54.4	52.8	50.9
2015/04/23	16:17:54	50.1	52.8	51.2	49.5
2015/04/23	16:17:55	48.4	51.2	49.6	47.8
2015/04/23	16:17:56	46.9	49.6	48.1	46.5
2015/04/23	16:17:57	46.7	48.1	47.3	46.4
2015/04/23	16:17:58	46.3	47.3	46.7	45.9
2015/04/23	16:17:59	46.5	46.7	46.6	46.2
2015/04/23	16:18:00	46.5	46.6	46.4	46.1
2015/04/23	16:18:01	46.2	46.6	46.3	45.9
2015/04/23	16:18:02	46.2	46.3	46.2	45.9
2015/04/23	16:18:03	46.2	46.3	46.0	45.6
2015/04/23	16:18:04	46.7	46.6	46.2	46.4
2015/04/23	16:18:05	46.5	46.6	46.5	46.3
2015/04/23	16:18:06	46.4	46.5	46.4	46.2
2015/04/23	16:18:07	47.0	46.9	46.5	46.4
2015/04/23	16:18:08	45.7	46.7	46.1	45.3
2015/04/23	16:18:09	46.5	46.5	46.1	45.9
2015/04/23	16:18:10	47.4	47.2	46.5	46.6
2015/04/23	16:18:11	47.1	47.3	47.0	46.7
2015/04/23	16:18:12	45.8	47.2	46.4	45.5
2015/04/23	16:18:13	45.6	46.4	45.9	45.3
2015/04/23	16:18:14	46.2	46.2	45.8	45.5
2015/04/23	16:18:15	46.6	46.5	46.1	46.2

2015/04/23	16:18:16	46.6	46.5	46.4	46.1
2015/04/23	16:18:17	48.2	47.7	46.6	47.1
2015/04/23	16:18:18	47.8	47.9	47.7	47.6
2015/04/23	16:18:19	47.8	48.0	47.6	47.0
2015/04/23	16:18:20	47.3	47.8	47.5	47.0
2015/04/23	16:18:21	49.3	48.8	47.4	47.1
2015/04/23	16:18:22	48.8	49.1	48.7	48.2
2015/04/23	16:18:23	48.9	49.1	48.8	48.3
2015/04/23	16:18:24	48.2	48.8	48.4	47.9
2015/04/23	16:18:25	47.1	48.4	47.6	46.5
2015/04/23	16:18:26	48.1	48.1	47.5	47.3
2015/04/23	16:18:27	51.2	50.3	48.1	49.7
2015/04/23	16:18:28	52.5	51.9	50.4	51.3
2015/04/23	16:18:29	50.6	51.6	51.0	50.3
2015/04/23	16:18:30	50.6	51.0	50.7	50.2
2015/04/23	16:18:31	47.7	50.8	48.9	46.5
2015/04/23	16:18:32	46.5	48.9	47.6	45.9
2015/04/23	16:18:33	46.0	47.5	46.6	45.5
2015/04/23	16:18:34	45.0	46.6	45.7	44.6
2015/04/23	16:18:35	44.6	45.7	45.0	44.4
2015/04/23	16:18:36	45.1	45.1	45.0	44.7
2015/04/23	16:18:37	46.2	45.8	45.1	45.3
2015/04/23	16:18:38	47.3	46.9	45.8	46.0
2015/04/23	16:18:39	49.3	48.7	46.9	48.0
2015/04/23	16:18:40	48.1	48.7	48.2	47.4
2015/04/23	16:18:41	46.9	48.2	47.5	46.4
2015/04/23	16:18:42	47.5	47.6	47.5	47.2
2015/04/23	16:18:43	48.3	48.1	47.4	47.2
2015/04/23	16:18:44	48.1	48.3	48.0	47.6
2015/04/23	16:18:45	47.0	48.0	47.4	46.8
2015/04/23	16:18:46	46.3	47.4	46.7	46.1
2015/04/23	16:18:47	47.4	47.3	46.7	46.4
2015/04/23	16:18:48	47.8	47.7	47.3	47.3
2015/04/23	16:18:49	46.9	47.7	47.2	46.5
2015/04/23	16:18:50	46.5	47.3	46.6	46.0
2015/04/23	16:18:51	45.9	46.7	46.1	45.4
2015/04/23	16:18:52	45.5	46.2	45.7	45.2
2015/04/23	16:18:53	46.7	46.4	45.7	45.5
2015/04/23	16:18:54	47.9	47.4	46.4	47.5
2015/04/23	16:18:55	50.5	49.7	47.4	48.7
2015/04/23	16:18:56	48.0	49.8	48.5	46.5
2015/04/23	16:18:57	48.3	48.5	48.2	47.0
2015/04/23	16:18:58	47.3	48.5	47.7	46.6
2015/04/23	16:18:59	48.7	48.5	47.6	47.0
2015/04/23	16:19:00	48.6	48.9	48.4	47.4
2015/04/23	16:19:01	46.9	48.4	47.5	46.1
2015/04/23	16:19:02	47.8	47.8	47.4	47.0

2015/04/23	16:19:03	49.6	49.4	47.8	47.4
2015/04/23	16:19:04	45.7	48.7	47.1	45.5
2015/04/23	16:19:05	47.1	47.2	46.7	45.5
2015/04/23	16:19:06	49.2	48.6	47.3	48.2
2015/04/23	16:19:07	50.4	49.7	48.7	49.6
2015/04/23	16:19:08	49.3	49.7	49.0	48.1
2015/04/23	16:19:09	54.0	52.8	49.7	52.0
2015/04/23	16:19:10	51.4	52.5	51.7	50.4
2015/04/23	16:19:11	53.8	53.3	51.9	52.5
2015/04/23	16:19:12	53.0	53.8	52.7	50.1
2015/04/23	16:19:13	48.7	52.7	50.7	48.5
2015/04/23	16:19:14	51.6	51.4	50.7	50.6
2015/04/23	16:19:15	49.9	51.2	50.2	48.7
2015/04/23	16:19:16	49.1	50.7	49.7	48.2
2015/04/23	16:19:17	49.9	49.9	49.5	48.7
2015/04/23	16:19:18	49.7	49.9	49.7	49.4
2015/04/23	16:19:19	50.3	50.2	49.8	49.7
2015/04/23	16:19:20	52.5	51.8	50.2	51.1
2015/04/23	16:19:21	53.5	53.2	51.8	51.9
2015/04/23	16:19:22	50.6	52.7	51.5	50.2
2015/04/23	16:19:23	50.9	51.5	51.0	50.2
2015/04/23	16:19:24	50.0	51.2	50.5	49.6
2015/04/23	16:19:25	51.9	51.6	50.3	49.4
2015/04/23	16:19:26	51.7	51.9	51.5	51.0
2015/04/23	16:19:27	51.8	51.9	51.4	50.5
2015/04/23	16:19:28	50.9	51.8	51.0	50.1
2015/04/23	16:19:29	49.9	51.0	50.3	48.9
2015/04/23	16:19:30	48.9	50.4	49.5	48.1
2015/04/23	16:19:31	46.5	49.6	47.8	45.8
2015/04/23	16:19:32	45.3	47.8	46.4	45.0
2015/04/23	16:19:33	46.1	46.4	45.9	45.0
2015/04/23	16:19:34	46.7	46.6	46.3	46.5
2015/04/23	16:19:35	45.6	46.6	45.9	45.1
2015/04/23	16:19:36	45.3	45.9	45.5	45.1
2015/04/23	16:19:37	45.1	45.5	45.2	44.8
2015/04/23	16:19:38	44.4	45.3	44.7	44.0
2015/04/23	16:19:39	44.7	44.7	44.6	44.2
2015/04/23	16:19:40	45.2	45.1	44.7	44.7
2015/04/23	16:19:41	45.8	45.6	45.2	45.6
2015/04/23	16:19:42	46.0	45.9	45.5	45.6
2015/04/23	16:19:43	47.6	47.1	45.9	46.7
2015/04/23	16:19:44	47.4	47.3	47.1	47.2
2015/04/23	16:19:45	47.1	47.3	47.1	46.7
2015/04/23	16:19:46	46.4	47.1	46.6	46.1
2015/04/23	16:19:47	46.6	46.7	46.6	46.3
2015/04/23	16:19:48	46.5	46.7	46.6	46.2
2015/04/23	16:19:49	46.4	46.6	46.4	45.9

2015/04/23	16:19:50	45.9	46.5	46.1	45.7
2015/04/23	16:19:51	48.7	48.2	46.1	46.1
2015/04/23	16:19:52	49.3	49.0	48.2	49.1
2015/04/23	16:19:53	49.0	49.1	48.9	48.7
2015/04/23	16:19:54	49.5	49.4	49.0	49.1
2015/04/23	16:19:55	48.9	49.4	49.0	48.5
2015/04/23	16:19:56	47.3	49.0	48.0	46.8
2015/04/23	16:19:57	47.5	47.9	47.6	46.4
2015/04/23	16:19:58	48.5	48.3	47.7	47.6
2015/04/23	16:19:59	48.8	48.7	48.3	48.5
2015/04/23	16:20:00	50.3	49.8	48.6	49.6
2015/04/23	16:20:01	51.2	50.9	49.7	50.0
2015/04/23	16:20:02	50.9	51.2	50.8	50.1
2015/04/23	16:20:03	48.2	50.8	49.3	47.5
2015/04/23	16:20:04	47.7	49.3	48.3	47.1
2015/04/23	16:20:05	49.0	49.0	48.4	48.3
2015/04/23	16:20:06	49.7	49.5	48.6	48.0
2015/04/23	16:20:07	53.7	52.6	49.5	51.7
2015/04/23	16:20:08	53.3	53.0	52.6	53.0
2015/04/23	16:20:09	52.5	53.4	52.5	50.7
2015/04/23	16:20:10	51.2	52.5	51.6	50.5
2015/04/23	16:20:11	52.2	52.1	51.5	50.9
2015/04/23	16:20:12	52.1	52.1	51.9	51.6
2015/04/23	16:20:13	52.7	52.7	52.0	51.7
2015/04/23	16:20:14	51.2	52.4	51.7	51.0
2015/04/23	16:20:15	52.1	52.0	51.7	51.4
2015/04/23	16:20:16	51.4	52.1	51.6	50.7
2015/04/23	16:20:17	52.4	52.2	51.5	51.1
2015/04/23	16:20:18	51.3	52.2	51.7	51.0
2015/04/23	16:20:19	51.3	51.7	51.4	50.8
2015/04/23	16:20:20	53.8	53.1	51.5	52.4
2015/04/23	16:20:21	52.9	53.1	52.6	52.0
2015/04/23	16:20:22	56.1	55.4	53.1	54.3
2015/04/23	16:20:23	54.5	55.4	54.6	53.2
2015/04/23	16:20:24	53.5	54.7	53.9	52.7
2015/04/23	16:20:25	51.4	53.9	52.5	51.0
2015/04/23	16:20:26	52.8	53.2	52.4	51.2
2015/04/23	16:20:27	51.6	52.5	51.5	50.0
2015/04/23	16:20:28	49.7	52.1	50.7	48.9
2015/04/23	16:20:29	50.8	51.2	50.0	47.8
2015/04/23	16:20:30	50.1	50.8	50.3	49.2
2015/04/23	16:20:31	51.8	51.7	50.4	49.5
2015/04/23	16:20:32	51.6	51.5	50.6	49.5
2015/04/23	16:20:33	50.2	51.5	50.7	49.7
2015/04/23	16:20:34	47.8	50.7	49.1	47.6
2015/04/23	16:20:35	47.5	49.1	48.1	47.3
2015/04/23	16:20:36	47.6	48.2	47.7	47.0

2015/04/23	16:20:37	47.2	48.0	47.4	46.3
2015/04/23	16:20:38	46.5	47.3	46.8	46.2
2015/04/23	16:20:39	46.1	46.8	46.3	45.6
2015/04/23	16:20:40	45.9	46.5	46.0	45.6
2015/04/23	16:20:41	46.3	46.4	46.1	45.9
2015/04/23	16:20:42	45.6	46.3	45.7	45.0
2015/04/23	16:20:43	50.3	49.7	45.7	45.6
2015/04/23	16:20:44	50.5	50.6	49.2	46.8
2015/04/23	16:20:45	48.5	50.3	49.2	46.9
2015/04/23	16:20:46	48.5	49.5	48.4	46.1
2015/04/23	16:20:47	47.3	48.8	47.4	45.6
2015/04/23	16:20:48	47.3	48.2	47.5	46.4
2015/04/23	16:20:49	48.3	48.1	47.3	46.8
2015/04/23	16:20:50	48.0	48.5	47.8	46.1
2015/04/23	16:20:51	46.4	47.8	47.0	46.0
2015/04/23	16:20:52	45.4	47.0	46.1	45.3
2015/04/23	16:20:53	44.5	46.1	45.1	44.2
2015/04/23	16:20:54	44.7	45.1	44.8	44.0
2015/04/23	16:20:55	44.3	44.9	44.6	44.2
2015/04/23	16:20:56	44.8	44.8	44.5	44.4
2015/04/23	16:20:57	45.2	45.1	44.7	44.9
2015/04/23	16:20:58	45.7	45.4	45.0	45.3
2015/04/23	16:20:59	45.4	45.5	45.3	44.9
2015/04/23	16:21:00	46.7	46.4	45.5	46.1
2015/04/23	16:21:01	47.4	47.1	46.4	46.7
2015/04/23	16:21:02	45.2	46.9	45.9	44.8
2015/04/23	16:21:03	45.6	45.9	45.6	44.9
2015/04/23	16:21:04	44.8	45.8	45.1	44.5
2015/04/23	16:21:05	45.1	45.2	45.0	44.5
2015/04/23	16:21:06	45.1	45.2	44.9	44.6
2015/04/23	16:21:07	46.2	45.8	45.2	45.4
2015/04/23	16:21:08	47.6	47.0	45.8	46.4
2015/04/23	16:21:09	47.7	47.5	47.0	47.3
2015/04/23	16:21:10	47.6	47.6	47.2	46.8
2015/04/23	16:21:11	53.4	52.7	47.6	48.1
2015/04/23	16:21:12	52.4	52.5	51.7	49.9
2015/04/23	16:21:13	51.3	52.3	51.7	51.1
2015/04/23	16:21:14	50.9	51.6	51.2	50.3
2015/04/23	16:21:15	49.3	51.2	50.0	48.4
2015/04/23	16:21:16	47.8	50.0	48.8	47.4
2015/04/23	16:21:17	47.3	48.8	47.9	46.9
2015/04/23	16:21:18	47.2	47.9	47.4	46.7
2015/04/23	16:21:19	46.7	47.4	46.9	46.1
2015/04/23	16:21:20	52.1	51.2	47.0	48.5
2015/04/23	16:21:21	49.5	51.1	50.1	48.5
2015/04/23	16:21:22	46.6	50.0	48.2	45.7
2015/04/23	16:21:23	46.8	48.5	47.1	44.7

2015/04/23	16:21:24	45.2	47.1	46.0	44.8
2015/04/23	16:21:25	51.9	51.0	45.8	45.3
2015/04/23	16:21:26	51.1	52.1	50.3	46.0
2015/04/23	16:21:27	48.4	51.0	49.3	45.7
2015/04/23	16:21:28	47.7	49.3	48.2	44.9
2015/04/23	16:21:29	45.7	48.4	46.8	44.9
2015/04/23	16:21:30	48.4	48.6	47.1	45.8
2015/04/23	16:21:31	50.1	49.8	47.1	46.4
2015/04/23	16:21:32	47.1	49.9	48.2	46.2
2015/04/23	16:21:33	45.9	48.2	46.9	45.7
2015/04/23	16:21:34	46.3	47.0	46.5	45.8
2015/04/23	16:21:35	46.6	46.8	46.5	46.0
2015/04/23	16:21:36	45.6	46.5	45.9	45.3
2015/04/23	16:21:37	45.6	45.9	45.6	45.0
2015/04/23	16:21:38	44.8	45.8	45.2	44.6
2015/04/23	16:21:39	44.9	45.3	44.9	44.3
2015/04/23	16:21:40	45.5	45.4	45.0	45.2
2015/04/23	16:21:41	46.3	46.1	45.3	45.5
2015/04/23	16:21:42	45.7	46.0	45.8	45.4
2015/04/23	16:21:43	45.5	45.8	45.6	45.2
2015/04/23	16:21:44	45.1	45.6	45.2	44.8
2015/04/23	16:21:45	45.4	45.5	45.2	44.9
2015/04/23	16:21:46	44.6	45.3	44.8	44.2
2015/04/23	16:21:47	51.3	50.7	44.8	44.8
2015/04/23	16:21:48	50.5	51.2	50.1	47.5
2015/04/23	16:21:49	49.2	50.6	49.6	47.8
2015/04/23	16:21:50	49.9	50.3	49.5	48.4
2015/04/23	16:21:51	49.2	49.8	48.9	47.2
2015/04/23	16:21:52	50.6	50.5	49.6	50.1
2015/04/23	16:21:53	49.5	50.2	49.7	48.7
2015/04/23	16:21:54	47.4	49.7	48.3	46.7
2015/04/23	16:21:55	47.5	48.5	47.7	46.4
2015/04/23	16:21:56	46.0	47.7	46.7	45.4
2015/04/23	16:21:57	50.5	50.2	46.5	45.5
2015/04/23	16:21:58	54.9	53.9	50.3	51.4
2015/04/23	16:21:59	50.3	53.1	51.6	50.0
2015/04/23	16:22:00	47.4	51.6	49.4	46.7
2015/04/23	16:22:01	48.1	49.4	48.7	47.5
2015/04/23	16:22:02	47.4	48.7	47.9	46.7
2015/04/23	16:22:03	46.0	47.9	46.7	45.2
2015/04/23	16:22:04	44.7	46.7	45.6	44.4
2015/04/23	16:22:05	44.7	45.6	45.1	44.6
2015/04/23	16:22:06	46.0	45.8	45.1	45.2
2015/04/23	16:22:07	46.0	46.0	45.7	45.6
2015/04/23	16:22:08	45.8	46.0	45.8	45.6
2015/04/23	16:22:09	47.2	46.9	45.9	46.1
2015/04/23	16:22:10	46.1	46.9	46.3	45.6

2015/04/23	16:22:11	51.1	50.5	46.2	45.6
2015/04/23	16:22:12	51.3	51.3	49.6	46.5
2015/04/23	16:22:13	48.4	51.3	49.6	45.5
2015/04/23	16:22:14	49.4	50.2	48.8	45.2
2015/04/23	16:22:15	48.1	49.4	47.7	44.8
2015/04/23	16:22:16	47.4	49.2	47.9	45.4
2015/04/23	16:22:17	44.7	47.9	46.2	44.3
2015/04/23	16:22:18	44.4	46.1	45.1	44.1
2015/04/23	16:22:19	44.8	45.1	44.9	44.4
2015/04/23	16:22:20	45.8	45.6	45.0	45.0
2015/04/23	16:22:21	45.4	45.7	45.4	44.9
2015/04/23	16:22:22	45.4	45.5	45.4	45.1
2015/04/23	16:22:23	45.3	45.4	45.3	45.1
2015/04/23	16:22:24	45.2	45.4	45.2	44.9
2015/04/23	16:22:25	45.1	45.2	45.0	44.7
2015/04/23	16:22:26	45.8	45.8	45.1	44.8
2015/04/23	16:22:27	52.9	51.2	45.8	49.3
2015/04/23	16:22:28	49.8	51.3	50.3	47.5
2015/04/23	16:22:29	47.6	50.3	48.6	46.4
2015/04/23	16:22:30	48.1	49.3	48.1	45.8
2015/04/23	16:22:31	45.9	48.2	46.8	45.4
2015/04/23	16:22:32	45.3	46.8	45.9	45.0
2015/04/23	16:22:33	45.1	46.0	45.4	44.9
2015/04/23	16:22:34	44.8	45.5	45.0	44.5
2015/04/23	16:22:35	45.2	45.1	45.0	44.8
2015/04/23	16:22:36	46.6	46.1	45.1	45.6
2015/04/23	16:22:37	46.3	46.3	46.2	46.0
2015/04/23	16:22:38	47.0	46.7	46.2	46.4
2015/04/23	16:22:39	47.3	47.1	46.7	46.7
2015/04/23	16:22:40	46.5	47.0	46.6	46.1
2015/04/23	16:22:41	46.4	46.6	46.4	45.9
2015/04/23	16:22:42	46.2	46.4	46.3	46.0
2015/04/23	16:22:43	45.7	46.4	45.9	44.9
2015/04/23	16:22:44	45.5	45.9	45.6	45.0
2015/04/23	16:22:45	46.5	46.3	45.5	45.0
2015/04/23	16:22:46	50.6	49.9	46.3	46.7
2015/04/23	16:22:47	48.6	50.2	48.6	45.7
2015/04/23	16:22:48	44.8	48.6	46.6	44.4
2015/04/23	16:22:49	44.5	46.6	45.4	44.3
2015/04/23	16:22:50	44.5	45.5	44.9	44.2
2015/04/23	16:22:51	44.4	44.9	44.6	44.2
2015/04/23	16:22:52	45.1	45.0	44.5	44.3
2015/04/23	16:22:53	44.9	45.0	44.8	44.6
2015/04/23	16:22:54	45.3	45.2	44.9	44.8
2015/04/23	16:22:55	52.3	50.7	45.2	46.1
2015/04/23	16:22:56	50.3	51.0	50.3	48.4
2015/04/23	16:22:57	49.3	50.4	48.9	45.8

2015/04/23	16:22:58	46.8	50.0	48.3	46.2
2015/04/23	16:22:59	48.2	48.8	47.4	45.5
2015/04/23	16:23:00	46.1	48.3	47.0	45.2
2015/04/23	16:23:01	47.7	48.1	46.9	45.6
2015/04/23	16:23:02	47.0	47.4	46.6	45.3
2015/04/23	16:23:03	46.0	47.2	46.4	45.2
2015/04/23	16:23:04	46.0	46.5	46.1	44.9
2015/04/23	16:23:05	45.5	46.3	45.7	45.0
2015/04/23	16:23:06	47.2	46.8	45.7	45.7
2015/04/23	16:23:07	48.7	48.5	46.1	45.2
2015/04/23	16:23:08	46.4	48.3	47.2	45.7
2015/04/23	16:23:09	47.8	47.9	46.5	44.6
2015/04/23	16:23:10	46.3	47.6	46.7	45.7
2015/04/23	16:23:11	46.9	46.9	46.5	45.5
2015/04/23	16:23:12	46.2	46.9	46.4	45.7
2015/04/23	16:23:13	45.9	46.4	46.1	45.7
2015/04/23	16:23:14	46.5	46.4	46.1	46.1
2015/04/23	16:23:15	46.9	46.7	46.4	46.5
2015/04/23	16:23:16	46.8	47.0	46.7	46.4
2015/04/23	16:23:17	46.2	46.7	46.4	46.0
2015/04/23	16:23:18	46.0	46.4	46.1	45.8
2015/04/23	16:23:19	45.5	46.1	45.8	45.5
2015/04/23	16:23:20	45.5	45.8	45.6	45.2
2015/04/23	16:23:21	47.3	47.0	45.6	45.5
2015/04/23	16:23:22	46.2	46.7	46.2	45.0
2015/04/23	16:23:23	45.7	46.4	45.7	44.6
2015/04/23	16:23:24	44.1	45.7	44.8	43.7
2015/04/23	16:23:25	44.7	44.8	44.6	44.1
2015/04/23	16:23:26	44.8	44.9	44.7	44.6
2015/04/23	16:23:27	45.4	45.2	44.8	44.7
2015/04/23	16:23:28	45.0	45.2	44.9	44.5
2015/04/23	16:23:29	46.0	45.7	45.1	45.3
2015/04/23	16:23:30	46.0	46.0	45.7	45.8
2015/04/23	16:23:31	45.8	45.9	45.7	45.2
2015/04/23	16:23:32	47.1	46.9	45.8	45.8
2015/04/23	16:23:33	48.9	48.3	46.9	48.1
2015/04/23	16:23:34	49.7	49.5	48.1	47.9
2015/04/23	16:23:35	48.8	49.5	48.8	47.5
2015/04/23	16:23:36	47.3	49.1	48.0	46.0
2015/04/23	16:23:37	46.8	48.0	47.3	46.0
2015/04/23	16:23:38	47.2	47.5	47.1	46.2
2015/04/23	16:23:39	48.1	48.0	47.1	46.5
2015/04/23	16:23:40	51.2	50.2	48.0	50.0
2015/04/23	16:23:41	49.4	50.3	49.5	47.6
2015/04/23	16:23:42	47.8	49.5	48.4	46.7
2015/04/23	16:23:43	47.8	48.4	47.7	46.9
2015/04/23	16:23:44	47.2	48.2	47.5	46.6

2015/04/23	16:23:45	48.9	48.8	47.4	47.0
2015/04/23	16:23:46	55.3	53.8	49.0	52.2
2015/04/23	16:23:47	53.2	53.6	52.7	50.4
2015/04/23	16:23:48	53.1	53.5	52.8	51.7
2015/04/23	16:23:49	50.8	53.4	52.0	48.8
2015/04/23	16:23:50	51.2	51.9	51.1	48.0
2015/04/23	16:23:51	51.8	52.0	51.1	49.4
2015/04/23	16:23:52	49.6	51.8	50.5	49.1
2015/04/23	16:23:53	50.9	51.0	49.9	48.2
2015/04/23	16:23:54	50.7	51.0	50.5	49.7
2015/04/23	16:23:55	50.7	51.0	50.3	49.4
2015/04/23	16:23:56	51.6	51.4	50.9	49.9
2015/04/23	16:23:57	51.1	51.4	50.9	50.1
2015/04/23	16:23:58	51.6	51.9	51.2	50.0
2015/04/23	16:23:59	50.2	51.2	50.5	49.5
2015/04/23	16:24:00	50.7	50.8	50.6	50.3
2015/04/23	16:24:01	48.0	50.7	49.2	47.1
2015/04/23	16:24:02	47.3	49.4	48.0	46.0
2015/04/23	16:24:03	49.4	49.0	47.8	46.6
2015/04/23	16:24:04	51.8	51.1	49.1	50.0
2015/04/23	16:24:05	50.8	51.1	50.8	50.3
2015/04/23	16:24:06	53.7	53.1	50.8	50.3
2015/04/23	16:24:07	52.8	53.0	52.3	50.8
2015/04/23	16:24:08	53.4	53.6	52.9	51.8
2015/04/23	16:24:09	52.3	53.2	52.6	51.6
2015/04/23	16:24:10	51.8	52.6	52.0	50.6
2015/04/23	16:24:11	53.1	52.9	51.8	51.0
2015/04/23	16:24:12	49.9	52.6	51.0	48.1
2015/04/23	16:24:13	50.4	50.9	50.0	47.5
2015/04/23	16:24:14	55.3	54.3	51.0	51.9
2015/04/23	16:24:15	52.3	53.8	52.6	49.7
2015/04/23	16:24:16	53.2	53.2	52.0	50.4
2015/04/23	16:24:17	51.8	53.2	52.3	51.0
2015/04/23	16:24:18	52.0	53.0	51.8	49.7
2015/04/23	16:24:19	50.4	51.8	50.7	48.2
2015/04/23	16:24:20	49.8	51.2	50.3	48.1
2015/04/23	16:24:21	50.5	51.0	50.0	49.3
2015/04/23	16:24:22	50.0	50.4	50.0	48.9
2015/04/23	16:24:23	52.3	51.8	50.1	50.6
2015/04/23	16:24:24	52.0	52.1	50.8	49.7
2015/04/23	16:24:25	48.9	51.9	50.2	47.7
2015/04/23	16:24:26	53.6	53.0	49.6	46.8
2015/04/23	16:24:27	47.1	52.7	50.0	46.2
2015/04/23	16:24:28	47.2	50.0	48.6	46.5
2015/04/23	16:24:29	47.5	48.7	47.7	46.1
2015/04/23	16:24:30	47.2	47.8	47.4	46.5
2015/04/23	16:24:31	46.3	47.4	46.6	45.5

2015/04/23	16:24:32	49.0	48.5	46.6	46.4
2015/04/23	16:24:33	48.3	49.0	48.2	47.2
2015/04/23	16:24:34	47.3	48.2	47.7	46.2
2015/04/23	16:24:35	47.3	47.7	47.2	46.1
2015/04/23	16:24:36	48.1	48.0	47.6	47.5
2015/04/23	16:24:37	48.0	48.0	47.8	47.6
2015/04/23	16:24:38	47.1	47.9	47.3	46.5
2015/04/23	16:24:39	48.2	48.1	47.3	46.8
2015/04/23	16:24:40	47.3	48.2	47.5	46.4
2015/04/23	16:24:41	46.7	47.5	46.7	45.8
2015/04/23	16:24:42	54.3	52.8	47.1	50.1
2015/04/23	16:24:43	50.4	52.5	51.2	49.1
2015/04/23	16:24:44	49.8	51.2	49.8	47.5
2015/04/23	16:24:45	49.0	50.6	49.6	47.6
2015/04/23	16:24:46	46.0	49.7	47.7	45.3
2015/04/23	16:24:47	45.3	47.7	46.4	45.0
2015/04/23	16:24:48	47.4	47.2	46.3	45.6
2015/04/23	16:24:49	47.6	47.7	47.0	46.5
2015/04/23	16:24:50	47.7	47.7	47.4	46.7
2015/04/23	16:24:51	47.2	47.8	47.3	46.4
2015/04/23	16:24:52	46.9	47.4	47.0	46.4
2015/04/23	16:24:53	46.2	47.1	46.5	45.7
2015/04/23	16:24:54	50.0	49.8	46.2	45.3
2015/04/23	16:24:55	52.6	52.2	50.0	48.1
2015/04/23	16:24:56	52.6	52.9	51.6	48.0
2015/04/23	16:24:57	49.8	51.7	50.6	46.2
2015/04/23	16:24:58	47.8	50.6	48.9	46.7
2015/04/23	16:24:59	49.9	50.4	49.3	47.2
2015/04/23	16:25:00	49.2	49.7	48.7	47.2
2015/04/23	16:25:01	48.2	49.3	48.6	47.1
2015/04/23	16:25:02	50.0	49.8	48.4	47.4
2015/04/23	16:25:03	50.2	50.5	48.6	47.3
2015/04/23	16:25:04	48.2	50.4	49.0	46.7
2015/04/23	16:25:05	48.9	49.3	48.1	46.2
2015/04/23	16:25:06	48.8	49.4	48.9	47.9
2015/04/23	16:25:07	51.2	51.0	48.6	46.9
2015/04/23	16:25:08	49.2	50.2	48.3	45.8
2015/04/23	16:25:09	47.7	49.9	48.6	46.5
2015/04/23	16:25:10	45.2	48.5	46.8	45.0
2015/04/23	16:25:11	47.6	47.6	46.2	44.7
2015/04/23	16:25:12	45.8	47.6	46.5	45.0
2015/04/23	16:25:13	45.0	46.5	45.6	44.6
2015/04/23	16:25:14	45.7	45.8	45.5	45.0
2015/04/23	16:25:15	46.2	46.1	45.7	45.9
2015/04/23	16:25:16	49.6	48.7	46.1	46.8
2015/04/23	16:25:17	50.0	49.6	48.7	49.7
2015/04/23	16:25:18	48.8	49.6	49.0	48.0

2015/04/23	16:25:19	47.9	49.0	48.3	47.4
2015/04/23	16:25:20	47.3	48.3	47.7	47.1
2015/04/23	16:25:21	46.8	47.7	47.1	46.5
2015/04/23	16:25:22	46.2	47.2	46.6	45.8
2015/04/23	16:25:23	45.9	46.6	46.1	45.5
2015/04/23	16:25:24	47.8	47.4	46.2	46.3
2015/04/23	16:25:25	47.5	47.7	47.4	46.9
2015/04/23	16:25:26	53.7	52.8	47.4	47.1
2015/04/23	16:25:27	55.2	54.5	52.4	52.1
2015/04/23	16:25:28	51.5	54.5	52.9	50.2
2015/04/23	16:25:29	53.6	53.6	52.9	52.2
2015/04/23	16:25:30	52.3	53.2	52.3	50.5
2015/04/23	16:25:31	50.4	52.8	51.3	49.3
2015/04/23	16:25:32	49.5	51.3	50.2	49.2
2015/04/23	16:25:33	49.3	50.2	49.7	48.8
2015/04/23	16:25:34	51.8	51.4	49.7	49.7
2015/04/23	16:25:35	53.9	53.2	51.4	52.4
2015/04/23	16:25:36	51.9	53.4	52.3	50.3
2015/04/23	16:25:37	50.7	52.4	51.2	49.0
2015/04/23	16:25:38	49.9	51.2	50.3	48.3
2015/04/23	16:25:39	47.0	50.6	48.7	46.5
2015/04/23	16:25:40	48.4	48.7	48.5	47.2
2015/04/23	16:25:41	53.5	52.2	48.5	48.5
2015/04/23	16:25:42	50.1	52.2	51.1	48.6
2015/04/23	16:25:43	50.4	51.0	50.5	49.2
2015/04/23	16:25:44	51.0	51.3	50.8	49.7
2015/04/23	16:25:45	49.2	50.8	49.8	48.3
2015/04/23	16:25:46	47.9	49.9	48.7	47.2
2015/04/23	16:25:47	49.6	49.4	48.6	48.3
2015/04/23	16:25:48	48.5	49.2	48.6	47.7
2015/04/23	16:25:49	47.2	48.7	47.8	46.5
2015/04/23	16:25:50	48.8	48.7	47.8	47.2
2015/04/23	16:25:51	48.2	48.5	48.1	47.2
2015/04/23	16:25:52	46.9	48.0	47.4	46.4
2015/04/23	16:25:53	47.4	47.4	47.3	46.8
2015/04/23	16:25:54	47.1	47.5	47.1	46.7
2015/04/23	16:25:55	46.3	47.2	46.6	45.6
2015/04/23	16:25:56	46.0	46.6	46.1	45.3
2015/04/23	16:25:57	45.6	46.3	45.8	45.2
2015/04/23	16:25:58	46.7	46.6	45.6	45.0
2015/04/23	16:25:59	51.7	50.8	46.6	47.8
2015/04/23	16:26:00	50.8	51.3	49.8	47.2
2015/04/23	16:26:01	47.9	50.6	49.0	46.4
2015/04/23	16:26:02	49.1	49.6	48.7	45.8
2015/04/23	16:26:03	48.6	49.3	48.6	46.6
2015/04/23	16:26:04	47.1	48.6	47.6	46.5
2015/04/23	16:26:05	49.1	48.8	47.7	47.5

2015/04/23	16:26:06	47.5	48.4	47.7	46.4
2015/04/23	16:26:07	46.4	48.0	46.9	45.1
2015/04/23	16:26:08	45.9	46.9	46.1	44.4
2015/04/23	16:26:09	46.0	46.5	46.0	44.8
2015/04/23	16:26:10	47.3	47.2	45.6	44.9
2015/04/23	16:26:11	48.9	48.3	47.3	48.2
2015/04/23	16:26:12	48.3	48.7	48.2	47.7
2015/04/23	16:26:13	48.6	48.7	48.1	47.7
2015/04/23	16:26:14	47.5	48.4	47.8	47.0
2015/04/23	16:26:15	46.2	47.8	46.8	45.8
2015/04/23	16:26:16	46.8	47.0	46.1	44.9
2015/04/23	16:26:17	46.0	47.1	46.4	45.7
2015/04/23	16:26:18	45.8	46.4	46.1	45.5
2015/04/23	16:26:19	45.8	46.1	45.9	45.5
2015/04/23	16:26:20	47.7	47.2	45.9	45.8
2015/04/23	16:26:21	47.6	47.6	47.2	47.0
2015/04/23	16:26:22	47.1	47.4	47.2	46.8
2015/04/23	16:26:23	47.7	47.6	47.1	46.8
2015/04/23	16:26:24	47.8	47.8	47.4	47.1
2015/04/23	16:26:25	47.6	48.0	47.5	46.5
2015/04/23	16:26:26	45.6	47.5	46.4	45.1
2015/04/23	16:26:27	46.7	46.9	45.9	44.9
2015/04/23	16:26:28	45.3	46.6	45.9	45.0
2015/04/23	16:26:29	45.5	45.8	45.6	45.1
2015/04/23	16:26:30	45.0	45.7	45.2	44.7
2015/04/23	16:26:31	46.4	46.1	45.2	45.2
2015/04/23	16:26:32	45.1	45.9	45.4	44.4
2015/04/23	16:26:33	46.0	45.9	45.4	45.2
2015/04/23	16:26:34	45.9	45.9	45.8	45.6
2015/04/23	16:26:35	46.6	46.5	45.9	45.9
2015/04/23	16:26:36	46.4	47.0	46.2	45.2
2015/04/23	16:26:37	46.3	46.3	45.9	45.1
2015/04/23	16:26:38	46.0	46.3	46.1	45.8
2015/04/23	16:26:39	45.1	46.1	45.5	44.9
2015/04/23	16:26:40	45.0	45.5	45.1	44.7
2015/04/23	16:26:41	46.1	45.8	45.2	45.7
2015/04/23	16:26:42	47.1	46.8	45.8	46.2
2015/04/23	16:26:43	47.9	47.7	46.8	46.9
2015/04/23	16:26:44	46.9	47.4	46.9	46.3
2015/04/23	16:26:45	49.3	48.6	47.2	48.4
2015/04/23	16:26:46	48.0	48.6	48.2	47.6
2015/04/23	16:26:47	48.0	48.2	47.9	47.2
2015/04/23	16:26:48	48.6	48.6	48.2	48.0
2015/04/23	16:26:49	46.9	48.4	47.5	46.5
2015/04/23	16:26:50	47.7	47.7	47.4	46.5
2015/04/23	16:26:51	46.0	47.6	46.7	45.8
2015/04/23	16:26:52	44.8	46.6	45.6	44.5

2015/04/23	16:26:53	44.2	45.6	44.7	43.9
2015/04/23	16:26:54	44.9	45.1	44.6	44.2
2015/04/23	16:26:55	44.7	44.9	44.6	43.8
2015/04/23	16:26:56	44.9	44.9	44.6	44.2
2015/04/23	16:26:57	48.5	47.9	44.8	44.8
2015/04/23	16:26:58	47.9	48.2	47.5	46.5
2015/04/23	16:26:59	44.9	47.9	46.3	44.6
2015/04/23	16:27:00	44.7	46.2	45.3	44.4
2015/04/23	16:27:01	44.2	45.3	44.6	43.8
2015/04/23	16:27:02	44.3	44.7	44.4	44.0
2015/04/23	16:27:03	45.2	45.0	44.4	44.3
2015/04/23	16:27:04	45.4	45.3	44.9	45.1
2015/04/23	16:27:05	47.3	46.8	45.2	45.3
2015/04/23	16:27:06	45.5	46.8	46.0	45.1
2015/04/23	16:27:07	44.8	46.0	45.2	44.2
2015/04/23	16:27:08	44.7	45.3	44.8	44.1
2015/04/23	16:27:09	44.0	44.8	44.3	43.6
2015/04/23	16:27:10	43.8	44.4	44.0	43.6
2015/04/23	16:27:11	43.5	44.0	43.7	43.3
2015/04/23	16:27:12	44.5	44.2	43.7	43.9
2015/04/23	16:27:13	44.6	44.4	44.2	43.9
2015/04/23	16:27:14	43.4	44.4	43.8	43.0
2015/04/23	16:27:15	44.5	44.5	43.5	43.1
2015/04/23	16:27:16	43.9	44.8	43.9	42.9
2015/04/23	16:27:17	43.0	43.9	43.3	42.6
2015/04/23	16:27:18	43.7	43.7	43.1	42.7
2015/04/23	16:27:19	44.0	44.0	43.7	43.4
2015/04/23	16:27:20	43.1	43.8	43.3	42.7
2015/04/23	16:27:21	43.2	43.4	43.2	43.0
2015/04/23	16:27:22	44.4	44.1	43.2	43.2
2015/04/23	16:27:23	43.6	44.2	43.7	42.9
2015/04/23	16:27:24	43.9	43.9	43.6	42.8
2015/04/23	16:27:25	45.3	44.8	43.9	44.3
2015/04/23	16:27:26	46.4	46.0	44.7	44.8
2015/04/23	16:27:27	47.8	47.2	46.1	47.4
2015/04/23	16:27:28	48.6	48.2	47.2	47.6
2015/04/23	16:27:29	48.1	48.2	47.8	47.3
2015/04/23	16:27:30	49.1	48.8	48.1	48.3
2015/04/23	16:27:31	47.5	48.8	47.9	46.5
2015/04/23	16:27:32	48.4	48.3	47.9	47.7
2015/04/23	16:27:33	49.2	49.0	48.2	47.9
2015/04/23	16:27:34	47.2	49.0	48.0	46.6
2015/04/23	16:27:35	48.3	48.3	47.8	47.4
2015/04/23	16:27:36	51.5	50.4	48.3	49.6
2015/04/23	16:27:37	48.1	50.4	49.0	47.1
2015/04/23	16:27:38	46.6	48.9	47.6	46.1
2015/04/23	16:27:39	45.3	47.6	46.3	45.0

2015/04/23	16:27:40	47.2	47.1	46.2	45.4
2015/04/23	16:27:41	44.7	46.9	45.6	44.5
2015/04/23	16:27:42	45.5	45.7	45.3	44.4
2015/04/23	16:27:43	49.1	48.3	45.7	46.5
2015/04/23	16:27:44	47.3	48.4	47.6	46.6
2015/04/23	16:27:45	48.1	48.0	47.4	46.6
2015/04/23	16:27:46	46.2	47.9	46.8	45.2
2015/04/23	16:27:47	47.7	47.5	46.8	46.4
2015/04/23	16:27:48	45.7	47.5	46.4	45.1
2015/04/23	16:27:49	48.8	48.3	46.4	46.2
2015/04/23	16:27:50	50.7	50.1	48.2	48.7
2015/04/23	16:27:51	44.8	49.9	47.4	44.5
2015/04/23	16:27:52	43.8	47.4	45.5	43.3
2015/04/23	16:27:53	44.9	45.5	45.1	44.0
2015/04/23	16:27:54	47.4	46.8	45.2	45.8
2015/04/23	16:27:55	50.4	49.7	46.8	47.4
2015/04/23	16:27:56	50.9	50.6	49.8	49.6
2015/04/23	16:27:57	48.6	50.5	49.4	48.1
2015/04/23	16:27:58	48.5	49.4	48.9	47.9
2015/04/23	16:27:59	48.4	48.9	48.6	48.1
2015/04/23	16:28:00	47.5	48.7	47.8	46.4
2015/04/23	16:28:01	47.1	47.8	47.3	46.5
2015/04/23	16:28:02	47.3	47.4	47.2	47.0
2015/04/23	16:28:03	47.3	47.6	47.2	46.1
2015/04/23	16:28:04	48.1	47.8	47.2	47.5
2015/04/23	16:28:05	47.1	47.8	47.3	46.6
2015/04/23	16:28:06	47.7	47.7	47.3	47.0
2015/04/23	16:28:07	48.4	48.5	47.6	46.8
2015/04/23	16:28:08	47.9	48.2	47.6	46.5
2015/04/23	16:28:09	46.9	48.1	47.3	45.6
2015/04/23	16:28:10	46.0	47.4	46.5	45.3
2015/04/23	16:28:11	46.7	46.9	46.4	45.6
2015/04/23	16:28:12	47.0	47.0	46.1	44.9
2015/04/23	16:28:13	45.2	47.0	45.8	43.6
2015/04/23	16:28:14	46.6	46.5	45.5	43.5
2015/04/23	16:28:15	46.0	46.6	46.1	44.9
2015/04/23	16:28:16	44.2	46.0	45.0	44.0
2015/04/23	16:28:17	46.3	45.9	45.0	44.9
2015/04/23	16:28:18	45.3	45.8	45.2	44.2
2015/04/23	16:28:19	45.0	45.6	45.1	44.0
2015/04/23	16:28:20	45.3	45.5	45.1	44.6
2015/04/23	16:28:21	47.0	46.8	44.8	43.7
2015/04/23	16:28:22	44.4	46.7	45.4	43.8
2015/04/23	16:28:23	43.2	45.4	44.1	42.8
2015/04/23	16:28:24	43.4	44.1	43.5	42.7
2015/04/23	16:28:25	43.0	43.9	43.3	42.8
2015/04/23	16:28:26	42.6	43.3	42.8	42.4

2015/04/23	16:28:27	44.0	43.7	42.8	42.6
2015/04/23	16:28:28	44.0	44.0	43.4	42.9
2015/04/23	16:28:29	47.0	46.6	43.9	43.9
2015/04/23	16:28:30	43.9	45.7	44.7	43.7
2015/04/23	16:28:31	43.6	44.7	44.0	43.2
2015/04/23	16:28:32	44.8	44.7	44.0	43.6
2015/04/23	16:28:33	46.3	45.8	44.7	45.7
2015/04/23	16:28:34	44.9	45.7	45.2	44.7
2015/04/23	16:28:35	45.0	45.3	44.8	44.0
2015/04/23	16:28:36	43.7	45.1	44.3	43.4
2015/04/23	16:28:37	44.2	44.3	44.1	43.7
2015/04/23	16:28:38	44.5	44.6	44.3	43.9
2015/04/23	16:28:39	44.1	44.3	44.1	43.4
2015/04/23	16:28:40	46.5	46.1	44.2	44.5
2015/04/23	16:28:41	46.0	46.3	45.9	45.1
2015/04/23	16:28:42	45.9	46.0	45.7	44.8
2015/04/23	16:28:43	49.0	48.4	46.0	47.0
2015/04/23	16:28:44	48.6	48.6	48.2	48.0
2015/04/23	16:28:45	49.2	49.0	48.5	48.2
2015/04/23	16:28:46	48.7	49.6	48.6	47.3
2015/04/23	16:28:47	47.1	48.6	47.7	46.6
2015/04/23	16:28:48	48.3	48.2	47.6	47.1
2015/04/23	16:28:49	50.3	49.6	48.3	49.0
2015/04/23	16:28:50	51.7	51.1	49.6	49.9
2015/04/23	16:28:51	50.7	51.6	50.6	48.9
2015/04/23	16:28:52	48.3	50.6	49.3	47.9
2015/04/23	16:28:53	45.6	49.3	47.3	44.8
2015/04/23	16:28:54	47.5	47.5	47.3	46.4
2015/04/23	16:28:55	46.2	47.5	46.6	45.7
2015/04/23	16:28:56	45.0	46.7	45.6	44.2
2015/04/23	16:28:57	44.4	45.6	44.9	44.0
2015/04/23	16:28:58	44.5	44.8	44.6	43.9
2015/04/23	16:28:59	44.2	44.7	44.4	43.8
2015/04/23	16:29:00	44.3	44.4	44.3	43.9
2015/04/23	16:29:01	44.6	44.7	44.2	43.9
2015/04/23	16:29:02	45.9	45.8	44.5	44.3
2015/04/23	16:29:03	44.2	45.6	44.8	44.0
2015/04/23	16:29:04	44.5	44.8	44.6	44.0
2015/04/23	16:29:05	45.1	44.9	44.6	44.8
2015/04/23	16:29:06	45.1	45.2	44.9	44.7
2015/04/23	16:29:07	45.3	45.2	44.9	44.9
2015/04/23	16:29:08	45.1	45.2	45.1	44.9
2015/04/23	16:29:09	45.1	45.2	45.0	44.8
2015/04/23	16:29:10	45.3	45.3	45.1	45.1
2015/04/23	16:29:11	46.0	45.7	45.2	45.5
2015/04/23	16:29:12	46.3	46.1	45.7	45.8
2015/04/23	16:29:13	46.7	46.6	46.1	46.4

2015/04/23	16:29:14	46.7	46.8	46.6	46.3
2015/04/23	16:29:15	46.5	46.7	46.5	45.8
2015/04/23	16:29:16	46.1	46.5	46.2	45.9
2015/04/23	16:29:17	46.9	46.7	46.3	46.4
2015/04/23	16:29:18	46.1	46.7	46.3	45.9
2015/04/23	16:29:19	46.4	46.5	46.3	46.0
2015/04/23	16:29:20	45.4	46.3	45.7	45.1
2015/04/23	16:29:21	45.1	45.7	45.3	44.8
2015/04/23	16:29:22	44.8	45.3	45.0	44.5
2015/04/23	16:29:23	44.3	45.0	44.5	43.8
2015/04/23	16:29:24	43.8	44.6	44.1	43.5
2015/04/23	16:29:25	43.9	44.1	43.9	43.6
2015/04/23	16:29:26	44.3	44.3	44.0	43.8
2015/04/23	16:29:27	44.4	44.4	44.2	44.0
2015/04/23	16:29:28	43.9	44.3	44.0	43.4
2015/04/23	16:29:29	44.0	44.2	43.7	43.1
2015/04/23	16:29:30	43.6	44.3	43.8	43.4
2015/04/23	16:29:31	44.7	44.6	43.7	43.5
2015/04/23	16:29:32	45.7	45.7	44.3	43.9
2015/04/23	16:29:33	48.7	48.7	46.1	44.4
2015/04/23	16:29:34	44.7	47.0	45.7	44.0
2015/04/23	16:29:35	44.4	45.7	45.0	44.2
2015/04/23	16:29:36	44.8	45.1	44.8	44.5
2015/04/23	16:29:37	45.7	45.6	44.7	44.2
2015/04/23	16:29:38	44.2	45.3	44.7	43.8
2015/04/23	16:29:39	44.2	44.7	44.3	43.9
2015/04/23	16:29:40	44.1	44.5	44.2	43.8
2015/04/23	16:29:41	44.0	44.3	44.0	43.7
2015/04/23	16:29:42	44.8	44.8	44.1	43.9
2015/04/23	16:29:43	44.1	44.5	44.3	43.8
2015/04/23	16:29:44	44.0	44.4	44.1	43.4
2015/04/23	16:29:45	44.7	44.7	44.0	43.5
2015/04/23	16:29:46	43.1	44.3	43.5	42.8
2015/04/23	16:29:47	43.1	43.5	43.3	42.9
2015/04/23	16:29:48	43.8	43.6	43.3	43.3
2015/04/23	16:29:49	44.4	44.2	43.6	44.1
2015/04/23	16:29:50	44.0	44.2	44.0	43.8
2015/04/23	16:29:51	43.7	44.0	43.8	43.5
2015/04/23	16:29:52	43.1	43.9	43.4	43.0
2015/04/23	16:29:53	43.6	43.6	43.3	43.2
2015/04/23	16:29:54	43.1	43.7	43.3	42.6
2015/04/23	16:29:55	43.9	43.7	43.3	43.3
2015/04/23	16:29:56	43.1	43.7	43.3	42.8
2015/04/23	16:29:57	43.3	43.3	43.2	43.0
2015/04/23	16:29:58	43.4	43.5	43.3	43.2
2015/04/23	16:29:59	43.4	43.4	43.3	43.1
2015/04/23	16:30:00	43.5	43.5	43.3	43.2

2015/04/23	16:30:01	44.8	44.5	43.6	43.7
2015/04/23	16:30:02	43.8	44.2	43.9	43.5
2015/04/23	16:30:03	43.4	43.9	43.6	43.1
2015/04/23	16:30:04	44.0	44.0	43.7	43.6
2015/04/23	16:30:05	43.7	43.9	43.7	43.5
2015/04/23	16:30:06	43.1	43.7	43.3	42.7
2015/04/23	16:30:07	43.4	43.5	43.3	43.0
2015/04/23	16:30:08	43.6	43.6	43.3	43.2
2015/04/23	16:30:09	43.2	43.5	43.2	42.8
2015/04/23	16:30:10	43.2	43.3	43.2	43.1
2015/04/23	16:30:11	43.6	43.5	43.2	43.1
2015/04/23	16:30:12	43.2	43.6	43.2	42.6
2015/04/23	16:30:13	43.3	43.3	43.1	42.8
2015/04/23	16:30:14	44.7	44.3	43.3	43.7
2015/04/23	16:30:15	45.6	45.4	44.3	44.2
2015/04/23	16:30:16	47.8	47.2	45.4	46.5
2015/04/23	16:30:17	49.2	48.9	47.1	47.1
2015/04/23	16:30:18	49.5	49.4	48.5	48.1
2015/04/23	16:30:19	48.6	49.4	48.9	48.0
2015/04/23	16:30:20	47.8	49.0	48.3	47.0
2015/04/23	16:30:21	47.8	48.4	47.7	46.5
2015/04/23	16:30:22	54.8	54.5	48.1	47.4
2015/04/23	16:30:23	47.0	52.7	50.1	44.7
2015/04/23	16:30:24	46.0	50.1	48.0	45.3
2015/04/23	16:30:25	47.8	48.0	47.6	46.3
2015/04/23	16:30:26	47.0	48.1	47.3	46.2
2015/04/23	16:30:27	47.7	47.7	47.2	46.4
2015/04/23	16:30:28	47.3	47.6	47.4	46.8
2015/04/23	16:30:29	47.0	47.4	47.1	46.6
2015/04/23	16:30:30	46.8	47.3	46.8	45.9
2015/04/23	16:30:31	45.7	46.8	46.2	45.3
2015/04/23	16:30:32	45.9	46.3	46.0	45.4
2015/04/23	16:30:33	44.8	45.9	45.2	44.6
2015/04/23	16:30:34	45.6	45.6	45.0	44.5
2015/04/23	16:30:35	46.0	46.1	45.6	45.0
2015/04/23	16:30:36	45.2	45.8	45.3	44.8
2015/04/23	16:30:37	47.2	46.7	45.4	45.6
2015/04/23	16:30:38	47.4	47.2	46.7	47.0
2015/04/23	16:30:39	47.2	47.6	47.1	46.1
2015/04/23	16:30:40	45.3	47.1	46.0	45.0
2015/04/23	16:30:41	45.7	46.1	45.7	44.9
2015/04/23	16:30:42	45.5	45.8	45.6	45.2
2015/04/23	16:30:43	45.8	45.8	45.6	45.6
2015/04/23	16:30:44	48.6	48.4	45.4	44.7
2015/04/23	16:30:45	48.5	48.9	48.0	46.0
2015/04/23	16:30:46	49.7	49.7	48.3	48.2
2015/04/23	16:30:47	47.5	49.2	48.1	46.8

2015/04/23	16:30:48	48.5	49.0	47.5	45.8
2015/04/23	16:30:49	45.6	48.5	47.0	45.5
2015/04/23	16:30:50	45.8	47.0	46.3	44.9
2015/04/23	16:30:51	45.5	46.3	45.7	45.0
2015/04/23	16:30:52	46.7	46.4	46.0	45.2
2015/04/23	16:30:53	46.8	46.7	46.2	45.9
2015/04/23	16:30:54	48.0	47.6	46.7	47.2
2015/04/23	16:30:55	48.6	48.4	47.6	47.7
2015/04/23	16:30:56	47.1	48.4	47.6	46.8
2015/04/23	16:30:57	46.4	47.6	46.7	45.2
2015/04/23	16:30:58	45.6	46.7	46.0	44.7
2015/04/23	16:30:59	45.6	46.0	45.7	44.7
2015/04/23	16:31:00	45.1	45.7	45.2	44.4
2015/04/23	16:31:01	45.1	45.5	45.1	44.3
2015/04/23	16:31:02	47.3	46.8	44.8	43.8
2015/04/23	16:31:03	48.4	48.3	46.6	46.5
2015/04/23	16:31:04	46.3	47.6	46.8	45.1
2015/04/23	16:31:05	46.2	46.8	46.4	45.6
2015/04/23	16:31:06	45.2	46.4	45.5	44.1
2015/04/23	16:31:07	45.2	46.0	45.3	44.4
2015/04/23	16:31:08	45.0	45.5	45.0	43.9
2015/04/23	16:31:09	45.6	45.5	44.7	43.6
2015/04/23	16:31:10	46.9	46.8	45.6	45.0
2015/04/23	16:31:11	45.7	46.2	45.8	45.0
2015/04/23	16:31:12	45.3	45.8	45.4	44.3
2015/04/23	16:31:13	44.5	45.6	44.9	44.1
2015/04/23	16:31:14	44.3	44.9	44.5	44.0
2015/04/23	16:31:15	46.6	46.3	44.4	44.2
2015/04/23	16:31:16	47.0	46.9	46.1	45.8
2015/04/23	16:31:17	46.6	47.0	46.7	45.9
2015/04/23	16:31:18	46.8	47.0	46.7	46.2
2015/04/23	16:31:19	45.9	46.7	46.1	45.0
2015/04/23	16:31:20	46.3	46.5	46.1	45.7
2015/04/23	16:31:21	45.3	46.2	45.6	44.3
2015/04/23	16:31:22	44.7	45.7	44.8	43.1
2015/04/23	16:31:23	46.7	47.0	45.1	43.3
2015/04/23	16:31:24	45.7	46.4	45.5	43.8
2015/04/23	16:31:25	45.0	45.5	44.7	42.8
2015/04/23	16:31:26	44.4	45.4	44.3	42.6
2015/04/23	16:31:27	43.0	45.1	43.9	42.7
2015/04/23	16:31:28	52.8	52.3	43.7	43.1
2015/04/23	16:31:29	42.7	50.0	47.0	42.6
2015/04/23	16:31:30	42.9	46.9	44.9	42.5
2015/04/23	16:31:31	43.4	44.9	44.0	42.9
2015/04/23	16:31:32	43.8	44.0	43.7	42.9
2015/04/23	16:31:33	45.1	44.7	44.0	44.6
2015/04/23	16:31:34	49.2	48.7	44.6	44.3

2015/04/23	16:31:35	46.0	48.3	47.0	45.0
2015/04/23	16:31:36	47.2	47.6	47.0	45.7
2015/04/23	16:31:37	44.6	47.0	45.6	44.0
2015/04/23	16:31:38	43.5	45.5	44.4	43.2
2015/04/23	16:31:39	43.8	44.4	44.0	43.5
2015/04/23	16:31:40	43.5	44.0	43.7	43.2
2015/04/23	16:31:41	43.5	43.7	43.6	43.2
2015/04/23	16:31:42	43.5	43.6	43.5	43.2
2015/04/23	16:31:43	44.2	44.0	43.5	43.6
2015/04/23	16:31:44	44.7	44.4	44.0	44.4
2015/04/23	16:31:45	44.5	44.5	44.3	44.1
2015/04/23	16:31:46	44.6	44.6	44.5	44.5
2015/04/23	16:31:47	44.4	44.6	44.4	44.2
2015/04/23	16:31:48	44.0	44.5	44.2	43.8
2015/04/23	16:31:49	45.3	45.0	44.2	44.2
2015/04/23	16:31:50	46.7	46.1	45.0	46.0
2015/04/23	16:31:51	46.7	46.5	46.1	46.3
2015/04/23	16:31:52	48.7	48.2	46.5	47.0
2015/04/23	16:31:53	47.5	48.3	47.7	46.9
2015/04/23	16:31:54	47.1	47.7	47.3	46.7
2015/04/23	16:31:55	47.1	47.3	47.2	46.8
2015/04/23	16:31:56	45.5	47.1	46.2	45.0
2015/04/23	16:31:57	46.8	46.9	45.9	45.3
2015/04/23	16:31:58	47.6	47.3	46.9	47.2
2015/04/23	16:31:59	48.2	48.0	47.2	47.0
2015/04/23	16:32:00	48.3	48.4	47.6	46.9
2015/04/23	16:32:01	47.1	48.3	47.6	46.7
2015/04/23	16:32:02	49.5	48.9	47.6	48.0
2015/04/23	16:32:03	48.3	49.2	48.4	47.4
2015/04/23	16:32:04	46.6	48.4	47.3	46.2
2015/04/23	16:32:05	53.6	52.6	47.3	48.7
2015/04/23	16:32:06	52.0	52.4	51.8	50.8
2015/04/23	16:32:07	51.6	52.8	51.6	49.4
2015/04/23	16:32:08	48.1	51.5	49.7	47.2
2015/04/23	16:32:09	50.9	50.6	49.6	48.7
2015/04/23	16:32:10	51.5	51.2	50.7	50.6
2015/04/23	16:32:11	48.4	51.2	49.6	47.8
2015/04/23	16:32:12	53.6	52.5	49.6	51.4
2015/04/23	16:32:13	51.7	52.5	51.9	50.9
2015/04/23	16:32:14	52.0	52.4	51.8	50.7
2015/04/23	16:32:15	50.1	52.0	50.7	48.9
2015/04/23	16:32:16	49.2	50.7	49.8	48.8
2015/04/23	16:32:17	47.8	49.8	48.6	47.3
2015/04/23	16:32:18	48.1	48.6	48.1	46.9
2015/04/23	16:32:19	49.8	49.5	48.4	48.8
2015/04/23	16:32:20	49.3	49.7	49.0	48.1
2015/04/23	16:32:21	52.1	51.4	49.2	49.4

2015/04/23	16:32:22	52.2	52.1	51.2	50.8
2015/04/23	16:32:23	52.3	52.5	51.8	51.2
2015/04/23	16:32:24	49.9	52.3	50.8	48.9
2015/04/23	16:32:25	48.3	50.8	49.4	47.6
2015/04/23	16:32:26	50.3	50.1	49.5	49.7
2015/04/23	16:32:27	50.9	50.9	49.8	49.2
2015/04/23	16:32:28	55.4	54.2	50.9	53.7
2015/04/23	16:32:29	50.0	53.9	51.8	48.9
2015/04/23	16:32:30	45.8	51.8	49.1	45.5
2015/04/23	16:32:31	45.5	49.1	47.2	45.3
2015/04/23	16:32:32	45.2	47.2	46.0	44.9
2015/04/23	16:32:33	45.3	46.0	45.4	44.1
2015/04/23	16:32:34	46.4	46.3	45.8	46.0
2015/04/23	16:32:35	44.8	46.2	45.4	44.6
2015/04/23	16:32:36	44.0	45.3	44.5	43.5
2015/04/23	16:32:37	43.2	44.5	43.7	43.0
2015/04/23	16:32:38	43.8	43.9	43.6	43.3
2015/04/23	16:32:39	44.1	44.0	43.8	43.7
2015/04/23	16:32:40	44.4	44.4	44.0	44.0
2015/04/23	16:32:41	44.7	44.6	44.2	44.1
2015/04/23	16:32:42	44.0	44.6	44.1	43.6
2015/04/23	16:32:43	44.0	44.4	43.9	43.2
2015/04/23	16:32:44	43.1	43.9	43.4	42.8
2015/04/23	16:32:45	43.3	43.5	43.3	43.1
2015/04/23	16:32:46	43.5	43.5	43.2	43.1
2015/04/23	16:32:47	44.6	44.4	43.5	43.9
2015/04/23	16:32:48	44.2	44.3	44.1	43.9
2015/04/23	16:32:49	44.6	44.5	44.2	44.2
2015/04/23	16:32:50	44.3	44.5	44.3	43.9
2015/04/23	16:32:51	45.4	45.1	44.3	44.4
2015/04/23	16:32:52	46.0	45.8	45.1	45.3
2015/04/23	16:32:53	46.5	46.3	45.7	46.1
2015/04/23	16:32:54	47.8	47.4	46.3	46.8
2015/04/23	16:32:55	45.6	47.2	46.3	45.4
2015/04/23	16:32:56	45.1	46.2	45.6	44.8
2015/04/23	16:32:57	45.6	45.7	45.3	44.9
2015/04/23	16:32:58	45.5	45.9	45.5	45.0
2015/04/23	16:32:59	45.1	45.5	45.3	44.7
2015/04/23	16:33:00	45.5	45.5	45.2	45.1
2015/04/23	16:33:01	47.4	46.9	45.5	46.0
2015/04/23	16:33:02	46.3	46.8	46.5	45.9
2015/04/23	16:33:03	46.5	46.8	46.4	45.8
2015/04/23	16:33:04	45.6	46.4	45.9	45.3
2015/04/23	16:33:05	44.8	45.9	45.3	44.5
2015/04/23	16:33:06	44.8	45.3	45.0	44.6
2015/04/23	16:33:07	44.7	45.1	44.8	44.4
2015/04/23	16:33:08	45.1	45.0	44.8	44.6

2015/04/23	16:33:09	45.3	45.2	45.0	45.0
2015/04/23	16:33:10	47.1	46.5	45.2	46.1
2015/04/23	16:33:11	48.7	48.1	46.5	47.7
2015/04/23	16:33:12	48.0	48.1	47.7	47.1
2015/04/23	16:33:13	50.3	49.9	48.1	48.7
2015/04/23	16:33:14	48.9	50.0	49.2	48.1
2015/04/23	16:33:15	47.7	49.1	48.3	47.3
2015/04/23	16:33:16	46.2	48.3	47.1	45.5
2015/04/23	16:33:17	46.8	47.1	46.8	45.9
2015/04/23	16:33:18	45.3	46.9	45.9	45.0
2015/04/23	16:33:19	44.5	45.9	45.1	44.2
2015/04/23	16:33:20	45.1	45.2	45.0	44.6
2015/04/23	16:33:21	47.5	46.8	45.4	45.8
2015/04/23	16:33:22	44.9	46.4	45.5	44.5
2015/04/23	16:33:23	45.7	45.7	45.4	44.8
2015/04/23	16:33:24	45.5	45.7	45.5	45.2
2015/04/23	16:33:25	44.8	45.5	45.1	44.7
2015/04/23	16:33:26	44.6	45.2	44.7	44.2
2015/04/23	16:33:27	43.8	44.7	44.1	43.6
2015/04/23	16:33:28	43.6	44.2	43.8	43.3
2015/04/23	16:33:29	45.5	45.0	43.8	43.8
2015/04/23	16:33:30	44.9	45.0	44.9	44.6
2015/04/23	16:33:31	44.7	45.0	44.8	44.4
2015/04/23	16:33:32	44.4	44.8	44.5	44.2
2015/04/23	16:33:33	43.6	44.5	43.9	42.8
2015/04/23	16:33:34	44.3	44.4	43.6	43.0
2015/04/23	16:33:35	45.4	45.4	44.4	43.5
2015/04/23	16:33:36	44.1	44.7	44.3	43.6
2015/04/23	16:33:37	44.0	44.3	44.0	43.4
2015/04/23	16:33:38	44.3	44.3	44.1	44.1
2015/04/23	16:33:39	44.7	44.5	44.2	44.3
2015/04/23	16:33:40	44.1	44.4	44.0	43.4
2015/04/23	16:33:41	44.6	44.5	44.3	43.9
2015/04/23	16:33:42	45.7	45.4	44.5	44.5
2015/04/23	16:33:43	48.0	47.4	45.5	46.1
2015/04/23	16:33:44	51.6	50.8	47.3	47.9
2015/04/23	16:33:45	50.6	50.6	49.8	48.4
2015/04/23	16:33:46	51.0	51.2	50.2	49.3
2015/04/23	16:33:47	48.1	50.8	49.3	47.5
2015/04/23	16:33:48	48.3	49.2	48.7	47.1
2015/04/23	16:33:49	47.9	48.8	48.0	46.3
2015/04/23	16:33:50	44.8	48.0	46.3	44.6
2015/04/23	16:33:51	45.9	46.4	45.5	44.4
2015/04/23	16:33:52	45.5	46.3	45.9	45.0
2015/04/23	16:33:53	46.9	46.5	45.9	46.1
2015/04/23	16:33:54	45.7	46.5	46.0	45.5
2015/04/23	16:33:55	45.7	46.0	45.8	45.1

2015/04/23	16:33:56	46.1	46.0	45.9	45.8
2015/04/23	16:33:57	46.0	46.0	45.9	45.8
2015/04/23	16:33:58	47.9	47.3	46.0	46.2
2015/04/23	16:33:59	46.5	47.1	46.7	46.3
2015/04/23	16:34:00	46.2	46.7	46.4	46.0
2015/04/23	16:34:01	46.0	46.4	46.2	45.7
2015/04/23	16:34:02	46.7	46.6	46.2	46.0
2015/04/23	16:34:03	47.3	47.0	46.6	46.8
2015/04/23	16:34:04	52.5	51.7	47.1	47.9
2015/04/23	16:34:05	53.2	53.0	51.3	50.7
2015/04/23	16:34:06	54.4	54.0	53.0	53.9
2015/04/23	16:34:07	51.6	54.0	52.6	50.9
2015/04/23	16:34:08	51.7	52.6	51.9	50.2
2015/04/23	16:34:09	51.3	52.4	51.5	49.8
2015/04/23	16:34:10	49.7	51.5	50.4	49.4
2015/04/23	16:34:11	48.1	50.4	49.0	47.5
2015/04/23	16:34:12	47.0	49.0	47.8	46.4
2015/04/23	16:34:13	46.4	47.8	47.0	46.1
2015/04/23	16:34:14	46.1	47.0	46.4	45.8
2015/04/23	16:34:15	45.7	46.4	45.9	45.1
2015/04/23	16:34:16	45.6	45.9	45.7	45.1
2015/04/23	16:34:17	45.7	46.0	45.6	44.9
2015/04/23	16:34:18	45.9	45.9	45.5	44.9
2015/04/23	16:34:19	48.7	48.0	45.8	45.9
2015/04/23	16:34:20	47.6	48.0	47.4	46.5
2015/04/23	16:34:21	47.0	47.9	47.1	45.8
2015/04/23	16:34:22	46.2	47.1	46.4	45.5
2015/04/23	16:34:23	47.5	47.4	46.5	45.9
2015/04/23	16:34:24	51.7	50.7	47.6	48.3
2015/04/23	16:34:25	50.3	51.3	50.2	48.4
2015/04/23	16:34:26	47.3	50.7	48.3	44.2
2015/04/23	16:34:27	46.1	48.3	47.0	44.9
2015/04/23	16:34:28	45.1	47.0	45.9	44.7
2015/04/23	16:34:29	45.6	45.9	45.6	45.1
2015/04/23	16:34:30	45.4	45.7	45.4	44.6
2015/04/23	16:34:31	45.1	45.4	45.1	44.4
2015/04/23	16:34:32	47.3	46.9	45.3	45.2
2015/04/23	16:34:33	45.7	46.3	46.0	45.2
2015/04/23	16:34:34	45.4	46.1	45.6	44.7
2015/04/23	16:34:35	44.5	45.6	44.9	44.2
2015/04/23	16:34:36	49.0	48.0	44.9	46.3
2015/04/23	16:34:37	44.4	47.5	45.9	44.2
2015/04/23	16:34:38	44.9	45.9	45.2	44.6
2015/04/23	16:34:39	45.6	45.6	45.1	44.3
2015/04/23	16:34:40	45.3	45.7	45.3	44.5
2015/04/23	16:34:41	44.1	45.3	44.5	43.6
2015/04/23	16:34:42	44.6	44.7	44.5	44.3

2015/04/23	16:34:43	44.7	44.8	44.6	44.3
2015/04/23	16:34:44	44.5	44.7	44.5	43.9
2015/04/23	16:34:45	44.1	44.5	44.2	43.6
2015/04/23	16:34:46	44.3	44.4	44.2	43.7
2015/04/23	16:34:47	44.7	44.7	44.3	44.3
2015/04/23	16:34:48	44.5	44.6	44.4	44.1
2015/04/23	16:34:49	44.5	44.6	44.5	44.2
2015/04/23	16:34:50	44.6	44.6	44.3	43.9
2015/04/23	16:34:51	45.0	44.9	44.6	44.4
2015/04/23	16:34:52	44.9	44.9	44.6	44.1
2015/04/23	16:34:53	44.7	44.9	44.8	44.5
2015/04/23	16:34:54	45.1	45.0	44.7	44.5
2015/04/23	16:34:55	45.8	45.6	45.0	45.0
2015/04/23	16:34:56	47.1	46.7	45.5	46.6
2015/04/23	16:34:57	48.1	47.6	46.6	47.2
2015/04/23	16:34:58	47.8	47.8	47.7	47.5
2015/04/23	16:34:59	48.1	48.0	47.6	47.2
2015/04/23	16:35:00	47.4	48.0	47.5	46.9
2015/04/23	16:35:01	47.5	47.6	47.4	47.0
2015/04/23	16:35:02	50.8	50.0	47.5	47.9
2015/04/23	16:35:03	50.8	50.9	50.0	49.0
2015/04/23	16:35:04	51.5	51.2	50.2	49.1
2015/04/23	16:35:05	52.1	51.8	51.1	51.1
2015/04/23	16:35:06	53.0	52.7	51.9	51.3
2015/04/23	16:35:07	51.2	52.4	51.5	50.1
2015/04/23	16:35:08	52.1	52.2	51.7	50.5
2015/04/23	16:35:09	52.8	52.5	51.9	52.4
2015/04/23	16:35:10	52.6	52.9	52.4	51.2
2015/04/23	16:35:11	50.0	52.5	51.0	49.4
2015/04/23	16:35:12	50.7	51.0	50.7	49.9
2015/04/23	16:35:13	49.6	50.7	49.9	48.7
2015/04/23	16:35:14	51.0	50.7	50.1	50.5
2015/04/23	16:35:15	52.3	51.8	50.7	51.4
2015/04/23	16:35:16	51.2	51.9	51.3	50.3
2015/04/23	16:35:17	51.8	51.8	51.0	49.9
2015/04/23	16:35:18	52.2	52.1	51.8	51.5
2015/04/23	16:35:19	53.2	52.8	52.0	52.8
2015/04/23	16:35:20	53.2	53.1	52.8	52.4
2015/04/23	16:35:21	51.3	53.1	51.9	50.0
2015/04/23	16:35:22	50.7	51.9	51.2	49.7
2015/04/23	16:35:23	50.0	51.3	50.5	49.6
2015/04/23	16:35:24	50.1	50.6	50.2	49.3
2015/04/23	16:35:25	51.1	50.8	50.3	50.6
2015/04/23	16:35:26	51.5	51.3	50.8	51.1
2015/04/23	16:35:27	50.9	51.2	50.8	50.0
2015/04/23	16:35:28	51.7	51.8	51.1	50.2
2015/04/23	16:35:29	48.2	51.2	49.5	47.2

2015/04/23	16:35:30	46.5	49.5	47.9	46.1
2015/04/23	16:35:31	46.1	47.9	46.9	45.7
2015/04/23	16:35:32	47.5	47.3	46.8	46.3
2015/04/23	16:35:33	48.2	48.0	47.3	47.8
2015/04/23	16:35:34	47.4	47.9	47.6	47.1
2015/04/23	16:35:35	47.0	47.6	47.3	46.4
2015/04/23	16:35:36	46.9	47.7	46.9	45.5
2015/04/23	16:35:37	45.8	46.9	46.0	44.6
2015/04/23	16:35:38	47.1	47.0	46.4	46.7
2015/04/23	16:35:39	45.1	46.8	45.8	45.0
2015/04/23	16:35:40	44.5	45.8	45.1	43.9
2015/04/23	16:35:41	44.6	45.1	44.8	44.3
2015/04/23	16:35:42	48.3	47.5	44.8	45.1
2015/04/23	16:35:43	45.7	47.5	46.3	44.8
2015/04/23	16:35:44	43.5	46.3	44.7	42.9
2015/04/23	16:35:45	43.3	44.7	43.8	42.9
2015/04/23	16:35:46	51.8	51.4	43.7	42.8
2015/04/23	16:35:47	43.4	49.5	46.8	43.1
2015/04/23	16:35:48	43.8	46.8	45.2	43.6
2015/04/23	16:35:49	43.9	45.2	44.4	43.6
2015/04/23	16:35:50	44.3	44.5	44.3	44.1
2015/04/23	16:35:51	44.9	44.7	44.4	44.3
2015/04/23	16:35:52	44.7	44.8	44.6	44.3
2015/04/23	16:35:53	47.4	46.8	44.8	45.6
2015/04/23	16:35:54	47.9	47.5	46.8	47.2
2015/04/23	16:35:55	49.1	48.8	47.3	47.1
2015/04/23	16:35:56	49.4	49.2	48.8	48.6
2015/04/23	16:35:57	49.2	49.5	49.2	48.5
2015/04/23	16:35:58	48.9	49.2	48.6	47.7
2015/04/23	16:35:59	47.8	49.3	48.2	46.5
2015/04/23	16:36:00	47.1	48.2	47.5	46.3
2015/04/23	16:36:01	45.9	47.5	46.4	45.0
2015/04/23	16:36:02	46.3	46.6	45.9	44.7
2015/04/23	16:36:03	45.3	46.5	45.8	44.8
2015/04/23	16:36:04	46.4	46.2	45.8	45.8
2015/04/23	16:36:05	47.3	46.9	46.2	46.7
2015/04/23	16:36:06	48.8	48.3	46.9	47.4
2015/04/23	16:36:07	54.0	52.9	48.4	49.9
2015/04/23	16:36:08	54.1	53.8	52.9	53.1
2015/04/23	16:36:09	51.8	53.6	52.5	50.6
2015/04/23	16:36:10	52.4	52.7	51.8	50.2
2015/04/23	16:36:11	55.6	54.7	52.7	54.6
2015/04/23	16:36:12	55.9	55.5	54.7	55.0
2015/04/23	16:36:13	56.6	56.3	55.5	56.1
2015/04/23	16:36:14	57.5	57.2	56.2	56.5
2015/04/23	16:36:15	52.0	56.9	54.5	50.8
2015/04/23	16:36:16	55.7	55.3	54.3	53.0

2015/04/23	16:36:17	61.0	60.0	55.3	55.6
2015/04/23	16:36:18	61.0	60.7	60.0	60.6
2015/04/23	16:36:19	59.0	60.6	59.5	57.6
2015/04/23	16:36:20	57.8	59.5	58.3	55.3
2015/04/23	16:36:21	60.2	59.7	58.8	59.2
2015/04/23	16:36:22	61.5	61.0	59.8	60.5
2015/04/23	16:36:23	57.0	60.7	58.8	56.7
2015/04/23	16:36:24	56.4	58.8	57.3	55.4
2015/04/23	16:36:25	54.8	57.3	55.9	54.4
2015/04/23	16:36:26	55.6	55.9	55.6	54.3
2015/04/23	16:36:27	52.3	55.8	53.9	51.2
2015/04/23	16:36:28	51.2	53.8	52.4	50.9
2015/04/23	16:36:29	49.9	52.4	51.0	49.0
2015/04/23	16:36:30	49.1	51.0	49.8	48.6
2015/04/23	16:36:31	47.1	49.8	48.3	46.7
2015/04/23	16:36:32	46.7	48.3	47.4	46.3
2015/04/23	16:36:33	45.8	47.3	46.4	45.3
2015/04/23	16:36:34	46.6	46.5	46.4	46.0
2015/04/23	16:36:35	46.3	46.6	46.3	45.8
2015/04/23	16:36:36	48.4	47.9	46.3	46.2
2015/04/23	16:36:37	47.2	48.2	47.3	46.2
2015/04/23	16:36:38	47.3	47.4	47.1	46.1
2015/04/23	16:36:39	47.7	47.6	47.3	47.1
2015/04/23	16:36:40	47.4	47.6	47.4	47.2
2015/04/23	16:36:41	47.2	47.5	47.3	47.0
2015/04/23	16:36:42	47.7	47.6	47.3	47.2
2015/04/23	16:36:43	46.9	47.6	47.1	46.2
2015/04/23	16:36:44	46.9	47.1	47.0	46.6
2015/04/23	16:36:45	46.2	47.0	46.5	45.9
2015/04/23	16:36:46	46.5	46.7	46.4	46.0
2015/04/23	16:36:47	46.4	46.5	46.3	45.9
2015/04/23	16:36:48	46.7	46.7	46.4	46.2
2015/04/23	16:36:49	47.7	47.4	46.6	46.7
2015/04/23	16:36:50	48.4	48.1	47.5	48.0
2015/04/23	16:36:51	47.1	48.1	47.5	46.8
2015/04/23	16:36:52	47.6	47.7	47.3	46.8
2015/04/23	16:36:53	48.5	48.3	47.7	48.0
2015/04/23	16:36:54	48.4	48.5	48.3	48.2
2015/04/23	16:36:55	47.4	48.3	47.7	47.2
2015/04/23	16:36:56	47.5	47.7	47.6	47.1
2015/04/23	16:36:57	47.2	47.6	47.3	46.9
2015/04/23	16:36:58	48.3	48.0	47.3	47.1
2015/04/23	16:36:59	47.8	48.1	47.3	46.1
2015/04/23	16:37:00	47.2	47.9	47.5	46.7
2015/04/23	16:37:01	46.1	47.5	46.5	45.1
2015/04/23	16:37:02	47.3	47.2	46.1	44.8
2015/04/23	16:37:03	47.3	47.5	46.8	45.9

2015/04/23	16:37:04	44.8	47.3	45.9	44.0
2015/04/23	16:37:05	45.2	46.0	45.4	44.7
2015/04/23	16:37:06	45.0	45.5	45.2	44.7
2015/04/23	16:37:07	45.1	45.3	45.0	44.5
2015/04/23	16:37:08	47.3	47.0	45.2	45.5
2015/04/23	16:37:09	45.6	46.4	45.9	44.9
2015/04/23	16:37:10	44.1	45.9	44.9	43.8
2015/04/23	16:37:11	47.7	47.5	44.8	43.8
2015/04/23	16:37:12	44.8	46.6	45.4	43.5
2015/04/23	16:37:13	43.2	45.4	44.1	42.8
2015/04/23	16:37:14	43.7	44.1	43.6	42.5
2015/04/23	16:37:15	44.7	44.5	44.0	43.5
2015/04/23	16:37:16	43.7	44.3	43.9	43.2
2015/04/23	16:37:17	44.5	44.4	44.1	44.0
2015/04/23	16:37:18	44.3	44.6	44.0	43.3
2015/04/23	16:37:19	44.4	44.6	43.9	43.2
2015/04/23	16:37:20	44.5	44.6	44.3	43.6
2015/04/23	16:37:21	45.7	45.6	44.4	44.0
2015/04/23	16:37:22	45.7	46.0	45.5	44.8
2015/04/23	16:37:23	45.6	45.7	45.4	44.7
2015/04/23	16:37:24	44.8	45.6	45.0	44.5
2015/04/23	16:37:25	44.6	45.1	44.7	44.2
2015/04/23	16:37:26	45.2	45.1	44.7	44.7
2015/04/23	16:37:27	46.9	46.6	45.0	45.0
2015/04/23	16:37:28	46.4	46.6	46.4	46.0
2015/04/23	16:37:29	47.2	47.0	46.4	46.3
2015/04/23	16:37:30	46.8	47.1	46.8	46.1
2015/04/23	16:37:31	47.4	47.3	46.7	46.4
2015/04/23	16:37:32	49.4	48.8	47.2	47.8
2015/04/23	16:37:33	48.4	48.9	48.3	47.3
2015/04/23	16:37:34	50.1	50.4	47.6	45.6
2015/04/23	16:37:35	46.8	49.8	47.8	45.1
2015/04/23	16:37:36	45.9	48.5	47.1	45.1
2015/04/23	16:37:37	47.1	47.5	46.9	45.9
2015/04/23	16:37:38	45.4	46.9	46.0	45.0
2015/04/23	16:37:39	46.6	46.6	45.9	45.5
2015/04/23	16:37:40	50.9	49.6	46.6	48.7
2015/04/23	16:37:41	54.5	53.4	49.6	50.6
2015/04/23	16:37:42	51.5	53.4	52.2	50.5
2015/04/23	16:37:43	52.4	52.6	51.7	50.8
2015/04/23	16:37:44	53.0	52.9	52.6	52.5
2015/04/23	16:37:45	50.3	52.8	51.3	49.5
2015/04/23	16:37:46	50.6	51.3	50.8	49.5
2015/04/23	16:37:47	50.2	51.2	50.3	49.1
2015/04/23	16:37:48	46.7	50.3	48.3	45.4
2015/04/23	16:37:49	44.5	48.3	46.3	44.1
2015/04/23	16:37:50	44.3	46.3	45.1	44.0

2015/04/23	16:37:51	44.0	45.1	44.4	43.7
2015/04/23	16:37:52	43.7	44.4	43.9	43.2
2015/04/23	16:37:53	44.2	44.2	43.8	43.3
2015/04/23	16:37:54	49.9	48.7	44.2	45.0
2015/04/23	16:37:55	47.5	48.9	47.3	44.9
2015/04/23	16:37:56	47.6	48.5	47.5	45.8
2015/04/23	16:37:57	44.9	47.5	46.0	43.7
2015/04/23	16:37:58	45.4	46.2	45.7	44.6
2015/04/23	16:37:59	44.3	45.7	44.9	44.1
2015/04/23	16:38:00	43.7	44.9	44.1	43.5
2015/04/23	16:38:01	43.3	44.1	43.6	42.9
2015/04/23	16:38:02	44.7	44.5	43.5	43.2
2015/04/23	16:38:03	43.7	44.4	43.9	43.2
2015/04/23	16:38:04	44.1	44.1	43.8	43.3
2015/04/23	16:38:05	43.9	44.3	43.9	43.2
2015/04/23	16:38:06	43.6	43.8	43.5	42.9
2015/04/23	16:38:07	44.5	44.4	43.7	43.4
2015/04/23	16:38:08	43.7	44.3	44.0	43.5
2015/04/23	16:38:09	45.1	44.9	43.8	43.1
2015/04/23	16:38:10	45.9	45.7	44.5	43.7
2015/04/23	16:38:11	46.2	46.2	45.5	45.4
2015/04/23	16:38:12	45.4	46.1	45.6	45.0
2015/04/23	16:38:13	46.8	46.5	45.8	45.8
2015/04/23	16:38:14	48.3	47.9	46.5	47.1
2015/04/23	16:38:15	47.7	47.9	47.4	46.5
2015/04/23	16:38:16	48.2	48.2	47.5	46.9
2015/04/23	16:38:17	48.8	48.6	48.2	48.1
2015/04/23	16:38:18	48.1	48.6	48.2	47.4
2015/04/23	16:38:19	46.1	48.2	47.0	45.7
2015/04/23	16:38:20	48.4	48.5	46.2	44.9
2015/04/23	16:38:21	48.1	49.1	47.7	45.9
2015/04/23	16:38:22	47.4	49.3	47.2	44.0
2015/04/23	16:38:23	45.8	47.5	46.2	44.0
2015/04/23	16:38:24	45.7	46.2	45.8	44.5
2015/04/23	16:38:25	44.3	45.9	44.9	43.5
2015/04/23	16:38:26	48.1	47.7	44.7	43.6
2015/04/23	16:38:27	45.1	47.6	46.0	43.8
2015/04/23	16:38:28	44.5	46.4	45.3	43.6
2015/04/23	16:38:29	45.7	45.9	45.1	44.6
2015/04/23	16:38:30	45.0	45.6	45.1	44.2
2015/04/23	16:38:31	50.6	49.8	45.3	46.4
2015/04/23	16:38:32	48.0	49.7	48.2	44.7
2015/04/23	16:38:33	45.8	48.2	46.9	44.1
2015/04/23	16:38:34	44.8	47.0	45.7	44.1
2015/04/23	16:38:35	46.0	46.2	45.5	44.7
2015/04/23	16:38:36	45.0	46.2	45.4	44.7
2015/04/23	16:38:37	46.0	46.0	45.2	44.8

2015/04/23	16:38:38	47.9	47.3	45.8	45.8
2015/04/23	16:38:39	47.9	47.8	47.3	46.9
2015/04/23	16:38:40	47.3	47.6	47.4	47.0
2015/04/23	16:38:41	45.9	47.4	46.5	45.5
2015/04/23	16:38:42	44.9	46.5	45.5	44.5
2015/04/23	16:38:43	45.4	46.0	45.0	44.1
2015/04/23	16:38:44	43.5	45.4	44.3	43.3
2015/04/23	16:38:45	42.8	44.3	43.4	42.6
2015/04/23	16:38:46	43.5	43.5	43.4	42.8
2015/04/23	16:38:47	45.4	44.7	43.5	44.1
2015/04/23	16:38:48	44.7	45.0	44.2	43.3
2015/04/23	16:38:49	43.2	44.7	43.8	42.7
2015/04/23	16:38:50	42.8	43.8	43.2	42.7
2015/04/23	16:38:51	43.5	43.4	43.1	42.7
2015/04/23	16:38:52	43.7	43.7	43.4	43.1
2015/04/23	16:38:53	43.0	43.5	43.2	42.8
2015/04/23	16:38:54	42.6	43.2	42.8	42.3
2015/04/23	16:38:55	43.6	43.4	42.7	42.5
2015/04/23	16:38:56	44.2	43.9	43.3	43.8
2015/04/23	16:38:57	43.9	44.0	43.7	43.2
2015/04/23	16:38:58	45.4	44.8	44.1	44.5
2015/04/23	16:38:59	45.6	45.3	44.8	45.1
2015/04/23	16:39:00	45.6	45.5	45.2	45.1
2015/04/23	16:39:01	47.4	46.8	45.5	46.5
2015/04/23	16:39:02	48.5	48.2	46.8	47.1
2015/04/23	16:39:03	52.3	51.2	48.3	49.7
2015/04/23	16:39:04	46.4	50.7	48.5	46.0
2015/04/23	16:39:05	45.6	48.5	46.9	45.0
2015/04/23	16:39:06	46.1	46.9	46.4	45.1
2015/04/23	16:39:07	45.1	46.5	45.6	44.3
2015/04/23	16:39:08	43.5	45.6	44.3	43.1
2015/04/23	16:39:09	48.8	47.8	44.3	45.1
2015/04/23	16:39:10	45.3	47.0	46.0	44.2
2015/04/23	16:39:11	43.9	46.1	44.8	43.5
2015/04/23	16:39:12	44.7	44.9	44.5	43.3
2015/04/23	16:39:13	45.9	45.7	44.8	44.6
2015/04/23	16:39:14	48.2	47.9	45.7	45.1
2015/04/23	16:39:15	47.6	47.8	46.9	45.3
2015/04/23	16:39:16	45.0	47.2	46.1	44.4
2015/04/23	16:39:17	44.1	46.1	44.9	43.6
2015/04/23	16:39:18	44.3	44.9	44.5	43.8
2015/04/23	16:39:19	44.2	44.5	44.3	43.9
2015/04/23	16:39:20	43.9	44.5	44.1	43.5
2015/04/23	16:39:21	43.6	44.1	43.7	43.1
2015/04/23	16:39:22	43.6	43.8	43.6	43.3
2015/04/23	16:39:23	44.5	44.3	43.6	43.9
2015/04/23	16:39:24	47.8	47.1	44.1	44.5

2015/04/23	16:39:25	45.9	47.3	46.2	44.7
2015/04/23	16:39:26	44.8	46.2	45.4	44.6
2015/04/23	16:39:27	44.7	45.4	44.9	44.1
2015/04/23	16:39:28	45.1	45.2	44.8	44.1
2015/04/23	16:39:29	45.3	45.3	45.0	44.7
2015/04/23	16:39:30	48.2	47.5	45.3	46.4
2015/04/23	16:39:31	48.8	48.6	47.5	47.4
2015/04/23	16:39:32	45.9	48.1	46.8	44.9
2015/04/23	16:39:33	45.3	46.7	45.8	44.5
2015/04/23	16:39:34	44.9	46.0	45.3	44.4
2015/04/23	16:39:35	45.0	45.3	44.9	44.3
2015/04/23	16:39:36	45.1	45.3	45.1	44.6
2015/04/23	16:39:37	44.6	45.1	44.8	44.3
2015/04/23	16:39:38	44.2	44.8	44.5	43.9
2015/04/23	16:39:39	44.8	44.7	44.5	44.3
2015/04/23	16:39:40	45.1	45.0	44.6	44.5
2015/04/23	16:39:41	44.7	45.0	44.8	44.4
2015/04/23	16:39:42	47.3	46.8	44.9	45.8
2015/04/23	16:39:43	46.1	46.9	46.0	44.5
2015/04/23	16:39:44	45.0	46.0	45.3	43.8
2015/04/23	16:39:45	46.4	46.3	45.6	45.5
2015/04/23	16:39:46	45.4	46.0	45.5	44.6
2015/04/23	16:39:47	44.9	45.6	45.3	44.6
2015/04/23	16:39:47	0.0	0.0	0.0	0.0

NOISE MEASUREMENT LOCATION 3

Date	Time	LAeq	LASmax	LASmin	LAF90.00
2015/04/23	16:11:02	46.8	46.6	46.3	46.4
2015/04/23	16:11:03	46.9	46.9	46.5	46.4
2015/04/23	16:11:04	47.2	47.2	46.7	46.6
2015/04/23	16:11:05	45.8	46.9	46.2	45.4
2015/04/23	16:11:06	46.0	46.2	45.9	45.4
2015/04/23	16:11:07	46.2	46.2	46.0	45.8
2015/04/23	16:11:08	45.9	46.2	45.9	45.5
2015/04/23	16:11:09	46.0	46.2	46.0	45.5
2015/04/23	16:11:10	46.4	46.3	45.9	45.6
2015/04/23	16:11:11	46.8	46.7	46.3	46.2
2015/04/23	16:11:12	47.3	47.1	46.7	46.8
2015/04/23	16:11:13	46.7	47.1	46.8	46.5
2015/04/23	16:11:14	48.0	47.7	46.8	46.8
2015/04/23	16:11:15	47.8	47.8	47.6	47.6
2015/04/23	16:11:16	47.9	47.9	47.7	47.4
2015/04/23	16:11:17	47.5	47.9	47.6	47.2
2015/04/23	16:11:18	47.3	47.6	47.4	47.0
2015/04/23	16:11:19	47.9	47.8	47.4	47.5
2015/04/23	16:11:20	47.7	47.9	47.6	47.3
2015/04/23	16:11:21	47.2	47.7	47.3	46.4
2015/04/23	16:11:22	48.1	47.9	47.3	47.3
2015/04/23	16:11:23	47.6	47.9	47.6	47.2
2015/04/23	16:11:24	47.2	47.7	47.3	46.9
2015/04/23	16:11:25	47.5	47.5	47.3	47.1
2015/04/23	16:11:26	47.1	47.4	47.2	46.8
2015/04/23	16:11:27	47.0	47.2	46.9	46.3
2015/04/23	16:11:28	46.4	47.1	46.7	46.2
2015/04/23	16:11:29	47.1	47.1	46.7	46.5
2015/04/23	16:11:30	51.6	51.2	46.6	45.8
2015/04/23	16:11:31	47.5	51.0	49.1	46.6
2015/04/23	16:11:32	46.9	49.1	47.8	46.4
2015/04/23	16:11:33	46.9	47.8	47.3	46.4
2015/04/23	16:11:34	48.3	48.0	47.3	47.2
2015/04/23	16:11:35	48.2	48.2	47.8	47.5
2015/04/23	16:11:36	48.5	48.5	48.2	47.8
2015/04/23	16:11:37	47.5	48.3	47.8	46.7
2015/04/23	16:11:38	48.1	48.1	47.8	47.4
2015/04/23	16:11:39	48.7	48.5	48.1	48.4
2015/04/23	16:11:40	48.1	48.4	48.0	47.5
2015/04/23	16:11:41	47.7	48.4	48.0	47.5
2015/04/23	16:11:42	47.1	48.0	47.4	46.8
2015/04/23	16:11:43	46.7	47.4	46.9	46.3
2015/04/23	16:11:44	47.7	47.6	47.0	47.0
2015/04/23	16:11:45	47.0	47.3	47.1	46.6
2015/04/23	16:11:46	46.5	47.1	46.7	46.2
2015/04/23	16:11:47	46.9	46.8	46.7	46.5
2015/04/23	16:11:48	47.5	47.3	46.8	46.9

2015/04/23	16:11:49	48.9	48.5	47.2	47.8
2015/04/23	16:11:50	49.7	49.8	48.5	47.8
2015/04/23	16:11:51	47.9	49.0	48.4	47.3
2015/04/23	16:11:52	49.9	49.6	48.3	48.0
2015/04/23	16:11:53	51.3	50.7	49.6	50.5
2015/04/23	16:11:54	48.5	50.6	49.3	47.6
2015/04/23	16:11:55	47.1	49.3	48.0	46.4
2015/04/23	16:11:56	46.1	48.0	46.9	45.8
2015/04/23	16:11:57	45.9	46.9	46.3	45.7
2015/04/23	16:11:58	46.2	46.3	46.1	45.8
2015/04/23	16:11:59	46.9	46.8	46.2	45.8
2015/04/23	16:12:00	48.1	48.0	46.7	46.7
2015/04/23	16:12:01	46.6	47.9	47.1	45.5
2015/04/23	16:12:02	45.9	47.1	46.4	45.5
2015/04/23	16:12:03	45.9	46.4	46.1	45.4
2015/04/23	16:12:04	45.2	46.1	45.5	45.0
2015/04/23	16:12:05	45.1	45.5	45.2	44.8
2015/04/23	16:12:06	44.7	45.2	44.8	44.3
2015/04/23	16:12:07	45.2	45.1	44.8	44.8
2015/04/23	16:12:08	45.8	45.6	45.1	45.4
2015/04/23	16:12:09	46.3	46.0	45.6	46.0
2015/04/23	16:12:10	47.8	47.5	46.0	46.4
2015/04/23	16:12:11	47.6	47.7	47.4	47.3
2015/04/23	16:12:12	47.4	47.6	47.1	46.6
2015/04/23	16:12:13	47.4	47.7	47.4	47.1
2015/04/23	16:12:14	46.8	47.4	47.0	46.4
2015/04/23	16:12:15	47.1	47.2	47.0	46.6
2015/04/23	16:12:16	46.9	47.1	46.9	46.5
2015/04/23	16:12:17	47.2	47.2	46.9	46.7
2015/04/23	16:12:18	46.6	47.1	46.7	46.2
2015/04/23	16:12:19	46.1	46.8	46.3	45.6
2015/04/23	16:12:20	46.3	46.5	46.2	45.9
2015/04/23	16:12:21	46.0	46.2	46.0	45.6
2015/04/23	16:12:22	45.8	46.4	45.8	45.2
2015/04/23	16:12:23	46.0	46.0	45.8	45.5
2015/04/23	16:12:24	46.1	46.1	46.0	45.7
2015/04/23	16:12:25	46.4	46.3	46.0	46.0
2015/04/23	16:12:26	46.1	46.2	46.0	45.5
2015/04/23	16:12:27	45.8	46.3	45.9	45.3
2015/04/23	16:12:28	46.5	46.3	45.9	46.0
2015/04/23	16:12:29	46.6	46.5	46.3	46.4
2015/04/23	16:12:30	46.8	46.7	46.5	46.6
2015/04/23	16:12:31	46.5	46.7	46.6	46.4
2015/04/23	16:12:32	46.7	46.7	46.6	46.4
2015/04/23	16:12:33	46.2	46.7	46.3	45.8
2015/04/23	16:12:34	45.9	46.4	46.0	45.6
2015/04/23	16:12:35	45.8	46.1	45.9	45.6

2015/04/23	16:12:36	45.7	45.9	45.7	45.4
2015/04/23	16:12:37	45.5	45.8	45.6	45.3
2015/04/23	16:12:38	45.5	45.6	45.4	45.1
2015/04/23	16:12:39	45.9	45.8	45.5	45.6
2015/04/23	16:12:40	46.1	46.0	45.8	45.7
2015/04/23	16:12:41	46.5	46.3	46.0	46.2
2015/04/23	16:12:42	47.4	47.1	46.3	46.9
2015/04/23	16:12:43	46.9	47.1	46.9	46.6
2015/04/23	16:12:44	46.3	46.9	46.5	46.0
2015/04/23	16:12:45	46.1	46.5	46.2	45.9
2015/04/23	16:12:46	45.9	46.2	46.0	45.6
2015/04/23	16:12:47	46.3	46.3	45.9	45.8
2015/04/23	16:12:48	46.6	46.5	46.3	46.2
2015/04/23	16:12:49	46.8	46.7	46.5	46.6
2015/04/23	16:12:50	47.0	46.9	46.7	46.7
2015/04/23	16:12:51	47.1	47.1	46.9	46.7
2015/04/23	16:12:52	46.6	47.1	46.7	46.2
2015/04/23	16:12:53	45.9	46.7	46.2	45.8
2015/04/23	16:12:54	45.8	46.2	45.9	45.5
2015/04/23	16:12:55	47.4	47.4	45.9	45.5
2015/04/23	16:12:56	46.1	46.6	46.3	45.5
2015/04/23	16:12:57	46.6	46.6	46.3	46.2
2015/04/23	16:12:58	46.0	46.4	46.2	45.9
2015/04/23	16:12:59	45.9	46.2	46.0	45.7
2015/04/23	16:13:00	46.8	46.6	46.0	45.8
2015/04/23	16:13:01	48.6	48.0	46.7	47.8
2015/04/23	16:13:02	48.2	48.2	48.0	47.8
2015/04/23	16:13:03	47.8	48.1	47.8	47.3
2015/04/23	16:13:04	46.9	47.8	47.3	46.6
2015/04/23	16:13:05	46.5	47.2	46.8	46.4
2015/04/23	16:13:06	46.4	46.8	46.5	46.0
2015/04/23	16:13:07	46.5	46.6	46.5	46.3
2015/04/23	16:13:08	46.1	46.5	46.2	45.9
2015/04/23	16:13:09	46.3	46.4	46.2	46.0
2015/04/23	16:13:10	46.4	46.5	46.3	46.1
2015/04/23	16:13:11	46.3	46.4	46.3	45.9
2015/04/23	16:13:12	46.8	46.7	46.2	46.1
2015/04/23	16:13:13	46.7	46.7	46.6	46.4
2015/04/23	16:13:14	47.2	47.0	46.7	47.0
2015/04/23	16:13:15	46.7	47.0	46.8	46.4
2015/04/23	16:13:16	47.1	47.1	46.8	46.6
2015/04/23	16:13:17	46.7	46.9	46.5	45.9
2015/04/23	16:13:18	47.0	47.1	46.9	46.7
2015/04/23	16:13:19	47.4	47.2	46.9	46.9
2015/04/23	16:13:20	47.8	47.6	47.2	47.6
2015/04/23	16:13:21	48.4	48.1	47.6	47.6
2015/04/23	16:13:22	48.6	48.5	48.1	48.2

2015/04/23	16:13:23	49.3	49.1	48.4	48.6
2015/04/23	16:13:24	48.0	49.1	48.3	47.3
2015/04/23	16:13:25	47.9	48.3	48.0	47.6
2015/04/23	16:13:26	47.8	48.1	47.8	47.5
2015/04/23	16:13:27	48.8	48.5	47.9	48.4
2015/04/23	16:13:28	48.5	48.6	48.3	47.9
2015/04/23	16:13:29	48.1	48.4	48.2	47.9
2015/04/23	16:13:30	47.8	48.2	48.0	47.6
2015/04/23	16:13:31	48.8	48.6	47.9	47.5
2015/04/23	16:13:32	50.3	49.8	48.6	49.2
2015/04/23	16:13:33	49.6	49.8	49.6	49.3
2015/04/23	16:13:34	49.1	49.7	49.3	48.7
2015/04/23	16:13:35	49.5	49.5	49.2	48.8
2015/04/23	16:13:36	49.8	49.7	49.4	49.5
2015/04/23	16:13:37	50.7	50.3	49.6	50.1
2015/04/23	16:13:38	50.5	50.5	50.2	50.1
2015/04/23	16:13:39	50.4	50.6	50.3	50.0
2015/04/23	16:13:40	51.8	51.5	50.3	50.0
2015/04/23	16:13:41	51.5	51.8	51.4	50.8
2015/04/23	16:13:42	51.9	51.8	51.3	51.0
2015/04/23	16:13:43	52.1	52.3	51.2	50.0
2015/04/23	16:13:44	52.7	52.6	52.2	52.1
2015/04/23	16:13:45	52.5	52.9	52.5	51.9
2015/04/23	16:13:46	53.6	53.2	52.5	52.8
2015/04/23	16:13:47	52.3	53.2	52.5	51.6
2015/04/23	16:13:48	53.5	53.5	52.7	52.1
2015/04/23	16:13:49	51.9	52.9	52.4	50.7
2015/04/23	16:13:50	52.2	52.4	52.1	51.4
2015/04/23	16:13:51	53.6	53.3	52.3	52.4
2015/04/23	16:13:52	52.9	53.6	52.9	52.0
2015/04/23	16:13:53	50.6	52.9	51.6	50.1
2015/04/23	16:13:54	50.1	51.6	50.6	49.5
2015/04/23	16:13:55	49.4	50.6	49.9	49.1
2015/04/23	16:13:56	49.2	50.0	49.5	48.8
2015/04/23	16:13:57	49.1	49.5	49.2	48.8
2015/04/23	16:13:58	49.4	49.4	49.1	48.8
2015/04/23	16:13:59	49.8	49.7	49.3	49.2
2015/04/23	16:14:00	49.0	49.8	49.2	48.5
2015/04/23	16:14:01	48.6	49.2	48.6	47.8
2015/04/23	16:14:02	48.2	48.9	48.4	47.8
2015/04/23	16:14:03	48.1	48.4	48.1	47.2
2015/04/23	16:14:04	48.4	48.6	48.3	47.8
2015/04/23	16:14:05	46.9	48.3	47.5	46.6
2015/04/23	16:14:06	46.8	47.5	47.0	46.6
2015/04/23	16:14:07	46.9	47.1	46.9	46.7
2015/04/23	16:14:08	47.4	47.3	46.9	46.6
2015/04/23	16:14:09	47.6	47.5	47.3	47.0

2015/04/23	16:14:10	47.9	47.8	47.5	47.4
2015/04/23	16:14:11	46.9	47.8	47.3	46.7
2015/04/23	16:14:12	47.5	47.6	47.2	46.7
2015/04/23	16:14:13	46.1	47.3	46.6	45.9
2015/04/23	16:14:14	46.3	46.6	46.4	46.0
2015/04/23	16:14:15	46.4	46.5	46.2	45.6
2015/04/23	16:14:16	47.1	46.9	46.4	46.5
2015/04/23	16:14:17	47.9	47.6	46.9	47.4
2015/04/23	16:14:18	47.7	47.7	47.5	47.2
2015/04/23	16:14:19	48.7	48.4	47.7	48.1
2015/04/23	16:14:20	48.1	48.5	48.1	47.7
2015/04/23	16:14:21	48.9	48.7	48.1	47.9
2015/04/23	16:14:22	48.9	48.8	48.6	48.5
2015/04/23	16:14:23	49.2	49.3	48.8	48.2
2015/04/23	16:14:24	48.7	49.0	48.7	48.1
2015/04/23	16:14:25	47.9	48.8	48.1	46.8
2015/04/23	16:14:26	48.2	48.5	48.0	47.1
2015/04/23	16:14:27	47.3	48.0	47.5	47.0
2015/04/23	16:14:28	47.8	47.8	47.5	47.2
2015/04/23	16:14:29	47.7	47.8	47.7	47.5
2015/04/23	16:14:30	48.2	48.1	47.6	47.5
2015/04/23	16:14:31	47.8	48.2	47.8	47.4
2015/04/23	16:14:32	47.7	48.0	47.7	47.1
2015/04/23	16:14:33	46.9	47.8	47.2	46.5
2015/04/23	16:14:34	47.6	47.5	47.2	46.8
2015/04/23	16:14:35	47.8	47.8	47.4	47.1
2015/04/23	16:14:36	46.5	47.6	46.9	46.1
2015/04/23	16:14:37	46.4	46.9	46.6	46.0
2015/04/23	16:14:38	46.6	46.6	46.4	45.9
2015/04/23	16:14:39	47.6	47.6	46.3	46.0
2015/04/23	16:14:40	46.4	47.6	46.9	46.3
2015/04/23	16:14:41	46.2	46.9	46.4	45.7
2015/04/23	16:14:42	46.9	46.7	46.5	46.6
2015/04/23	16:14:43	46.9	46.9	46.7	46.7
2015/04/23	16:14:44	47.2	47.1	46.8	46.6
2015/04/23	16:14:45	48.0	47.9	47.0	46.9
2015/04/23	16:14:46	47.0	47.8	47.3	46.5
2015/04/23	16:14:47	46.7	47.3	46.9	46.1
2015/04/23	16:14:48	46.8	47.0	46.8	46.3
2015/04/23	16:14:49	47.2	47.4	46.8	46.3
2015/04/23	16:14:50	48.0	48.1	46.6	46.0
2015/04/23	16:14:51	46.2	48.2	46.9	45.5
2015/04/23	16:14:52	45.7	46.8	46.2	45.1
2015/04/23	16:14:53	45.9	46.2	46.0	45.7
2015/04/23	16:14:54	46.0	46.1	46.0	45.8
2015/04/23	16:14:55	46.7	46.4	46.0	46.3
2015/04/23	16:14:56	46.8	46.7	46.4	46.5

2015/04/23	16:14:57	46.7	46.8	46.6	46.3
2015/04/23	16:14:58	46.6	46.7	46.6	46.4
2015/04/23	16:14:59	46.7	46.8	46.6	46.3
2015/04/23	16:15:00	47.3	47.3	46.6	46.4
2015/04/23	16:15:01	46.8	47.2	46.8	46.4
2015/04/23	16:15:02	46.9	47.0	46.7	46.4
2015/04/23	16:15:03	47.4	47.3	47.0	47.1
2015/04/23	16:15:04	47.4	47.4	47.2	47.1
2015/04/23	16:15:05	48.3	48.6	47.2	46.7
2015/04/23	16:15:06	49.1	49.6	47.8	46.4
2015/04/23	16:15:07	46.6	48.3	47.4	46.1
2015/04/23	16:15:08	46.6	47.4	46.9	46.3
2015/04/23	16:15:09	46.4	46.9	46.6	46.1
2015/04/23	16:15:10	46.1	46.6	46.3	46.0
2015/04/23	16:15:11	46.0	46.3	46.1	45.8
2015/04/23	16:15:12	46.8	46.6	46.1	46.0
2015/04/23	16:15:13	46.3	46.7	46.3	45.9
2015/04/23	16:15:14	46.4	46.4	46.3	46.2
2015/04/23	16:15:15	46.7	46.6	46.4	46.5
2015/04/23	16:15:16	46.9	47.0	46.6	46.2
2015/04/23	16:15:17	46.4	46.7	46.4	46.0
2015/04/23	16:15:18	47.0	47.1	46.3	45.9
2015/04/23	16:15:19	45.8	46.8	46.2	45.5
2015/04/23	16:15:20	45.7	46.3	45.9	45.4
2015/04/23	16:15:21	45.4	45.9	45.5	45.1
2015/04/23	16:15:22	46.6	46.4	45.6	45.7
2015/04/23	16:15:23	47.7	47.3	46.4	47.3
2015/04/23	16:15:24	48.1	47.8	47.3	47.5
2015/04/23	16:15:25	47.4	47.9	47.5	46.9
2015/04/23	16:15:26	46.2	47.5	46.7	45.9
2015/04/23	16:15:27	46.9	46.9	46.6	46.2
2015/04/23	16:15:28	46.5	46.9	46.6	46.1
2015/04/23	16:15:29	46.3	46.6	46.4	46.0
2015/04/23	16:15:30	48.3	48.0	46.4	46.0
2015/04/23	16:15:31	46.4	47.7	46.9	46.1
2015/04/23	16:15:32	46.7	47.0	46.7	46.1
2015/04/23	16:15:33	46.5	46.8	46.6	46.1
2015/04/23	16:15:34	46.3	46.6	46.4	45.9
2015/04/23	16:15:35	46.3	46.5	46.3	46.1
2015/04/23	16:15:36	46.4	46.4	46.3	46.2
2015/04/23	16:15:37	46.5	46.5	46.4	46.4
2015/04/23	16:15:38	50.5	50.4	46.5	46.4
2015/04/23	16:15:39	49.2	51.2	49.3	47.1
2015/04/23	16:15:40	48.1	49.3	48.6	46.9
2015/04/23	16:15:41	48.3	48.7	48.3	47.6
2015/04/23	16:15:42	46.9	48.3	47.5	46.7
2015/04/23	16:15:43	47.0	47.5	47.2	46.6

2015/04/23	16:15:44	47.6	47.6	47.1	46.8
2015/04/23	16:15:45	47.4	47.7	47.4	46.8
2015/04/23	16:15:46	47.1	47.4	47.1	46.8
2015/04/23	16:15:47	48.0	47.7	47.3	47.6
2015/04/23	16:15:48	47.1	47.7	47.3	46.8
2015/04/23	16:15:49	47.6	47.6	47.3	47.3
2015/04/23	16:15:50	46.5	47.5	46.9	46.2
2015/04/23	16:15:51	46.8	46.9	46.7	46.2
2015/04/23	16:15:52	47.3	47.2	46.9	47.0
2015/04/23	16:15:53	48.1	47.8	47.2	47.6
2015/04/23	16:15:54	47.5	47.8	47.5	47.1
2015/04/23	16:15:55	48.2	48.1	47.6	47.6
2015/04/23	16:15:56	48.5	48.4	48.0	48.1
2015/04/23	16:15:57	48.4	48.5	48.3	48.0
2015/04/23	16:15:58	48.1	48.4	48.2	47.7
2015/04/23	16:15:59	47.3	48.2	47.6	47.1
2015/04/23	16:16:00	47.0	47.6	47.2	46.8
2015/04/23	16:16:01	46.5	47.2	46.7	46.3
2015/04/23	16:16:02	46.1	46.7	46.3	45.8
2015/04/23	16:16:03	45.8	46.3	46.0	45.6
2015/04/23	16:16:04	46.2	46.2	46.0	45.9
2015/04/23	16:16:05	45.7	46.1	45.9	45.6
2015/04/23	16:16:06	45.8	45.9	45.8	45.4
2015/04/23	16:16:07	46.1	46.1	45.8	45.7
2015/04/23	16:16:08	46.1	46.1	45.9	45.8
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2015/04/23	16:16:11	47.8	47.5	47.0	47.5
2015/04/23	16:16:12	47.6	47.7	47.5	47.1
2015/04/23	16:16:13	47.3	47.5	47.4	47.1
2015/04/23	16:16:14	47.2	47.4	47.2	46.8
2015/04/23	16:16:15	47.0	47.3	47.0	46.6
2015/04/23	16:16:16	46.5	47.1	46.7	46.2
2015/04/23	16:16:17	46.4	46.7	46.5	45.9
2015/04/23	16:16:18	46.4	46.5	46.4	46.2
2015/04/23	16:16:19	46.2	46.5	46.3	45.8
2015/04/23	16:16:20	46.0	46.3	46.1	45.8
2015/04/23	16:16:21	46.1	46.1	45.9	45.6
2015/04/23	16:16:22	46.2	46.2	46.1	45.9
2015/04/23	16:16:23	46.3	46.3	46.1	45.9
2015/04/23	16:16:24	46.1	46.3	46.2	45.9
2015/04/23	16:16:25	46.5	46.4	46.2	46.2
2015/04/23	16:16:26	47.1	46.8	46.4	46.6
2015/04/23	16:16:27	50.0	49.5	46.8	47.0
2015/04/23	16:16:28	47.9	48.7	48.2	47.6
2015/04/23	16:16:29	47.1	48.3	47.5	46.7
2015/04/23	16:16:30	46.5	47.5	46.8	45.9

2015/04/23	16:16:31	46.3	46.8	46.5	45.9
2015/04/23	16:16:32	46.5	46.6	46.5	46.3
2015/04/23	16:16:33	45.9	46.5	46.1	45.4
2015/04/23	16:16:34	46.2	46.3	46.0	45.7
2015/04/23	16:16:35	45.8	46.2	45.9	45.4
2015/04/23	16:16:36	46.1	46.1	45.8	45.6
2015/04/23	16:16:37	45.9	46.0	45.9	45.5
2015/04/23	16:16:38	45.9	46.0	45.8	45.6
2015/04/23	16:16:39	47.2	46.8	45.9	46.2
2015/04/23	16:16:40	48.2	47.7	46.8	47.7
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2015/04/23	16:16:43	46.5	47.2	46.8	46.3
2015/04/23	16:16:44	46.2	46.8	46.4	46.0
2015/04/23	16:16:45	45.8	46.4	46.0	45.6
2015/04/23	16:16:46	46.0	46.1	45.9	45.6
2015/04/23	16:16:47	46.0	46.2	46.0	45.7
2015/04/23	16:16:48	46.5	46.4	46.0	46.1
2015/04/23	16:16:49	46.9	46.8	46.2	46.1
2015/04/23	16:16:50	46.5	46.9	46.5	46.0
2015/04/23	16:16:51	45.8	46.6	46.1	45.5
2015/04/23	16:16:52	45.6	46.1	45.8	45.2
2015/04/23	16:16:53	45.4	45.8	45.5	45.1
2015/04/23	16:16:54	45.6	45.6	45.5	45.2
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2015/04/23	16:16:57	47.3	47.1	46.7	47.1
2015/04/23	16:16:58	47.0	47.2	46.9	46.6
2015/04/23	16:16:59	46.9	47.0	46.8	46.6
2015/04/23	16:17:00	47.1	47.2	46.9	46.7
2015/04/23	16:17:01	46.8	47.1	46.8	46.2
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2015/04/23	16:17:03	46.3	46.6	46.3	45.9
2015/04/23	16:17:04	46.5	46.5	46.3	46.1
2015/04/23	16:17:05	47.2	47.0	46.4	46.4
2015/04/23	16:17:06	47.4	47.4	47.0	46.9
2015/04/23	16:17:07	47.3	47.4	47.0	46.6
2015/04/23	16:17:08	47.1	47.4	47.1	46.4
2015/04/23	16:17:09	47.4	47.4	47.1	46.4
2015/04/23	16:17:10	47.3	47.4	47.2	46.9
2015/04/23	16:17:11	46.9	47.3	47.0	46.6
2015/04/23	16:17:12	48.2	48.1	47.0	46.8
2015/04/23	16:17:13	47.8	47.8	47.4	47.0
2015/04/23	16:17:14	49.7	49.3	47.7	48.0
2015/04/23	16:17:15	47.6	49.3	48.2	46.8
2015/04/23	16:17:16	47.5	48.2	47.8	47.3
2015/04/23	16:17:17	47.1	47.8	47.4	46.7

2015/04/23	16:17:18	47.3	47.7	47.2	46.4
2015/04/23	16:17:19	47.5	47.4	47.2	46.9
2015/04/23	16:17:20	47.2	47.4	47.2	46.7
2015/04/23	16:17:21	48.1	47.9	47.3	47.6
2015/04/23	16:17:22	48.4	48.2	47.9	48.1
2015/04/23	16:17:23	47.2	48.2	47.5	46.7
2015/04/23	16:17:24	47.3	47.6	47.3	46.8
2015/04/23	16:17:25	47.0	47.3	47.1	46.8
2015/04/23	16:17:26	47.3	47.3	47.1	46.9
2015/04/23	16:17:27	46.9	47.2	47.0	46.7
2015/04/23	16:17:28	47.5	47.3	47.0	47.0
2015/04/23	16:17:29	47.3	47.4	47.2	46.9
2015/04/23	16:17:30	47.7	47.6	47.3	47.3
2015/04/23	16:17:31	48.4	48.3	47.6	47.7
2015/04/23	16:17:32	49.1	48.9	48.3	48.8
2015/04/23	16:17:33	49.5	49.3	48.9	49.3
2015/04/23	16:17:34	50.5	50.4	49.2	49.1
2015/04/23	16:17:35	48.1	50.0	48.9	47.9
2015/04/23	16:17:36	47.7	48.9	48.2	47.4
2015/04/23	16:17:37	48.7	48.5	48.0	47.3
2015/04/23	16:17:38	48.0	48.7	48.1	47.4
2015/04/23	16:17:39	47.9	48.3	47.7	46.9
2015/04/23	16:17:40	47.8	48.1	47.9	47.5
2015/04/23	16:17:41	47.3	47.9	47.5	47.0
2015/04/23	16:17:42	47.6	47.9	47.4	46.9
2015/04/23	16:17:43	47.0	47.5	47.1	46.5
2015/04/23	16:17:44	47.9	47.8	47.2	47.2
2015/04/23	16:17:45	48.5	48.4	47.5	47.5
2015/04/23	16:17:46	48.9	48.6	48.1	48.4
2015/04/23	16:17:47	48.5	48.7	48.4	47.7
2015/04/23	16:17:48	48.4	48.7	48.3	47.8
2015/04/23	16:17:49	48.4	48.5	48.3	48.0
2015/04/23	16:17:50	47.5	48.4	47.8	47.2
2015/04/23	16:17:51	47.6	47.9	47.7	47.3
2015/04/23	16:17:52	47.8	47.8	47.7	47.6
2015/04/23	16:17:53	47.5	47.7	47.6	47.3
2015/04/23	16:17:54	47.7	47.7	47.6	47.4
2015/04/23	16:17:55	47.6	47.7	47.6	47.3
2015/04/23	16:17:56	48.0	47.8	47.6	47.7
2015/04/23	16:17:57	48.4	48.3	47.8	47.6
2015/04/23	16:17:58	47.8	48.4	47.9	47.1
2015/04/23	16:17:59	47.6	47.9	47.7	47.2
2015/04/23	16:18:00	48.6	48.5	47.6	47.4
2015/04/23	16:18:01	49.4	49.2	48.5	48.9
2015/04/23	16:18:02	49.0	49.1	49.0	48.7
2015/04/23	16:18:03	47.7	49.0	48.2	47.3
2015/04/23	16:18:04	47.7	48.2	47.9	47.5

2015/04/23	16:18:05	47.6	48.0	47.7	47.3
2015/04/23	16:18:06	48.9	48.5	47.7	47.5
2015/04/23	16:18:07	49.0	48.9	48.5	48.8
2015/04/23	16:18:08	50.4	50.1	48.8	49.0
2015/04/23	16:18:09	50.8	50.7	50.1	50.1
2015/04/23	16:18:10	49.0	50.5	49.6	48.8
2015/04/23	16:18:11	49.4	49.6	49.2	48.3
2015/04/23	16:18:12	50.3	50.1	49.5	49.9
2015/04/23	16:18:13	50.6	50.4	50.1	50.0
2015/04/23	16:18:14	48.0	50.4	49.0	47.6
2015/04/23	16:18:15	47.4	49.0	48.1	47.3
2015/04/23	16:18:16	48.6	48.6	47.9	47.2
2015/04/23	16:18:17	54.3	53.7	48.6	50.0
2015/04/23	16:18:18	53.2	54.5	52.9	50.5
2015/04/23	16:18:19	51.7	52.9	52.2	49.9
2015/04/23	16:18:20	49.9	52.3	50.8	48.8
2015/04/23	16:18:21	47.5	50.8	49.1	47.3
2015/04/23	16:18:22	48.3	49.1	48.5	47.3
2015/04/23	16:18:23	47.3	48.5	47.8	46.9
2015/04/23	16:18:24	47.9	47.9	47.7	47.5
2015/04/23	16:18:25	49.3	49.0	47.9	48.3
2015/04/23	16:18:26	54.7	53.7	49.0	51.5
2015/04/23	16:18:27	49.1	53.0	51.0	48.7
2015/04/23	16:18:28	49.6	50.9	50.2	48.9
2015/04/23	16:18:29	50.4	50.5	49.8	49.3
2015/04/23	16:18:30	50.9	50.8	50.4	50.5
2015/04/23	16:18:31	50.0	51.0	50.1	48.4
2015/04/23	16:18:32	47.8	50.0	48.9	47.3
2015/04/23	16:18:33	49.5	49.5	48.5	47.4
2015/04/23	16:18:34	47.0	49.4	48.1	46.7
2015/04/23	16:18:35	46.7	48.0	47.2	46.4
2015/04/23	16:18:36	47.2	47.3	47.0	46.5
2015/04/23	16:18:37	48.6	48.2	47.2	47.6
2015/04/23	16:18:38	47.5	48.0	47.7	47.2
2015/04/23	16:18:39	46.8	47.7	47.0	46.2
2015/04/23	16:18:40	48.6	48.3	47.0	46.5
2015/04/23	16:18:41	47.7	48.5	47.8	47.2
2015/04/23	16:18:42	47.2	48.1	47.3	46.4
2015/04/23	16:18:43	46.4	47.3	46.8	46.1
2015/04/23	16:18:44	46.8	46.9	46.7	46.5
2015/04/23	16:18:45	46.5	46.9	46.5	46.0
2015/04/23	16:18:46	46.6	46.6	46.5	46.3
2015/04/23	16:18:47	46.9	46.8	46.5	46.5
2015/04/23	16:18:48	47.7	47.4	46.8	47.3
2015/04/23	16:18:49	47.9	47.7	47.3	47.4
2015/04/23	16:18:50	47.8	47.8	47.7	47.5
2015/04/23	16:18:51	47.3	47.8	47.5	47.0

2015/04/23	16:18:52	47.4	47.5	47.2	46.9
2015/04/23	16:18:53	47.6	47.6	47.4	47.3
2015/04/23	16:18:54	47.9	47.8	47.6	47.4
2015/04/23	16:18:55	48.1	48.0	47.8	47.9
2015/04/23	16:18:56	47.7	48.0	47.7	47.3
2015/04/23	16:18:57	48.5	48.3	47.8	47.9
2015/04/23	16:18:58	51.1	50.7	48.2	48.4
2015/04/23	16:18:59	50.1	50.6	50.3	49.6
2015/04/23	16:19:00	49.6	50.3	49.8	49.2
2015/04/23	16:19:01	49.6	49.9	49.5	48.8
2015/04/23	16:19:02	49.7	50.4	49.4	48.2
2015/04/23	16:19:03	47.7	49.4	48.4	47.4
2015/04/23	16:19:04	47.8	48.4	47.9	47.3
2015/04/23	16:19:05	47.7	48.1	47.8	47.5
2015/04/23	16:19:06	48.0	48.1	47.7	47.5
2015/04/23	16:19:07	47.9	48.2	47.9	47.3
2015/04/23	16:19:08	47.3	47.9	47.5	47.0
2015/04/23	16:19:09	48.6	48.3	47.5	47.7
2015/04/23	16:19:10	48.9	48.8	48.3	48.1
2015/04/23	16:19:11	49.5	49.3	48.8	49.0
2015/04/23	16:19:12	50.6	50.3	49.3	49.3
2015/04/23	16:19:13	51.3	51.0	50.3	50.8
2015/04/23	16:19:14	52.3	51.9	51.0	51.7
2015/04/23	16:19:15	52.2	52.2	51.9	51.8
2015/04/23	16:19:16	53.4	53.1	52.2	52.9
2015/04/23	16:19:17	54.4	54.0	52.8	52.2
2015/04/23	16:19:18	59.5	59.0	53.5	52.9
2015/04/23	16:19:19	55.4	59.1	56.9	53.5
2015/04/23	16:19:20	55.0	56.9	55.8	54.4
2015/04/23	16:19:21	56.5	56.3	55.9	56.0
2015/04/23	16:19:22	56.4	56.4	56.1	55.8
2015/04/23	16:19:23	60.6	59.8	56.5	58.4
2015/04/23	16:19:24	59.6	59.8	59.7	59.3
2015/04/23	16:19:25	61.3	61.0	59.7	59.5
2015/04/23	16:19:26	60.0	60.8	60.2	59.1
2015/04/23	16:19:27	62.0	61.5	60.4	60.7
2015/04/23	16:19:28	58.5	61.6	59.8	56.9
2015/04/23	16:19:29	58.1	59.8	58.7	56.9
2015/04/23	16:19:30	57.9	59.1	58.1	56.3
2015/04/23	16:19:31	55.6	58.1	56.6	54.6
2015/04/23	16:19:32	54.7	56.6	55.6	54.1
2015/04/23	16:19:33	54.7	55.6	54.9	53.9
2015/04/23	16:19:34	51.4	54.9	53.0	51.2
2015/04/23	16:19:35	51.5	53.0	52.1	51.1
2015/04/23	16:19:36	50.7	52.1	51.3	50.2
2015/04/23	16:19:37	51.2	51.3	51.1	50.4
2015/04/23	16:19:38	52.3	52.1	51.3	51.4

2015/04/23	16:19:39	50.5	51.8	51.0	49.7
2015/04/23	16:19:40	50.7	51.1	50.8	50.0
2015/04/23	16:19:41	49.9	50.8	50.1	49.3
2015/04/23	16:19:42	55.0	54.5	50.3	50.2
2015/04/23	16:19:43	48.8	52.9	50.8	48.2
2015/04/23	16:19:44	49.5	50.8	50.0	48.7
2015/04/23	16:19:45	48.8	49.9	49.2	48.4
2015/04/23	16:19:46	48.3	49.3	48.6	47.7
2015/04/23	16:19:47	49.0	48.9	48.6	48.5
2015/04/23	16:19:48	50.1	49.8	48.8	48.9
2015/04/23	16:19:49	52.4	52.0	49.8	50.1
2015/04/23	16:19:50	49.9	51.7	50.6	49.7
2015/04/23	16:19:51	48.3	50.6	49.3	48.0
2015/04/23	16:19:52	49.0	49.3	49.1	48.4
2015/04/23	16:19:53	48.3	49.1	48.5	47.6
2015/04/23	16:19:54	48.9	48.9	48.4	47.9
2015/04/23	16:19:55	49.4	49.4	48.6	48.2
2015/04/23	16:19:56	48.8	49.2	48.9	48.2
2015/04/23	16:19:57	47.9	49.0	48.4	47.6
2015/04/23	16:19:58	47.6	48.4	47.9	47.4
2015/04/23	16:19:59	49.3	48.9	47.9	47.6
2015/04/23	16:20:00	51.9	51.2	48.7	48.5
2015/04/23	16:20:01	48.7	51.2	49.8	48.2
2015/04/23	16:20:02	47.6	49.7	48.6	47.3
2015/04/23	16:20:03	47.6	48.6	48.0	47.2
2015/04/23	16:20:04	48.4	48.5	47.9	47.5
2015/04/23	16:20:05	49.5	49.3	47.9	47.4
2015/04/23	16:20:06	59.6	58.9	49.3	51.2
2015/04/23	16:20:07	54.3	59.0	56.3	49.3
2015/04/23	16:20:08	49.3	56.2	53.3	47.8
2015/04/23	16:20:09	48.7	53.3	51.0	48.0
2015/04/23	16:20:10	48.5	51.0	49.6	47.8
2015/04/23	16:20:11	48.4	49.6	48.9	47.5
2015/04/23	16:20:12	46.2	48.8	47.4	46.0
2015/04/23	16:20:13	46.1	47.4	46.6	45.9
2015/04/23	16:20:14	46.9	46.8	46.7	46.4
2015/04/23	16:20:15	47.1	47.0	46.8	46.8
2015/04/23	16:20:16	46.7	47.0	46.8	46.4
2015/04/23	16:20:17	47.1	47.0	46.8	46.8
2015/04/23	16:20:18	47.9	47.6	47.0	47.4
2015/04/23	16:20:19	47.6	47.7	47.4	46.9
2015/04/23	16:20:20	53.3	52.9	47.3	46.7
2015/04/23	16:20:21	47.2	52.7	50.1	46.6
2015/04/23	16:20:22	54.1	53.8	50.1	49.1
2015/04/23	16:20:23	56.9	56.4	51.5	47.3
2015/04/23	16:20:24	47.5	56.0	52.7	46.9
2015/04/23	16:20:25	53.1	53.5	51.4	47.9

2015/04/23	16:20:26	48.0	53.3	50.8	47.8
2015/04/23	16:20:27	47.6	50.8	49.1	47.2
2015/04/23	16:20:28	50.9	50.6	48.9	48.3
2015/04/23	16:20:29	47.0	50.3	48.5	46.7
2015/04/23	16:20:30	47.0	48.5	47.7	46.3
2015/04/23	16:20:31	47.7	47.8	47.6	47.1
2015/04/23	16:20:32	48.5	48.4	47.8	48.1
2015/04/23	16:20:33	57.4	55.8	48.1	47.7
2015/04/23	16:20:34	58.5	58.4	55.0	53.1
2015/04/23	16:20:35	52.6	57.8	55.2	50.9
2015/04/23	16:20:36	54.5	56.4	54.3	49.3
2015/04/23	16:20:37	50.9	54.2	52.6	47.6
2015/04/23	16:20:38	49.6	52.7	50.9	48.6
2015/04/23	16:20:39	48.2	50.9	49.4	47.7
2015/04/23	16:20:40	47.5	49.5	48.3	46.9
2015/04/23	16:20:41	63.4	62.5	47.9	47.0
2015/04/23	16:20:42	48.3	61.9	58.0	46.9
2015/04/23	16:20:43	56.1	58.0	54.7	46.5
2015/04/23	16:20:44	55.0	58.7	55.7	48.1
2015/04/23	16:20:45	58.3	58.4	55.8	50.3
2015/04/23	16:20:46	48.9	56.6	53.5	48.1
2015/04/23	16:20:47	55.5	55.8	53.0	49.5
2015/04/23	16:20:48	53.6	54.4	53.7	50.4
2015/04/23	16:20:49	53.8	54.2	53.8	53.2
2015/04/23	16:20:50	53.0	54.0	53.3	52.4
2015/04/23	16:20:51	52.1	53.4	52.5	50.7
2015/04/23	16:20:52	50.0	52.5	51.1	49.8
2015/04/23	16:20:53	49.0	51.1	49.9	48.4
2015/04/23	16:20:54	49.0	49.9	49.4	48.7
2015/04/23	16:20:55	48.9	49.4	49.1	48.6
2015/04/23	16:20:56	55.6	54.9	49.1	49.0
2015/04/23	16:20:57	49.4	54.5	52.1	49.1
2015/04/23	16:20:58	49.8	52.0	50.8	48.9
2015/04/23	16:20:59	49.9	50.8	50.2	49.5
2015/04/23	16:21:00	49.4	50.3	49.7	49.0
2015/04/23	16:21:01	50.6	50.5	49.6	49.1
2015/04/23	16:21:02	50.4	50.6	50.3	49.7
2015/04/23	16:21:03	49.8	50.4	49.9	49.1
2015/04/23	16:21:04	51.0	50.8	50.0	50.2
2015/04/23	16:21:05	50.0	50.7	50.2	49.4
2015/04/23	16:21:06	50.5	50.6	50.2	49.6
2015/04/23	16:21:07	49.8	50.3	49.9	49.2
2015/04/23	16:21:08	50.6	50.6	50.0	49.7
2015/04/23	16:21:09	49.5	50.5	49.8	48.1
2015/04/23	16:21:10	47.2	49.8	48.4	47.0
2015/04/23	16:21:11	47.4	48.4	47.8	47.1
2015/04/23	16:21:12	47.3	47.8	47.5	47.1

2015/04/23	16:21:13	47.0	47.6	47.2	46.6
2015/04/23	16:21:14	46.6	47.1	46.8	46.2
2015/04/23	16:21:15	46.9	47.0	46.8	46.7
2015/04/23	16:21:16	46.8	46.9	46.7	46.5
2015/04/23	16:21:17	46.1	46.8	46.3	45.9
2015/04/23	16:21:18	46.5	46.5	46.3	46.2
2015/04/23	16:21:19	47.4	47.1	46.5	46.9
2015/04/23	16:21:20	47.1	47.1	46.9	46.7
2015/04/23	16:21:21	48.1	47.8	47.1	47.5
2015/04/23	16:21:22	48.2	48.0	47.7	47.8
2015/04/23	16:21:23	48.9	48.7	48.0	48.2
2015/04/23	16:21:24	47.9	48.7	48.2	47.4
2015/04/23	16:21:25	48.8	48.6	48.3	48.4
2015/04/23	16:21:26	50.7	50.1	48.6	49.3
2015/04/23	16:21:27	51.0	50.8	50.0	50.2
2015/04/23	16:21:28	50.3	50.9	50.3	49.7
2015/04/23	16:21:29	49.0	50.3	49.6	48.4
2015/04/23	16:21:30	48.7	49.6	49.1	48.4
2015/04/23	16:21:31	51.1	50.5	49.2	50.2
2015/04/23	16:21:32	50.6	50.6	50.3	50.1
2015/04/23	16:21:33	50.0	50.6	50.1	49.6
2015/04/23	16:21:34	49.3	50.6	49.4	47.7
2015/04/23	16:21:35	47.8	49.4	48.5	47.3
2015/04/23	16:21:36	47.9	48.5	48.0	47.3
2015/04/23	16:21:37	48.1	48.3	48.0	47.5
2015/04/23	16:21:38	48.1	48.1	47.9	47.7
2015/04/23	16:21:39	48.7	48.5	48.1	48.4
2015/04/23	16:21:40	48.0	48.5	48.1	47.8
2015/04/23	16:21:41	46.9	48.1	47.4	46.5
2015/04/23	16:21:42	47.5	47.5	47.3	47.0
2015/04/23	16:21:43	46.9	47.5	47.0	46.4
2015/04/23	16:21:44	47.3	47.3	47.0	46.5
2015/04/23	16:21:45	49.5	48.9	47.1	47.2
2015/04/23	16:21:46	49.8	49.5	48.9	49.3
2015/04/23	16:21:47	48.4	49.4	48.8	48.1
2015/04/23	16:21:48	48.0	48.8	48.3	47.6
2015/04/23	16:21:49	48.6	48.6	48.3	48.0
2015/04/23	16:21:50	48.3	48.4	48.2	47.8
2015/04/23	16:21:51	48.9	48.7	48.3	48.3
2015/04/23	16:21:52	49.4	49.3	48.7	48.8
2015/04/23	16:21:53	49.5	49.5	49.2	48.8
2015/04/23	16:21:54	49.1	49.3	49.1	48.4
2015/04/23	16:21:55	49.2	49.3	49.1	48.7
2015/04/23	16:21:56	50.2	50.1	49.1	48.8
2015/04/23	16:21:57	49.6	50.2	49.6	48.7
2015/04/23	16:21:58	50.0	49.9	49.6	49.2
2015/04/23	16:21:59	51.1	50.7	49.9	50.7

2015/04/23	16:22:00	51.9	51.5	50.6	51.0
2015/04/23	16:22:01	49.7	51.5	50.4	49.2
2015/04/23	16:22:02	50.2	50.4	50.1	49.2
2015/04/23	16:22:03	49.3	50.3	49.6	48.5
2015/04/23	16:22:04	48.9	49.6	49.2	48.1
2015/04/23	16:22:05	48.6	49.4	48.8	48.1
2015/04/23	16:22:06	47.9	48.8	48.3	47.7
2015/04/23	16:22:07	47.9	48.3	48.0	47.4
2015/04/23	16:22:08	48.2	48.2	47.9	47.4
2015/04/23	16:22:09	49.7	49.2	48.2	49.2
2015/04/23	16:22:10	48.8	49.1	48.8	48.2
2015/04/23	16:22:11	48.3	49.0	48.5	48.0
2015/04/23	16:22:12	47.4	48.5	47.8	47.2
2015/04/23	16:22:13	47.0	47.8	47.3	46.8
2015/04/23	16:22:14	47.2	47.4	47.2	46.9
2015/04/23	16:22:15	47.6	47.7	47.3	47.1
2015/04/23	16:22:16	47.5	47.6	47.4	47.0
2015/04/23	16:22:17	47.0	47.5	47.2	46.9
2015/04/23	16:22:18	47.7	47.6	47.1	46.9
2015/04/23	16:22:19	47.6	47.8	47.5	47.1
2015/04/23	16:22:20	46.8	47.6	47.0	46.3
2015/04/23	16:22:21	46.9	47.0	46.9	46.4
2015/04/23	16:22:22	47.8	47.7	47.0	46.9
2015/04/23	16:22:23	47.0	47.4	47.2	46.6
2015/04/23	16:22:24	49.7	49.0	47.2	47.5
2015/04/23	16:22:25	51.8	51.3	49.0	49.5
2015/04/23	16:22:26	49.1	50.6	49.8	48.3
2015/04/23	16:22:27	49.6	49.8	49.4	48.7
2015/04/23	16:22:28	50.7	50.8	49.7	48.9
2015/04/23	16:22:29	47.0	50.2	48.5	46.8
2015/04/23	16:22:30	46.9	48.5	47.5	46.6
2015/04/23	16:22:31	46.4	47.5	46.8	45.9
2015/04/23	16:22:32	46.4	47.0	46.5	45.8
2015/04/23	16:22:33	46.4	46.5	46.4	46.0
2015/04/23	16:22:34	46.7	46.7	46.5	46.3
2015/04/23	16:22:35	47.4	47.2	46.6	47.0
2015/04/23	16:22:36	47.7	47.6	47.2	47.6
2015/04/23	16:22:37	47.7	47.7	47.5	47.3
2015/04/23	16:22:38	47.8	47.8	47.5	47.1
2015/04/23	16:22:39	49.7	49.4	47.7	47.8
2015/04/23	16:22:40	49.2	49.8	49.0	47.9
2015/04/23	16:22:41	48.4	49.0	48.6	47.7
2015/04/23	16:22:42	48.5	48.8	48.5	48.1
2015/04/23	16:22:43	47.5	48.5	47.8	47.0
2015/04/23	16:22:44	48.0	48.0	47.7	47.1
2015/04/23	16:22:45	52.4	52.2	47.8	47.3
2015/04/23	16:22:46	51.8	52.2	50.5	48.8

2015/04/23	16:22:47	52.6	53.9	51.8	48.7
2015/04/23	16:22:48	52.0	52.4	51.3	48.9
2015/04/23	16:22:49	51.0	52.1	51.2	50.0
2015/04/23	16:22:50	49.9	51.6	50.4	48.2
2015/04/23	16:22:51	51.1	51.0	50.3	50.0
2015/04/23	16:22:52	51.7	51.5	50.7	50.7
2015/04/23	16:22:53	55.2	54.7	50.9	50.4
2015/04/23	16:22:54	54.1	54.8	54.1	52.9
2015/04/23	16:22:55	53.0	54.2	53.4	51.0
2015/04/23	16:22:56	47.5	53.3	50.7	47.3
2015/04/23	16:22:57	55.0	54.1	50.6	49.7
2015/04/23	16:22:58	52.9	53.9	53.0	51.8
2015/04/23	16:22:59	52.1	52.9	52.4	50.9
2015/04/23	16:23:00	51.0	52.5	51.5	49.7
2015/04/23	16:23:01	51.4	51.7	51.3	50.1
2015/04/23	16:23:02	49.7	51.4	50.3	48.2
2015/04/23	16:23:03	48.7	50.5	49.2	47.4
2015/04/23	16:23:04	49.7	50.2	48.8	47.3
2015/04/23	16:23:05	48.9	49.5	49.1	47.6
2015/04/23	16:23:06	45.9	49.1	47.4	45.5
2015/04/23	16:23:07	53.1	52.2	47.4	46.7
2015/04/23	16:23:08	50.6	51.4	50.0	47.2
2015/04/23	16:23:09	48.2	51.2	49.5	47.0
2015/04/23	16:23:10	54.4	53.6	49.3	47.8
2015/04/23	16:23:11	53.5	53.6	52.8	51.4
2015/04/23	16:23:12	49.4	53.1	51.2	48.1
2015/04/23	16:23:13	53.9	53.9	50.9	49.7
2015/04/23	16:23:14	51.6	53.3	52.0	49.5
2015/04/23	16:23:15	53.2	52.9	52.1	51.4
2015/04/23	16:23:16	58.1	57.8	52.8	54.0
2015/04/23	16:23:17	52.6	56.7	54.5	50.7
2015/04/23	16:23:18	59.0	57.9	54.2	49.9
2015/04/23	16:23:19	56.9	58.8	56.6	50.2
2015/04/23	16:23:20	52.3	56.6	54.4	48.9
2015/04/23	16:23:21	54.1	54.9	53.1	48.8
2015/04/23	16:23:22	50.7	54.4	52.5	49.7
2015/04/23	16:23:23	53.8	53.4	52.5	51.9
2015/04/23	16:23:24	54.5	54.3	52.4	49.4
2015/04/23	16:23:25	53.5	55.4	53.3	47.8
2015/04/23	16:23:26	55.5	55.0	53.1	52.3
2015/04/23	16:23:27	56.7	57.2	54.1	52.0
2015/04/23	16:23:28	50.8	55.6	53.2	48.9
2015/04/23	16:23:29	48.1	53.2	50.7	47.8
2015/04/23	16:23:30	48.6	50.7	49.5	48.2
2015/04/23	16:23:31	47.8	49.5	48.5	47.2
2015/04/23	16:23:32	47.4	48.5	47.8	47.1
2015/04/23	16:23:33	47.5	47.9	47.6	47.2

2015/04/23	16:23:34	47.3	47.6	47.4	47.1
2015/04/23	16:23:35	47.1	47.4	47.2	46.7
2015/04/23	16:23:36	49.8	49.2	47.3	47.8
2015/04/23	16:23:37	52.2	51.6	48.9	48.7
2015/04/23	16:23:38	49.9	51.6	50.1	47.9
2015/04/23	16:23:39	54.1	54.4	49.9	47.9
2015/04/23	16:23:40	52.0	52.5	51.3	47.8
2015/04/23	16:23:41	52.9	53.5	51.9	49.9
2015/04/23	16:23:42	49.8	52.7	50.8	47.2
2015/04/23	16:23:43	55.1	54.8	50.3	47.1
2015/04/23	16:23:44	52.5	55.2	52.7	48.3
2015/04/23	16:23:45	47.1	52.7	50.1	46.6
2015/04/23	16:23:46	47.5	50.1	48.7	47.1
2015/04/23	16:23:47	48.0	48.6	48.0	47.0
2015/04/23	16:23:48	49.4	49.1	48.4	48.4
2015/04/23	16:23:49	49.3	49.2	48.7	48.2
2015/04/23	16:23:50	48.7	49.2	48.8	47.7
2015/04/23	16:23:51	47.6	48.9	48.0	46.9
2015/04/23	16:23:52	46.9	48.0	47.3	46.2
2015/04/23	16:23:53	62.1	60.7	47.4	47.3
2015/04/23	16:23:54	51.0	60.7	56.9	47.4
2015/04/23	16:23:55	46.6	56.9	53.3	46.3
2015/04/23	16:23:56	45.9	53.3	50.2	45.7
2015/04/23	16:23:57	46.6	50.2	48.2	45.9
2015/04/23	16:23:58	47.9	49.3	47.8	46.2
2015/04/23	16:23:59	46.4	47.8	47.0	46.3
2015/04/23	16:24:00	46.2	47.0	46.5	46.0
2015/04/23	16:24:01	48.0	47.6	46.5	46.7
2015/04/23	16:24:02	48.6	48.4	47.6	47.6
2015/04/23	16:24:03	46.9	48.1	47.4	46.7
2015/04/23	16:24:04	47.0	47.4	47.2	46.8
2015/04/23	16:24:05	50.1	49.9	47.0	46.6
2015/04/23	16:24:06	46.8	49.4	47.9	46.0
2015/04/23	16:24:07	46.5	47.9	47.1	46.3
2015/04/23	16:24:08	46.8	47.1	46.9	46.3
2015/04/23	16:24:09	46.3	46.9	46.5	45.9
2015/04/23	16:24:10	46.1	46.5	46.2	45.9
2015/04/23	16:24:11	46.9	46.8	46.3	46.4
2015/04/23	16:24:12	47.1	47.1	46.7	46.6
2015/04/23	16:24:13	46.8	47.0	46.8	46.3
2015/04/23	16:24:14	47.5	47.4	46.9	46.9
2015/04/23	16:24:15	58.3	56.8	47.4	50.0
2015/04/23	16:24:16	59.4	58.9	55.6	54.2
2015/04/23	16:24:17	55.9	58.1	56.4	51.1
2015/04/23	16:24:18	56.1	57.2	56.2	53.5
2015/04/23	16:24:19	57.1	57.6	56.2	52.7
2015/04/23	16:24:20	56.0	56.9	55.7	53.5

2015/04/23	16:24:21	52.1	56.8	54.1	48.6
2015/04/23	16:24:22	52.1	54.1	52.6	47.9
2015/04/23	16:24:23	54.9	54.7	53.2	52.9
2015/04/23	16:24:24	53.7	54.2	53.6	52.2
2015/04/23	16:24:25	57.2	56.4	54.0	54.6
2015/04/23	16:24:26	50.9	56.2	53.5	47.2
2015/04/23	16:24:27	47.3	53.4	50.6	46.6
2015/04/23	16:24:28	48.6	50.7	49.1	46.2
2015/04/23	16:24:29	56.5	54.8	49.5	52.2
2015/04/23	16:24:30	47.2	54.5	51.5	47.1
2015/04/23	16:24:31	47.6	51.4	49.4	47.0
2015/04/23	16:24:32	47.6	49.4	48.4	47.2
2015/04/23	16:24:33	48.4	48.6	48.2	47.7
2015/04/23	16:24:34	49.6	49.4	48.6	49.0
2015/04/23	16:24:35	48.0	49.2	48.4	47.5
2015/04/23	16:24:36	48.0	48.4	48.1	47.5
2015/04/23	16:24:37	47.8	48.3	47.9	47.3
2015/04/23	16:24:38	48.5	48.4	47.8	46.8
2015/04/23	16:24:39	54.5	53.3	48.3	48.7
2015/04/23	16:24:40	51.0	53.4	51.7	49.2
2015/04/23	16:24:41	47.5	51.7	49.5	46.9
2015/04/23	16:24:42	49.8	50.3	49.3	47.2
2015/04/23	16:24:43	53.1	52.9	48.9	47.6
2015/04/23	16:24:44	51.6	52.9	52.0	50.2
2015/04/23	16:24:45	48.6	51.9	50.1	48.4
2015/04/23	16:24:46	48.0	50.1	49.0	47.2
2015/04/23	16:24:47	48.4	49.0	48.6	48.0
2015/04/23	16:24:48	48.3	48.7	48.4	47.8
2015/04/23	16:24:49	50.0	49.7	48.4	48.7
2015/04/23	16:24:50	50.7	50.7	49.7	49.1
2015/04/23	16:24:51	48.1	50.0	49.0	47.6
2015/04/23	16:24:52	48.4	49.0	48.4	47.4
2015/04/23	16:24:53	53.2	52.9	48.7	48.5
2015/04/23	16:24:54	53.8	53.8	52.2	51.3
2015/04/23	16:24:55	47.4	52.9	50.3	47.1
2015/04/23	16:24:56	47.3	50.3	48.6	46.7
2015/04/23	16:24:57	50.7	50.6	48.5	46.9
2015/04/23	16:24:58	51.7	52.0	49.7	47.7
2015/04/23	16:24:59	49.0	50.6	49.6	47.5
2015/04/23	16:25:00	50.5	50.4	49.8	49.1
2015/04/23	16:25:01	49.4	50.4	49.6	48.9
2015/04/23	16:25:02	48.6	49.6	48.9	47.9
2015/04/23	16:25:03	47.6	49.1	48.1	47.0
2015/04/23	16:25:04	47.6	48.1	47.8	47.1
2015/04/23	16:25:05	47.5	47.8	47.5	47.2
2015/04/23	16:25:06	47.4	47.7	47.4	47.0
2015/04/23	16:25:07	47.9	47.7	47.4	47.5

2015/04/23	16:25:08	47.5	47.8	47.6	47.1
2015/04/23	16:25:09	47.9	48.0	47.5	47.2
2015/04/23	16:25:10	46.3	47.8	46.9	46.1
2015/04/23	16:25:11	47.8	47.7	47.0	47.1
2015/04/23	16:25:12	52.4	51.6	47.4	48.5
2015/04/23	16:25:13	50.3	51.0	49.5	47.2
2015/04/23	16:25:14	54.4	53.6	51.0	52.0
2015/04/23	16:25:15	46.2	53.1	50.1	46.0
2015/04/23	16:25:16	50.9	51.2	49.8	46.3
2015/04/23	16:25:17	51.7	51.4	50.1	48.4
2015/04/23	16:25:18	46.8	51.4	49.1	46.5
2015/04/23	16:25:19	50.6	50.8	48.1	46.4
2015/04/23	16:25:20	54.5	54.1	50.7	51.4
2015/04/23	16:25:21	49.9	53.0	51.3	49.2
2015/04/23	16:25:22	50.2	51.3	50.4	48.6
2015/04/23	16:25:23	50.3	51.1	50.4	49.3
2015/04/23	16:25:24	50.4	50.5	50.1	49.3
2015/04/23	16:25:25	50.2	50.6	50.2	49.5
2015/04/23	16:25:26	53.2	52.6	50.3	51.6
2015/04/23	16:25:27	53.0	53.0	51.9	51.1
2015/04/23	16:25:28	51.3	53.1	51.7	48.7
2015/04/23	16:25:29	51.4	52.2	51.3	49.2
2015/04/23	16:25:30	53.0	52.6	51.3	50.6
2015/04/23	16:25:31	52.8	53.0	52.5	51.6
2015/04/23	16:25:32	52.0	52.9	52.1	50.6
2015/04/23	16:25:33	51.8	52.4	51.8	50.6
2015/04/23	16:25:34	51.1	51.8	51.3	50.4
2015/04/23	16:25:35	52.3	52.1	51.4	51.3
2015/04/23	16:25:36	50.6	52.0	51.1	49.8
2015/04/23	16:25:37	51.2	51.3	50.7	49.8
2015/04/23	16:25:38	54.0	53.6	51.2	51.1
2015/04/23	16:25:39	53.6	53.4	52.6	51.8
2015/04/23	16:25:40	53.6	54.3	53.0	49.9
2015/04/23	16:25:41	53.5	54.0	52.4	49.7
2015/04/23	16:25:42	50.6	53.3	51.8	49.3
2015/04/23	16:25:43	53.0	52.9	51.1	49.0
2015/04/23	16:25:44	51.3	52.9	51.9	50.1
2015/04/23	16:25:45	51.7	52.7	51.4	49.1
2015/04/23	16:25:46	50.1	51.4	50.6	48.7
2015/04/23	16:25:47	50.7	51.1	50.4	49.2
2015/04/23	16:25:48	52.8	52.4	50.9	51.4
2015/04/23	16:25:49	53.1	52.8	52.1	51.7
2015/04/23	16:25:50	51.5	52.9	51.5	49.2
2015/04/23	16:25:51	52.6	52.9	52.1	51.1
2015/04/23	16:25:52	51.2	52.5	51.2	48.1
2015/04/23	16:25:53	50.3	51.7	50.7	49.1
2015/04/23	16:25:54	48.3	50.7	49.5	47.3

2015/04/23	16:25:55	53.9	53.4	49.3	48.5
2015/04/23	16:25:56	50.2	52.9	51.5	49.1
2015/04/23	16:25:57	49.3	51.4	50.2	48.7
2015/04/23	16:25:58	50.1	50.4	50.1	49.6
2015/04/23	16:25:59	49.1	50.1	49.5	48.1
2015/04/23	16:26:00	52.8	52.3	49.4	49.1
2015/04/23	16:26:01	50.9	52.2	51.3	50.0
2015/04/23	16:26:02	52.8	52.5	51.5	50.9
2015/04/23	16:26:03	52.2	52.7	52.2	51.0
2015/04/23	16:26:04	49.3	52.3	50.4	47.7
2015/04/23	16:26:05	48.4	50.4	49.2	47.7
2015/04/23	16:26:06	50.2	50.6	49.4	47.4
2015/04/23	16:26:07	51.0	51.0	49.3	48.1
2015/04/23	16:26:08	51.9	52.7	51.0	47.7
2015/04/23	16:26:09	52.2	52.9	50.9	48.0
2015/04/23	16:26:10	52.1	52.6	51.5	48.9
2015/04/23	16:26:11	50.7	51.5	50.9	49.1
2015/04/23	16:26:12	48.6	51.1	49.7	46.8
2015/04/23	16:26:13	52.8	52.1	49.7	48.5
2015/04/23	16:26:14	54.8	54.5	51.7	51.3
2015/04/23	16:26:15	50.5	53.8	52.0	48.0
2015/04/23	16:26:16	47.7	51.9	49.8	47.2
2015/04/23	16:26:17	51.6	51.3	49.5	48.2
2015/04/23	16:26:18	49.1	51.2	50.0	48.7
2015/04/23	16:26:19	50.8	50.9	49.7	48.8
2015/04/23	16:26:20	51.6	51.6	50.6	49.2
2015/04/23	16:26:21	50.8	51.3	50.7	49.8
2015/04/23	16:26:22	51.8	51.8	51.0	50.8
2015/04/23	16:26:23	48.8	51.6	50.0	48.0
2015/04/23	16:26:24	49.4	50.0	49.6	48.7
2015/04/23	16:26:25	47.4	49.6	48.4	46.8
2015/04/23	16:26:26	48.4	48.7	48.3	47.7
2015/04/23	16:26:27	49.7	49.3	48.3	48.5
2015/04/23	16:26:28	49.0	49.3	49.0	48.7
2015/04/23	16:26:29	50.9	50.4	49.0	49.3
2015/04/23	16:26:30	54.7	54.2	50.4	50.7
2015/04/23	16:26:31	49.1	53.4	51.2	48.6
2015/04/23	16:26:32	48.7	51.2	49.8	48.3
2015/04/23	16:26:33	50.1	50.2	49.7	48.6
2015/04/23	16:26:34	51.6	51.3	49.8	49.4
2015/04/23	16:26:35	50.5	51.3	50.7	49.7
2015/04/23	16:26:36	50.6	50.8	50.0	48.7
2015/04/23	16:26:37	51.9	51.6	50.7	51.1
2015/04/23	16:26:38	50.9	51.6	50.7	49.2
2015/04/23	16:26:39	49.7	51.3	50.3	48.6
2015/04/23	16:26:40	50.5	50.6	50.1	48.9
2015/04/23	16:26:41	49.1	50.5	49.7	48.3

2015/04/23	16:26:42	49.4	50.2	49.3	48.0
2015/04/23	16:26:43	49.2	49.4	48.8	46.9
2015/04/23	16:26:44	50.1	49.9	49.2	48.2
2015/04/23	16:26:45	48.9	50.0	49.3	48.2
2015/04/23	16:26:46	47.7	49.3	48.3	47.2
2015/04/23	16:26:47	48.1	48.4	48.0	47.3
2015/04/23	16:26:48	47.7	48.3	47.8	47.2
2015/04/23	16:26:49	48.4	48.3	47.9	47.3
2015/04/23	16:26:50	50.5	49.8	48.3	48.3
2015/04/23	16:26:51	51.2	50.9	49.7	49.6
2015/04/23	16:26:52	48.8	51.0	49.6	48.0
2015/04/23	16:26:53	48.5	49.6	49.0	48.1
2015/04/23	16:26:54	50.9	50.7	48.7	47.6
2015/04/23	16:26:55	51.9	51.5	50.7	50.5
2015/04/23	16:26:56	51.7	51.7	51.2	50.6
2015/04/23	16:26:57	49.3	51.6	50.2	48.3
2015/04/23	16:26:58	48.3	50.2	49.1	48.1
2015/04/23	16:26:59	49.4	49.5	49.0	47.9
2015/04/23	16:27:00	49.0	49.5	49.1	48.4
2015/04/23	16:27:01	48.5	49.2	48.7	47.9
2015/04/23	16:27:02	47.3	48.7	47.8	47.0
2015/04/23	16:27:03	47.1	47.8	47.4	46.6
2015/04/23	16:27:04	48.9	48.6	47.4	47.3
2015/04/23	16:27:05	49.5	49.2	48.6	48.9
2015/04/23	16:27:06	49.0	49.1	48.9	48.5
2015/04/23	16:27:07	49.8	49.7	49.1	49.1
2015/04/23	16:27:08	49.2	49.8	49.2	48.0
2015/04/23	16:27:09	48.4	49.2	48.7	47.8
2015/04/23	16:27:10	49.1	49.2	48.5	47.8
2015/04/23	16:27:11	48.2	49.0	48.5	47.9
2015/04/23	16:27:12	48.6	49.0	48.3	47.1
2015/04/23	16:27:13	47.5	48.3	47.8	46.7
2015/04/23	16:27:14	47.6	47.9	47.7	47.2
2015/04/23	16:27:15	48.4	48.3	47.7	47.7
2015/04/23	16:27:16	47.1	48.1	47.4	46.4
2015/04/23	16:27:17	47.1	47.5	47.2	46.7
2015/04/23	16:27:18	46.8	47.2	46.9	46.6
2015/04/23	16:27:19	47.0	47.0	46.8	46.6
2015/04/23	16:27:20	50.9	50.3	46.9	46.7
2015/04/23	16:27:21	53.1	52.4	50.1	49.2
2015/04/23	16:27:22	51.7	52.6	51.5	49.0
2015/04/23	16:27:23	47.8	51.9	49.9	47.7
2015/04/23	16:27:24	47.6	49.8	48.6	47.4
2015/04/23	16:27:25	47.9	48.6	48.1	47.3
2015/04/23	16:27:26	48.6	48.6	48.2	47.9
2015/04/23	16:27:27	49.9	49.5	48.5	48.1
2015/04/23	16:27:28	51.2	50.8	49.4	49.2

2015/04/23	16:27:29	50.5	51.2	50.5	48.9
2015/04/23	16:27:30	52.3	51.9	50.4	50.0
2015/04/23	16:27:31	52.2	52.3	51.9	51.3
2015/04/23	16:27:32	51.3	51.9	51.1	49.4
2015/04/23	16:27:33	50.9	52.1	50.8	48.4
2015/04/23	16:27:34	50.8	51.9	50.5	47.5
2015/04/23	16:27:35	47.2	50.5	48.7	46.6
2015/04/23	16:27:36	46.5	48.7	47.4	46.2
2015/04/23	16:27:37	48.7	48.6	47.2	46.5
2015/04/23	16:27:38	51.8	51.0	48.8	49.4
2015/04/23	16:27:39	48.5	50.4	49.3	47.9
2015/04/23	16:27:40	51.0	50.6	49.1	48.5
2015/04/23	16:27:41	50.2	50.6	50.1	49.1
2015/04/23	16:27:42	52.8	52.3	50.5	50.9
2015/04/23	16:27:43	54.0	53.5	52.4	53.0
2015/04/23	16:27:44	53.2	53.7	53.3	52.2
2015/04/23	16:27:45	53.1	53.5	52.4	50.0
2015/04/23	16:27:46	52.0	53.6	52.3	48.7
2015/04/23	16:27:47	50.2	52.5	50.9	46.9
2015/04/23	16:27:48	45.8	50.9	48.5	45.6
2015/04/23	16:27:49	46.3	48.4	47.3	45.6
2015/04/23	16:27:50	47.2	47.3	47.1	46.6
2015/04/23	16:27:51	47.6	47.6	47.1	46.8
2015/04/23	16:27:52	47.1	47.6	47.1	46.3
2015/04/23	16:27:53	47.4	47.5	47.2	46.8
2015/04/23	16:27:54	46.8	47.5	47.0	46.3
2015/04/23	16:27:55	46.9	47.2	46.9	46.3
2015/04/23	16:27:56	47.6	47.6	46.7	46.4
2015/04/23	16:27:57	49.3	49.0	47.5	47.4
2015/04/23	16:27:58	46.7	48.4	47.4	46.5
2015/04/23	16:27:59	49.1	48.7	47.4	47.0
2015/04/23	16:28:00	49.8	49.5	48.6	48.7
2015/04/23	16:28:01	48.7	49.5	48.9	47.9
2015/04/23	16:28:02	49.4	49.4	48.5	47.5
2015/04/23	16:28:03	49.2	49.7	49.1	48.1
2015/04/23	16:28:04	48.8	49.3	48.8	48.0
2015/04/23	16:28:05	49.0	49.0	48.7	48.0
2015/04/23	16:28:06	50.4	50.0	49.1	49.0
2015/04/23	16:28:07	47.8	49.8	48.7	46.9
2015/04/23	16:28:08	49.0	49.4	48.7	47.3
2015/04/23	16:28:09	48.2	48.6	48.1	47.0
2015/04/23	16:28:10	49.6	49.6	48.6	48.3
2015/04/23	16:28:11	50.8	50.4	49.0	48.6
2015/04/23	16:28:12	50.6	50.6	49.9	48.8
2015/04/23	16:28:13	48.5	50.6	49.4	47.6
2015/04/23	16:28:14	49.8	50.0	49.3	48.2
2015/04/23	16:28:15	49.1	49.7	48.8	47.0

2015/04/23	16:28:16	50.1	49.9	49.2	48.3
2015/04/23	16:28:17	48.4	49.8	48.8	46.9
2015/04/23	16:28:18	47.0	48.8	47.7	46.3
2015/04/23	16:28:19	46.2	47.7	46.8	45.9
2015/04/23	16:28:20	51.2	50.3	46.8	48.5
2015/04/23	16:28:21	49.5	49.8	49.4	48.6
2015/04/23	16:28:22	47.0	49.7	48.2	46.9
2015/04/23	16:28:23	48.9	49.1	47.8	46.9
2015/04/23	16:28:24	51.1	50.9	49.1	48.4
2015/04/23	16:28:25	52.7	52.7	49.2	47.3
2015/04/23	16:28:26	50.5	53.2	51.2	49.1
2015/04/23	16:28:27	49.1	51.3	49.9	47.6
2015/04/23	16:28:28	46.5	49.9	48.1	46.1
2015/04/23	16:28:29	47.5	48.1	47.1	45.3
2015/04/23	16:28:30	48.4	48.9	48.0	46.1
2015/04/23	16:28:31	45.9	48.0	46.7	45.3
2015/04/23	16:28:32	48.5	48.2	46.4	45.3
2015/04/23	16:28:33	47.7	48.3	47.8	46.7
2015/04/23	16:28:34	46.1	47.8	46.8	45.8
2015/04/23	16:28:35	46.5	46.8	46.6	46.0
2015/04/23	16:28:36	48.4	47.9	46.6	46.3
2015/04/23	16:28:37	48.0	48.0	47.5	47.0
2015/04/23	16:28:38	49.2	49.0	47.7	46.2
2015/04/23	16:28:39	46.5	49.0	47.6	45.8
2015/04/23	16:28:40	46.1	47.6	46.7	45.8
2015/04/23	16:28:41	47.9	47.8	46.6	46.1
2015/04/23	16:28:42	46.7	47.7	47.1	46.2
2015/04/23	16:28:43	47.9	48.0	46.7	46.0
2015/04/23	16:28:44	49.2	48.8	47.8	47.0
2015/04/23	16:28:45	46.2	48.7	47.3	45.8
2015/04/23	16:28:46	49.8	49.1	47.2	46.5
2015/04/23	16:28:47	46.6	49.0	47.7	46.5
2015/04/23	16:28:48	46.6	47.7	47.0	46.1
2015/04/23	16:28:49	45.6	47.0	46.2	45.3
2015/04/23	16:28:50	46.6	46.5	46.2	46.0
2015/04/23	16:28:51	50.1	49.3	46.5	47.0
2015/04/23	16:28:52	47.0	48.9	47.8	46.3
2015/04/23	16:28:53	47.2	47.8	46.9	45.6
2015/04/23	16:28:54	48.9	48.8	47.5	46.9
2015/04/23	16:28:55	46.1	48.3	47.0	45.6
2015/04/23	16:28:56	45.5	47.2	46.2	45.2
2015/04/23	16:28:57	48.3	47.8	46.0	45.5
2015/04/23	16:28:58	45.8	47.7	46.5	45.2
2015/04/23	16:28:59	44.6	46.5	45.4	44.5
2015/04/23	16:29:00	48.3	47.7	45.2	44.5
2015/04/23	16:29:01	47.0	47.9	47.2	45.9
2015/04/23	16:29:02	45.2	47.2	46.1	45.0

2015/04/23	16:29:03	50.1	49.3	46.0	46.4
2015/04/23	16:29:04	46.9	49.2	47.7	45.0
2015/04/23	16:29:05	50.2	49.7	47.4	45.5
2015/04/23	16:29:06	46.5	49.7	47.9	46.0
2015/04/23	16:29:07	50.6	50.1	47.7	46.4
2015/04/23	16:29:08	51.8	51.4	49.5	48.7
2015/04/23	16:29:09	52.1	52.2	51.2	50.4
2015/04/23	16:29:10	50.2	51.7	50.3	47.2
2015/04/23	16:29:11	47.8	51.2	49.2	46.7
2015/04/23	16:29:12	47.1	49.2	48.1	46.6
2015/04/23	16:29:13	49.1	49.1	47.7	46.5
2015/04/23	16:29:14	52.8	52.1	48.9	48.9
2015/04/23	16:29:15	47.4	51.8	49.6	47.0
2015/04/23	16:29:16	46.6	49.6	47.9	46.2
2015/04/23	16:29:17	48.8	49.0	47.2	45.7
2015/04/23	16:29:18	50.5	50.2	49.1	49.1
2015/04/23	16:29:19	47.2	49.9	48.4	46.5
2015/04/23	16:29:20	46.6	48.5	47.3	46.0
2015/04/23	16:29:21	49.1	48.7	47.4	47.6
2015/04/23	16:29:22	48.1	48.4	48.2	47.5
2015/04/23	16:29:23	48.1	48.5	47.4	46.3
2015/04/23	16:29:24	50.9	50.5	48.6	48.0
2015/04/23	16:29:25	49.9	50.5	49.7	48.3
2015/04/23	16:29:26	51.6	51.6	49.4	47.5
2015/04/23	16:29:27	51.8	52.0	50.8	48.7
2015/04/23	16:29:28	55.6	55.3	51.6	51.9
2015/04/23	16:29:29	49.3	54.5	52.0	48.6
2015/04/23	16:29:30	47.7	52.0	49.8	46.7
2015/04/23	16:29:31	47.3	49.7	48.4	46.5
2015/04/23	16:29:32	51.4	50.9	48.2	47.6
2015/04/23	16:29:33	56.9	55.8	50.9	54.6
2015/04/23	16:29:34	60.0	58.7	55.9	59.2
2015/04/23	16:29:35	59.9	59.8	58.8	58.0
2015/04/23	16:29:36	55.7	59.2	57.4	55.0
2015/04/23	16:29:37	54.4	57.4	55.7	52.7
2015/04/23	16:29:38	51.7	55.6	53.6	51.4
2015/04/23	16:29:39	52.0	53.6	52.7	50.9
2015/04/23	16:29:40	51.4	52.7	51.9	50.4
2015/04/23	16:29:41	49.7	51.9	50.5	47.9
2015/04/23	16:29:42	51.2	51.1	50.3	48.1
2015/04/23	16:29:43	48.6	50.9	49.6	48.1
2015/04/23	16:29:44	48.4	49.6	48.9	48.1
2015/04/23	16:29:45	48.7	49.0	48.7	47.7
2015/04/23	16:29:46	49.4	49.6	48.1	47.1
2015/04/23	16:29:47	49.0	49.6	49.1	48.0
2015/04/23	16:29:48	47.8	49.6	48.3	46.9
2015/04/23	16:29:49	51.7	50.8	48.2	47.3

2015/04/23	16:29:50	51.2	51.6	49.2	46.4
2015/04/23	16:29:51	49.3	51.6	49.9	45.8
2015/04/23	16:29:52	46.7	49.9	48.2	45.4
2015/04/23	16:29:53	51.9	51.2	48.1	47.4
2015/04/23	16:29:54	48.8	51.2	49.6	46.8
2015/04/23	16:29:55	49.1	49.9	48.7	46.1
2015/04/23	16:29:56	48.9	49.9	49.0	47.0
2015/04/23	16:29:57	49.6	49.7	48.4	46.5
2015/04/23	16:29:58	51.3	51.0	49.4	48.7
2015/04/23	16:29:59	48.6	50.8	49.5	47.1
2015/04/23	16:30:00	51.9	51.7	49.6	49.2
2015/04/23	16:30:01	47.1	50.9	48.9	46.6
2015/04/23	16:30:02	46.9	48.9	47.7	45.9
2015/04/23	16:30:03	45.6	47.7	46.5	45.2
2015/04/23	16:30:04	48.2	47.9	46.4	45.7
2015/04/23	16:30:05	46.1	47.7	46.7	45.4
2015/04/23	16:30:06	47.6	47.8	46.0	45.0
2015/04/23	16:30:07	50.7	49.7	47.6	48.4
2015/04/23	16:30:08	46.3	49.5	47.7	45.2
2015/04/23	16:30:09	45.3	47.7	46.4	44.7
2015/04/23	16:30:10	45.4	46.4	45.8	45.2
2015/04/23	16:30:11	45.1	45.8	45.4	45.0
2015/04/23	16:30:12	48.1	47.8	45.4	45.2
2015/04/23	16:30:13	52.7	51.4	47.7	50.0
2015/04/23	16:30:14	48.1	51.3	49.3	46.3
2015/04/23	16:30:15	46.1	49.3	47.6	45.7
2015/04/23	16:30:16	47.8	48.0	47.2	45.8
2015/04/23	16:30:17	46.2	47.8	46.8	45.7
2015/04/23	16:30:18	48.5	48.5	46.4	45.6
2015/04/23	16:30:19	49.7	49.4	48.5	47.6
2015/04/23	16:30:20	48.6	49.2	48.8	48.0
2015/04/23	16:30:21	48.1	48.8	48.1	47.1
2015/04/23	16:30:22	52.3	51.7	48.5	49.1
2015/04/23	16:30:23	52.2	52.2	51.3	50.5
2015/04/23	16:30:24	50.6	52.1	51.2	49.6
2015/04/23	16:30:25	49.0	51.1	49.9	48.6
2015/04/23	16:30:26	52.4	51.8	49.9	49.5
2015/04/23	16:30:27	49.6	51.7	50.4	48.4
2015/04/23	16:30:28	50.6	50.9	50.4	49.3
2015/04/23	16:30:29	48.1	50.4	49.1	47.9
2015/04/23	16:30:30	47.9	49.1	48.4	47.2
2015/04/23	16:30:31	49.0	49.3	48.5	47.4
2015/04/23	16:30:32	47.6	48.5	48.0	47.3
2015/04/23	16:30:33	48.2	48.3	48.0	47.6
2015/04/23	16:30:34	48.4	48.4	47.8	47.3
2015/04/23	16:30:35	49.1	49.1	48.0	47.3
2015/04/23	16:30:36	49.0	49.3	48.6	47.7

2015/04/23	16:30:37	47.7	49.1	48.2	46.8
2015/04/23	16:30:38	47.5	48.5	47.8	46.4
2015/04/23	16:30:39	47.2	47.8	47.3	46.5
2015/04/23	16:30:40	47.5	47.7	47.4	46.8
2015/04/23	16:30:41	49.0	48.4	47.4	47.2
2015/04/23	16:30:42	48.1	48.6	48.1	47.2
2015/04/23	16:30:43	47.6	48.1	47.8	47.2
2015/04/23	16:30:44	49.9	49.6	47.8	47.6
2015/04/23	16:30:45	52.7	52.0	49.5	51.4
2015/04/23	16:30:46	50.0	51.7	50.6	48.7
2015/04/23	16:30:47	49.7	51.0	49.9	48.3
2015/04/23	16:30:48	49.8	50.4	49.4	47.7
2015/04/23	16:30:49	49.1	50.0	49.3	48.2
2015/04/23	16:30:50	48.4	49.6	48.8	47.9
2015/04/23	16:30:51	53.3	52.4	48.8	48.5
2015/04/23	16:30:52	51.7	52.4	51.7	50.1
2015/04/23	16:30:53	48.8	51.8	50.2	47.7
2015/04/23	16:30:54	49.6	50.2	49.7	48.4
2015/04/23	16:30:55	48.9	49.9	49.2	48.0
2015/04/23	16:30:56	49.0	49.3	48.7	47.7
2015/04/23	16:30:57	50.9	50.4	49.4	49.3
2015/04/23	16:30:58	52.5	52.7	50.2	48.4
2015/04/23	16:30:59	49.8	51.2	50.4	48.2
2015/04/23	16:31:00	48.9	50.4	49.6	48.6
2015/04/23	16:31:01	47.4	49.6	48.3	46.9
2015/04/23	16:31:02	47.5	48.3	47.8	47.1
2015/04/23	16:31:03	47.1	47.7	47.2	46.2
2015/04/23	16:31:04	48.1	48.1	47.5	47.3
2015/04/23	16:31:05	48.7	48.6	47.7	47.2
2015/04/23	16:31:06	50.9	50.1	48.4	49.5
2015/04/23	16:31:07	48.3	50.1	48.7	46.9
2015/04/23	16:31:08	49.1	50.0	48.8	46.8
2015/04/23	16:31:09	48.2	48.9	48.4	47.5
2015/04/23	16:31:10	48.5	48.7	48.4	47.9
2015/04/23	16:31:11	56.8	55.7	48.4	48.6
2015/04/23	16:31:12	51.3	55.1	53.0	49.7
2015/04/23	16:31:13	48.1	53.0	50.6	47.8
2015/04/23	16:31:14	47.4	50.6	48.9	46.5
2015/04/23	16:31:15	49.0	49.4	48.6	47.4
2015/04/23	16:31:16	47.0	48.9	47.8	46.4
2015/04/23	16:31:17	51.4	50.8	47.7	46.9
2015/04/23	16:31:18	49.8	50.8	49.8	47.9
2015/04/23	16:31:19	46.9	50.3	48.4	46.0
2015/04/23	16:31:20	50.1	49.8	48.1	46.2
2015/04/23	16:31:21	48.4	49.6	48.8	48.0
2015/04/23	16:31:22	47.8	48.8	48.1	46.9
2015/04/23	16:31:23	47.6	48.3	47.6	46.4

2015/04/23	16:31:24	53.7	52.8	47.8	47.1
2015/04/23	16:31:25	50.6	51.8	50.9	48.1
2015/04/23	16:31:26	51.7	52.2	51.1	49.8
2015/04/23	16:31:27	46.0	51.3	48.9	45.8
2015/04/23	16:31:28	49.6	49.9	47.9	46.2
2015/04/23	16:31:29	54.8	54.5	50.0	48.4
2015/04/23	16:31:30	47.6	52.7	50.1	45.5
2015/04/23	16:31:31	52.7	52.1	49.4	45.8
2015/04/23	16:31:32	49.6	51.9	50.6	49.2
2015/04/23	16:31:33	47.4	50.6	49.0	46.7
2015/04/23	16:31:34	47.0	49.0	47.8	46.3
2015/04/23	16:31:35	48.2	48.4	47.4	46.3
2015/04/23	16:31:36	51.4	50.9	47.7	46.6
2015/04/23	16:31:37	49.7	51.3	49.9	47.4
2015/04/23	16:31:38	48.6	49.9	49.1	46.4
2015/04/23	16:31:39	47.8	49.1	48.4	46.8
2015/04/23	16:31:40	46.6	48.4	47.3	46.0
2015/04/23	16:31:41	47.4	47.7	46.9	45.8
2015/04/23	16:31:42	47.7	48.0	47.6	46.8
2015/04/23	16:31:43	47.1	47.6	47.2	46.6
2015/04/23	16:31:44	54.3	53.0	47.2	47.3
2015/04/23	16:31:45	50.9	52.6	50.6	47.1
2015/04/23	16:31:46	46.5	51.9	49.3	46.2
2015/04/23	16:31:47	48.5	49.5	48.7	47.3
2015/04/23	16:31:48	48.0	48.7	47.7	46.1
2015/04/23	16:31:49	49.1	49.4	48.6	47.6
2015/04/23	16:31:50	47.8	48.6	48.1	47.1
2015/04/23	16:31:51	48.6	48.7	47.7	47.1
2015/04/23	16:31:52	55.6	54.4	48.7	50.7
2015/04/23	16:31:53	50.2	54.3	52.0	47.6
2015/04/23	16:31:54	50.0	52.0	50.3	47.3
2015/04/23	16:31:55	55.5	55.4	51.2	49.5
2015/04/23	16:31:56	58.2	57.5	52.7	49.0
2015/04/23	16:31:57	56.2	57.0	55.5	52.9
2015/04/23	16:31:58	56.8	57.3	56.0	53.5
2015/04/23	16:31:59	55.3	57.0	54.9	51.7
2015/04/23	16:32:00	67.8	67.3	56.4	56.8
2015/04/23	16:32:01	62.6	66.6	63.3	52.0
2015/04/23	16:32:02	52.2	65.2	61.2	50.8
2015/04/23	16:32:03	60.1	61.5	58.9	50.4
2015/04/23	16:32:04	56.8	60.9	58.7	52.2
2015/04/23	16:32:05	56.3	58.7	56.2	47.4
2015/04/23	16:32:06	53.1	57.8	54.5	47.5
2015/04/23	16:32:07	48.4	56.0	52.8	46.9
2015/04/23	16:32:08	53.6	54.2	51.5	47.0
2015/04/23	16:32:09	47.7	53.7	50.9	47.5
2015/04/23	16:32:10	48.2	50.9	49.4	47.4

2015/04/23	16:32:11	47.1	49.4	48.1	46.6
2015/04/23	16:32:12	49.8	49.4	48.1	47.5
2015/04/23	16:32:13	47.6	49.2	48.1	46.3
2015/04/23	16:32:14	47.9	48.5	47.8	46.2
2015/04/23	16:32:15	47.6	47.8	47.4	46.4
2015/04/23	16:32:16	47.6	47.8	47.5	46.7
2015/04/23	16:32:17	48.5	48.3	47.8	47.8
2015/04/23	16:32:18	46.5	48.1	47.1	46.1
2015/04/23	16:32:19	46.2	47.1	46.6	45.9
2015/04/23	16:32:20	46.0	46.6	46.2	45.8
2015/04/23	16:32:21	46.0	46.2	45.9	45.6
2015/04/23	16:32:22	46.9	46.8	46.2	46.1
2015/04/23	16:32:23	46.8	46.9	46.5	46.1
2015/04/23	16:32:24	46.5	46.7	46.4	45.8
2015/04/23	16:32:25	46.5	46.6	46.4	45.9
2015/04/23	16:32:26	46.0	46.7	46.1	45.1
2015/04/23	16:32:27	46.0	46.1	45.9	45.4
2015/04/23	16:32:28	46.3	46.3	46.1	46.0
2015/04/23	16:32:29	46.8	46.6	46.1	46.0
2015/04/23	16:32:30	47.6	47.3	46.6	46.8
2015/04/23	16:32:31	50.2	49.6	47.4	48.3
2015/04/23	16:32:32	56.3	55.1	49.7	52.2
2015/04/23	16:32:33	59.8	58.7	55.1	57.6
2015/04/23	16:32:34	58.1	59.0	58.0	55.4
2015/04/23	16:32:35	55.9	58.0	56.6	54.4
2015/04/23	16:32:36	50.3	56.6	53.8	49.7
2015/04/23	16:32:37	48.2	53.7	51.1	46.9
2015/04/23	16:32:38	45.8	51.0	48.6	45.6
2015/04/23	16:32:39	45.7	48.5	47.0	45.4
2015/04/23	16:32:40	45.7	47.0	46.2	45.1
2015/04/23	16:32:41	47.4	47.1	46.2	46.0
2015/04/23	16:32:42	49.7	48.9	46.9	46.8
2015/04/23	16:32:43	49.0	49.6	48.7	47.0
2015/04/23	16:32:44	47.8	48.7	48.1	46.8
2015/04/23	16:32:45	48.8	48.7	47.9	47.1
2015/04/23	16:32:46	47.9	48.8	48.0	46.3
2015/04/23	16:32:47	51.6	51.1	47.3	45.5
2015/04/23	16:32:48	55.3	54.2	51.0	51.7
2015/04/23	16:32:49	52.8	54.5	53.2	49.2
2015/04/23	16:32:50	46.9	53.1	50.4	46.6
2015/04/23	16:32:51	46.9	50.3	48.5	46.6
2015/04/23	16:32:52	46.7	48.5	47.5	46.5
2015/04/23	16:32:53	49.9	49.3	47.4	47.5
2015/04/23	16:32:54	50.5	50.2	49.0	48.2
2015/04/23	16:32:55	50.1	50.5	50.0	49.5
2015/04/23	16:32:56	48.8	50.1	49.3	48.2
2015/04/23	16:32:57	48.2	49.3	48.6	47.4

2015/04/23	16:32:58	48.6	49.2	48.3	46.7
2015/04/23	16:32:59	47.5	48.3	47.5	46.3
2015/04/23	16:33:00	47.1	48.5	47.2	45.5
2015/04/23	16:33:01	46.1	47.2	46.5	45.4
2015/04/23	16:33:02	47.5	47.5	46.1	45.2
2015/04/23	16:33:03	48.6	48.3	47.4	47.9
2015/04/23	16:33:04	47.1	48.2	47.4	45.8
2015/04/23	16:33:05	45.8	47.4	46.5	45.5
2015/04/23	16:33:06	46.0	46.5	46.0	45.3
2015/04/23	16:33:07	46.6	46.5	46.2	45.8
2015/04/23	16:33:08	45.6	46.6	45.9	45.1
2015/04/23	16:33:09	50.1	49.9	45.6	45.1
2015/04/23	16:33:10	49.6	50.3	49.5	47.6
2015/04/23	16:33:11	47.6	49.5	48.3	46.5
2015/04/23	16:33:12	47.3	48.6	47.8	46.9
2015/04/23	16:33:13	48.4	48.3	47.7	47.2
2015/04/23	16:33:14	47.4	48.4	47.7	46.6
2015/04/23	16:33:15	47.3	47.7	47.4	46.4
2015/04/23	16:33:16	45.7	47.4	46.4	45.5
2015/04/23	16:33:17	45.6	46.4	45.9	45.2
2015/04/23	16:33:18	45.6	46.0	45.7	45.3
2015/04/23	16:33:19	45.3	45.7	45.4	44.9
2015/04/23	16:33:20	45.2	45.4	45.3	44.9
2015/04/23	16:33:21	45.6	45.6	45.3	45.2
2015/04/23	16:33:22	46.0	45.9	45.5	45.5
2015/04/23	16:33:23	46.1	46.1	45.8	45.6
2015/04/23	16:33:24	46.6	46.5	46.0	46.1
2015/04/23	16:33:25	47.1	46.9	46.5	46.7
2015/04/23	16:33:26	46.3	46.8	46.5	46.1
2015/04/23	16:33:27	47.1	47.0	46.4	46.1
2015/04/23	16:33:28	47.3	47.3	46.9	46.7
2015/04/23	16:33:29	47.5	47.5	47.2	47.1
2015/04/23	16:33:30	49.2	48.7	47.4	47.5
2015/04/23	16:33:31	48.1	48.8	48.2	47.1
2015/04/23	16:33:32	50.1	49.6	48.2	48.6
2015/04/23	16:33:33	49.4	49.6	49.0	48.3
2015/04/23	16:33:34	52.3	51.8	49.4	49.9
2015/04/23	16:33:35	48.7	51.1	49.8	47.1
2015/04/23	16:33:36	47.5	49.8	48.5	46.9
2015/04/23	16:33:37	48.2	48.6	48.3	47.2
2015/04/23	16:33:38	49.1	49.2	47.7	46.8
2015/04/23	16:33:39	51.5	51.4	49.3	47.4
2015/04/23	16:33:40	49.7	50.3	48.9	46.4
2015/04/23	16:33:41	48.4	50.3	49.1	47.1
2015/04/23	16:33:42	50.6	50.5	48.8	46.6
2015/04/23	16:33:43	50.9	51.1	49.7	48.0
2015/04/23	16:33:44	48.9	50.6	49.4	46.7

2015/04/23	16:33:45	51.2	51.1	49.4	48.1
2015/04/23	16:33:46	47.1	50.2	48.5	46.3
2015/04/23	16:33:47	53.4	52.4	48.6	50.6
2015/04/23	16:33:48	48.0	51.7	49.9	46.0
2015/04/23	16:33:49	52.1	51.5	50.1	49.2
2015/04/23	16:33:50	49.8	51.5	50.2	48.0
2015/04/23	16:33:51	48.6	50.2	49.3	47.0
2015/04/23	16:33:52	52.1	51.6	49.1	48.4
2015/04/23	16:33:53	48.6	51.4	49.9	46.8
2015/04/23	16:33:54	49.5	50.4	49.5	47.6
2015/04/23	16:33:55	50.3	50.5	48.5	46.4
2015/04/23	16:33:56	48.1	50.5	49.1	47.4
2015/04/23	16:33:57	49.5	49.5	48.8	46.9
2015/04/23	16:33:58	49.1	49.7	49.2	48.0
2015/04/23	16:33:59	48.0	49.2	48.5	47.6
2015/04/23	16:34:00	48.4	48.6	48.3	47.6
2015/04/23	16:34:01	48.0	48.7	48.0	47.1
2015/04/23	16:34:02	47.3	48.2	47.5	46.7
2015/04/23	16:34:03	46.6	47.5	46.9	46.2
2015/04/23	16:34:04	50.0	49.5	46.8	46.5
2015/04/23	16:34:05	50.1	50.1	49.1	48.4
2015/04/23	16:34:06	51.0	50.9	49.7	48.9
2015/04/23	16:34:07	50.7	51.0	50.5	50.0
2015/04/23	16:34:08	51.2	51.3	50.7	49.7
2015/04/23	16:34:09	45.6	50.9	48.4	45.1
2015/04/23	16:34:10	45.8	48.4	47.0	45.3
2015/04/23	16:34:11	47.7	47.5	47.0	46.9
2015/04/23	16:34:12	50.3	49.7	47.4	47.5
2015/04/23	16:34:13	50.2	50.8	49.7	47.0
2015/04/23	16:34:14	47.3	49.7	48.3	45.7
2015/04/23	16:34:15	47.6	48.7	47.7	46.3
2015/04/23	16:34:16	47.5	48.1	47.7	47.0
2015/04/23	16:34:17	48.5	48.3	47.7	47.5
2015/04/23	16:34:18	51.8	51.5	48.1	47.8
2015/04/23	16:34:19	47.8	50.3	48.8	46.8
2015/04/23	16:34:20	50.0	49.8	49.2	48.4
2015/04/23	16:34:21	51.5	51.3	49.6	49.1
2015/04/23	16:34:22	47.6	50.3	48.8	46.7
2015/04/23	16:34:23	48.5	49.2	48.6	47.2
2015/04/23	16:34:24	47.5	48.7	47.9	46.3
2015/04/23	16:34:25	47.6	48.0	47.5	46.5
2015/04/23	16:34:26	49.6	49.1	47.9	48.4
2015/04/23	16:34:27	48.9	49.1	48.8	48.0
2015/04/23	16:34:28	49.0	49.6	48.7	47.1
2015/04/23	16:34:29	49.1	49.4	48.7	47.7
2015/04/23	16:34:30	48.2	49.1	48.3	46.9
2015/04/23	16:34:31	48.1	48.4	48.1	47.3

2015/04/23	16:34:32	49.2	49.2	48.3	47.7
2015/04/23	16:34:33	47.7	48.7	48.1	47.4
2015/04/23	16:34:34	48.7	48.7	47.8	47.1
2015/04/23	16:34:35	50.8	50.3	48.6	49.4
2015/04/23	16:34:36	48.3	50.3	49.1	47.7
2015/04/23	16:34:37	47.2	49.1	48.0	46.7
2015/04/23	16:34:38	48.4	48.3	47.9	47.7
2015/04/23	16:34:39	47.9	48.4	48.0	47.4
2015/04/23	16:34:40	47.9	48.1	47.9	47.4
2015/04/23	16:34:41	48.5	48.3	48.0	48.0
2015/04/23	16:34:42	47.9	48.3	47.9	47.2
2015/04/23	16:34:43	47.6	48.2	47.8	47.2
2015/04/23	16:34:44	46.5	47.8	47.0	46.3
2015/04/23	16:34:45	46.6	47.0	46.7	46.1
2015/04/23	16:34:46	46.8	46.8	46.7	46.3
2015/04/23	16:34:47	47.0	47.0	46.8	46.7
2015/04/23	16:34:48	48.1	47.9	46.9	46.8
2015/04/23	16:34:49	48.0	48.2	47.9	47.5
2015/04/23	16:34:50	47.1	47.9	47.4	46.7
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2015/04/23	16:34:53	46.5	49.4	47.9	46.2
2015/04/23	16:34:54	47.5	47.9	47.5	46.5
2015/04/23	16:34:55	53.2	52.2	47.8	48.8
2015/04/23	16:34:56	53.7	53.2	52.3	50.1
2015/04/23	16:34:57	53.5	54.2	53.0	50.7
2015/04/23	16:34:58	49.6	53.0	51.3	48.3
2015/04/23	16:34:59	51.1	51.5	50.3	48.4
2015/04/23	16:35:00	50.7	51.8	50.9	49.9
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2015/04/23	16:35:02	49.2	50.1	49.3	48.3
2015/04/23	16:35:03	47.8	49.3	48.4	47.2
2015/04/23	16:35:04	48.6	48.8	48.3	47.6
2015/04/23	16:35:05	49.3	49.4	48.3	47.5
2015/04/23	16:35:06	48.6	49.2	48.5	47.4
2015/04/23	16:35:07	47.2	48.5	47.8	45.8
2015/04/23	16:35:08	48.7	48.8	47.9	46.8
2015/04/23	16:35:09	51.5	50.7	48.1	47.8
2015/04/23	16:35:10	53.6	53.5	50.9	49.8
2015/04/23	16:35:11	46.6	52.2	49.5	45.1
2015/04/23	16:35:12	48.3	49.5	47.6	44.5
2015/04/23	16:35:13	45.7	49.2	47.4	45.4
2015/04/23	16:35:14	51.4	51.6	47.1	45.5
2015/04/23	16:35:15	50.7	51.3	48.1	45.4
2015/04/23	16:35:16	54.0	54.5	49.6	46.7
2015/04/23	16:35:17	52.2	53.9	51.5	45.8
2015/04/23	16:35:18	45.5	52.7	49.6	45.0

2015/04/23	16:35:19	52.7	53.0	49.6	45.8
2015/04/23	16:35:20	45.4	51.1	48.4	45.3
2015/04/23	16:35:21	50.5	50.9	48.0	45.7
2015/04/23	16:35:22	51.7	51.2	49.4	47.6
2015/04/23	16:35:23	49.3	51.2	50.1	49.1
2015/04/23	16:35:24	50.0	50.3	49.7	48.2
2015/04/23	16:35:25	53.1	52.4	50.2	50.2
2015/04/23	16:35:26	48.5	51.8	50.0	47.8
2015/04/23	16:35:27	48.3	50.0	49.0	47.6
2015/04/23	16:35:28	46.8	49.1	47.6	45.8
2015/04/23	16:35:29	45.9	47.6	46.6	45.6
2015/04/23	16:35:30	45.7	46.6	46.0	45.4
2015/04/23	16:35:31	46.5	46.4	46.0	45.8
2015/04/23	16:35:32	45.6	46.4	45.8	45.0
2015/04/23	16:35:33	45.5	45.8	45.5	45.0
2015/04/23	16:35:34	45.7	45.7	45.6	45.3
2015/04/23	16:35:35	45.8	45.9	45.7	45.6
2015/04/23	16:35:36	46.7	46.4	45.8	45.7
2015/04/23	16:35:37	47.9	47.4	46.4	47.4
2015/04/23	16:35:38	47.3	47.4	47.3	47.0
2015/04/23	16:35:39	46.5	47.3	46.8	46.2
2015/04/23	16:35:40	46.8	46.9	46.7	46.3
2015/04/23	16:35:41	47.3	47.2	46.7	46.5
2015/04/23	16:35:42	47.8	47.6	47.1	46.9
2015/04/23	16:35:43	47.4	47.6	47.4	47.0
2015/04/23	16:35:44	48.0	47.9	47.5	47.7
2015/04/23	16:35:45	49.9	49.3	47.9	48.5
2015/04/23	16:35:46	52.9	52.3	49.4	50.3
2015/04/23	16:35:47	53.9	53.5	52.4	52.4
2015/04/23	16:35:48	50.5	53.1	51.6	49.8
2015/04/23	16:35:49	50.0	51.6	50.6	49.3
2015/04/23	16:35:50	48.3	50.7	49.2	47.7
2015/04/23	16:35:51	47.4	49.2	48.1	46.9
2015/04/23	16:35:52	46.5	48.1	47.2	46.2
2015/04/23	16:35:53	46.4	47.2	46.7	46.3
2015/04/23	16:35:54	45.9	46.7	46.2	45.6
2015/04/23	16:35:55	46.1	46.3	46.0	45.7
2015/04/23	16:35:56	45.7	46.2	45.9	45.5
2015/04/23	16:35:57	46.1	46.3	45.5	44.9
2015/04/23	16:35:58	46.7	46.6	46.3	45.9
2015/04/23	16:35:59	45.7	46.5	46.0	45.1
2015/04/23	16:36:00	45.2	46.1	45.6	45.0
2015/04/23	16:36:01	45.7	45.7	45.6	45.3
2015/04/23	16:36:02	46.0	45.9	45.6	45.7
2015/04/23	16:36:03	45.7	45.9	45.6	45.2
2015/04/23	16:36:04	45.6	45.8	45.6	45.3
2015/04/23	16:36:05	45.1	45.6	45.3	44.9

2015/04/23	16:36:06	45.5	45.4	45.3	45.3
2015/04/23	16:36:07	45.9	45.7	45.4	45.4
2015/04/23	16:36:08	46.4	46.2	45.7	45.7
2015/04/23	16:36:09	46.5	46.5	46.3	46.2
2015/04/23	16:36:10	46.0	46.4	46.1	45.7
2015/04/23	16:36:11	46.3	46.3	46.2	45.9
2015/04/23	16:36:12	46.2	46.3	46.1	45.9
2015/04/23	16:36:13	45.9	46.2	46.0	45.6
2015/04/23	16:36:14	46.4	46.4	45.9	45.6
2015/04/23	16:36:15	46.0	46.4	46.1	45.7
2015/04/23	16:36:16	45.8	46.1	45.9	45.5
2015/04/23	16:36:17	46.2	46.1	46.0	46.0
2015/04/23	16:36:18	45.6	46.1	45.8	45.4
2015/04/23	16:36:19	45.5	45.8	45.5	44.9
2015/04/23	16:36:20	46.3	46.1	45.7	46.0
2015/04/23	16:36:21	46.5	46.3	46.0	46.3
2015/04/23	16:36:22	46.2	46.4	46.0	45.4
2015/04/23	16:36:23	46.2	46.4	45.9	45.5
2015/04/23	16:36:24	46.3	46.6	46.1	45.4
2015/04/23	16:36:25	47.3	47.1	46.1	45.4
2015/04/23	16:36:26	46.8	47.2	46.7	46.0
2015/04/23	16:36:27	47.2	47.2	46.7	46.0
2015/04/23	16:36:28	47.1	47.3	46.6	45.6
2015/04/23	16:36:29	47.5	47.6	47.1	46.2
2015/04/23	16:36:30	48.0	48.0	47.2	46.9
2015/04/23	16:36:31	47.1	47.9	47.4	46.6
2015/04/23	16:36:32	46.7	47.6	46.9	46.1
2015/04/23	16:36:33	46.1	47.0	46.4	45.8
2015/04/23	16:36:34	45.7	46.4	46.0	45.5
2015/04/23	16:36:35	46.5	46.3	46.0	46.0
2015/04/23	16:36:36	47.0	46.8	46.3	46.5
2015/04/23	16:36:37	47.4	47.3	46.9	47.1
2015/04/23	16:36:38	47.1	47.3	47.1	46.8
2015/04/23	16:36:39	46.7	47.1	46.8	46.3
2015/04/23	16:36:40	47.1	47.1	46.7	46.3
2015/04/23	16:36:41	48.3	47.8	47.1	47.8
2015/04/23	16:36:42	48.2	48.2	47.7	47.3
2015/04/23	16:36:43	47.9	48.1	47.9	47.6
2015/04/23	16:36:44	47.9	48.1	47.9	47.6
2015/04/23	16:36:45	47.2	47.9	47.4	46.7
2015/04/23	16:36:46	47.6	47.6	47.4	47.0
2015/04/23	16:36:47	48.0	48.0	47.5	47.5
2015/04/23	16:36:48	48.0	48.1	47.9	47.6
2015/04/23	16:36:49	47.6	48.0	47.5	46.3
2015/04/23	16:36:50	48.6	48.5	47.7	47.0
2015/04/23	16:36:51	48.2	48.4	47.7	46.6
2015/04/23	16:36:52	47.6	48.4	47.8	47.2

2015/04/23	16:36:53	48.5	48.5	47.8	47.7
2015/04/23	16:36:54	49.0	49.0	48.0	47.5
2015/04/23	16:36:55	49.0	49.3	48.8	48.0
2015/04/23	16:36:56	49.4	49.3	48.7	48.2
2015/04/23	16:36:57	49.4	49.6	49.3	48.9
2015/04/23	16:36:58	49.5	49.6	49.0	48.5
2015/04/23	16:36:59	49.6	49.9	49.5	49.0
2015/04/23	16:37:00	50.2	50.1	49.5	49.4
2015/04/23	16:37:01	49.0	50.0	49.3	48.6
2015/04/23	16:37:02	49.3	49.9	49.2	48.0
2015/04/23	16:37:03	48.6	49.2	48.7	47.9
2015/04/23	16:37:04	49.7	49.8	48.9	48.2
2015/04/23	16:37:05	48.5	49.1	48.7	48.1
2015/04/23	16:37:06	47.7	48.9	48.1	47.1
2015/04/23	16:37:07	47.3	48.1	47.6	46.9
2015/04/23	16:37:08	47.6	47.8	47.5	47.1
2015/04/23	16:37:09	46.8	47.6	47.0	46.1
2015/04/23	16:37:10	46.6	47.0	46.8	46.0
2015/04/23	16:37:11	46.6	46.8	46.4	45.7
2015/04/23	16:37:12	48.0	47.5	46.8	47.3
2015/04/23	16:37:13	47.9	48.0	47.1	46.3
2015/04/23	16:37:14	49.9	49.5	48.0	48.6
2015/04/23	16:37:15	46.1	49.4	47.7	45.8
2015/04/23	16:37:16	50.3	50.0	47.5	46.4
2015/04/23	16:37:17	47.4	49.7	48.3	45.9
2015/04/23	16:37:18	45.5	48.3	46.8	45.2
2015/04/23	16:37:19	46.0	46.7	46.3	45.6
2015/04/23	16:37:20	47.8	47.4	46.4	46.6
2015/04/23	16:37:21	47.5	47.8	47.3	46.4
2015/04/23	16:37:22	46.3	47.3	46.7	46.0
2015/04/23	16:37:23	45.8	46.6	46.1	45.5
2015/04/23	16:37:24	45.9	46.2	46.0	45.7
2015/04/23	16:37:25	46.7	46.5	46.0	45.9
2015/04/23	16:37:26	48.1	48.3	46.3	45.9
2015/04/23	16:37:27	46.1	47.3	46.6	45.6
2015/04/23	16:37:28	45.9	46.6	46.1	45.7
2015/04/23	16:37:29	46.7	46.7	46.1	45.9
2015/04/23	16:37:30	46.8	46.7	46.3	46.1
2015/04/23	16:37:31	49.1	48.5	46.7	47.3
2015/04/23	16:37:32	48.1	48.5	48.1	47.8
2015/04/23	16:37:33	49.8	49.6	48.0	47.3
2015/04/23	16:37:34	51.3	50.7	49.6	50.7
2015/04/23	16:37:35	52.5	51.9	50.7	51.5
2015/04/23	16:37:36	53.6	53.4	52.0	51.5
2015/04/23	16:37:37	53.2	53.7	52.6	50.0
2015/04/23	16:37:38	49.4	52.6	51.0	47.6
2015/04/23	16:37:39	48.7	51.0	49.6	48.3

2015/04/23	16:37:40	48.0	49.6	48.6	47.4
2015/04/23	16:37:41	47.8	48.6	48.0	47.0
2015/04/23	16:37:42	47.9	48.3	48.0	47.4
2015/04/23	16:37:43	47.2	47.9	47.5	46.5
2015/04/23	16:37:44	47.4	47.5	47.3	46.8
2015/04/23	16:37:45	49.5	49.0	47.6	48.4
2015/04/23	16:37:46	49.5	49.4	49.0	48.9
2015/04/23	16:37:47	49.1	49.2	49.1	48.7
2015/04/23	16:37:48	48.7	49.2	48.8	48.3
2015/04/23	16:37:49	49.9	49.6	48.9	49.2
2015/04/23	16:37:50	49.7	49.9	49.6	49.0
2015/04/23	16:37:51	50.3	50.2	49.5	49.2
2015/04/23	16:37:52	51.3	50.9	50.2	51.1
2015/04/23	16:37:53	50.4	50.9	50.5	49.7
2015/04/23	16:37:54	50.7	51.1	50.4	49.5
2015/04/23	16:37:55	51.2	51.1	50.6	50.3
2015/04/23	16:37:56	51.7	51.6	51.1	51.0
2015/04/23	16:37:57	52.7	52.4	51.4	51.7
2015/04/23	16:37:58	52.2	52.7	52.1	51.1
2015/04/23	16:37:59	52.4	52.3	52.1	51.8
2015/04/23	16:38:00	52.1	52.3	52.2	51.9
2015/04/23	16:38:01	51.7	52.2	51.9	51.4
2015/04/23	16:38:02	52.7	52.4	51.9	52.2
2015/04/23	16:38:03	52.1	52.5	52.2	51.8
2015/04/23	16:38:04	52.8	52.5	52.1	52.1
2015/04/23	16:38:05	51.7	52.7	51.9	50.4
2015/04/23	16:38:06	49.3	51.9	50.4	48.7
2015/04/23	16:38:07	49.4	50.4	49.8	49.1
2015/04/23	16:38:08	47.9	49.8	48.7	47.7
2015/04/23	16:38:09	48.0	48.7	48.2	47.4
2015/04/23	16:38:10	47.6	48.2	47.7	46.8
2015/04/23	16:38:11	47.3	48.0	47.5	46.6
2015/04/23	16:38:12	47.6	47.7	47.3	46.3
2015/04/23	16:38:13	47.0	47.6	47.0	46.0
2015/04/23	16:38:14	47.4	47.8	47.3	46.1
2015/04/23	16:38:15	46.5	47.3	46.8	46.3
2015/04/23	16:38:16	46.8	47.0	46.8	46.4
2015/04/23	16:38:17	47.1	47.0	46.8	46.8
2015/04/23	16:38:18	47.3	47.2	47.0	46.8
2015/04/23	16:38:19	48.8	48.4	47.3	47.7
2015/04/23	16:38:20	47.8	48.5	47.9	47.2
2015/04/23	16:38:21	47.5	47.9	47.6	47.2
2015/04/23	16:38:22	46.7	47.7	47.1	46.6
2015/04/23	16:38:23	46.5	47.1	46.7	46.3
2015/04/23	16:38:24	46.0	46.7	46.3	45.8
2015/04/23	16:38:25	46.0	46.4	46.1	45.7
2015/04/23	16:38:26	46.7	46.5	46.2	46.4

2015/04/23	16:38:27	46.9	46.7	46.5	46.6
2015/04/23	16:38:28	47.2	47.1	46.8	46.9
2015/04/23	16:38:29	47.1	47.2	47.0	46.7
2015/04/23	16:38:30	47.1	47.1	47.0	46.8
2015/04/23	16:38:31	47.8	47.6	47.1	47.4
2015/04/23	16:38:32	47.4	47.5	47.4	47.1
2015/04/23	16:38:33	47.4	47.6	47.4	47.2
2015/04/23	16:38:34	47.3	47.5	47.3	47.0
2015/04/23	16:38:35	47.3	47.5	47.3	47.0
2015/04/23	16:38:36	47.4	47.5	47.2	46.6
2015/04/23	16:38:37	47.5	48.0	47.2	46.5
2015/04/23	16:38:38	47.7	48.0	46.8	46.0
2015/04/23	16:38:39	50.2	49.6	48.2	48.0
2015/04/23	16:38:40	53.9	52.9	49.1	49.4
2015/04/23	16:38:41	50.4	52.6	51.4	48.6
2015/04/23	16:38:42	55.6	55.3	50.8	48.9
2015/04/23	16:38:43	51.2	55.6	53.0	49.1
2015/04/23	16:38:44	48.4	53.0	50.8	47.2
2015/04/23	16:38:45	46.3	50.7	48.6	45.9
2015/04/23	16:38:46	46.7	48.6	47.5	46.4
2015/04/23	16:38:47	47.0	47.9	47.1	46.2
2015/04/23	16:38:48	46.2	47.1	46.5	45.7
2015/04/23	16:38:49	46.2	46.5	46.0	45.3
2015/04/23	16:38:50	46.2	46.5	46.1	45.7
2015/04/23	16:38:51	46.0	46.4	46.1	45.7
2015/04/23	16:38:52	47.0	46.8	46.1	46.0
2015/04/23	16:38:53	47.4	47.4	46.7	46.9
2015/04/23	16:38:54	46.2	47.4	46.5	45.4
2015/04/23	16:38:55	46.5	46.6	46.4	45.7
2015/04/23	16:38:56	46.2	46.6	46.3	45.9
2015/04/23	16:38:57	46.4	46.6	46.3	45.9
2015/04/23	16:38:58	46.6	46.7	46.2	45.9
2015/04/23	16:38:59	46.4	46.6	45.9	45.2
2015/04/23	16:39:00	45.7	46.6	46.1	45.4
2015/04/23	16:39:01	47.0	46.8	46.1	46.0
2015/04/23	16:39:02	46.8	46.9	46.6	46.2
2015/04/23	16:39:03	47.2	47.3	46.9	46.3
2015/04/23	16:39:04	47.0	47.2	46.8	46.1
2015/04/23	16:39:05	47.1	47.5	46.9	46.1
2015/04/23	16:39:06	49.0	49.0	46.6	45.7
2015/04/23	16:39:07	48.6	49.6	48.4	46.6
2015/04/23	16:39:08	48.2	48.6	48.2	46.9
2015/04/23	16:39:09	46.7	48.1	47.1	45.7
2015/04/23	16:39:10	48.1	48.0	47.4	47.5
2015/04/23	16:39:11	47.4	47.8	47.3	46.4
2015/04/23	16:39:12	51.6	50.8	47.7	49.1
2015/04/23	16:39:13	50.5	51.2	50.3	48.7

2015/04/23	16:39:14	47.8	50.4	48.8	46.4
2015/04/23	16:39:15	46.7	48.8	47.6	46.2
2015/04/23	16:39:16	47.4	47.6	47.3	46.7
2015/04/23	16:39:17	47.7	48.0	47.5	46.6
2015/04/23	16:39:18	47.4	47.6	47.2	46.5
2015/04/23	16:39:19	48.7	48.3	47.6	48.1
2015/04/23	16:39:20	48.6	48.5	48.2	48.2
2015/04/23	16:39:21	49.1	49.0	48.4	48.5
2015/04/23	16:39:22	49.6	49.5	48.8	48.6
2015/04/23	16:39:23	53.2	53.2	49.4	48.3
2015/04/23	16:39:24	47.3	51.3	49.3	46.6
2015/04/23	16:39:25	46.8	49.2	47.9	46.5
2015/04/23	16:39:26	46.3	47.9	47.0	46.0
2015/04/23	16:39:27	46.4	47.0	46.6	46.0
2015/04/23	16:39:28	46.7	46.8	46.1	45.4
2015/04/23	16:39:29	46.4	46.8	46.5	46.1
2015/04/23	16:39:30	46.8	46.9	46.5	46.2
2015/04/23	16:39:31	46.0	46.7	46.2	45.8
2015/04/23	16:39:32	47.4	47.0	46.1	45.6
2015/04/23	16:39:33	46.9	47.1	46.9	46.6
2015/04/23	16:39:34	48.8	48.7	46.6	45.8
2015/04/23	16:39:35	46.1	48.5	47.2	45.7
2015/04/23	16:39:36	47.3	47.3	47.0	46.0
2015/04/23	16:39:37	47.6	47.6	47.2	47.0
2015/04/23	16:39:38	46.5	47.6	46.9	46.1
2015/04/23	16:39:39	47.2	47.4	46.3	45.3
2015/04/23	16:39:40	46.0	47.3	46.5	45.6
2015/04/23	16:39:41	46.3	46.8	46.3	45.6
2015/04/23	16:39:42	45.9	46.3	46.0	45.5
2015/04/23	16:39:43	46.3	46.4	46.0	45.8
2015/04/23	16:39:44	45.6	46.2	45.9	45.4
2015/04/23	16:39:45	45.8	46.0	45.8	45.4
2015/04/23	16:39:46	45.8	45.9	45.6	45.0
2015/04/23	16:39:47	46.4	46.2	45.8	45.6
2015/04/23	16:39:48	48.1	47.9	46.0	45.8
2015/04/23	16:39:49	49.1	48.9	48.0	47.3
2015/04/23	16:39:50	48.0	48.7	47.9	46.0
2015/04/23	16:39:51	48.4	48.4	47.8	47.4
2015/04/23	16:39:52	49.2	49.0	48.4	48.5
2015/04/23	16:39:53	49.0	49.0	48.8	48.7
2015/04/23	16:39:54	49.4	49.3	48.7	48.2
2015/04/23	16:39:55	49.7	49.6	49.3	49.1
2015/04/23	16:39:56	49.4	49.5	49.3	48.6
2015/04/23	16:39:57	48.8	49.5	49.0	48.3
2015/04/23	16:39:58	50.1	49.9	49.0	48.8
2015/04/23	16:39:59	48.1	49.7	48.8	47.7
2015/04/23	16:40:00	46.0	48.7	47.3	45.7

2015/04/23	16:40:01	45.5	47.2	46.3	45.2
2015/04/23	16:40:02	45.5	46.3	45.8	45.1
2015/04/23	16:40:03	46.1	46.0	45.7	45.0
2015/04/23	16:40:04	46.6	46.5	45.9	45.7
2015/04/23	16:40:05	46.9	46.8	46.5	46.4
2015/04/23	16:40:06	46.1	46.7	46.3	45.7
2015/04/23	16:40:07	45.7	46.3	45.9	45.2
2015/04/23	16:40:08	46.4	46.2	45.9	45.9
2015/04/23	16:40:09	46.9	46.7	46.2	46.2
2015/04/23	16:40:10	47.7	47.5	46.8	46.4
2015/04/23	16:40:11	45.5	47.2	46.2	45.2
2015/04/23	16:40:12	45.9	46.3	46.0	45.4
2015/04/23	16:40:13	45.6	46.0	45.6	45.2
2015/04/23	16:40:14	46.8	46.6	46.0	45.6
2015/04/23	16:40:15	49.6	49.5	46.1	45.5
2015/04/23	16:40:16	47.4	49.6	48.2	46.6
2015/04/23	16:40:17	46.4	48.2	47.1	46.0
2015/04/23	16:40:18	45.9	47.1	46.3	45.5
2015/04/23	16:40:19	45.8	46.3	45.9	45.3
2015/04/23	16:40:20	46.9	47.0	45.7	45.0
2015/04/23	16:40:21	46.2	46.5	46.1	45.2
2015/04/23	16:40:22	45.8	46.5	46.1	45.4
2015/04/23	16:40:23	46.4	46.4	46.1	45.5
2015/04/23	16:40:24	46.6	46.6	45.9	45.1
2015/04/23	16:40:25	46.4	46.8	46.4	45.7
2015/04/23	16:40:26	47.1	47.0	46.3	45.5
2015/04/23	16:40:27	45.6	46.9	46.1	45.2
2015/04/23	16:40:28	46.0	46.4	45.9	45.1
2015/04/23	16:40:29	45.6	46.1	45.8	45.1
2015/04/23	16:40:30	45.9	45.9	45.7	45.5
2015/04/23	16:40:31	45.1	45.8	45.4	44.9
2015/04/23	16:40:32	45.7	46.0	45.3	44.9
2015/04/23	16:40:33	46.3	46.1	45.4	45.1
2015/04/23	16:40:34	46.9	46.6	46.1	46.7
2015/04/23	16:40:35	45.5	46.6	45.9	45.1
2015/04/23	16:40:36	46.4	46.4	45.6	44.9
2015/04/23	16:40:37	47.1	46.8	46.3	46.5
2015/04/23	16:40:38	47.0	47.0	46.8	46.7
2015/04/23	16:40:39	47.3	47.2	46.9	46.8
2015/04/23	16:40:40	48.2	47.9	47.2	47.5
2015/04/23	16:40:41	48.4	48.3	47.9	48.1
2015/04/23	16:40:42	50.4	50.1	48.1	47.8
2015/04/23	16:40:43	49.5	50.1	49.3	47.1
2015/04/23	16:40:44	49.7	49.7	48.9	47.4
2015/04/23	16:40:45	47.5	49.7	48.3	46.3
2015/04/23	16:40:46	45.6	48.3	46.8	45.2
2015/04/23	16:40:47	46.4	46.8	46.5	45.7

2015/04/23	16:40:48	46.8	46.8	46.6	46.6
2015/04/23	16:40:49	46.4	46.9	46.5	45.8
2015/04/23	16:40:50	46.2	46.5	46.3	46.0
2015/04/23	16:40:51	47.3	47.1	46.3	46.0
2015/04/23	16:40:52	47.1	47.5	47.0	46.4
2015/04/23	16:40:53	48.3	48.0	47.0	47.0
2015/04/23	16:40:54	46.6	47.7	47.0	45.8
2015/04/23	16:40:55	46.9	47.3	46.9	46.3
2015/04/23	16:40:56	46.2	46.9	46.5	45.7
2015/04/23	16:40:57	45.6	46.6	45.9	45.2
2015/04/23	16:40:58	45.7	46.0	45.7	45.3
2015/04/23	16:40:59	46.2	46.1	45.8	45.8
2015/04/23	16:41:00	45.5	46.1	45.7	45.2
2015/04/23	16:41:01	46.0	46.0	45.7	45.4
2015/04/23	16:41:02	47.2	46.8	45.9	45.8
2015/04/23	16:41:03	46.3	47.0	46.4	45.4
2015/04/23	16:41:04	45.6	46.4	45.9	45.4
2015/04/23	16:41:05	0.0	0.0	0.0	0.0

NOISE MEASUREMENT LOCATION 4

Date	Time	LAeq	LASmax	LASmin	LAF90.00
2015/04/23	16:50:47	0.0	0.0	0.0	0.0
2015/04/23	16:50:47	51.2	52.5	52.4	49.5
2015/04/23	16:50:48	50.2	52.4	51.2	50.0
2015/04/23	16:50:49	56.8	56.8	50.2	48.8
2015/04/23	16:50:50	48.0	56.4	53.1	47.4
2015/04/23	16:50:51	46.9	53.0	50.3	46.5
2015/04/23	16:50:52	46.4	50.2	48.2	45.9
2015/04/23	16:50:53	45.8	48.2	46.9	45.5
2015/04/23	16:50:54	46.3	47.0	46.5	45.8
2015/04/23	16:50:55	46.8	46.9	46.4	46.0
2015/04/23	16:50:56	52.4	52.4	46.6	46.2
2015/04/23	16:50:57	46.8	49.7	48.2	46.3
2015/04/23	16:50:58	46.9	48.2	47.4	46.6
2015/04/23	16:50:59	47.5	47.7	46.9	46.3
2015/04/23	16:51:00	49.7	49.3	47.7	48.2
2015/04/23	16:51:01	48.2	49.1	48.5	47.6
2015/04/23	16:51:02	46.9	48.5	47.5	46.5
2015/04/23	16:51:03	47.1	47.5	47.1	46.3
2015/04/23	16:51:04	47.0	47.4	47.0	46.4
2015/04/23	16:51:05	46.4	47.2	46.8	46.3
2015/04/23	16:51:06	46.8	46.9	46.5	45.9
2015/04/23	16:51:07	46.5	47.1	46.5	45.5
2015/04/23	16:51:08	47.3	47.6	46.1	45.2
2015/04/23	16:51:09	46.3	47.3	46.6	45.6
2015/04/23	16:51:10	46.3	46.6	46.0	45.3
2015/04/23	16:51:11	46.0	46.6	46.2	45.6
2015/04/23	16:51:12	49.4	48.6	46.2	46.5
2015/04/23	16:51:13	48.3	48.9	48.2	47.5
2015/04/23	16:51:14	47.2	48.2	47.7	46.6
2015/04/23	16:51:15	47.3	47.7	47.3	46.8
2015/04/23	16:51:16	50.0	49.6	47.5	47.9
2015/04/23	16:51:17	48.7	49.6	49.0	48.2
2015/04/23	16:51:18	46.8	48.9	47.7	46.3
2015/04/23	16:51:19	47.1	47.7	47.2	46.1
2015/04/23	16:51:20	47.9	47.8	47.4	47.4
2015/04/23	16:51:21	48.2	48.1	47.7	47.5
2015/04/23	16:51:22	47.4	47.9	47.5	46.6
2015/04/23	16:51:23	47.1	47.5	47.1	46.2
2015/04/23	16:51:24	46.7	47.3	46.9	46.6
2015/04/23	16:51:25	46.5	46.9	46.7	46.2
2015/04/23	16:51:26	46.0	46.7	46.2	45.8
2015/04/23	16:51:27	46.1	46.3	46.1	45.8
2015/04/23	16:51:28	46.0	46.1	45.9	45.6
2015/04/23	16:51:29	46.2	46.2	46.1	46.0
2015/04/23	16:51:30	47.4	47.1	46.1	45.9
2015/04/23	16:51:31	48.0	47.7	47.1	47.5
2015/04/23	16:51:32	46.8	47.6	47.1	46.4

2015/04/23	16:51:33	47.8	47.6	47.0	46.5
2015/04/23	16:51:34	48.6	48.3	47.6	48.3
2015/04/23	16:51:35	47.5	48.2	47.7	47.0
2015/04/23	16:51:36	49.2	48.8	47.7	47.7
2015/04/23	16:51:37	48.1	48.6	48.3	47.7
2015/04/23	16:51:38	47.7	48.3	47.7	47.1
2015/04/23	16:51:39	46.8	48.0	47.2	46.5
2015/04/23	16:51:40	47.2	47.7	47.1	46.5
2015/04/23	16:51:41	46.9	47.1	46.9	46.5
2015/04/23	16:51:42	48.0	47.9	47.0	47.1
2015/04/23	16:51:43	48.6	48.4	47.9	47.8
2015/04/23	16:51:44	47.4	48.3	47.7	47.0
2015/04/23	16:51:45	47.0	47.7	47.3	46.6
2015/04/23	16:51:46	47.7	47.7	47.2	47.1
2015/04/23	16:51:47	46.2	47.6	46.8	45.9
2015/04/23	16:51:48	46.7	47.0	46.7	46.0
2015/04/23	16:51:49	46.3	46.7	46.4	45.9
2015/04/23	16:51:50	46.4	46.6	46.4	46.2
2015/04/23	16:51:51	46.0	46.4	46.2	45.8
2015/04/23	16:51:52	46.1	46.2	46.0	45.8
2015/04/23	16:51:53	46.4	46.3	46.2	46.1
2015/04/23	16:51:54	46.7	46.6	46.3	46.2
2015/04/23	16:51:55	47.3	47.1	46.4	46.2
2015/04/23	16:51:56	48.6	48.2	47.1	47.3
2015/04/23	16:51:57	48.4	48.3	48.2	48.2
2015/04/23	16:51:58	49.1	48.9	48.3	48.5
2015/04/23	16:51:59	48.7	49.1	48.6	48.0
2015/04/23	16:52:00	49.2	49.1	48.7	48.7
2015/04/23	16:52:01	49.9	49.6	49.1	49.4
2015/04/23	16:52:02	49.8	49.8	49.5	49.3
2015/04/23	16:52:03	49.4	49.8	49.5	48.8
2015/04/23	16:52:04	48.9	49.5	49.1	48.4
2015/04/23	16:52:05	50.2	50.0	48.9	48.3
2015/04/23	16:52:06	50.4	50.4	50.0	49.6
2015/04/23	16:52:07	49.9	50.2	49.9	49.2
2015/04/23	16:52:08	49.4	50.1	49.5	48.7
2015/04/23	16:52:09	49.3	49.5	49.3	48.6
2015/04/23	16:52:10	51.3	50.8	49.4	49.9
2015/04/23	16:52:11	51.7	51.6	50.7	50.5
2015/04/23	16:52:12	48.4	51.1	49.6	48.0
2015/04/23	16:52:13	49.7	49.8	49.6	48.7
2015/04/23	16:52:14	49.0	49.7	49.1	48.1
2015/04/23	16:52:15	48.7	49.1	48.8	47.8
2015/04/23	16:52:16	50.6	50.3	48.9	49.2
2015/04/23	16:52:17	47.9	50.2	48.9	47.7
2015/04/23	16:52:18	47.4	48.9	48.0	47.3
2015/04/23	16:52:19	47.3	48.0	47.6	47.1

2015/04/23	16:52:20	47.2	47.7	47.3	47.0
2015/04/23	16:52:21	47.2	47.3	47.2	46.9
2015/04/23	16:52:22	47.4	47.4	47.2	47.0
2015/04/23	16:52:23	47.1	47.5	47.1	46.3
2015/04/23	16:52:24	46.7	47.1	46.8	46.3
2015/04/23	16:52:25	46.8	46.9	46.8	46.5
2015/04/23	16:52:26	46.9	47.0	46.6	46.2
2015/04/23	16:52:27	48.8	48.4	46.9	47.7
2015/04/23	16:52:28	48.9	48.9	48.4	48.1
2015/04/23	16:52:29	48.6	48.6	48.5	48.2
2015/04/23	16:52:30	48.6	48.8	48.5	48.0
2015/04/23	16:52:31	48.1	48.6	48.2	47.6
2015/04/23	16:52:32	48.3	48.4	48.1	47.7
2015/04/23	16:52:33	49.3	49.0	48.4	49.0
2015/04/23	16:52:34	50.0	49.7	49.0	49.4
2015/04/23	16:52:35	49.2	49.8	49.3	48.7
2015/04/23	16:52:36	48.5	49.3	48.8	48.1
2015/04/23	16:52:37	48.4	48.8	48.5	48.1
2015/04/23	16:52:38	47.9	48.6	48.1	47.4
2015/04/23	16:52:39	47.6	48.1	47.7	47.3
2015/04/23	16:52:40	47.3	47.8	47.4	46.8
2015/04/23	16:52:41	48.4	48.2	47.3	46.7
2015/04/23	16:52:42	46.7	48.2	47.2	46.3
2015/04/23	16:52:43	47.4	47.5	47.2	46.8
2015/04/23	16:52:44	46.6	47.4	46.8	46.2
2015/04/23	16:52:45	46.2	46.8	46.4	45.9
2015/04/23	16:52:46	47.4	47.1	46.5	47.0
2015/04/23	16:52:47	47.6	47.5	47.0	46.8
2015/04/23	16:52:48	49.3	48.9	47.3	47.2
2015/04/23	16:52:49	50.6	50.2	48.9	49.2
2015/04/23	16:52:50	50.4	50.4	49.7	48.9
2015/04/23	16:52:51	49.1	50.6	49.5	47.8
2015/04/23	16:52:52	50.3	50.4	49.4	48.5
2015/04/23	16:52:53	51.0	51.1	49.7	48.9
2015/04/23	16:52:54	52.1	51.5	50.3	50.5
2015/04/23	16:52:55	53.3	52.7	51.5	52.7
2015/04/23	16:52:56	54.4	54.0	52.7	53.2
2015/04/23	16:52:57	50.5	53.7	51.9	49.8
2015/04/23	16:52:58	49.6	51.9	50.7	48.8
2015/04/23	16:52:59	51.9	51.6	50.7	50.6
2015/04/23	16:53:00	52.5	52.2	51.6	52.3
2015/04/23	16:53:01	50.8	52.1	51.3	50.2
2015/04/23	16:53:02	50.9	51.3	50.9	50.3
2015/04/23	16:53:03	51.7	51.5	51.2	51.6
2015/04/23	16:53:04	52.0	51.9	51.5	51.4
2015/04/23	16:53:05	51.7	51.9	51.6	51.0
2015/04/23	16:53:06	53.0	52.7	51.6	51.6

2015/04/23	16:53:07	55.9	55.0	52.7	54.7
2015/04/23	16:53:08	55.1	55.8	54.7	51.9
2015/04/23	16:53:09	52.0	54.6	53.1	51.5
2015/04/23	16:53:10	49.0	53.1	50.9	48.1
2015/04/23	16:53:11	47.8	50.9	49.3	47.7
2015/04/23	16:53:12	47.7	49.2	48.4	47.2
2015/04/23	16:53:13	47.6	48.6	47.8	46.7
2015/04/23	16:53:14	47.2	47.8	47.5	46.8
2015/04/23	16:53:15	46.8	47.5	47.1	46.7
2015/04/23	16:53:16	47.0	47.1	47.0	46.6
2015/04/23	16:53:17	47.5	47.4	47.0	47.0
2015/04/23	16:53:18	49.0	48.5	47.4	48.2
2015/04/23	16:53:19	51.0	50.3	48.6	50.0
2015/04/23	16:53:20	52.8	52.2	50.3	51.5
2015/04/23	16:53:21	53.5	53.1	52.2	52.6
2015/04/23	16:53:22	50.5	52.9	51.5	49.8
2015/04/23	16:53:23	48.9	51.5	50.0	48.5
2015/04/23	16:53:24	46.6	50.0	48.1	45.9
2015/04/23	16:53:25	46.1	48.1	47.0	45.8
2015/04/23	16:53:26	45.9	47.0	46.3	45.4
2015/04/23	16:53:27	45.3	46.3	45.7	45.0
2015/04/23	16:53:28	45.4	45.7	45.5	45.3
2015/04/23	16:53:29	45.4	45.6	45.4	45.2
2015/04/23	16:53:30	45.7	45.7	45.5	45.4
2015/04/23	16:53:31	45.8	45.8	45.6	45.5
2015/04/23	16:53:32	45.8	45.9	45.7	45.5
2015/04/23	16:53:33	45.2	45.7	45.4	45.0
2015/04/23	16:53:34	45.3	45.5	45.3	45.0
2015/04/23	16:53:35	45.4	45.5	45.3	44.9
2015/04/23	16:53:36	45.2	45.3	45.2	44.5
2015/04/23	16:53:37	46.7	46.4	45.3	45.7
2015/04/23	16:53:38	45.9	46.2	46.0	45.5
2015/04/23	16:53:39	45.4	46.0	45.6	45.0
2015/04/23	16:53:40	45.2	45.6	45.3	44.9
2015/04/23	16:53:41	45.1	45.4	45.2	44.8
2015/04/23	16:53:42	46.0	45.8	45.3	45.5
2015/04/23	16:53:43	46.0	45.9	45.8	45.8
2015/04/23	16:53:44	45.8	45.9	45.8	45.5
2015/04/23	16:53:45	46.3	46.2	45.8	46.0
2015/04/23	16:53:46	47.1	46.8	46.1	46.4
2015/04/23	16:53:47	49.0	48.4	46.8	47.3
2015/04/23	16:53:48	49.7	49.3	48.4	49.1
2015/04/23	16:53:49	48.4	49.3	48.7	47.7
2015/04/23	16:53:50	47.4	48.7	47.9	47.2
2015/04/23	16:53:51	47.3	47.9	47.6	46.9
2015/04/23	16:53:52	48.1	48.0	47.6	47.6
2015/04/23	16:53:53	49.1	48.8	48.0	48.6

2015/04/23	16:53:54	50.5	50.0	48.8	49.6
2015/04/23	16:53:55	51.6	51.0	50.0	51.3
2015/04/23	16:53:56	51.4	51.3	51.0	51.1
2015/04/23	16:53:57	51.3	51.3	51.2	51.0
2015/04/23	16:53:58	51.8	51.7	51.3	51.2
2015/04/23	16:53:59	54.1	53.5	51.7	52.3
2015/04/23	16:54:00	54.5	54.2	53.6	54.1
2015/04/23	16:54:01	53.1	54.2	53.4	52.2
2015/04/23	16:54:02	51.9	53.4	52.5	51.5
2015/04/23	16:54:03	51.3	52.5	51.7	50.8
2015/04/23	16:54:04	52.1	52.5	51.4	50.5
2015/04/23	16:54:05	54.6	54.2	51.5	49.7
2015/04/23	16:54:06	50.1	53.7	51.8	49.8
2015/04/23	16:54:07	49.7	51.8	50.5	48.8
2015/04/23	16:54:08	48.9	50.6	49.6	48.4
2015/04/23	16:54:09	50.6	50.7	49.1	48.2
2015/04/23	16:54:10	54.4	54.5	51.8	48.6
2015/04/23	16:54:11	47.7	52.2	50.0	47.2
2015/04/23	16:54:12	48.1	50.0	48.9	47.6
2015/04/23	16:54:13	48.8	49.0	48.7	48.3
2015/04/23	16:54:14	48.1	48.9	48.4	47.6
2015/04/23	16:54:15	49.2	49.1	48.3	47.8
2015/04/23	16:54:16	47.6	49.0	48.1	47.0
2015/04/23	16:54:17	47.4	48.1	47.6	46.9
2015/04/23	16:54:18	47.2	47.8	47.4	46.8
2015/04/23	16:54:19	47.7	47.7	47.3	47.1
2015/04/23	16:54:20	48.2	48.0	47.4	47.1
2015/04/23	16:54:21	48.3	48.3	47.9	47.6
2015/04/23	16:54:22	48.3	48.4	48.2	47.9
2015/04/23	16:54:23	48.6	48.5	48.2	48.1
2015/04/23	16:54:24	51.9	51.2	48.5	49.4
2015/04/23	16:54:25	53.2	52.6	51.2	52.9
2015/04/23	16:54:26	53.3	53.2	52.6	52.4
2015/04/23	16:54:27	49.7	52.9	51.1	49.3
2015/04/23	16:54:28	48.1	51.1	49.5	47.6
2015/04/23	16:54:29	50.4	50.6	49.1	48.0
2015/04/23	16:54:30	48.4	50.0	48.9	47.3
2015/04/23	16:54:31	47.0	48.9	47.8	46.7
2015/04/23	16:54:32	47.3	47.8	47.5	46.9
2015/04/23	16:54:33	47.4	47.6	47.2	46.6
2015/04/23	16:54:34	48.0	47.9	47.6	47.3
2015/04/23	16:54:35	46.8	47.8	47.1	46.3
2015/04/23	16:54:36	47.0	47.2	46.9	46.5
2015/04/23	16:54:37	49.2	48.7	47.1	47.6
2015/04/23	16:54:38	49.9	49.5	48.7	49.5
2015/04/23	16:54:39	48.0	49.5	48.5	47.7
2015/04/23	16:54:40	46.5	48.5	47.4	46.3

2015/04/23	16:54:41	46.8	47.8	46.9	45.6
2015/04/23	16:54:42	45.0	46.9	45.8	44.5
2015/04/23	16:54:43	45.3	45.8	45.5	44.9
2015/04/23	16:54:44	46.9	46.6	45.6	45.8
2015/04/23	16:54:45	49.1	48.4	46.7	48.2
2015/04/23	16:54:46	52.8	51.9	48.4	49.8
2015/04/23	16:54:47	56.1	55.0	52.0	55.2
2015/04/23	16:54:48	52.7	55.0	53.5	50.8
2015/04/23	16:54:49	49.7	53.5	51.5	49.2
2015/04/23	16:54:50	49.3	51.5	50.3	48.9
2015/04/23	16:54:51	49.7	50.3	49.9	49.4
2015/04/23	16:54:52	49.3	49.9	49.5	49.0
2015/04/23	16:54:53	49.4	49.9	49.3	48.4
2015/04/23	16:54:54	48.3	49.3	48.7	48.0
2015/04/23	16:54:55	49.4	49.2	48.7	48.7
2015/04/23	16:54:56	48.6	49.2	48.8	48.1
2015/04/23	16:54:57	49.0	49.0	48.8	48.7
2015/04/23	16:54:58	49.9	49.6	49.0	49.2
2015/04/23	16:54:59	51.2	50.7	49.7	50.4
2015/04/23	16:55:00	54.0	53.3	50.8	51.9
2015/04/23	16:55:01	56.1	55.4	53.3	54.7
2015/04/23	16:55:02	57.8	57.2	55.5	56.9
2015/04/23	16:55:03	55.9	57.3	56.3	54.3
2015/04/23	16:55:04	54.7	56.3	55.3	53.9
2015/04/23	16:55:05	51.2	55.3	53.1	50.3
2015/04/23	16:55:06	48.8	53.1	50.8	47.8
2015/04/23	16:55:07	48.1	50.8	49.4	47.6
2015/04/23	16:55:08	49.2	49.4	49.2	48.8
2015/04/23	16:55:09	49.8	49.7	49.2	49.2
2015/04/23	16:55:10	51.3	50.9	49.7	50.2
2015/04/23	16:55:11	54.0	53.2	50.9	52.5
2015/04/23	16:55:12	56.5	55.7	53.3	55.3
2015/04/23	16:55:13	58.3	57.6	55.7	57.4
2015/04/23	16:55:14	61.5	60.6	57.6	59.3
2015/04/23	16:55:15	61.1	61.1	60.5	60.2
2015/04/23	16:55:16	58.5	60.8	59.4	57.6
2015/04/23	16:55:17	57.3	59.4	58.1	56.8
2015/04/23	16:55:18	55.0	58.1	56.3	53.8
2015/04/23	16:55:19	56.4	56.5	56.0	54.0
2015/04/23	16:55:20	55.5	56.7	55.8	55.0
2015/04/23	16:55:21	52.8	55.8	54.1	51.7
2015/04/23	16:55:22	54.1	54.4	53.5	52.2
2015/04/23	16:55:23	55.7	55.4	54.4	55.0
2015/04/23	16:55:24	54.0	55.1	54.3	52.9
2015/04/23	16:55:25	54.5	54.8	54.5	54.1
2015/04/23	16:55:26	52.4	54.5	53.3	52.2
2015/04/23	16:55:27	52.7	53.3	52.6	51.5

2015/04/23	16:55:28	55.7	55.0	53.2	54.4
2015/04/23	16:55:29	56.2	55.9	55.0	55.5
2015/04/23	16:55:30	57.4	56.9	55.9	56.9
2015/04/23	16:55:31	57.7	57.5	56.8	57.1
2015/04/23	16:55:32	56.2	57.4	56.6	56.0
2015/04/23	16:55:33	58.5	58.2	56.6	56.1
2015/04/23	16:55:34	55.8	57.6	56.5	55.0
2015/04/23	16:55:35	56.8	57.0	56.2	54.9
2015/04/23	16:55:36	53.8	56.7	55.1	53.3
2015/04/23	16:55:37	53.7	55.0	54.3	53.0
2015/04/23	16:55:38	52.5	54.3	53.3	52.3
2015/04/23	16:55:39	51.6	53.3	52.2	50.9
2015/04/23	16:55:40	53.0	53.1	51.8	50.7
2015/04/23	16:55:41	53.6	53.5	53.0	52.8
2015/04/23	16:55:42	55.4	55.0	53.5	54.1
2015/04/23	16:55:43	52.5	54.7	53.3	51.8
2015/04/23	16:55:44	52.8	53.3	53.0	52.0
2015/04/23	16:55:45	52.3	53.0	52.5	51.8
2015/04/23	16:55:46	52.9	53.0	52.3	51.7
2015/04/23	16:55:47	53.6	53.6	53.0	52.5
2015/04/23	16:55:48	52.6	53.2	52.8	51.9
2015/04/23	16:55:49	53.3	53.3	52.8	52.5
2015/04/23	16:55:50	51.7	53.2	52.2	50.8
2015/04/23	16:55:51	51.1	52.2	51.5	50.1
2015/04/23	16:55:52	52.7	52.4	51.6	52.0
2015/04/23	16:55:53	52.4	52.5	52.1	51.4
2015/04/23	16:55:54	53.5	53.1	52.5	53.1
2015/04/23	16:55:55	52.8	53.1	52.9	52.5
2015/04/23	16:55:56	52.5	52.9	52.7	52.3
2015/04/23	16:55:57	51.9	52.7	52.1	51.1
2015/04/23	16:55:58	49.8	52.1	50.8	49.7
2015/04/23	16:55:59	49.5	50.8	50.0	49.1
2015/04/23	16:56:00	49.9	50.1	49.9	49.6
2015/04/23	16:56:01	50.7	50.4	49.9	50.2
2015/04/23	16:56:02	49.0	50.3	49.5	48.7
2015/04/23	16:56:03	49.7	49.7	49.4	49.0
2015/04/23	16:56:04	50.5	50.3	49.7	49.9
2015/04/23	16:56:05	50.6	50.6	50.0	49.6
2015/04/23	16:56:06	52.3	51.9	50.6	51.1
2015/04/23	16:56:07	52.4	52.4	51.9	51.4
2015/04/23	16:56:08	50.1	52.1	50.9	49.6
2015/04/23	16:56:09	50.0	50.9	50.2	49.1
2015/04/23	16:56:10	50.7	50.7	50.4	50.1
2015/04/23	16:56:11	50.6	50.9	50.6	50.1
2015/04/23	16:56:12	49.4	50.6	49.7	48.4
2015/04/23	16:56:13	49.3	49.8	49.4	48.9
2015/04/23	16:56:14	49.6	49.7	49.4	48.9

2015/04/23	16:56:15	49.9	49.9	49.3	48.8
2015/04/23	16:56:16	49.7	50.1	49.7	49.1
2015/04/23	16:56:17	48.8	49.7	49.2	48.4
2015/04/23	16:56:18	49.2	49.3	49.1	48.9
2015/04/23	16:56:19	50.0	49.7	49.2	49.6
2015/04/23	16:56:20	50.1	50.0	49.7	49.7
2015/04/23	16:56:21	51.6	51.3	49.9	49.9
2015/04/23	16:56:22	52.9	52.3	51.3	52.5
2015/04/23	16:56:23	51.7	52.3	51.7	50.9
2015/04/23	16:56:24	52.4	52.5	52.0	50.7
2015/04/23	16:56:25	53.0	52.9	52.2	52.1
2015/04/23	16:56:26	52.2	52.5	52.2	51.0
2015/04/23	16:56:27	50.6	52.4	51.3	50.1
2015/04/23	16:56:28	49.7	51.3	50.4	49.5
2015/04/23	16:56:29	49.2	50.4	49.6	48.8
2015/04/23	16:56:30	48.4	49.6	48.9	48.2
2015/04/23	16:56:31	48.8	48.9	48.6	48.2
2015/04/23	16:56:32	48.5	49.0	48.6	48.2
2015/04/23	16:56:33	48.5	48.6	48.4	48.1
2015/04/23	16:56:34	49.1	49.0	48.6	48.6
2015/04/23	16:56:35	50.4	50.0	48.9	49.5
2015/04/23	16:56:36	51.3	50.9	50.0	50.8
2015/04/23	16:56:37	54.0	53.2	50.9	52.3
2015/04/23	16:56:38	55.9	55.0	53.2	54.9
2015/04/23	16:56:39	54.0	55.0	54.3	53.5
2015/04/23	16:56:40	53.3	54.3	53.6	52.8
2015/04/23	16:56:41	51.2	53.6	52.2	50.5
2015/04/23	16:56:42	49.2	52.2	50.6	48.7
2015/04/23	16:56:43	48.3	50.6	49.3	48.0
2015/04/23	16:56:44	48.5	49.3	48.8	48.0
2015/04/23	16:56:45	49.2	49.1	48.8	48.7
2015/04/23	16:56:46	50.8	50.4	49.1	49.6
2015/04/23	16:56:47	53.2	52.4	50.4	52.2
2015/04/23	16:56:48	54.9	54.2	52.4	53.8
2015/04/23	16:56:49	57.3	56.5	54.3	56.2
2015/04/23	16:56:50	53.6	56.4	54.8	52.9
2015/04/23	16:56:51	51.6	54.8	53.1	51.4
2015/04/23	16:56:52	50.6	53.0	51.7	50.3
2015/04/23	16:56:53	50.9	51.7	51.2	50.6
2015/04/23	16:56:54	51.0	51.2	51.0	50.8
2015/04/23	16:56:55	53.0	52.6	51.1	51.4
2015/04/23	16:56:56	54.3	53.9	52.6	53.4
2015/04/23	16:56:57	54.1	54.6	53.8	52.1
2015/04/23	16:56:58	51.5	53.8	52.4	50.6
2015/04/23	16:56:59	49.6	52.4	50.7	48.4
2015/04/23	16:57:00	47.5	50.7	49.0	47.4
2015/04/23	16:57:01	49.2	49.3	48.8	47.5

2015/04/23	16:57:02	55.3	54.7	49.3	50.3
2015/04/23	16:57:03	58.3	57.4	54.8	56.3
2015/04/23	16:57:04	51.9	56.8	54.3	49.7
2015/04/23	16:57:05	48.8	54.3	51.8	48.3
2015/04/23	16:57:06	48.6	51.7	50.1	48.3
2015/04/23	16:57:07	47.7	50.0	48.7	47.5
2015/04/23	16:57:08	48.8	49.0	48.1	47.3
2015/04/23	16:57:09	50.1	49.8	49.0	49.8
2015/04/23	16:57:10	47.9	49.6	48.6	47.6
2015/04/23	16:57:11	47.3	48.6	47.9	47.1
2015/04/23	16:57:12	47.7	47.9	47.8	47.4
2015/04/23	16:57:13	47.8	47.8	47.7	47.4
2015/04/23	16:57:14	48.8	48.6	47.8	47.9
2015/04/23	16:57:15	50.3	49.8	48.6	49.7
2015/04/23	16:57:16	52.0	51.4	49.8	51.2
2015/04/23	16:57:17	54.5	53.8	51.4	52.7
2015/04/23	16:57:18	56.4	55.7	53.8	55.6
2015/04/23	16:57:19	58.4	57.8	55.7	57.0
2015/04/23	16:57:20	58.5	58.2	57.8	58.1
2015/04/23	16:57:21	57.7	58.2	57.8	57.2
2015/04/23	16:57:22	58.1	58.2	57.5	57.1
2015/04/23	16:57:23	56.9	58.4	57.2	55.4
2015/04/23	16:57:24	55.9	57.2	56.5	55.1
2015/04/23	16:57:25	58.4	57.8	56.4	56.7
2015/04/23	16:57:26	54.9	57.6	56.0	53.8
2015/04/23	16:57:27	52.6	56.0	54.2	52.4
2015/04/23	16:57:28	51.7	54.2	52.8	51.4
2015/04/23	16:57:29	49.8	52.7	51.0	49.1
2015/04/23	16:57:30	48.4	51.0	49.6	48.1
2015/04/23	16:57:31	48.1	49.6	48.8	47.7
2015/04/23	16:57:32	48.4	48.8	48.5	48.1
2015/04/23	16:57:33	48.3	48.6	48.3	47.7
2015/04/23	16:57:34	47.4	48.3	47.8	47.1
2015/04/23	16:57:35	47.8	47.8	47.6	47.4
2015/04/23	16:57:36	47.9	47.9	47.8	47.7
2015/04/23	16:57:37	48.0	48.0	47.8	47.6
2015/04/23	16:57:38	48.1	48.1	48.0	47.8
2015/04/23	16:57:39	47.7	48.0	47.8	47.6
2015/04/23	16:57:40	48.9	48.7	47.8	47.8
2015/04/23	16:57:41	50.4	49.8	48.7	50.0
2015/04/23	16:57:42	50.0	50.0	49.7	49.4
2015/04/23	16:57:43	50.8	50.5	49.9	50.3
2015/04/23	16:57:44	50.3	50.5	50.2	49.7
2015/04/23	16:57:45	51.1	50.9	50.3	50.4
2015/04/23	16:57:46	53.3	52.7	50.9	51.7
2015/04/23	16:57:47	55.7	54.8	52.7	54.8
2015/04/23	16:57:48	56.3	55.8	54.8	55.5

2015/04/23	16:57:49	52.6	55.6	53.9	51.5
2015/04/23	16:57:50	50.0	53.9	51.9	49.6
2015/04/23	16:57:51	49.3	51.8	50.4	49.0
2015/04/23	16:57:52	49.3	50.4	49.8	48.7
2015/04/23	16:57:53	48.2	49.9	48.8	47.5
2015/04/23	16:57:54	47.7	48.8	48.2	47.5
2015/04/23	16:57:55	47.7	48.2	47.8	47.4
2015/04/23	16:57:56	47.4	47.8	47.5	47.1
2015/04/23	16:57:57	47.6	47.7	47.5	47.2
2015/04/23	16:57:58	47.6	47.6	47.5	47.4
2015/04/23	16:57:59	48.3	48.2	47.6	47.6
2015/04/23	16:58:00	48.9	48.7	48.2	48.7
2015/04/23	16:58:01	49.7	49.4	48.6	48.8
2015/04/23	16:58:02	51.1	50.6	49.4	50.3
2015/04/23	16:58:03	52.0	51.5	50.6	51.6
2015/04/23	16:58:04	52.5	52.2	51.5	52.1
2015/04/23	16:58:05	51.8	52.1	51.9	51.5
2015/04/23	16:58:06	51.3	52.0	51.5	50.8
2015/04/23	16:58:07	50.8	51.5	51.0	50.4
2015/04/23	16:58:08	51.0	51.1	50.8	50.3
2015/04/23	16:58:09	50.6	51.3	50.7	50.0
2015/04/23	16:58:10	51.4	51.1	50.7	50.8
2015/04/23	16:58:11	51.5	51.5	51.0	50.8
2015/04/23	16:58:12	53.5	53.0	51.5	52.7
2015/04/23	16:58:13	53.4	53.5	53.0	52.2
2015/04/23	16:58:14	51.7	53.1	52.2	51.0
2015/04/23	16:58:15	51.4	52.2	51.7	50.6
2015/04/23	16:58:16	53.4	53.1	51.8	52.0
2015/04/23	16:58:17	53.7	53.9	53.2	52.5
2015/04/23	16:58:18	51.9	53.3	52.4	51.2
2015/04/23	16:58:19	51.7	52.4	51.9	51.0
2015/04/23	16:58:20	51.8	52.0	51.8	51.5
2015/04/23	16:58:21	52.3	52.2	51.8	51.7
2015/04/23	16:58:22	54.2	53.7	52.1	52.3
2015/04/23	16:58:23	55.3	54.7	53.7	54.7
2015/04/23	16:58:24	54.9	55.0	54.6	53.9
2015/04/23	16:58:25	52.8	54.7	53.6	52.7
2015/04/23	16:58:26	52.7	53.7	53.0	52.3
2015/04/23	16:58:27	53.0	53.3	52.9	52.2
2015/04/23	16:58:28	50.9	53.0	51.8	50.4
2015/04/23	16:58:29	50.2	51.8	50.9	49.8
2015/04/23	16:58:30	51.0	51.1	50.6	49.7
2015/04/23	16:58:31	52.4	52.0	51.1	51.5
2015/04/23	16:58:32	51.8	52.2	51.8	50.9
2015/04/23	16:58:33	51.1	51.8	51.2	50.3
2015/04/23	16:58:34	50.4	51.3	50.7	50.0
2015/04/23	16:58:35	51.5	51.3	50.7	50.6

2015/04/23	16:58:36	50.3	51.3	50.6	49.4
2015/04/23	16:58:37	51.8	51.6	50.5	50.1
2015/04/23	16:58:38	50.7	51.7	50.9	49.8
2015/04/23	16:58:39	50.2	50.9	50.4	49.6
2015/04/23	16:58:40	50.5	50.6	50.4	50.1
2015/04/23	16:58:41	50.5	50.5	50.4	50.3
2015/04/23	16:58:42	50.8	50.7	50.5	50.5
2015/04/23	16:58:43	50.9	51.0	50.7	50.4
2015/04/23	16:58:44	50.6	50.8	50.6	50.3
2015/04/23	16:58:45	51.1	51.0	50.7	50.8
2015/04/23	16:58:46	51.8	51.6	51.0	51.1
2015/04/23	16:58:47	52.1	51.9	51.4	51.7
2015/04/23	16:58:48	51.8	52.0	51.8	51.3
2015/04/23	16:58:49	52.0	51.9	51.8	51.6
2015/04/23	16:58:50	52.0	52.0	51.8	51.5
2015/04/23	16:58:51	53.7	53.2	51.9	52.1
2015/04/23	16:58:52	56.0	55.2	53.2	54.4
2015/04/23	16:58:53	56.3	55.9	55.2	55.9
2015/04/23	16:58:54	59.5	58.9	55.9	55.9
2015/04/23	16:58:55	53.7	57.7	55.6	52.4
2015/04/23	16:58:56	50.3	55.6	53.0	49.5
2015/04/23	16:58:57	48.5	53.0	50.8	48.3
2015/04/23	16:58:58	48.9	50.8	49.8	48.5
2015/04/23	16:58:59	48.6	49.8	49.1	48.0
2015/04/23	16:59:00	47.7	49.1	48.2	46.9
2015/04/23	16:59:01	47.0	48.2	47.5	46.7
2015/04/23	16:59:02	47.3	47.5	47.4	47.0
2015/04/23	16:59:03	47.4	47.5	47.3	46.9
2015/04/23	16:59:04	48.5	48.1	47.5	48.0
2015/04/23	16:59:05	49.4	49.0	48.1	48.6
2015/04/23	16:59:06	50.8	50.4	49.0	49.7
2015/04/23	16:59:07	52.2	51.6	50.4	51.9
2015/04/23	16:59:08	52.8	52.5	51.5	51.7
2015/04/23	16:59:09	54.9	54.3	52.5	53.9
2015/04/23	16:59:10	55.5	55.4	54.3	53.9
2015/04/23	16:59:11	50.3	54.8	52.5	49.2
2015/04/23	16:59:12	48.6	52.5	50.4	48.2
2015/04/23	16:59:13	48.4	50.4	49.3	48.0
2015/04/23	16:59:14	47.2	49.3	48.1	46.9
2015/04/23	16:59:15	47.1	48.1	47.4	46.4
2015/04/23	16:59:16	47.0	47.6	47.3	46.9
2015/04/23	16:59:17	47.3	47.3	47.2	46.9
2015/04/23	16:59:18	48.2	48.0	47.3	47.8
2015/04/23	16:59:19	49.1	48.7	47.9	48.5
2015/04/23	16:59:20	50.3	49.8	48.7	49.3
2015/04/23	16:59:21	52.4	51.8	49.8	51.1
2015/04/23	16:59:22	54.0	53.4	51.8	53.0

2015/04/23	16:59:23	56.8	56.0	53.5	55.0
2015/04/23	16:59:24	57.3	56.8	56.0	56.7
2015/04/23	16:59:25	56.0	56.7	56.2	55.6
2015/04/23	16:59:26	55.7	56.3	55.8	54.8
2015/04/23	16:59:27	52.3	55.8	53.9	51.8
2015/04/23	16:59:28	50.9	53.9	52.2	50.3
2015/04/23	16:59:29	49.3	52.2	50.6	49.0
2015/04/23	16:59:30	48.3	50.6	49.3	47.8
2015/04/23	16:59:31	47.7	49.2	48.4	47.4
2015/04/23	16:59:32	47.1	48.3	47.6	46.8
2015/04/23	16:59:33	47.0	47.6	47.2	46.8
2015/04/23	16:59:34	47.5	47.5	47.2	47.0
2015/04/23	16:59:35	47.2	47.5	47.2	46.9
2015/04/23	16:59:36	47.9	47.7	47.3	47.3
2015/04/23	16:59:37	47.8	47.8	47.6	47.2
2015/04/23	16:59:38	47.2	47.9	47.4	46.7
2015/04/23	16:59:39	47.1	47.4	47.2	46.7
2015/04/23	16:59:40	47.3	47.5	47.1	46.8
2015/04/23	16:59:41	47.4	47.4	47.2	46.7
2015/04/23	16:59:42	47.4	47.5	47.2	46.9
2015/04/23	16:59:43	46.9	47.4	47.1	46.5
2015/04/23	16:59:44	46.8	47.1	46.7	46.0
2015/04/23	16:59:45	46.8	47.0	46.8	46.5
2015/04/23	16:59:46	47.5	47.3	46.9	46.8
2015/04/23	16:59:47	46.8	47.3	46.9	46.3
2015/04/23	16:59:48	47.2	47.1	46.9	46.6
2015/04/23	16:59:49	48.6	48.1	47.1	47.7
2015/04/23	16:59:50	50.0	49.5	48.0	48.9
2015/04/23	16:59:51	53.3	52.5	49.5	51.4
2015/04/23	16:59:52	52.8	53.1	52.4	51.7
2015/04/23	16:59:53	49.5	52.4	50.9	49.0
2015/04/23	16:59:54	50.3	50.9	50.5	49.8
2015/04/23	16:59:55	50.8	50.7	50.4	50.2
2015/04/23	16:59:56	53.3	52.6	50.8	51.6
2015/04/23	16:59:57	54.7	54.1	52.7	53.8
2015/04/23	16:59:58	53.2	54.2	53.4	52.6
2015/04/23	16:59:59	51.8	53.4	52.5	51.5
2015/04/23	17:00:00	52.3	52.5	52.3	51.7
2015/04/23	17:00:01	52.5	52.5	52.2	51.9
2015/04/23	17:00:02	55.6	54.9	52.5	53.7
2015/04/23	17:00:03	58.3	57.3	54.9	57.1
2015/04/23	17:00:04	55.3	57.2	56.0	54.7
2015/04/23	17:00:05	55.5	56.3	55.5	54.3
2015/04/23	17:00:06	53.0	55.5	54.1	52.6
2015/04/23	17:00:07	52.2	54.1	52.9	51.6
2015/04/23	17:00:08	50.5	52.9	51.5	50.0
2015/04/23	17:00:09	49.6	51.5	50.4	49.1

2015/04/23	17:00:10	48.9	50.4	49.5	48.6
2015/04/23	17:00:11	48.3	49.5	48.8	48.0
2015/04/23	17:00:12	49.0	49.1	48.8	48.2
2015/04/23	17:00:13	47.4	48.8	48.0	46.7
2015/04/23	17:00:14	47.3	48.1	47.6	46.8
2015/04/23	17:00:15	48.4	48.3	47.4	46.5
2015/04/23	17:00:16	47.6	48.3	47.7	46.7
2015/04/23	17:00:17	47.5	47.8	47.5	47.0
2015/04/23	17:00:18	48.3	48.2	47.6	47.7
2015/04/23	17:00:19	47.2	48.0	47.5	47.0
2015/04/23	17:00:20	46.6	47.5	47.0	46.3
2015/04/23	17:00:21	46.7	47.0	46.8	46.3
2015/04/23	17:00:22	46.8	46.9	46.8	46.6
2015/04/23	17:00:23	46.7	46.9	46.7	46.4
2015/04/23	17:00:24	47.6	47.4	46.7	46.6
2015/04/23	17:00:25	48.8	48.3	47.4	48.2
2015/04/23	17:00:26	48.3	48.4	48.2	48.0
2015/04/23	17:00:27	48.7	48.6	48.3	48.1
2015/04/23	17:00:28	47.6	48.5	47.9	47.4
2015/04/23	17:00:29	48.4	48.4	47.7	47.2
2015/04/23	17:00:30	47.8	48.3	48.0	47.6
2015/04/23	17:00:31	48.8	48.6	47.9	47.7
2015/04/23	17:00:32	48.2	48.7	48.3	47.9
2015/04/23	17:00:33	48.1	48.4	48.1	47.6
2015/04/23	17:00:34	49.0	48.9	48.1	47.9
2015/04/23	17:00:35	51.5	50.9	48.9	49.8
2015/04/23	17:00:36	55.6	54.6	51.0	52.8
2015/04/23	17:00:37	57.7	56.8	54.6	57.1
2015/04/23	17:00:38	56.2	56.7	56.1	54.7
2015/04/23	17:00:39	55.7	56.5	55.9	55.0
2015/04/23	17:00:40	57.6	57.2	56.1	56.5
2015/04/23	17:00:41	58.0	57.8	57.2	57.6
2015/04/23	17:00:42	55.6	57.7	56.4	54.9
2015/04/23	17:00:43	56.5	56.7	56.2	55.3
2015/04/23	17:00:44	56.2	56.4	56.0	55.0
2015/04/23	17:00:45	57.8	57.5	56.4	56.5
2015/04/23	17:00:46	58.8	58.4	57.5	57.6
2015/04/23	17:00:47	57.0	58.2	57.6	56.2
2015/04/23	17:00:48	57.7	57.8	57.5	57.1
2015/04/23	17:00:49	58.8	58.5	57.7	58.1
2015/04/23	17:00:50	57.6	58.7	57.8	56.4
2015/04/23	17:00:51	57.1	57.8	57.3	56.5
2015/04/23	17:00:52	57.3	57.6	57.2	56.6
2015/04/23	17:00:53	56.0	57.2	56.5	55.6
2015/04/23	17:00:54	55.6	56.5	55.8	54.6
2015/04/23	17:00:55	58.6	57.8	56.1	57.7
2015/04/23	17:00:56	55.5	57.8	56.4	54.7

2015/04/23	17:00:57	53.9	56.4	55.1	53.1
2015/04/23	17:00:58	52.6	55.1	53.6	52.0
2015/04/23	17:00:59	51.3	53.6	52.3	50.9
2015/04/23	17:01:00	50.7	52.3	51.3	50.4
2015/04/23	17:01:01	49.7	51.3	50.4	49.2
2015/04/23	17:01:02	55.0	54.6	50.4	50.2
2015/04/23	17:01:03	50.3	53.0	51.5	49.9
2015/04/23	17:01:04	49.6	51.5	50.4	49.3
2015/04/23	17:01:05	49.6	50.5	49.9	49.0
2015/04/23	17:01:06	50.5	50.5	49.7	48.9
2015/04/23	17:01:07	53.2	52.7	50.4	51.0
2015/04/23	17:01:08	56.5	55.5	52.7	55.5
2015/04/23	17:01:09	55.8	56.2	55.4	53.8
2015/04/23	17:01:10	52.1	55.4	53.6	51.2
2015/04/23	17:01:11	51.7	53.6	52.6	51.3
2015/04/23	17:01:12	53.2	53.0	52.6	52.7
2015/04/23	17:01:13	52.9	53.0	52.8	52.4
2015/04/23	17:01:14	54.3	53.9	53.0	53.9
2015/04/23	17:01:15	54.0	54.1	53.9	53.6
2015/04/23	17:01:16	52.7	54.0	53.1	51.9
2015/04/23	17:01:17	52.8	53.1	52.8	52.2
2015/04/23	17:01:18	51.6	52.9	52.1	51.3
2015/04/23	17:01:19	52.4	52.4	52.1	51.8
2015/04/23	17:01:20	53.3	53.1	52.1	51.7
2015/04/23	17:01:21	53.2	53.2	52.8	52.3
2015/04/23	17:01:22	52.8	53.0	52.9	52.3
2015/04/23	17:01:23	53.8	53.5	52.9	53.0
2015/04/23	17:01:24	55.2	54.7	53.4	53.8
2015/04/23	17:01:25	56.8	56.2	54.7	56.1
2015/04/23	17:01:26	58.0	57.5	56.3	57.4
2015/04/23	17:01:27	59.0	58.5	57.4	58.1
2015/04/23	17:01:28	59.3	59.1	58.5	58.9
2015/04/23	17:01:29	55.5	58.9	57.1	54.9
2015/04/23	17:01:30	53.7	57.1	55.3	53.2
2015/04/23	17:01:31	52.9	55.3	53.9	52.2
2015/04/23	17:01:32	51.9	53.8	52.7	51.4
2015/04/23	17:01:33	53.2	53.1	52.5	51.5
2015/04/23	17:01:34	51.0	53.1	51.9	50.2
2015/04/23	17:01:35	53.6	53.3	51.6	50.6
2015/04/23	17:01:36	53.2	53.4	53.1	52.5
2015/04/23	17:01:37	53.7	53.7	52.9	52.4
2015/04/23	17:01:38	58.6	57.4	53.7	56.1
2015/04/23	17:01:39	58.1	58.0	57.4	57.6
2015/04/23	17:01:40	57.0	58.0	57.3	56.3
2015/04/23	17:01:41	54.6	57.3	55.7	53.1
2015/04/23	17:01:42	51.9	55.6	53.7	51.4
2015/04/23	17:01:43	53.5	53.8	53.0	51.6

2015/04/23	17:01:44	53.8	53.9	53.7	53.4
2015/04/23	17:01:45	53.2	53.8	53.4	53.0
2015/04/23	17:01:46	54.2	54.2	53.3	53.0
2015/04/23	17:01:47	56.2	55.5	54.3	55.7
2015/04/23	17:01:48	56.8	56.4	55.4	55.7
2015/04/23	17:01:49	57.5	57.2	56.4	56.8
2015/04/23	17:01:50	58.9	58.4	57.2	57.9
2015/04/23	17:01:51	60.1	59.6	58.5	59.4
2015/04/23	17:01:52	57.2	59.5	58.2	57.0
2015/04/23	17:01:53	57.3	58.2	57.6	56.3
2015/04/23	17:01:54	56.6	57.6	57.0	56.0
2015/04/23	17:01:55	55.6	57.0	56.1	54.6
2015/04/23	17:01:56	54.4	56.0	55.1	53.4
2015/04/23	17:01:57	55.4	55.4	55.0	54.8
2015/04/23	17:01:58	54.6	55.3	54.7	53.9
2015/04/23	17:01:59	56.3	56.1	54.9	55.1
2015/04/23	17:02:00	52.6	55.7	53.9	51.7
2015/04/23	17:02:01	53.2	53.9	53.5	52.4
2015/04/23	17:02:02	55.4	54.9	53.5	53.5
2015/04/23	17:02:03	53.6	55.0	54.0	52.7
2015/04/23	17:02:04	52.8	54.0	53.3	52.4
2015/04/23	17:02:05	52.1	53.3	52.6	51.9
2015/04/23	17:02:06	52.2	52.7	52.3	51.6
2015/04/23	17:02:07	50.2	52.3	51.1	49.9
2015/04/23	17:02:08	49.7	51.1	50.3	49.6
2015/04/23	17:02:09	51.0	51.0	50.1	49.6
2015/04/23	17:02:10	53.2	52.5	51.0	52.4
2015/04/23	17:02:11	54.8	54.1	52.5	53.8
2015/04/23	17:02:12	55.8	55.4	54.1	54.5
2015/04/23	17:02:13	56.0	56.0	55.5	55.1
2015/04/23	17:02:14	54.7	55.6	55.1	54.5
2015/04/23	17:02:15	54.8	55.0	54.9	54.4
2015/04/23	17:02:16	57.2	56.5	55.0	55.6
2015/04/23	17:02:17	54.7	56.4	55.4	54.4
2015/04/23	17:02:18	55.2	55.4	55.1	54.2
2015/04/23	17:02:19	56.5	56.3	55.4	56.0
2015/04/23	17:02:20	57.2	56.9	56.3	56.7
2015/04/23	17:02:21	53.9	56.9	55.1	52.8
2015/04/23	17:02:22	52.2	55.1	53.5	51.9
2015/04/23	17:02:23	51.5	53.5	52.4	51.2
2015/04/23	17:02:24	51.4	52.4	51.7	50.7
2015/04/23	17:02:25	50.8	51.7	51.0	49.8
2015/04/23	17:02:26	49.5	51.0	50.0	49.0
2015/04/23	17:02:27	48.1	50.0	48.9	47.8
2015/04/23	17:02:28	47.6	48.9	48.1	47.4
2015/04/23	17:02:29	47.3	48.1	47.5	46.7
2015/04/23	17:02:30	46.1	47.5	46.7	46.0

2015/04/23	17:02:31	46.3	46.7	46.5	46.1
2015/04/23	17:02:32	45.9	46.5	46.1	45.5
2015/04/23	17:02:33	45.7	46.1	45.8	45.4
2015/04/23	17:02:34	45.6	45.9	45.6	45.2
2015/04/23	17:02:35	46.4	46.2	45.8	46.1
2015/04/23	17:02:36	46.1	46.2	46.1	45.9
2015/04/23	17:02:37	48.3	47.6	46.1	46.3
2015/04/23	17:02:38	46.6	47.5	46.9	46.3
2015/04/23	17:02:39	47.9	47.6	46.9	46.7
2015/04/23	17:02:40	48.2	48.1	47.5	47.4
2015/04/23	17:02:41	51.9	51.1	47.9	48.9
2015/04/23	17:02:42	55.2	54.2	51.1	54.3
2015/04/23	17:02:43	55.1	55.1	54.2	53.4
2015/04/23	17:02:44	49.2	54.5	52.0	48.5
2015/04/23	17:02:45	50.0	52.0	50.9	48.5
2015/04/23	17:02:46	50.5	51.0	50.7	50.1
2015/04/23	17:02:47	50.4	50.7	50.5	50.2
2015/04/23	17:02:48	51.6	51.4	50.3	50.0
2015/04/23	17:02:49	50.5	51.7	50.7	49.5
2015/04/23	17:02:50	49.3	50.7	49.8	48.8
2015/04/23	17:02:51	48.7	49.8	49.2	48.5
2015/04/23	17:02:52	48.7	49.2	48.8	48.3
2015/04/23	17:02:53	49.1	49.1	48.8	48.5
2015/04/23	17:02:54	49.8	49.6	49.0	49.5
2015/04/23	17:02:55	50.9	50.5	49.6	50.2
2015/04/23	17:02:56	51.7	51.3	50.5	51.2
2015/04/23	17:02:57	52.9	52.4	51.4	52.5
2015/04/23	17:02:58	54.0	53.5	52.4	53.2
2015/04/23	17:02:59	53.4	53.6	53.4	53.1
2015/04/23	17:03:00	53.8	53.8	53.4	53.0
2015/04/23	17:03:01	53.5	53.7	53.3	52.7
2015/04/23	17:03:02	54.6	54.3	53.7	53.8
2015/04/23	17:03:03	52.8	54.6	53.2	51.2
2015/04/23	17:03:04	51.0	53.3	51.9	50.4
2015/04/23	17:03:05	50.3	51.9	50.9	49.5
2015/04/23	17:03:06	49.9	50.9	50.2	49.3
2015/04/23	17:03:07	49.4	50.2	49.6	48.9
2015/04/23	17:03:08	49.1	49.8	49.3	48.6
2015/04/23	17:03:09	48.6	49.3	48.9	48.2
2015/04/23	17:03:10	48.3	48.9	48.4	47.8
2015/04/23	17:03:11	48.5	48.6	48.2	47.7
2015/04/23	17:03:12	47.6	48.5	47.9	47.4
2015/04/23	17:03:13	47.4	48.0	47.6	47.0
2015/04/23	17:03:14	47.1	47.6	47.2	46.7
2015/04/23	17:03:15	47.0	47.2	47.0	46.5
2015/04/23	17:03:16	46.5	47.1	46.7	46.0
2015/04/23	17:03:17	46.4	46.7	46.5	46.0

2015/04/23	17:03:18	48.8	48.4	46.6	46.5
2015/04/23	17:03:19	49.3	49.1	48.2	47.3
2015/04/23	17:03:20	48.1	48.9	48.3	47.1
2015/04/23	17:03:21	47.3	48.4	47.7	46.8
2015/04/23	17:03:22	47.2	47.7	47.2	46.6
2015/04/23	17:03:23	47.4	47.6	47.4	47.2
2015/04/23	17:03:24	47.6	47.6	47.4	47.3
2015/04/23	17:03:25	48.9	48.6	47.6	47.6
2015/04/23	17:03:26	49.7	49.4	48.4	48.3
2015/04/23	17:03:27	50.2	50.0	49.5	49.4
2015/04/23	17:03:28	48.9	50.0	49.2	47.8
2015/04/23	17:03:29	48.9	49.2	48.9	48.2
2015/04/23	17:03:30	50.6	50.3	49.0	49.4
2015/04/23	17:03:31	48.5	50.2	49.1	47.9
2015/04/23	17:03:32	47.1	49.1	48.0	46.6
2015/04/23	17:03:33	47.5	48.1	47.6	46.8
2015/04/23	17:03:34	46.6	47.6	47.1	46.4
2015/04/23	17:03:35	46.8	47.1	46.9	46.6
2015/04/23	17:03:36	47.0	47.0	46.8	46.4
2015/04/23	17:03:37	49.2	48.6	47.0	47.7
2015/04/23	17:03:38	49.0	48.9	48.6	48.5
2015/04/23	17:03:39	49.7	49.7	48.9	48.6
2015/04/23	17:03:40	50.4	50.2	49.3	48.9
2015/04/23	17:03:41	50.1	50.3	49.8	49.3
2015/04/23	17:03:42	52.4	51.8	50.4	50.8
2015/04/23	17:03:43	51.0	51.8	51.2	50.0
2015/04/23	17:03:44	51.5	51.6	51.3	50.6
2015/04/23	17:03:45	49.9	51.3	50.4	49.0
2015/04/23	17:03:46	53.1	52.6	50.6	51.3
2015/04/23	17:03:47	53.0	52.9	52.3	52.1
2015/04/23	17:03:48	55.1	54.5	52.9	53.5
2015/04/23	17:03:49	52.8	54.5	53.5	52.3
2015/04/23	17:03:50	52.5	53.5	52.8	51.9
2015/04/23	17:03:51	53.0	53.1	52.9	52.8
2015/04/23	17:03:52	54.2	54.1	52.7	52.0
2015/04/23	17:03:53	56.3	55.5	54.1	55.4
2015/04/23	17:03:54	55.8	55.8	55.4	55.2
2015/04/23	17:03:55	56.4	56.3	55.7	55.5
2015/04/23	17:03:56	56.9	56.7	56.3	56.5
2015/04/23	17:03:57	58.4	58.1	56.7	57.2
2015/04/23	17:03:58	62.3	61.3	58.2	61.2
2015/04/23	17:03:59	64.0	63.4	61.3	62.5
2015/04/23	17:04:00	65.1	64.5	63.5	64.4
2015/04/23	17:04:01	63.5	64.5	63.8	62.9
2015/04/23	17:04:02	61.3	63.8	62.4	61.1
2015/04/23	17:04:03	60.4	62.4	61.2	59.7
2015/04/23	17:04:04	58.6	61.2	59.8	58.2

2015/04/23	17:04:05	57.6	59.8	58.5	56.7
2015/04/23	17:04:06	55.6	58.4	56.9	55.1
2015/04/23	17:04:07	54.8	56.9	55.7	54.5
2015/04/23	17:04:08	54.6	55.7	54.9	53.6
2015/04/23	17:04:09	53.2	54.9	53.9	52.6
2015/04/23	17:04:10	50.8	53.9	52.2	50.3
2015/04/23	17:04:11	50.3	52.2	51.1	50.1
2015/04/23	17:04:12	51.6	51.5	51.1	50.9
2015/04/23	17:04:13	53.0	52.5	51.4	52.1
2015/04/23	17:04:14	55.8	54.9	52.5	53.2
2015/04/23	17:04:15	58.8	57.9	54.9	56.0
2015/04/23	17:04:16	55.9	57.8	56.6	55.3
2015/04/23	17:04:17	56.3	56.6	56.2	55.1
2015/04/23	17:04:18	57.6	57.3	56.6	56.9
2015/04/23	17:04:19	59.6	59.0	57.3	58.2
2015/04/23	17:04:20	57.6	59.1	58.0	56.3
2015/04/23	17:04:21	55.3	58.0	56.3	52.4
2015/04/23	17:04:22	50.0	56.2	53.4	49.5
2015/04/23	17:04:23	48.5	53.4	51.0	48.0
2015/04/23	17:04:24	48.4	51.0	49.6	48.1
2015/04/23	17:04:25	48.4	49.6	48.8	48.2
2015/04/23	17:04:26	48.1	48.8	48.4	47.7
2015/04/23	17:04:27	49.9	49.8	48.2	47.8
2015/04/23	17:04:28	49.3	49.7	49.4	49.2
2015/04/23	17:04:29	50.2	50.0	49.4	49.2
2015/04/23	17:04:30	51.1	50.7	50.1	50.7
2015/04/23	17:04:31	49.9	50.7	50.1	49.2
2015/04/23	17:04:32	52.2	52.2	49.2	48.1
2015/04/23	17:04:33	49.4	52.4	50.4	47.5
2015/04/23	17:04:34	47.6	50.4	48.9	47.4
2015/04/23	17:04:35	48.7	48.9	48.4	47.7
2015/04/23	17:04:36	48.5	48.9	48.7	48.3
2015/04/23	17:04:37	48.1	48.7	48.4	47.9
2015/04/23	17:04:38	48.6	48.5	48.3	48.2
2015/04/23	17:04:39	47.9	48.5	48.1	47.7
2015/04/23	17:04:40	47.4	48.1	47.7	47.2
2015/04/23	17:04:41	47.9	47.9	47.7	47.7
2015/04/23	17:04:42	47.9	48.0	47.8	47.5
2015/04/23	17:04:43	47.8	47.9	47.6	47.3
2015/04/23	17:04:44	50.4	49.6	47.9	49.6
2015/04/23	17:04:45	50.3	50.1	49.6	49.9
2015/04/23	17:04:46	51.1	50.8	50.0	49.9
2015/04/23	17:04:47	53.4	52.8	50.8	52.2
2015/04/23	17:04:48	54.2	53.7	52.8	53.7
2015/04/23	17:04:49	52.2	53.6	52.7	51.8
2015/04/23	17:04:50	51.7	52.7	52.1	51.4
2015/04/23	17:04:51	50.6	52.1	51.1	50.1

2015/04/23	17:04:52	48.3	51.1	49.5	47.7
2015/04/23	17:04:53	47.7	49.5	48.4	47.4
2015/04/23	17:04:54	46.9	48.4	47.5	46.5
2015/04/23	17:04:55	47.0	47.5	47.2	46.8
2015/04/23	17:04:56	47.8	47.7	47.1	46.6
2015/04/23	17:04:57	48.0	47.8	47.6	47.8
2015/04/23	17:04:58	48.6	48.3	47.8	48.0
2015/04/23	17:04:59	49.8	49.3	48.3	49.3
2015/04/23	17:05:00	50.2	50.0	49.2	49.1
2015/04/23	17:05:01	52.1	51.6	50.0	50.8
2015/04/23	17:05:02	57.6	56.5	51.7	54.3
2015/04/23	17:05:03	57.1	56.9	56.5	57.0
2015/04/23	17:05:04	55.4	56.8	56.0	55.1
2015/04/23	17:05:05	56.4	56.4	55.8	55.4
2015/04/23	17:05:06	56.0	56.4	56.1	55.7
2015/04/23	17:05:07	54.0	56.1	54.9	53.5
2015/04/23	17:05:08	52.2	54.8	53.3	51.6
2015/04/23	17:05:09	51.0	53.4	51.9	49.9
2015/04/23	17:05:10	49.7	51.9	50.7	49.6
2015/04/23	17:05:11	49.8	50.7	50.1	49.4
2015/04/23	17:05:12	50.8	50.6	50.1	50.3
2015/04/23	17:05:13	50.8	50.7	50.6	50.5
2015/04/23	17:05:14	52.8	52.2	50.7	51.2
2015/04/23	17:05:15	52.6	52.6	51.9	51.5
2015/04/23	17:05:16	53.3	53.0	52.6	53.0
2015/04/23	17:05:17	54.1	53.7	52.9	52.8
2015/04/23	17:05:18	54.3	54.2	53.7	53.7
2015/04/23	17:05:19	53.9	54.2	54.0	53.7
2015/04/23	17:05:20	52.8	54.0	53.3	52.6
2015/04/23	17:05:21	53.6	53.7	52.9	52.1
2015/04/23	17:05:22	52.8	53.7	53.1	52.1
2015/04/23	17:05:23	52.9	53.5	52.9	52.0
2015/04/23	17:05:24	53.2	53.2	52.9	52.7
2015/04/23	17:05:25	52.1	53.2	52.4	51.5
2015/04/23	17:05:26	51.0	52.4	51.5	50.1
2015/04/23	17:05:27	56.5	55.2	51.8	54.7
2015/04/23	17:05:28	58.2	57.4	55.2	57.1
2015/04/23	17:05:29	58.6	58.4	57.4	57.3
2015/04/23	17:05:30	55.2	58.1	56.3	53.9
2015/04/23	17:05:31	55.0	56.3	55.4	53.8
2015/04/23	17:05:32	53.5	55.4	54.4	53.0
2015/04/23	17:05:33	54.1	54.4	54.1	53.6
2015/04/23	17:05:34	52.8	54.2	53.3	52.3
2015/04/23	17:05:35	52.6	53.3	52.6	51.7
2015/04/23	17:05:36	52.7	53.2	52.7	52.2
2015/04/23	17:05:37	56.0	55.0	52.6	54.5
2015/04/23	17:05:38	58.4	57.5	55.0	55.4

2015/04/23	17:05:39	57.0	58.1	56.8	54.5
2015/04/23	17:05:40	54.7	56.8	55.5	53.2
2015/04/23	17:05:41	53.5	55.8	54.3	51.7
2015/04/23	17:05:42	53.7	54.4	53.8	52.6
2015/04/23	17:05:43	53.4	53.8	53.2	52.2
2015/04/23	17:05:44	57.6	56.7	53.8	55.7
2015/04/23	17:05:45	53.8	56.7	55.1	53.7
2015/04/23	17:05:46	55.2	55.3	55.1	54.3
2015/04/23	17:05:47	56.2	55.9	55.1	54.9
2015/04/23	17:05:48	57.8	57.3	55.9	56.5
2015/04/23	17:05:49	57.8	57.8	57.3	57.1
2015/04/23	17:05:50	56.4	57.5	56.3	54.7
2015/04/23	17:05:51	53.4	56.9	55.0	52.8
2015/04/23	17:05:52	53.3	55.0	54.1	52.9
2015/04/23	17:05:53	53.2	54.1	53.5	52.9
2015/04/23	17:05:54	53.8	53.8	53.3	52.7
2015/04/23	17:05:55	56.1	55.6	53.8	53.9
2015/04/23	17:05:56	54.1	55.6	54.6	53.4
2015/04/23	17:05:57	52.0	54.6	53.1	51.4
2015/04/23	17:05:58	50.1	53.1	51.5	49.9
2015/04/23	17:05:59	49.7	51.5	50.4	49.5
2015/04/23	17:06:00	49.7	50.4	50.0	49.4
2015/04/23	17:06:01	49.5	50.0	49.7	49.3
2015/04/23	17:06:02	49.5	49.8	49.5	49.1
2015/04/23	17:06:03	56.1	55.5	49.5	49.5
2015/04/23	17:06:04	50.1	53.5	51.8	49.2
2015/04/23	17:06:05	51.8	52.2	51.3	50.4
2015/04/23	17:06:06	50.0	52.0	50.7	49.2
2015/04/23	17:06:07	51.8	51.7	50.3	49.2
2015/04/23	17:06:08	50.0	51.6	50.6	49.2
2015/04/23	17:06:09	48.8	50.6	49.5	48.1
2015/04/23	17:06:10	47.7	49.5	48.4	47.5
2015/04/23	17:06:11	47.0	48.4	47.6	46.7
2015/04/23	17:06:12	48.2	48.1	47.4	46.9
2015/04/23	17:06:13	48.5	48.4	48.1	48.2
2015/04/23	17:06:14	48.0	48.6	48.0	47.1
2015/04/23	17:06:15	47.0	48.0	47.4	46.5
2015/04/23	17:06:16	46.6	47.4	46.9	46.3
2015/04/23	17:06:17	46.4	46.9	46.6	46.1
2015/04/23	17:06:18	46.9	46.8	46.6	46.4
2015/04/23	17:06:19	47.3	47.1	46.8	47.0
2015/04/23	17:06:20	47.0	47.1	47.0	46.7
2015/04/23	17:06:21	47.7	47.5	47.1	47.2
2015/04/23	17:06:22	47.6	47.6	47.4	47.1
2015/04/23	17:06:23	48.5	48.2	47.6	48.1
2015/04/23	17:06:24	49.2	48.9	48.2	48.7
2015/04/23	17:06:25	48.8	48.9	48.7	48.4

2015/04/23	17:06:26	50.1	49.7	48.9	49.7
2015/04/23	17:06:27	48.6	49.6	49.0	48.0
2015/04/23	17:06:28	46.4	48.9	47.5	45.7
2015/04/23	17:06:29	49.5	49.1	47.3	46.3
2015/04/23	17:06:30	49.3	49.3	49.1	48.7
2015/04/23	17:06:31	49.1	49.3	49.0	48.6
2015/04/23	17:06:32	48.6	49.0	48.7	48.0
2015/04/23	17:06:33	48.5	48.8	48.6	48.1
2015/04/23	17:06:34	48.1	48.6	48.2	47.4
2015/04/23	17:06:35	50.3	49.7	48.4	49.5
2015/04/23	17:06:36	50.4	50.3	49.7	49.5
2015/04/23	17:06:37	50.2	50.2	49.9	49.3
2015/04/23	17:06:38	50.3	50.3	50.1	49.8
2015/04/23	17:06:39	51.7	51.5	50.3	50.1
2015/04/23	17:06:40	49.4	50.9	50.0	49.2
2015/04/23	17:06:41	48.3	50.0	49.0	47.7
2015/04/23	17:06:42	48.1	49.0	48.5	47.9
2015/04/23	17:06:43	49.1	48.9	48.4	48.1
2015/04/23	17:06:44	48.5	49.1	48.6	48.0
2015/04/23	17:06:45	48.0	48.6	48.2	47.4
2015/04/23	17:06:46	48.7	48.6	48.2	48.2
2015/04/23	17:06:47	51.0	50.5	48.5	49.2
2015/04/23	17:06:48	48.2	50.1	48.9	47.6
2015/04/23	17:06:49	48.7	49.0	48.4	47.5
2015/04/23	17:06:50	49.6	49.6	49.0	48.5
2015/04/23	17:06:51	48.2	49.2	48.7	47.7
2015/04/23	17:06:52	48.5	48.7	48.4	47.7
2015/04/23	17:06:53	48.6	48.8	48.5	48.2
2015/04/23	17:06:54	48.9	48.9	48.5	48.3
2015/04/23	17:06:55	50.1	49.7	48.9	49.4
2015/04/23	17:06:56	49.3	49.8	49.4	48.8
2015/04/23	17:06:57	51.3	50.8	49.4	49.3
2015/04/23	17:06:58	48.0	50.7	49.2	47.7
2015/04/23	17:06:59	48.6	49.2	48.7	47.6
2015/04/23	17:07:00	50.3	50.2	48.6	48.2
2015/04/23	17:07:01	49.0	50.5	49.4	47.9
2015/04/23	17:07:02	47.8	49.4	48.4	47.0
2015/04/23	17:07:03	48.3	48.5	47.9	47.1
2015/04/23	17:07:04	62.1	60.6	48.5	50.4
2015/04/23	17:07:05	59.4	61.3	59.0	51.4
2015/04/23	17:07:06	50.0	59.0	55.6	48.3
2015/04/23	17:07:07	48.9	55.6	52.7	48.3
2015/04/23	17:07:08	52.2	53.4	52.1	49.3
2015/04/23	17:07:09	49.6	52.1	50.8	49.1
2015/04/23	17:07:10	51.6	51.5	50.6	50.0
2015/04/23	17:07:11	53.8	53.2	51.5	52.8
2015/04/23	17:07:12	55.6	54.9	53.2	55.0

2015/04/23	17:07:13	57.1	56.4	54.9	56.4
2015/04/23	17:07:14	54.5	56.3	55.2	54.0
2015/04/23	17:07:15	53.7	55.2	54.3	53.1
2015/04/23	17:07:16	52.0	54.2	52.9	50.8
2015/04/23	17:07:17	51.0	52.8	51.7	50.5
2015/04/23	17:07:18	49.8	51.7	50.6	49.6
2015/04/23	17:07:19	49.1	50.6	49.7	48.8
2015/04/23	17:07:20	48.6	49.7	49.1	48.2
2015/04/23	17:07:21	50.7	50.4	49.1	49.0
2015/04/23	17:07:22	49.5	50.4	49.8	49.4
2015/04/23	17:07:23	49.5	50.0	49.6	49.1
2015/04/23	17:07:24	49.5	49.6	49.4	48.9
2015/04/23	17:07:25	50.8	50.4	49.6	49.7
2015/04/23	17:07:26	51.8	51.4	50.4	51.3
2015/04/23	17:07:27	54.4	53.8	51.5	52.9
2015/04/23	17:07:28	55.0	54.8	54.0	53.3
2015/04/23	17:07:29	54.3	54.5	53.8	52.9
2015/04/23	17:07:30	54.3	55.0	54.2	53.0
2015/04/23	17:07:31	51.9	54.2	52.7	50.7
2015/04/23	17:07:32	50.2	52.7	51.3	50.0
2015/04/23	17:07:33	51.2	51.3	51.1	50.1
2015/04/23	17:07:34	51.8	51.7	51.3	51.4
2015/04/23	17:07:35	56.4	56.0	51.7	52.5
2015/04/23	17:07:36	53.4	55.4	54.0	52.1
2015/04/23	17:07:37	54.7	54.7	54.4	54.5
2015/04/23	17:07:38	55.5	55.5	54.7	54.0
2015/04/23	17:07:39	53.9	55.0	54.4	53.4
2015/04/23	17:07:40	55.2	55.0	54.4	54.4
2015/04/23	17:07:41	53.7	55.1	54.1	53.1
2015/04/23	17:07:42	51.9	54.1	52.9	51.6
2015/04/23	17:07:43	51.3	52.8	51.9	50.9
2015/04/23	17:07:44	50.8	51.9	51.1	50.1
2015/04/23	17:07:45	49.2	51.1	50.0	48.6
2015/04/23	17:07:46	48.7	50.0	49.1	48.2
2015/04/23	17:07:47	48.2	49.2	48.5	47.8
2015/04/23	17:07:48	47.5	48.5	47.9	47.1
2015/04/23	17:07:49	47.1	47.9	47.4	46.8
2015/04/23	17:07:50	48.4	48.4	47.2	46.8
2015/04/23	17:07:51	47.3	48.2	47.6	47.1
2015/04/23	17:07:52	47.4	47.6	47.4	47.0
2015/04/23	17:07:53	47.2	47.5	47.3	47.0
2015/04/23	17:07:54	47.4	47.4	47.2	47.1
2015/04/23	17:07:55	48.1	47.9	47.3	47.4
2015/04/23	17:07:56	49.5	49.0	47.9	48.6
2015/04/23	17:07:57	52.1	51.4	49.1	50.2
2015/04/23	17:07:58	53.5	52.8	51.4	52.9
2015/04/23	17:07:59	53.2	53.1	52.7	52.7

2015/04/23	17:08:00	54.6	54.4	52.9	52.4
2015/04/23	17:08:01	53.9	54.6	53.9	52.4
2015/04/23	17:08:02	51.1	53.9	52.4	50.7
2015/04/23	17:08:03	50.4	52.3	51.2	49.7
2015/04/23	17:08:04	53.7	53.3	51.3	50.9
2015/04/23	17:08:05	50.2	52.8	51.0	48.6
2015/04/23	17:08:06	49.5	51.0	50.2	48.4
2015/04/23	17:08:07	50.2	50.5	50.1	49.4
2015/04/23	17:08:08	49.3	50.1	49.6	49.0
2015/04/23	17:08:09	50.7	50.4	49.6	49.6
2015/04/23	17:08:10	52.1	51.5	50.4	51.3
2015/04/23	17:08:11	51.9	51.8	51.5	51.5
2015/04/23	17:08:12	52.8	52.4	51.8	52.3
2015/04/23	17:08:13	53.4	53.1	52.4	52.8
2015/04/23	17:08:14	52.8	53.0	52.8	52.5
2015/04/23	17:08:15	54.2	54.0	52.9	53.0
2015/04/23	17:08:16	56.5	55.8	54.0	55.9
2015/04/23	17:08:17	57.4	56.9	55.8	56.8
2015/04/23	17:08:18	56.4	56.9	56.6	56.1
2015/04/23	17:08:19	54.5	56.6	55.2	53.2
2015/04/23	17:08:20	53.1	55.2	54.0	52.7
2015/04/23	17:08:21	53.5	54.1	53.7	52.9
2015/04/23	17:08:22	54.1	54.1	53.4	52.6
2015/04/23	17:08:23	53.8	54.3	53.8	53.2
2015/04/23	17:08:24	52.7	53.8	53.1	51.8
2015/04/23	17:08:25	50.8	53.1	51.8	50.3
2015/04/23	17:08:26	50.3	51.7	50.9	49.9
2015/04/23	17:08:27	50.7	51.0	50.3	48.7
2015/04/23	17:08:28	51.3	51.3	50.7	50.0
2015/04/23	17:08:29	51.4	51.7	50.9	50.3
2015/04/23	17:08:30	50.6	51.3	50.8	50.1
2015/04/23	17:08:31	52.1	51.8	51.0	51.3
2015/04/23	17:08:32	53.7	53.1	51.8	52.8
2015/04/23	17:08:33	54.1	53.9	53.1	53.4
2015/04/23	17:08:34	52.5	53.6	52.9	51.9
2015/04/23	17:08:35	51.7	52.9	52.1	51.3
2015/04/23	17:08:36	50.7	52.1	51.3	50.4
2015/04/23	17:08:37	49.7	51.3	50.4	49.3
2015/04/23	17:08:38	52.6	52.4	50.3	49.7
2015/04/23	17:08:39	52.7	52.9	52.4	51.8
2015/04/23	17:08:40	51.5	52.5	51.7	50.8
2015/04/23	17:08:41	54.0	53.5	52.0	52.8
2015/04/23	17:08:42	55.8	55.1	53.5	54.7
2015/04/23	17:08:43	53.6	55.1	54.1	52.7
2015/04/23	17:08:44	53.2	54.1	53.6	52.4
2015/04/23	17:08:45	51.5	53.6	52.3	50.9
2015/04/23	17:08:46	52.5	53.0	51.7	50.3

2015/04/23	17:08:47	50.6	52.5	51.4	50.3
2015/04/23	17:08:48	51.5	51.6	51.1	50.5
2015/04/23	17:08:49	52.1	52.2	51.6	50.9
2015/04/23	17:08:50	51.5	51.8	51.6	50.9
2015/04/23	17:08:51	51.7	51.8	51.3	50.6
2015/04/23	17:08:52	54.1	53.4	51.8	53.2
2015/04/23	17:08:53	53.4	53.6	53.3	52.9
2015/04/23	17:08:54	52.0	53.4	52.5	51.6
2015/04/23	17:08:55	50.6	52.5	51.4	50.2
2015/04/23	17:08:56	50.3	51.4	50.7	49.7
2015/04/23	17:08:57	50.2	51.0	50.3	49.5
2015/04/23	17:08:58	49.9	50.3	50.0	49.1
2015/04/23	17:08:59	51.6	51.1	50.2	51.2
2015/04/23	17:09:00	52.4	52.1	51.1	51.5
2015/04/23	17:09:01	58.1	57.0	52.2	54.5
2015/04/23	17:09:02	57.7	57.8	56.9	56.0
2015/04/23	17:09:03	55.4	57.2	56.1	54.5
2015/04/23	17:09:04	55.6	56.1	55.8	54.7
2015/04/23	17:09:05	55.7	55.8	55.6	55.1
2015/04/23	17:09:06	55.5	55.9	55.5	54.7
2015/04/23	17:09:07	55.4	55.7	55.4	55.0
2015/04/23	17:09:08	54.9	55.4	54.7	53.6
2015/04/23	17:09:09	57.4	56.8	55.2	56.9
2015/04/23	17:09:10	57.2	57.4	56.8	55.6
2015/04/23	17:09:11	55.4	56.8	55.6	53.4
2015/04/23	17:09:12	54.7	56.2	55.2	53.4
2015/04/23	17:09:13	54.6	55.6	54.8	54.0
2015/04/23	17:09:14	55.5	55.5	54.8	54.0
2015/04/23	17:09:15	54.9	55.2	54.7	53.9
2015/04/23	17:09:16	60.4	59.3	55.2	57.3
2015/04/23	17:09:17	57.9	59.3	58.2	55.7
2015/04/23	17:09:18	55.0	58.2	56.4	54.1
2015/04/23	17:09:19	54.9	56.4	55.6	53.1
2015/04/23	17:09:20	53.0	55.6	54.2	52.5
2015/04/23	17:09:21	54.0	54.2	54.0	53.1
2015/04/23	17:09:22	56.0	55.6	54.1	54.2
2015/04/23	17:09:23	60.6	59.6	55.6	58.3
2015/04/23	17:09:24	60.1	60.2	59.6	59.1
2015/04/23	17:09:25	58.3	59.7	58.8	57.4
2015/04/23	17:09:26	56.3	58.8	57.3	54.9
2015/04/23	17:09:27	55.1	57.3	56.1	54.1
2015/04/23	17:09:28	54.6	56.1	55.2	54.3
2015/04/23	17:09:29	52.9	55.2	53.9	52.3
2015/04/23	17:09:30	52.5	53.9	53.1	52.2
2015/04/23	17:09:31	52.1	53.1	52.4	51.5
2015/04/23	17:09:32	51.8	52.4	51.9	50.8
2015/04/23	17:09:33	53.0	53.2	52.1	51.3

2015/04/23	17:09:34	51.5	52.4	51.8	51.0
2015/04/23	17:09:35	52.8	52.6	51.7	51.4
2015/04/23	17:09:36	54.6	54.0	52.3	51.7
2015/04/23	17:09:37	54.4	54.8	54.0	52.7
2015/04/23	17:09:38	54.0	54.1	53.6	52.5
2015/04/23	17:09:39	56.4	55.7	54.1	54.7
2015/04/23	17:09:40	54.1	55.7	54.7	53.5
2015/04/23	17:09:41	53.5	54.6	54.0	52.9
2015/04/23	17:09:42	53.1	54.1	53.5	52.5
2015/04/23	17:09:43	51.9	53.4	52.5	51.5
2015/04/23	17:09:44	51.4	52.5	51.8	50.9
2015/04/23	17:09:45	52.6	52.4	51.9	52.0
2015/04/23	17:09:46	52.0	52.5	52.1	51.6
2015/04/23	17:09:47	52.3	52.5	52.1	51.6
2015/04/23	17:09:48	53.0	52.9	51.9	50.9
2015/04/23	17:09:49	55.2	54.6	52.9	54.2
2015/04/23	17:09:50	54.1	55.0	54.0	52.9
2015/04/23	17:09:51	51.9	54.0	52.8	51.4
2015/04/23	17:09:52	52.1	52.8	52.2	51.4
2015/04/23	17:09:53	50.7	52.5	51.4	50.0
2015/04/23	17:09:54	53.0	53.0	51.3	50.5
2015/04/23	17:09:55	49.5	52.2	50.7	49.0
2015/04/23	17:09:56	53.5	53.3	49.8	48.2
2015/04/23	17:09:57	49.2	53.2	51.1	48.9
2015/04/23	17:09:58	48.8	51.1	49.8	48.6
2015/04/23	17:09:59	48.0	49.8	48.8	47.6
2015/04/23	17:10:00	48.0	48.8	48.4	47.5
2015/04/23	17:10:01	47.9	48.4	48.0	47.5
2015/04/23	17:10:02	47.6	48.0	47.7	47.3
2015/04/23	17:10:03	48.8	48.6	47.6	47.1
2015/04/23	17:10:04	48.0	48.6	48.2	47.8
2015/04/23	17:10:05	48.0	48.2	48.0	47.2
2015/04/23	17:10:06	48.1	48.1	48.0	47.8
2015/04/23	17:10:07	49.8	49.3	48.1	48.3
2015/04/23	17:10:08	48.7	49.4	48.8	47.8
2015/04/23	17:10:09	47.9	48.8	48.3	47.8
2015/04/23	17:10:10	48.4	48.4	48.3	48.1
2015/04/23	17:10:11	50.4	50.0	48.3	48.2
2015/04/23	17:10:12	49.4	49.8	49.6	49.2
2015/04/23	17:10:13	50.1	50.0	49.6	49.5
2015/04/23	17:10:14	52.5	51.9	50.0	50.7
2015/04/23	17:10:15	54.9	54.1	51.9	53.7
2015/04/23	17:10:16	54.7	54.5	54.1	54.5
2015/04/23	17:10:17	56.2	55.7	54.5	55.1
2015/04/23	17:10:18	55.2	55.8	55.3	53.9
2015/04/23	17:10:19	52.6	55.3	53.7	51.8
2015/04/23	17:10:20	50.4	53.7	51.9	50.0

2015/04/23	17:10:21	49.1	51.9	50.3	48.8
2015/04/23	17:10:22	50.1	50.4	49.6	48.6
2015/04/23	17:10:23	48.2	50.4	49.2	48.0
2015/04/23	17:10:24	49.2	49.3	49.0	48.5
2015/04/23	17:10:25	50.8	50.3	49.3	50.1
2015/04/23	17:10:26	52.6	52.1	50.3	50.9
2015/04/23	17:10:27	55.3	54.6	52.1	54.2
2015/04/23	17:10:28	56.6	55.9	54.6	56.1
2015/04/23	17:10:29	55.7	56.0	55.7	55.2
2015/04/23	17:10:30	57.5	57.1	55.7	55.5
2015/04/23	17:10:31	60.5	59.5	57.1	59.0
2015/04/23	17:10:32	56.4	59.4	57.6	55.5
2015/04/23	17:10:33	54.9	57.6	56.1	54.5
2015/04/23	17:10:34	53.6	56.1	54.6	52.3
2015/04/23	17:10:35	52.6	54.6	53.4	52.3
2015/04/23	17:10:36	50.8	53.4	51.9	50.4
2015/04/23	17:10:37	50.0	51.9	50.7	49.1
2015/04/23	17:10:38	48.5	50.7	49.5	48.3
2015/04/23	17:10:39	50.4	50.2	49.4	48.6
2015/04/23	17:10:40	53.1	52.4	50.0	50.0
2015/04/23	17:10:41	52.0	52.6	52.0	51.0
2015/04/23	17:10:42	51.3	52.0	51.5	50.7
2015/04/23	17:10:43	51.8	51.8	51.7	51.5
2015/04/23	17:10:44	53.0	52.7	51.7	51.7
2015/04/23	17:10:45	55.6	54.9	52.7	53.8
2015/04/23	17:10:46	55.1	55.2	54.9	54.6
2015/04/23	17:10:47	54.2	55.0	54.5	54.0
2015/04/23	17:10:48	55.1	54.9	54.5	54.6
2015/04/23	17:10:49	56.0	55.8	54.9	55.1
2015/04/23	17:10:50	56.3	56.1	55.8	55.8
2015/04/23	17:10:51	55.7	56.2	55.7	54.9
2015/04/23	17:10:52	54.6	55.7	55.0	54.1
2015/04/23	17:10:53	56.3	56.0	55.0	54.8
2015/04/23	17:10:54	59.0	58.3	56.0	57.4
2015/04/23	17:10:55	61.7	60.9	58.3	60.0
2015/04/23	17:10:56	60.8	61.4	60.6	59.5
2015/04/23	17:10:57	59.1	60.7	59.6	57.9
2015/04/23	17:10:58	56.4	59.6	57.8	55.9
2015/04/23	17:10:59	55.1	57.8	56.3	54.7
2015/04/23	17:11:00	53.4	56.3	54.7	52.8
2015/04/23	17:11:01	53.1	54.6	53.6	52.3
2015/04/23	17:11:02	53.9	53.9	53.7	53.5
2015/04/23	17:11:03	54.8	54.5	53.9	54.3
2015/04/23	17:11:04	56.3	55.8	54.6	55.7
2015/04/23	17:11:05	56.9	56.6	55.8	56.0
2015/04/23	17:11:06	54.8	56.4	55.3	53.7
2015/04/23	17:11:07	52.1	55.3	53.6	51.6

2015/04/23	17:11:08	51.1	53.5	52.1	50.8
2015/04/23	17:11:09	50.6	52.1	51.2	50.2
2015/04/23	17:11:10	48.6	51.2	49.7	48.2
2015/04/23	17:11:11	48.2	49.7	48.9	48.0
2015/04/23	17:11:12	48.4	48.8	48.6	48.1
2015/04/23	17:11:13	48.7	48.7	48.5	48.2
2015/04/23	17:11:14	49.1	49.1	48.7	48.5
2015/04/23	17:11:15	48.0	48.9	48.3	47.6
2015/04/23	17:11:16	47.8	48.3	47.9	47.4
2015/04/23	17:11:17	48.5	48.3	48.0	48.1
2015/04/23	17:11:18	48.9	48.8	48.3	48.5
2015/04/23	17:11:19	50.0	49.6	48.8	49.4
2015/04/23	17:11:20	51.5	51.1	49.6	50.3
2015/04/23	17:11:21	52.5	52.0	51.1	52.3
2015/04/23	17:11:22	51.8	52.1	51.7	51.0
2015/04/23	17:11:23	50.8	51.7	51.2	50.5
2015/04/23	17:11:24	51.0	51.2	51.0	50.6
2015/04/23	17:11:25	52.0	51.7	51.1	51.3
2015/04/23	17:11:26	52.3	52.1	51.7	52.0
2015/04/23	17:11:27	53.1	52.8	52.1	52.8
2015/04/23	17:11:28	54.2	53.8	52.8	53.6
2015/04/23	17:11:29	54.7	54.4	53.8	54.4
2015/04/23	17:11:30	54.2	54.4	54.1	53.7
2015/04/23	17:11:31	54.0	54.5	54.0	53.1
2015/04/23	17:11:32	52.2	54.0	52.9	51.5
2015/04/23	17:11:33	50.6	52.9	51.6	50.2
2015/04/23	17:11:34	50.0	51.6	50.7	49.9
2015/04/23	17:11:35	49.7	50.6	50.1	49.5
2015/04/23	17:11:36	50.0	50.2	50.0	49.8
2015/04/23	17:11:37	50.7	50.6	50.0	49.8
2015/04/23	17:11:38	51.0	50.9	50.5	50.7
2015/04/23	17:11:39	51.7	51.5	50.8	50.7
2015/04/23	17:11:40	52.8	52.5	51.5	52.2
2015/04/23	17:11:41	54.2	53.6	52.4	53.5
2015/04/23	17:11:42	55.1	54.6	53.7	54.7
2015/04/23	17:11:43	56.4	55.9	54.6	54.9
2015/04/23	17:11:44	54.3	55.8	54.9	53.8
2015/04/23	17:11:45	56.0	55.8	54.9	54.7
2015/04/23	17:11:46	55.4	56.0	55.4	54.3
2015/04/23	17:11:47	53.7	55.4	54.4	53.1
2015/04/23	17:11:48	52.9	54.4	53.5	52.5
2015/04/23	17:11:49	51.5	53.5	52.2	50.7
2015/04/23	17:11:50	49.3	52.2	50.7	49.1
2015/04/23	17:11:51	50.1	50.6	50.3	49.5
2015/04/23	17:11:52	51.6	51.3	50.3	50.5
2015/04/23	17:11:53	53.7	53.1	51.3	52.5
2015/04/23	17:11:54	57.6	56.6	53.1	54.5

2015/04/23	17:11:55	56.4	56.8	56.4	55.8
2015/04/23	17:11:56	55.4	56.4	55.7	54.9
2015/04/23	17:11:57	57.3	56.8	55.7	55.5
2015/04/23	17:11:58	57.2	57.2	56.8	56.6
2015/04/23	17:11:59	54.4	57.0	55.4	53.3
2015/04/23	17:12:00	52.7	55.4	53.9	52.5
2015/04/23	17:12:01	51.9	53.9	52.8	51.7
2015/04/23	17:12:02	52.0	52.7	52.2	51.5
2015/04/23	17:12:03	52.2	52.5	52.2	52.0
2015/04/23	17:12:04	54.1	53.6	52.3	52.6
2015/04/23	17:12:05	56.5	55.6	53.6	54.7
2015/04/23	17:12:06	53.7	55.6	54.4	52.7
2015/04/23	17:12:07	53.2	54.3	53.7	52.3
2015/04/23	17:12:08	51.8	53.7	52.6	51.0
2015/04/23	17:12:09	49.3	52.7	50.9	49.0
2015/04/23	17:12:10	48.5	50.8	49.5	48.0
2015/04/23	17:12:11	47.9	49.5	48.4	47.0
2015/04/23	17:12:12	48.2	48.8	48.2	47.0
2015/04/23	17:12:13	46.9	48.2	47.5	46.4
2015/04/23	17:12:14	47.0	47.5	47.2	46.6
2015/04/23	17:12:15	47.2	47.3	47.1	46.8
2015/04/23	17:12:16	48.2	47.9	47.2	47.3
2015/04/23	17:12:17	48.4	48.3	47.9	47.9
2015/04/23	17:12:18	49.2	48.9	48.3	48.8
2015/04/23	17:12:19	51.1	50.5	48.9	49.5
2015/04/23	17:12:20	52.2	51.8	50.6	51.6
2015/04/23	17:12:21	53.9	53.4	51.8	52.6
2015/04/23	17:12:22	57.5	56.6	53.5	55.5
2015/04/23	17:12:23	56.5	56.6	56.4	56.1
2015/04/23	17:12:24	57.1	56.9	56.5	56.4
2015/04/23	17:12:25	57.3	57.3	56.9	56.8
2015/04/23	17:12:26	54.6	57.1	55.6	53.9
2015/04/23	17:12:27	54.9	55.6	55.2	54.2
2015/04/23	17:12:28	53.3	55.2	54.1	52.9
2015/04/23	17:12:29	51.8	54.0	52.7	51.3
2015/04/23	17:12:30	51.2	52.7	51.8	50.8
2015/04/23	17:12:31	49.4	51.7	50.4	49.0
2015/04/23	17:12:32	48.4	50.4	49.2	48.0
2015/04/23	17:12:33	47.7	49.2	48.3	47.3
2015/04/23	17:12:34	46.9	48.3	47.5	46.6
2015/04/23	17:12:35	45.7	47.5	46.4	45.2
2015/04/23	17:12:36	45.2	46.4	45.7	44.9
2015/04/23	17:12:37	45.5	45.7	45.5	45.1
2015/04/23	17:12:38	46.4	46.1	45.6	45.9
2015/04/23	17:12:39	46.6	46.4	46.1	46.4
2015/04/23	17:12:40	46.1	46.5	46.2	45.8
2015/04/23	17:12:41	45.6	46.2	45.8	45.4

2015/04/23	17:12:42	46.6	46.5	45.8	45.5
2015/04/23	17:12:43	47.5	47.3	46.4	46.3
2015/04/23	17:12:44	47.9	47.9	47.3	47.0
2015/04/23	17:12:45	46.2	47.5	46.7	45.8
2015/04/23	17:12:46	45.4	46.7	45.9	45.2
2015/04/23	17:12:47	45.7	45.9	45.8	45.4
2015/04/23	17:12:48	46.6	46.4	45.8	46.1
2015/04/23	17:12:49	51.5	50.8	46.3	46.7
2015/04/23	17:12:50	47.0	50.0	48.4	46.7
2015/04/23	17:12:51	48.0	48.4	48.1	47.4
2015/04/23	17:12:52	53.2	52.6	48.2	48.4
2015/04/23	17:12:53	48.4	51.5	49.9	48.1
2015/04/23	17:12:54	48.7	49.9	49.2	48.4
2015/04/23	17:12:55	49.2	49.3	49.1	48.6
2015/04/23	17:12:56	49.3	49.3	49.2	49.1
2015/04/23	17:12:57	49.8	49.7	49.2	49.2
2015/04/23	17:12:58	50.6	50.4	49.7	49.8
2015/04/23	17:12:59	52.0	51.5	50.4	51.1
2015/04/23	17:13:00	52.2	51.9	51.5	51.9
2015/04/23	17:13:01	53.1	52.8	51.9	52.1
2015/04/23	17:13:02	50.4	52.6	51.3	49.7
2015/04/23	17:13:03	49.5	51.2	50.3	49.3
2015/04/23	17:13:04	50.9	50.7	50.2	49.7
2015/04/23	17:13:05	53.9	53.0	50.7	51.6
2015/04/23	17:13:06	54.7	54.3	53.0	53.2
2015/04/23	17:13:07	57.0	56.3	54.3	55.7
2015/04/23	17:13:08	57.9	57.4	56.3	57.4
2015/04/23	17:13:09	55.0	57.3	55.9	54.4
2015/04/23	17:13:10	53.9	55.9	54.7	53.1
2015/04/23	17:13:11	51.5	54.7	52.9	50.8
2015/04/23	17:13:12	50.2	52.9	51.4	49.9
2015/04/23	17:13:13	49.6	51.4	50.3	49.0
2015/04/23	17:13:14	48.7	50.3	49.3	48.3
2015/04/23	17:13:15	48.5	49.3	48.9	48.2
2015/04/23	17:13:16	49.7	49.4	48.9	49.0
2015/04/23	17:13:17	51.0	50.6	49.4	50.0
2015/04/23	17:13:18	55.0	54.2	50.6	51.8
2015/04/23	17:13:19	54.7	54.8	54.2	53.9
2015/04/23	17:13:20	51.8	54.4	52.9	51.2
2015/04/23	17:13:21	50.8	52.9	51.7	50.5
2015/04/23	17:13:22	50.5	51.7	50.9	50.0
2015/04/23	17:13:23	50.5	51.1	50.5	49.6
2015/04/23	17:13:24	48.9	50.5	49.5	48.5
2015/04/23	17:13:25	48.4	49.6	48.8	47.7
2015/04/23	17:13:26	47.7	48.8	48.2	47.4
2015/04/23	17:13:27	47.3	48.2	47.6	46.8
2015/04/23	17:13:28	46.8	47.6	47.1	46.6

2015/04/23	17:13:29	48.4	48.2	47.1	46.8
2015/04/23	17:13:30	51.1	50.4	48.0	47.8
2015/04/23	17:13:31	47.2	50.4	48.7	47.0
2015/04/23	17:13:32	48.9	49.1	48.4	47.4
2015/04/23	17:13:33	47.9	49.0	48.3	47.6
2015/04/23	17:13:34	48.3	48.4	48.3	48.1
2015/04/23	17:13:35	48.1	48.4	48.1	47.4
2015/04/23	17:13:36	47.9	48.3	48.0	47.5
2015/04/23	17:13:37	47.7	48.0	47.7	47.4
2015/04/23	17:13:38	47.7	47.8	47.7	47.2
2015/04/23	17:13:39	48.6	48.3	47.7	48.1
2015/04/23	17:13:40	48.3	48.3	48.2	48.1
2015/04/23	17:13:41	49.8	49.3	48.3	48.9
2015/04/23	17:13:42	49.6	49.5	49.2	49.3
2015/04/23	17:13:43	51.4	50.8	49.5	50.2
2015/04/23	17:13:44	52.9	52.3	50.9	52.0
2015/04/23	17:13:45	53.6	53.2	52.3	53.1
2015/04/23	17:13:46	51.8	53.1	52.3	51.3
2015/04/23	17:13:47	50.4	52.3	51.1	49.6
2015/04/23	17:13:48	50.6	51.4	50.8	50.3
2015/04/23	17:13:49	49.6	50.8	50.1	49.3
2015/04/23	17:13:50	50.8	50.9	49.9	49.3
2015/04/23	17:13:51	49.3	50.4	49.8	49.1
2015/04/23	17:13:52	50.8	50.5	49.8	49.7
2015/04/23	17:13:53	52.3	51.7	50.5	51.1
2015/04/23	17:13:54	52.5	52.5	51.6	51.4
2015/04/23	17:13:55	51.4	52.3	51.7	51.2
2015/04/23	17:13:56	51.0	51.7	51.3	50.7
2015/04/23	17:13:57	51.9	51.8	51.2	50.5
2015/04/23	17:13:58	55.3	54.6	51.8	52.2
2015/04/23	17:13:59	53.9	54.7	54.1	53.4
2015/04/23	17:14:00	53.1	54.1	53.5	52.9
2015/04/23	17:14:01	53.1	53.5	53.2	52.9
2015/04/23	17:14:02	51.8	53.2	52.3	51.2
2015/04/23	17:14:03	50.9	52.3	51.5	50.6
2015/04/23	17:14:04	50.3	51.5	50.8	50.1
2015/04/23	17:14:05	49.7	50.8	50.1	49.3
2015/04/23	17:14:06	49.4	50.1	49.7	49.1
2015/04/23	17:14:07	49.6	49.8	49.6	49.3
2015/04/23	17:14:08	50.6	50.2	49.6	49.9
2015/04/23	17:14:09	50.7	50.5	50.2	50.4
2015/04/23	17:14:10	50.4	50.6	50.2	49.4
2015/04/23	17:14:11	49.7	50.5	50.0	49.3
2015/04/23	17:14:12	50.3	50.3	49.9	49.5
2015/04/23	17:14:13	54.1	53.2	50.3	51.4
2015/04/23	17:14:14	52.0	53.4	52.3	50.2
2015/04/23	17:14:15	50.3	52.3	51.1	49.8

2015/04/23	17:14:16	49.9	51.1	50.4	49.6
2015/04/23	17:14:17	51.1	51.0	50.4	50.2
2015/04/23	17:14:18	49.9	50.9	50.3	49.6
2015/04/23	17:14:19	50.3	50.4	50.2	49.5
2015/04/23	17:14:20	50.4	50.4	50.2	49.9
2015/04/23	17:14:21	48.9	50.4	49.5	48.4
2015/04/23	17:14:22	48.1	49.5	48.7	47.7
2015/04/23	17:14:23	48.7	48.8	48.7	48.4
2015/04/23	17:14:24	48.5	49.0	48.5	47.8
2015/04/23	17:14:25	48.3	48.5	48.3	48.0
2015/04/23	17:14:26	49.4	49.1	48.4	48.6
2015/04/23	17:14:27	50.7	50.4	49.1	49.1
2015/04/23	17:14:28	50.4	51.0	50.1	48.8
2015/04/23	17:14:29	48.8	50.1	49.4	48.5
2015/04/23	17:14:30	49.8	49.9	49.0	48.2
2015/04/23	17:14:31	49.9	50.0	49.8	49.6
2015/04/23	17:14:32	51.6	51.1	49.9	50.2
2015/04/23	17:14:33	52.4	52.1	51.2	51.8
2015/04/23	17:14:34	50.6	52.0	51.1	49.9
2015/04/23	17:14:35	49.9	51.1	50.4	49.6
2015/04/23	17:14:36	50.7	50.7	50.3	50.1
2015/04/23	17:14:37	50.1	50.7	50.3	49.4
2015/04/23	17:14:38	50.3	50.4	50.0	49.5
2015/04/23	17:14:39	53.3	52.5	50.4	51.1
2015/04/23	17:14:40	51.7	52.5	51.9	51.0
2015/04/23	17:14:41	51.4	51.9	51.6	50.8
2015/04/23	17:14:42	53.2	52.9	51.6	51.7
2015/04/23	17:14:43	56.9	56.0	52.9	54.8
2015/04/23	17:14:44	58.8	58.0	56.0	57.5
2015/04/23	17:14:45	56.0	58.1	56.6	54.5
2015/04/23	17:14:46	54.2	56.7	55.2	52.1
2015/04/23	17:14:47	51.4	55.2	53.2	51.0
2015/04/23	17:14:48	52.4	53.2	52.5	50.9
2015/04/23	17:14:49	50.9	52.8	51.7	50.6
2015/04/23	17:14:50	50.3	51.6	50.9	50.0
2015/04/23	17:14:51	53.5	52.8	50.8	50.2
2015/04/23	17:14:52	54.8	54.5	53.0	52.5
2015/04/23	17:14:53	57.7	56.8	53.5	52.1
2015/04/23	17:14:54	52.6	56.6	54.5	52.0
2015/04/23	17:14:55	55.5	55.4	54.2	52.7
2015/04/23	17:14:56	56.4	56.2	55.2	55.1
2015/04/23	17:14:57	55.5	56.6	55.5	53.7
2015/04/23	17:14:58	53.6	55.5	54.3	52.6
2015/04/23	17:14:59	54.5	54.9	54.2	53.3
2015/04/23	17:15:00	53.2	54.3	53.4	51.8
2015/04/23	17:15:01	53.6	53.9	53.6	52.8
2015/04/23	17:15:02	52.4	53.5	52.9	51.8

2015/04/23	17:15:03	53.8	53.5	52.9	53.3
2015/04/23	17:15:04	54.4	54.2	53.5	53.4
2015/04/23	17:15:05	55.1	54.8	53.6	52.8
2015/04/23	17:15:06	55.8	55.6	54.8	55.0
2015/04/23	17:15:07	58.1	57.2	55.4	55.1
2015/04/23	17:15:08	56.8	57.3	56.9	56.1
2015/04/23	17:15:09	58.4	58.1	56.8	56.5
2015/04/23	17:15:10	58.2	58.4	58.0	57.5
2015/04/23	17:15:11	57.6	58.1	57.6	56.5
2015/04/23	17:15:12	59.9	59.6	57.7	57.4
2015/04/23	17:15:13	53.4	59.0	56.4	52.6
2015/04/23	17:15:14	52.4	56.4	54.4	51.9
2015/04/23	17:15:15	52.3	54.4	53.2	51.8
2015/04/23	17:15:16	54.2	54.0	53.2	53.0
2015/04/23	17:15:17	54.7	54.8	53.4	52.2
2015/04/23	17:15:18	51.9	54.4	53.0	51.6
2015/04/23	17:15:19	52.7	53.0	52.8	52.0
2015/04/23	17:15:20	53.5	53.3	52.9	52.9
2015/04/23	17:15:21	52.4	53.6	52.6	50.6
2015/04/23	17:15:22	51.4	52.5	51.9	50.6
2015/04/23	17:15:23	50.7	52.0	51.2	50.3
2015/04/23	17:15:24	52.7	52.4	51.1	50.3
2015/04/23	17:15:25	54.6	54.1	52.4	53.8
2015/04/23	17:15:26	52.6	53.9	53.1	52.1
2015/04/23	17:15:27	51.6	53.1	52.2	51.2
2015/04/23	17:15:28	50.2	52.2	50.9	49.3
2015/04/23	17:15:29	50.8	51.0	50.7	50.0
2015/04/23	17:15:30	52.3	52.0	50.8	50.9
2015/04/23	17:15:31	52.3	52.2	52.0	52.0
2015/04/23	17:15:32	51.4	52.2	51.6	50.8
2015/04/23	17:15:33	50.6	51.6	50.9	49.7
2015/04/23	17:15:34	52.9	52.5	51.1	51.5
2015/04/23	17:15:35	55.0	54.4	52.5	52.8
2015/04/23	17:15:36	52.5	54.4	53.1	50.4
2015/04/23	17:15:37	53.3	53.5	52.3	50.3
2015/04/23	17:15:38	54.8	54.5	53.5	53.7
2015/04/23	17:15:39	52.1	54.4	53.0	51.2
2015/04/23	17:15:40	54.5	54.6	52.5	50.5
2015/04/23	17:15:41	51.0	54.1	52.3	50.1
2015/04/23	17:15:42	49.5	52.3	50.8	48.9
2015/04/23	17:15:43	50.2	50.8	50.4	49.6
2015/04/23	17:15:44	48.8	50.4	49.4	48.2
2015/04/23	17:15:45	48.3	49.4	48.8	47.6
2015/04/23	17:15:46	49.5	49.3	48.8	48.7
2015/04/23	17:15:47	49.3	49.3	49.1	48.7
2015/04/23	17:15:48	52.9	52.2	49.3	49.2
2015/04/23	17:15:49	48.6	51.8	50.1	48.4

2015/04/23	17:15:50	48.6	50.1	49.2	48.1
2015/04/23	17:15:51	50.2	49.8	49.3	49.5
2015/04/23	17:15:52	49.0	49.9	49.3	48.6
2015/04/23	17:15:53	48.5	49.3	48.8	48.1
2015/04/23	17:15:54	48.3	48.9	48.5	48.1
2015/04/23	17:15:55	48.0	48.5	48.2	47.5
2015/04/23	17:15:56	49.3	49.0	48.2	48.3
2015/04/23	17:15:57	49.9	49.7	49.0	49.6
2015/04/23	17:15:58	50.0	50.0	49.5	49.0
2015/04/23	17:15:59	51.5	51.2	50.0	50.2
2015/04/23	17:16:00	52.8	52.3	51.2	52.1
2015/04/23	17:16:01	53.9	53.5	52.3	52.7
2015/04/23	17:16:02	53.3	53.5	53.2	52.7
2015/04/23	17:16:03	52.0	53.3	52.5	51.3
2015/04/23	17:16:04	59.1	58.1	52.6	53.1
2015/04/23	17:16:05	55.7	58.3	56.5	53.7
2015/04/23	17:16:06	56.1	56.5	56.2	53.8
2015/04/23	17:16:07	58.6	58.1	56.3	55.9
2015/04/23	17:16:08	60.2	59.7	57.9	57.7
2015/04/23	17:16:09	60.2	60.2	59.6	59.1
2015/04/23	17:16:10	58.0	59.9	58.8	57.6
2015/04/23	17:16:11	60.1	59.9	58.7	58.0
2015/04/23	17:16:12	55.9	59.7	57.6	54.8
2015/04/23	17:16:13	55.9	57.6	56.6	55.4
2015/04/23	17:16:14	56.3	56.7	56.2	55.0
2015/04/23	17:16:15	52.5	56.4	54.4	52.2
2015/04/23	17:16:16	51.5	54.4	52.8	50.5
2015/04/23	17:16:17	53.9	53.6	52.8	53.1
2015/04/23	17:16:18	50.5	53.5	51.8	49.9
2015/04/23	17:16:19	51.5	51.8	51.6	51.0
2015/04/23	17:16:20	51.9	51.9	51.6	51.3
2015/04/23	17:16:21	52.4	52.3	51.9	51.8
2015/04/23	17:16:22	52.4	52.4	52.1	52.0
2015/04/23	17:16:23	52.9	52.7	52.3	52.4
2015/04/23	17:16:24	54.0	53.6	52.7	53.5
2015/04/23	17:16:25	55.6	55.0	53.6	54.5
2015/04/23	17:16:26	56.0	55.7	55.0	55.3
2015/04/23	17:16:27	56.7	56.5	55.7	56.2
2015/04/23	17:16:28	56.0	56.3	55.9	54.9
2015/04/23	17:16:29	57.3	57.0	56.2	56.3
2015/04/23	17:16:30	57.3	57.3	57.1	56.6
2015/04/23	17:16:31	56.1	57.1	56.5	55.5
2015/04/23	17:16:32	56.4	56.8	56.3	55.7
2015/04/23	17:16:33	54.3	56.4	55.1	53.7
2015/04/23	17:16:34	52.7	55.1	53.8	52.4
2015/04/23	17:16:35	53.2	53.8	53.4	52.7
2015/04/23	17:16:36	53.1	53.5	53.2	52.8

2015/04/23	17:16:37	56.0	55.2	53.3	54.2
2015/04/23	17:16:38	56.0	55.7	55.3	55.6
2015/04/23	17:16:39	56.4	56.3	55.6	55.6
2015/04/23	17:16:40	57.3	57.0	56.3	56.6
2015/04/23	17:16:41	55.2	56.8	55.8	54.6
2015/04/23	17:16:42	53.5	55.8	54.4	52.3
2015/04/23	17:16:43	51.8	54.4	52.9	51.5
2015/04/23	17:16:44	50.0	52.9	51.3	49.5
2015/04/23	17:16:45	48.5	51.2	49.7	47.7
2015/04/23	17:16:46	47.4	49.6	48.4	47.1
2015/04/23	17:16:47	49.0	49.0	48.3	47.5
2015/04/23	17:16:48	48.9	49.1	48.7	48.3
2015/04/23	17:16:49	49.5	49.6	48.6	47.7
2015/04/23	17:16:50	48.4	49.3	48.8	48.2
2015/04/23	17:16:51	48.6	48.9	48.6	48.2
2015/04/23	17:16:52	48.2	48.6	48.3	47.7
2015/04/23	17:16:53	48.5	48.5	48.4	48.2
2015/04/23	17:16:54	48.9	48.8	48.5	48.3
2015/04/23	17:16:55	49.8	49.5	48.7	48.6
2015/04/23	17:16:56	53.7	52.6	49.6	51.4
2015/04/23	17:16:57	53.2	53.0	52.6	52.5
2015/04/23	17:16:58	53.7	53.7	53.0	52.4
2015/04/23	17:16:59	51.5	53.2	52.2	51.0
2015/04/23	17:17:00	50.5	52.2	51.2	50.2
2015/04/23	17:17:01	51.0	51.2	50.9	50.3
2015/04/23	17:17:02	53.0	52.4	51.2	52.5
2015/04/23	17:17:03	53.7	53.5	52.4	52.3
2015/04/23	17:17:04	55.5	54.9	53.5	55.0
2015/04/23	17:17:05	54.9	55.2	54.7	53.6
2015/04/23	17:17:06	52.3	54.8	53.3	51.6
2015/04/23	17:17:07	50.8	53.3	51.9	50.6
2015/04/23	17:17:08	51.0	51.9	51.4	50.6
2015/04/23	17:17:09	51.1	51.4	51.2	50.8
2015/04/23	17:17:10	51.7	51.8	50.9	50.5
2015/04/23	17:17:11	52.1	52.4	51.8	51.1
2015/04/23	17:17:12	52.6	52.5	51.6	50.5
2015/04/23	17:17:13	52.4	53.0	52.1	50.2
2015/04/23	17:17:14	49.2	52.1	50.6	49.0
2015/04/23	17:17:15	51.9	51.7	50.4	49.7
2015/04/23	17:17:16	51.2	51.8	51.3	50.9
2015/04/23	17:17:17	50.0	51.3	50.5	49.7
2015/04/23	17:17:18	51.0	50.9	50.6	50.7
2015/04/23	17:17:19	54.0	53.4	50.9	51.2
2015/04/23	17:17:20	55.0	54.5	53.4	54.5
2015/04/23	17:17:21	55.0	54.9	54.4	54.2
2015/04/23	17:17:22	56.7	56.2	54.9	55.5
2015/04/23	17:17:23	55.1	56.3	55.4	54.0

2015/04/23	17:17:24	53.2	55.4	54.1	52.7
2015/04/23	17:17:25	51.9	54.0	52.9	51.2
2015/04/23	17:17:26	51.9	52.9	52.3	51.4
2015/04/23	17:17:27	53.0	52.8	52.3	52.2
2015/04/23	17:17:28	55.4	54.7	52.8	53.3
2015/04/23	17:17:29	57.6	56.9	54.7	56.1
2015/04/23	17:17:30	58.7	58.2	56.9	57.9
2015/04/23	17:17:31	57.8	58.5	57.8	56.8
2015/04/23	17:17:32	55.7	57.8	56.6	55.4
2015/04/23	17:17:33	56.2	56.6	56.3	55.7
2015/04/23	17:17:34	55.2	56.4	55.6	54.1
2015/04/23	17:17:35	53.1	55.6	54.1	52.1
2015/04/23	17:17:36	51.1	54.0	52.5	50.9
2015/04/23	17:17:37	50.4	52.5	51.3	49.9
2015/04/23	17:17:38	49.9	51.3	50.4	49.4
2015/04/23	17:17:39	48.6	50.4	49.3	48.2
2015/04/23	17:17:40	48.9	49.3	49.0	48.4
2015/04/23	17:17:41	48.9	49.1	48.9	48.6
2015/04/23	17:17:42	48.7	48.9	48.7	48.3
2015/04/23	17:17:43	49.1	49.1	48.8	48.7
2015/04/23	17:17:44	48.9	49.2	48.9	48.4
2015/04/23	17:17:45	48.7	48.9	48.7	48.4
2015/04/23	17:17:46	49.4	49.2	48.8	49.0
2015/04/23	17:17:47	49.4	49.3	49.2	49.1
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2015/04/23	17:17:49	53.1	52.4	50.7	52.1
2015/04/23	17:17:50	54.9	54.4	52.4	53.4
2015/04/23	17:17:51	56.9	56.2	54.4	56.1
2015/04/23	17:17:52	55.1	56.2	55.5	54.5
2015/04/23	17:17:53	54.7	55.7	54.8	53.3
2015/04/23	17:17:54	53.4	54.8	54.0	53.1
2015/04/23	17:17:55	53.1	54.0	53.4	52.4
2015/04/23	17:17:56	53.1	53.4	53.1	52.5
2015/04/23	17:17:57	52.8	53.2	52.7	51.8
2015/04/23	17:17:58	55.6	55.0	52.9	52.9
2015/04/23	17:17:59	55.3	55.9	54.9	53.4
2015/04/23	17:18:00	53.9	55.0	54.2	52.7
2015/04/23	17:18:01	54.1	54.3	53.9	53.1
2015/04/23	17:18:02	55.4	55.0	54.3	54.9
2015/04/23	17:18:03	54.7	55.2	54.7	53.5
2015/04/23	17:18:04	58.5	57.6	54.6	54.4
2015/04/23	17:18:05	55.9	57.2	56.4	55.1
2015/04/23	17:18:06	59.0	58.4	56.3	56.0
2015/04/23	17:18:07	57.5	58.4	57.6	56.1
2015/04/23	17:18:08	58.2	58.3	57.6	56.9
2015/04/23	17:18:09	57.3	58.0	57.4	56.2
2015/04/23	17:18:10	52.5	57.3	55.0	51.9

2015/04/23	17:18:11	52.7	55.0	53.7	52.2
2015/04/23	17:18:12	54.2	54.1	53.7	53.5
2015/04/23	17:18:13	53.6	53.9	53.5	52.8
2015/04/23	17:18:14	54.0	54.2	53.7	53.4
2015/04/23	17:18:15	52.5	53.9	53.0	52.2
2015/04/23	17:18:16	52.4	53.0	52.7	52.0
2015/04/23	17:18:17	52.7	52.8	52.5	52.1
2015/04/23	17:18:18	53.5	53.4	52.8	52.5
2015/04/23	17:18:19	52.7	53.1	52.8	51.8
2015/04/23	17:18:20	53.7	53.5	52.9	52.9
2015/04/23	17:18:21	54.8	54.4	53.5	54.4
2015/04/23	17:18:22	55.9	55.5	54.3	54.7
2015/04/23	17:18:23	51.5	55.5	53.4	50.8
2015/04/23	17:18:24	50.4	53.3	51.8	49.9
2015/04/23	17:18:25	51.4	51.8	51.4	49.8
2015/04/23	17:18:26	52.3	52.1	51.7	51.6
2015/04/23	17:18:27	52.1	52.1	51.9	51.7
2015/04/23	17:18:28	53.3	53.0	52.1	52.6
2015/04/23	17:18:29	53.8	53.5	53.0	53.5
2015/04/23	17:18:30	51.9	53.5	52.5	51.5
2015/04/23	17:18:31	52.7	52.8	52.5	52.1
2015/04/23	17:18:32	53.7	53.3	52.6	52.5
2015/04/23	17:18:33	52.8	53.6	52.8	51.5
2015/04/23	17:18:34	52.4	52.8	52.3	51.5
2015/04/23	17:18:35	53.8	53.5	52.7	53.2
2015/04/23	17:18:36	52.7	53.4	52.9	52.4
2015/04/23	17:18:37	53.9	53.7	53.0	53.1
2015/04/23	17:18:38	52.1	53.4	52.6	51.7
2015/04/23	17:18:39	52.4	52.7	52.4	51.9
2015/04/23	17:18:40	52.8	52.8	52.4	52.0
2015/04/23	17:18:41	52.6	52.9	52.6	52.0
2015/04/23	17:18:42	52.5	52.8	52.4	51.9
2015/04/23	17:18:43	52.6	52.7	52.3	51.9
2015/04/23	17:18:44	52.4	52.7	52.3	51.9
2015/04/23	17:18:45	52.7	53.0	52.5	51.6
2015/04/23	17:18:46	53.9	53.6	52.5	52.0
2015/04/23	17:18:47	54.4	54.3	53.4	53.4
2015/04/23	17:18:48	53.8	54.3	53.8	52.9
2015/04/23	17:18:49	54.5	54.6	53.5	52.6
2015/04/23	17:18:50	54.2	54.8	54.1	53.2
2015/04/23	17:18:51	55.5	55.3	54.0	53.0
2015/04/23	17:18:52	56.2	55.9	55.4	55.6
2015/04/23	17:18:53	57.2	56.7	55.7	56.1
2015/04/23	17:18:54	56.7	57.0	56.6	55.9
2015/04/23	17:18:55	54.2	56.6	55.1	52.9
2015/04/23	17:18:56	53.5	55.1	54.1	52.7
2015/04/23	17:18:57	52.8	54.1	53.3	52.1

2015/04/23	17:18:58	53.2	53.8	53.1	51.6
2015/04/23	17:18:59	52.1	53.1	52.4	51.0
2015/04/23	17:19:00	52.3	52.5	52.3	51.8
2015/04/23	17:19:01	53.0	52.8	52.3	52.5
2015/04/23	17:19:02	54.6	54.2	52.7	52.6
2015/04/23	17:19:03	54.8	54.6	54.2	54.6
2015/04/23	17:19:04	53.6	54.6	53.9	52.9
2015/04/23	17:19:05	52.4	53.9	53.0	52.1
2015/04/23	17:19:06	52.3	53.0	52.6	51.7
2015/04/23	17:19:07	54.1	53.7	52.6	52.7
2015/04/23	17:19:08	55.3	54.8	53.7	54.9
2015/04/23	17:19:09	56.7	56.1	54.7	54.7
2015/04/23	17:19:10	54.2	56.2	54.9	53.6
2015/04/23	17:19:11	52.9	54.9	53.8	52.7
2015/04/23	17:19:12	52.1	53.8	52.7	51.5
2015/04/23	17:19:13	50.9	52.7	51.6	50.5
2015/04/23	17:19:14	50.1	51.6	50.7	49.8
2015/04/23	17:19:15	52.1	51.9	50.5	49.7
2015/04/23	17:19:16	50.7	51.9	51.1	50.3
2015/04/23	17:19:17	49.4	51.1	50.1	49.1
2015/04/23	17:19:18	50.2	50.3	49.8	49.3
2015/04/23	17:19:19	50.3	50.4	50.0	49.7
2015/04/23	17:19:20	49.7	50.5	49.9	49.1
2015/04/23	17:19:21	50.6	50.6	49.7	49.1
2015/04/23	17:19:22	52.7	52.1	50.5	51.5
2015/04/23	17:19:23	53.1	52.9	51.7	50.8
2015/04/23	17:19:24	52.2	53.2	52.3	51.1
2015/04/23	17:19:25	53.4	53.3	52.0	50.7
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2015/04/23	17:19:27	55.6	56.2	55.8	55.1
2015/04/23	17:19:28	54.6	55.8	55.0	54.2
2015/04/23	17:19:29	55.4	55.5	55.1	54.5
2015/04/23	17:19:30	54.4	55.2	54.7	53.5
2015/04/23	17:19:31	55.0	55.2	54.8	54.5
2015/04/23	17:19:32	52.6	54.9	53.4	51.7
2015/04/23	17:19:33	51.1	53.4	52.2	50.5
2015/04/23	17:19:34	51.6	52.2	51.6	50.6
2015/04/23	17:19:35	51.1	52.0	51.4	50.3
2015/04/23	17:19:36	52.5	52.3	51.2	50.8
2015/04/23	17:19:37	51.9	52.5	51.9	51.0
2015/04/23	17:19:38	50.4	51.9	51.0	50.1
2015/04/23	17:19:39	51.1	51.3	50.6	49.6
2015/04/23	17:19:40	51.5	51.4	51.2	51.3
2015/04/23	17:19:41	52.6	52.2	51.4	51.5
2015/04/23	17:19:42	52.9	52.7	52.2	52.4
2015/04/23	17:19:43	55.6	54.7	52.8	54.3
2015/04/23	17:19:44	55.8	55.6	54.6	54.5

2015/04/23	17:19:45	57.7	57.3	55.4	55.4
2015/04/23	17:19:46	58.1	58.0	57.3	57.3
2015/04/23	17:19:47	55.4	57.7	56.3	54.4
2015/04/23	17:19:48	53.6	56.3	54.9	53.0
2015/04/23	17:19:49	55.4	55.6	54.6	53.9
2015/04/23	17:19:50	54.7	55.5	55.0	54.5
2015/04/23	17:19:51	57.5	56.8	55.1	56.2
2015/04/23	17:19:52	57.9	57.5	56.8	57.3
2015/04/23	17:19:53	56.0	57.5	56.5	55.4
2015/04/23	17:19:54	54.2	56.5	55.1	53.1
2015/04/23	17:19:55	53.8	55.1	54.4	53.0
2015/04/23	17:19:56	53.2	54.4	53.6	52.7
2015/04/23	17:19:57	52.1	53.6	52.7	51.3
2015/04/23	17:19:58	52.7	53.6	52.1	49.4
2015/04/23	17:19:59	54.3	54.1	52.8	52.8
2015/04/23	17:20:00	50.3	53.8	51.9	49.6
2015/04/23	17:20:01	48.9	51.8	50.3	48.6
2015/04/23	17:20:02	50.4	50.5	50.1	49.2
2015/04/23	17:20:03	51.2	51.1	50.3	50.0
2015/04/23	17:20:04	49.5	50.9	50.1	49.3
2015/04/23	17:20:05	53.3	52.6	50.0	49.3
2015/04/23	17:20:06	52.2	52.7	51.2	48.8
2015/04/23	17:20:07	50.6	52.7	51.3	48.0
2015/04/23	17:20:08	50.0	51.3	50.3	48.3
2015/04/23	17:20:09	47.5	50.3	48.7	46.9
2015/04/23	17:20:10	48.6	48.8	48.4	47.1
2015/04/23	17:20:11	48.7	49.0	48.5	47.9
2015/04/23	17:20:12	48.8	48.9	48.7	48.3
2015/04/23	17:20:13	48.3	48.7	48.2	47.6
2015/04/23	17:20:14	54.2	53.3	48.6	49.3
2015/04/23	17:20:15	53.1	54.2	52.8	50.3
2015/04/23	17:20:16	48.7	52.7	50.7	47.9
2015/04/23	17:20:17	48.0	50.7	49.2	47.6
2015/04/23	17:20:18	48.0	49.2	48.5	47.5
2015/04/23	17:20:19	48.0	48.6	48.2	47.6
2015/04/23	17:20:20	49.5	49.5	47.8	47.1
2015/04/23	17:20:21	47.8	49.2	48.4	47.6
2015/04/23	17:20:22	48.3	48.4	48.1	47.2
2015/04/23	17:20:23	49.8	49.6	48.2	47.7
2015/04/23	17:20:24	47.5	49.4	48.3	47.2
2015/04/23	17:20:25	47.2	48.3	47.6	47.0
2015/04/23	17:20:26	53.5	52.7	47.5	46.7
2015/04/23	17:20:27	57.6	57.4	50.5	46.6
2015/04/23	17:20:28	58.6	58.8	54.9	48.5
2015/04/23	17:20:29	54.7	58.4	56.3	52.5
2015/04/23	17:20:30	48.0	56.3	52.9	47.4
2015/04/23	17:20:31	48.1	52.9	50.6	47.4

2015/04/23	17:20:32	48.6	50.6	49.4	47.8
2015/04/23	17:20:33	48.7	49.4	48.6	47.4
2015/04/23	17:20:34	48.6	49.6	48.7	47.5
2015/04/23	17:20:35	47.5	48.7	47.9	47.1
2015/04/23	17:20:36	48.0	48.1	47.9	47.6
2015/04/23	17:20:37	48.0	48.3	47.9	47.2
2015/04/23	17:20:38	47.7	47.9	47.7	47.3
2015/04/23	17:20:39	48.1	48.1	47.8	47.5
2015/04/23	17:20:40	48.3	48.2	47.9	47.9
2015/04/23	17:20:41	49.7	49.2	48.2	49.2
2015/04/23	17:20:42	49.1	49.5	49.0	48.3
2015/04/23	17:20:43	48.0	49.0	48.4	47.7
2015/04/23	17:20:44	49.4	49.1	48.4	48.2
2015/04/23	17:20:45	49.1	49.2	48.9	48.5
2015/04/23	17:20:46	49.0	49.2	49.0	48.6
2015/04/23	17:20:47	49.5	49.4	49.0	48.9
2015/04/23	17:20:48	50.8	50.4	49.4	50.1
2015/04/23	17:20:49	53.0	52.3	50.4	51.7
2015/04/23	17:20:50	54.0	53.1	52.3	53.5
2015/04/23	17:20:50	0.0	0.0	0.0	0.0

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: Venice Auxiliary Pumping Plant (VAPP) PROJ. # 00476.15

SITE IDENTIFICATION: LT1 OBSERVER(S): Eric Moskus
ADDRESS: Proposed location of VAPP
START DATE / TIME: 8/20/15 END DATE / TIME: 8/25/15

METEROLOGICAL CONDITIONS:
TEMP: °F HUMIDITY: %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: Rion NL-21 TYPE: 1 (2) SERIAL #: 00676771
CALIBRATOR: LD CAL 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.9 dBA SPL WINDSCREEN

SETTINGS: ~~A-WEIGHTED~~ (SLOW) FAST FRONTAL (RANDOM) (ANSI) OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	

COMMENTS:

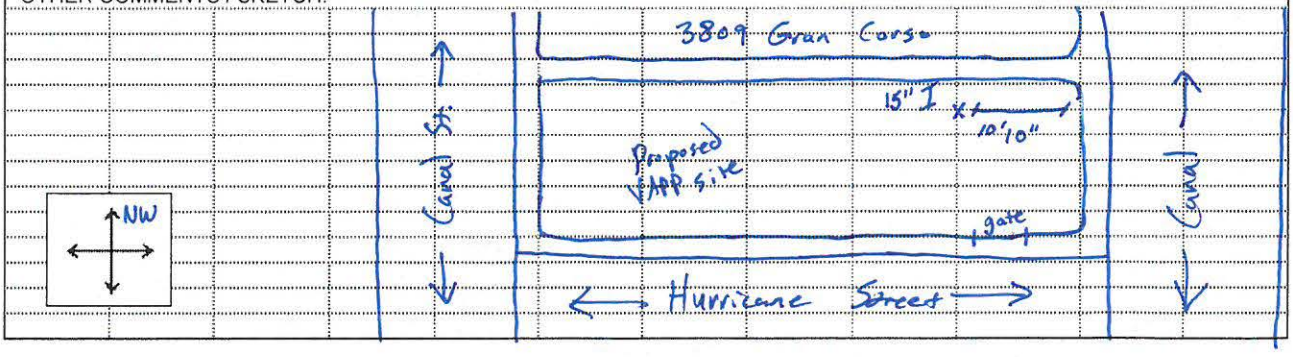
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: -MIN SPEED #2 COUNT SPEED

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD (SOFT) MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: Venice Auxiliary Pumping Plant (VAPP) PROJ. # 00476.15

SITE IDENTIFICATION: ST1 OBSERVER(S): Eric Moskus
ADDRESS: Vacant property next to 3815 Via Dolce
START DATE / TIME: 8/20/15 END DATE / TIME: 8/20/15

METEROLOGICAL CONDITIONS:
TEMP: 80 °F HUMIDITY: 61 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 3-8 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 2 SERIAL #: 0004005
CALIBRATOR: LD CAL 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.94 dBA SPL WINDSCREEN ✓

SETTINGS: ~~A-WEIGHTED~~ ~~SLOW~~ FAST FRONTAL ~~RANDOM~~ ~~ANSI~~ OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	~~OTHER:~~ L8.33	~~(TYPE?)~~ L1.67	L25
-005	14:12	14:28	51.3	59.4	45.7	47.6	50.3	53.9	54.2	56.5	52

COMMENTS: - audible traffic from Marquesas Way/Via Dolce

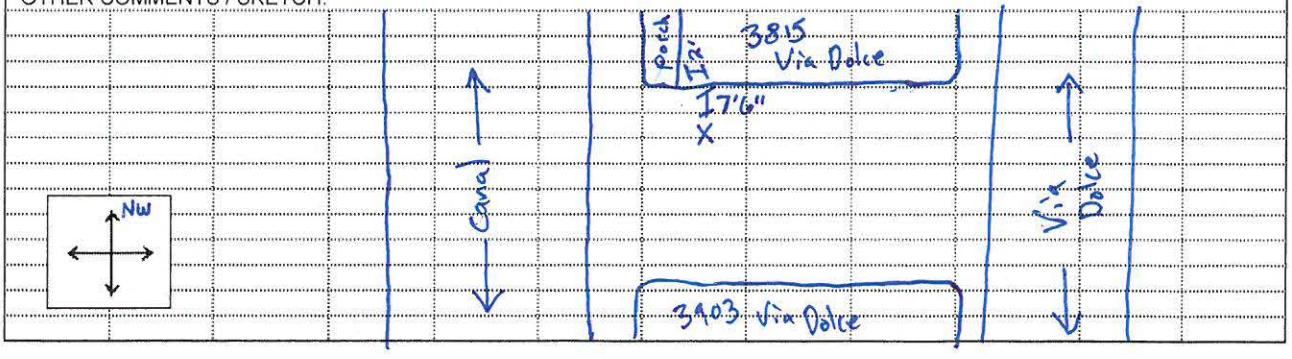
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: ~~TRAFFIC~~ AIRCRAFT RAIL INDUSTRIAL ~~AMBIENT~~ OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN SPEED #2 COUNT SPEED

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: ~~DIST. AIRCRAFT~~ / RUSTLING LEAVES / ~~DIST. BARKING DOGS~~ / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT ~~MIXED~~ FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: Venice Auxiliary Pumping Plant (VAPP) PROJ. # 00476.15

SITE IDENTIFICATION: ST1 OBSERVER(S): Eric Moskus
ADDRESS: 3815 Via Dolce
START DATE / TIME: 8/25/15 END DATE / TIME: 8/25/15

METEROLOGICAL CONDITIONS:
TEMP: 74.8 °F HUMIDITY: 83 %R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 3.5-7 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST ~~PRTLY CLOUDY~~ FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 831 TYPE: (1) 2 SERIAL #: 0003786
CALIBRATOR: LD CAL 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.95 dBA SPL WINDSCREEN ✓

SETTINGS: (A-WEIGHTED) (SLOW) FAST FRONTAL (RANDOM) (ANSI) OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	L8.33 OTHER:	L1.67 (TYPE?)	L25
.034	13:00:28	13:19:34	49.9	59	43.4	46.1	49.1	52.4	52.6	55	50.8

COMMENTS:
- people / construction crew talking near apartments across canal
- traffic from Marquesas (also 3B Via Dolce barely audible
- aircraft takeoffs unavailable
- distant construction activities

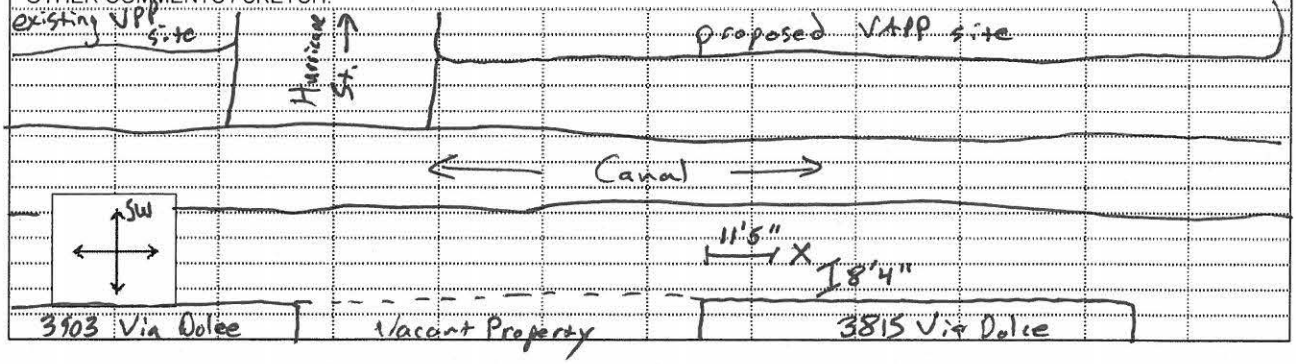
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL (AMBIENT) OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN SPEED #2 COUNT SPEED

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: ~~DIST. AIRCRAFT~~ / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: Venice Auxiliary Pumping Plant (VAPP) PROJ. # 00476.15

SITE IDENTIFICATION: ST2 OBSERVER(S): Eric Moskus
ADDRESS: 129 Hurricane Street
START DATE / TIME: 8/20/15 13:24 END DATE / TIME: 8/20/15

METEROLOGICAL CONDITIONS:
TEMP: 79 °F HUMIDITY: 62 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 1-5 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD LxT TYPE: 1 2 SERIAL #: 0004005
CALIBRATOR: LD CAL 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST _____ dBA SPL POST-TEST _____ dBA SPL WINDSCREEN _____

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER: _____

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	L8.33 ~~OTHER:~~	L1.67 ~~(TYPE?)~~	L25
.004	13:24	13:44	49.8	60.4	46.4	47.5	48.8	52	52.2	53.4	50.2

COMMENTS: - sound of running water audible from existing Venice Pumping Plant (VPP)
- various construction activities around neighborhood audible throughout measurement

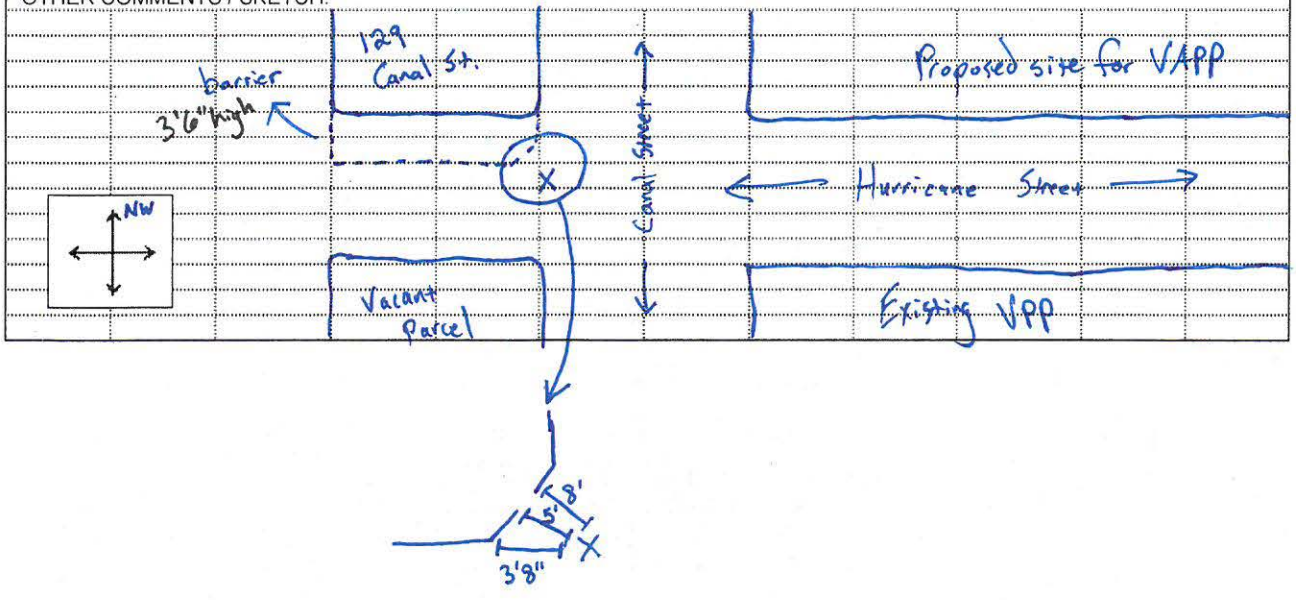
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: _____
ROADWAY TYPE: _____
TRAFFIC COUNT DURATION: _____-MIN SPEED #2 COUNT SPEED

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: _____
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: Venice Auxiliary Pumping Plant (VAPP) PROJ. # 00476.15

SITE IDENTIFICATION: ST2 OBSERVER(S): Eric Moskus
ADDRESS: 129 Hurricane St.
START DATE / TIME: 8/25/15 END DATE / TIME: 8/25/15

METEROLOGICAL CONDITIONS:
TEMP: 79.7 °F HUMIDITY: 70.6 %R.H. WIND: (CALM) LIGHT MODERATE VARIABLE
WINDSPEED: 1.1-3.5 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST (PRTLY CLOUDY) FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 831 TYPE: (1) 2 SERIAL #: 0003786
CALIBRATOR: LD CAL 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.07 dBA SPL WINDSCREEN ✓
SETTINGS: (A-WEIGHTED) (SLOW) FAST FRONTAL (RANDOM) (ANSI) OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	L8.33 ~~OTHER:~~	L1.67 ~~(TYPE?)~~	L25
0036	14:24:10	14:45:34	50.4	58.3	46.8	48	49.6	52.1	52.4	55.6	50.8

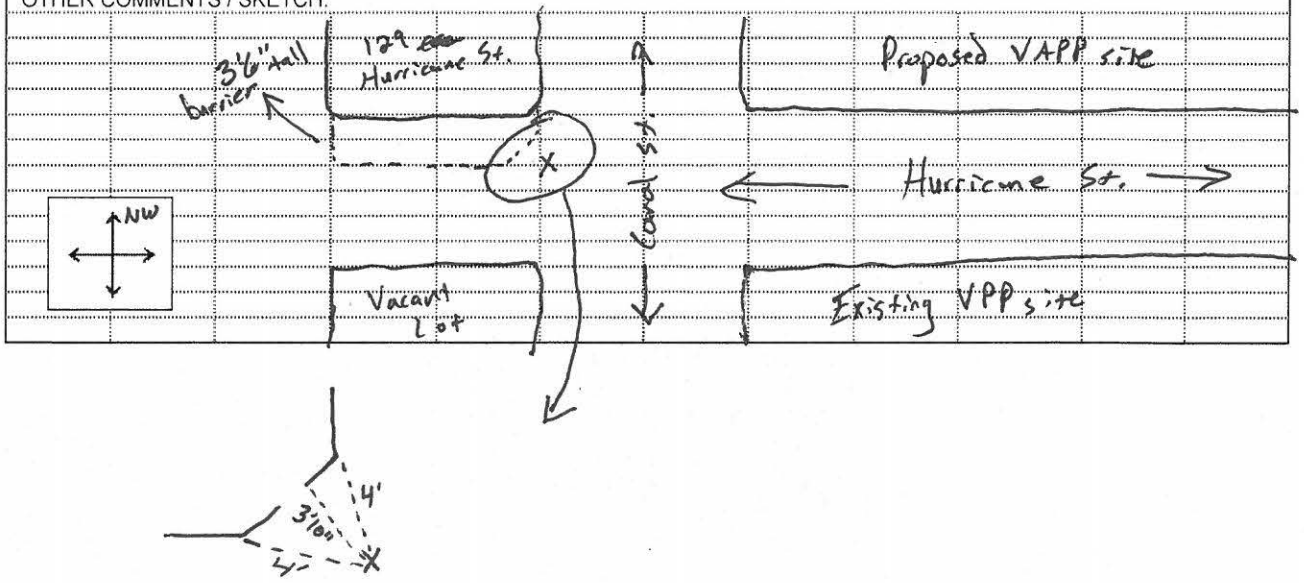
COMMENTS: - running water audible from VPP - probable noise floor
- audible aircrafts overhead
≈ 46 dBA when quiet
- cars from across canal (via Dolce & Marquesas Way) slightly audible

SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL (AMBIENT) OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN SPEED #2 COUNT SPEED

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / (BIRDS) / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: VAPP PROJ. # 476.15

SITE IDENTIFICATION: ST-3 OBSERVER(S): Jonathan Higginson
ADDRESS: Unit 1 120 Hurricane Street
START DATE / TIME: 8/20/15 1:24PM END DATE / TIME: 1:42 PM

METEROLOGICAL CONDITIONS:
TEMP: 79 °F HUMIDITY: 62 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 1-5 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

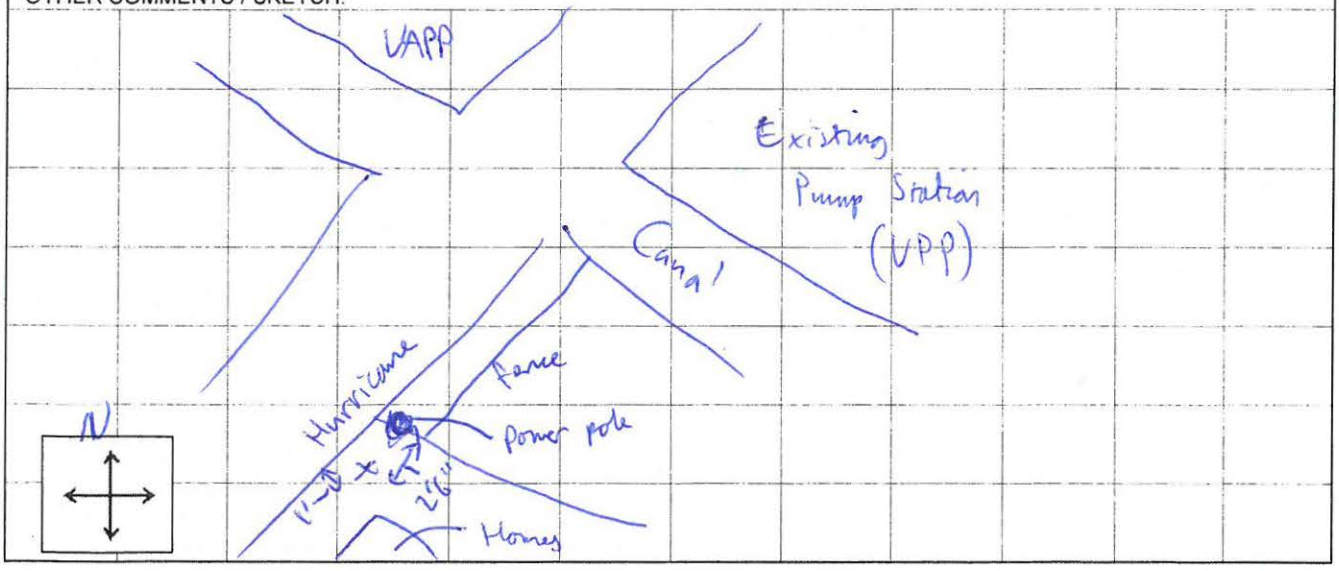
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 831 TYPE: 1 2 SERIAL #: 3786
CALIBRATOR: LD CAL200 SERIAL #: 6645
CALIBRATION CHECK: 114.0 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{Aeq}	L_{AS} max	1.67	8.33	10	25	50	90	min
026	1:24PM	1:42PM	49.9	58.8	56.2	53.0	52.5	50.0	48.1	46.5	44.8

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Rooftop construction @ end of block. Existing pump station barely audible (not measurable). faint falling water noise

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: Venice Auxiliary Pumping Plant (VAPP) PROJ. # 00476.15

SITE IDENTIFICATION: ST3 OBSERVER(S): Eric Moskus
ADDRESS: 120 Hurricane St.
START DATE / TIME: 8/25/15 END DATE / TIME: 8/25/15

METEROLOGICAL CONDITIONS:
TEMP: 76.4 °F HUMIDITY: 77.6 %R.H. WIND: (CALM) LIGHT MODERATE VARIABLE
WINDSPEED: (1.6-4) MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST (PRTLY CLOUDY) FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 831 TYPE: (1) 2 SERIAL #: 0003786
CALIBRATOR: LD CAL 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.94 dBA SPL WINDSCREEN
SETTINGS: (A-WEIGHTED) (SLOW) FAST FRONTAL (RANDOM) (ANSI) OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	~~OTHER:~~ L8.33	~~(TYPE?)~~ L1.67	L25
.035	13:45:43	14:19:53	48.7	61.1	42.8	45	47.3	51.1	51.5	54.2	49

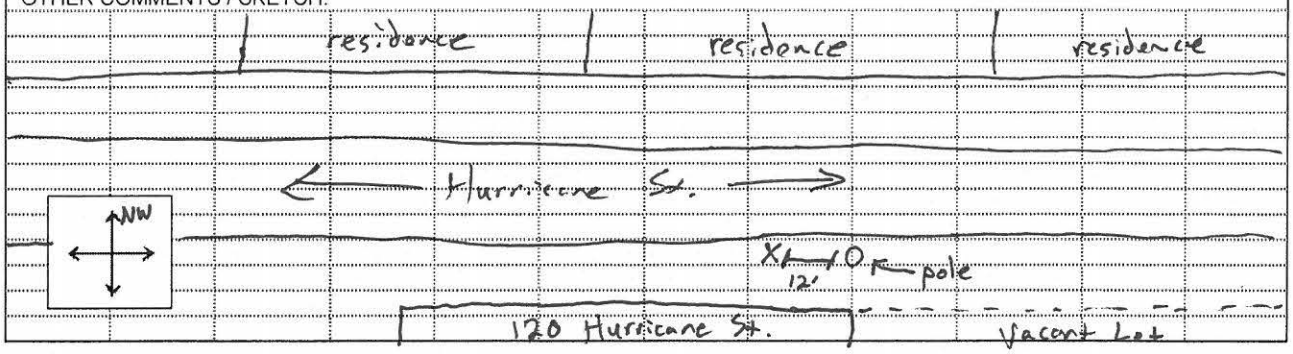
COMMENTS: - distant aircraft & construction
- some traffic audible from Pacific Ave./Hurricane St. intersection
≈42-43 dB when quiet

SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL (AMBIENT) OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN SPEED (← towards site) #2 COUNT SPEED (→ away from site)

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:	1				1			
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER
OTHER SOURCES: (DIST. AIRCRAFT) RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: (HARD) SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



- mic 12' from pole on edge of street/sidewalk
- pole is on property line of vacant lot & 120 Hurricane St.

FIELD NOISE MEASUREMENT DATA

PROJECT: VAPP PROJ. # 476.15

SITE IDENTIFICATION: ST-4 OBSERVER(S): Jonathan Higginson
ADDRESS: Trail near 107 Roma Ct.
START DATE / TIME: 8/20/15 2:08PM END DATE / TIME: 2:24PM

METEROLOGICAL CONDITIONS:
TEMP: 80 °F HUMIDITY: 61 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 3-8 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

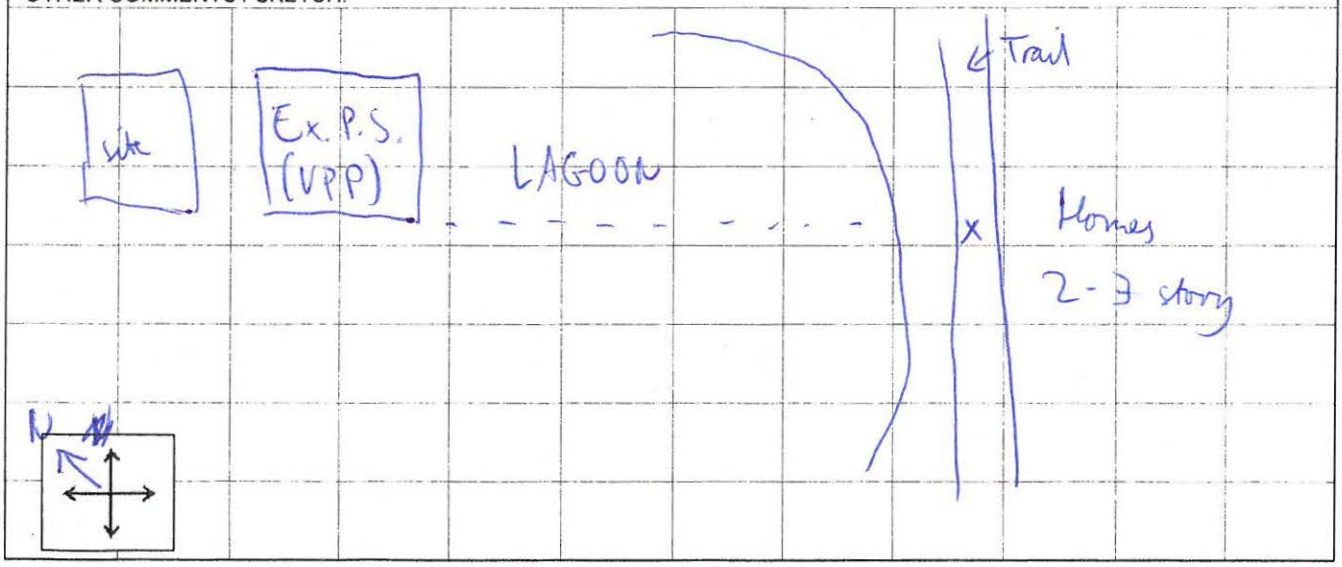
ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 831 TYPE: 1 2 SERIAL #: 3786
CALIBRATOR: LD CAL 200 SERIAL #: 6645
CALIBRATION CHECK: 114.0 WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

FILE / MEAS #	START TIME	END TIME	L_{Aeq}	L_{AS} max	1.67	8.33	10	25	50	90	min
027	2:08pm	2:24pm	50.7	57.8	55.2	53.2	52.4	51.3	50.0	48.0	46.2

COMMENTS:

NOISE SOURCE INFO:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
Distant construction activity. Ex Pump Bldg not audible.

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: Dirt / lawn / water
PHOTOS: ✓
OTHER COMMENTS / SKETCH:



This spreadsheet calculates traffic noise levels based on TNM Version 2.5 Lookup Tables.

**** Type in yellow cells only.**

Traffic Data:

- ☒ Enter ADT Traffic
- ☐ Enter Loudest-hour Traffic

Units:

- ☐ Metric
- ☒ English

Calculate

ICF INTERNATIONAL®

Link	Roadway	Segment Location	Hard or Soft Ground (H or S)	BARRIER			Total Daily Traffic Volumes **(ADT)**	Traffic Mix		Vehicle Speed	Sound Levels at Receiver Locations	
				Present 1=yes	Height min. 7 ft. max. 32 ft.	Distance 35 ft. or 100 ft.		Number #	Description	mph max. 80	Distance feet, min. 33 max. 1000	dB CNEL
1	**24 trucks per day**	**All**	S				48	12	Daytime Trucks Only	25	33	**52.4**
2												
3												
4												
5												
6												
7												
8												
9												
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Table 1. Construction Noise Analysis - Demolition

Receptor	Equipment		Typical Level @ 50', dBA[1]	Usage Factor[1,2]	Number of Units	Distance to Receiver, ft.	Hard or Soft Site?	Barrier Attenuation, dB	Leq(h), dBA
	Item No.	Description							
1	18	Excavator	80.7	0.4	1	125	hard	0	69
	2	Backhoe	77.6	0.4	1	125	hard	0	66
	23	Grader	85	0.4	1	125	hard	0	73
	25	Hammer, Jack	88.9	0.2	1	125	hard	0	74
		Combined Equipment							***78***
2	18	Excavator	80.7	0.4	1	35	hard	0	80
	2	Backhoe	77.6	0.4	1	35	hard	0	77
	23	Grader	85	0.4	1	35	hard	0	84
	25	Hammer, Jack	88.9	0.2	1	35	hard	0	85
		Combined Equipment							***89***
3	18	Excavator	80.7	0.4	1	55	hard	0	76
	2	Backhoe	77.6	0.4	1	55	hard	0	73
	23	Grader	85	0.4	1	55	hard	0	80
	25	Hammer, Jack	88.9	0.2	1	55	hard	0	81
		Combined Equipment							***85***
4	18	Excavator	80.7	0.4	1	130	hard	0	68
	2	Backhoe	77.6	0.4	1	130	hard	0	65
	23	Grader	85	0.4	1	130	hard	0	73
	25	Hammer, Jack	88.9	0.2	1	130	hard	0	74
		Combined Equipment							***77***
5	18	Excavator	80.7	0.4	1	465	hard	5	52
	2	Backhoe	77.6	0.4	1	465	hard	5	49
	23	Grader	85	0.4	1	465	hard	5	57
	25	Hammer, Jack	88.9	0.2	1	465	hard	5	58
		Combined Equipment							***61***

1. Obtained or estimated from:
   FHWA Roadway Construction Noise Model (RCNM), Version 1.1, December 8, 2008
2. Usage Factor = percentage of time equipment is operating in noisiest mode while in use

Table 2. Construction Noise Analysis - Site Preparation

Receptor	Equipment		Typical Level @ 50', dBA[1]	Usage Factor[1,2]	Number of Units	Distance to Receiver, ft.	Hard or Soft Site?	Barrier Attenuation, dB	Leq(h), dBA
	Item No.	Description							
1	18	Excavator	80.7	0.4	1	125	hard	0	69
	23	Grader	85	0.4	1	125	hard	0	73
	12	Crane	80.6	0.16	1	125	hard	0	65
		Combined Equipment							***75***
2	18	Excavator	80.7	0.4	1	35	hard	0	80
	23	Grader	85	0.4	1	35	hard	0	84
	12	Crane	80.6	0.16	1	35	hard	0	76
		Combined Equipment							***86***
3	18	Excavator	80.7	0.4	1	55	hard	0	76
	23	Grader	85	0.4	1	55	hard	0	80
	12	Crane	80.6	0.16	1	55	hard	0	72
		Combined Equipment							***82***
4	18	Excavator	80.7	0.4	1	130	hard	0	68
	23	Grader	85	0.4	1	130	hard	0	73
	12	Crane	80.6	0.16	1	130	hard	0	64
		Combined Equipment							***75***
5	18	Excavator	80.7	0.4	1	465	hard	5	52
	23	Grader	85	0.4	1	465	hard	5	57
	12	Crane	80.6	0.16	1	465	hard	5	48
		Combined Equipment							***58***

1. Obtained or estimated from:
   FHWA Roadway Construction Noise Model (RCNM), Version 1.1, December 8, 2008
2. Usage Factor = percentage of time equipment is operating in noisiest mode while in use

Table 3. Construction Noise Analysis - Grading

Receptor	Equipment		Typical Level @ 50', dBA[1]	Usage Factor[1,2]	Number of Units	Distance to Receiver, ft.	Hard or Soft Site?	Barrier Attenuation, dB	Leq(h), dBA
	Item No.	Description							
1	2	Backhoe	77.6	0.4	1	125	hard	0	66
	23	Grader	85	0.4	1	125	hard	0	73
		Combined Equipment							***74***
2	2	Backhoe	77.6	0.4	1	35	hard	0	77
	23	Grader	85	0.4	1	35	hard	0	84
		Combined Equipment							***85***
3	2	Backhoe	77.6	0.4	1	55	hard	0	73
	23	Grader	85	0.4	1	55	hard	0	80
		Combined Equipment							***81***
4	2	Backhoe	77.6	0.4	1	130	hard	0	65
	23	Grader	85	0.4	1	130	hard	0	73
		Combined Equipment							***73***
5	2	Backhoe	77.6	0.4	1	465	hard	5	49
	23	Grader	85	0.4	1	465	hard	5	57
		Combined Equipment							***57***

1. Obtained or estimated from:
   FHWA Roadway Construction Noise Model (RCNM), Version 1.1, December 8, 2008
2. Usage Factor = percentage of time equipment is operating in noisiest mode while in use

Table 4a. Construction Noise Analysis - Building Construction, With Pile Driving

Receptor	Equipment		Typical Level @ 50', dBA[1]	Usage Factor[1,2]	Number of Units	Distance to Receiver, ft.	Hard or Soft Site?	Barrier Attenuation, dB	Leq(h), dBA
	Item No.	Description							
1	12	Crane	80.6	0.16	1	125	hard	0	65
	9	Compactor	83.2	0.2	1	125	hard	0	68
	35	Pile-driver (Impact)	101.3	0.2	1	60	hard	0	93
	10	Compressor, Air	77.7	0.4	1	125	hard	0	66
		Combined Equipment							***93***
2	12	Crane	80.6	0.16	1	35	hard	0	76
	9	Compactor	83.2	0.2	1	35	hard	0	79
	35	Pile-driver (Impact)	101.3	0.2	1	35	hard	0	97
	10	Compressor, Air	77.7	0.4	1	35	hard	0	77
		Combined Equipment							***98***
3	12	Crane	80.6	0.16	1	55	hard	0	72
	9	Compactor	83.2	0.2	1	55	hard	0	75
	35	Pile-driver (Impact)	101.3	0.2	1	40	hard	0	96
	10	Compressor, Air	77.7	0.4	1	55	hard	0	73
		Combined Equipment							***96***
4	12	Crane	80.6	0.16	1	130	hard	0	64
	9	Compactor	83.2	0.2	1	130	hard	0	68
	35	Pile-driver (Impact)	101.3	0.2	1	130	hard	0	86
	10	Compressor, Air	77.7	0.4	1	130	hard	0	65
		Combined Equipment							***86***
5	12	Crane	80.6	0.16	1	465	hard	5	48
	9	Compactor	83.2	0.2	1	465	hard	5	52
	35	Pile-driver (Impact)	101.3	0.2	1	465	hard	0	75
	10	Compressor, Air	77.7	0.4	1	465	hard	5	49
		Combined Equipment							***75***

1. Obtained or estimated from:
   FHWA Roadway Construction Noise Model (RCNM), Version 1.1, December 8, 2008
2. Usage Factor = percentage of time equipment is operating in noisiest mode while in use

Table 4b. Construction Noise Analysis - Building Construction, Without Pile Driving

Receptor	Equipment		Typical Level @ 50', dBA[1]	Usage Factor[1,2]	Number of Units	Distance to Receiver, ft.	Hard or Soft Site?	Barrier Attenuation, dB	Leq(h), dBA
	Item No.	Description							
1	12	Crane	80.6	0.16	1	125	hard	0	65
	9	Compactor	83.2	0.2	1	125	hard	0	68
	10	Compressor, Air	77.7	0.4	1	125	hard	0	66
		Combined Equipment							***71***
2	12	Crane	80.6	0.16	1	35	hard	0	76
	9	Compactor	83.2	0.2	1	35	hard	0	79
	10	Compressor, Air	77.7	0.4	1	35	hard	0	77
		Combined Equipment							***82***
3	12	Crane	80.6	0.16	1	55	hard	0	72
	9	Compactor	83.2	0.2	1	55	hard	0	75
	10	Compressor, Air	77.7	0.4	1	55	hard	0	73
		Combined Equipment							***78***
4	12	Crane	80.6	0.16	1	130	hard	0	64
	9	Compactor	83.2	0.2	1	130	hard	0	68
	10	Compressor, Air	77.7	0.4	1	130	hard	0	65
		Combined Equipment							***71***
5	12	Crane	80.6	0.16	1	465	hard	5	48
	9	Compactor	83.2	0.2	1	465	hard	5	52
	10	Compressor, Air	77.7	0.4	1	465	hard	5	49
		Combined Equipment							***55***

1. Obtained or estimated from:
   FHWA Roadway Construction Noise Model (RCNM), Version 1.1, December 8, 2008
2. Usage Factor = percentage of time equipment is operating in noisiest mode while in use

Table 5. Construction Noise Analysis - Paving

Receptor	Equipment		Typical Level @ 50', dBA[1]	Usage Factor[1,2]	Number of Units	Distance to Receiver, ft.	Hard or Soft Site?	Barrier Attenuation, dB	Leq(h), dBA
	Item No.	Description							
1	23	Grader	85	0.4	1	125	hard	0	73
	18	Excavator	80.7	0.4	1	125	hard	0	69
	41	Pump, Concrete (or concrete p	81.4	0.2	2	125	hard	0	69
		Combined Equipment							***76***
2	23	Grader	85	0.4	1	35	hard	0	84
	18	Excavator	80.7	0.4	1	35	hard	0	80
	41	Pump, Concrete (or concrete p	81.4	0.2	2	35	hard	0	81
		Combined Equipment							***87***
3	23	Grader	85	0.4	1	55	hard	0	80
	18	Excavator	80.7	0.4	1	55	hard	0	76
	41	Pump, Concrete (or concrete p	81.4	0.2	2	55	hard	0	77
		Combined Equipment							***83***
4	23	Grader	85	0.4	1	130	hard	0	73
	18	Excavator	80.7	0.4	1	130	hard	0	68
	41	Pump, Concrete (or concrete p	81.4	0.2	2	130	hard	0	69
		Combined Equipment							***75***
5	23	Grader	85	0.4	1	465	hard	5	57
	18	Excavator	80.7	0.4	1	465	hard	5	52
	41	Pump, Concrete (or concrete p	81.4	0.2	2	465	hard	5	53
		Combined Equipment							***59***

1. Obtained or estimated from:
   FHWA Roadway Construction Noise Model (RCNM), Version 1.1, December 8, 2008
2. Usage Factor = percentage of time equipment is operating in noisiest mode while in use

Construction Vibration Analysis

Phase	Reference PPV @ 25 feet	Receptor 1				Receptor 2				Receptor 3			
		Closest Distance	Farthest Distance	Low PPV	High PPV	Closest Distance	Farthest Distance	Low PPV	High PPV	Closest Distance	Farthest Distance	Low PPV	High PPV
Demolition	0.089	90	180	0.0101	0.0217	10	90	0.0217	0.2439	25	120	0.0158	0.0890
Site Preparation	0.089	90	180	0.0101	0.0217	10	90	0.0217	0.2439	25	120	0.0158	0.0890
Grading	0.089	90	180	0.0101	0.0217	10	90	0.0217	0.2439	25	120	0.0158	0.0890
Building Construction (pile driving)	0.65	50	175	0.0764	0.3032	10	90	0.1588	1.7809	30	150	0.0906	0.5319
Building Construction (no pile driving)	0.089	90	180	0.0101	0.0217	10	90	0.0217	0.2439	25	120	0.0158	0.0890
Paving	0.089	90	180	0.0101	0.0217	10	90	0.0217	0.2439	25	120	0.0158	0.0890

Phase	Reference PPV @ 25 feet	Receptor 4				Receptor 5				VPP Structure			
		Closest Distance	Farthest Distance	Low PPV	High PPV	Closest Distance	Farthest Distance	Low PPV	High PPV	Closest Distance	Farthest Distance	Low PPV	High PPV
Demolition	0.089	85	200	0.0090	0.0232	420	510	0.0032	0.0040	30	110	0.0174	0.0728
Site Preparation	0.089	85	200	0.0090	0.0232	420	510	0.0032	0.0040	30	110	0.0174	0.0728
Grading	0.089	85	200	0.0090	0.0232	420	510	0.0032	0.0040	30	110	0.0174	0.0728
Building Construction (pile driving)	0.65	100	165	0.0815	0.1415	420	510	0.0236	0.0292	30	110	0.1274	0.5319
Building Construction (no pile driving)	0.089	95	220	0.0081	0.0205	420	510	0.0032	0.0040	30	110	0.0174	0.0728
Paving	0.089	85	200	0.0090	0.0232	420	510	0.0032	0.0040	30	110	0.0174	0.0728

Appendix J

Trip Generation Memorandum & Parking Memorandum

FEHR PEERS

MEMORANDUM

Date: October 3, 2016

To: Gilbert Ruiz, ICF Inc.

From: Netai Basu

Subject: ***Parking Assessment – Venice Auxiliary Pumping Plant Project***

LA15-2780.00

Fehr & Peers has prepared this technical memorandum to summarize the results of a parking utilization analysis for the proposed Venice Auxiliary Pumping Plant project (VAPP) located in the Ballona West neighborhood in Los Angeles, California. This memorandum describes the existing parking supply and utilization in the vicinity of the project site, and analyzes whether there is sufficient existing parking supply for the VAPP in the vicinity of the project site. This memorandum is presented in four sections. First, we describe the project background and related projects. Next, we describe the data collection efforts. We then present the existing utilization and parking assessment for the VAPP project site and we discuss the parking implications for the surrounding neighborhood. We finally summarize the parking assessment for this project.

PROJECT BACKGROUND

The City of Los Angeles owns and operates the Venice Pumping Plant (VPP) near the Ballona Lagoon and Grand Canal. The VPP is the largest of the City's five pumping stations and is considered a critical facility to convey sewage from the tributary area, as there are currently no diversions to bypass the pumping plant. The facility collects sewage from the coastal areas of the City through one existing 48-inch pipeline (force main) and transports it south to the Hyperion Treatment Plant in Playa Del Rey.

During periods of heavy rain, the facility has almost exceeded capacity and has had multiple simultaneous pump failure. As such, system redundancy is needed. The Venice Auxiliary Pumping Plant (VAPP) project is intended to provide additional, dependable pumping capacity to accommodate peak wet-weather flows. Figure 1 displays the project site within the surrounding neighborhood.

Figure 1 – VAPP Project Location Map



Source: ICF. 2016

RELATED PROJECTS

Venice Dual Force Main Project

A second 54-inch pipeline, known as the Venice Dual Force Main Project (VDFM), is planned for construction to convey flows from VPP and VAPP to a discharge vault nearly two miles to the southeast near the intersection of Vista Del Mar & Gills Street. To minimize impacts to the surrounding community, streamline construction activities, and minimize overall project cost, the City is planning to schedule construction of the VAPP immediately following completion of the VDFM project. Construction of the VDFM is anticipated to begin in January 2017. Although work on the overall VDFM project will continue until December 2019, construction in the vicinity of Hurricane Street is scheduled to be completed by the end of 2017.

Manifold Project

Construction of the VPP manifold connecting the existing VPP and proposed VDFM project within Hurricane Street was completed in August 2015. With the Venice manifold in place, both the VPP and VAPP will be able to tie-in, thereby forming one system with one control facility.

DATA COLLECTION

Parking utilization surveys were conducted bi-hourly from 8:00 AM to 10:00 PM near the project site on a typical weekend day and a typical weekday (Saturday, September 12 and Thursday September 17, 2015). These days were selected to represent typical weekend and weekday conditions and because they do not fall on street sweeping or trash collection days. The local street sweeping schedule varies by street but parking is generally restricted on Mondays or Tuesdays from 10:00 AM to 12:00 PM. Trash collection occurs on Fridays.

Counts were collected of on-street public parking and one off-street public lot in a study radius of approximately 0.3 mile around the project site. The number of available parking spaces for each roadway segment or lot was inventoried at the beginning of data collection efforts. Parking utilization was separated between unrestricted parking and any restricted parking for a given location. The only time-restricted parking within the vicinity of the project site is the metered spaces located along Strongs Drive between Anchorage Street and Washington Boulevard, while the remaining spaces are only restricted per their respective scheduled street-sweeping and trash collection days.

Figure 2 identifies the parking supply for the VAPP project site. For unmarked, on-street spaces, the number of spaces was estimated by measuring the available curb space and assuming an average length of 22.5 feet per vehicle, unless occupancy surveys showed a higher occupancy on a particular block.

VAPP PROJECT SITE PARKING ANALYSIS

The proposed VAPP site is located in the Marina Peninsula neighborhood just west of the Venice Grand Canal, on the northeast corner of Hurricane Street and Canal Court. The area surrounding VAPP is a mix of predominantly single-family and multi-family residential. Washington Boulevard, located approximately 0.3 mile north of the project site, serves as the nearest and primary commercial corridor.

Parking within the community is predominantly unrestricted, publicly available and on-street. Several streets serve primarily as pedestrian walkways, linking the Grand Canal to the beach. A City-owned off-street parking lot is located on the northwestern edge of the study area, at the terminus of Washington Boulevard. It includes a total of 364 parking spaces (329 regular, 26 extended spaces for recreational vehicles and nine spaces designated for disabled parking). Hurricane Street, where the VAPP site is located, also contains restricted on-street parking. Once construction begins, Hurricane Street will be permanently closed to traffic between Esplanade and Canal Court. This will result in the loss of five on-street parking spaces. Additionally, the segment of Canal Court adjacent to the project site will be temporarily closed during the construction period; however, parking is prohibited there.

The Venice Pumping Plant currently requires two employees per 8-hour shift (three shifts over a 24-hour period) and two parking spaces are located within the VPP site. Once VAPP becomes operational, this staffing level will remain unchanged. Thus VAPP/VPP would require up to four parking spaces at the peak time, when shift changes occur. Per the Venice Specific Plan and the Venice Local Coastal Program Land Use Plan, the project must also provide one space for Beach Impact Zone parking. The proposed project will construct eight off-street parking spaces at 128 Hurricane Street, which will fully satisfy the need for replacement parking (five spaces), employee parking (four spaces including the existing two off-street employee spaces within the VPP), and the one new space required as Beach Impact Zone parking.

As shown in Table 1 and Table 2, there are an estimated 763 publicly available parking spaces in the survey area, including 399 publicly available on-street spaces and 364 spaces at the public parking lot. This also includes eight time-restricted parking spaces and 391 unrestricted parking spaces. We divided the study area by zones, as shown in Figure 3 and Figure 4 to better summarize the peak period weekend and weekday occupancy data:

- Zone 1 – Parking capacity within 700 feet of the project site
- Zone 2 – Parking capacity from 700 to 1,000 feet of the project site.
- Zone 3 – Parking capacity from 1,000 to 1,700 feet of the project site
- Zone 4 – Public parking lot located at the western terminus of Washington Boulevard

Table 3 and Table 4 illustrate parking occupancy for the entire 14-hour data collection period for the weekend and weekday, organized by zone. Figure 3 and Figure 4 illustrate the peak-period occupancy rates by zone on a typical weekend day and weekday, which is discussed further below.

As shown in Figure 3, the weekend peak utilization by zone for the surveyed parking near the project site, observed from 4:00 to 6:00 PM on Saturday September 12, 2015, shows that the on-street spaces are almost fully occupied:

- Zone 1 – 97% of spaces utilized, with three spaces available
- Zone 2 – 95% of spaces utilized, with eight spaces available
- Zone 3 – 99% of spaces utilized, with one space available
- Zone 4 – 71% of spaces utilized, with 106 spaces available

Figure 4 displays the weekday peak utilization by zone for the surveyed parking near the project site, observed from 2:00 to 4:00 PM on Thursday September 17, 2015 as follows:

- Zone 1 – 79% of spaces utilized, with 22 spaces available
- Zone 2 – 71% of spaces utilized, with 48 spaces available
- Zone 3 – 81% of spaces utilized, with 24 spaces available
- Zone 4 – 44% of spaces utilized, with 204 spaces available

Based on this analysis, the available parking supply near the VAPP site is sufficient under normal circumstances to replace the five spaces that would be removed from Hurricane Street as part of the proposed project. Within approximately 1,000 feet of the VAPP site, at least 70 spaces are available during the weekday peak period and at least 11 spaces are available during the busier weekend peak period.

SUMMARY AND CONCLUSIONS

The planned VAPP project, located in the Marina Peninsula neighborhood in Los Angeles, California, is intended to provide additional pumping capacity to the existing VPP. Parking utilization surveys were conducted in the neighborhood around the project site over a typical weekday and a typical weekend day at 2-hour intervals.

During the 2-year construction period of the VAPP, the loss of the five existing parking spaces from Hurricane Street between Canal Court and the Grand Canal would temporarily reduce the parking supply in the project vicinity. This will affect the convenience of drivers seeking to park, by reducing the total supply of on-street parking in the neighborhood around the VAPP site, although the total on-street parking in the vicinity could still accommodate these vehicles. During peak times on peak summer weekend days, weekdays and holidays, however, it is recognized that parking utilization is higher than what was observed on the survey dates. On those days the loss of these on-street spaces could result in a small increase in vehicles circling through the neighborhood as they seek available parking.

Upon project completion, the on-street parking on Hurricane Street east of Canal Court would be fully replaced off-street at 128 Hurricane Street. In addition, the proposed VAPP project, together with the existing VPP facility, would provide four employee parking spaces, sufficient to accommodate its needs, as well as one additional space as required for Beach Impact Zone parking. Thus, upon completion the project would result in one additional parking space in the project vicinity.



Figure 2
Parking Inventory



Figure 3
Parking Utilization - Weekend Peak Hour (4:00 PM)



Figure 4
Parking Utilization - Weekday Peak Hour (2:00 PM)

Table 1 - Parking Inventory and Occupancy - Weekend Peak Period (Saturday 9/12/15, 4 pm - 6 pm)

	Zone 1	Zone 2	Zone 3	Zone 4	Overall
Public Parking Inventory	104	166	129	364	**763**
Available Spaces	3	8	1	106	**118**
Occupancy Rate	**97%**	**95%**	**99%**	**71%**	**98%**

Note - occupancy rate includes cars parked legally and illegally

Table 2 - Parking Inventory and Occupancy - Weekday Peak Period (Thursday 9/17/15, 2 pm - 4 pm)

	Zone 1	Zone 2	Zone 3	Zone 4	Overall
Public Parking Inventory	104	166	129	364	**763**
Available Spaces	22	48	24	204	**298**
Occupancy Rate	**79%**	**71%**	**81%**	**44%**	**61%**

Note - occupancy rate includes cars parked legally and illegally

Table 3 - On-Street Parking Occupancy by Zone - Weekend (Saturday 9/12/15, 4pm -6 pm)

Time Beginning	Zone 1	Zone 2	Zone 3	Zone 4	Average Occupancy
8:00	82%	88%	86%	10%	**50%**
10:00	88%	89%	86%	24%	**57%**
12:00	94%	93%	92%	48%	**72%**
14:00	94%	95%	92%	72%	**83%**
16:00	94%	95%	96%	71%	**84%**
18:00	91%	96%	92%	54%	**75%**
20:00	88%	95%	81%	43%	**67%**

Note - occupancy rate includes cars parked legally and illegally

Table 4 - On-Street Parking Occupancy by Zone - Weekday (Thursday 9/17/15, 2pm - 4 pm)

Time Beginning	Zone 1	Zone 2	Zone 3	Zone 4	Average Occupancy
8:00	80%	75%	61%	8%	**41%**
10:00	73%	73%	70%	13%	**44%**
12:00	73%	68%	73%	30%	**52%**
14:00	82%	72%	90%	44%	**63%**
16:00	80%	70%	76%	37%	**56%**
18:00	78%	70%	92%	37%	**59%**
20:00	75%	71%	85%	23%	**51%**

Note - occupancy rate includes cars parked legally and illegally

FEHR PEERS

MEMORANDUM

Date: October 3, 2016

To: Gilbert Ruiz, ICF Inc.

From: Netai Basu

Subject: ***Trip Generation Analysis – Venice Auxiliary Pumping Plant Project***

LA15-2780.00

This technical memorandum summarizes the results of a trip generation analysis for the proposed Venice Auxiliary Pumping Plant project (VAPP). This memorandum includes several sections. The first section provides the project background, a description of related infrastructure projects, and construction information for the proposed VAPP project. That is followed by a description of the street system in the vicinity of the project. Estimates of construction-period and permanent trip generation are made and their significance assessed. The memorandum concludes with a summary of the key conclusions.

PROJECT BACKGROUND

The City of Los Angeles owns and operates the Venice Pumping Plant (VPP) near the Ballona Lagoon and Grand Canal. The VPP is the largest of the City's five pumping stations and is considered a critical facility to convey sewage from the tributary area, as there are currently no diversions to bypass the pumping plant. The facility collects sewage from the coastal areas of the City through one existing 48-inch pipeline (force main) and transports it south to the Hyperion Treatment Plant in Playa Del Rey. The Venice Auxiliary Pumping Plant (VAPP) project is intended to provide additional, dependable pumping capacity to accommodate peak wet-weather flows.

The proposed VAPP site is located in the Ballona West neighborhood just west of the Venice Grand Canal, on the northeast corner of Hurricane Street & Canal Court. The area surrounding VAPP is a mix of predominantly single-family and multi-family residential. Washington Boulevard, located approximately 0.4 mile north of the project site, is the nearest commercial corridor. Figure 1 displays the project site within the surrounding neighborhood.

Figure 1 – VAPP Project Location Map



Source: ICF. 2016

RELATED PROJECTS

Venice Dual Force Main Project

A second 54-inch pipeline, known as the Venice Dual Force Main Project (VDFM), is planned for construction to convey flows from VPP and VAPP to a discharge vault nearly two miles to the southeast near the intersection of Vista Del Mar & Gills Street. To minimize impacts to the surrounding community, streamline construction activities, and minimize overall project cost, the City is planning to schedule construction of the VAPP immediately following completion of the VDFM project. Construction of the VDFM is anticipated to begin in January 2017. Although work on the overall VDFM project will continue until December 2019, construction in the vicinity of Hurricane Street is scheduled to be completed by the end of 2017.

Manifold Project

Construction of the VPP manifold connecting the existing VPP and proposed VDFM project within Hurricane Street was completed in August 2015. With the Venice manifold in place, both the VPP and proposed VAPP will be able to tie-in, thereby forming one system with one control facility.

EXISTING STREET SYSTEM

Below is a brief description of the major streets serving the proposed project site. Sidewalks are generally available in the vicinity of the project area. Table 1 displays the operational characteristics of the local street system.

- Canal Court – Canal Court is a short undivided alleyway that runs between Driftwood Street to the north and the Ballona Lagoon to the south. Parking is not permitted along Canal Street.

- Galleon Street – Galleon Street is a short undivided local street that runs east/west between Pacific Avenue and Esplanade, just west of the Venice Canal/Ballona Lagoon. Parking is permitted on both sides of the street, though some restrictions are present along several properties.

- Hurricane Street – Hurricane Street is a short undivided local street that runs east/west between Ocean Front Walk and Esplanade, just west of the Venice Canal/Ballona Lagoon. The street terminates adjacent to the project site and parking is permitted on both sides of the street.

- Lincoln Boulevard (SR 1) – SR 1 is an arterial street that runs north/south in the study area and it generally provides four travel lanes. Metered parking is available on both sides of the street and the speed limit is 35 MPH.

- Marquesas Way – Marquesas Way is a short 4-lane secondary street that runs east/west and connects Via Dolce and Via Marina. Parking is permitted on the east side of the street and the speed limit is 25 MPH.

- Pacific Avenue – Pacific Avenue is a 2-lane secondary arterial that runs north/south between Barnard Way to the north and Via Marina to the south. Between Washington Boulevard and Hurricane Street, parking is restricted along the east side of the street but it is unrestricted on the north side. The posted speed limit within this segment is 30 MPH.

- Via Marina – Via Marina is a 4-lane street that runs north/south between Washington Boulevard and Pacific Avenue. No parking is allowed on either side of the street and the speed limit is 40 MPH.

- Via Dolce – Via Dolce is a secondary arterial that runs north/south between Washington Boulevard and Marquesas Way. It includes two northbound lanes and one southbound lane, plus bicycle lanes. Parking is allowed on both sides of the street and the speed limit is 35 MPH.

- Washington Boulevard – Washington Boulevard is a Major Highway Class II arterial street that runs east/west between Venice Beach and the City of Whittier. It generally provides four travel lanes plus bicycle lanes. Metered parking is generally available on both sides of the street. The speed limit is 35 MPH.

The City of Los Angeles allows major and secondary arterials to be used as truck routes. The City's policy is to allow trucks to also travel in a "reasonable fashion" to and from a work site, including over collector and local streets.

EXISTING TRANSIT SYSTEM

Transit service within the study area is provided as follows:

- Metro Lines 108 and 358 operate on Pacific Avenue between Via Marina and Washington Boulevard and along Washington Boulevard between Pacific Avenue and Palawan Way. The lines run between Marina del Rey and Pico Rivera, with Line 358 providing limited stop service during the peak periods.
- Culver City Bus Line 1 provides service on Washington Boulevard between Venice and the West Los Angeles Transit Center.
- Commuter Express Line 437 is operated by LAODT and runs on Via Dolce and Pacific Avenue in the project area. This line runs between Marina del Rey and downtown Los Angeles.

PROJECT TRAFFIC PROJECTIONS – CONSTRUCTION-PERIOD

The traffic projections for the proposed project were developed using three steps: estimating the trip generation of the project, determining trip distribution, and assigning the project traffic to the roadway system. The information used in this analysis was provided by the Los Angeles Bureau of Engineering (LABOE) and the project team.

Construction of the project is planned to begin in March 2018 and is expected to take approximately two years to complete, ending in 2020. The construction involves several key phases, which may overlap, as described below:

1. Stages 1-2: Mobilization, Site Preparation, and Excavation – three to four months (155 days), including approximately two to three months of soil hauling;
2. Stage 3: Pump Station Foundation/Electrical – nine to 10 months;
3. Stage 4: Diversion Structure – four to six months; and
4. Stages 5-6: Pump Station Integration/Finishing – two to four months.

Construction activities will be limited to the hours from 8:00 AM to 6:00 PM on weekdays and Saturdays. No construction is permitted on Sundays and holidays. Soil trucks are proposed to be at the project site only between 9:00 AM and 4:00 PM. The use of the pile driver, grader and jackhammer construction equipment would only occur between 9:00 AM to 3:30 PM. Workers would park at an off-site location and be shuttled to and from the project site each work day. While no specific off-site location has been identified at this time, it would likely lie within five miles of the project site. The selected contractor would be required to identify and secure a suitable location. Worker shuttles are generally expected to depart the site between 5:00 and 6:00 PM. On days when soil export is occurring, workers would all be on-site before soil trucks begin

to arrive and would remain on-site until after the last soil export truck departs. Table 2 presents the estimated vehicle trip generation at the project site during the analyzed peak hours and on a typical weekday.

Soil Haul Trucks

Figure 1 shows the three laydown areas that will be used during construction for material and equipment storage: Laydown Area 1 is at 128 Hurricane Street, Laydown Area 2 occupies two County-owned properties at 3819 and 3821 Via Dolce that lie directly east of the VAPP site across the Grand Canal, and Laydown Area 3 is a City-owned property at 9940 Jefferson Boulevard in Culver City. Peak hauling activity is anticipated to occur during Stages 1 and 2 when the site preparation and excavation occur and during Stage 3, when soil will be needed to backfill the site once the major infrastructure is in place. It is anticipated that the site excavation would involve the removal of approximately 10,000 cubic yards (CY) of earth over a 2- to 3-month period during Stages 1 and 2. Approximately 2,300 CY would be stockpiled at Laydown Area 1 and approximately 7,700 CY would be transported off-site and stockpiled at Laydown Area 3. It is expected that approximately half of this soil (3,850 CY) will be returned to the project site and used as backfill. Upon project completion, the remaining 3,850 CY of soil stockpiled at Laydown Area 3 would be exported to an area landfill, such as Sunshine Canyon. These activities are estimated to generate up to 24 truckloads of soil per day. This equates to 48 1-way trips (24 inbound, 24 outbound) on the peak days of activity. Applying a Passenger Car Equivalent (PCE) factor of 2.0 for these heavy trucks to account for their influence on the traffic stream (that is, they occupy additional road space and have different operating capabilities compared with passenger cars), these 48 1-way trips would be 96 1-way PCE trips.

The capacity of soil hauling trucks used is expected to be seven CY or 10 CY. If each truck were to carry seven CY of soil and, the 10,000 CY of export soil would require a total of approximately 1,430 truckloads or 2,860 1-way trips. The larger trucks would require approximately 1,000 truckloads or 2,000 1-way trips. Of this, approximately 1,540 or 2,200 1-way truck trips would occur between the project site and Laydown Area 3 to export 7,700 CY of soil, the difference being whether trucks used have a capacity of seven CY or 10 CY. Under the scenario which includes return of up to half of that soil as backfill at the project site, an additional 770 to 1,100 1-way truck trips would occur.

To account for the possibility of less-than-full loads, soil expansion or other factors, as many as 35% more total soil-hauling truck trips may be required, yielding estimates of up to approximately 2,970 or 2,080 1-way truck trips to export soil (with seven or 10 CY trucks) and up to 1,486 or 1,040 1-way truck trips to import soil (with seven or 10 CY trucks).

Equipment and Delivery Trucks

In addition to soil haul trucks, the project would generate equipment and delivery truck trips during each phase of construction. Such trips are estimated to be two per day (four PCE trips per

day) and could include cranes, bulldozers, excavators, and other large items of machinery. These materials would be delivered to the site and stored on-site.

Construction Employees

The number of construction workers would vary throughout the construction period. During Stages 1 and 2 and Stage 4, approximately eight workers would be on-site each day. Stage 3 would require up to 20 workers on-site daily. Stages 5 and 6 would require approximately six workers per day. Parking for all construction workers will be provided off-site and they would be transported to/from the project site by 10- to 15-passenger shuttles or vans. The off-site location for workers traveling to the site via shuttle is currently unknown but is assumed to be within five miles and lie south of the project site.

Construction Period Trip Generation Estimates

Based on the aforementioned information, a construction period trip generation analysis was conducted to estimate daily peak PCE trips. It was found that the soil hauling during Stages 1 to 3 would generate the highest number of daily trips to and from the site. During the initial phase, as shown in Table 2, a maximum net increase of 104 daily 1-way PCE trips is estimated to and from the site, composed of 48 1-way soil truck trips, four 1-way delivery trips and two 1-way worker shuttle trips. During Stage 3, up to 58 daily vehicle trips would occur, composed of 48 1-way soil truck trips, four 1-way delivery trips and four 1-way worker shuttle trips, as shown in Table 2. Considering the PCE factor of 2.0 for the truck trips, this stage of construction would result in up to 108 daily PCE trips. The soil hauling trips would be spread across the day and are estimated to occur at up to three loads per hour (six 1-way trips). Employee shuttle trips would occur before soil hauling activities begin each day, and after they end. As such, site-generated traffic would be quite low during the weekday AM and PM peak hours.

Potential Haul Routes

Trucks traveling to and from the site will use a specific haul route, which will be defined once the storage site for the export soil has been definitely identified. Laydown Area 3 is a City-owned property at 9940 Jefferson Boulevard. Access to Laydown Area 3 would follow Hurricane Street, Canal Court, Galleon Street, Pacific Avenue, Washington Boulevard, Lincoln Boulevard, and other streets such as Slauson Avenue, Sepulveda Boulevard and Jefferson Boulevard. The final haul route will be selected in consultation with LADOT and Culver City.

NEIGHBORHOOD STREET IMPACTS

This section assesses the likelihood of potential traffic impacts from construction activity on local streets within the study area. The City of Los Angeles has established threshold criteria to determine significant traffic impacts of a proposed project in its jurisdiction. Although the methodologies and the criteria to calculate volume-to-capacity (V/C) ratios for intersections are intended by LADOT to identify potential traffic impacts during operation, they can also be applied to construction periods.

Under the City of Los Angeles guidelines, a project would be considered to significantly impact a local residential street if the projected increase in daily traffic volumes is as follows:

Projected Average Daily Traffic with Project (Final ADT)	**Project-Related Increase in ADT**
0 to 999	120 or more
1,000 to 1,999	12% or more of final ADT
2,000 to 2,999	10% or more of final ADT
3,000 or more	8% or more of final ADT

Based on these guidelines, VAPP construction activity would not result in any significant traffic impacts on study area streets because the maximum number of daily project trips is estimated to be 108 1-way trips, which is below the minimum threshold volume considered significant.

PROJECT IMPACT ANALYSIS – OPERATIONAL PERIOD

Once VAPP becomes operational, site-generated traffic is not expected to change. The current staffing level, two employees at all times, working in three eight-hour shifts each day, will be maintained. Thus, no additional traffic would be generated the impact would be considered less than significant.

CMP AND FREEWAY ANALYSIS

2010 Congestion Management Program (CMP) for Los Angeles County (Metro, July 2010) provides procedures for conducting transportation impact analyses for the regional transportation system. The CMP requires that when an environmental impact report is prepared for a project, traffic and transit impact analyses be conducted for select regional facilities based on the quantity of project traffic expected to use these facilities. The CMP guidelines require that the first issue addressed is the determination of the geographic scope of the study area. The criteria for determining the study area for CMP arterial monitoring intersections and for freeway monitoring locations are:

- All CMP arterial monitoring intersections where the proposed project will add 50 or more trips during either the AM or PM weekday peak hours of adjacent street traffic.
- All CMP mainline freeway monitoring locations where the proposed project will add 150 or more trips, in either direction, during either the AM or PM weekday peak hours.

The CMP arterial monitoring intersection nearest to the project site is located at Lincoln and SR 90. Based on the project trip generation previously presented, the proposed project would not add more than 50 vehicles per hour (vph) at any CMP monitoring intersections during the peak hours, nor more than 150 1-way trips on a CMP freeway monitoring station. Thus, no further CMP analysis is required and these impacts are considered less than significant.

SUMMARY AND CONCLUSIONS

Fehr & Peers conducted a trip generation assessment for the VAPP Project to evaluate the potential for the project to significantly impact traffic conditions, according to the City's adopted thresholds of significance. The key findings and conclusions of the study are summarized below:

- Construction of the proposed project would occur in six stages, which would result in temporary increases in traffic at the site for approximately 24 months between 2018 and 2020. The greatest number of daily trips would occur during Stages 1 and 2 when soil would be excavated from the site and exported, and in Stage 3 when a portion of it would be returned to the site as backfill. During each of these stages, an estimated 24 truckloads of soil would be taken from or delivered to the site per day.

- PCE factors were applied to the estimated number of soil and delivery truck trips to develop project trip generation estimates with PCE, and the estimated PCE trips were used in the traffic impact analysis. Trip generation estimates included employee trips, delivery truck trips and soil hauling truck trips. It is estimated that construction of the proposed project would generate up to 104 1-way daily PCE trips at the project site during Stages 1 and 2 and up to 108 1-way daily PCE trips during Stage 3. Daily trips during Stages 4 through 6 would be considerably lower.

- Traffic impacts during construction were found to be less than significant, based on the volume of traffic generated.

TABLE 1
EXISTING SURFACE STREET CHARACTERISTICS

Street	From	To	Through Lanes		Median Type	Bicycle Facility	Speed Limit
			NB/EB	SB/WB			
Canal Court	Ballona Lagoon	Galleon Street	1	1	--	--	25
Galleon Street	Esplanade	Pacific Avenue	1	1	--	--	25
Hurricane Street	Esplanade	Pacific Avenue	1	1	--	--	25
Marquesas Way	Via Dolce	Via Marina	2	2	DY	--	25
Pacific Avenue	Washington Boulevard	Lighthouse Street	1	1	--	--	25
Via Dolce	Washington Boulevard	Marquesas Way	2	1	DY	LANES	35
Via Marina	Washington Boulevard	Marquesas Way	2	2	RM	--	40
Washington Boulevard	Pacific Avenue	Lincoln Boulevard	2	2	DY	LANES	35

Notes: RM = Raised Median DY = Double Yellow Centerline

TABLE 2
DAILY TRIP GENERATION ESTIMATES BY CONSTRUCTION STAGE
VENICE AUXILIARY PUMPING PLANT

Stage	Stage Name	Duration [Days]	Daily Workers by Phase	Worker Trips at Site per Day *	Soil Haul Truck Trips per Day **	Other Truck Trips per Day	Total Daily 1-Way Vehicle Trips	Total Daily 1-Way PCE Trips
1-2	**Mobilization/Site Prep**	**30**	3	4		2	6	8
	Excavation/Shoring	**95**	8	4	48	2	54	104
3	**Pump Station Foundation**	**50**	20	8		2	10	12
	Pump Station and	**245**	20	8	48	2	58	108
4	**Diversion Structure**	**64**	8	4		2	6	8
5-6	**Pump Station Integration**	**85**	6	4		2	6	8

* Assumes that employees will be shuttled to/from the project site after parking off-site. Capacity of shuttle is assumed to be 15 passengers or less.

** 10,000 cubic yards of soil will be exported during Stages 1 and 2, including 2,300 CY to Laydown Area 1 and 7,700 CY to Laydown Area 3.
If needed, up to 3,850 CY will be imported (returned) to the site for backfill. The balance of the exported soil is expected to be used as cover at an area landfill.

Appendix K

Phase I Environmental Site Assessment (128 Hurricane Street)

PHASE I
ENVIRONMENTAL SITE ASSESSMENT
128 HURRICANE STREET
VENICE, CALIFORNIA 90292

PREPARED FOR:
Brown and Caldwell
18200 Von Karman Avenue, #400
Irvine, California 92612

City of Los Angeles
Department of Public Works
1149 South Broadway, Suite 600, Mail Stop 939
Los Angeles, California 90015

PREPARED BY:
Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
475 Goddard, Suite 200
Irvine, California 92618

June 21, 2016
Project No. 209666001

June 21, 2016
Project No. 209666001

Mr. Cleve Lee
Brown and Caldwell
18200 Von Karman Avenue, #400
Irvine, California 92612

Subject: Phase I Environmental Site Assessment
128 Hurricane Street
Venice, California 90292

Dear Mr. Lee:

In general accordance with our proposal dated April 8, 2016, Ninyo & Moore has performed a Phase I Environmental Site Assessment of the above-referenced site. The attached report presents our methodology, findings, opinions, and conclusions regarding the environmental conditions at the site. We appreciate the opportunity to be of service to you on this project.

Sincerely,
NINYO & MOORE

Dennis Fee
Staff Environmental Engineer

Patrick Cullip
Project Engineer

John Jay Roberts, PG, CEG
Senior Geologist

DWF/PJC/JJR/mtf/sc

Distribution: (4) Addressee (3 hard copies; 1 via e-mail)

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EXECUTIVE SUMMARY

Ninyo & Moore conducted a Phase I Environmental Site Assessment (ESA) of the approximately 3,400 square-foot property at 128 Hurricane Street in the community of Venice, Los Angeles, California (site; Figure 1). Ninyo & Moore was contracted by Brown and Caldwell to conduct this assessment on behalf of the City of Los Angeles (the user) in general accordance with our proposal dated April 8, 2016. Historical research, document review, and site assessment activities were conducted in April and May, 2016. In general, the following items were noted.

- The site is assigned the Los Angeles County Assessor's Parcel Number (APN) 422-5010-016. Based on the environmental lien search, the site is currently owned by Sharon R McQueen and Daniel P Whalen Trustees of McQueen-Whalen Revocable Trust, and is not occupied.

- The site has not been developed with structures from at least 1928 through the time of this report.

- The area surrounding the site was developed with oil production facilities from at least 1938 through 1952, and with residential properties from at least 1963 through the time of this report. The Venice Pumping Plant appeared adjacent to the east of the site by at least 1963.

- The site address was not listed on searched environmental databases.

- Site access was not granted; therefore, a site reconnaissance was conducted from public rights-of way. This is considered a significant physical limitation and data gap. Two groundwater monitoring wells were observed on Hurricane Street, adjacent to the north and northeast of the site. One pole-mounted transformer was observed adjacent to the east of the site.

- To date, Ninyo & Moore has not received an owner questionnaire from the site owners, Sharon R McQueen and Daniel P Whalen Trustees. This is considered a data gap. If information from the completed owner questionnaire is received that alters the conclusions and recommendations of this report, an addendum will be prepared.

- According to the State of California, Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR) well finder website, a historical oil production well is present on the site (McDonald 2, API 03713842). Based on a review of documents provided by the user, the "McDonald 2" well was abandoned in 1932. A permit to re-abandon the well was issued in 2002 and renewed annually from 2004 to 2008. According to DOGGR, the well has not been re-abandoned. This represents a REC.

- According to the ZIMAS website, the site lies within a methane zone. This is considered a REC.

- Based on a review of documents provided by the user, a geotechnical investigation conducted on the site in 2006 found two concrete vaults and concentrations of petroleum hydrocarbons in the upper 2 feet of soil at up to 6,500 parts per million (ppm). Records indicating the removal, mixing, stockpiling, testing, and/or disposal of the contaminated soil were not found. This is considered a REC.

- Based on historical research and results of the Vapor Encroachment Screening Matrix (VESM) conducted by Ninyo & Moore, a VEC is likely to currently exist beneath the site.

- Off-site concerns were not observed based on historical documents review.

Ninyo & Moore has performed a Phase I ESA in conformance with the scope and limitations of ASTM Practice E 1527-13 of the property at 128 Hurricane Street in the community of Venice, Los Angeles, California, the site. Any exception to, or deletions from, this practice are described in Section 1.4 of this report. This assessment has revealed the following RECs in connection with the property:

- The presence of an abandoned oil well (McDonald 2, API 03713842) on the site.

- The site lies within a methane zone.

- The results of geotechnical investigation in 2006 indicate high concentrations of petroleum hydrocarbons in soil on site.

- The results of the VESM indicate that a possible VEC currently exists beneath the site.

Ninyo & Moore recommends a limited subsurface investigation to evaluate the RECs and VEC.

1. INTRODUCTION

Ninyo & Moore conducted a Phase I Environmental Site Assessment (ESA) of the approximate 3,400 square-foot (sf) property at 128 Hurricane Street, in the community of Venice, Los Angeles, California (site; Figure 1). Ninyo & Moore was contracted by Brown & Caldwell (client) on behalf of the City of Los Angeles (the user) to conduct this assessment in general accordance with our proposal dated April 8, 2016. The following sections identify the purpose, involved parties, scope of services, and limitations and exceptions associated with this Phase I ESA.

1.1. Purpose

The objective of the Phase I ESA is to evaluate, in general accordance with the process described in ASTM International (ASTM) Practice E 1527-13, recognized environmental conditions (RECs), which are defined by ASTM as "the presence or likely presence of any hazardous substance or petroleum products in, on, or at a property: (1) due to a release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment."

As defined in ASTM E 1527-13, de minimis conditions are not considered RECs. A de minimis condition is defined as "a condition that generally does not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies."

Identification of RECs fall into three categories: existing RECs (as defined above); Historical RECs (HRECs); or Controlled RECs (CRECs).

- HREC – A HREC is defined as "a past release of any hazardous substance or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations [AULs], institutional controls, or engineering controls)."

- CREC – A CREC is defined as "recognized environmental conditions resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria

established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, AULs, institutional controls, or engineering controls)."

1.2. Involved Parties

Mr. Dennis Fee of Ninyo & Moore performed regulatory inquiries, historical research, and document review. Mr. Patrick Cullip of Ninyo & Moore performed the site reconnaissance on June 17, 2016. Messrs. Cullip and John Jay Roberts of Ninyo & Moore performed project oversight and quality review. Resumes of professionals conducting this Phase I ESA are provided in Appendix A. The Phase I ESA was prepared for the City of Los Angeles (user).

1.3. Scope of Services

Ninyo & Moore's scope of services for this Phase I ESA included the following:

- Review readily available maps and reports pertaining to the site.
- Review available lease and title records for the site to evaluate probable past site uses and their possible impact on the current environmental status of the site.
- Conduct an interview if available with a property representative regarding the environmental status of the site.
- Perform a site reconnaissance to document existing hazardous materials handling, storage, and disposal practices, areas of possibly contaminated surficial soil or surface water, possible sources of polychlorinated biphenyls (PCBs), USTs and aboveground storage tanks (ASTs), and possible sources of contamination from activities at the site and adjacent properties. Ninyo & Moore was not provided access to the site by the owner to perform the site reconnaissance.
- Review readily available historical documents, including aerial photographs, Sanborn Fire Insurance Rate maps, building department records, historical topographic maps, and reverse city directories, as applicable.
- Review federal, state, tribal, and local regulatory agency databases for the site and for properties located within a specified radius of the site. The databases document locations of known hazardous waste sites, landfills, leaking underground storage tanks (LUSTs), and permitted facilities that utilize USTs.
- Review of readily available local regulatory agency files for the site.

- Prepare this Phase I ESA report for the site. The Phase I ESA report documents the findings and provides opinions and recommendations regarding possible environmental impacts at the site. Color photographs are provided in the report.

1.4. Limitations and Exceptions

The environmental services described in this report have been conducted in general accordance with current regulatory guidelines and the standard-of-care exercised by environmental consultants performing similar work in the project area. No warranty, expressed or implied, is made regarding the professional opinions presented in this report.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires any additional information or has questions regarding the content, interpretations presented, or completeness of this document.

The findings, opinions, and conclusions are based on an analysis of the observed site conditions and the referenced literature. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject property or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control. Ninyo & Moore cannot warrant or guarantee that not finding indicators of any particular hazardous material means that this particular hazardous material or any other hazardous materials do not exist on the site. Additional research, including invasive testing, can reduce the uncertainty, but no techniques now commonly employed can eliminate the uncertainty altogether.

1.5. Special Terms and Conditions

This study did not include an evaluation of geotechnical conditions or potential geologic hazards. In addition, unless otherwise indicated in this report, this Phase I ESA does not include analysis of the following: asbestos-containing materials, methane gas, radon, lead-based paint, lead in drinking water, underground pipelines, wetlands, regulatory compliance,

cultural and historic resources, industrial hygiene, health and safety, ecological resources, endangered species, indoor air quality, or high voltage power lines.

1.6. User Reliance

This report may be relied upon by, and is intended exclusively for the client and the City of Los Angeles. Any use or reuse of the findings, opinions, and/or conclusions of this report by parties other than these is undertaken at said parties' sole risk.

1.7. Physical Limitations

Ninyo & Moore was not provided access to the site by the owner to perform the site reconnaissance. This is considered a significant physical limitation.

1.8. Data Gaps

The following data gaps were encountered during the preparation of this Phase I ESA. If information from these data gaps alters the conclusions and recommendations of this report, an addendum will be prepared.

- Ninyo & Moore was not provided access to the site by the owner to perform the site reconnaissance.
- The owner was not available for an interview concerning the past and current conditions of the site.

2. SITE DESCRIPTION

The following sections describe the location, general characteristics and current uses of the site, the structures present at the site, the occupants of the site, the heating and cooling systems utilized in the site buildings, the sewage disposal system, and the potable water provider for the site. The current uses of adjacent properties are also described. A site location map is presented as Figure 1. An aerial photograph depicting the site and vicinity are presented as Figure 2. Photographs of the site taken during the site reconnaissance are presented in Appendix B.

2.1. General Site Characteristics

The site consists of an approximate 3,400 sf, irregularly-shaped property at 128 Hurricane Street in the community of Venice, Los Angeles, California. The site is assigned the Los Angeles County Assessor's Parcel Number (APN) 422-5010-016.

2.1.1. Site Description

The site is currently a vacant lot, and was recently used for storage of vehicles and miscellaneous items during the construction of various public construction projects, based on a review of aerial photographs, Google Earth, the site reconnaissance, and information provided by the City.

2.1.2. Occupants

The site is currently unoccupied.

2.1.3. Roads

The site is bound to the north by Hurricane Street. The site is bound to the east by Canal Court.

2.1.4. Heating and Cooling Systems

Heating and cooling systems in the site vicinity are powered by natural gas and electricity provided by Southern California Gas Company and the Los Angeles Department of Water and Power (LADWP), respectively.

2.1.5. Sewage Disposal/Septic Systems

Sewage disposal is provided to the site vicinity by the City of Los Angeles Department of Public Works (LACDPW).

2.1.6. Potable Water

Potable water is provided to the site vicinity by LADWP.

2.1.7. Other Utilities

Other utilities are not currently provided to the site.

2.2. Adjoining Properties

Table 1 lists the properties adjoining the site and associated land use. Based on the nature of the adjacent properties and observations made during our site reconnaissance, it is unlikely that these properties have impacted the environmental integrity of the site.

Table 1 – Adjoining Properties

Location	Current Occupant(s)
North	Residential Properties (primarily houses) and the Esplanade, a City-owned public right-of-way (ROW), beyond which are Via Dolce and apartment buildings.
East	Venice Pumping Plant
South	The Esplanade, beyond which is Ballona Lagoon
West	Residential Properties (houses and apartment buildings), beyond which are Venice Beach and the Pacific Ocean.

3. USER PROVIDED INFORMATION

The following sections summarize information provided by the user to assist the environmental professional in identifying the possibility of RECs in connection with the site, and to fulfill the user's responsibilities in accordance with Section 6 of ASTM Practice E 1527-13. Ninyo & Moore received an All Appropriate Inquiries (AAI) Questionnaire, completed by Mr. William Jones, representative of the user. The questionnaire is included in Appendix C.

3.1. Current Title Information

Title information was not provided by the user.

3.2. Environmental Liens or Activity and Use Limitations (AULs)

Mr. Jones indicated he was not aware of environmental liens or AULs for the site. Ninyo & Moore requested an environmental lien search, which is summarized in Section 5.7.

3.3. Specialized Knowledge

Mr. Jones indicated that there is an abandoned oil well on site, and soils tested in advance of demolition activities were conducted at the southern end of the property.

3.4. Commonly Known or Reasonably Ascertainable Information

Mr. Jones indicated he has no commonly known or reasonably ascertainable information regarding the environmental conditions of the site.

3.5. Valuation Reduction for Environmental Issues

Mr. Jones indicated the relationship of the purchase price to the fair market value of the property was unknown.

3.6. Presence or Likely Presence of Contamination

Mr. Jones indicated that there is likely to be contamination on the property due it former use as an oil production site.

3.7. Other User Provided Information

The user provided Ninyo & Moore with previous documents relating to the environmental integrity of the site. The first set of documents provides information on a geotechnical investigation conducted at the site in 2006. The second set of documents provides information on the abandonment of a formerly active oil well on the site. Both of these documents are summarized in Section 5.8. The user also provided a Phase I Questionnaire completed by the former occupant, Mr. Jones of the City of Los Angeles Bureau of Engineering. This questionnaire is summarized in Section 9.

4. PHYSICAL SETTING

The following sections include discussions of topographic, geologic, hydrogeologic conditions, and wetlands characterization in the vicinity of the site, based upon our document review and our visual reconnaissance of the site and adjacent areas.

4.1. Topographic Conditions

Based on a review of the United States Geological Survey (USGS), 7.5-Minute Topographic Quadrangle Map Series, Venice, California, 1981 photorevised from 1978, the site is situated at an elevation of approximately 5 feet above mean sea level. The site and immediate vicinity are relatively flat.

4.2. Geologic and Soil Conditions

The site is located at the northwest edge of the Peninsular Ranges Geomorphic Province of California. Landmarks in the vicinity of the site include the Los Angeles Basin to the east, the Santa Monica Bay to the southwest, and the Santa Monica Mountains to the northwest.

According to a previous subsurface investigation conducted at the site in 2006 (LADPW, 2006), the site is underlain by fill consisting primarily of brown silty sand with fragments of

broken glass and concrete. The site vicinity is expected to be underlain primarily by fill due to the filling and grading of former La Ballona Wetlands estuary in the Marina del Rey area.

4.3. Site Hydrology

The following sections discuss the site hydrology in terms of surface water and groundwater.

4.3.1. Surface Waters

Natural surface water bodies, including ponds, streams, or other bodies of water, are not present on the site. The Ballona Lagoon lies south and adjacent to the site. The Pacific Ocean is approximately 0.22 mile south and west of the site. Marina del Rey is approximately 0.22 mile east of the site.

4.3.2. Wetlands

Based on information obtained from the United States Fish and Wildlife Service webpage (http://www.fws.gov/wetlands/data/Mapper.html), portions of the Ballona Lagoon, south and adjacent to the site, are considered estuarine and marine wetland habitat.

4.3.3. Groundwater

The site is within the Santa Monica Subbasin of the Coastal Plain of Los Angeles Groundwater Basin. Groundwater information for the site was not readily available. Ninyo & Moore reviewed the State Water Resources Control Board's (SWRCB's) GeoTracker website (GeoTracker) for groundwater information in the site vicinity. One facility with groundwater data was located 0.72 mile southeast of the site: Del Rey Fuel, LLC at 13800 Bora Bora Way. According to GeoTracker, groundwater was measured on November 6, 2015 at approximately 6.9 to 7.5 feet below ground surface (bgs). Groundwater is expected to flow to the southwest, towards the Pacific Ocean (McAlister GeoScience, 2016).

5. HISTORICAL USE INFORMATION

Ninyo & Moore conducted a historical record search for both the site and surrounding areas. This review included one or more of the following sources that were found to be both reasonably

ascertainable and useful for the purposes of this Phase I ESA: historical aerial photographs, historical fire insurance maps, historical city directories, building permits, topographic maps, and zoning/land use records. The following table lists the historical data types reviewed for this Phase I ESA, their source, their respective dates, and data failures encountered during our review, if any.

Table 2 – Summary of Historical Records Reviewed

Data Type	Source	Source Dates	Data Limitation
Historical Aerial Photographs	Environmental Data Resources, Inc.	1928-2012	None
City Directories	Environmental Data Resources, Inc.	1920-2013	No listings for the site
Sanborn Fire Insurance Maps	Environmental Data Resources, Inc.	1918-1970	None
Topographic Map	Environmental Data Resources, Inc., USGS 7.5-Minute Topographic Quadrangle Map Series, Venice, California	1896-2012	None
Note: USGS – United States Geological Survey			

Although one or more of the sources listed above provided limited information with regards to the historical use of the site, the information gathered from the sources reviewed as a whole is adequate to develop a history of the previous uses of the site and the surrounding area in accordance with Section 8.3 of ASTM Practice E 1527-13.

5.1. Historical Aerial Photographs

Historical aerial photographs dated 1928 to 2012 were provided by Environmental Data Resources, Inc. (EDR). Table 3 presents a summary of our review (Appendix D).

Table 3 – Aerial Photograph Review

Photograph Date	Subject Property	Site Vicinity	
1928	The site appeared undeveloped.	North	Hurricane Street and other roads were present.
		East	A canal was present.
		West	Residential structures were present along the coastline.
		South	Ballona Lagoon and residential structures were present.

Table 3 – Aerial Photograph Review

Photograph Date	Subject Property	Site Vicinity	
1938, 1947, 1952	The site appeared similar to that observed in the 1928 aerial photograph.	North	An oil derrick was present to the northwest. Facilities related to oil production were present to the northeast. A crude oil AST was present adjacent to the west.
		East	
		West	
		South	An off-shore oil derrick was present in the estuary adjacent to the south.
1963	The site appeared similar to that observed in the 1952 aerial photograph.	North	Residential structures were under construction.
		East	The Venice Pumping Plant was present adjacent to the site.
		West	The site vicinity was similar to that observed in the 1952 aerial photograph.
		South	
1972, 1983, 1989, 1994	The site appeared similar to that observed in the 1963 aerial photograph.	North	Additional residential structures were present.
		East	The site vicinity was similar to that observed in the 1963 aerial photograph
		West	Additional residential structures were present adjacent to the site.
		South	The site vicinity was similar to that observed in the 1963 aerial photograph
2002, 2005, 2009, 2010, 2012	The site appeared similar to that observed in the 1989 aerial photograph, with a trailer appearing in the 2002 and 2010 photographs.	North	The site vicinity was highly developed with residential properties. The canal (Ballona Lagoon) remained along the same trajectory.
		East	
		West	
		South	

Based on aerial photograph review, the site was vacant from at least 1928 through 2012. The site vicinity was mostly vacant land in 1928. The site vicinity was developed with oil production facilities from at least 1938 through 1952, and with residential properties from at least 1963 through 2012. The Venice Pumping Plant was present adjacent to the east of the site by at least 1963. Hurricane Street and Canal Court were in their current location by 1938. The historic presence of oil production facilities in the site vicinity is further discussed in Section 5.3.

5.2. Sanborn Fire Insurance Rate Maps

Ninyo & Moore requested Sanborn Fire Insurance Rate Maps for the site from EDR. Sanborn Fire Insurance Map reports were provided from EDR dating from 1918, 1950, and 1970. The Certified Sanborn Map Report is provided in Appendix D. A summary of our review of the Sanborn Fire Insurance Maps is as follows:

1918 Sanborn Map – The site was not depicted in the 1918 Sanborn map. The Sanborn Map depicts areas to the south and west of the site. The site vicinity was lightly developed with residential properties. A lagoon appeared to the south. Hurricane Street was formerly named Progress Club Avenue and trended along its current path.

1950 Sanborn Map – The site was not depicted in the 1950 Sanborn map, and included the same area shown in the 1918 Sanborn map. The site vicinity was developed with additional residential structures. Hurricane Street was formerly named 39th Avenue and trended along its current path. Oil derricks appeared to the southeast of the site.

1970 Sanborn Maps – The site was not depicted in the 1970 Sanborn map, and included the same area shown in the 1918 and 1950 Sanborn maps. Additional residential structures were present in the site vicinity. Hurricane Street was named as it is currently.

Based on the review of historical Sanborn Fire Insurance Maps, the site vicinity was successively more developed with residential properties from 1918 through 1970. The Ballona Lagoon remained relatively unchanged from 1918 through 1970. The site, as well as areas to the north and east of the site, was not depicted in the Sanborn maps provided. RECs were not found for the site from reviewing the available Sanborn Maps.

5.3. Oil and Gas Maps and Methane

According to the State of California, Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR), Well Finder website (DOGGR, 2016), the site lies within the administrative boundaries of the Playa Del Rey Oil Field. One oil well was observed on site, with American Petroleum Institute (API) number 03713842. The well is plugged and abandoned. Numerous oil wells, most of which are plugged and abandoned, were observed within one mile of the site. The presence of a historical oil well on site represents a REC. The oil well is discussed in more detail in Section 5.8.

Based on the City of Los Angeles Zoning Information and Map Access System (ZIMAS) website, the site lies within a methane zone. This is considered a REC for the site.

5.4. City Directories

EDR provided a historical city directory report for the site and site vicinity from 1920 through 2013. The site was not listed under the city directory. Adjacent properties were listed as primarily residential properties. The city directories are provided in Appendix D.

Based on information from the city directories, the site was not occupied from at least 1920 to 2013. RECs were not identified in the city directories reviewed.

5.5. Building Permits

Ninyo & Moore reviewed records on file for the site at the City Los Angeles Department of Building and Safety (LADBS). The following is a summary of our review.

An electrical permit for a 200 amp temporary power pole was issued by the LADBS on June 19, 2013, but was withdrawn the same day. Additional building permits were not found for the site. The review of building permits for the site was not indicative of a REC for the site.

5.6. Historical Topographic Maps

Historical topographic maps dated 1896, 1923, 1924, 1934, 1947 photorevised 1950, 1963 photorevised 1964, 1972, 1978 photorevised 1981, and 2012 were provided by EDR. The historical topographic maps from 1896 showed the site vicinity as being a part of the La Ballona Wetlands, which was more extensive than it is today. The historical topographic maps from 1923 through 1934 showed a harbor was built. The historical topographic maps from 1964 to 2012 showed Marina del Rey in its current configuration. Structures were not observed on the site. The review of historical topographic maps was not indicative of a REC for the site. Copies of the historical topographic maps are included in Appendix D.

5.7. Environmental Liens Search

An environmental liens search was provided by EDR and dated April 15, 2016. According to the EDR Environmental LienSearch™ report, environmental liens or other AULs were not found for the site address. The current legal owner was listed as Sharon R McQueen and Daniel P Whalen Trustees of the McQueen-Whalen Revocable Trust. A copy of the EDR Environmental LienSearch™ report is included in Appendix D.

5.8. Previous Report and Documents

Previous reports and documents were provided to Ninyo & Moore for review by the user, the LADWP. The reports and documents are included in Appendix C. The following is a summary of our review.

A Geotechnical Investigation Summary Report, dated July 24, 2006, and prepared by the City of Los Angeles, Bureau of Engineering, Geotechnical Services Division (GSD) was provided to Ninyo & Moore for review. During the geotechnical investigation, two hand auger borings (B-1 and B-2) were advanced within the vicinity of two concrete vaults to determine the extent of contamination, if any, from the vaults. The purpose of the vaults was not provided. Obvious visual evidence of contamination from the vaults was not observed. The borings encountered fill consisting of brown silty sand with some fragments of broken glass up to the maximum depth explored of 2 feet bgs. Samples were analyzed for petroleum hydrocarbons, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and Title 22 Metals. The sample from B-1 was found to contain concentrations of petroleum hydrocarbons at 6,500 parts per million (ppm), and the sample from B-2 was found to contain concentrations of petroleum hydrocarbons at 100 ppm. GSD recommended disposing of the concrete vaults and contaminated soil at a landfill. GSD also recommended confirmation sampling after removal of the contaminated soil. According to information provided by the City, the two concrete vaults were removed as part of the Ballona Lagoon Enhancement Phase IIIA project. The City also indicated requests were not made to GSD to observe the removal, mixing, stockpiling, testing and/or disposal of the contaminated soil, and a follow-up report was not made. The presence of petroleum hydrocarbon-impacted soil on site represents a REC.

Various documents concerning the abandonment of former oil production well on site were also provided to Ninyo & Moore for review. The well is named “McDonald 2” and last was producing at an approximate daily rate of 50 barrels of oil and 200 barrels of water in January 1931. The well went dry, and was abandoned in May 1932. The bottom of the hole was plugged at 2,018 feet bgs. Various cement plugs were emplaced in the hole, from 1996 to 1929 feet and 729 to 675 feet. All other spaces were filled with heavy mud. The hole had been cemented at deeper depths prior to this final abandonment. In May 2002, the DOGGR approved the re-abandonment of McDonald 2. The owner at the time wished to have the well abandoned according to present day abandonment standards so that the property could be sold. The reabandonment of McDonald 2 entailed having new cement plugs from 1,200 to 1,100 feet bgs, 980 to 880 feet bgs, and 696 to 596 feet bgs. All portions of the well not

plugged with cement were to be filled with clay-based mud. The permit to conduct well operations was subsequently renewed annually from 2004 to 2008. In each case, the site owner had not yet completed the reabandonment activities described in the initial reabandonment permit. According to the City, a representative of the City spoke with Jack Collinder of the DOGGR Cypress Division 1 on April 28, 2016, and was informed that the abandonment of McDonald 2 was not performed. Mr. Collinder also indicated the well is required to be re-abandoned if the site is to be used for other purposes than a laydown area. As described in Section 5.3, the presence of an abandoned oil well on site represents a REC.

6. ENVIRONMENTAL DATABASE REPORT REVIEW

EDR performed an environmental information database search dated April 13, 2016 (Appendix E). The EDR report included federal, state, and local databases. The following paragraphs describe the databases that contain noted properties of environmental concern, and include a discussion of the regulatory status of the facilities and potential environmental impact to the subject site. Based on hydrologic information obtained from the SWRCB *GeoTracker* website, groundwater within the site vicinity is estimated between 6.9 and 7.5 feet bgs. Groundwater in the site vicinity is expected to flow to the southwest towards the Pacific Ocean.

6.1. National Priorities List (NPL): Distance Searched – 1 mile

The NPL is the United States Environmental Protection Agency (EPA) database of uncontrolled or abandoned hazardous waste properties listed for priority remedial actions under the Superfund program.

Neither the site nor properties located within the searched distance were listed on this database.

6.2. Proposed and Delisted NPL: Distance Searched – 1 mile

The Proposed NPL database lists properties that are currently being evaluated for priority remedial actions for the Superfund program. The Delisted NPL database includes properties that are deleted from the NPL database based upon the National Oil and Hazardous Substances Pollution Contingency Plan. This deletion takes place after no further response to the NPL is appropriate.

Neither the site nor properties located within the searched distance were listed on this database.

6.3. Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) List: Distance Searched – ½ mile

The CERCLIS database contains properties which are either proposed or on the NPL and properties which are in the screening and assessment phase for possible inclusion on the NPL.

Neither the site nor properties located within the searched distance were listed on this database.

6.4. CERCLIS/No Further Remedial Action Planned (NFRAP) List: Distance Searched – ½ mile

CERCLIS sites designated as NFRAP have been removed from the CERCLIS database following an initial investigation where no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration.

Neither the site nor properties located within the searched distance were listed on this database.

6.5. Corrective Action Report: Distance Searched – 1 mile

The EPA maintains this database of *Resource Conservation and Recovery Act* (RCRA) facilities that are undergoing corrective action. A corrective action order is issued when a release of hazardous waste or constituents into the environment from a RCRA facility has occurred.

Neither the site nor properties located within the searched distance were listed on this database.

6.6. RCRA Treatment, Storage and Disposal (TSD) Facilities List: Distance Searched – ½ mile

The RCRA TSD database is a compilation by the EPA of facilities that report generation, storage, transportation, treatment, or disposal of hazardous waste.

Neither the site nor properties located within the searched distance were listed on this database.

6.7. RCRA Generators List: Distance Searched – Site and Adjacent

This list identifies facilities that generate hazardous waste as defined by RCRA. Inclusion on this list is for permitting purposes and is not indicative of a release.

The Los Angeles Pumping Plant #46 at 140 Hurricane Street, adjacent to the northeast and up-gradient of the site, was listed as a small-quantity hazardous materials generator. No violations were found for the Los Angeles Pumping Plant. This is not considered a REC for the site.

6.8. Emergency Response Notification System (ERNS) List: Distance Searched – Site

The ERNS database contains information of reported releases of oil and hazardous substances and is maintained by the EPA.

The site was not listed on this database.

6.9. United States Engineering Controls: Distance Searched – ½ mile

This database is an EPA listing of sites with engineering controls in place, such as various forms of caps, building foundations, liners, and treatment methods intended to eliminate pathways for regulated substances to enter environmental media or affect human health.

Neither the site nor properties located within the searched distance were listed on this database.

6.10. United States Institutional Controls: Distance Searched – ½ mile

This database is an EPA listing of sites with institutional controls in place, such as administrative measures, groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements, intended to prevent exposure to contaminants remaining on site.

Neither the site nor properties located within the searched distance were listed on this database.

6.11. State Sites: Distance Searched – 1 mile

The State Sites database consists of potential or confirmed hazardous substance release properties. Ninyo & Moore reviewed the EnviroStor database for this information.

The site was not listed on this database. The following three facilities located within the searched distance are listed on the EnviroStor database:

Facility and Address	Distance (feet)/ Direction from Site	Groundwater Gradient (General for Vicinity Flow)	Regulatory Status	Date of Last Action	REC (Yes/No)
Western Circuits Inc. 4138 Del Rey Avenue	0.38 mile north-northwest	Cross-gradient	Inactive	01/01/2008	N
Nike Bty 70	0.70 mile southeast	Cross-gradient	Inactive – Needs Evaluation	07/01/2005	N
Marina del Rey 13837 Fiji	0.95 mile east	Up to cross-gradient	Refer: Other Agency	03/22/1984	N
Notes: N – No					

Based on the distance, direction (relative to groundwater flow), and/or their current regulatory status, it is unlikely that activities at these facilities have impacted the environmental integrity of the site. This information is not indicative of a REC.

6.12. Solid Waste Landfill Sites (SWL): Distance Searched – ½ mile

The SWL database consists of open and closed solid waste disposal facilities and transfer stations. The data comes from the Integrated Waste Management Unit Database.

Neither the site nor properties located within the searched distance were listed on this database.

6.13. State Leaking Underground Storage Tank (LUST) Lists: Distance Searched – ½ mile

Databases of the LUST information system are maintained by the Regional Water Quality Control Board (RWQCB).

Neither the site nor properties located within the searched distance were listed on this database.

6.14. Statewide Spills, Leaks, Investigations and Cleanup (SLIC) Lists: Distance Searched – ½ mile

The SLIC program, a state listing, is designed to protect and restore water quality from spills, leaks, and similar discharges. The program is maintained by the Regional Water Quality Control Board (RWQCB).

The site was not listed on this database. The following five facilities located within the searched distance are listed on the SLIC database:

Facility, Address	Distance/ Direction from Site	Groundwater Gradient (General for Vicinity Flow)	SLIC Case Number	Regulatory Status	Closure Date (if applicable)	Environ-mental Concern (Y/N)
Timberlake Group International 4100-5000 Pacific	0.12 mile south	Down to crossgradient	0485A	No further action	NA	N
Via Dolce Acquisition Area 3 3700-3706 Canal	0.14 mile north-northwest	Crossgradient	0485D	Completed – Case Closed	10/02/1999	N
Via Dolce Acquisition Area 1 3602 Pacific Avenue	0.15 mile northwest	Crossgradient	0485B	Completed – Case Closed	10/02/1999	N
Via Dolce Acquisition Area 2 3600-3615 Canal	0.15 mile north-northwest	Crossgradient	0485C	Completed – Case Closed	10/02/1999	N
Baron's Cleaners 510 Washington	0.48 mile north	Up-to-Crossgradient	1120	Completed – Case Closed	06/11/2012	N
Notes: N – No NA – not available						

Based on their distance, direction, and regulatory status, the identified SLIC cases do not represent a REC for the site.

6.15. Underground Storage Tank (UST) Registration List: Distance Searched – Site and Adjacent

UST records are provided by the SWRCB's Hazardous Substance Storage Container Database. Inclusion of facilities on this list does not necessarily indicate a release.

Neither the site nor adjacent properties were listed on this database.

6.16. Permitted Aboveground Storage Tank (AST) List: Distance Searched – Site and Adjacent

According to EDR, AST records are provided by the Department of Building and Fire Safety. Inclusion of facilities on this list does not necessarily indicate a release.

Neither the site nor properties located within the searched distance were listed on this database.

6.17. Voluntary Cleanup Program (VCP) Sites: Distance Searched – ½ mile

This database is a California Environmental Protection Agency listing of properties involved in the voluntary remediation program.

Neither the site nor properties located within the searched distance were listed on this database.

6.18. Brownfields: Distance Searched – ½ mile

This database is a Department of Toxic Substances Control (DTSC) tracking system of California Brownfields sites.

Neither the site nor properties located within the searched distance were listed on this database.

6.19. Indian Reservation: Distance Searched – 1 mile

USGS map layer portrays Indian administered land within the United States with an area equal to or greater than 640 acres.

Indian reservation land was not found to be within the searched distance.

6.20. Indian LUST: Distance Searched – ½ mile

This is a database maintained by the EPA of LUSTs on Indian land in Arizona, California, New Mexico, and Nevada.

Neither the site nor properties located within the searched distance were listed on this database.

6.21. Indian UST: Distance Searched – ¼ mile

This is a database maintained by the EPA of USTs on Indian land.

Neither the site nor properties located within the searched distance were listed on this database.

6.22. Drycleaners: Distance Searched – ¼ mile

EDR provided a list of drycleaner related facilities that have EPA identification numbers. These facilities with certain Standard Industrial Classification codes: power laundries, family and commercial; garment pressing and cleaners' agents; linen supply; coin-operated laundries and cleaning; dry cleaning plants except rugs; carpet and upholstery cleaning; industrial launderers; laundry and garment services.

The site was not listed on this database. Baron's Cleaners at 510 Washington, approximately 0.48 mile north and up-to-crossgradient of the site, was listed on the database for a tetrachloroethylene (PCE) and trichlorethyelene (TCE) spill. Due to the regulatory status and distance from the site, this listing is not considered a REC for the site.

7. SITE RECONNAISSANCE

As stated in Section 1.7, Ninyo & Moore was not granted access to the site by the site owner to perform a site reconnaissance. Therefore, Ninyo & Moore performed the site reconnaissance from public ROWs. Ninyo & Moore's inability to visually observe the site is considered a significant physical limitation and data gap and may impede our ability to effectively identify RECs for the site. The information regarding the site stated by Ninyo & Moore in the following sections and in this report is based on historical and online references and observations from public ROWs. This information may not accurately reflect the current conditions of the site. Photographs taken during the site reconnaissance are included in Appendix B.

7.1. Use and Storage of Hazardous Substances and Petroleum Products

Evidence of the use and storage of hazardous substances and petroleum products was not observed based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

7.2. Storage and Disposal of Hazardous Waste

Evidence of storage or disposal of hazardous waste was not observed based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

7.3. Unidentified Substance Containers

Unidentified substance containers were not observed based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

7.4. Evidence of Releases

Evidence of releases was not observed based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

7.5. Aboveground Storage Tanks (ASTs) and Underground Storage Tanks (USTs)

Evidence of USTs (e.g., fill pipes, vent pipes, and emergency power generators) or ASTs were not observed on or adjacent to the boundaries of the site based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

7.6. Polychlorinated Biphenyls (PCBs)

Potential sources of PCBs, like transformers, were not observed on the site based on a review of aerial photographs, Google Earth, and visual observations from public ROWs. One pole-mounted transformer was observed adjacent to the east of the site. Staining or signs of release were not observed.

7.7. Wastewater Systems

Wastewater systems provided to the site were not observed based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

7.8. Stormwater Systems

Stormwater systems provided to the site were not observed based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

7.9. Wells

Wells, such as water supply wells and groundwater monitoring wells, were not observed on the site based on a review of aerial photographs, Google Earth, and visual observations from public ROWs. As stated in Section 5.8, an abandoned oil well is present on the site and is considered a REC. Two groundwater monitoring wells were observed on Hurricane Street, adjacent to the north and northeast of the site.

7.10. Surface/Subsurface Structures

Surface structures or evidence of subsurface structures (e.g., sumps, vaults, oil/water separators, and other surface impoundments) were not observed based on a review of aerial photographs, Google Earth, and visual observations from public ROWs. As stated in Section 5.8, two concrete vaults were present on the site prior to 2006 and were removed.

7.11. On-Site Records

On-site records were not available for the site.

7.12. Controlled Substances Production

Evidence of controlled substance production, such as methamphetamine laboratories, was not noted within or adjacent to the boundaries of the site based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

7.13. Other Environmental Issues

Other environmental issues were not noted on the site based on a review of aerial photographs, Google Earth, and visual observations from public ROWs.

8. ENVIRONMENTAL REGULATORY AGENCY INQUIRIES

Based on the site reconnaissance, historical research, and environmental database review, information regarding the site and relevant surrounding properties requests for records were made to local government agencies and, if available, reviewed by Ninyo & Moore. Based on information obtained from local government agencies, it was judged that interviews of regulatory officials would not provide additional meaningful information to the Phase I ESA. The following information for the site was found during our regulatory agency review for this Phase I ESA. Agency responses are provided in Appendix F.

8.1. Regional Water Quality Control Board (RWQCB)

Ninyo & Moore made requests to the Spills, Leaks, Investigation and Cleanup, Well Investigation Program Case List and UST units of the Los Angeles RWQCB to review records that may be available for the site. According to the RWQCB, records are not available for the site address.

8.2. California Department of Toxic Substances Control

Ninyo & Moore made requests to the DTSC – Cypress and Chatsworth offices to review records that may be available for the site. According to the DTSC – Cypress and Chatsworth offices, no such records exist for the site.

8.3. South Coast Air Quality Management District (SCAQMD)

Ninyo & Moore reviewed the SCAQMD's Facility Information Detail Search (FINDS) website for permits regarding the site address. According to the FINDS website, no records are available for the site address.

8.4. Los Angeles County Fire Department (LAFD) – Haz-Mat Division

Ninyo & Moore made requests to the LAFD – HazMat Division to review records that may be available for the site. According to the LAFD, no files were found for the site address.

8.5. Los Angeles County Fire Department (LAFD) – UST Division

Ninyo & Moore made requests to the LAFD – UST Division to review records that may be available for the site. According to the LAFD – UST Division, no files were found for the site address.

8.6. Los Angeles County Public Health Investigation (LAPHI)

Ninyo & Moore made requests to the LAPHI Hazardous Materials Division to review records that may be available for the site. According to the LAPHI Hazardous Materials Divisions, files for the site were not found.

9. INTERVIEW

Ninyo & Moore submitted a questionnaire for completion by the owners, Sharon R McQueen and Daniel P Whalen Trustees. To date, Ninyo & Moore has not received the owner questionnaire from Sharon R McQueen and Daniel P Whalen Trustees. This is considered a data gap. If information from the owner alters the conclusions and recommendations of this report, an addendum will be prepared.

Ninyo & Moore was provided a questionnaire completed by the former occupant of the site, Mr. William Jones of the City of Los Angeles Bureau of Engineering. According to Mr. Jones, it is unknown if hazardous materials are stored on site, or if USTs or ASTs are currently or formerly present on the site. Mr. Jones indicated that there potentially have been releases of hazardous materials or petroleum products on the site due to an oil production well located on the property, which has been abandoned. Mr. Jones indicated he had the following documents of interest

pertaining to the site: environmental permits, geotechnical investigations or studies, and other reports. Mr. Jones was not aware of the following regarding the site: past, threatened, or pending litigation or administrative proceedings; government notices of violation; or government notices of possible liability. Documents pertaining to a former geotechnical investigation, as well as the abandoned oil production well, are summarized in Section 5.8. A copy of the questionnaire is provided in Appendix C.

10. VAPOR MIGRATION

Ninyo & Moore conducted a preliminary vapor encroachment screen (pVES) for potential chemicals of concern (COCs) that may migrate as vapors onto the site as a result of contaminated soil and/or groundwater near the site. The purpose of the pVES is to identify a vapor encroachment condition (VEC), which is the presence or likely presence of COC vapors in subsurface soils at the site caused by the release of vapors from contaminated soil or groundwater either on or near the site. The potential for VEC beneath the site was evaluated using a Vapor Encroachment Screening Matrix (VESM). The VESM included performing a Search Distance Test to identify if there are any known or suspect contaminated sites surrounding or upgradient of the site within specific search radii, a COC Test (for those known or suspect contaminated sites identified within the Search Distance Test) to evaluate whether or not COCs are likely to be present, and a Critical Distance Test to evaluate whether or not COCs in a contaminated plume may be within the critical distance of the site (100 feet for non-petroleum contaminants, and 30 feet for petroleum hydrocarbon contaminants). Based on the concentration of petroleum hydrocarbons detected in soil on the site in 2006, the presence of a historical oil-production well (Section 5.8), and the presence of the site within a methane zone, it is likely that a VEC exists beneath the site. A copy of the VESM is included in Appendix G.

11. FINDINGS, OPINIONS, AND CONCLUSIONS

Based upon the results of this Phase I ESA, the following findings, opinions, and conclusions are provided.

11.1. Findings and Opinions

Ninyo & Moore conducted a Phase I Environmental Site Assessment (ESA) of the approximately 3,400 square-foot property at 128 Hurricane Street in the community of Venice, Los Angeles, California (site; Figure 1). Ninyo & Moore was contracted by Brown and Caldwell to conduct this assessment on behalf of the City of Los Angeles (the user) in general accordance with our proposal dated April 8, 2016. Historical research, document review, and site assessment activities were conducted in April and May, 2016. In general, the following items were noted.

- The site is assigned the Los Angeles County APN 422-5010-016. Based on the environmental lien search, the site is currently owned by Sharon R McQueen and Daniel P Whalen Trustees of McQueen-Whalen Revocable Trust, and is not occupied.

- The site has not been developed with structures from at least 1928 through the time of this report.

- The area surrounding the site was developed with oil production facilities from at least 1938 through 1952, and with residential properties from at least 1963 through the time of this report. The Venice Pumping Plant appeared adjacent to the east of the site by at least 1963.

- The site address was not listed on searched environmental databases.

- Site access was not granted; therefore, a site reconnaissance was conducted from public ROWs. This is considered a significant physical limitation and data gap. Two groundwater monitoring wells were observed on Hurricane Street, adjacent to the north and northeast of the site. One pole-mounted transformer was observed adjacent to the east of the site.

- To date, Ninyo & Moore has not received an owner questionnaire from the site owners, Sharon R McQueen and Daniel P Whalen Trustees. This is considered a data gap. If information from the completed owner questionnaire is received that alters the conclusions and recommendations of this report, an addendum will be prepared.

- According to the DOGGR well finder website, a historical oil production well is present on the site (McDonald 2, API 03713842). Based on a review of documents provided by the user, the "McDonald 2" well was abandoned in 1932. A permit to re-abandon the well was issued in 2002 and renewed annually from 2004 to 2008. According to DOGGR, the well has not been re-abandoned. This represents a REC.

- According to the ZIMAS website, the site lies within a methane zone. This is considered a REC.

- Based on a review of documents provided by the user, a geotechnical investigation conducted on the site in 2006 found two concrete vaults and concentrations of petroleum hydrocarbons in the upper 2 feet of soil at up to 6,500 parts per million (ppm). Records indicating the removal, mixing, stockpiling, testing, and/or disposal of the contaminated soil were not found. This is considered a REC.

- Based on historical research and results of the VESM conducted by Ninyo & Moore, a VEC is likely to currently exist beneath the site.

- Off-site concerns were not observed based on historical documents review.

11.2. Conclusions

Ninyo & Moore has performed a Phase I ESA in conformance with the scope and limitations of ASTM Practice E 1527-13 of property at 128 Hurricane Street in the community of Venice, California, the site. Any exception to, or deletions from, this practice are described in Section 1.4 of this report. This assessment has revealed the following RECs in connection with the property:

- The presence of an abandoned oil well (McDonald 2, API 03713842) on the site.

- The site lies within a methane zone.

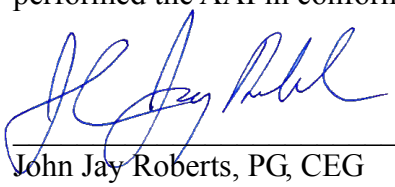
- The results of geotechnical investigation in 2006 indicate high concentrations of petroleum hydrocarbons in soil on site.

- The results of the VESM indicate that a possible VEC currently exists beneath the site.

Ninyo & Moore recommends a limited subsurface investigation to evaluate the RECs and VEC.

12. ENVIRONMENTAL PROFESSIONAL STATEMENT

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined by §312.10 of 40 Code of Federal Regulations (CFR) 312. I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. I have developed and performed the AAI in conformance with the standards and practices set forth in 40 CFR Part 312.



John Jay Roberts, PG, CEG
Senior Geologist

6/21/16
Date

13. REFERENCES

California Department of Conservation, Division of Oil, Gas, and Geothermal Resources, 2016, Well Finder website, http://www.conservation.ca.gov/dog/Pages/Wellfinder.aspx.

City of Los Angeles, Department of Public Works, Bureau of Engineering, Geotechnical Engineering Division, 2006, Summary of Field Investigations, 128 Hurricane Street, dated July 24.

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United States Geological Survey, 1981 photorevised from 1978, 7.5-Minute Topographic Quadrangle Map Series, Venice, California.

ZIMAS, see Zone Information and Map Access System.

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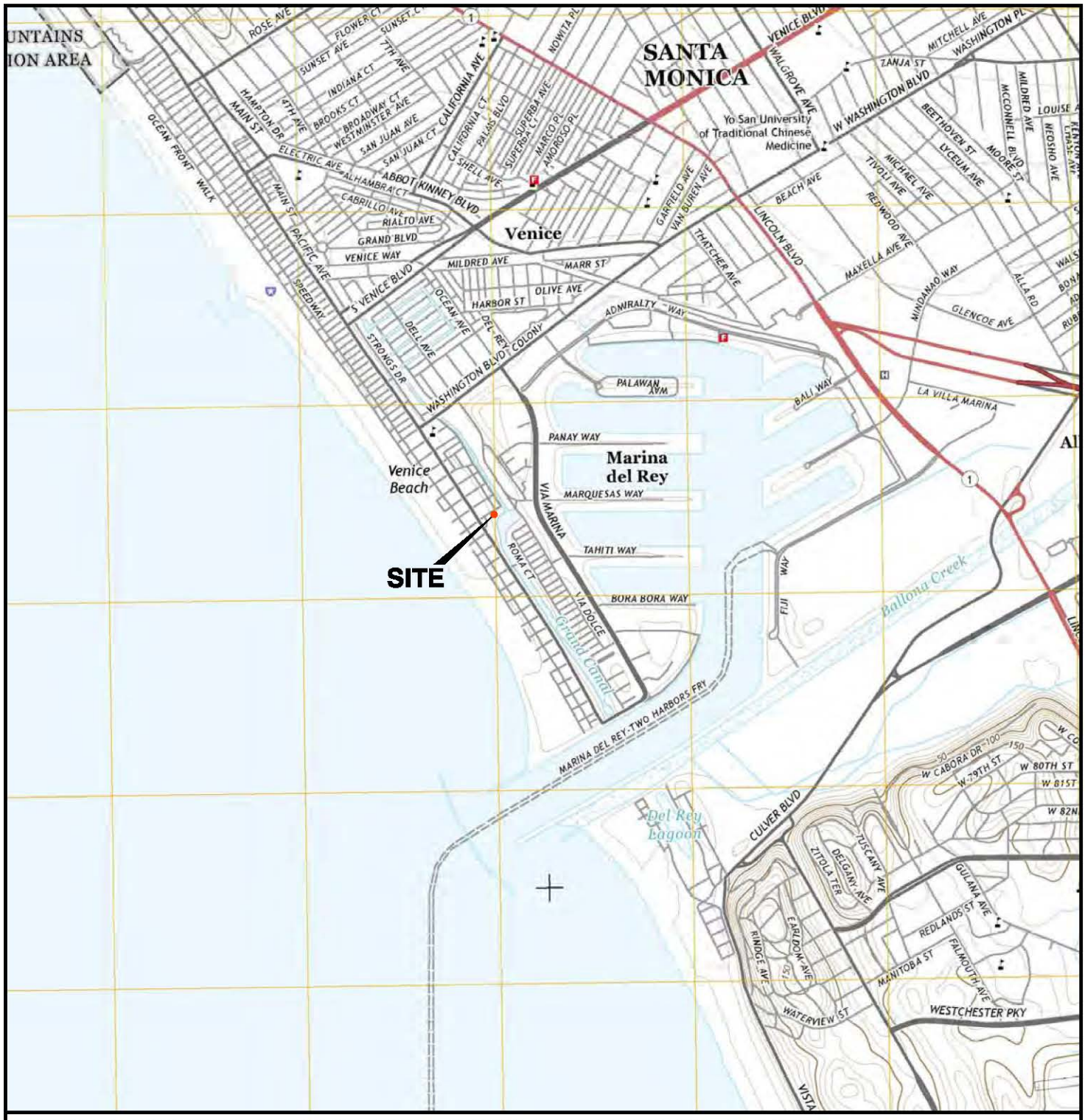


REFERENCE: 7.5 MINUTE USGS TOPOGRAPHIC MAP OF VENICE, CALIFORNIA QUADRANGLE, DATED 2015, SCALE 1:24000.

N

SCALE IN FEET

0 2,400 4,800

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	128 HURRICANE STREET MARINA DEL REY, CALIFORNIA	1
209666001	6/16		

209666001_SL.dwg 06:52:06 05/06/2016 GK



REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2016.

LEGEND

SITE BOUNDARY		T	POLE-MOUNTED TRANSFORMER
GROUNDWATER MONITORING WELL		128	STREET ADDRESS

N

SCALE IN FEET

0 60 120

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		SITE PLAN	FIGURE
PROJECT NO.	DATE	128 HURRICANE STREET MARINA DEL REY, CALIFORNIA	2
209666001	6/16		

209666001_SP.dwg 09:23:06 05/06/2016 GK

APPENDIX A

RESUMES OF PROFESSIONALS

JOHN JAY ROBERTS, PG, CEG
SENIOR GEOLOGIST

EDUCATION

B.S., Geology, 1973, University of Southern California

REGISTRATIONS AND CERTIFICATIONS

PG 3489 (California)

CEG 1018 (California)

EXPERIENCE HIGHLIGHTS

Environmental Assessments for Schools

Human Health Risk Screening Evaluations for School Sites

Environmental and Geotechnical Services for Redevelopment of an Existing School Site

Brownfields Clean-up Grant Application for Industrial Property

Environmental Services for a New High School

Pipeline Risk Analyses

Groundwater Discharge Evaluation for Dewatering Subdrain

Environmental Assessment for Redevelopment of a Commercial Site

Environmental Consulting Services for Commercial, Industrial, and Residential Properties

Redevelopment of Former Lockheed B-1 Facility

Hazardous Waste Landfill Expansion

Hazardous Waste Ponds Investigations

Geological Logging and Coordination During the Installation of Three Groundwater Production Wells

Hydrogeological Assessment Report

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists

National Groundwater Association

As a Senior Geologist, Mr. Jay Roberts has extensive experience performing environmental and geotechnical investigations of commercial and industrial properties and environmental site assessments of school sites, including Initial Site Assessments (ISAs), Hazardous Materials Assessments (HMAs), Phase Is, Phase IIs, PEA, SSI, RAW, RAP, and O&M plans. Mr. Roberts has completed characterization, remediation, and human health assessments on numerous properties. He has prepared successful applications for Brownfields clean-up grants and managed and performed hydrogeologic investigations, groundwater resource evaluations, and water supply studies. He also provides expert witness and litigation support for environmental, geotechnical, and mining matters.

REPRESENTATIVE PROJECT EXPERIENCE

Initial Site Assessment Ball Road Grade Separation, Anaheim, California: Technical Director for an ISA for the Ball Road Grade Separation Project in Anaheim. The project includes evaluation of alternatives for Ball Road at the interchange with the Metrolink/SCRRA Railroad rail crossing. The ISA included review of historical sources for previous uses iinvolvi9ng hazardous wastes, regulatory agency databases research, and site reconnaissance to view for indications of potential hazardous waste impact on facilities along the proposed alignments.

Initial Site Assessment Raymond Avenue Grade Separation, Fullerton, California: Technical Director for an ISA and ADL for the Raymond Avenue Grade Separation Project in Fullerton. The project includes the lowering of Raymond Avenue to create an underpass at the Burlington Northern Santa Fe (BNSF) rail crossing. The Project in-progress will include an ADL Survey and subsurface investigation for suspected impacts in the exposed soil areas along Raymond and Valencia Avenues.

Initial Site Assessment State College Boulevard Separation and ADL Survey, Fullerton, California: Technical Director for an ISA and ADL for the State College Boulevard Separation Project in Fullerton. The project involves the lowering of State College Boulevard to create an underpass at the Burlington Northern Santa Fe (BNSF) rail crossing. The Project includes an ADL Survey in the exposed soil areas along State College Boulevard.

Initial Site Assessment Mount Vernon Avenue Bridge Expansion, San Bernardino, California: Technical Director for an ISA for the Mount Vernon Bridge Expansion project. The Project involved research and review of historical documents into property uses dealing back into the early 1900's due to long history of the site usage as a railroad hub. The records reviewed consisted of environmental investigations, remedial activities, and contaminated groundwater. Regulatory agencies representatives were also contacted for specifics on current states of remedial activities at impacted sites within the influence of the Project.

Initial Site Assessment Milliken Avenue, Mission Boulevard, and Philadelphia Street, Ontario, California: Technical Director for an ISA and ADL for the proposed grade separation at the existing at-grade crossing of South Milliken Avenue and the Union Pacific Railroad (UPRR) in Ontario, California. The Project includes an ADL survey to be performed adjacent to Milliken Avenue, Mission Boulevard, and Philadelphia Street to evaluate surface and subsurface soil for the presence and concentration of ADL in proposed roadway improvement areas.

Phase I Environmental Site Assessments, Tehachapi Renewable Transmission Project, Kern County, California for Southern California Edison (SCE): Project Manager for Phase I Environmental Site Assessments (ESAs) for 10 separate Sites in Kern County, California for Southern California Edison (SCE) for the Tehachapi Renewable Transmission Project. The Phase I ESAs were performed in accordance with the ASTM International (ASTM), Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process Designation E 1527-05 and Practices for All Appropriate Inquiries (AAI) as set forth in the Code of Federal Regulations (CFR), Title 40, Part 312. In order to meet the accelerated schedule for the project, the 10 separate Phase I ESA reports were completed within approximately three weeks from authorization. In accordance with the ASTM and AAI requirements, Ninyo & Moore reviewed readily available historical documents, including historical aerial photographs, Sanborn Fire Insurance Rate maps, building department records, historical topographic maps, and city directories, as applicable. Ninyo & Moore conducted a review of federal, state, tribal, and local regulatory agency databases for each Site and for properties located within the specified radius (by the ASTM Standard) of each Site for locations of known hazardous waste sites, landfills, leaking underground storage tanks (LUSTs), and permitted facilities with USTs.

REPRESENTATIVE PROJECT EXPERIENCE (continued)

The Phase I ESAs included a reconnaissance of each Site to document existing hazardous materials handling, storage, and disposal practices, areas of possibly contaminated surficial soil or surface water, possible sources of polychlorinated biphenyls (PCBs), USTs and ASTs, and possible sources of contamination from activities at the Site and adjacent properties, and an interview of each Site property representative. The results of each Phase I ESA were presented in a comprehensive report, which included a summary whether or not recognized environmental conditions (RECs) were found on the any of the 10 Sites.

Environmental Site Assessments and Hazardous Building Materials Survey, Beverly Hills Post Office Building, California: Project Manager for a Preliminary Environmental Site Assessment/Phase I ESA of the proposed Wallis Annenberg Cultural Center of Beverly Hills. The site consisted of the existing historic Beverly Hills Post Office building and surrounding parking lots proposed to be converted to a new cultural center, including an underground parking structure proposed to be constructed beneath existing street rights of way and portions of the adjacent Beverly Hills City Hall property. Ninyo & Moore reviewed historical and regulatory records, conducted a site reconnaissance, and interviewed property representatives in order to prepare a comprehensive report summarizing potential environmental concerns associated with redevelopment of the site. Potential environmental concerns (PECs) included the historical development of the site as lumber storage yard, a train depot, and railroad right-of-ways, the former presence of an underground storage tank, and releases associated with off-site fire station and gas station facilities. Also, due to the age of the building the presence of the potential presence of asbestos-containing materials (ACMs), lead-based paints (LBPs), and other hazardous building materials was suspected.

Environmental Assessments for 12 School Sites, Western Riverside County, California: Project Manager for Phase I studies through complete environmental investigations and site closure status granted by DTSC, the lead regulatory agency. All 12 sites required DTSC's rigorous PEA investigations, including soil gas and/or soil matrix sampling. One site required a soil RAW and implementation. Public participation services in accordance with DTSC requirements were also provided.

Environmental Assessments for 10 School Sites, Western San Bernardino County, California: Project Manager for Phase I studies through complete environmental investigations and site closure status granted by DTSC, the lead regulatory agency. All 10 sites required DTSC's rigorous PEA investigations, including soil gas and/or soil matrix sampling. Sampling and analyses was conducted on the sites primarily for past agricultural activities. One site required an additional investigation for an on-site burn dump. Public participation services in accordance with DTSC requirements were also provided to the client school district.

Environmental Consulting Services for Commercial, Industrial, and Residential Properties Throughout California, Oregon, and Washington: Project Manager for Phase I studies throughout the western United States. Mr. Roberts managed, directed, coordinated a staff conducting Phase Is, and reviewed and signed each report. These services were performed for a variety of fiduciary institutions, attorneys, and school districts. These services included complete investigations to meet ASTM standards, as well additional studies required by the client. In order to fully characterize conditions, Phase II investigations were recommended and completed, ranging from additional historical research through soil and/or groundwater sampling.

PATRICK CULLIP, EIT

TASK LEADER: FACILITIES ENGINEERING

EDUCATION

B.S. Mechanical Engineering, Loyola Marymount University, Los Angeles

REGISTRATIONS AND CERTIFICATIONS

Loss Prevention System (LPS)
OSHA HAZWOPER with annual 8-hour refreshers
OSHA HAZWOPER Site Supervisor Training
OSHA Excavation Competent Person Certification
First Aid and CPR Training
BNSF Contractor Orientation Safety certified

EXPERIENCE HIGHLIGHTS

Phase I Environmental Site Assessments
Sampling Surveys
1166 Soil Monitoring
Preliminary Environmental Assessment

Mr. Patrick Cullip has over three years experience performing environmental remediation, operations and maintenance (O&M), remediation system installation, groundwater/soil vapor sampling, well installation, underground storage tank (UST) removal, soil contamination removal, dual-phase extractions, aerially-deposited lead (ADL) sampling, geological and geotechnical logging, quarterly groundwater monitoring reports, pilot test reports, design, and oversight projects; conducting environmental site assessments (ESAs) and feasibility testing; and evaluating regulatory compliance.

REPRESENTATIVE PROJECT EXPERIENCE

Port of Los Angeles, Wilmington, California: Senior Staff Environmental Engineer, conducted groundwater monitoring on numerous existing monitoring wells, using hand bailers.

Long Beach Unified School District, Long Beach, California: Senior Staff Environmental Engineer, collected soil samples using hand-auger and direct-push methods, to assess lead and pesticide contamination from lead based paint and termiticides along the edges of classroom and administrative buildings at Jordan High School, and prepared reports for government agencies. Sample results were used to determine the extent of contamination and potential associated health risks to field personnel participating in planned remodeling/demolition activities. Prepared the preliminary environmental assessment (PEA) report for sampling and associated remedial action work plan (RAW) for required soil remediation.

City of Los Angeles, Temescal Canyon Park Storm Water Project, Pacific Palisades, California: Senior Staff Environmental Engineer, conducted South Coast Air Quality Management District Rule 1166 air monitoring of soil being excavated for future storm water holding tank. The soil consists of undocumented fill found to contain petroleum hydrocarbons.

Caltrans, Various Locations, Southern California: Senior Staff Environmental Engineer, collected soil samples, using hand-auger methods, of roadside soils to assess aerially deposited lead (ADL) impacts of soil from years of contamination from leaded gasoline. Sample results were used to determine the waste classification for proper disposal and handling of road and highways improvements.

Phase I ESAs – Various Sites, Southern California: Field Manager, performed numerous Phase I ESAs of commercial, industrial, and residential properties throughout Southern California for various financial institutions, land developers, and government agencies. The Phase I ESAs included reviewing regulatory files of various government agencies to evaluate the extent and type of impacts at sites, conducting site walks and owner/operator interviews, and preparing reports.

Los Angeles Unified School District (LAUSD), Los Angeles, California: Oversaw groundwater/soil vapor extraction tests at various sites to determine extent of contamination. Field Manager for a complex site excavation for future school; tasks included lead/hydrocarbon soil testing, hazardous/non-hazardous soil removal, and air quality monitoring. Directed cleaning/removal of USTs, soil contamination chase-out, and removal. Supervised installation of groundwater/soil vapor monitoring wells. Directed maintenance on groundwater/soil vapor systems. Organized, managed, and operated numerous dual-phase extraction tests to remove site contaminants. Executed various O&M visits for existing soil vapor and groundwater remediation systems. Tracked effluent readings for various sites to ensure permitting compliance. Prepared dozens of environmental reports including quarterly groundwater monitoring reports, pilot tests, site assessments, remedial action plans, and RECAPs.

APPENDIX B

PHOTOGRAPHIC DOCUMENTATION



Photograph 1: **Looking southeast at the site.**



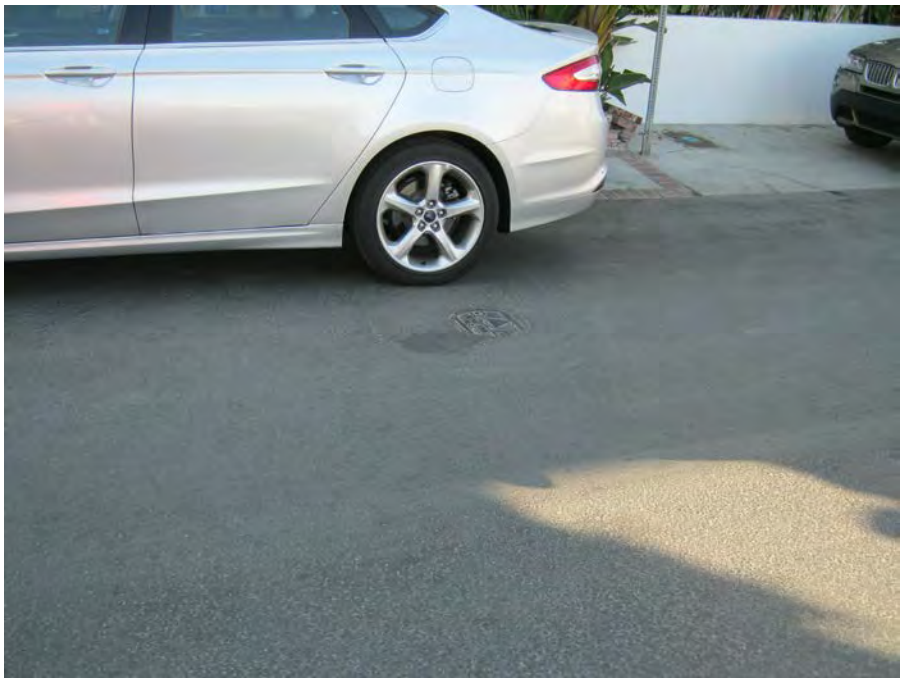
Photograph 2: **Looking northwest at the site.**



Photograph 3: **Looking southwest at the site.**



Photograph 4: **View of pole-mounted transformer adjacent to the east of the site.**



Photograph 5: **View of groundwater monitoring well on Hurricane Street, adjacent to the north of the site.**



Photograph 6: **Looking northwest away from the site at Hurricane Street, beyond which are residential properties.**



Photograph 7: **Looking northeast away from the site at the Venice Pumping Plant.**



Photograph 8: **Looking north away from the site at Canal Court, beyond which is a vacant lot.**



Photograph 9: **Looking southeast away from the site on the Esplanade (City-owned public right-of-way) at the Ballona Lagoon.**



Photograph 10: **Looking southwest at the site, beyond which is an apartment complex.**

APPENDIX C

USER AND OWNER PROVIDED INFORMATION

PHASE I ESA QUESTIONNAIRE

Purpose: The property described below is referred hereafter as the "Site". The purpose of this questionnaire is to facilitate the Environmental Professional in conducting an Environmental Assessment of the Site on behalf of its Client. Please answer this questionnaire to the best of your ability by providing your personal as well as the institutional knowledge of your organization regarding the Site.

Site description: Property located at 128 Hurricane Street, Venice, CA.

Form Completed By:

Name: William Jones

Organization: City of Los Angeles, Bureau of Engineering

Address: 1149 S Broadway, #600

Telephone Number: 485-5760

Email: william.jones@lacity.org

Signature:

You are:

The current owner ☐

~~The current occupant~~ ☒

Past owner ☐

Past occupant ☑

Date Completed: 04/14/2016

Are any chemicals, such as (but not limited to) hazardous materials, pesticides, herbicides, petroleum products, or hazardous waste **Currently** or **Formerly** Brought/Used/Stored on Site? Unknown

Has the site been graded or fill material ever brought onto the Site? Unknown

Are or were Underground or Aboveground Storage Tanks **Currently** or **Formerly** Present On Site? Unknown

Are you aware of any releases of hazardous materials or petroleum products onto the ground, groundwater or surface waters of the Site? Potentially, as an oil production well was located on the property.

Are or were there any wells, septic systems, or clarifier on the Site?: Abandoned Oil Well

Documents of Interest	Available	
Do You Have Any of the Following Documents of Interest With Respect to the Site:	YES	NO
Phase I Environmental Site Assessment Reports		X
Phase II Environmental Site Assessment with Subsurface Investigation Reports		X
Environmental Audit Reports		X
Property Information Sheet (Non-Residential properties)		X
Environmental Permits (NPDES, industrial wastewater, solid waste, hazardous waste, etc.) AND You Have These	X	
Underground or Aboveground Tank Registration		Unknown
Hazardous Waste Generator Notices or Reports		Unknown
Material Safety Data Sheets (for chemicals in quantities greater than 5 gallons)		Unknown
Community Right-to-Know Plans		Unknown
Spill Prevention and Control Plans		Unknown
Past or Current Violation Notices at the Site		Unknown
Environmental Liens on the Site		Unknown
Geotechnical Investigations or Studies	X	
Other Reports	X	

Knowledge With Respect to the Subject Property	Knowledge	
Do You Possess Knowledge Regarding Any of the Following with Respect to the Subject Site:	YES	NO
Pending, Threatened, Past Litigation Involving Hazardous Materials/Petroleum Products		X
Pending, Threatened, Past Admin. Proceedings Involving Hazardous Materials/Petroleum Products		X
Government Notice of Violation of Environmental Laws		X
Government Notice of Possible Liability Involving Hazardous Materials/Petroleum Products		X

Please return this completed form by sending via email or mailing to Patrick Cullip, Ninyo & Moore, 475 Goddard, Irvine, CA 92618, email pcullip@ninyoandmoore.com, tel. (949) 753-7070, fax (949) 753-7071

PHASE I ESA/AAI REQUIREMENTS

According to the All Appropriate Inquiry (AAI, 40 CFR 312) requirements and ASTM (E 1527-05) guidance on conducting Phase I Environmental Site Assessments, the "user" of the assessment must provide the following information, if available, to the environmental professional in order to qualify for Landowner Liability Protections (LLPs) offered by the Small Business Liability Relief and Brownfields Revitalization Act of 2001. Please check yes or no and provide any additional information you may have regarding the site. Failure to provide this information could result in a determination that "all appropriate inquiry" is not complete.

(1) Environmental cleanup liens that are filed or recorded against the site (40 CFR 132.25).
Are you aware of any environmental cleanup liens against the property that are filed or recorded under federal, tribal, state, or local law?

☐ Yes ☑ No

If yes, please explain:

(2) Activity and land use limitations that are in place on the site or that have been filed or recorded in a registry (40 CFR 312.26).
Are you aware of any activity use limitations (AULs), such as engineering controls, land use restrictions, or institutional controls that are in place at the site and/or have been filed or recorded in a registry under federal, tribal, state or local law?

☐ Yes ☑ No

If yes, please explain:

(3) Specialized knowledge or experience of the person/department requesting the Phase I ESA and seeking to qualify for the landowner liability protections (40 CFR 312.28).
As the user of this ESA, do you have any specialized knowledge or experience related to the property or adjoining properties? For example, are you involved in the same line of business as the current or former occupants of the property or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by this type of business?

☑ Yes ☐ No

If yes, please explain: Abandoned oil well onsite. Soils tested in avance of demolition activities at southerly end of property.

(4) Relationship of the purchase price to the fair market value of the property, if it were not contaminated (40 CFR 312.29).
Does the purchase price offered for this property reasonably reflect the fair market value of the property? If there is a difference between the purchase price and the fair market value, have you considered whether the lower purchase price is because contamination is known or believed to be at the property?

Please discuss: unknown

(5) Commonly known or reasonably ascertainable information about the property (40 CFR 312.30).
Are you aware of commonly known or reasonably ascertainable information about the property that would help the environmental professional to identify conditions indicative of releases or threatened releases? For example, as user,
(a) Do you know the past uses of the property? oil production; staging area for construction.
(b) Do you know of specific chemicals that are present or once were present at the property? unknown
(c) Do you know of spills or other chemical releases that have taken place at the property? unknown
(d) Do you know of any environmental cleanups that have taken place or are ongoing at the property?

☐ Yes ☑ No

If yes, please explain:

(6) The degree of obviousness of the presence or likely presence of contamination at the property and the ability to detect the contamination by appropriate investigation (40 CFR 312.31).
As the user of this ESA, based on your knowledge and experience related to the property, are there any obvious indicators that point to the presence or likely presence of contamination at the property?

☑ Yes ☐ No

If yes, please explain: former use as an oil production site.

William Jones		04/14/16
Print Name	Signature	Date

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LOS ANGELES, CA 90015-2213

http://eng.lacity.org

8/30/07

COPIES TO
- Ding Lee
- Jon Hackett

Date: OCT 6 2006

California Coastal Commission
South Coast District Office
200 Oceangate, 10th Floor
Long Beach, CA 90802-4416

ATTN: Charles R. Posner, Coastal Program Analyst

Re: BALLONA LAGOON PHASE III
CDP Application 5-01-257 AND A-5-VEN-01-279

Dear Mr. Posner:

Enclosed, please find your copies of the following items for your files-

1) Geotechnical investigation summary report (File No. 06-042, July 24, 2006) as referenced in our August 10, 2006 email message.
2) Recent photographs (Figures 1-6) of the vaults and their surroundings (the photographs were taken last June).
3) Two Vertical Aerial Photographs, taken in 1938 and 1994 that shows the area where the vaults are located.

Should you have any questions or need additional information, please contact William Jones of my staff at (213) 485-5760.

Sincerely,

William Jones
Environmental Specialist II
Environmental Management Group

Wj: wj-m559
ATTACH.

cc: 1) Luis Ganaja, BOE
2) Guillermo Barragan, BOE
3) Morton Price, BOE

CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
Bureau of Engineering
GEOTECHNICAL ENGINEERING DIVISION

Date: July 24, 2006
F.I. #06-042

SUMMARY OF FIELD INVESTIGATION

Location:	128 Hurricane Street
Thomas Guide:	Page 701 H-1
Requested By:	William Jones (BOE/EMG)
In Attendance:	Morton Price and (GED), Lisette Ramos, Tania Christo (GSD)
Date of Investigation:	June 28, 2006

DESCRIPTION AND REMARKS

At the request of William Jones of the Environmental Management Group, the Geotechnical Engineering Division (GED) has completed a field investigation regarding soil characterization near two concrete vaults in the Marina Del Rey area of the City.

This field investigation has been prepared to summarize the observations made.

Summary of Observations

As depicted by Figure 1, 128 Hurricane Street is located at the intersection of Hurricane Street and Canal Court in the Marina Del Rey area of the City.

The Site is an empty lot occupied by two concrete vaults. The site is adjacent to the Grand Canal. One of the vaults has wooden siding around the perimeter, but neither had any access hatches. A hole was observed in one of the vaults, but not enough to allow inspection of the interior of the vaults. There was no obvious visual or olfactory evidence of contamination from the vaults.

GED representatives met Department of General Services, Standards Division staff and collected two soil samples from two different hand auger borings; B-1 (2 ft below ground surface (bgs)) and B-2 (1 ft bgs). Figure 2 shows a plot with boring locations.

The borings consisted of brown silty sand (fill) with some fragments of broken glass. Boring B-1 encountered concrete fragments at 2 ft bgs, B-2 encountered concrete fragments at 1 ft bgs. Boring B-2 had an odor of animal waste. Water was not encountered in the borings.

The soil samples were analyzed for Petroleum Hydrocarbons (EPA 1664), Polychlorinated Byphenols (PCBs), VOCs (EPA 8260) and Title 22 metals. Results of EPA 1664 indicated a high level 6,500 ppm of petroleum hydrocarbons at 2 ft in B-1. Boring B-2 at 1 ft bgs was fund to be 100 ppm.

PCBs were not detected at the method detection limit; VOCs were also not detected at the method detection limits. Title 22 metals were not detected at hazardous levels.

A copy of the Standards report is attached at the end of this Field Investigation.

Conclusions and Recommendations

GED is of the opinion that the heavy hydrocarbons may be degraded heavy hydrocarbons from previous oil drilling activity at the site, or a naturally occurring degraded stringer of heavy hydrocarbons. There is also a possibility the heavy hydrocarbons may be a result of peat material in the soil.

As for disposal, the concrete vaults can go to a Class III Landfill. As for the heavy hydrocarbon impacted soils, GED recommends contacting Class III disposal facilities to see if any will accept soil with this concentration of hydrocarbons. Some Class III facilities may not accept such a high concentration of heavy hydrocarbons, so there is a possibility of this soil requiring disposal at a Class II facility. GED recommends sampling the soil again after it has been removed and stockpiled, after it has been mixed with other soils. The concentration of heavy hydrocarbon concentration may drop below 1000 ppm due to soil mixing, at which point most Class III Landfills will accept the soil, assuming there is no visual or olfactory signs of contamination.

Additionally, if the area around the vaults is to be developed into residential property in the future, the heavy hydrocarbon impacted soil should be removed to a concentration of less than 100 ppm heavy hydrocarbons.

Questions regarding this field investigation should be directed to Morton Price at (213) 847-0466.

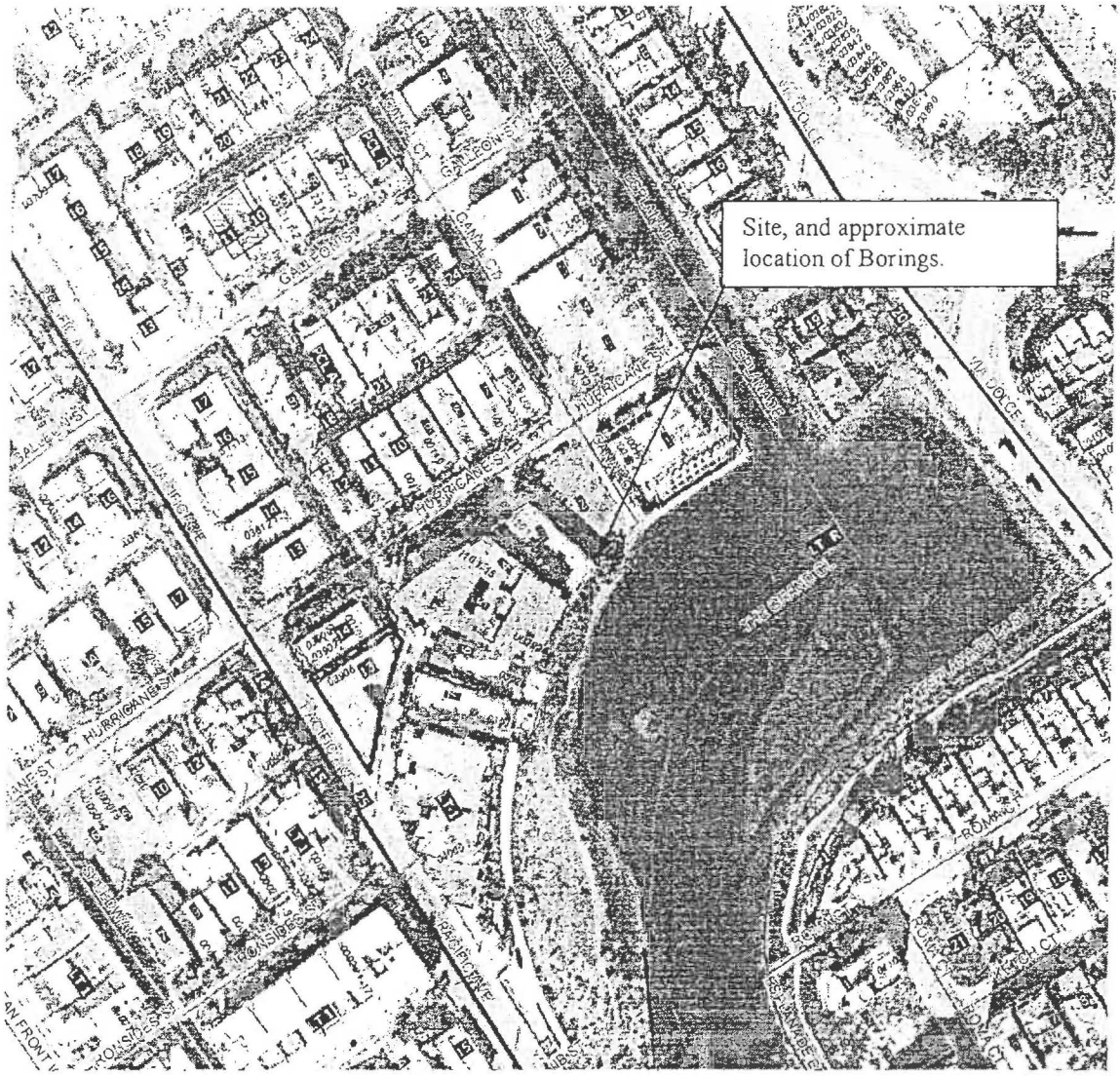


Figure 1 Location map showing 128 Hurricane Street and vicinity with approximate vault and sampling locations (not to scale).

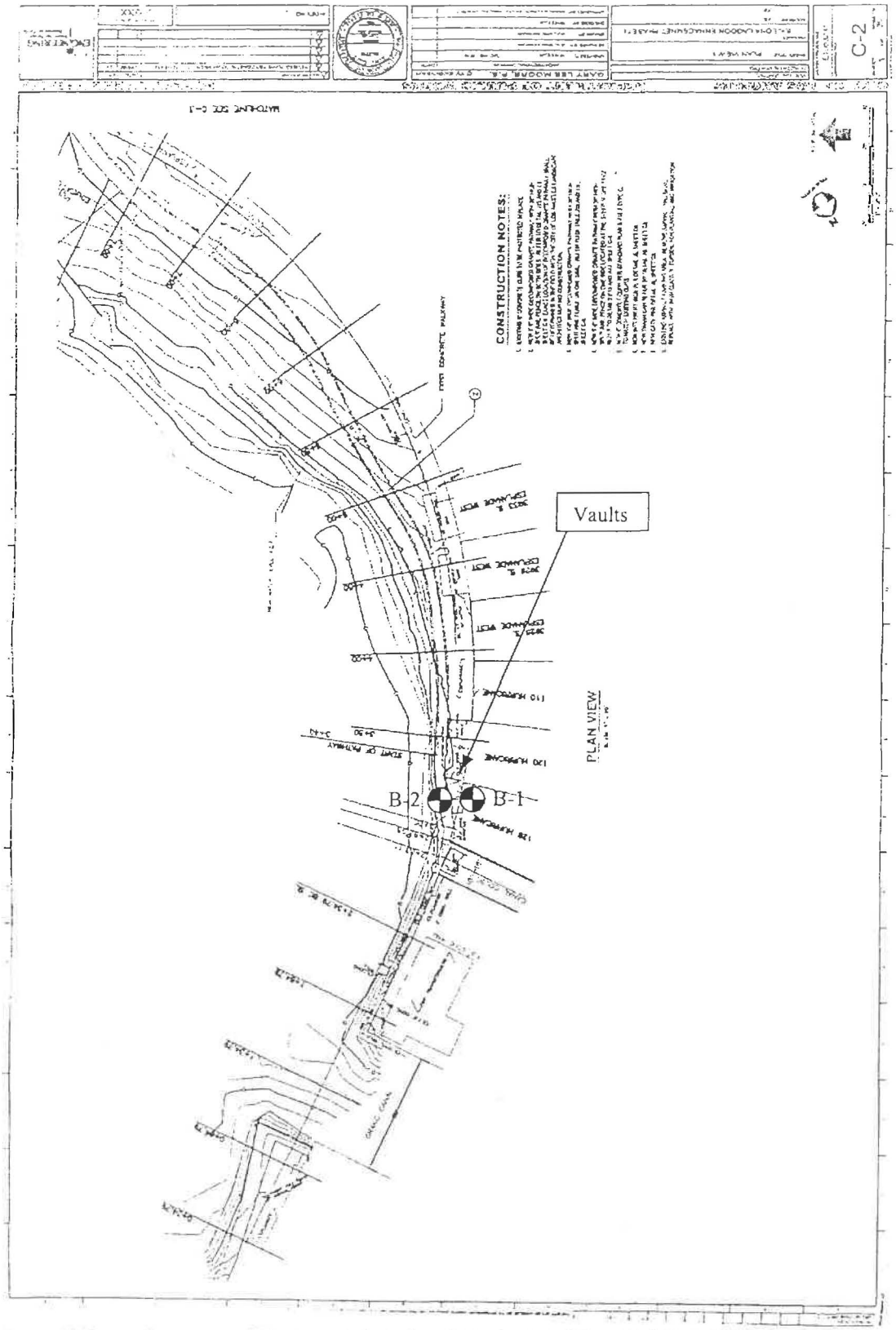


Figure 2 Location map of the area, showing locations of the vaults and borings. Not to scale.

CITY OF LOS ANGELES
DEPARTMENT OF GENERAL SERVICES
STANDARDS DIVISION
2319 DORRIS PLACE
LOS ANGELES, CA 90031
(213) 485-2242
FAX (213) 485-5075

Lab.#: 06-00498-01 to 02

BALLONA CREEK ENH.
W.O. E1903240

Received: June 28, 2006
Reported: July 19, 2006

To: Chris Johnson, Division Engineer
Bureau of Engineering/Geotechnical Services Division

Attn: Morton Price, Engineering Geologist Associate III
Bureau of Engineering/Geotechnical Services Division

SAMPLE ANALYSIS RESULTS

At the request of the Bureau of Engineering's Geotechnical Services Division, two soil samples from Ballona Creek Enhancement were collected and analyzed for possible contamination.

Neither sample exceeded the total threshold limit concentration (TTLC) or soluble threshold limit concentrations (STLC) specified in the California Administrative Code Title 22 regulations for any heavy metal. The B1 @ 2' sample contained a high level of petroleum hydrocarbon contamination (6500 ppm).

The samples were analyzed in accordance with the State of California Department of Health Services' Environmental Laboratory Accreditation Program (ELAP) approved methods. The specific methods are listed on the data sheets.

The chain of custody and data sheets are attached.

PAPKIN K. HOVASAPIAN, Director
General Services/Standards

PKH:KK:CDW:CC:MT:cdw

...cable and made from recycled waste

City of Los Angeles
Department of General Services
Standards Testing Laboratory

Quality Assurance Report

Lab Number: 06-00498-01

Date Extracted: 06/29/06
Date Analyzed 07/07/06
Analyzed By: LR

PCB

Matrix: Soil

Concentration in ug/Kg (ppb)

Compound	Sample	Matrix Spike			Matrix Spike Duplicate			Control	RPD	RPD
	Result	Conc.	Result	% Rec	Conc.	Result	% Rec	Limit		Limit
PCB 1260	0.00	400	237	59	400	256	64	47-137	7.7	30

A. Method EPA 608
B. Instrument: Hewlett-Packard 5890 GC with dual Electron Capture Detectors.
C. Columns: HP-35MS, 0.32mm, 30 meters; DB-XLB, 0.32mm, 30 meters.

RPD - Relative Percent Difference

Los Angeles, CA 90031
Tel: (213) 485-2242
Fax: (213) 485-5075

CHAIN OF CUSTODY RECORD

City of Los Angeles - General Services/Standards Division
Environmental/Chemistry Section

Organic Lab: (323) 226-1653
Inorganic Lab: (323) 226-1656
Chemical Lab: (323) 226-1[illegible]

Page ____ of ____

Sample Location/Address: Ballona Creek Enhancement Sampled By: MP/LR/TL

	Laboratory Use Only / Laboratory Log Numbers	Sample Date	Sample Time	Sample Description	Temp	Preserv.	Container No.	Container Type/Cap	Container Matrix	Analysis Requested
1	06-00498-01A,B,C	6/28	10:15AM	B-1 @ 2' depth		$NaHSO_4$	3	40mL vials	S	8260
2	D,E,F						3	125mL Glass jar	S	TRPH, PCB, T22T
3	06-00498-02A,B,C	6/28	10:30AM	B-2 @ 1' depth		$NaHSO_4$	3	40mL vials	S	8260
4	D,E,F							125mL Glass jar	S	TRPH, PCB, T22
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

Work Order No. E1903240 Requested By/Report To: Morton Price Organization: Geotech

Address: _____ Tel#: _____ Fax#: _____ Mail Stop: _____ Rush? _____

(May incur extra cost)

	Current Holder (Print Name)	Signature	Date	Time		Current Holder (Print Name)	Signature	Date	Time
1					4				
2	Tania Christo	[signature]	6/28	12:50pm	5				
3					6				

Revised: 1/0[illegible]

JUL 0 6 2006

Analysis Date 6/29/2006	EPA METHOD 6010B				
	REPORTING LIMITS(mg/kg)				
PW/ENGINEERING/GEOTECH	Ag 1 33	As 10 0	Ba 2 00	Be 1.33	Cd 1 33
Ballona Creek Enhancement	Co 1 33	Cr 1 33	Cu 2 00	Mo 2 00	Ni 2 00
	Pb 6 67	Sb 10 0	Se 10.0	Tl 10 0	V 2.00
Glass Jar, 125ml	Zn 1.33	Hg 0.08 (EPA METHOD 7471A)			

LAB NO: 06-0498-01F Date : 6/28/2006 1015

METHOD: TTLC AD'L INF: B - 1 @ 2' Depth

Ag	As	Ba	Be	Cd	Co	Cr	Cu	Hg
<1.33	<10.0	145	<1.33	<1.33	4.15	10.1	17.3	0.16
Mo	**Ni**	**Pb**	**Sb**	**Se**	**Tl**	**V**	**Zn**	
<2.00	14.1	17.1	<10.0	<10.0	<10.0	23.9	74.8	

LAB NO: 06-0498-02F Date : 6/28/2006 1030

METHOD: TTLC AD'L INF: B - 2 @ 1' Depth

Ag	As	Ba	Be	Cd	Co	Cr	Cu	Hg
<1.33	<10.0	54.5	<1.33	<1.33	4.37	12.9	20.4	0.40
Mo	**Ni**	**Pb**	**Sb**	**Se**	**Tl**	**V**	**Zn**	
4.10	12.8	21.9	<10.0	<10.0	<10.0	26.2	72.0	

All Metal Test Results in ppm

Department of General Services
Standards Testing Laboratory

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS
Hexane Extractable Material (HEM)

PROJECT: Ballona Creek Enhancement

Date Reported: 06/30/06 Type: Solid
Analyzed By: TC

Sample Name	Lab I.D. #	Date Sampled	Date Extracted	Date Analyzed	Conc. (ppm)
Blank	-	-	06/29/06	06/30/06	<30
B-1 @ 2' Depth	06-00498-01D	06/28/06	06/29/06	06/30/06	6500
B-2 @ 1' Depth	06-00498-02D	06/28/06	06/29/06	06/30/06	100

Quality Assurance Report

Laboratory No. Clean Soil

Sample	Conc. (ppm)	% Recovery	RPD
Clean Soil	5.7		
Clean Soil Matrix Spike	320	110	16
Clean Soil Matrix Spike Duplicate	270	96	
LCS (Clean soil)	270	96	

Method: EPA 1664 (Modified)
Reporting Limit = 30ppm
Spike Recovery Limit = 70 - 130%
Spike RPD Limit = 30
LCS Recovery Limit = 80 - 120%

City of Los Angeles, Dept of General Services, Standards Testing Laboratory

VOLATILE ORGANIC COMPOUNDS

Project: BALLONA CREEK ENHANCEMENT

mg/kg (ppm)

Laboratory ID No	Method Blank	06-00498-01A	06-00498-02A						RL
Sample Location		B-1 @ 2'	B-2 @ 1'						Low
Sample Date		6/28/06	6/28/06						Level
Analysis Date	7/7/06	7/7/06	7/7/06						
Analysis Initials	MG	MG	MG						
Analysis Method	Low Level	Low Level	Low Level						
Multiplier	1	1	1						X Multiplier
Dichlorodifluoromethane	*	*	*						0.0032
Chloromethane	*	*	*						0.0032
Vinyl chloride	*	*	*						0.0032
Bromomethane	*	*	*						0.0032
Chloroethane	*	*	*						0.0032
Trichlorofluoromethane	*	*	*						0.0032
Ethanol	*	*	*						1.0
1,1-Dichloroethene	*	*	*						0.0016
Methylene chloride	*	*	*						0.0016
2-Methyl-2-propanonol (TBA)	*	*	*						0.0080
trans-1,2-Dichloroethene	*	*	*						0.0016
2-Methoxy-2-methylpropane (MTBE)	*	*	*						0.0016
1,1-Dichloroethane	*	*	*						0.0016
Diisopropylether (DIPE)	*	*	*						0.0016
2-Ethoxy-2-methylpropane (ETBE)	*	*	*						0.0016
2,2-Dichloropropane	*	*	*						0.0016
cis-1,2-Dichloroethene	*	*	*						0.0016
2-Butanone (MEK)	*	*	*						0.0020
Bromochloromethane	*	*	*						0.0016
Chloroform	*	*	*						0.0016
1,1,1-Trichloroethane	*	*	*						0.0016
2-Ethoxy-2-methylbutane (TAME)	*	*	*						0.0016
Carbon tetrachloride	*	*	*						0.0016
1,1-Dichloropropene	*	*	*						0.0016
Benzene	*	*	*						0.0016
1,2-Dichloroethane	*	*	*						0.0016
Trichloroethene	*	*	*						0.0016
1,2-Dichloropropane	*	*	*						0.0016
Dibromomethane	*	*	*						0.0016
Bromodichloromethane	*	*	*						0.0016
2-Chloroethyl vinyl ether	*	*	*						0.0040
cis-1,3-Dichloropropene	*	*	*						0.0016
4-Methyl-2-pentanone (MIBK)	*	*	*						0.00080
Toluene	*	*	*						0.0016
trans-1,3-Dichloropropene	*	*	*						0.0016
1,1,2-Trichloroethane	*	*	*						0.0016
Tetrachloroethene	*	*	*						0.0080
1,3-Dichloropropane	*	*	*						0.0016
Dibromochloromethane	*	*	*						0.0016
1,2-Dibromoethane	*	*	*						0.0016
Chlorobenzene	*	*	*						0.0016
1,1,1,2-Tetrachloroethane	*	*	*						0.0016
Ethylbenzene	*	*	*						0.0016
meta & para-Xylenes	*	*	*						0.0032
ortho-Xylene	*	*	*						0.0016
Styrene	*	*	*						0.0016
Bromoform	*	*	*						0.0080
Isopropylbenzene	*	*	*						0.0016
1,1,2,2-Tetrachloroethane	*	*	*						0.0016
Bromobenzene	*	*	*						0.0016
1,2,3-Trichloropropane	*	*	*						0.0016
n-Propylbenzene	*	*	*						0.0016
2-Chlorotoluene	*	*	*						0.0016
1,3,5-Trimethylbenzene	*	*	*						0.0016
4-Chlorotoluene	*	*	*						0.0016
tert-Butylbenzene	*	*	*						0.0016
1,2,4-Trimethylbenzene	*	*	*						0.0016
sec-Butylbenzene	*	*	*						0.0016
1,3-Dichlorobenzene	*	*	*						0.0016
p-Isopropyltoluene	*	*	*						0.0016
1,4-Dichlorobenzene	*	*	*						0.0016
n-Butylbenzene	*	*	*						0.0016
1,2-Dichlorobenzene	*	*	*						0.0016
1,2-Dibromo-3-chloropropane	*	*	*						0.0016
1,2,4-Trichlorobenzene	*	*	*						0.0016
Hexachlorobutadiene	*	*	*						0.0080
Naphthalene	*	*	*						0.0016
1,2,3-Trichlorobenzene	*	*	*						0.0016
Total	*	*	*						

QUALITY CONTROL

Surrogate Compounds	% Recovery								% Recovery
Dibromofluoromethane	110	112	111.0						88.7 - 110
Toluene-d8	99.3	96.8	98.1						84.3 - 113
4-Bromofluorobenzene	94.3	109	99.5						86.5 - 117

A: Method: EPA Method 8260B

B: Instrument #2: Hewlett-Packard 5890 with 5971 Series Mass-Selective Detector

C: Column: DB-624, 0.531 D., 3.0 Micron Thickness, 75 Meters

City of Los Angeles, Dept of General Services, Standards Testing Laboratory

PESTICIDES & POLYCHLORINATED BIPHENYLS (PCB'S)

Project: Ballona Creek Enhancement

Concentrations in mg/kg (ppm)

Laboratory I.D.	Soil Blank	06-00498-01	06-00498-02			Reporting
Sample Location		B-1 @ 2.0'	B-2 @ 1.0'			Limit
Sample Date	06/28/06	06/28/06	06/28/06			
Analysis Date	07/07/06	07/07/06	07/07/06			
Analysts Initials	LR	LR	LR			
Arochlor 1016	*	*	*			0.20
Arochlor 1221	*	*	*			0.20
Arochlor 1232	*	*	*			0.20
Arochlor 1242	*	*	*			0.20
Arochlor 1248	*	*	*			0.20
Arochlor 1254	*	*	*			0.20
Arochlor 1260	*	*	*			0.20
Total	*	*	*			

QUALITY CONTROL

Surrogate Compound						Control Limits (% Recovery)
Tetrachloro-m-xylene	58.3	73.5	73.0			13.4 - 118
Decachlorobiphenyl	90.8	59.8	68.8			23.0 - 165

A: Method. EPA Method 8081A & 8082
B. Instrument: Hewlett-Packard 5890 GC with Dual Electron Capture Detectors.
C. Columns: DB-35ms, 0.32mm, 30 meters; DB-XLB, 0.32mm, 30 meters.

* Below Reporting Limit

JUL 0 6 2006

Metals QC Validation Report

Sample ID#: 06-0498-01F
Analysis Date: 6/29/2006
Instrument: ICP
Matrix: Solid
Replicate: A

Metal	Sample Result	Spike 1 Result	Spike 2 Result	Spike Amount	% RPD	% Spike Recovery
As	0	2.982	2.991	3	0.15	99.55
Cd	0	7.632	7.721	8	0.58	95.96
Cr	0.1521	7.723	7.721	8	0.01	94.62
Cu	0.2592	7.577	7.625	8	0.32	91.77
Pb	0.2561	7.46	7.652	8	1.27	91.25
Hg	0.94	10.27	10.56	10	1.39	94.75
Mo	0	7.322	7.327	8	0.03	91.56
Ni	0.2116	7.791	7.534	8	1.68	93.14
Se	0	7.332	7.493	8	1.09	92.66
Ag	0	0.9418	0.9137	1	1.51	92.78
Zn	1.122	8.644	8.775	8	0.75	94.84
Sb	0	7.35	7.349	8	0.01	91.87
Tl	0	7.076	7.222	8	1.02	89.36
Be	0	1.992	1.996	2	0.10	99.70
Ba	2.179	10.38	9.369	8	5.12	96.19
Co	0.0622	7.84	7.975	8	0.85	98.07
V	0.3581	3.184	3.158	3	0.41	93.76

City of Los Angeles
Department of General Services
Standards Testing Laboratory

Quality Assurance Report

Lab Number: 06-00498-01A

Date Analyzed 7/7/06
Analyzed By: MG

Volatile Organic Compounds

Matrix: LL-SOIL

Concentration in ug/Kg (ppb)

Compound	Sample	Matrix Spike			Matrix Spike Duplicate			Control	RPD	RPD
	Result	Conc.	Result	% Rec	Conc.	Result	% Rec	Limit		Limit
1,1-Dichloroethene	0.0	50.0	47.4	95.0	50.0	47.4	95.0	68.1 - 146	0.00	20
Methylene Chloride	0.0	50.0	57.7	115	50.0	56.2	112	70.3 - 137	2.6	16
1,1-Dichloroethane	0.0	50.0	54.0	108	50.0	53.4	107	78.5 - 131	1.1	20
Chloroform	0.0	50.0	56.8	114	50.0	55.5	111	74.2 - 129	2.3	13
1,1,1-Trichloroethane	0.0	50.0	51.0	102	50.0	50.3	101	66.2 - 131	1.4	18
Benzene	0.0	50.0	50.8	102	50.0	50.7	101	73.7 - 134	0.20	17
1,2-Dichloroethane	0.0	50.0	57.8	116	50.0	57.3	115	76.2 - 126	0.87	17
Trichloroethene	0.0	50.0	48.0	96.0	50.0	46.2	92.4	65.2 - 129	3.8	18
Toluene	0.0	50.0	46.5	93.0	50.0	45.9	91.8	68.1 - 127	1.3	20
Tetrachloroethene	0.0	50.0	42.6	85.2	50.0	43.0	86.0	55.3 - 140	0.93	21
Chlorobenzene	0.0	50.0	46.3	92.6	50.0	45.9	91.8	63.0 - 129	0.87	15
1,4-Dichlorobenzene	0.0	50.0	35.6	71.2	50.0	35.8	71.6	51.2 - 130	0.56	21
Methyl isobutyl ether (MTBE)	0.0	50.0	51.9	119	50.0	57.4	115	70.8 - 139	3.8	16

A. Method EPA 8260
B. Instrument#2: Hewlett-Packard 5890 w/5971 Mass-Selective Detector
C. Column: DB-624, 0.53 mm I.D., 3.0 micron Film Thickness, 75 Meters
As of 3/15/06

06-00498 COC Report Supplement

Regulatory Code (W-Wastewater, H-Hazardous Waste, A-ASTM) W

Project Title: BALLONA CREEK ENHANCEMENT
Project Location:
Remarks:

Received: 06/28/06 12:57 PM by TC
Req#: D78 WO#: E1903240
Sampled by: MP/LR/TC

06-00498-01 Sample Description: B-1 @ 2' depth — Sample Matrix: S
Sampled IN: 06/28/06 10:15 AM OUT: Remarks:

06-00498-01A	Description: Glass Vial,40ml/wNaHSO4,VOC,5g	5035 Sample Collection; VOC Analysis (GC/MS)
Client Bottle? ☐	Comments: Arrived intact & in good condition, arrived in ice chest @ 13°C	
06-00498-01D	Description: Glass Jar, 125ml	Total Hydrocarbons by Gravimetric
Client Bottle? ☐	Comments: Arrived intact & in good condition, arrived in ice chest @ 13°C	
06-00498-01E	Description: Glass Jar, 125ml	8082 - PCB's Only Analysis
Client Bottle? ☐	Comments: Arrived intact & in good condition, arrived in ice chest @ 13°C	
06-00498-01F	Description: Glass Jar, 125ml	Title 22 TTLC (All Elements)
Client Bottle? ☐	Comments: Arrived intact & in good condition, arrived in ice chest @ 13°C	

06-00498-02 Sample Description: B-2 @ 1' depth — Sample Matrix: S
Sampled IN: 06/28/06 10:30 AM OUT: Remarks:

06-00498-02A	Description: Glass Vial,40ml/wNaHSO4,VOC,5g	5035 Sample Collection; VOC Analysis (GC/MS)
Client Bottle? ☐	Comments: Arrived intact & in good condition, arrived in ice chest @ 13°C	
06-00498-02D	Description: Glass Jar, 125ml	Total Hydrocarbons by Gravimetric
Client Bottle? ☐	Comments: Arrived intact & in good condition, arrived in ice chest @ 13°C	
06-00498-02E	Description: Glass Jar, 125ml	8082 - PCB's Only Analysis
Client Bottle? ☐	Comments: Arrived intact & in good condition, arrived in ice chest @ 13°C	
06-00498-02F	Description: Glass Jar, 125ml	Title 22 TTLC (All Elements)
Client Bottle? ☐	Comments: Arrived intact & in good condition, arrived in ice chest @ 13°C	

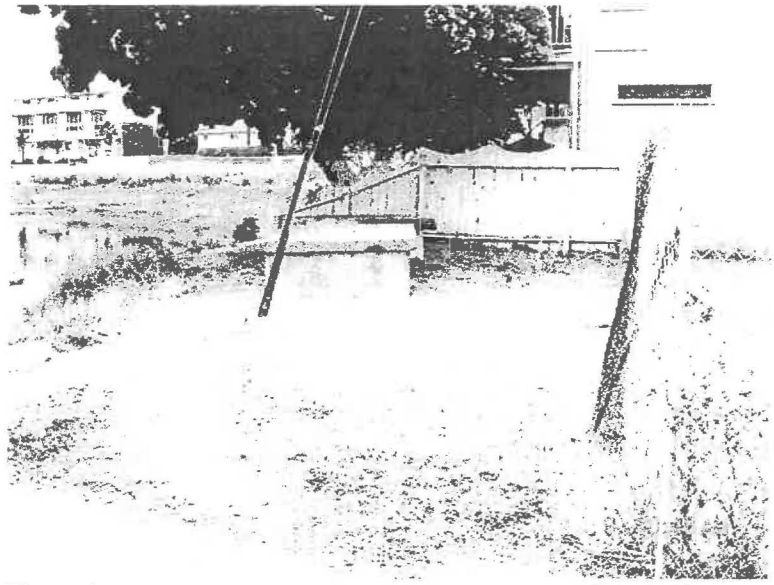


Figure 1

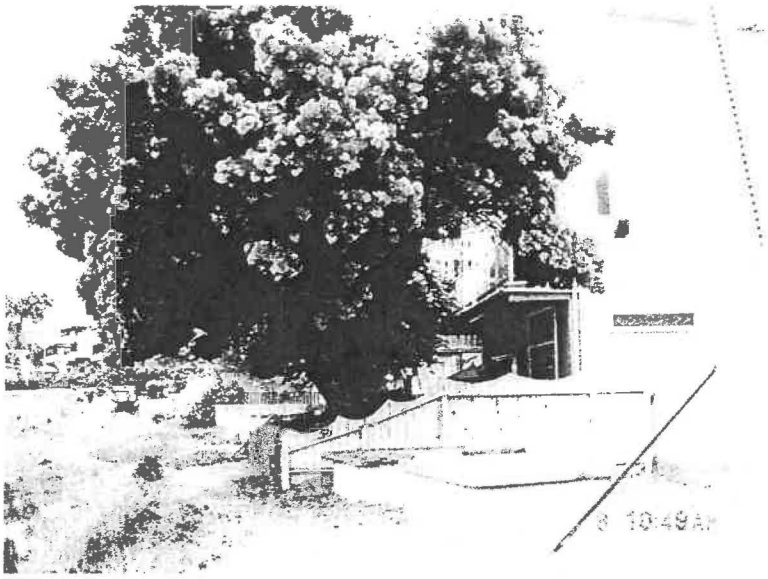


Figure 2

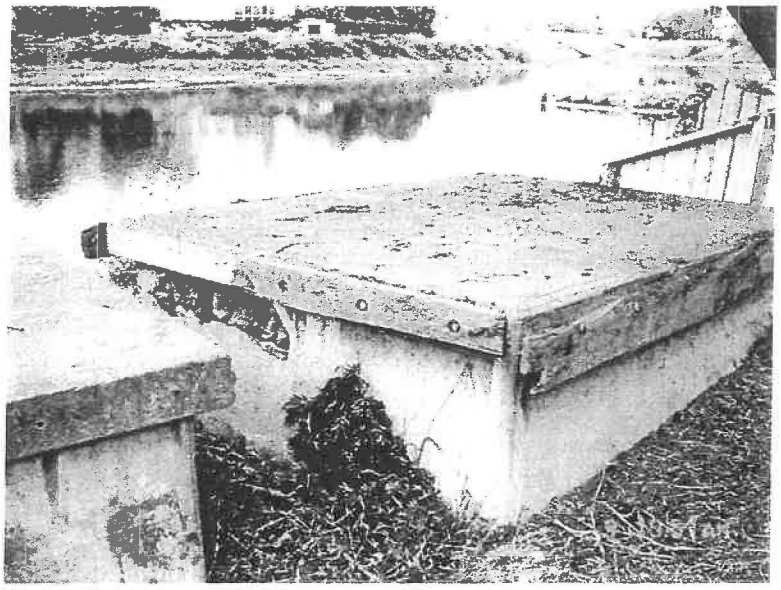


Figure 3

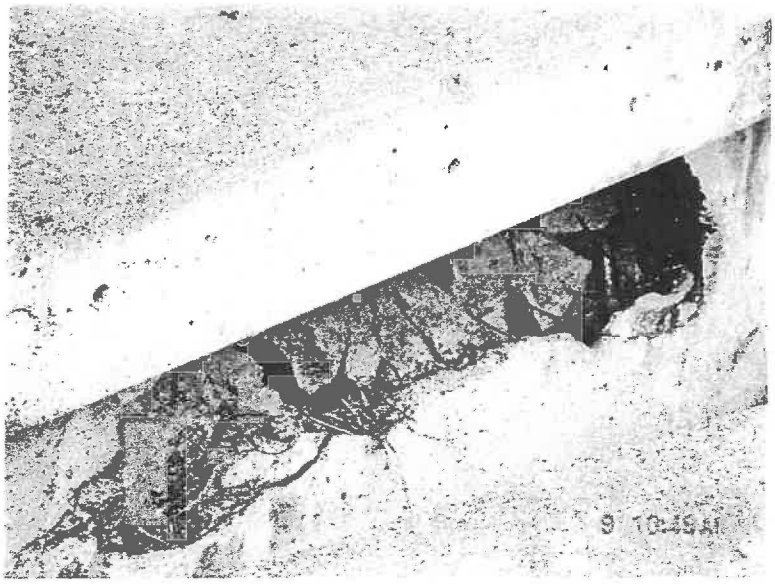


Figure 4

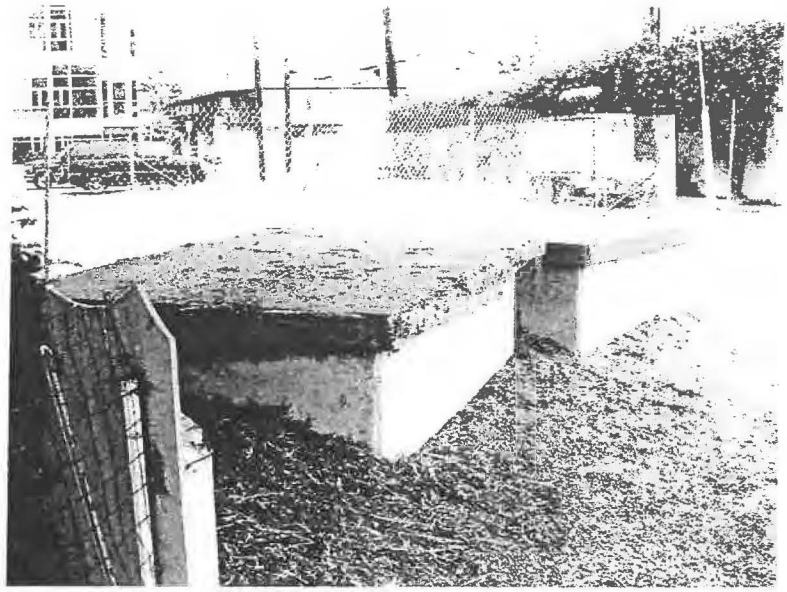
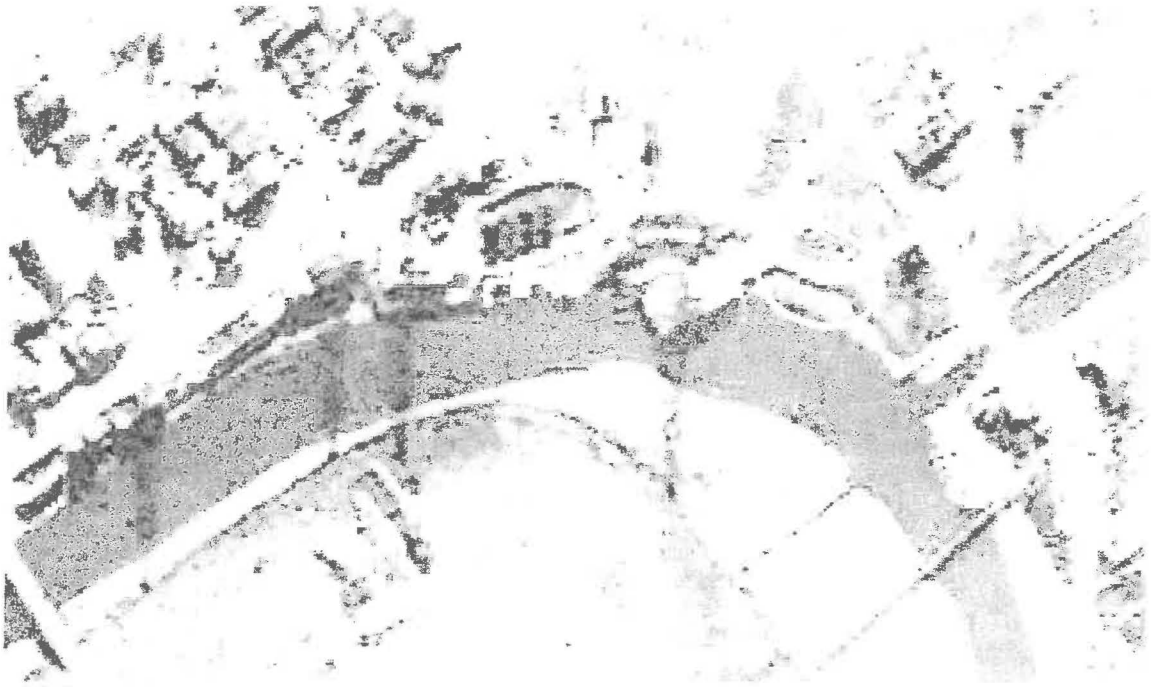


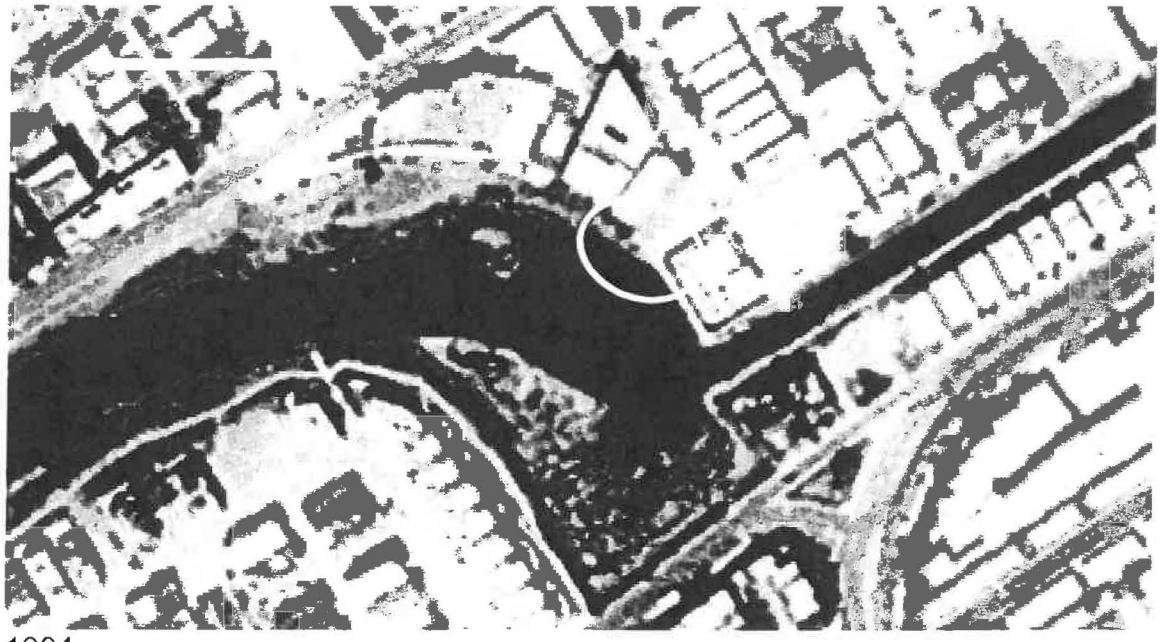
Figure 5



Figure 6



1938



1994

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

No. P 108-0397

554 (Field Code)

09 (Area Code)

-- (New Pool Code)

-- (Old Pool Code)

PERMIT TO CONDUCT WELL OPERATIONS

Daniel P. Whalen
3011 Thatcher Ave.
Marina Del Rey, CA 90292

Cypress, California
May 28, 2008

Your **supplementary** proposal to **reabandon** well **McDonald Petroleum , Ltd./"Mcdonald" 2**, A.P.I. No. **037-13842**, Section **21**, T. **2S**, R. **15W**, **S.B.** B. & M., **Playa Del Rey** Field, **Venice** area, -- pool, **Los Angeles** County, dated **5/13/2008**, received **5/28/2008** has been examined in conjunction with records filed in this office.

THE PROPOSAL IS APPROVED PROVIDED:

1. The permit to **reabandon** this well is extended through **May 28, 2009**.
2. In all other respects the well shall be **reabandoned** in accordance with the provisions set forth in our report No. **P 107-0277**, dated **May 9, 2007**.
3. This Division shall be consulted and a Supplementary Notice may be required before making any changes in the proposed program.

NOTE:

This is the final renewal of this notice. If work has not commenced on this well by May 28, 2009, this permit will be summarily cancelled.

CM:cm

cc: Update

BLANKET BOND

Engineer: Chris McCullough

Phone: 714/816-6847

Hal Bopp
State Oil and Gas Supervisor

By _____
For William E. Brannon, *Deputy Supervisor*

A copy of this permit and the proposal must be posted at the well site prior to commencing operations. Records for work done under this permit are due within 60 days after the work has been completed or the operations have been suspended.

OG 111

DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

WELL STATUS INQUIRY

05/CM

P# 108-0397

Cypress, California
May 8, 2008

FOR DIVISION USE ONLY		
	FORMS	
BOND	OGD114	OGD121
/	/	5-28-08 KS

Daniel P. Whalen
3011 Thatcher Ave.
Marina Del Rey, CA 90292

In a notice dated **4/16/07**, you propose to **reabandon** well **McDonald Petroleum, Ltd./"Mcdonald" 2**, API No. **037-13842**, Sec. **21**, T. **2S**, R. **15W**, **S.B.** B. & M., **Playa Del Rey** Field, **Los Angeles** County.

Please indicate below, conditions or intentions regarding this proposed work and return the completed form to this office within 10 days.

Hal Bopp
State Oil and Gas Supervisor

By _____
Chris McCullough, *Associate Engineer*

CM:vm

☐ **PROPOSED WORK HAS BEEN DONE. (If you check this space, please file the required well records on this work in duplicate within 60 days after work was completed.*)**

☐ **PROPOSED WORK IS IN PROGRESS AND SHOULD BE COMPLETE ABOUT_____. (Date of completion.)**

☒ **PROPOSED WORK HAS NOT BEEN DONE, BUT WE STILL INTEND TO DO THE WORK.****

- ☐ **SUPPLEMENTARY NOTICE (Form OG123) ATTACHED.**
- ☒ **PLEASE CONSIDER THIS FORM AS A SUPPLEMENTARY NOTICE.**

☐ **WE DO NOT INTEND TO DO THE PROPOSED WORK. Please cancel our notice to _____ dated _____.**

☐ **OTHER:** _____

_____ 5/13/08
(Signature) *Date*

DANIEL P. WHALEN, OWNER
(Name and Title)

* **Division 3 of the Public Resources Code states in part:**
Section 3215, ...Well records shall be filed 60 days after completion or suspension of proposed work.

** **Section 3203, ...If operations have not commenced within one year of receipt of the notice, the notice will be considered cancelled. (To prevent cancellation, file a Supplementary Notice with the division.)**

THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES
5816 CORPORATE AVENUE, SUITE 200
CYPRESS, CALIFORNIA 90630-4731

★ ★ ★ UNITED STATES POSTAGE
143
3620 $00.390 PB8579908
9679 MAILED FROM CYPRESS, CA 90630 MAY 10 07

RECD MAY 29 2007

McDONALD PETROLEUM, LTD.
752 Subway Terminal Building
Los Angeles, CA 90[redacted]

NIXIE 900 DC 1 00 05/25/07
RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
UNABLE TO FORWARD
BC: 90630474750 *2118-07615-10-39

RETURN
SENDER

90630[redacted]4747

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

No. P 107-0277

554 (Field Code)

09 (Area Code)

-- (New Pool Code)

-- (Old Pool Code)

PERMIT TO CONDUCT WELL OPERATIONS

Daniel P. Whalen
3011 Thatcher Ave.
Marina Del Rey, CA 90292

Cypress, California
May 9, 2007

Your proposal to **reabandon** well **McDonald Petroleum, Ltd./"Mcdonald" 2**, A.P.I. No. **037-13842**, Section **21**, T. **2S**, R. **15W**, **S.B.** B. & M., **Playa Del Rey** Field, **Venice** area, -- pool, **Los Angeles** County, dated **4/16/2007**, received **4/17/2007** has been examined in conjunction with records filed in this office.

THE PROPOSAL IS APPROVED PROVIDED:

1. Blowout prevention equipment with hydraulic controls, equivalent to this Division's Class **II2M** requirements, or better, shall be installed and maintained in operating condition.
2. All portions of the well not plugged with cement shall be filled with clay base mud having a minimum density of 72 lb/cu ft and a minimum gel-shear strength of 25 lb/100 sq ft.
3. The well shall be plugged with cement from **1896'** to **1840'**.
4. For the isolation of the freshwater sands a cavity shot shall be detonated at **1200'** and the well shall be plugged with cement from **1200' to 1090'**.
5. The cement plug proposed to be placed to **596'**, shall extend from **746'** to **596'**.
6. The well shall be plugged with cement from at least **55'** to **5'**.
7. This division shall be consulted and a Supplementary Notice may be required before making any changes in the proposed program.
8. **THIS DIVISION SHALL BE NOTIFIED TO:**
   a. Inspect the installed blowout prevention equipment prior to commencing downhole operations.
   b. Witness the mudding of the well.
   c. Witness the location and hardness of the cement plugs at **1840'**, **1090'** and **880'**.
   d. Witness the placing, location and hardness of the cement plugs from **746'** to **596'** and **55'** to **5'**.
   e. Inspect and approve the cleanup of the well site.

NOTE:

1. The base of the freshwater sands is at **1200'**±.
2. This division does not pass upon your right to enter the property, but merely approves the proposal as conforming to our requirements.

CM:cm
cc: Update
EDP
McDonald Petroleum, Ltd.
NO BOND REQUIRED

Engineer: Chris McCullough

Phone: 714/816-6847

Hal Bopp
State Oil and Gas Supervisor

By _____
For R. K. Baker, *Deputy Supervisor*

A copy of this permit and the proposal must be posted at the well site prior to commencing operations. Records for work done under this permit are due within 60 days after the work has been completed or the operations have been suspended.

OG 111

OG/CM

P# 1070277

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

FOR DIVISION USE ONLY		
	Forms	
Bond	OGD114	OGD121
BB		4/17/07

SUPPLEMENTARY NOTICE

A notice to the Division of Oil, Gas, and Geothermal Resources, *dated* _____, stating the intention to

Re ABANDON (Drill, rework, abandon) well MCDONALD PETROLEUM LTD. "MCDONALD" #2 (Well designation), API No. 037-13842

Sec. 21, T (2S-5) 15, R. 15W, SB B.&M., PLATA DEL REY Field,

LOS ANGELES County, should be amended because of changed conditions.

1. The complete casing record of the well (present hole), including plugs and perforations, is as follows:

14" CEM 696'; 8 5/8" CEM. 3,526', WSO, CAVITY SHOT @ 1950' CUT AND PULLED FROM 980', DAMAGED @ 2,000', TD 5,860. PLUGGED WITH CEMENT 4,642'- 4,500', 2,018'-1,896', 729'-675', ?-5'?

2. The total depth is: 5,860 feet. The effective depth is: — feet.

3. Present completion zone (s): — (Name). Anticipated completion zone (s): — (Name).

4. Present zone pressure: — psi. Anticipated/existing new zone pressure: — psi.

We now propose: *(A complete program is preferred and may be attached.)*

SUPPLEMENTARY NOTICE TO ABANDON:

1. DRILL OUT SURFACE PLUG
2. CLEAN OUT WELL TO 1200' +/-. PROVIDE CAVITY SHOT AT 1200'
3. PLUG WELL WITH CEMENT FROM 1,200'-1100', 980'-880', AND 696'-596'.
4. PROVIDE CLAY BASE MUD HAVING A DENSITY OF 72 lb/cf (MIN.) AND A GEL-SHEAR STRENGTH OF 25 lb/100sf (MIN) AT ALL PORTIONS OF THE WELL ABOVE 1,100' NOT FILLED WITH CEMENT.
5. DIVISION SHALL BE NOTIFIED PRIOR TO PLACING CEMENT PLUGS AT 1200'-1100', 880' 596', AND AT SURFACE.
6. DIVISION SHALL BE NOTIFIED PRIOR TO MUDDING OF THE WELL AND INSPECT/APPROVE THE CLEAN UP OF THE WELL SITE.
7. PLEASE NOTE ADDITIONAL REQUIREMENTS (IF ANY) ON PERMIT.

Note: If the well is to be redrilled, show proposed bottom-hole coordinates and estimated true vertical depth.
The Division must be notified if changes to this plan become necessary.

Name of Operator	Telephone Number	
DANIEL F. WHALEN	310-804-5817	
Address	City	Zip Code
3011 THATCHER AVENUE	MARINA DEL REY	90292
Name of Person Filing Notice	Signature	Date
DANIEL F. WHALEN		16 APRIL 2007

OG123 (8/97) **File in Duplicate**

4-17-2007

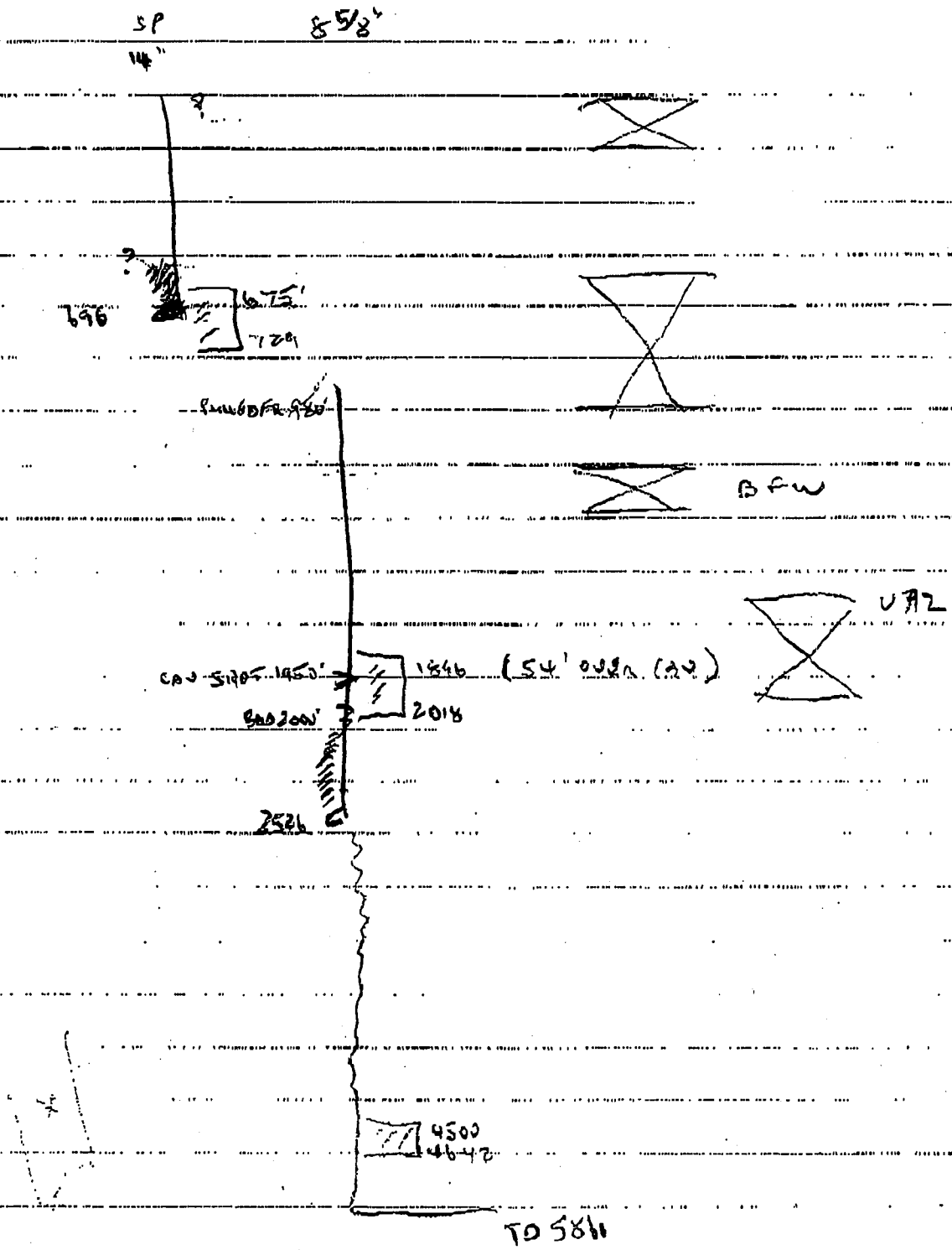
SP 36 10½ 350 lx

14" C 696 ; 8 5/8" C 2526 [illegible] BAD 2000', CAV 1950', PF 980 TD 5860

[illegible] 4642-4500, 2018-1846, 729'-675'

BFW 2200' ±

UAZ 2200' ±



TRANSMITTAL

April 17, 2007

TO:	CHRIS McCULLOUGH (FAX #714-816-6853)
FROM:	COLONEL DAN WHALEN, 8048
SUBJECT:	Processing AF IMT 40A

To Whom It May Concern:

Please process the attached Supplementary Notice at your earliest convenience.

If you have any questions, please contact me at 310-804-5817.

Thank you.

Attachment:
1. OG123
2. Well notes

RESOURCE AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

REPORT OF CANCELLATION

Cypress, California
March 6, 2007

Daniel P. Whalen
3011 Thatcher Ave.
Marina Del Rey, CA 90292

In accordance with **the expiration of Permit to Conduct Well Operation (reabandon)** the following change pertaining to your well **McDonald Petroleum, Ltd./"McDonald" 2**, API. No. **037-13842**, **Playa Del Rey** Field, **Los Angeles** County, Sec. **21**, T. **2S**, R. **15W**, S.B. B. & M., is being made in our records:

Your notice to **reabandon** dated **April 26, 2002**, and our report No. P **102-0288**, issued in answer thereto, are hereby **cancelled** inasmuch as the work will not be done. If you have an individual bond on file covering this notice, it will be returned. No request for such return is necessary.

Hal Bopp
State Oil and Gas Supervisor

By Chris McCullough
Associate Engineer

CM:cm

cc: Update
McDonald Petroleum, Ltd.

OG165 3-17-99

4-13-07 Daniel Whalen / AA
Requested that permit be renewed
I informed him that he should
submit a new NOI. Faxed him his
original NOI of 2002 and the original permit
A Andrade

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

No. P 106-0158

554 (Field Code)

09 (Area Code)

-- (New Pool Code)

-- (Old Pool Code)

PERMIT TO CONDUCT WELL OPERATIONS

Daniel P. Whalen
3011 Thatcher Ave
Marina Del Rey, CA 90292

Cypress, California
March 8, 2006

Your **supplementary** proposal to **reabandon** well **McDonald Petroleum, Ltd./"Mcdonald" 2**, A.P.I. No. **037-13842**, Section **21**, T. **2S**, R. **15W**, **S.B.** B. & M., **Playa Del Rey** Field, **Venice** area, -- pool, **Los Angeles** County, dated **2/15/2006**, received **2/23/2006** has been examined in conjunction with records filed in this office.

THE PROPOSAL IS APPROVED PROVIDED:

1. In all other respects the well shall be **reabandoned** in accordance with the provisions set forth in our report **No. P102-0288, dated 5/1/2002.**
2. This Division shall be consulted and a Supplementary Notice may be required before making any changes in the proposed program.

Cancelled 3/16/2007

FML:fl
cc: Update
EDP
BLANKET BOND

Engineer: Floyd Leeson

Phone: 714/816-6847

Hal Bopp
State Oil and Gas Supervisor

By _____
For R. K. Baker, *Deputy Supervisor*

A copy of this permit and the proposal must be posted at the well site prior to commencing operations. Records for work done under this permit are due within 60 days after the work has been completed or the operations have been suspended.

OG 111

OG/FL

3/1/06

P# 166-0158

The Resources Agency of California
Department of Conservation
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

WELL STATUS INQUIRY

Cypress, Calif.

Feb 15, 2006

Daniel P. Whalen
3011 Thatcher Ave.
Marina Del Rey, CA 90292

In notice dated 4/26/2002, you propose to reabandon
Wells McDonald Petroleum/ "McDonald" 2 API number 037-13842
Field Playa Del Rey, County L.A., Sec. 21, T. 2S, R. 15W, SB B.&M.

Please indicate below the conditions or intentions regarding this proposed work, and return the completed form to this office within 10 days.

Hal Bopp
State Oil and Gas Supervisor

By Thomas Leeson
714-816-6847

☐ PROPOSED WORK HAS BEEN DONE. (If you check this box, please file the required well records on this work in duplicate within 60 days after work was completed.*)

☐ PROPOSED WORK IS IN PROGRESS AND SHOULD BE COMPLETED ABOUT _____.
(date)

☒ PROPOSED WORK HAS NOT BEEN DONE, BUT WE STILL INTEND TO DO THE WORK.**

- ☐ SUPPLEMENTARY NOTICE (Form OG123) ATTACHED.
- ☒ PLEASE CONSIDER THIS FORM AS A SUPPLEMENTARY NOTICE.

☐ WE DO NOT INTEND TO DO THE PROPOSED WORK. Please cancel our notice to _____, dated _____.

☐ OTHER: _____

Feb 21, 2006
(Signature)

DANIEL P. WHALEN – OWNER
(Name and title)

* Division 3 of the *Public Resources Code* states, in part:
Section 3215, ...Well records shall be filed 60 days after completion or suspension of proposed work.

** Section 3203, ...If operations have not commenced within one year of receipt of the notice, the notice will be considered canceled. (To prevent cancelation, file a Supplementary Notice with the division.)

OGD3 (12/97)

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

No. P 105-0054

554 (Field Code)

09 (Area Code)

-- (New Pool Code)

-- (Old Pool Code)

PERMIT TO CONDUCT WELL OPERATIONS

Daniel P. Whalen
3011 Thatcher Ave
Marina Del Rey, CA 90292

Cypress, California
February 7, 2005

Your **supplementary** proposal to **reabandon** well **McDonald Petroleum, Ltd./"Mcdonald" 2**, A.P.I. No. **037-13842**, Section **21**, T. **2S**, R. **15W**, **S.B.** B. & M., **Playa Del Rey** Field, **Venice** area, **--** pool, **Los Angeles** County, dated **1/6/2004**, received **1/25/2005** has been examined in conjunction with records filed in this office.

THE PROPOSAL IS APPROVED PROVIDED:

1. In all other respects the well shall be **reabandoned** in accordance with the provisions set forth in our report **No. P102-0288, dated 5/1/2002.**
2. This Division shall be consulted and a Supplementary Notice may be required before making any changes in the proposed program.

Cancelled 3/16/2009

FML:fl
cc: Update
EDP
BLANKET BOND

Hal Bopp
State Oil and Gas Supervisor

Engineer: Floyd Leeson

Phone: 714/816-6847

By _____
For R. K. Baker, *Deputy Supervisor*

A copy of this permit and the proposal must be posted at the well site prior to commencing operations. Records for work done under this permit are due within 60 days after the work has been completed or the operations have been suspended.

OG 111

2/4/05
OG/FL
P#105-0054

The Resources Agency of California
Department of Conservation
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

WELL STATUS INQUIRY

Cypress, Calif.

Jan 6, 2004

Daniel P. Whalen
3011 Thatcher Ave.
Marina Del Rey, CA 90292

In notice dated 4/26/2002, you propose to reabandon
Wells McDonald Petroleum/ "McDonald" 2 API number 037-13842
Field Playa Del Rey, County L.A., Sec. 21, T. 2S, R. 15W, SB B.&M.

Please indicate below the conditions or intentions regarding this proposed work, and return the completed form to this office within 10 days.

W. F. Guerard, Jr.
State Oil and Gas Supervisor
By

☐ PROPOSED WORK HAS BEEN DONE. (If you check this box, please file the required well records on this work in duplicate within 60 days after work was completed.*)

☐ PROPOSED WORK IS IN PROGRESS AND SHOULD BE COMPLETED ABOUT _____.
(date)

☒ PROPOSED WORK HAS NOT BEEN DONE, BUT WE STILL INTEND TO DO THE WORK.**

- ☐ SUPPLEMENTARY NOTICE (Form OG123) ATTACHED.
- ☒ PLEASE CONSIDER THIS FORM AS A SUPPLEMENTARY NOTICE.

☐ WE DO NOT INTEND TO DO THE PROPOSED WORK. Please cancel our notice to _____

_____, dated _____.

☐ OTHER: _____

_____ JAN 20, 2005
(Signature)

DANIEL P. WHALEN OWNER
(Name and title)

* Division 3 of the *Public Resources Code* states, in part:
Section 3215, ...Well records shall be filed 60 days after completion or suspension of proposed work.

** Section 3203, ...If operations have not commenced within one year of receipt of the notice, the notice will be considered canceled. (To prevent cancelation, file a Supplementary Notice with the division.)

OGD3 (12/97)

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

No. P 104-0019

554 (Field Code)

09 (Area Code)

-- (New Pool Code)

-- (Old Pool Code)

PERMIT TO CONDUCT WELL OPERATIONS

Daniel P. Whalen
3011 Thatcher Ave
Marina Del Rey, CA 90292

Cypress, California
January 20, 2004

Your **supplementary** proposal to **reabandon** well **McDonald Petroleum, Ltd./"Mcdonald" 2**, A.P.I. No. **037-13842**, Section **21**, T. **2S**, R. **15W**, **S.B.** B. & M., **Playa Del Rey** Field, **Venice** area, -- pool, **Los Angeles** County, dated **1/7/2004**, received **1/16/2004** has been examined in conjunction with records filed in this office.

THE PROPOSAL IS APPROVED PROVIDED:

1. In all other respects the well shall be **reabandoned** in accordance with the provisions set forth in our report **No. P102-0288, dated 5/1/2002.**
2. This Division shall be consulted and a Supplementary Notice may be required before making any changes in the proposed program.

Cancelled 3/16/2007

FML:fl
cc: Update
EDP
BLANKET BOND

Engineer: Floyd Leeson

Phone: 714/816-6847

Hal Bopp
State Oil and Gas Supervisor

By _____
For R. K. Baker, *Deputy Supervisor*

A copy of this permit and the proposal must be posted at the well site prior to commencing operations. Records for work done under this permit are due within 60 days after the work has been completed or the operations have been suspended.

OG 111

DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

OG1 FL

WELL STATUS INQUIRY

Cypress, California
January 7, 2004

P# 104-0019

FOR DIVISION USE ONLY		
	FORMS	
BOND	OGD114	OGD121
NA	—	1/20/04

Daniel P. Whalen
3011 Thatcher Ave
Marina Del Rey, CA 90292

In a notice dated **4/26/02**, you propose to **reabandon** well **"McDonald" 2**, API No. **037-13842**, Sec. **21**, T. **2S**, R. **15W**, **S.B.** B. & M., **Playa Del Rey** Field, **Los Angeles** County.

Please indicate below, conditions or intentions regarding this proposed work and return the completed form to this office within 10 days.

Hal Bopp
State Oil and Gas Supervisor

By Floyd Leeson
Floyd Leeson, *Operations Engineer*

FL:vb

☐ **PROPOSED WORK HAS BEEN DONE. (If you check this space, please file the required well records on this work in duplicate within 60 days after work was completed.*)**

☐ **PROPOSED WORK IS IN PROGRESS AND SHOULD BE COMPLETE ABOUT_____. (Date of completion.)**

☒ **PROPOSED WORK HAS NOT BEEN DONE, BUT WE STILL INTEND TO DO THE WORK.****

- ☐ **SUPPLEMENTARY NOTICE (Form OG123) ATTACHED.**
- ☒ **PLEASE CONSIDER THIS FORM AS A SUPPLEMENTARY NOTICE.**

☐ **WE DO NOT INTEND TO DO THE PROPOSED WORK. Please cancel our notice to _____ dated _____.**

☐ **OTHER:** _____

(Signature) JAN 14, 2004 Date

DANIEL P. WHALEN OWNER
(Name and Title)

* **Division 3 of the Public Resources Code states in part:**
Section 3215, ...Well records shall be filed 60 days after completion or suspension of proposed work.

** **Section 3203, ...If operations have not commenced within one year of receipt of the notice, the notice will be considered cancelled. (To prevent cancellation, file a Supplementary Notice with the division.)**

RECEIVED
JAN 16 2004
DIVISION OF OIL, GAS & GEOTHERMAL RESOURCES

OGD3 *3-16-99*

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

No. P 102-0288

554 (Field Code)

09 (Area Code)

-- (New Pool Code)

-- (Old Pool Code)

PERMIT TO CONDUCT WELL OPERATIONS

Daniel P. Whalen
3011 Thatcher Ave.
Marina Del Rey, CA 90292

Cypress, California
May 1, 2002

Your proposal to **reabandon** well **McDonald Petroleum, Ltd./"Mcdonald" 2**, A.P.I. No. **037-13842**, Section **21**, T. **2S**, R. **15W**, **S.B.** B. & M., **Playa Del Rey** Field, **Venice** area, -- pool, **Los Angeles** County, dated **4/26/2002**, received **4/26/2002** has been examined in conjunction with records filed in this office.

THE PROPOSAL IS APPROVED PROVIDED:

1. Blowout prevention equipment with hydraulic controls, equivalent to this Division's Class **II2M** requirements, or better, shall be installed and maintained in operating condition.
2. All portions of the well not plugged with cement shall be filled with clay base mud having a minimum density of 72 lb/cu ft and a minimum gel-shear strength of 25 lb/100 sq ft.
3. The well shall be cleaned out to at least **1200'+/-.**
4. For the isolation of the oil, gas and freshwater sands a cavity shot shall be detonated at **1200'** and the well shall be plugged with cement from **1200' to 1100'.**
5. The well shall be plugged from **980' to 880'** and from **696' to 596'.**
6. This division shall be consulted and a Supplementary Notice may be required before making any changes in the proposed program.
7. **THIS DIVISION SHALL BE NOTIFIED TO:**
   a. Witness the placing, location and hardness of the cement plug from **1200' to 1100'.**
   b. Witness the mudding of the well.
   c. Witness the placing, location and hardness of the cement plugs **at 880', 596' and at surface.**
   d. Inspect and approve the cleanup of the well site.

NOTE:

1. The base of the freshwater sands is at **1200'±.**
2. A Division witnessed and approved leak test of the surface plug prior to welding on the steel plate at the surface is a requirement of the Construction Site Review process.

FML:fl
cc: Update
EDP

BLANKET BOND

CANCELLED 3/6/2007

William F. Guerard, Jr.
State Oil and Gas Supervisor

Engineer: Floyd Leeson

Phone: 714/816-6847

By _____
For R. K. Baker, *Deputy Supervisor*

A copy of this permit and the proposal must be posted at the well site prior to commencing operations. Records for work done under this permit are due within 60 days after the work has been completed or the operations have been suspended.

OG 111

OG1FL

P#102-0288

RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
DIVISION OF OIL, GAS, AND GEOTHERMAL RESOURCES

FOR DIVISION USE ONLY		
	Forms	
Bond	OGD114	OGD121
NA JB		4/29/02

SUPPLEMENTARY NOTICE

A notice to the Division of Oil, Gas, and Geothermal Resources, *dated* OCT 15, 1931, stating the intention to

ABANDON (*Drill, rework, abandon*) well MCDONALD PETROLEUM LTD, MCDONALD #2 (*Well designation*), API No. 037-13842

Sec. 21, T. 2-S, R. 15W, SB B.&M., PLAYA DEL REY Field,

LOS ANGELES County, should be amended because of changed conditions.

1. The complete casing record of the well (present hole), including plugs and perforations, is as follows:

14" CEM 696'; 8 5/8" CEM. 3,526', WSO, CAVITY SHOT @ 1950' CUT AND PULLED FROM 980', DAMAGED @ 2000', TD 5,860. PLUGGED WITH CEMENT 4,642' - 4500', 2,018'-1,896', 729'-675', ?-5'?

2. The total depth is: 5,860 feet. The effective depth is: — feet.

3. Present completion zone (s): — (Name). Anticipated completion zone (s): — (Name).

4. Present zone pressure: — psi. Anticipated/existing new zone pressure: — psi.

We now propose: *(A complete program is preferred and may be attached.)*

SUPPLEMENTARY NOTICE TO ABANDON:

1. DRILL OUT SURFACE PLUG.
2. PLACE CEMENT FROM 675' TO 10'.
3. DIVISION INSPECT FOR LEAK TEST.
4. INSTALL VENT.

try to get @ SFW, to 1200' + c/s & plug

55409 Playa Venice

NOTE: PROGRAM MUST SATISFY DIVISION REQUIREMENTS FOR ABANDONMENT TO CURRENT STANDARDS. IF DIVISION HAS ADDITIONAL REQUIREMENTS, PLEASE NOTE ON PERMIT.

Cancelled 3/6/2007

Note: If the well is to be redrilled, show proposed bottom-hole coordinates and estimated true vertical depth.
The Division must be notified if changes to this plan become necessary.

Name of Operator	Telephone Number	
DANIEL P. WHALEN	310-823-6811 / CELL 310	
Address	City	Zip Code
3011 THATCHER AVENUE	MARINA DEL REY	90292
Name of Person Filing Notice	Signature	Date
DANIEL P. WHALEN		26 APRIL 02

OG123 (8/97) File In Duplicate

John H. Kramer
2361 Diamond Head Way
Oxnard, CA 93030

October 22, 1999

Mr. Ed Santiago
Department of Conservation
Division of Oil, Gas & Geothermal Resources
5816 Corporate Avenue, Suite 200
Cypress, CA 90630

Dear Ed:

I have some additional information on the property with the abandoned well that I spoke to you about recently on the telephone. Here is what I have:

Address: 138 Hurricane Los Angeles, CA 90292 a vacant fenced corner lot.

Legal Description: County of Los Angeles, Lot 2, Block 5, Silver Strand Tract, As per map recorded in Book 7, Page 86 of Maps, in the office of the County Recorder of Said County.

General Description: Southwest corner of Hurricane and Canal Court.

I am assisting the Trustor for the estate, a Mr. Louis Pearson. He went to the L. A. County Recorder's Office and all they were going to give him for a map were copies of the oilfield Munger Map which I already had and are enclosed. The well involved is the McDonald Petroleum Ltd McDonald No. 2. Mr. Pearson contacted your office and was furnished the DOGGR documents on the present condition of the well, copies of which are enclosed. I would very much appreciate information on what the DOGGR requirements are to bring McDonald No. 2 into compliance with present day abandonment standards so the property can be sold. If you need more information let me know. During the day I can be reached at (805) 899-3144 Ext. 28.

Thanks for your help. It was a pleasure talking with you the other day and getting caught up a bit on who was still around.

Sincerely,

John H. Kramer

John H. Kramer

Cc: Mr. Louis Pearson, Trustor

10-26-99 10:30 AM
TALKED TO HIM
- GAVE HIM INFO
JM

629 South Hill Street
Los Angeles, California
September 27, 1932.

Mr. W. H. Graham,
2906 Cherry Avenue,
Long Beach, Cal.

Dear Sir:

Your report of abandonment of Hubert F. Laugharn, Receiver for McDonald Petroleum, Ltd., well No. "McDonald" 2, Sec. 21, T. 2 S., R. 15 W., S. B. B. & M., Playa del Rey oil field, Los Angeles County, dated September 21, 1932, and submitted to this Division on our form 102, has been examined in conjunction with records filed in this office.

A review of the reports and records shows that the requirements of this Division, which are based on all information filed with it, have now been fulfilled.

Yours truly,

R. D. Bush,
State Oil and Gas Supervisor,

By [signature]
Deputy Supervisor.

CC - Hubert F. Laugharn, Receiver

R. D. Bush

RWW:EMS

Reference to file on data

Maps 42	[illegible]	Cross Section	Cards	Forms 114	Forms 121
A-L					✓

1
AAU
9-30-32

FORM 102. 74353 2-30 10M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

DIVISION OF OIL AND GAS
RECEIVED
SEP 24 1932
LOS ANGELES, CALIFORNIA

LOG OF OIL OR GAS WELL

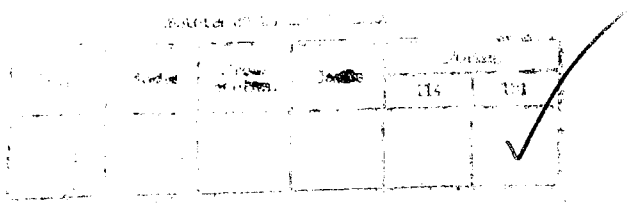
FIELD Playa del Rey COMPANY Hubert E. Laughran Rec.
McDonald Petroleum Ltd.
Sec. 21, T. 2 S., R. 15 W., S.B. B. & M., Well No. McDonald No. 2

In compliance with the provisions of Chapter 718, Statutes 1915, as amended, the information given herewith is a complete and correct record of all work done on the well since the previous record, dated May 18, 1932., was filed.

SIGNED Smith & Graham.

Date Sept. 21, 1932. Title W. H. Graham
(President, Secretary or Agent)

The hole could not be cleaned out below 2018'
On May 12th 1932 350 bbls of mud was dumped in the hole.
Fluid level did not rise above 30'
A cavity shot was made in the 8 5/8" casing at 1950' as haevy mud would not permit it to be run lower.
The shot cavity was cleaned out and 30 sacks of Victor cement was dumped at 2018'
Top of plug was located at 1929'
8 sacks of cement was dumped at 1929'
Top of cement plug located at 1896'
The hole was filled with heavy mud and the 8 5/8" casing was shot and pulled from 980'
The hole was cleaned out to 729' and 30 sacks of Victor cement was dumped. Top of plug was located at 675'
The hole was filled with heavy mud and the surface casing capped at the bottom of the cellar.



ORM 109-A. 81305 12-30 20M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Special Report on Operations Witnessed

No. T-1-24110

Los Angeles, Cal. June 3, 1932.

Mr. W. H. Graham,
Long Beach, Cal.

~~Agent for~~ SMITH & GRAHAM, CONTRACTORS. ~~Company~~

DEAR SIR: Hubert F. Laugharn, Receiver for McDonald Petroleum, Ltd.
Operations at ~~your~~ well No. "McDONALD" 2 Section 21, T. 2-S., R. 15-W., S. B. B. & M., Playa del Rey Oil Field, in Los Angeles County, were witnessed by R. P. Phillips, representative of the supervisor, on May 24, 1932. There was also present J. C. Ayres, Driller, and H. H. Davis, Helper.

Casing Record 14" S.P. cem. 696'; 8-5/8" cem. 3526'. W.S.O., reported bad at about 2000', shot at 1950', pulled from 980'; T.D. 5860', plugged with cement 4642'-4500', 2018'-1896' and 729'-675'.

The operations were performed for the purpose of testing the location and hardness of a cement plug proposed to be placed on the stub of the 8-5/8" casing in the process of abandonment.

and the data and conclusions are as follows:

ON MAY 23, 1932, THE INSPECTOR ARRIVED AT THE WELL AT 2:10 P.M. AND MR. AYRES REPORTED THE FOLLOWING:

1. The 8-5/8" casing was shot at 980' with a collar shot and pulled from that depth.
2. The hole was cleaned out to 729'.

THE INSPECTOR NOTED THAT 30 sacks of Victor cement was dumped at 729'.

The operations were completed at 4:05 p.m.

ON MAY 24, 1932, THE INSPECTOR ARRIVED AT THE WELL AT 3:35 P.M. AND NOTED THAT the bailer could not be spudded below 675' and brought up a sample of set cement.

The test was completed at 4:15 p.m.

THE LOCATION AND HARDNESS OF THE CEMENT PLUG AT 675' ARE APPROVED.

cc-Hubert F. Laugharn, Receiver

RPP:GH

R. D. BUSH
State Oil and Gas Supervisor
By [signature] Deputy

ORM 109-A. 81365 12-30 20M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Special Report on Operations Witnessed

No. T-1-24074

Los Angeles, Cal. May 18, 1932.

Mr. W. H. Graham,
Long Beach, Cal.

~~Agent for~~ SMITH & GRAHAM, CONTRACTORS. ~~Company~~

121

DEAR SIR:

Operations at ~~your~~ well No. HUBERT F. LAUGHARN, RECEIVER FOR MCDONALD PETROLEUM, LTD. "MCDONALD" 2 Section 21, T. 2 S, R. 15 W., S.B. B. & M., Playa del Rey Oil Field, in Los Angeles County, were witnessed by J. B. Witty, representative of the supervisor, on May 16, 1932. There was also present J. C. Ayres, Driller, Gordon Graham, Contractor.

Casing Record 14" S.P. cem. 696'; 8-5/8" cem. 3526', W.S.O., reported bad at about 2000'; shot at 1950'. T.D. 5860', plugged with cement 4642'-4500', and 2018'-1896'.

The operations were performed for the purpose of testing the location and hardness of a cement plug required to be placed from 2000' to 1970' in the process of abandonment.

and the data and conclusions are as follows:

INSPECTOR JOHNSON VISITED THE WELL ON MAY 13, 1932, AND MR. GRAHAM REPORTED THE FOLLOWING:
1. The hole could not be cleaned out below 2018'.
2. On May 12, 1932, 350 bbls. of mud was dumped in the hole in an attempt to fill it to the surface. At no time did the fluid level rise above 30'.

INSPECTOR JOHNSON NOTED THE FOLLOWING:
1. The hole was open to 2018'.
2. The 8-5/8" casing was shot at 1950' with a 4"x5' shell containing 30 lb. of 80% gelatin.
3. The shot could not be run lower than 1950' due to the heavy mud in the hole.
4. The shot cavity was cleaned out and 30 sacks of Victor cement was dumped at 2018'.

INSPECTOR JOHNSON AGAIN VISITED THE WELL ON MAY 14, 1932, AND NOTED THE FOLLOWING:
1. The bailer was spudded to a depth of 1929' and brought up a sample of set cement.
2. 8 sacks of Victor cement was dumped at 1929'.

THE INSPECTOR ARRIVED AT THE WELL AT 9:40 A. M., AND NOTED THE FOLLOWING: The bailer could not be spudded below 1896' and brought up a sample of set cement.

The test was completed at 10:00 a. m.

THE LOCATION AND HARDNESS OF CEMENT PLUG AT 1896' ARE APPROVED.

cc-Hubert F. Laugharn, Receiver.
JBW:OH

R. D. BUSH
State Oil and Gas Supervisor

By _____ Deputy

FORM 111. 92582 2-32 20M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Report on Proposed Operations

No. P -1-24279

Los Angeles, Cal. May 13, 19 32.

MR. W. H. Graham,

Long Beach, Cal.

~~Agent~~ for SMITH & GRAHAM ~~Company~~

DEAR SIR:

HUBERT F. LAUGHARN, RECEIVER FOR MCDONALD PETROLEUM, LTD.

Your proposal to abandon / Well No. "MCDONALD" 2,

Section 21, T. 2 S., R. 15 W., S.B. B. & M., Playa del Rey Oil Field, Los Angeles County,

dated May 10, 19 32, received May 12, 19 32, has been examined in conjunction with records filed in this office.

Present conditions as shown by the records and the proposal are as follows:

Records in addition to, or at variance with those shown in the notice:
The 8-5/8" shut-off was approved.
Total depth 5860'; bridged with cement 4642'-4500'.
This well last produced during January 1931 at the average daily rate of 50 bbl. of oil and 200 bbl. of water.

THE NOTICE STATES:
"The present condition of the well is as follows:
14" Surface Casing set at 696'
8 5/8" Casing set at 3526'
Reported bad at about 2000'
Bottom of hole plugged at 4500'"

PROPOSAL:
"The proposed work is as follows:
To clean out hole to bad place in casing.
Shoot cavity shot at this point. Clean out cavity and fill with 20' cement plug.
Remove 8 5/8" casing, fill hole with heavy mud and Cap the surface casing with a metal seal."

DECISION:
THE PROPOSAL IS APPROVED PROVIDED THAT:

1. The hole shall be cleaned out to the bad place in the casing at about 2000' and shot with 10' shell containing 50 lb. of 80% gelatin.
2. The shot cavity shall be cleaned out and plugged with a cement plug at least 30' long.
3. The 8-5/8" casing shall not be pulled from below 676'.
4. The stub of the 8-5/8" casing shall be capped with a cement plug at least 20' long.
5. All portions of the hole not plugged with cement shall be filled with heavy mud.
6. THIS DIVISION SHALL BE NOTIFIED TO WITNESS:
   (a) The depth to which the hole is cleaned out.
   (b) The shooting operations at about 2000'.
   (c) The placing of the cement plug in the shot cavity.
   (d) The location and hardness of the cement plug at about 1970'.
   (e) The cutting or shooting of the 8-5/8" casing at 676'.
   (f) The placing of the cement plug on the stub of the 8-5/8" casing.
   (g) The location and hardness of the cement plug at 656'.

NOTE: A complete report in duplicate on our form 102 shall be filed with this Division after the completion of the above work.
In approving the above proposal this Division does not pass upon your right to enter upon this property, but merely approves the work as conforming to our requirements for abandonment.

R. D. BUSH
State Oil and Gas Supervisor

By [signature] Deputy

c-Hubert F. Laugharn, Receiver.
CLB:OH

FORM 108. 75114 3-30 5M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

DIVISION OF OIL AND GAS
RECEIVED
MAY 12 1932
LOS ANGELES, CALIFORNIA

Notice of Intention to Abandon Well

This notice must be given at least five days before work is to begin

Long Beach, Cal. May 10th 1932

MR. E.Huguenin,

Deputy State Oil and Gas Supervisor

Los Angeles, Calif. Cal.

DEAR SIR:

In compliance with Section 16, Chapter 718, Statutes of 1915, as amended, notice is hereby given that it is our intention to abandon well No. McDonald No.2, Sec. 21, T. 2 S, R. , B. & M., Venice, Playa Del Rey, Oil Field, Los Angeles, County, commencing work on the 10th day of May 1932

The present condition of the well is as follows:

14" Surface Casing set at 696'
8 5/8" Casing set at 3526'
Reported bad at about 2000'
Bottom of hole plugged at 4500'

The proposed work is as follows:

To clean out hole to bad place in casing.
Shoot cavity shot at this point. Clean out cavity and fill with 20' cement plug.
Remove 8 5/8" casing, fill hole with heavy mud and Cap the surface casing with a metal seal.

Approved

Reference to file of data

Maps	Model	Cross section	Cards	Forms 114	Forms 121
				✓	✓

Respectfully yours

Smith & Graham,
Name of Company or Operator

By W. H. Graham

ADDRESS NOTICE TO DEPUTY STATE OIL AND GAS SUPERVISOR IN CHARGE OF DISTRICT WHERE WELL IS LOCATED

629 South Hill Street
Los Angeles
February 25, 1932

Hubert F. Laugharn, Receiver
for McDonald Petroleum Company
621 Subway Terminal Building
Los Angeles, California

Dear Sir:

Please refer to my letter of November 13, 1931, regarding your well No. "McDonald" 2, which has now been standing idle over a year in bad mechanical condition. Engineer Barton discussed this matter some months ago with your Mr. Smith, who stated that the well at that time was in process of going into bankruptcy and that a trustee would undoubtedly be appointed at that time. Will you please advise me whether this well is still under your receivership, and if not, who was appointed trustee in bankruptcy?

Yours truly,

Deputy Supervisor.

cc-R. D. Bush
Follow-up

EH-GH

FORM 111. 79322 9-30 20M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Report on Proposed Operations

No. P-1-23717

Los Angeles, Cal. October 17, 1931.

MR. B. D. Owens,
Compton, Cal.
~~Agent for~~ OWENS & OWENS ~~Company~~

DEAR SIR:

Your HUBERT F. LAUGHARN, RECEIVER proposal to abandon / Well No. "MCDONALD" 2,
Section 21, T2 S., R.15 W., S.B. B. & M., Playa del Rey Oil Field, Los Angeles County,
dated Oct. 15, 1931, received Oct. 15, 1931, has been examined in conjunction with records filed in this office.

Present conditions as shown by the records and the proposal are as follows:

Records in addition to, or at variance with those shown in the notice:
Casing: 14" S. P. cem. 696'
8-5/8" cement 3526', W. S. O.
T. D. 5860'; cement bridge from 4642' to 4500'.
This well was last produced in January, 1931, and at that time made approximately 50 bbl. per day of oil and 200 bbl. per day of water from the upper zone.

THE NOTICE STATES:
"The present condition of the well is as follows:
14" S. P. cem. 696'
8 5/8" cem. 3526 (36#) W.S.X.O.
Liner ?
Scout Report 5841' Bottom
" " Pluged back 4550'"

PROPOSAL:
"The proposed work is as follows:
Abandon well in accordance with your requirements"

DECISION:
THE PROPOSAL IS APPROVED PROVIDED THAT:
1. The hole shall be cleaned out to depth of 3546' or 20' below the shoe of the 8-5/8" casing.
2. A solid cement bridge shall be placed from 3546' up to 3506' or to a point 20' above the shoe of the 8-5/8" casing.
3. The 8-5/8" casing shall not be removed from below 676'.
4. A 20' cement plug shall be placed on top of the stub of the 8-5/8" casing from approximately 676' up to 656'.
5. All portions of the hole not filled with cement shall be filled with heavy mud fluid.
6. The 14" S.P. casing shall be securely capped at the surface.
7. THIS DIVISION SHALL BE NOTIFIED TO WITNESS:
   (a) The placing of the cement from 3546' up to 3506'.
   (b) The shooting or cutting of the 8-5/8" casing at 676'.
   (c) The location and hardness of the cement plug at 656'.

NOTE: In approving the above proposal this Division does not pass upon your right to enter upon this property, but merely approves the work as conforming to our requirements for abandonment.

R. D. BUSH
State Oil and Gas Supervisor

By [signature] Deputy

cc-Hubert F. Laugharn, Receiver

RWW:OH

FORM 108. 75114 3-30 5M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Notice of Intention to Abandon Well

This notice must be given at least five days before work is to begin

Los Angeles, Cal. Oct. 15, 1931

MR. E. Huguinin

Deputy State Oil and Gas Supervisor

629 S. Hill St. Los Angels Cal.

DEAR SIR:

In compliance with Section 16, Chapter 718, Statutes of 1915, as amended, notice is hereby given that it is our intention to abandon well No. Herbert F Laughran, Receiver McDonald #2, Sec. 21, T. 2 S. R. 15 W, S.B. B. & M., Playa Del Rey Oil Field, Los Angeles County, commencing work on the 21st day of Oct. 1931

The present condition of the well is as follows:

14" S. P. Cem. 696'
8 5/8" Cem. 3526 (36#) W.S.A.
Liner ?
Scout Report 5841' Bottom
" " Pluged back 4550'

The proposed work is as follows:

Abandon Well in accordance with your requirements

Reference to file of data

Maps	Model	[illegible]	Cases	Forms 1	Forms 121
[illegible]				✓	✓

Respectfully yours

Owens & Owens.
Name of Company or Operator

808. So. Pornsettia Compton Calif

By B. D. Owens

ADDRESS NOTICE TO DEPUTY STATE OIL AND GAS SUPERVISOR IN CHARGE OF DISTRICT WHERE WELL IS LOCATED

RECEIPT IS ACKNOWLEDGED OF COPY OF LETTER

Dated April 22, 1931

Addressed to Hubert F. Haugharn, Receiver

AUTHORIZING CHANGES IN NUMBERS OR DESIGNATIONS OF WELLS AS FOLLOWS:

On Sec. 21, T. 2 S., R. 15 W., S. B. B. & M.

Wells No. 1 and 2 of McDonald Petroleum Company will hereafter be known, respectively, as No. "McDonald" 1 and "McDonald" 2.

On Sec. 28, T. 2 S., R. 15 W., S. B. B. & M.

Well No. 1 of West Bay Oil Company will hereafter be known as well No. "West Bay" 1.

Well No. 1 of Gantz Oil Syndicate will hereafter be known as well No. "Gantz" 1.

Corrections Made as Follows	By Whom
Weekly Summaries	
121	
Elev. and Loc. Cards	
Production Reports	
Well Records { Folders	Emma
Well Records { Reports	E.J.K.
Peg Models	
Graphics	
Field Maps	E.J.K.

Bk - E. J. K.
4/23/31

MEMORANDUM FOR WELL RECORD.

Letters of March 10 and 11, 1931, to R. D. Bush, stating that Hubert F. Laugharn was appointed receiver or trustee for the following, are filed with record of well No. 1 (formerly McDonald Petroleum, Ltd.)

McDonald Petroleum, Ltd. Wells Nos. 1 and 2, Sec. 21; and well No. 4, Sec. 28, 2 S., 15 W.

Deuel Pet. Corp. Ltd. wells Nos. "Deuel" 1 and "Deuel" 2, Sec. 21, 2 S., 15 W.

Altadena Oil Co. well No. "Altadena" 1, Sec. 21, 2 S., 15 W.

Inland Petroleum Co. Ltd. well No. 1, Sec. 26, 2 S., 15 W.

Gantz Oil Syndicate well No. 1, Sec. 28, 2 S., 15 W.

West Bay Oil Co. Ltd. well No. 1, Sec. 28, 2 S., 15 W.

Seashore Pet. Corp. Ltd. & Deuel Pet. Corp. Ltd. well No. 1, Sec. 21, 2 S., 15 W.

Goetz Petroleum Corp. Ltd. well No. 1, Sec. 21, 2 S., 15 W.

FOI 109-B. 70973 8-29 12M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Report on Test of Water Shut-off
(BAILING)

No. T -1-22268

Los Angeles, Cal. December 3, 1930.

Mr. C. C. Boatright,
Los Angeles, Cal.

Agent for McDONALD PETROLEUM, LTD. ~~Company~~

DEAR SIR:

Your well No. 2, Sec. 21, T. 2-S., R. 15-W., S. B. B. & M.,
Playa del Rey Oil Field, in Los Angeles County, was tested for
shut-off of water on November 23 (Time and date), 1930. Mr F. C. Hodges,
designated by the supervisor, was present as prescribed in Section 19, Chapter 718, Statutes 1915, as amended, and there were also present M. P. Boatright, Driller,
and T. B. Turner, Operator.

Location of water tested above 3526' and normal fluid level not reported

Depth and manner of water shut-off: { 3526 ft. of 8-5/8 in. 36 lb. / ~~ft. of in. lb.~~ } casing was re{ cemented / 11-17-30 / ~~landed~~ } in shale Formation

at 3526 ft. with 60 sacks Blue Diamond cement by casing method.

Water string was landed in 10½" rotary (Size, rotary or cable tool) hole.

Casing record of well 14" S.P. cem. 696'; 8-5/8" as above.

with cement from 4642' to 4500' and

Reported total depth of hole 5860 ft. Hole bridged from 3552 ft. to 3531 ft. Hole cleaned out to 3531 ft. for this test.

At time of test depth of hole measured 3525 ft. and bailer brought up sample of sand and set cement

At 3:00 p.m., Nov. 22, 1930 (Time and date) oil bailed to showing ft., drilling fluid { bailed / ~~swabbed~~ } to 1500 ft.

At 2:30 p.m., Nov. 23, 1930 (Time and date) top of oil found at showing ft., top of fluid found at 1455 ft.

Result of test:

MR. BOATRIGHT REPORTED THE FOLLOWING:

1. 3526' of 8-5/8" 36-lb. casing was first cemented on October 31, 1930, with 350 sacks of Blue Diamond cement by the casing method.
2. No casing test was made.
3. 25' of set cement was drilled out of the 8-5/8" casing, equivalent to 7 sacks.
4. The last 100 sacks of cement was treated with quick setting chemical.
5. The shut-off was not effective and the 8-5/8" casing was re-cemented on November 4, 1930, with 40 sacks of Blue Diamond cement by the tubing method.
6. No casing test was made.
7. 125' of set cement was drilled out of the 8-5/8" casing, equivalent to 35 sacks.
8. The 8-5/8" casing was again re-cemented on November 17, as noted above.
9. No fluid entered the well when bailed to 1500' and allowed to stand 2 hr. for a casing test.
10. 139' of set cement was drilled out of the 8-5/8" casing, equivalent to 39 sacks.

(CONTINUED ON PAGE TWO)

-Company

R. D. BUSH
State Oil and Gas Supervisor

FCH:GH

By _____ Deputy

FOR 109-X. 78976 8-30 3M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Report on Test of Water Shut-off
OR
Special Report on Operations Witnessed

No. T-1-22288

McDONALD PETROLEUM, LTD. ~~Company~~

Well No. 2, Sec. 21, T. 2-S., R. 15-W., S. B. B. & M.,

THE INSPECTOR NOTED THE FOLLOWING:
1. The fluid rose 45' in 23½ hr., equivalent to 4.5 bbl. per 24 hr.
2. A fluid sample from 3525' consisted of heavy, gas-cut, oily mud that tasted fresh.

THE SHUT-OFF IS APPROVED.

R. D. BUSH
State Oil and Gas Supervisor

By [signature] Deputy

FORM 109-A. 70972 9-29 20M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Special Report on Operations Witnessed

No. T -1-21563

Los Angeles, Cal. Sept. 10 19 30

Mr. C. C. Boatright
Los Angeles, Cal.

121

Agent for McDONALD PETROLEUM, LTD. ~~COMPANY~~

DEAR SIR:

Operations at your well No. 2 Section 21, T. 2 S., R. 15 W., S.B. B. & M., Playa del Rey Oil Field, in Los Angeles County, were witnessed by R. W. Walling, representative of the supervisor, on 10:27 a.m. Sept. 5, 19 30. There was also present C. C. Boatright, Superintendant.

Casing Record 14" S. P. cemented 696'.

The operations were performed for the purpose of inspecting blow-out prevention equipment.

and the data and conclusions are as follows:

Mr. Boatright reported the following:
1. Bottom of hole at 3708'.
2. Changing from 6" to 5" drill pipe.
3. Will reduce size of hole.

Thoroguh investigation showed equipment as installed at the time of this inspection to be satisfactory.

CC-Company

RWW:H

R. D. BUSH
State Oil and Gas Supervisor

By E. Augustini Deputy

FORM 136. 74354 2-30 2M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

MEMORANDUM OF TELEPHONE OR PERSONAL CONVERSATION

_____ M. 9-2 1930
(Time) (Date)

Company McDonald Petroleum, Ltd Well No. 2

Field Playa del Rey Sec. 21 T. 2S R. 15W, SB B. & M.

On this date a personal telephone conversation was held, concerning the above well, with Mr. _____

of the _____ Company.

Details of operations were discussed as follows:

Core Record

3450-68 12' Rec - shale - slightly fractured - few streaks gray sand

3468-86 18' Rec. 7' shale, 2' grayish oil sand, 2½' shale, ½' gray sand
6' shale with streaks grayish oil sand

3486-3510 21' Rec 9' shale with streaks of gray sand, 1' shale, 1' gray sand, 1' bentonite
from 3497-98, 9' shale - streaks of gray sand.

3530-54 18' Rec 12' shale - thin streaks of oil sand, 6' faulted shale - some gray sand

3554-80 26' Rec 8' shale, 4½' oil sand, ½' shell, 2' oil sand, 4' shale,
3' oil sand, 6' shale - streaks of oil sand.

3580-3601 21 Rec Shale, streaks of oil sand - 2 - ½" streaks of grayish o. sd.

Signed Alvan M Johnson

Title [illegible]

FORM 111. 70974 9-29 20M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Report on Proposed Operations

No. P-1-21912

Los Angeles, Cal. June 30, 1930.

MR. C. C. Boatright,
Los Angeles, Cal.
Agent for McDONALD PETROLEUM, LTD. Company

121

DEAR SIR:

Your proposal to drill Well No. 2,
Section 21, T2-S., R.15-W., S.B. B. & M., Playa del Rey Oil Field, Los Angeles County,
dated May 31, 1930, received June 3, 1930, has been examined in conjunction with records filed in this office.

Present conditions as shown by the records and the proposal are as follows:

THE NOTICE STATES:

"The well is 28 feet S. and 19 feet W. from N.E. cor. Lot #2, Block #5, Silverstrand Tr. The elevation of the derrick floor above sea level is 12 feet. We estimate that the first productive oil or gas sand should be encountered at a depth of about 6100 feet, more or less."

PROPOSAL:

"We propose to use the following strings of casing, either cementing or landing them as here indicated:

Size of Casing	Weight	New or Second Hand	Depth	Landed or Cemented
14"	S.P.	New	700	Cemented
8-5/8"	36#	2nd hand	6100	"
6-5/8"	28#	2nd hand	6200	Landed

It is understood that if changes in this plan become necessary we are to notify you before cementing or landing casing."

DECISION:

THE PROPOSAL IS APPROVED PROVIDED THAT:

1. (a) Mud fluid of not less than 70 lb. per cubic foot shall be used in the drilling of the well and the column of mud fluid shall be maintained at all times to the surface, particularly while pulling the drill pipe.
   (b) Adequate blow-out prevention equipment shall be provided and ready for operation at all times.
2. Any hole to be sidetracked at any time during the drilling of this well shall be completely filled with cement.
3. The upper oil zone shall be cored continuously from 3400' to 3900' and a solid string of casing cemented over this zone.
4. The formations to be left back of the 8-5/8" casing shall be mudded by open circulation until the loss is not more than 5.0 bbl. per hr.
5. The exact cementing depth for the 8-5/8" casing shall be determined by careful coring, beginning not lower than 5950'.
6. The column of mud fluid back of the first water string shall be maintained to the surface for at least 30 days after cementing this water string.
7. THIS DIVISION SHALL BE NOTIFIED TO WITNESS:
   (a) Final mudding operations before cementing the 8-5/8" casing.
   (b) Bailing tests of the first water string and 8-5/8" shut-off.

Note: This report supersedes and nullifies report No. P-1-21810, dated June 6, 1930, for the reason that present developments in the immediate area indicate a productive zone between 3400' and 3900' at this location.

R. D. BUSH
State Oil and Gas Supervisor

By [signature] Deputy

cc-Company
BBN:GH

FORM 111. 70974 9-29 20M
CALIFORNIA STATE PRINTING OFFICE

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Report on Proposed Operations

No. P-1-21810

Los Angeles, Cal. June 6, 1930.

MR. Geo. A. McDonald,

Los Angeles, Cal.

xAgentxfor MCDONALD PETROLEUM, LTD. xCompanyx

DEAR SIR:

Your proposal to drill Well No. 2,

Section 21, T. 2 S., R. 15 W., S.B. B. & M., Playa del Rey Oil Field, Los Angeles County,

dated May 31, 1930, received June 3, 1930, has been examined in conjunction with records filed in this office.

Present conditions as shown by the records and the proposal are as follows:

THE NOTICE STATES:

"The well is 28 feet S. and 19 feet W. from N. E. cor. Lot #2, Block #5, Silverstrand Tr.
The elevation of the derrick floor above sea level is 12 feet.
We estimate that the first productive oil or gas sand should be encountered at a depth of about 6100 feet, more or less."

PROPOSAL:

"We propose to use the following strings of casing, either cementing or landing them as here indicated:

Size of Casing	Weight	New or Second Hand	Depth	Landed or Cemented
14"	S.P.	New	700	Cemented
8-5/8"	36#	2nd hand	6100	"
6-5/8"	28#	2nd hand	6200	Landed

It is understood that if changes in this plan become necessary we are to notify you before cementing or landing casing."

DECISION:

THE PROPOSAL IS APPROVED PROVIDED THAT:

1. (a) Mud fluid of not less than 70 lb. per cubic foot shall be used in the drilling of the well and the column of mud fluid shall be maintained at all times to the surface, particularly while pulling the drill pipe.
   (b) Adequate blow-out prevention equipment shall be provided and ready for operation at all times.
2. Any hole to be sidetracked at any time during the drilling of this well shall be completely filled with cement.
3. The upper zone shall be carefully cored starting not lower than 3500' and continuing to at least 3900' and this division consulted before drilling ahead.
4. The formations to be left back of the 8-5/8" casing shall be mudded by open circulation until the loss is not more than 5.0 bbl. per hr.
5. The exact cementing depth for the 8-5/8" casing shall be determined by careful coring, beginning not lower than 5950'.
6. The column of mud fluid back of the 8-5/8" casing shall be maintained to the surface for at least 30 days after cementing this casing.
7. THIS DIVISION SHALL BE NOTIFIED TO WITNESS:
   (a) Final mudding operations before cementing the 8-5/8" casing.
   (b) Bailing test of the 8-5/8" shut-off.

cc-Company
BEN:OH
N.

R. D. BUSH
State Oil and Gas Supervisor

By E. Huguenin Deputy

FORM 105. 68219 6-29 10M
CALIFORNIA STATE PRINTING OFFICE

DIVISION OF OIL AND GAS
RECEIVED
JUN 3 - 1930
LOS ANGELES, CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES

DIVISION OF OIL AND GAS

Notice of Intention to Drill New Well

This notice must be given before drilling begins

037-13845 2

Los Angeles Cal. May 31st. 1930

MR. E. Huguenin

Deputy State Oil and Gas Supervisor

611 New Orpheum Bldg., L.A. Cal.

DEAR SIR:

In compliance with Section 17, Chapter 718, Statutes of 1915, as amended, notice is hereby given that it is our intention to commence the work of drilling well No. 2, Sec. 21, T. 2 S., R. 15 W., S.B. B. & M., (Venice) Playa del Rey Oil Field, Los Angeles County.

The well is 28 feet X or S., and 19 feet X or W. from N.E. cor. Lot #2, Block #5, Silverstrand Tr.
(Give location in distance from section corners or other corners of legal subdivision)

The elevation of the derrick floor above sea level is 12 feet.

We propose to use the following strings of casing, either cementing or landing them as here indicated:

Size of Casing, Inches	Weight, Lb. Per Foot	New or Second Hand	Depth	Landed or Cemented
14"	S.P.	New	700	Cemented
8-5/8"	36#	2nd hand	6100	"
6-5/8	28#	2nd hand	6200	Landed

It is understood that if changes in this plan become necessary we are to notify you before cementing or landing casing.

We estimate that the first productive oil or gas sand should be encountered at a depth of about 6100 feet, more or less.

Respectfully yours

Address 752 Subway Terminal Bldg., Los Angeles, Calif.

McDONALD PETROLEUM, LTD.,
(Name of Company or Operator)

Telephone number Mutual 6183-6184

By Geo A McDonald

ADDRESS NOTICE TO DEPUTY STATE OIL AND GAS SUPERVISOR IN CHARGE OF DISTRICT WHERE WELL IS LOCATED

Lease consists of: Lot #2, Block #5, Silverstrand Tract, Venice, Calif.

Reference to file or data

Maps	Maps			Forms	
F.C.H. 6/2/30	None C.L.B.				

Book F.C.H. 6/2/30

APPENDIX D

HISTORICAL RESEARCH DOCUMENTATION

128 Hurricane Street

128 Hurricane Street

Marina Del Rey, CA 90292

Inquiry Number: 4591455.9

April 14, 2016

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

04/14/16

Site Name:

128 Hurricane Street
128 Hurricane Street
Marina Del Rey, CA 90292
EDR Inquiry # 4591455.9

Client Name:

Ninyo & Moore
475 Goddard
Irvine, CA 92618
Contact: Dennis Fee

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Search Results:

Year	Scale	Details	Source
2012	1"=500'	Flight Year: 2012	USDA/NAIP
2010	1"=500'	Flight Year: 2010	USDA/NAIP
2009	1"=500'	Flight Year: 2009	USDA/NAIP
2005	1"=500'	Flight Year: 2005	USDA/NAIP
2002	1"=500'	Flight Date: June, 05 2002	USGS
1994	1"=500'	Acquisition Date: June, 01 1994	USGS/DOQQ
1989	1"=500'	Flight Date: August, 22 1989	USGS
1983	1"=500'	Flight Date: November, 19 1983	EDR Proprietary Brewster Pacific
1972	1"=500'	Flight Date: November, 24 1972	EDR Proprietary Brewster Pacific
1963	1"=500'	Flight Date: February, 28 1963	USGS
1952	1"=500'	Flight Date: April, 11 1952	USGS
1947	1"=500'	Flight Date: January, 01 1947	Fairchild
1938	1"=500'	Flight Date: May, 22 1938	USGS
1928	1"=500'	Flight Date: January, 01 1928	Fairchild

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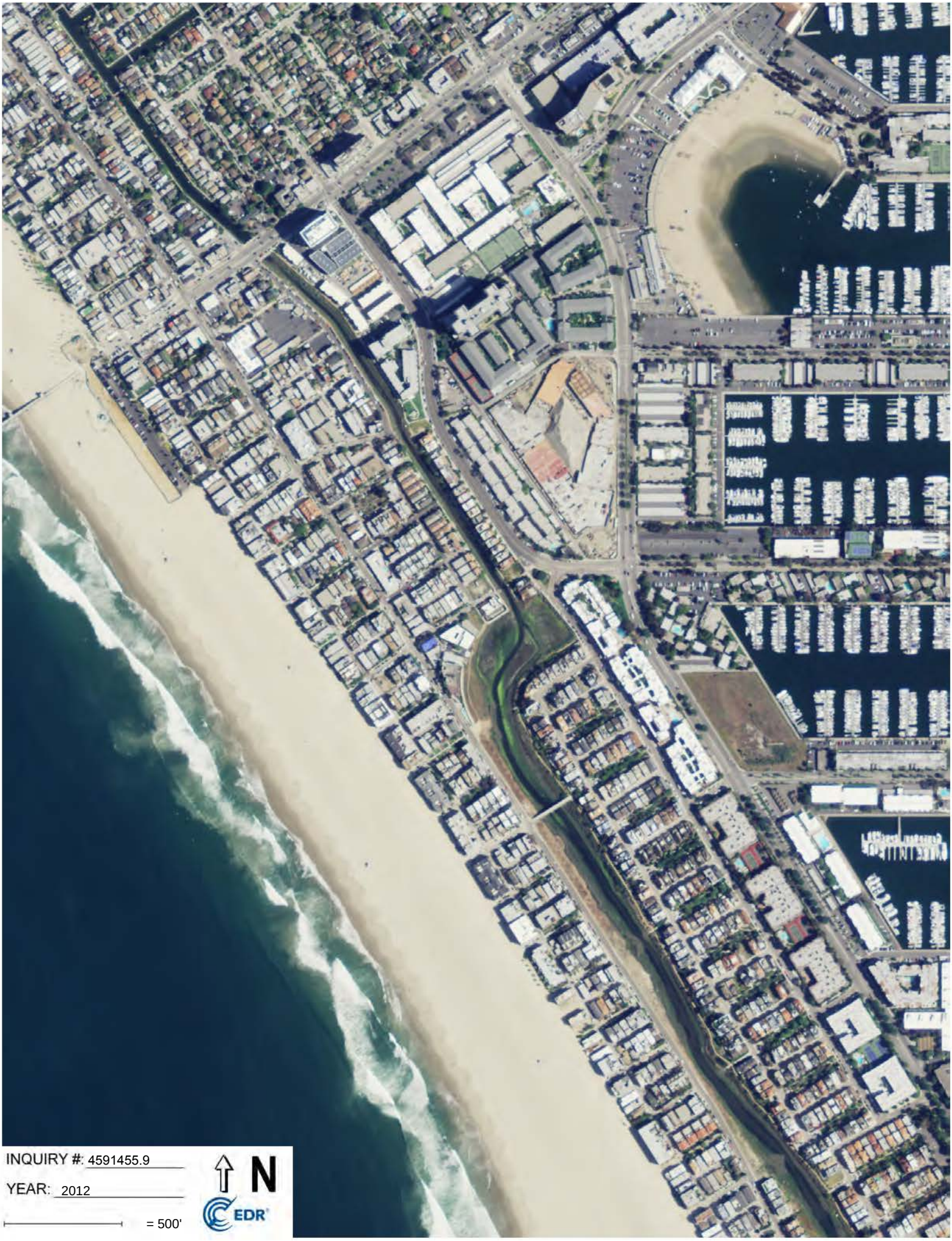
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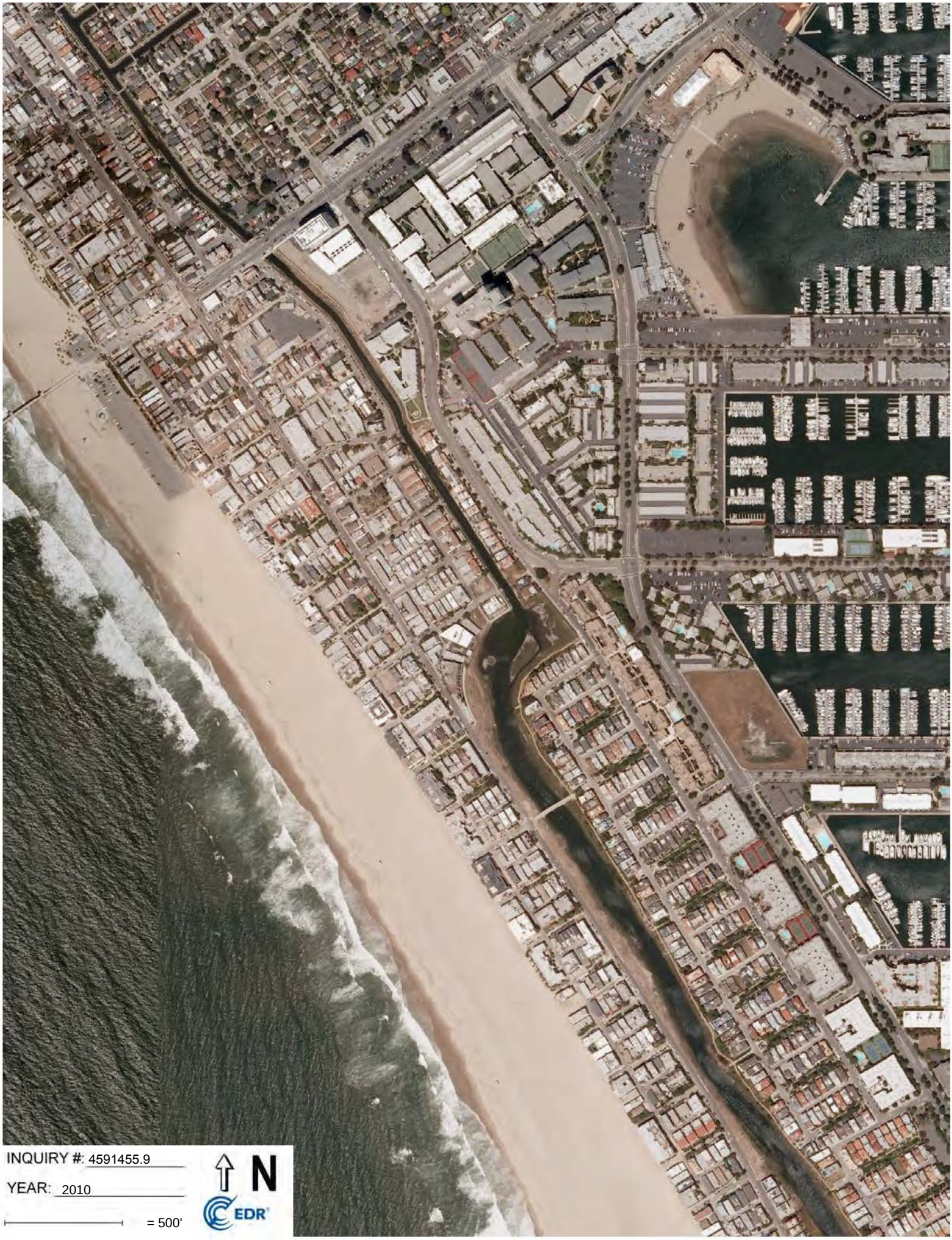
EDR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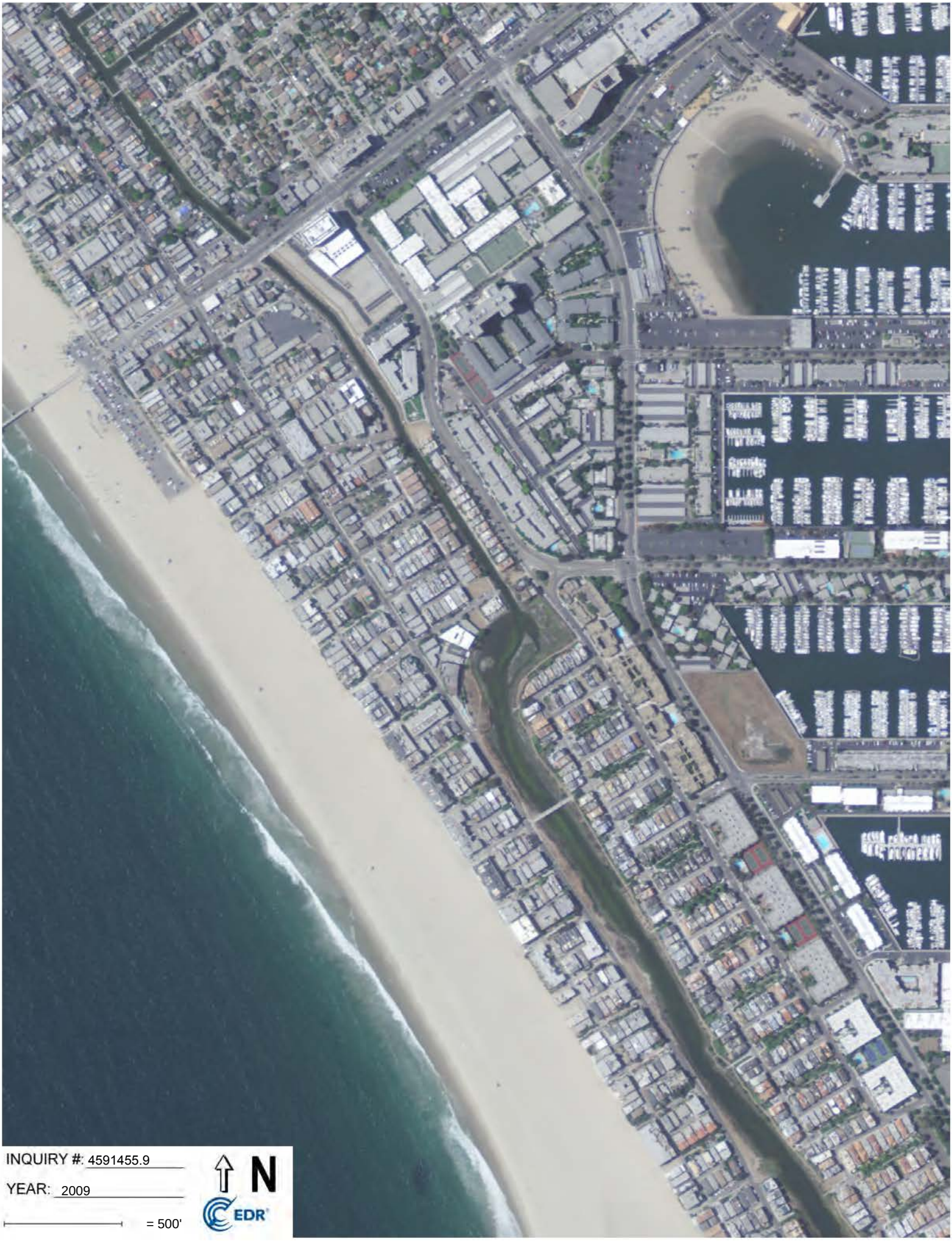
EDR



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YEAR: 2009

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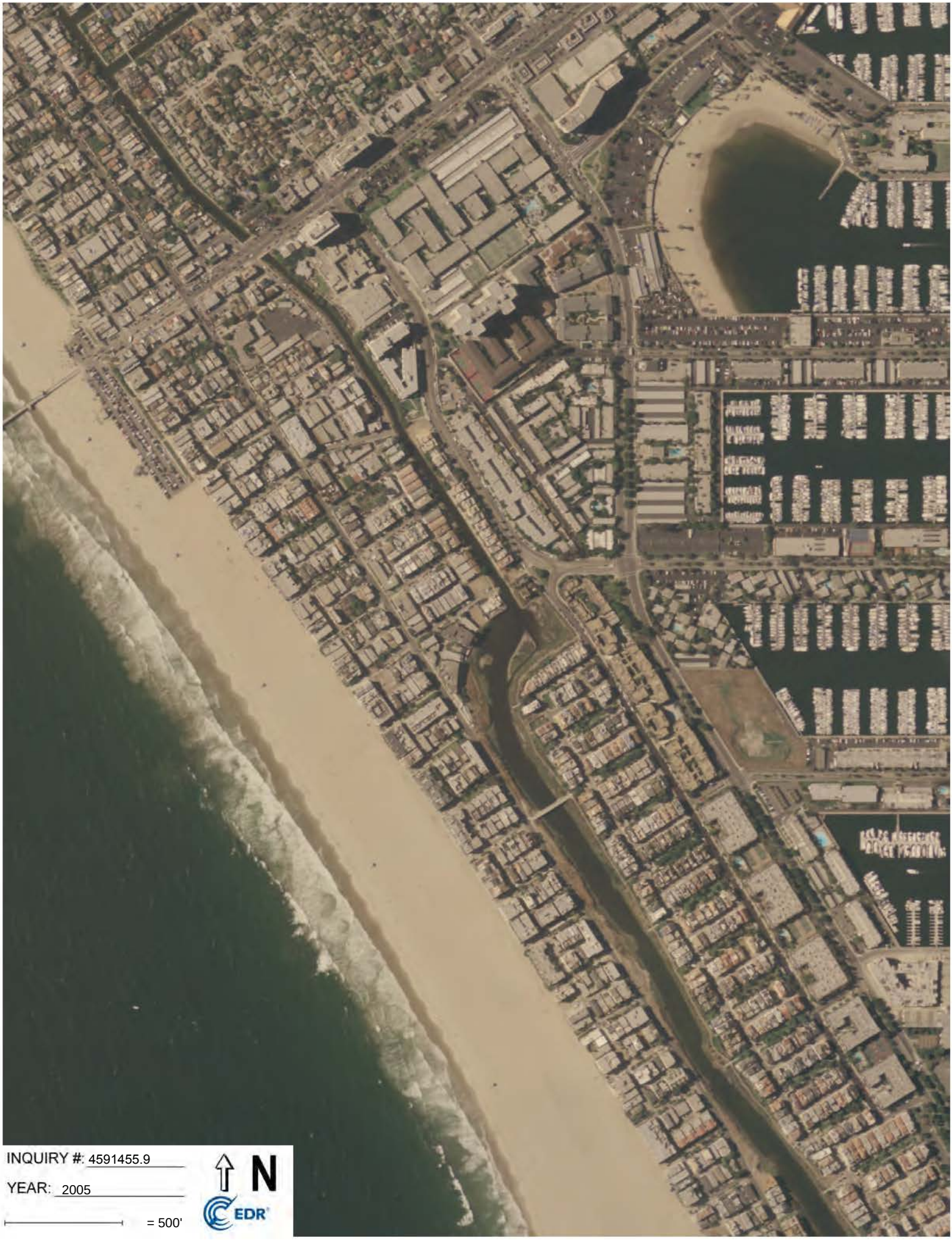
EDR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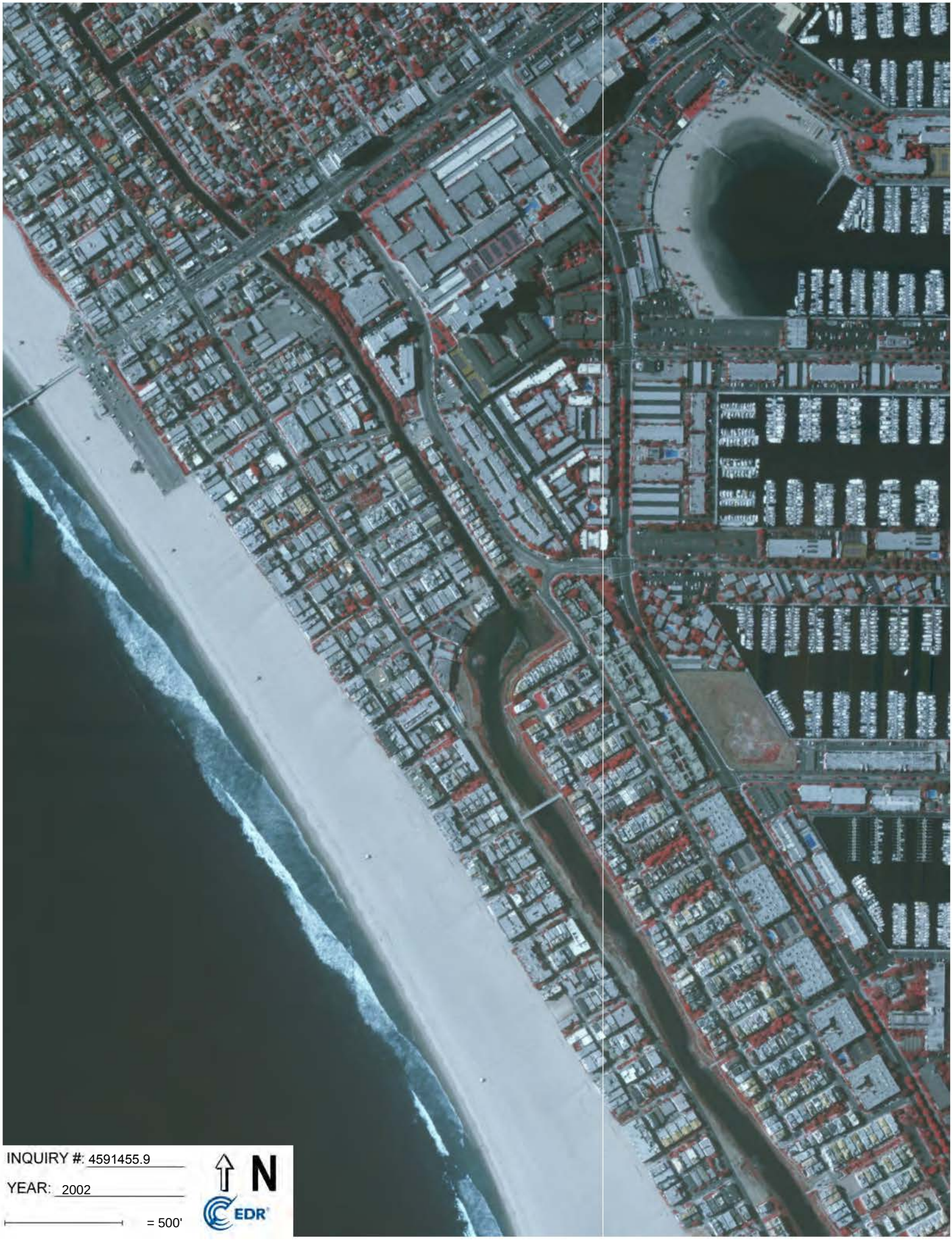
EDR



INQUIRY #: 4591455.9

YEAR: 2002

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EDR


INQUIRY #: 4591455.9
YEAR: 1994
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EDR


INQUIRY #: 4591455.9
YEAR: 1989
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EDR


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YEAR: 1983
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EDR


INQUIRY #: 4591455.9
YEAR: 1972
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EDR



INQUIRY #: 4591455.9

YEAR: 1963

= 500'

N

EDR


INQUIRY #: 4591455.9
YEAR: 1952
= 500'
N
EDR



INQUIRY #: 4591455.9

YEAR: 1947

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EDR



INQUIRY #: 4591455.9

YEAR: 1938

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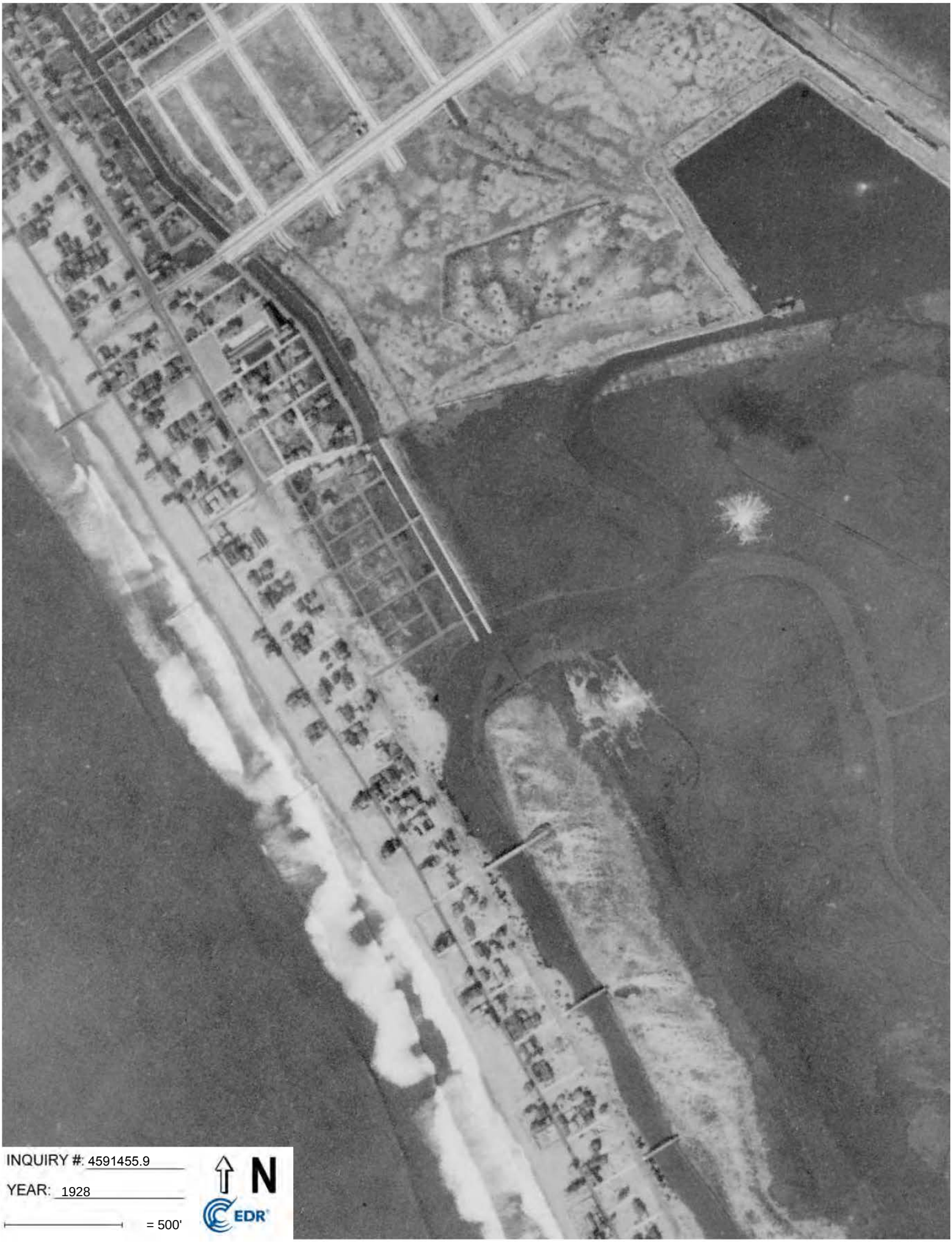
EDR



INQUIRY #: 4591455.9

YEAR: 1928

= 500'

N

EDR

128 Hurricane Street

128 Hurricane Street

Marina Del Rey, CA 90292

Inquiry Number: 4591455.3

April 13, 2016

Certified Sanborn® Map Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

04/13/16

Site Name:	Client Name:
128 Hurricane Street	Ninyo & Moore
128 Hurricane Street	475 Goddard
Marina Del Rey, CA 90292	Irvine, CA 92618
EDR Inquiry # 4591455.3	Contact: Dennis Fee

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Certified Sanborn Results:

Certification # FD59-4C18-9DF0

PO # 209666001

Project Phase I ESA

Maps Provided:

1970
1950
1918

Sanborn® Library search results

Certification #: FD59-4C18-9DF0

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Sanborn Sheet Key

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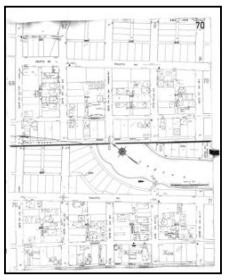
1970 Source Sheets



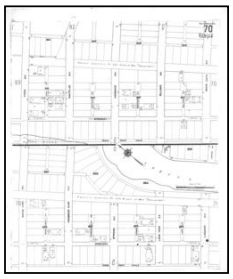
Volume Venice District, Sheet 70
1970

1950 Source Sheets



Volume Venice District, Sheet 70
1950

1918 Source Sheets



Volume 1, Sheet 70
1918

Certified Sanborn® Map

1970



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Certification #FD59-4C18-9DF0

Site Name:	128 Hurricane Street
Address:	128 Hurricane Street
City, ST, ZIP:	Marina Del Rey, CA 90292
Client:	Ninyo & Moore
EDR Inquiry:	4591455.3
Order Date:	04/13/2016
Certification #	FD59-4C18-9DF0
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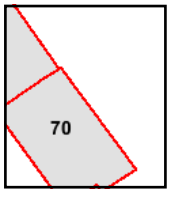
This Certified Sanborn Map combines the following sheets.
Outlined areas indicate map sheets within the collection.

0 Feet 150 300 600





Volume Venice District, Sheet 70

N

Certified Sanborn® Map

1950



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Certification #FD59-4C18-9DF0

Site Name:	128 Hurricane Street
Address:	128 Hurricane Street
City, ST, ZIP:	Marina Del Rey, CA 90292
Client:	Ninyo & Moore
EDR Inquiry:	4591455.3
Order Date:	04/13/2016
Certification #:	FD59-4C18-9DF0
Copyright	1950

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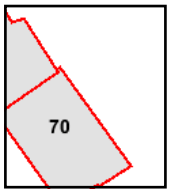
Outlined areas indicate map sheets within the collection.





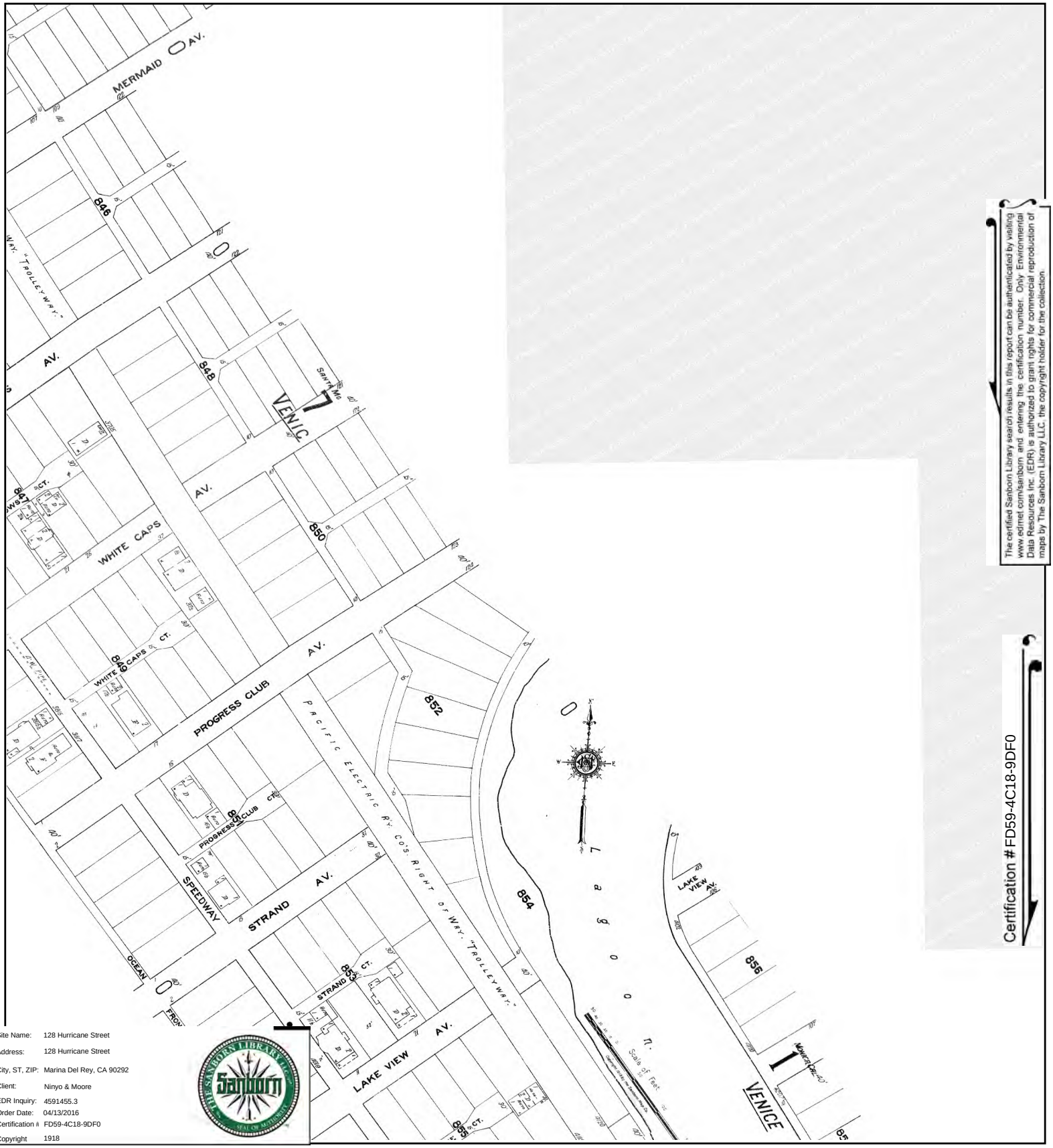
Volume Venice District, Sheet 70

0 Feet 150 300 600

N

Certified Sanborn® Map

1918



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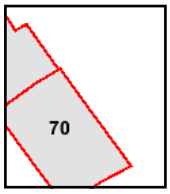
Certification #FD59-4C18-9DF0

Site Name:	128 Hurricane Street
Address:	128 Hurricane Street
City, ST, ZIP:	Marina Del Rey, CA 90292
Client:	Ninyo & Moore
EDR Inquiry:	4591455.3
Order Date:	04/13/2016
Certification #	FD59-4C18-9DF0
Copyright	1918

This Certified Sanborn Map combines the following sheets. Outlined areas indicate map sheets within the collection.





Volume 1, Sheet 70

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128 Hurricane Street

128 Hurricane Street
Marina Del Rey, CA 90292

Inquiry Number: 4591455.5
April 14, 2016

The EDR-City Directory Abstract

Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

DESCRIPTION

Environmental Data Resources, Inc.'s (EDR) City Directory Abstract is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Abstract includes a search and abstract of available city directory data. For each address, the directory lists the name of the corresponding occupant at five year intervals.

Business directories including city, cross reference and telephone directories were reviewed, if available, at approximately five year intervals for the years spanning 1920 through 2013. This report compiles information gathered in this review by geocoding the latitude and longitude of properties identified and gathering information about properties within 660 feet of the target property.

A summary of the information obtained is provided in the text of this report.

RESEARCH SUMMARY

The following research sources were consulted in the preparation of this report. An "X" indicates where information was identified in the source and provided in this report.

Year	Source	TP	Adjoining	Text Abstract	Source Image
2013	Cole Information Services	-	X	X	-
2008	Cole Information Services	-	X	X	-
2006	Haines Co., Inc.	-	X	X	-
2004	Haines Company	-	-	-	-
2003	Haines & Company	-	-	-	-
2001	Haines Company, Inc.	-	-	-	-
2000	Haines	-	X	X	-
	Haines & Company	-	X	X	-
1999	Haines Company	-	-	-	-
1996	GTE	-	-	-	-
1995	Pacific Bell	-	X	X	-
1992	PACIFIC BELL WHITE PAGES	-	-	-	-
1991	Pacific Bell	-	X	X	-
1990	PACIFIC BELL WHITE PAGES	-	-	-	-
1986	Pacific Bell	-	X	X	-
1985	Pacific Bell	-	X	X	-
1981	Pacific Telephone	-	-	-	-
1980	Pacific Telephone	-	X	X	-
1976	Pacific Telephone	-	X	X	-
1975	Pacific Telephone	-	X	X	-
1972	R. L. Polk & Co.	-	-	-	-
1971	R. L. Polk & Co.	-	-	-	-
1970	Pacific Telephone	-	X	X	-
1969	Pacific Telephone	-	-	-	-
1967	R. L. Polk & Co.	-	-	-	-

EXECUTIVE SUMMARY

Year	Source	TP	Adjoining	Text Abstract	Source Image
1966	Pacific Telephone	-	-	-	-
1965	Pacific Telephone	-	X	X	-
1964	Pacific Telephone	-	-	-	-
1963	Pacific Telephone	-	-	-	-
1962	Pacific Telephone	-	X	X	-
1961	R. L. Polk & Co.	-	-	-	-
1960	Pacific Telephone	-	X	X	-
1958	Pacific Telephone	-	X	X	-
1957	Pacific Telephone	-	X	X	-
1956	Pacific Telephone	-	X	X	-
1955	R. L. Polk & Co.	-	-	-	-
1954	R. L. Polk & Co.	-	X	X	-
1952	Los Angeles Directory Co.	-	-	-	-
1951	Los Angeles Directory Co.	-	-	-	-
1950	Pacific Telephone	-	-	-	-
1949	Los Angeles Directory Co.	-	-	-	-
1948	Associated Telephone Company, Ltd.	-	-	-	-
1947	Pacific Directory Co.	-	-	-	-
1946	Southern California Telephone Co	-	-	-	-
1945	R. L. Polk & Co.	-	-	-	-
1944	R. L. Polk & Co.	-	-	-	-
1942	Los Angeles Directory Co.	-	-	-	-
1940	Los Angeles Directory Co.	-	-	-	-
1939	Los Angeles Directory Co.	-	-	-	-
1938	Los Angeles Directory Company Publishers	-	-	-	-
1937	Los Angeles Directory Co.	-	-	-	-
1936	Los Angeles Directory Co.	-	X	X	-
1935	Los Angeles Directory Co.	-	X	X	-
1934	Los Angeles Directory Co.	-	-	-	-
1933	Los Angeles Directory Co.	-	X	X	-
1932	Los Angeles Directory Co.	-	-	-	-
1931	TRIBUNE-NEWS PUBLISHING CO.	-	-	-	-
1930	Los Angeles Directory Co.	-	-	-	-
1929	Los Angeles Directory Co.	-	X	X	-
1928	Los Angeles Directory Co.	-	X	X	-
1927	Los Angeles Directory Co.	-	-	-	-
1926	Los Angeles Directory Co.	-	-	-	-
1925	Los Angeles Directory Co.	-	-	-	-
1924	Los Angeles Directory Co.	-	X	X	-
1923	Los Angeles Directory Co.	-	-	-	-
1921	Los Angeles Directory Co.	-	-	-	-
1920	Los Angeles Directory Co.	-	-	-	-

FINDINGS

TARGET PROPERTY INFORMATION

ADDRESS

128 Hurricane Street
Marina Del Rey, CA 90292

FINDINGS DETAIL

Target Property research detail.

FINDINGS

ADJOINING PROPERTY DETAIL

The following Adjoining Property addresses were researched for this report. Detailed findings are provided for each address.

CANAL CT

3375 CANAL CT

Year	Uses	Source
1954	MAAS EDWIN L R	R. L. Polk & Co.

3380 CANAL CT

Year	Uses	Source
1954	FIKES E J	R. L. Polk & Co.

DOLCE

3766 DOLCE

Year	Uses	Source
1985	MOY KELVIN	Pacific Bell
	KUEHN CAMPBELL MARINA DEL REY	Pacific Bell

3796 DOLCE

Year	Uses	Source
1985	GREEN BERTRAM E	Pacific Bell

3806 DOLCE

Year	Uses	Source
1991	HOLIDAY BRUCE	Pacific Bell
1985	HOLIDAY BRUCE	Pacific Bell

3822 DOLCE

Year	Uses	Source
1985	WINCH ANTHONY D	Pacific Bell

3832 DOLCE

Year	Uses	Source
1991	MARTINEZ HENRY	Pacific Bell
1985	MARTINEZ HENRY	Pacific Bell

FINDINGS

3836 DOLCE

Year	Uses	Source
1991	HOUGHTONRAY	Pacific Bell
1985	HOUGHTON RAY	Pacific Bell

3842 DOLCE

Year	Uses	Source
1991	ARAGON REALTY	Pacific Bell
1985	KOSTROFF LARRY	Pacific Bell

3846 DOLCE

Year	Uses	Source
1985	DAVIS WAYNE A	Pacific Bell

3856 DOLCE

Year	Uses	Source
1991	OSGOODJ	Pacific Bell
1985	OSGOOD J	Pacific Bell

3862 DOLCE

Year	Uses	Source
1985	BARNHART ROSEMARY	Pacific Bell

3872 DOLCE

Year	Uses	Source
1991	GOSSRONE	Pacific Bell

3903 DOLCE

Year	Uses	Source
1991	SROLOFF SHELDON	Pacific Bell
1985	SROLOFF SHELDON	Pacific Bell

3905 DOLCE

Year	Uses	Source
1991	DEMARRALS-MARVINJOAN	Pacific Bell
	MARVIN IRA	Pacific Bell
1985	WHOLE PERSON CALENDAR THE	Pacific Bell
	SNYDER LESLIE	Pacific Bell

3907 DOLCE

Year	Uses	Source
1985	ROME CLIFFORD D & ASSOCIATES	Pacific Bell

FINDINGS

3909 DOLCE

Year	Uses	Source
1991	SNYDER LESLIE	Pacific Bell
	WHOLE PERSON CALENDAR THE	Pacific Bell
1985	SCHUSTER ROBT	Pacific Bell
	SCHUSTER ROBT	Pacific Bell

3950 DOLCE

Year	Uses	Source
1991	OBRIENE&A	Pacific Bell
	REINSTEIN ALAN	Pacific Bell
	WILLIAMS KATHY	Pacific Bell
	YAMATO C	Pacific Bell
	BRAGIN WOLFE H	Pacific Bell
1986	MAIER ROBT W MFRS AGT	Pacific Bell
1985	BASIC COMPONENTS CORP	Pacific Bell
	BOOTH RICHARD K	Pacific Bell
	MALER ROBT WM	Pacific Bell
	MBORE V	Pacific Bell
	YAMATO C	Pacific Bell
	WILLIAMS KATHY	Pacific Bell

4015 DOLCE

Year	Uses	Source
1985	RT DEVELOPMENT INC	Pacific Bell

4050 DOLCE

Year	Uses	Source
1991	FRIEDMAN ROBIN	Pacific Bell
	CHOM ISS	Pacific Bell
	FRTEDMAN JOS	Pacific Bell
	TAWIL MORRIS & CHERYL	Pacific Bell
	ROSE ROBT S	Pacific Bell
	KOLODZIEISKIDR	Pacific Bell
1985	HOLLADAY DAVID H (DAVE)	Pacific Bell
	KOLODZIEJSKI D R	Pacific Bell
	MINTZ ROBT J	Pacific Bell
	ROSE ROBT S	Pacific Bell
	FRIEDMAN ROBIN	Pacific Bell

FINDINGS

4150 DOLCE

Year	Uses	Source
1991	COTUD THOS MD	Pacific Bell
	FARQUHAR GEO RALPH	Pacific Bell
	GAMALELDIN MAHMOUD & WALID	Pacific Bell
	GRAHAM WALTER & DEBORAH	Pacific Bell
	GREENWALD G	Pacific Bell
	HAMILTONPARTNERS	Pacific Bell
	HARING K R	Pacific Bell
	HEWELLKELLEY	Pacific Bell
	WARNER GLENN	Pacific Bell
	CHASSLER HANK	Pacific Bell
	ABRAMSONLS	Pacific Bell
1986	CELLULAR WHOLESALERS MARINA DEL REY	Pacific Bell
1985	ABRAMSON L S	Pacific Bell
	WORLDWIDE CARPET BROKERS INC	Pacific Bell
	WARNER GLENN	Pacific Bell
	NESS JACK	Pacific Bell
	NESS JACK	Pacific Bell
	MAXWELL WM	Pacific Bell
	LOGAN M	Pacific Bell
	HOLSTRUM GARY	Pacific Bell
	HARING K R	Pacific Bell
	GREENWALD G	Pacific Bell
	GRAHAM WALTER & DEBORAH	Pacific Bell
	FARQUHAR GEO RALPH	Pacific Bell
	DEANE JOHN RUSSELL III	Pacific Bell
	CELLULAR WHOLESALERS MOBILE PHONES	Pacific Bell
	BROWNSTLEIN STEVEN H	Pacific Bell

EASTWIND

109 EASTWIND

Year	Uses	Source
2000	PEARSON Arthur	Haines & Company

111 EASTWIND

Year	Uses	Source
2000	PEARSON Iv	Haines & Company

FINDINGS

Year	Uses	Source
2000	ABRAHAM Ronald	Haines & Company

115 EASTWIND

Year	Uses	Source
2000	MURRAY Terrence	Haines & Company

125 EASTWIND

Year	Uses	Source
2000	JOHNSON Gerald	Haines & Company
	CHRISTIE Somantha	Haines & Company
	CHALUPSKY Hans	Haines & Company

130 EASTWIND

Year	Uses	Source
2000	X CANAL CT	Haines & Company
	BARAN Leslie E	Haines & Company
	OVERLAND Peter	Haines & Company
	WAGNER Sherry	Haines & Company

EASTWIND ST

109 EASTWIND ST

Year	Uses	Source
2006	V VALLEJOS Ivan	Haines Co., Inc.
1991	Stein David 8398684	Pacific Bell
	Stein David VENICE 3998550	Pacific Bell
	Stein Darlene	Pacific Bell
1975	GREENE L	Pacific Telephone

111 EASTWIND ST

Year	Uses	Source
1991	Abraham Ronald	Pacific Bell
	Abraham Sam VENICE 3973229	Pacific Bell
	ABRAHAM RONALD	Pacific Bell
1975	MILLS ADRIANE	Pacific Telephone

115 EASTWIND ST

Year	Uses	Source
2006	a MIKOS Marilyn	Haines Co., Inc.
1991	Mosetti Peter	Pacific Bell
	Mosh	Pacific Bell

FINDINGS

Year	Uses	Source
1991	Mosfsegh Hossein	Pacific Bell
	Mosey P 5521392	Pacific Bell
	MOSETTI PETER	Pacific Bell
1970	BLAKE A J	Pacific Telephone

119 EASTWIND ST

Year	Uses	Source
2006	A FEIRSteven	Haines Co., Inc.
	STRAIN Christopher	Haines Co., Inc.
	FREYRE Michelle	Haines Co., Inc.

125 EASTWIND ST

Year	Uses	Source
2008	TURBO ESPRESSO	Cole Information Services
2006	SERRANO Rachel	Haines Co., Inc.
	SCHULTE Michael B	Haines Co., Inc.
	HOLLSandra	Haines Co., Inc.
1991	SINGER SCOTT	Pacific Bell
	Singer Scott	Pacific Bell
1975	ABRAHAM RONALD	Pacific Telephone
1970	BARTOLUCC PAULA	Pacific Telephone
	SAMSON EDW L	Pacific Telephone
	RASHKOW ROBT	Pacific Telephone
	MARINO SANDY	Pacific Telephone
	HEGARTY JACK	Pacific Telephone

130 EASTWIND ST

Year	Uses	Source
2006	OVERLAND Peter	Haines Co., Inc.
	ARMSTRONG Robert	Haines Co., Inc.
1991	Ure Matthew	Pacific Bell
	Dartley Keith	Pacific Bell
	DARTLEY KEITH	Pacific Bell
1975	PENNINGLON DALE	Pacific Telephone
1970	BUCK K	Pacific Telephone

FINDINGS

ESPLANADA

3903 ESPLANADA

Year	Uses	Source
1962	HENRY F N	Pacific Telephone

ESPLANADE

3710 ESPLANADE

Year	Uses	Source
2000	X HURRICANE	Haines & Company
	MONTEJANO Lourdes	Haines & Company
	LICHTMAN V	Haines & Company
1970	DUFAY ALFRED	Pacific Telephone

3715 ESPLANADE

Year	Uses	Source
2000	HAYMAKER MD	Haines & Company
	SATTER WHITE Al	Haines & Company

3719 ESPLANADE

Year	Uses	Source
2000	BARSKY Ben	Haines & Company
	X FLEET	Haines & Company
1985	GRAY PEGASUS	Pacific Bell
1980	Gray Pegasus	Pacific Telephone

3801 ESPLANADE

Year	Uses	Source
2000	HENDRIE M	Haines & Company

3803 ESPLANADE

Year	Uses	Source
2000	CONKWRIGHT Lynn	Haines & Company

3805 ESPLANADE

Year	Uses	Source
2000	1/2 OLINGER Kerry	Haines & Company
	WILLIAMS Robt L	Haines & Company

FINDINGS

3807 ESPLANADE

Year	Uses	Source
2000	TOPP E	Haines & Company

3811 ESPLANADE

Year	Uses	Source
2008	WELDEN PRODUCTIONS	Cole Information Services
2000	GILBERT J	Haines & Company

3929 ESPLANADE

Year	Uses	Source
2000	KENNERLY Nancy	Haines & Company
1975	DOYLE DONALD W	Pacific Telephone
1970	JENKINS ALORIA B	Pacific Telephone
	JENKINS ALEXANDER F JR	Pacific Telephone

3933 ESPLANADE

Year	Uses	Source
2008	LAW OFFICE OF R J MOLLIGAN INC	Cole Information Services
2000	GANS Eliane	Haines & Company
1985	PRITCHARD SCOTT	Pacific Bell
1970	BISCHOF BRUCE	Pacific Telephone

ESPLANADE ST

3701 ESPLANADE ST

Year	Uses	Source
2006	LEEGROUP	Haines Co., Inc.
	LEE Jeffrey	Haines Co., Inc.

3705 ESPLANADE ST

Year	Uses	Source
2006	SHAPIROAlan	Haines Co., Inc.

3710 ESPLANADE ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1991	Acosta Greg G	Pacific Bell
	ACOSTA GREG G	Pacific Bell
1985	SOLANGE CATHERINE	Pacific Bell
	LOVE LIFE SEMINAR	Pacific Bell

FINDINGS

Year	Uses	Source
1985	HOW S YOUR LOVE LIFE SEMINAR	Pacific Bell
	CAMPBELL RICK	Pacific Bell
1980	Shl Iala Cheryl L	Pacific Telephone
1975	DU FAY ALFRED	Pacific Telephone
	PODGORNY JOHN	Pacific Telephone
1965	DU FAY ALFRED	Pacific Telephone
1962	STATEN JOS MRS	Pacific Telephone

3715 ESPLANADE ST

Year	Uses	Source
2006	MARKOVICHNatasha	Haines Co., Inc.
	WEHRLI Robedt	Haines Co., Inc.
1991	MOSS NOVEMBER J	Pacific Bell
	ROBERTS ALLEN M	Pacific Bell
	Moss November J	Pacific Bell
	Moss O WESTLOS ANGELES 4783408	Pacific Bell
	Moss Olga SANTA MONICA 8297340	Pacific Bell
	Moss R	Pacific Bell
	Roberts Allen M	Pacific Bell
1980	Frost Trisha	Pacific Telephone
	Kamerer Wm	Pacific Telephone
	Paneitz Vicki	Pacific Telephone
	Pence Cathy	Pacific Telephone
	Sa Uterwhite Al	Pacific Telephone
1975	FOND SONDRA	Pacific Telephone

3719 ESPLANADE ST

Year	Uses	Source
1991	GRAY PEGASUS	Pacific Bell
	KARMAN MA	Pacific Bell
	BARSKY BEN	Pacific Bell
	Barsky Ben	Pacific Bell
	Barsky E LOS ANGELES 3981316	Pacific Bell
	Gray Pegasus	Pacific Bell
	Karman Ma	Pacific Bell
1985	KARMAN MAL	Pacific Bell
	GERDL KATHY	Pacific Bell
	BARSKY BEN	Pacific Bell
1980	Taylor A L SANTA MONICA	Pacific Telephone

FINDINGS

Year	Uses	Source
1980	Taylor A K	Pacific Telephone
	Callaghan S	Pacific Telephone
	Callaham Marcel L	Pacific Telephone
	Karman Mal	Pacific Telephone
	Karman	Pacific Telephone
	Robinson Richard	Pacific Telephone
1975	LOCKREM B	Pacific Telephone

3801 ESPLANADE ST

Year	Uses	Source
2006	o HENDRIEM	Haines Co., Inc.
1991	Brewer H L	Pacific Bell
1985	WILKERSON STEVE	Pacific Bell
	LEE JEFF	Pacific Bell
1980	DHara Jacquelyn	Pacific Telephone

3803 ESPLANADE ST

Year	Uses	Source
2006	o CONKWRIGHTLynn	Haines Co., Inc.
1991	STEPHENSON ALAN P	Pacific Bell
	Stephenson Alan P	Pacific Bell
1985	STEPHENSON JANE M	Pacific Bell
1980	Ulmer Lon Carl	Pacific Telephone

3805 ESPLANADE ST

Year	Uses	Source
2006	WILLIAMS Robt L	Haines Co., Inc.
1985	LACK ANDREA	Pacific Bell
	MCGOURAN KENNETH C	Pacific Bell
	SAMSON L	Pacific Bell

3807 ESPLANADE ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1991	W fiams Robt L	Pacific Bell
1980	Bank Alan M	Pacific Telephone
	Banks Alan M	Pacific Telephone

FINDINGS

3809 ESPLANADE ST

Year	Uses	Source
1991	Shuler Kelth & Pam	Pacific Bell
1985	HILL MICHAEL JAY	Pacific Bell
1980	Low Alecx	Pacific Telephone

3907 ESPLANADE ST

Year	Uses	Source
2006	Donald	Haines Co., Inc.
	HAUSKNECHT	Haines Co., Inc.

3909 ESPLANADE ST

Year	Uses	Source
2006	HAUSKNECHT	Haines Co., Inc.
	Donald	Haines Co., Inc.

3929 ESPLANADE ST

Year	Uses	Source
2006	o KENNERLY Nancy	Haines Co., Inc.
1985	DOYLE DONALD	Pacific Bell
1980	Doyle Donald W	Pacific Telephone
1965	SCOTT PATRICIA	Pacific Telephone
1958	REYES ANDY	Pacific Telephone

3933 ESPLANADE ST

Year	Uses	Source
2006	o THAW Dale	Haines Co., Inc.
1991	BIRKNESS TOM	Pacific Bell
1985	MOORE KELLY	Pacific Bell
1980	Held W	Pacific Telephone
	Held Tony	Pacific Telephone
	Dieter Mary	Pacific Telephone
1975	PALLEY J	Pacific Telephone
1970	EAKES BERNARD F	Pacific Telephone

3807 1/2 ESPLANADE ST

Year	Uses	Source
1991	W-FIAMS ROBT L	Pacific Bell

FINDINGS

3809 1/2 ESPLANADE ST

Year	Uses	Source
1991	SHULERKELTH & PAM	Pacific Bell
1985	SHULER KEITH & PAM	Pacific Bell

FLEET

6 FLEET

Year	Uses	Source
2000	KAPLAN Gerald	Haines & Company
	LEMAL Paul	Haines & Company
	PORDUM K	Haines & Company
	VON Krusenstjema Patrik	Haines & Company
	APARTMENTS KAPLAN Gerald	Haines & Company

7 FLEET

Year	Uses	Source
2000	XXXX	Haines & Company
	DUFF C	Haines & Company
	APARTMENTS ANDERSON M J	Haines & Company
	DEPINTO Mike	Haines & Company
	FOOKES Shawn	Haines & Company
	GARRETT Marie	Haines & Company
	GARRETT Mickey	Haines & Company
	RESLER Jeffrey	Haines & Company
	RUBIN Jason	Haines & Company
	SHERMAN Steven	Haines & Company
	XXXX	Haines & Company
	X SPEEDWAY	Haines & Company
	ELLIS James	Haines & Company
	X PACIFIC AV	Haines & Company
	ATWILL Robert	Haines & Company
	KENNEDY John	Haines & Company
	LEFF Steve	Haines & Company
	ELLIS James	Haines & Company
	GRADWOHL Alan	Haines & Company
	XXXX	Haines & Company
	ELLIS James	Haines & Company
	MORGAN Gary	Haines & Company
	DREW Laura	Haines & Company

Year	Uses	Source
2000	HADFIELD David	Haines & Company
	KRESS Robert	Haines & Company
	DUFF Avery	Haines & Company

109 FLEET

Year	Uses	Source
2000	KAPLAN Marty	Haines & Company
	1/2 BEYMER John	Haines & Company

112 FLEET

Year	Uses	Source
2000	PORTNOY Caryl	Haines & Company

114 FLEET

Year	Uses	Source
2000	XXXX	Haines & Company

121 FLEET

Year	Uses	Source
2000	DEBUS David	Haines & Company
	KAPLAN Leon	Haines & Company

124 FLEET

Year	Uses	Source
2000	PEACE ASSOCIATES	Haines & Company
	VEDRES Frank	Haines & Company

129 FLEET

Year	Uses	Source
2000	CLARK Robert	Haines & Company
	X CANAL CT	Haines & Company

131 FLEET

Year	Uses	Source
2000	WEISENFELD George	Haines & Company

133 FLEET

Year	Uses	Source
2000	ENGLANG Tom	Haines & Company
	ENGLANG Pat	Haines & Company
	X ESPLANADE WST WALK	Haines & Company

FINDINGS

FLEET ST

6 FLEET ST

Year	*Uses*	*Source*
2006	APARTMENTS	Haines Co., Inc.
	o HOWARD Spencer	Haines Co., Inc.
	KATZ Barry	Haines Co., Inc.
	LEMAL Paul	Haines Co., Inc.
	PINK Mary	Haines Co., Inc.
	PRUETZRIck	Haines Co., Inc.
	RAPPOPORT David	Haines Co., Inc.
	RICOShanman	Haines Co., Inc.
	SEGAL Jeffery	Haines Co., Inc.
	SUSSMANL	Haines Co., Inc.
	YALLOUZ Yves	Haines Co., Inc.
	YOUNG Cliff	Haines Co., Inc.
1991	Kaplan Gerald	Pacific Bell
	Kaplan Gerald	Pacific Bell
	Kaplan Glen BRENTWOOD 4717797	Pacific Bell
	Kurtzman Stan Insurance	Pacific Bell
	Kurtzman Stanley	Pacific Bell
	Kurtrwei D LOS ANGELES 3974565	Pacific Bell
	Lemal Paul	Pacific Bell
	Leman Juke Laura SANTA MONICA 4503402	Pacific Bell
	Leman Sheila WESTLOS ANGELES 4773506	Pacific Bell
	RAPPOPORT AUDREY MS CULVER CITY	Pacific Bell
	Rappoport Phd David	Pacific Bell
	KAPLANGERALD	Pacific Bell
	KAPLANGERALD	Pacific Bell
	KURTZMAN STAN INSURANCE	Pacific Bell
	KURTZMAN STANLEY	Pacific Bell
	LEMAL PAUL	Pacific Bell
	RAPPOPORT AUDREY MS CULVER CITY	Pacific Bell
	RAPPOPORT PHD DAVID	Pacific Bell
1985	OTTLEGRAMS	Pacific Bell
	CALIFORNA FASHION MARKETING SERVICES	Pacific Bell

FINDINGS

Year	Uses	Source
1985	KURTZMAN STAN INSURANCE	Pacific Bell
	KURTZMAN STANLEY	Pacific Bell
	SCHULTZ LESLIE	Pacific Bell
	SILVERSTONE ROBT	Pacific Bell
1980	Fields Robt	Pacific Telephone
	Hellinger Sam	Pacific Telephone
	Kurtzman Stan Insurance	Pacific Telephone
	Lee Harlan	Pacific Telephone
	Portnoy Beverly	Pacific Telephone
	Portnoy Cary	Pacific Telephone
	Portnoy Cary I	Pacific Telephone
	Ross Herb	Pacific Telephone
	Wolfson Arnold R	Pacific Telephone
1975	GLASOMAN TERRENCE	Pacific Telephone
	AMYES KRISTIN SUE	Pacific Telephone
	BJURMAN GEO A	Pacific Telephone
	CARMEN LAWRENCE	Pacific Telephone
	HELLINGER SAM	Pacific Telephone
	LEEDS HOWARD	Pacific Telephone

7 FLEET ST

Year	Uses	Source
2008	TAG DESIGN	Cole Information Services
	DAETRIX	Cole Information Services
	MARKET MAKERS USA INC	Cole Information Services
	TELEPHONE COACHING LLC	Cole Information Services
2006	APARTMENTS	Haines Co., Inc.
	ARMFIELD Rocky	Haines Co., Inc.
	BAKERWilliam	Haines Co., Inc.
	COXE Cynthia	Haines Co., Inc.
	FOOKES Shawn	Haines Co., Inc.
	FOOKES Shawn	Haines Co., Inc.
	FOOKESShawn	Haines Co., Inc.
	GARRETT Mickey	Haines Co., Inc.
	GLASSMAN Terrence	Haines Co., Inc.
	KAMAUFFJohn	Haines Co., Inc.
	o KAFLAN Matthew	Haines Co., Inc.
	OWENSJeff	Haines Co., Inc.
	SCHNEIDER Steven	Haines Co., Inc.

FINDINGS

Year	Uses	Source
2006	SMITH M	Haines Co., Inc.
1991	Aguado Robt	Pacific Bell
	Bayer Mike	Pacific Bell
	Bayer Myron	Pacific Bell
	Garrett Marie & Mickey	Pacific Bell
	Kleinrock Stella & Leonard	Pacific Bell
	Levy Susan E	Pacific Bell
	Schubert Rubin	Pacific Bell
	Schubert Rubin	Pacific Bell
	Steinberg Robt B	Pacific Bell
	AGUADOROBT	Pacific Bell
	GARRETT MARIE & MICKEY	Pacific Bell
	KLEINROCK STELLA & LEONARD	Pacific Bell
	LEVY SUSAN E	Pacific Bell
	SCHUBERT RUBIN	Pacific Bell
	SCHUBERT RUBIN	Pacific Bell
	STEINBERG ROBT B	Pacific Bell
1985	KLEINROCKSTELLAS	Pacific Bell
	SCHUBERT RUBIN	Pacific Bell
	SCHUBERT RUBLN	Pacific Bell
	SILVERMAN JONATHAN	Pacific Bell
	WEINROTH DAVID	Pacific Bell
	GARRETT MARIE & MICKEY MARINA DEL REY	Pacific Bell
1980	First Colony Corp	Pacific Telephone
	Frackowiak & Associates ins	Pacific Telephone
	Shea John F Jr	Pacific Telephone
	Silverman Devora	Pacific Telephone
	Silverman Don	Pacific Telephone
	Brown Edw J	Pacific Telephone
	Daugard Craig	Pacific Telephone
	Daugard Cralg & Candace	Pacific Telephone
	Marina Del Rey Offices	Pacific Telephone
1975	ALDER RONI	Pacific Telephone
	COHEN HYMAN	Pacific Telephone
	DEVLIN JOS	Pacific Telephone
	GRANT BARRY N	Pacific Telephone
	LIEBERUM ROMI	Pacific Telephone
	METZINGER BARBARA	Pacific Telephone

FINDINGS

Year	Uses	Source
1975	PEARCE JAS H	Pacific Telephone
1970	ATKINSON ROBT R	Pacific Telephone
	GRIEGER ROBT	Pacific Telephone
	BERNSTEIN LAWRENCE A	Pacific Telephone
	DUBNOFF ENA	Pacific Telephone
	DUNCAN WM F	Pacific Telephone
	GREENBERG DAVID	Pacific Telephone
	HOFFMAN JAS R	Pacific Telephone
	ROBIN STEPHEN V	Pacific Telephone
	SCHERQUIST GARY L	Pacific Telephone
	SHAPIRO HARRY	Pacific Telephone
	STEVFEN RIUBIN CO THE	Pacific Telephone
	STEVENS JOHN	Pacific Telephone
	GELMAN ELLIS D	Pacific Telephone

11 FLEET ST

Year	Uses	Source
2006	S A BHAVE Prashant	Haines Co., Inc.
	TROJANJoe	Haines Co., Inc.

13 FLEET ST

Year	Uses	Source
2006	a ELLIS James	Haines Co., Inc.
1991	Cincotta Brian	Pacific Bell
	CINCOTTABRIAN	Pacific Bell
1985	GIFFIN TOM	Pacific Bell

15 FLEET ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1985	U-LIKE JUICE CO	Pacific Bell
1975	KRUZIC B R C	Pacific Telephone
	KRUZIC KEITH	Pacific Telephone

16 FLEET ST

Year	Uses	Source
1991	Keys Marcus	Pacific Bell
	Atwill Robt R	Pacific Bell
	Chrypinski Michael	Pacific Bell
	KEYSMARCUS	Pacific Bell

FINDINGS

Year	Uses	Source
1991	CHRYPINSKI MICHAEL	Pacific Bell
	ATWILLROBTR	Pacific Bell
1985	VANE B P	Pacific Bell
	SMALL PATRICK	Pacific Bell
	REYS MARCUS	Pacific Bell
	KEYS MARCUS	Pacific Bell
	ATWILL RORT R	Pacific Bell
1980	Stallone Richard	Pacific Telephone
	Shanks Kelly	Pacific Telephone
	Goldstein Seth	Pacific Telephone
	Ellls Alan D	Pacific Telephone
	Atwill Robt R	Pacific Telephone
	Appel J	Pacific Telephone
1975	PEDERSON DUANE	Pacific Telephone
	MORRISON JOHN	Pacific Telephone
	ALIEN LARRY	Pacific Telephone
	BRAY DONALD J	Pacific Telephone
	CALDWELL JAS	Pacific Telephone
	ELLIS ALAN D	Pacific Telephone
	KEARN L	Pacific Telephone
	KEARNS JUDITH L	Pacific Telephone
	MASDEO M T	Pacific Telephone

17 FLEET ST

Year	Uses	Source
2006	LEFF Steve	Haines Co., Inc.
1970	HASSAN RICHARD S	Pacific Telephone

20 FLEET ST

Year	Uses	Source
2006	ELLIS James	Haines Co., Inc.
1975	PARKER NIGEL	Pacific Telephone
1970	NYELAND BRUCE	Pacific Telephone
	HOWE HUMPHREY B	Pacific Telephone
	ASHODIAN DAVE	Pacific Telephone

21 FLEET ST

Year	Uses	Source
1985	PONCHICK ELLIOT	Pacific Bell

FINDINGS

Year	Uses	Source
1980	Derleg Leo J	Pacific Telephone
1975	DERIEG LEO J	Pacific Telephone

22 FLEET ST

Year	Uses	Source
2006	o FLEET Wiliam	Haines Co., Inc.
1975	HYMAN LES	Pacific Telephone

24 FLEET ST

Year	Uses	Source
2006	MACMILLAN Todd	Haines Co., Inc.
	e ELLIS James	Haines Co., Inc.
1991	ROTTMAN JOHN N	Pacific Bell
	Rottman Steven LOS ANGELES 4753058	Pacific Bell
	Rottman Steven SANTA MONICA 4532261	Pacific Bell
	Rottman S 2027809	Pacific Bell
	Rottman Richard MD	Pacific Bell
	Rottman John N	Pacific Bell
1980	Blxby E	Pacific Telephone

25 FLEET ST

Year	Uses	Source
2006	MORGAN Gary	Haines Co., Inc.

26 FLEET ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1980	Elberson Marshall	Pacific Telephone
1970	STUDEBAKER J L	Pacific Telephone

27 FLEET ST

Year	Uses	Source
2006	o ALTSHULER Linda	Haines Co., Inc.
1980	Chesley Howard	Pacific Telephone
	Notey Thos	Pacific Telephone
	Gindoff Bryan	Pacific Telephone
	Cole J	Pacific Telephone
1975	GINDOFF BRYAN	Pacific Telephone
1970	STANG JOHN F	Pacific Telephone

FINDINGS

Year	Uses	Source
1970	SHINODA MORNO	Pacific Telephone

28 FLEET ST

Year	Uses	Source
2006	KRess Robert	Haines Co., Inc.
1991	Murillo David	Pacific Bell
1980	Kress Roht	Pacific Telephone
	Lacy S	Pacific Telephone
	Mathewson Mark	Pacific Telephone
1975	GOLDMAN KENNETH L	Pacific Telephone
1970	SAVAGE RONALD W	Pacific Telephone

29 FLEET ST

Year	Uses	Source
2006	GELMAN Ellis	Haines Co., Inc.

30 FLEET ST

Year	Uses	Source
2006	DUFFAvery	Haines Co., Inc.
1980	Semper Peter J	Pacific Telephone
	Sempers	Pacific Telephone
	Sempers S	Pacific Telephone
1975	LEVY R	Pacific Telephone

31 FLEET ST

Year	Uses	Source
2006	BRYAN Peter	Haines Co., Inc.

32 FLEET ST

Year	Uses	Source
2006	DUFFAvery	Haines Co., Inc.
1985	ME NAUGHTON BRUCE	Pacific Bell
1980	Scolari Jos	Pacific Telephone

109 FLEET ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1991	WIRTHS WALTER & WENDY	Pacific Bell
	ARONSTEIN CHAS	Pacific Bell
	Aronstein Chas	Pacific Bell

FINDINGS

Year	Uses	Source
1991	Wirths Walter & Wendy	Pacific Bell
1985	JOSEPH FANE	Pacific Bell
1980	Call Christopher	Pacific Telephone
	Eddy Jack	Pacific Telephone

112 FLEET ST

Year	Uses	Source
1991	Evans M	Pacific Bell
1975	GROSS JACK M	Pacific Telephone
	GROSS JACK M	Pacific Telephone
1970	BENNETT RALPH	Pacific Telephone
1965	CURTIS E G MIKE	Pacific Telephone

113 FLEET ST

Year	Uses	Source
2008	WILD SEED FILMS	Cole Information Services
	KIM KANNER CREATIONS	Cole Information Services
2006	CAMPBELLTom E	Haines Co., Inc.

116 FLEET ST

Year	Uses	Source
2006	e KURLANDFrank	Haines Co., Inc.
	LUTZ Gary James	Haines Co., Inc.

119 FLEET ST

Year	Uses	Source
2006	SCRIBNER David	Haines Co., Inc.
	A FEUERBen	Haines Co., Inc.

120 FLEET ST

Year	Uses	Source
2006	WREDE Robert	Haines Co., Inc.
	WREDEJoan	Haines Co., Inc.
	JIRUCHA Steven	Haines Co., Inc.

121 FLEET ST

Year	Uses	Source
2006	FLORIN Malt	Haines Co., Inc.
1980	Mueller L	Pacific Telephone
	Mueller John	Pacific Telephone

Year	Uses	Source
1980	Edmisten John	Pacific Telephone
1975	LEINAAR WADE D	Pacific Telephone
	DAVIS COLETTE	Pacific Telephone

124 FLEET ST

Year	Uses	Source
2008	TR PROPERTIES	Cole Information Services
2006	o VEDRES Frank	Haines Co., Inc.
1991	Colllns T SANTA MONICA 4504554	Pacific Bell
	Collins Stephen	Pacific Bell
	Collins T LOS ANGELES 4702996	Pacific Bell

125 FLEET ST

Year	Uses	Source
2006	COESTERThomas	Haines Co., Inc.
	POHN Benjamin	Haines Co., Inc.

126 FLEET ST

Year	Uses	Source
2006	BIKNIUS Raymond	Haines Co., Inc.

128 FLEET ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

129 FLEET ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1991	Hayes Steven L	Pacific Bell
	Hayes Suzanne MARINA DEL REY 30580	Pacific Bell
	Pritzker Richard S	Pacific Bell
	Pritzker Sonya SANTA MONICA 4537043	Pacific Bell
	Pritzker Steven & Blythe SANTA MONICA 4511449	Pacific Bell
	Privacy Connection The	Pacific Bell
	Prival Allan SANTA MONICA	Pacific Bell
	HAYESSTEVENL	Pacific Bell
	PRITZKERRICHARDS	Pacific Bell
1975	BRADSHAW ARTHUR E L	Pacific Telephone
	OBRIEN ANN	Pacific Telephone

FINDINGS

Year	Uses	Source
1970	COX CHAS	Pacific Telephone
	ROBLSON CARL E	Pacific Telephone

130 FLEET ST

Year	Uses	Source
2006	BRANDERGlenn	Haines Co., Inc.

131 FLEET ST

Year	Uses	Source
2008	BUFFER PARTNERSHIP	Cole Information Services
2006	WEISENFELDGeorge	Haines Co., Inc.
1985	CORMANTODD	Pacific Bell
	WEISENFELD HOWARD	Pacific Bell
1980	Snyder Bernard	Pacific Telephone

132 FLEET ST

Year	Uses	Source
2013	BERGSEN & HALLER INC	Cole Information Services

133 FLEET ST

Year	Uses	Source
2006	o LITTKevin A	Haines Co., Inc.
1985	WEISENFELD GEO	Pacific Bell
1980	Stevens Richard	Pacific Telephone
	Falrbrother Lee	Pacific Telephone
1975	FALRBROTHER LEE	Pacific Telephone

17 1/2 FLEET ST

Year	Uses	Source
1970	HASSAN LEONARD	Pacific Telephone

28 1/2 FLEET ST

Year	Uses	Source
1991	MURILLO DAVID	Pacific Bell
1985	MURRAY MATT & ROBIN	Pacific Bell
1975	BISCH B P	Pacific Telephone

FINDINGS

GALLEON

14 GALLEON

Year	Uses	Source
2000	X SPEEDWAY	Haines & Company
	MILLER Michael	Haines & Company
	MILLER Barbara	Haines & Company

15 GALLEON

Year	Uses	Source
2000	SPRINGER H	Haines & Company

16 GALLEON

Year	Uses	Source
2000	BLOOM Jacob	Haines & Company
	FERSTEN E	Haines & Company

17 GALLEON

Year	Uses	Source
2000	BOYINGTON Paul	Haines & Company

20 GALLEON

Year	Uses	Source
2000	KING Bethan	Haines & Company
	VIGNEAU Donald	Haines & Company

21 GALLEON

Year	Uses	Source
2000	TITAN Glen	Haines & Company

24 GALLEON

Year	Uses	Source
2000	BRYANT Robert	Haines & Company

25 GALLEON

Year	Uses	Source
2000	ANTHONY James	Haines & Company

30 GALLEON

Year	Uses	Source
2000	FERRARI Alfred	Haines & Company

FINDINGS

32 GALLEON

Year	*Uses*	*Source*
2000	LAWLOR David	Haines & Company

34 GALLEON

Year	*Uses*	*Source*
2000	DUTKOWIAK Roch	Haines & Company

36 GALLEON

Year	*Uses*	*Source*
2000	X PACIFIC AV	Haines & Company
	TAUBMAN Sarah	Haines & Company
	RICHARDS Sam	Haines & Company
	PFARRER Charles	Haines & Company

114 GALLEON

Year	*Uses*	*Source*
2000	GREENE Lillian	Haines & Company

115 GALLEON

Year	*Uses*	*Source*
2000	DAVIES Gordon	Haines & Company
	JIRUCHA Steven	Haines & Company

116 GALLEON

Year	*Uses*	*Source*
2000	GREENE Henry W	Haines & Company

117 GALLEON

Year	*Uses*	*Source*
2000	TROY Gerald P	Haines & Company
	KWASNIEWSKI Gary	Haines & Company

121 GALLEON

Year	*Uses*	*Source*
2000	HANN Andrew	Haines & Company
	BILLAUER Michael	Haines & Company

123 GALLEON

Year	*Uses*	*Source*
2000	JIRUCHA Judy	Haines & Company

FINDINGS

126 GALLEON

Year	Uses	Source
2000	SOMERFELD Ericka	Haines & Company
	BRODY Scott	Haines & Company

127 GALLEON

Year	Uses	Source
2000	GALLEON 90292 CONT	Haines & Company
	NEFF Bill	Haines & Company
	DANTES Andrew	Haines & Company

130 GALLEON

Year	Uses	Source
2000	HODGES Robert	Haines & Company

131 GALLEON

Year	Uses	Source
2000	HOLTZ Magaly	Haines & Company
	HOLTZ John	Haines & Company
	LUSK David	Haines & Company
	TELENET	Haines & Company

132 GALLEON

Year	Uses	Source
2000	X CANAL CT	Haines & Company
	BENDER Kenneth	Haines & Company

GALLEON ST

14 GALLEON ST

Year	Uses	Source
2006	o HURLEY Michael	Haines Co., Inc.
1991	Garcia Marques Francesca	Pacific Bell
	GARCIA-MARQUES FRANCESCA	Pacific Bell
1985	STAVIG BROCK	Pacific Bell
	OMALLEY JASON	Pacific Bell
	FAIRWEATHER JOHN	Pacific Bell
1980	Wally S	Pacific Telephone
1975	AUSTIN H J	Pacific Telephone
	LASAS ALGIS	Pacific Telephone
	PETRIE KURT	Pacific Telephone

Year	Uses	Source
1965	WACHS JACQUES J	Pacific Telephone

15 GALLEON ST

Year	Uses	Source
2006	MCDOWELL Majorde	Haines Co., Inc.
1991	Alvarez Henry	Pacific Bell
	Lawrence Gary	Pacific Bell
	Lawrence Gary & Suzann 4748483	Pacific Bell
	Lawrence Gerda SANTA MONICA	Pacific Bell
	Lawrence Geri WESTLOS ANGELES	Pacific Bell
	Valente John	Pacific Bell
	ALVAREZ HENRY	Pacific Bell
	LAWRENCE GARY	Pacific Bell
	VALENTEJOHN	Pacific Bell
1985	KENYON KEITH	Pacific Bell
	CATABRESE ROBT	Pacific Bell
1980	Kenyon Keith	Pacific Telephone
	i Calabrese Robt	Pacific Telephone
	Calafia Development Corp	Pacific Telephone

16 GALLEON ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1985	BRUNO JOHN V	Pacific Bell

17 GALLEON ST

Year	Uses	Source
2006	LAFAZIA Ralph	Haines Co., Inc.
1991	Pignet Ray	Pacific Bell
	PIGNET RAY	Pacific Bell
1985	PIGNET RAY	Pacific Bell
1980	Pignet Ray	Pacific Telephone
1975	PIGNET RAY	Pacific Telephone
1970	PIGNET RAY	Pacific Telephone
1965	PIGNET RAY	Pacific Telephone

20 GALLEON ST

Year	Uses	Source
2006	OQUINN Ryan	Haines Co., Inc.
1980	Wickert M	Pacific Telephone

Year	Uses	Source
1980	Dash Marc LMD	Pacific Telephone
	Vasile Chas W MD	Pacific Telephone
1975	KAIROFF M	Pacific Telephone
	BEAR DENNIS	Pacific Telephone

21 GALLEON ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1980	Marienthal Elaine	Pacific Telephone
	Marienthal Lisa	Pacific Telephone
	Marienthal Louis B	Pacific Telephone
1976	Neiman Hal	Pacific Telephone
1975	NEIMAN HAL	Pacific Telephone
1970	CARR EDW L	Pacific Telephone
1965	CORSON BAYAOD R	Pacific Telephone

24 GALLEON ST

Year	Uses	Source
2006	BRYANT Robert	Haines Co., Inc.
1991	Chlo Wilt Allan D	Pacific Bell
	CHLOWILT ALLAN D 827	Pacific Bell
1980	Chlowitz Allan D	Pacific Telephone
1965	MALONE CECELIA S	Pacific Telephone

25 GALLEON ST

Year	Uses	Source
1980	Anthony Jim	Pacific Telephone
	Slawson	Pacific Telephone
1975	ANTHONY JIM	Pacific Telephone

30 GALLEON ST

Year	Uses	Source
2006	AHRABLOU Mercedeh	Haines Co., Inc.

32 GALLEON ST

Year	Uses	Source
2006	LANG Daniel	Haines Co., Inc.
1980	DOrazio J WEST LOS ANGELES	Pacific Telephone
	Tokumoto Tim	Pacific Telephone
	Weinstein Bella	Pacific Telephone

FINDINGS

Year	Uses	Source
1980	Weinstein Ben T atty	Pacific Telephone
	DOrazio Etter Dee	Pacific Telephone
1975	DORAZIO ETTER V	Pacific Telephone
	PARSCH RASMA	Pacific Telephone
1970	SCHLDGEN CAROL	Pacific Telephone
	KERN JOHN P H	Pacific Telephone
	FURRY WM S	Pacific Telephone
	MARCUS PAULINE	Pacific Telephone
	RICHARDSON JEANNE	Pacific Telephone
1965	FARR PEGGY	Pacific Telephone

34 GALLEON ST

Year	Uses	Source
2006	TURLEYPaul	Haines Co., Inc.

36 GALLEON ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

84 GALLEON ST

Year	Uses	Source
1985	LOS ANGELES	Pacific Bell
1980	Los Angeles	Pacific Telephone

110 GALLEON ST

Year	Uses	Source
2008	PRODUCTIONS RAO	Cole Information Services
2006	RAO Kran	Haines Co., Inc.
	A ZOOLALIAN Jim	Haines Co., Inc.

113 GALLEON ST

Year	Uses	Source
2006	HOHaomrn	Haines Co., Inc.
	a MARCUS Paul	Haines Co., Inc.

114 GALLEON ST

Year	Uses	Source
1970	BAUSGHMAN CARYLON S	Pacific Telephone

FINDINGS

115 GALLEON ST

Year	Uses	Source
2006	JIRUCHASteven	Haines Co., Inc.

116 GALLEON ST

Year	Uses	Source
1991	Greenelva P PACIFIC PALISADES 4544685	Pacific Bell
	Greene Henry W	Pacific Bell
	GREENEHENRYW	Pacific Bell
1985	GREENE HENRY W	Pacific Bell
1980	Greene Henry W	Pacific Telephone
1975	GREENE HENRY W	Pacific Telephone
1970	GREENE HENRY W	Pacific Telephone
1965	GREENE HENRY W	Pacific Telephone

117 GALLEON ST

Year	Uses	Source
2006	JIRUCHASteven	Haines Co., Inc.
1991	Coral Pacific Inc	Pacific Bell
	TROY GERALD P	Pacific Bell
	CORAL PACIFIC INC	Pacific Bell
	Troy Gerald P	Pacific Bell

120 GALLEON ST

Year	Uses	Source
2006	As SPICAJonathan	Haines Co., Inc.
	B VURGECZeke	Haines Co., Inc.

121 GALLEON ST

Year	Uses	Source
2006	POPIELINSKI Daniel	Haines Co., Inc.
	WEBSTER Diana G	Haines Co., Inc.
	BILLAUERMichael	Haines Co., Inc.

122 GALLEON ST

Year	Uses	Source
2006	LUYTi ES Kim	Haines Co., Inc.
	FINELLI Richard	Haines Co., Inc.

FINDINGS

123 GALLEON ST

Year	Uses	Source
2006	CHERRYJ	Haines Co., Inc.
	WREDE Robert	Haines Co., Inc.
	JIRUCHA Steven	Haines Co., Inc.

126 GALLEON ST

Year	Uses	Source
2008	MAVERICK EVENT PRODUCTIONS	Cole Information Services
	PUFF PROMOTIONS	Cole Information Services
2006	BRADYScott	Haines Co., Inc.
	B BRODY Scott	Haines Co., Inc.
	B BRODY Scott	Haines Co., Inc.
	PERAZIC Nina	Haines Co., Inc.
	PUFF PROMOTIONS	Haines Co., Inc.
1991	Mark E	Pacific Bell
	Mark Ellen VENICE 3968848	Pacific Bell
	Quinto David W	Pacific Bell
	MARK E	Pacific Bell
	QUINTODAVIDW	Pacific Bell

127 GALLEON ST

Year	Uses	Source
2006	DANTESAndrew	Haines Co., Inc.
	a LIPSHULTZJuiliana	Haines Co., Inc.
1962	WOLHAUPTER WM F	Pacific Telephone

130 GALLEON ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1985	HODGES ROBT T	Pacific Bell
1980	Hodges Robt T	Pacific Telephone
1975	HODGES ROBT T	Pacific Telephone
1970	BLUMBERG DIANNA	Pacific Telephone

131 GALLEON ST

Year	Uses	Source
2006	WALLACE Lawrence	Haines Co., Inc.

FINDINGS

132 GALLEON ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1991	Ametrano Michelle	Pacific Bell
1980	Clegg Beth	Pacific Telephone

150 GALLEON ST

Year	Uses	Source
1958	CLINIC THELOS ANGELES	Pacific Telephone

132 1/2 GALLEON ST

Year	Uses	Source
1970	HODGES ROBT T	Pacific Telephone

GRAND CANAL

3814 GRAND CANAL

Year	Uses	Source
2000	SEVEDGE Annette	Haines & Company
	MATHESON L F	Haines & Company

GRAND CANAL CT

3417 GRAND CANAL CT

Year	Uses	Source
1970	BUTTE BRUCE W	Pacific Telephone

3419 GRAND CANAL CT

Year	Uses	Source
1975	GOLDSMITH BRUCE	Pacific Telephone
1970	AXE RAY	Pacific Telephone

3602 GRAND CANAL CT

Year	Uses	Source
1985	ZILA DEBI	Pacific Bell

HURRICANE

15 HURRICANE

Year	Uses	Source
2000	KLINE Debbie 310 821 8663 E	Haines & Company
	EUGENE R 00 S	Haines & Company

Year	Uses	Source
2000	HAKIM Calixto	Haines & Company

17 HURRICANE

Year	Uses	Source
2000	HERTZ Mellissa 00 E	Haines & Company

20 HURRICANE

Year	Uses	Source
2000	DORIN David	Haines & Company

21 HURRICANE

Year	Uses	Source
2000	XXXX	Haines & Company

24 HURRICANE

Year	Uses	Source
2000	MOORE Dudley	Haines & Company

25 HURRICANE

Year	Uses	Source
2000	SCHWAB John L 310 821 5553 l	Haines & Company

27 HURRICANE

Year	Uses	Source
2000	COFFEY Frank	Haines & Company
	BEGLEY MAGGIE COMMUNICATIONS	Haines & Company
	KARPE Joan	Haines & Company

29 HURRICANE

Year	Uses	Source
2000	CASHION Brian E	Haines & Company
	GONNOUD Vincent	Haines & Company
	CLARKE Michael J	Haines & Company

30 HURRICANE

Year	Uses	Source
2000	XXXX	Haines & Company

34 HURRICANE

Year	Uses	Source
2000	JONES	Haines & Company

FINDINGS

36 HURRICANE

Year	*Uses*	*Source*
2000	XXXX	Haines & Company

109 HURRICANE

Year	*Uses*	*Source*
2000	FRIEDMAN Steven	Haines & Company

110 HURRICANE

Year	*Uses*	*Source*
2000	MC Denmott Thomas	Haines & Company
	MC Taggart Michael	Haines & Company
	ROSAK Ken	Haines & Company
	WYNN Seymour	Haines & Company
	WILKINS Amy	Haines & Company
	ZECH Hildegard	Haines & Company
	DEBIASE Robert	Haines & Company
	PLOTNICK Dean	Haines & Company
	RUZICKA Alan	Haines & Company
	DERHY Meir	Haines & Company
	DAVIDIAN Peter	Haines & Company
	PLOTNICK Harvey	Haines & Company
	PLOTNICK H	Haines & Company
	RUCH Lizi	Haines & Company
	BARNETT William	Haines & Company
	MILLER Robert S	Haines & Company
	X CANAL CT	Haines & Company
	APARTMENTS	Haines & Company
	CORREN M	Haines & Company
	HEIMEL Alan	Haines & Company
	HILTON Darin	Haines & Company

HURRICANE ST

10 HURRICANE ST

Year	*Uses*	*Source*
1991	Commander Bob	Pacific Bell
	COMMANDER BOB	Pacific Bell

FINDINGS

15 HURRICANE ST

Year	Uses	Source
2013	GLOBAL BOLLINGER	Cole Information Services
2006	o HAKIM Calixto	Haines Co., Inc.
1985	HARSH DAVID	Pacific Bell
	DALLMEYER ROBT F	Pacific Bell
1980	Steinberg David	Pacific Telephone
	Me Clure Michael	Pacific Telephone
	Hughes Ken A	Pacific Telephone
	Brezner Larry	Pacific Telephone
1975	PLOTKIN TOM M	Pacific Telephone
	PLOTKIN TIM	Pacific Telephone
1970	KEELEY ALLANI	Pacific Telephone
	MATZKE GARY	Pacific Telephone
	MARKSBERRY LYNN	Pacific Telephone
	MAGEE ARTHUR	Pacific Telephone
	GLESSNER MIMI	Pacific Telephone

17 HURRICANE ST

Year	Uses	Source
2006	HERTZ Mellssa	Haines Co., Inc.
	TANDY James	Haines Co., Inc.
1991	CAUGHEYDIANE	Pacific Bell
	CAUGHEY DIANE MILLER	Pacific Bell
	WYMAN WENDY PHD	Pacific Bell
	MC GINTY DENNIS J	Pacific Bell
	Caughey Diane	Pacific Bell
	Caughey Diane Miller	Pacific Bell
	Caughren David B 3917833	Pacific Bell
	Mc Ginty Dennis J	Pacific Bell
	Wyman Wendy Ph D	Pacific Bell
1985	ME GINTY DENNIS J	Pacific Bell
	MILLER TY SJR	Pacific Bell
	CAUGHEY DIANE MLLER	Pacific Bell
	CAUGHEY DIANE	Pacific Bell
1980	Dill M	Pacific Telephone
	Dill S	Pacific Telephone
	Hertz O Caughey	Pacific Telephone
	Mc Ginty Dennis J	Pacific Telephone
1965	GUERRERO BEN	Pacific Telephone

Year	Uses	Source
1965	COYNE RICHARD	Pacific Telephone

20 HURRICANE ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1980	Gordon Howard	Pacific Telephone
1970	RUSSELL MICHAEL	Pacific Telephone

21 HURRICANE ST

Year	Uses	Source
1980	NBC Co	Pacific Telephone
1975	BROWN MICHAEL	Pacific Telephone
1965	WORMALD ED	Pacific Telephone

24 HURRICANE ST

Year	Uses	Source
1970	HUSTED EDGAR K	Pacific Telephone
1965	BUSTED EDGAR MV394809	Pacific Telephone

25 HURRICANE ST

Year	Uses	Source
2006	RAUH Richard	Haines Co., Inc.
	SHEEHAN C	Haines Co., Inc.
	ZINK Russell	Haines Co., Inc.
1991	DECINDIS JOHN	Pacific Bell
	Albany Tony	Pacific Bell
	Bouchereau Laura	Pacific Bell
	Decindis John	Pacific Bell
	Decio Jamee WESTWOOD	Pacific Bell
	Decious K VENICE 3062263	Pacific Bell
	BOUCHEREAU LAURA	Pacific Bell
	ALBANY TONY	Pacific Bell
1985	ALBANY TONY	Pacific Bell
1970	ASHE ETHEL NI	Pacific Telephone

27 HURRICANE ST

Year	Uses	Source
2006	BEGLEY MAGGIE	Haines Co., Inc.
	COMMUNICATIONS	Haines Co., Inc.
1965	CLAPP RICHARD A	Pacific Telephone

FINDINGS

29 HURRICANE ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1991	Cashion Brian E	Pacific Bell
	Cashlon Duny	Pacific Bell
	Cashman C	Pacific Bell
	Me Namara S	Pacific Bell
	Mc Namara Scott Venice 3995766	Pacific Bell
	Mc Namara Sean Elizabeth SANTA MONICA 3963083	Pacific Bell
	Mc Namara Sheila LOS ANGELES 3978326	Pacific Bell
	Rsenthal Mark	Pacific Bell
	RSENTHAL MARK	Pacific Bell
	CASHION BRIAN E	Pacific Bell
	ME NAMARA S	Pacific Bell
1985	ROSENTHAL MARK	Pacific Bell
	CASHION BRIAN E	Pacific Bell
	ME NAMARA S	Pacific Bell
	TENDLER LANCE	Pacific Bell
	TENDLER T	Pacific Bell
1980	Me Namara S	Pacific Telephone
	Wilk Greg	Pacific Telephone
	Wilk H	Pacific Telephone
1975	JOHNSON GEO	Pacific Telephone
	GILLMAN LYLE	Pacific Telephone
	ME NAMARA S	Pacific Telephone

30 HURRICANE ST

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
1980	Amoya Productions	Pacific Telephone
1970	MARTINEZ MARIA	Pacific Telephone
1965	MARTINEZ C C	Pacific Telephone

34 HURRICANE ST

Year	Uses	Source
2006	o JONESLarry	Haines Co., Inc.

FINDINGS

36 HURRICANE ST

Year	*Uses*	*Source*
2006	SHARP Raymond	Haines Co., Inc.

109 HURRICANE ST

Year	*Uses*	*Source*
2006	EVERSTINE Mary	Haines Co., Inc.

110 HURRICANE ST

Year	*Uses*	*Source*
2006	HEIMEL Alan	Haines Co., Inc.
	APARTMENTS	Haines Co., Inc.
	HILTON Darin	Haines Co., Inc.
	HOFFS Mike	Haines Co., Inc.
	MCDERMOTT Thos	Haines Co., Inc.
	MCTAGGART Michael	Haines Co., Inc.
	RIST Catherins	Haines Co., Inc.
	WELCH Megan	Haines Co., Inc.
	WILLIAMS Mark C	Haines Co., Inc.
1991	FONS PETERG MARINA DEL REY	Pacific Bell
	Carmichael Dennis	Pacific Bell
	Fitch Jos	Pacific Bell
	Fitch L LOS ANGELES 4791276	Pacific Bell
	Fitch Louise VENICE	Pacific Bell
	Fons Peter G	Pacific Bell
	Heimel Alan	Pacific Bell
	Henry S A	Pacific Bell
	Henry SK WESTLOS ANGELES 4790188	Pacific Bell
	Hume Douglas	Pacific Bell
	Jackson Steven E	Pacific Bell
	Mc Dermott Thos	Pacific Bell
	Mc Taggart Michael	Pacific Bell
	CARMICHAEL DENNIS	Pacific Bell
	FITCH JOS	Pacific Bell
	HEIMEL ALAN	Pacific Bell
	HENRY S A	Pacific Bell
	HUME DOUGLAS	Pacific Bell
	JACKSONSTEVENE	Pacific Bell
	MCDERMOTTTHOS	Pacific Bell
	MC TAGGARTMICHAEL	Pacific Bell

FINDINGS

Year	Uses	Source
1985	SNYDER ENTERPRISES	Pacific Bell
	FILCH JOS	Pacific Bell
	COMMANDER BOB	Pacific Bell
	HELMELALAN	Pacific Bell
	HENRY S A	Pacific Bell
	HUME DOUGLAS	Pacific Bell
	ME TAGGART MICHAEL	Pacific Bell
	MCDERMOTT THOS	Pacific Bell
1980	Snyder Russell A	Pacific Telephone
	Stephenson	Pacific Telephone
	Blake Muriel	Pacific Telephone
	Blake Muriel	Pacific Telephone
	Fitch Jos	Pacific Telephone
	Heimel Alan	Pacific Telephone
	Henry S A	Pacific Telephone
	Luby TA	Pacific Telephone
	Mc Dermott Thos	Pacific Telephone
	Me Taggart Michael	Pacific Telephone
	Ready Frank E	Pacific Telephone
	Romney K	Pacific Telephone
1975	NELSON DANI	Pacific Telephone
	BANTA S	Pacific Telephone
	CLARK SUSAN ANN	Pacific Telephone
	FRIEDMAN HERB	Pacific Telephone
	GRIMMETT WM M III	Pacific Telephone
	KENYON KEITH	Pacific Telephone
	MAGNESS SUSAN	Pacific Telephone
	MALCOMB STEVE	Pacific Telephone
	MARRE RICK	Pacific Telephone
	PHILLIPS JACK	Pacific Telephone

113 HURRICANE ST

Year	Uses	Source
2008	JC PROPERTIES	Cole Information Services
2006	POON Kimball	Haines Co., Inc.
	HARRISON Rodedick	Haines Co., Inc.
1991	TULMAN GERALD	Pacific Bell
	Tulman Gerald	Pacific Bell
1985	MIRABELLA P	Pacific Bell

FINDINGS

Year	Uses	Source
1985	TULMAN GERALD	Pacific Bell
	LINDENBAUM E	Pacific Bell
1980	Austin Holly	Pacific Telephone
	Cohen Robin	Pacific Telephone
1975	COHEN ROBIN	Pacific Telephone
	MARTIN C	Pacific Telephone

115 HURRICANE ST

Year	Uses	Source
2013	MEDICAL SALES ASSOCIATES	Cole Information Services
2008	MEDICAL SALES ASSOCIATES	Cole Information Services
2006	ASSOCIATES	Haines Co., Inc.
	MEDICAL SALES	Haines Co., Inc.
	DEBIASE Robed	Haines Co., Inc.
1975	BARNARD JOHN T	Pacific Telephone
1970	RIORDAN NELSON	Pacific Telephone
	SANDERS DAVID G MD	Pacific Telephone

119 HURRICANE ST

Year	Uses	Source
2006	DIBBLE Ruth	Haines Co., Inc.
	RUZICKA Alan	Haines Co., Inc.
	TAYLOR G	Haines Co., Inc.
1991	FANNING MITCH & BRENDA	Pacific Bell
	Fanning Mitch & Brenda	Pacific Bell
1985	DE BIASE ROBT	Pacific Bell
1980	Craemer	Pacific Telephone
	Holgen Donald	Pacific Telephone
	De Biasio a T	Pacific Telephone
	Craedick David	Pacific Telephone
	De Biase Robt	Pacific Telephone
1975	NEWER GARY	Pacific Telephone
1970	EPSTEIN MICHAEL	Pacific Telephone
	KEENAN WM E	Pacific Telephone

120 HURRICANE ST

Year	Uses	Source
1985	HEADLEY UCPION	Pacific Bell
1980	Nalite BL	Pacific Telephone

Year	Uses	Source
1980	Nance Arnold & Catherine	Pacific Telephone
	Bates P Alexandra	Pacific Telephone
1975	FUNK JOHN LLHO	Pacific Telephone
	JENSEN ERIC	Pacific Telephone
1970	ANDRE LYNWOOD	Pacific Telephone
	CASADY MURRAY G	Pacific Telephone
	JONES WALLACE B	Pacific Telephone

121 HURRICANE ST

Year	Uses	Source
2006	DAVIDIAN Peter	Haines Co., Inc.
1980	Martin Margie	Pacific Telephone
	Miller Bruce Dr	Pacific Telephone
1970	GROSS DAVID H	Pacific Telephone

125 HURRICANE ST

Year	Uses	Source
2006	STARK Josph	Haines Co., Inc.
	PLOTNICK Harvey	Haines Co., Inc.
1985	SALDITCH LAN	Pacific Bell
1980	Hays Peter	Pacific Telephone
	Hays Robt J	Pacific Telephone
	Johnson Geo & Anne	Pacific Telephone
1970	DORFF RALPH L	Pacific Telephone
	BERNE JULIE	Pacific Telephone

127 HURRICANE ST

Year	Uses	Source
2006	PLOTNICK Harvey	Haines Co., Inc.
1991	PLOTNICK DEAN	Pacific Bell
	Repko Charlene	Pacific Bell
	Repking C LOS ANGELES	Pacific Bell
	Repitor Steve	Pacific Bell
	Plotnick Dean	Pacific Bell
	REPITORSTEVE	Pacific Bell
1985	MCCONNELL WM	Pacific Bell
	FLLMAN BARTON	Pacific Bell
1970	STANBERRY ROBT M	Pacific Telephone
	STANBERRY RICHARD A	Pacific Telephone

FINDINGS

129 HURRICANE ST

Year	Uses	Source
2008	SCOTT PROPERTIES	Cole Information Services
2006	No Current Listing	Haines Co., Inc.

171 HURRICANE ST

Year	Uses	Source
1991	Miller Ty SJr	Pacific Bell
	Miller U VENICE 8224012	Pacific Bell
	Miller V 4733489	Pacific Bell
	MILLERTYSJR	Pacific Bell

119 1/2 HURRICANE ST

Year	Uses	Source
1985	FUNDOCK DOROTHY	Pacific Bell
1975	GRELTZER C B	Pacific Telephone

121 1/2 HURRICANE ST

Year	Uses	Source
1975	KAHN RONALD	Pacific Telephone

121 1/4 HURRICANE ST

Year	Uses	Source
1985	FRAZER THOS M	Pacific Bell

IRONSIDES

1 IRONSIDES

Year	Uses	Source
2000	X SPEEDWAY	Haines & Company
	TOMBACK Lawrence	Haines & Company
	PULLMAN Morton A	Haines & Company
	GRAILER C Kenneth	Haines & Company
	ANELLO Robert D	Haines & Company

15 IRONSIDES

Year	Uses	Source
2000	XXXX	Haines & Company

17 IRONSIDES

Year	Uses	Source
2000	FRIEDERIC Lilian	Haines & Company

FINDINGS

20 IRONSIDES

Year	Uses	Source
2000	MC Callum Hugh	Haines & Company
	FUCHS Hal	Haines & Company

21 IRONSIDES

Year	Uses	Source
2000	FRIEDERIC Lilian	Haines & Company

24 IRONSIDES

Year	Uses	Source
2000	XXXX	Haines & Company
	IRONSIDES 90292 CONT	Haines & Company

25 IRONSIDES

Year	Uses	Source
2000	BALZER Robert	Haines & Company

27 IRONSIDES

Year	Uses	Source
2000	X PACIFIC AV	Haines & Company
	XXXX	Haines & Company

IRONSIDES ST

1 IRONSIDES ST

Year	Uses	Source
2008	SPERBER HOTEL GROUPS	Cole Information Services
	ML ENTERPRISES INC	Cole Information Services
2006	TORRES Diana a	Haines Co., Inc.
	TOMBACK Lawrence	Haines Co., Inc.
	REINBOLD Jay	Haines Co., Inc.
	PORTER Mark	Haines Co., Inc.
	KILGORE Nilkki	Haines Co., Inc.
	BRUNO Baron	Haines Co., Inc.
	CARSWELL John	Haines Co., Inc.
	CASTLEMAN Don	Haines Co., Inc.
	CHASE Stephanie	Haines Co., Inc.
	GRAILERKenneth C	Haines Co., Inc.
1991	Graler C Kenneth	Pacific Bell
	Greenwald Robt	Pacific Bell

FINDINGS

Year	Uses	Source
1991	Morris Kevin	Pacific Bell
	Pullman Morton A	Pacific Bell
	Tomback Lawrence	Pacific Bell
	Tomboc Ricardo 88219732	Pacific Bell
	Tombrink K LOS ANGELES 4791457	Pacific Bell
	GRALERC KENNETH	Pacific Bell
	GREENWALD ROBT	Pacific Bell
	MORRIS KEVIN	Pacific Bell
	PULLMAN MORTON A	Pacific Bell
	TOMBACK LAWRENCE	Pacific Bell
1985	SHOR JOEL DR	Pacific Bell
	DEVICTOR ROMEY	Pacific Bell
	DRUDY JOHN T	Pacific Bell
	GRALLER C KENNETH	Pacific Bell
	PULLMAN MORTON A	Pacific Bell
	SANVILLE JEAN DR	Pacific Bell
1980	Prince Arnold E	Pacific Telephone
	Alden David	Pacific Telephone
	De Victor Rorney	Pacific Telephone
	Drudy John T	Pacific Telephone
	Felkner Darrel	Pacific Telephone
	Grailer C Kenneth	Pacific Telephone
	Homer Linda	Pacific Telephone
	Pullman Morton A	Pacific Telephone
	Sanville Jean Dr	Pacific Telephone
	Shor Joel Dr	Pacific Telephone
	Werdin Russell Jr	Pacific Telephone
1975	BURIAN B D	Pacific Telephone
	CALABRESE ROBT	Pacific Telephone
	CLIPPINGER A	Pacific Telephone
	FINKELSTEIN SIMON	Pacific Telephone
	GOMBAR RICK	Pacific Telephone
	GRAILER C KENNETH	Pacific Telephone
	BAKER R M	Pacific Telephone

15 IRONSIDES ST

Year	Uses	Source
2008	KLH LIMOUSINE SER	Cole Information Services
2006	No Current Listing	Haines Co., Inc.

FINDINGS

Year	Uses	Source
1991	Machtinger Paula LCSW 2765221	Pacific Bell
	Machtinger Leonard S	Pacific Bell
	Kolb Robin	Pacific Bell
	Frohman Mel	Pacific Bell
	MACHTINGER LEONARD S	Pacific Bell
	KOLB ROBIN	Pacific Bell
	FROHMAN MEL	Pacific Bell
1985	GOLDEN DONN	Pacific Bell
	MACHTINGER LEONARD S	Pacific Bell
	POSEN LANCE	Pacific Bell
1980	Bogle Robt E	Pacific Telephone
	Leonard W Biff	Pacific Telephone
	Machtinger Leonard S	Pacific Telephone
	Swanson David	Pacific Telephone
	Swanson Diana	Pacific Telephone
1975	FONG CHOEY	Pacific Telephone
	GREENFELD NORTON	Pacific Telephone
	HATELEY J M	Pacific Telephone
	NOVACK DONALD	Pacific Telephone
	PEARSON SHELDON	Pacific Telephone
1970	BULGER THOS M	Pacific Telephone

17 IRONSIDES ST

Year	Uses	Source
1991	Walker Ann	Pacific Bell
1980	Kuperberg Howard	Pacific Telephone
1975	BRENT P J	Pacific Telephone
	BOCHES RALPH E	Pacific Telephone
1965	BROWN KATHERINE M	Pacific Telephone

20 IRONSIDES ST

Year	Uses	Source
2008	GRAY LUCIINDA PHD PROF CORP	Cole Information Services
	ANDREW J FREEDMAN PERSONAL MANAGEMEN	Cole Information Services
2006	APARTMENTS	Haines Co., Inc.
	BALFOUR Raviv	Haines Co., Inc.
	BEARNS Steffi	Haines Co., Inc.
	BELLACICCO Judith	Haines Co., Inc.

FINDINGS

Year	Uses	Source
2006	BENARDO Stephen	Haines Co., Inc.
	CIMENTJames D	Haines Co., Inc.
	FORD M	Haines Co., Inc.
	FREEMAN Cie	Haines Co., Inc.
	FUCHS Hal	Haines Co., Inc.
	GALANTI Robert a	Haines Co., Inc.
	MCCALLUMHugh	Haines Co., Inc.
	MOORE Sandra	Haines Co., Inc.
	MOSELEY Brock	Haines Co., Inc.
	PACKER Gregory	Haines Co., Inc.
	PASIO Paolo	Haines Co., Inc.
	SORENSENKriaten	Haines Co., Inc.
	o VINARSKYEmma	Haines Co., Inc.
1991	KENNEDY MICHAEL	Pacific Bell
	KOENIG LARRY	Pacific Bell
	WM T & MARY DOROTHY	Pacific Bell
	ZACHARYGEOC	Pacific Bell
	Kennedy Michael	Pacific Bell
	Koenig Larry	Pacific Bell
	Wm T & Mary Dorothy	Pacific Bell
	Me Callum Hugh	Pacific Bell
	Zachary Geo C	Pacific Bell
1985	EPSTEIN ELLIOTT	Pacific Bell
	JUl E	Pacific Bell
	KAYE BRADLEY S	Pacific Bell
	KLEIN STANLEY	Pacific Bell
	ZACHARY GEO C	Pacific Bell
1980	Marinello Diana	Pacific Telephone
	Walker Jack	Pacific Telephone
	Wilert W D	Pacific Telephone
	Zachary Geo C	Pacific Telephone
	Blackwell Connie	Pacific Telephone
	Feldman Lorne	Pacific Telephone
	Grass Jack	Pacific Telephone
	Jul E	Pacific Telephone
	Lecky Robt S	Pacific Telephone
	Maggio Florence	Pacific Telephone
	Mildenberger Robt	Pacific Telephone

FINDINGS

Year	Uses	Source
1980	Saboroff Steven L	Pacific Telephone
	Weiss Steve F	Pacific Telephone
	Weiss Steve	Pacific Telephone
	Weiss Steve	Pacific Telephone

21 IRONSIDES ST

Year	Uses	Source
1980	King Larry W	Pacific Telephone
1975	HERTZ RICHARD A	Pacific Telephone
1970	CARLTON FRANK	Pacific Telephone
1965	CARLTON FRANK	Pacific Telephone

23 IRONSIDES ST

Year	Uses	Source
1991	HEDBERGJOHN	Pacific Bell
	Kiesel Steve	Pacific Bell
	Hedberg John	Pacific Bell
1985	MIGLIORINI AL MICHAEL	Pacific Bell
1980	Wilson Lonnie	Pacific Telephone
1975	GORDON GENE	Pacific Telephone
	BRUMBAUGH DON	Pacific Telephone
1970	LEON GENEVIEVE V	Pacific Telephone

25 IRONSIDES ST

Year	Uses	Source
2006	o MAEDER Brad	Haines Co., Inc.
1991	WALKER NICHOLAS	Pacific Bell
	Walker P SANTA MONICA	Pacific Bell
	Walker P MAR VISTA	Pacific Bell
	W alker P SANTA MONICA	Pacific Bell
	Walker Nicholas	Pacific Bell
1980	Morano Enrico	Pacific Telephone
	Steele Mary	Pacific Telephone
	Fanner N J	Pacific Telephone
	Dileski J T	Pacific Telephone
1975	NIELSON JOHN	Pacific Telephone
	BRAUN MARK J	Pacific Telephone

FINDINGS

27 IRONSIDES ST

Year	*Uses*	*Source*
2006	RUEHMStefan	Haines Co., Inc.
	CAMPBELL Clara	Haines Co., Inc.
	GEORCStefan	Haines Co., Inc.
	s PARKER Rodger	Haines Co., Inc.
	OCONNELLTim	Haines Co., Inc.
	OCONNELL Oenrnis	Haines Co., Inc.
	LEDFORD Judith	Haines Co., Inc.
	B GRALNICK Mark	Haines Co., Inc.
1991	WALLIS MERYL	Pacific Bell
	Tanton Jane	Pacific Bell
	Tanton John	Pacific Bell
	Tanton L B SANTA MONICA 3993744	Pacific Bell
	Wallis Meryl	Pacific Bell
	TANTON JANE	Pacific Bell
	TANTON JOHN	Pacific Bell
1985	BAUMGARTEN MITCH	Pacific Bell
	TANTON JANE	Pacific Bell
	TANTON JOHN	Pacific Bell
1980	Schwarzmann R	Pacific Telephone
	Schwarzman Ph Ilip	Pacific Telephone
	Baumgarten Mitch	Pacific Telephone
	Credle Gary	Pacific Telephone
	Gralnick Mark	Pacific Telephone
	Tanton Jane	Pacific Telephone
	Tanton John	Pacific Telephone
1975	FONNER BENTON R	Pacific Telephone
	HOLLANDER BERNARD	Pacific Telephone
	HAMILTON FRANCIS	Pacific Telephone

23 1/2 IRONSIDES ST

Year	*Uses*	*Source*
1991	KIESEL STEVE	Pacific Bell
1985	FISHBEIN EDW	Pacific Bell

FINDINGS

JIB

4 JIB

Year	Uses	Source
2000	APARTMENTS HERZOG Ian	Haines & Company
	VOELKER Sandra	Haines & Company
	PELZIG Mira	Haines & Company
	PIOVANO Rubens	Haines & Company
	PORT Norman	Haines & Company
	X SPEEDWAY	Haines & Company
	CHANG Alain	Haines & Company
	GUSKIN Nathan	Haines & Company
	WEINTRAUB Karen	Haines & Company
	RUBIN Amy D	Haines & Company
	HALLER Robert	Haines & Company
	KARADJIAN Lisa	Haines & Company
	FITE R	Haines & Company
	BERKO Jerome	Haines & Company
	GARDNER Michael	Haines & Company
	LEDERMAN Bruce	Haines & Company
	PERFECT David	Haines & Company
	BRETZ Robert	Haines & Company
	ABOUAF Sondra	Haines & Company
	CHOI Kyung A	Haines & Company
	HERZOG Ian Oanafax	Haines & Company

71 JIB

Year	Uses	Source
2000	X PACIFIC AV	Haines & Company
	XXXX	Haines & Company

JIB ST

1 JIB ST

Year	Uses	Source
2006	o ATCHINSON E	Haines Co., Inc.
	BRONSTON Paul	Haines Co., Inc.
	KADOTA Claudia	Haines Co., Inc.
	TARASKA Richard	Haines Co., Inc.
	TRASKA Mike	Haines Co., Inc.

FINDINGS

Year	Uses	Source
1991	BARDETJOHN	Pacific Bell
	Bardet John	Pacific Bell
1985	BARDET JOHN	Pacific Bell
	KRASNOFF DARELL	Pacific Bell
	SPINAK RONDA	Pacific Bell
1980	Dicus Jim	Pacific Telephone
	Everts John	Pacific Telephone
	Rappaport Geo	Pacific Telephone
	Rod Robt L	Pacific Telephone
1975	EVERTS JOHN	Pacific Telephone
	MARKOVLTZ P	Pacific Telephone

4 JIB ST

Year	Uses	Source
2013	HERZOG IAN FAX	Cole Information Services
2008	SHENANDOAH INTERNATIONAL	Cole Information Services
	WILLIAM SOUND WEST	Cole Information Services
2006	BROWN Arvin	Haines Co., Inc.
	GALICH John	Haines Co., Inc.
	GOLD Hannah	Haines Co., Inc.
	HAJJAR Milri	Haines Co., Inc.
	e HARRIS Ronald	Haines Co., Inc.
	HERZOG Ian	Haines Co., Inc.
	KORNWASSER	Haines Co., Inc.
	Joseph	Haines Co., Inc.
	LICHTENSTEIN Lisa	Haines Co., Inc.
	PELZIG MIra	Haines Co., Inc.
	PORT Norman	Haines Co., Inc.
	SALKIN Jay	Haines Co., Inc.
1991	Herzoglan	Pacific Bell
	Herzoglan Oanafax	Pacific Bell
	Herzog J A	Pacific Bell
	Mc Kley Royce	Pacific Bell
	lc Kl Oney S LOS ANGELES 3120136	Pacific Bell
	Mcllieley Sherrne & Michael VENICE	Pacific Bell
	Metz Estelle & Jerry	Pacific Bell
	Pelzig Mira	Pacific Bell
	Port Norman	Pacific Bell

FINDINGS

Year	Uses	Source
1991	PORT 0 CALL PASADENAAT BRENTWOOD	Pacific Bell
	Raclne Earl	Pacific Bell
	Racne J 289076	Pacific Bell
	Yungfleisch JO	Pacific Bell
	HERZOGLAN	Pacific Bell
	HERZOGLANOANAFAX	Pacific Bell
	MCKLEYROYCE	Pacific Bell
	METZ ESTELLE & JERRY	Pacific Bell
	PELZIG MIRA	Pacific Bell
	Gershenson David	Pacific Bell
	PORT NORMAN	Pacific Bell
	RACLNE EARL	Pacific Bell
	YUNGFLEISCH JO	Pacific Bell
1985	HEUMANN WEMER	Pacific Bell
	MC KINLEY ROYCE	Pacific Bell
	METZ MARGIE	Pacific Bell
	PELZIG MIRA	Pacific Bell
	PORT NORMAN	Pacific Bell
	RACINE EARL	Pacific Bell
	SANQUIST CHAS E	Pacific Bell
	SCHNEIDER JUDY	Pacific Bell
	YUNGFLEISCH J O	Pacific Bell
	BLSHTON NORRIS J	Pacific Bell
1980	Green Sam	Pacific Telephone
	Heumann Werner	Pacific Telephone
	Martin SA	Pacific Telephone
	Mc Kioley Royce	Pacific Telephone
	Meta Margie	Pacific Telephone
	Mets Max	Pacific Telephone
	Pelcig Mira	Pacific Telephone
	Rockwell Marshall MD	Pacific Telephone
	Rockwell R B	Pacific Telephone
	Sanqulist Chas E	Pacific Telephone
	Scully Edw P	Pacific Telephone
	Shapkin Barton	Pacific Telephone
	Yungfleisch J O	Pacific Telephone
	Garden Edw MD	Pacific Telephone
	Doamani Roy	Pacific Telephone

FINDINGS

Year	Uses	Source
1980	Green S H	Pacific Telephone
	Green S	Pacific Telephone
	Green SJ	Pacific Telephone
1975	CRISLER B	Pacific Telephone
	DOUMANI ROY	Pacific Telephone
	LYNCH TERENCE	Pacific Telephone
	MANNERS P A	Pacific Telephone
	ME KINLEY ROYCE	Pacific Telephone
	PELZIG MIRA	Pacific Telephone
	PORT NORMAN	Pacific Telephone
	NACHT JEFFREY	Pacific Telephone

11 JIB ST

Year	Uses	Source
2006	YOUNGBLOOD	Haines Co., Inc.
	Meoan	Haines Co., Inc.
1991	Guslcin Nathan J	Pacific Bell
	CONCERNED CITIZENS OF THE MARINA PENINSULA	Pacific Bell
	EPSTEIN ERIKA	Pacific Bell
	Concerned Citizens Of The Marina Peninsula	Pacific Bell
	Concerned Home Owners Of Santa Monica SANTA MONICA 8296942	Pacific Bell
	Epstein Erika	Pacific Bell
1985	GUSKIN NATHAN J	Pacific Bell
	OAKMANS	Pacific Bell
1980	Oakman S	Pacific Telephone
	Guskin Nathan J	Pacific Telephone
	Hood Julie	Pacific Telephone
1975	CAPITALEASE	Pacific Telephone
	DIAMOND MARK	Pacific Telephone
1970	DIVERS JOHN G	Pacific Telephone
	HEAD ROBT V	Pacific Telephone
	BUTCHER CLINT	Pacific Telephone
	CAL-SPACE ENGINEERING INC	Pacific Telephone
	KSSNSNY PAUL J	Pacific Telephone

FINDINGS

14 JIB ST

Year	Uses	Source
2008	HABITAT INTERNATIONAL INC	Cole Information Services
2006	SOLMANRichard	Haines Co., Inc.
	SOLLMAN Richard	Haines Co., Inc.
	WOLFSON Jon	Haines Co., Inc.
1991	Ambler Lee	Pacific Bell
	Ambler S VENICE	Pacific Bell
	Priest Michael	Pacific Bell
	Priest Nathaniel S SANTA MONICA 3969443	Pacific Bell
	AMBLER LEE	Pacific Bell
	PRIESTMICHAEL	Pacific Bell
1985	SEMMELMAN ELLIOT	Pacific Bell
	DAHLGARD JAS	Pacific Bell
	AMBLERLEE	Pacific Bell
1980	Baker Marcia	Pacific Telephone
	Hendricksuon Gary	Pacific Telephone
	Meyhaus J	Pacific Telephone
1975	HENNIS SH	Pacific Telephone
	LEHMAN DONALD R	Pacific Telephone
	MEYHAUS J	Pacific Telephone

16 JIB ST

Year	Uses	Source
2006	KARADJIAN Lisa	Haines Co., Inc.
	Vi MORRISETTE Michael	Haines Co., Inc.
1991	HALLER ROBTL	Pacific Bell
	HALLER KRISTIE	Pacific Bell
	Haller L 65712	Pacific Bell
	Haller Kristie	Pacific Bell
	Haller Robt L	Pacific Bell
1985	HAILER ROBTL	Pacific Bell
1980	Haller Robert L	Pacific Telephone
	Haller JA	Pacific Telephone
1975	HA11ER J A	Pacific Telephone

17 JIB ST

Year	Uses	Source
2006	FITE R	Haines Co., Inc.

Year	Uses	Source
1991	Fite Richard YV	Pacific Bell
	Fite Scott JTodd MARINA DEL REY 8211944	Pacific Bell
	FITERICHARDYV	Pacific Bell
	Fite Troy 2769351	Pacific Bell
1985	FITE RICHARD V	Pacific Bell
	FITE JUDITH	Pacific Bell
1980	S Fite Richard V	Pacific Telephone
1975	FITE RICHARD V	Pacific Telephone
1970	BAKER EDW	Pacific Telephone

20 JIB ST

Year	Uses	Source
1980	Brayton Thad	Pacific Telephone
	Brayton Thad	Pacific Telephone
1975	MORGAN JEFF	Pacific Telephone
1970	ROHRBAUGH JUDITH	Pacific Telephone
	HOFFMAN MARIA	Pacific Telephone
1965	NEWNES NEETA MRS	Pacific Telephone

21 JIB ST

Year	Uses	Source
1985	MEEPOS BARBARA	Pacific Bell
1980	Castro Jas N	Pacific Telephone
	Cicchetti Patrick	Pacific Telephone
	Erickson J Gunnar	Pacific Telephone
	Keith David	Pacific Telephone
	Wiley John	Pacific Telephone
1975	CARMICHAEL MA	Pacific Telephone
	DYGERT EDW C	Pacific Telephone
	MULVEY JOHN M	Pacific Telephone
	PARKER C	Pacific Telephone
1970	CANE JAS R	Pacific Telephone
	GARRETT KELLY	Pacific Telephone
	POMORSKL BERNARD	Pacific Telephone
1965	MOSS NEIL	Pacific Telephone

23 JIB ST

Year	Uses	Source
2013	PROGESSIVE MEDIA WORKS	Cole Information Services

Year	Uses	Source
2006	CATALDE Brain	Haines Co., Inc.
1991	GRAYROGER J & CHERYL	Pacific Bell
	Gray Roger J & Cheryl	Pacific Bell
1985	CONNER GEO E	Pacific Bell

24 JIB ST

Year	Uses	Source
2006	BRETZ Robert	Haines Co., Inc.
1975	CAMPBELL COLIN	Pacific Telephone

25 JIB ST

Year	Uses	Source
2006	o PAGI Carlat	Haines Co., Inc.
1991	BAKERANTHONY	Pacific Bell
	JACOBS PATRICIA NM	Pacific Bell
	Jacobs Pau	Pacific Bell
	Jacobs Patricia NM	Pacific Bell
	Baker Anthony	Pacific Bell
1985	HUBBARD WM	Pacific Bell
1980	Thomas Sheri	Pacific Telephone
	Ralphs Grocery Company	Pacific Telephone
	Ralphs Donald	Pacific Telephone
	Miner Monte A	Pacific Telephone
	Mackenzie Spencer	Pacific Telephone
1975	FORMAN LEONARD	Pacific Telephone
1970	MACHATKA ROBT	Pacific Telephone
1965	VANDERMARIK MELVIN	Pacific Telephone

KETCH CT

14 KETCH CT

Year	Uses	Source
1975	DWYER BRUCE	Pacific Telephone

17 KETCH CT

Year	Uses	Source
1980	Jassen Robt A	Pacific Telephone

FINDINGS

KETCH ST

2 KETCH ST

Year	Uses	Source
1980	Lake Peter A	Pacific Telephone

14 KETCH ST

Year	Uses	Source
1965	BASSLER JAS	Pacific Telephone

15 KETCH ST

Year	Uses	Source
1965	STANLEY JOY M	Pacific Telephone

16 KETCH ST

Year	Uses	Source
1965	MOREL HARRY	Pacific Telephone
	KOPANKI WALTER	Pacific Telephone

20 KETCH ST

Year	Uses	Source
1991	Vogt Christopher	Pacific Bell
	Vogt David R SANTA MONICA 4507621	Pacific Bell

27 KETCH ST

Year	Uses	Source
1970	HARRIS ARTHUR L	Pacific Telephone

28 KETCH ST

Year	Uses	Source
1970	FARRINGTON ROBT	Pacific Telephone
1965	ODONNELL JOS	Pacific Telephone

OCEAN FRONT

3903 OCEAN FRONT

Year	Uses	Source
1929	GARDINER Robt S pres Jersey Farm Dairy Co	Los Angeles Directory Co.

FINDINGS

3905 OCEAN FRONT

Year	Uses	Source
1936	ARLING A E	Los Angeles Directory Co.

4019 OCEAN FRONT

Year	Uses	Source
1936	PFUSCH CALLLE J	Los Angeles Directory Co.

OCEAN FRONT ST

3815 OCEAN FRONT ST

Year	Uses	Source
1928	Meredith Begs	Los Angeles Directory Co.

3817 OCEAN FRONT ST

Year	Uses	Source
1928	Gordon Anna Mrs	Los Angeles Directory Co.

3903 OCEAN FRONT ST

Year	Uses	Source
1928	Gardiner R St J	Los Angeles Directory Co.

3905 OCEAN FRONT ST

Year	Uses	Source
1933	Arling A B	Los Angeles Directory Co.
1928	Ocean Front	Los Angeles Directory Co.
	Voick Geo	Los Angeles Directory Co.
	Volck A G	Los Angeles Directory Co.

4019 OCEAN FRONT ST

Year	Uses	Source
1933	Vacant	Los Angeles Directory Co.
1928	Prentiss E	Los Angeles Directory Co.

OCEAN FRONT WALK

3719 OCEAN FRONT WALK

Year	Uses	Source
1965	AVRIL ERNEST	Pacific Telephone
1962	AVRII ERNEST	Pacific Telephone
	POHLCTIUCK THOS	Pacific Telephone
1958	AVRIL ERNEST	Pacific Telephone

FINDINGS

3802 OCEAN FRONT WALK

Year	Uses	Source
2006	STAPLES Tim	Haines Co., Inc.
	SMITH Christopher	Haines Co., Inc.
2000	LEVINE Staci	Haines & Company
	VIGNEAU Donald P	Haines & Company
	OCEAN FRONT WALK 90292 CONT WARDEN David	Haines & Company
1991	Ep Stein L	Pacific Bell
	Gendell Joe	Pacific Bell
	Vigneau Donald P	Pacific Bell
	GENDELL JOE	Pacific Bell
	EPSTEINL	Pacific Bell
	Vignon C W LOS ANGELES 4478161	Pacific Bell
	Vignolle M VENICE 138271315	Pacific Bell
	Vignieri Michael & Michele	Pacific Bell
	VIGNEAU DONALD P	Pacific Bell
1985	VIGNEAU DONALD P	Pacific Bell
	PONAMAN TODD	Pacific Bell
	LOPEZ THERESA M	Pacific Bell
1980	Vigneau Donald P	Pacific Telephone
	Payne Jody	Pacific Telephone
	Klein Arleane	Pacific Telephone
1970	CAHAN HASKELL	Pacific Telephone
	BUTLER DANI H	Pacific Telephone

3806 OCEAN FRONT WALK

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	BAIER Mia Lee	Haines & Company
	CRANE Patrick	Haines & Company
	FORMAN Richard	Haines & Company
1991	Bernstein Marc	Pacific Bell
	BERNSTEIN MARC	Pacific Bell
	TANAKA KEN	Pacific Bell
	Tanaka Ken	Pacific Bell
1985	MANDEL TED & C	Pacific Bell
1980	Wolf Michele	Pacific Telephone
	Wolf Mieke	Pacific Telephone
	Zisman B	Pacific Telephone

Year	Uses	Source
1975	AMBERG H	Pacific Telephone
	ANDREWS SYDELLE	Pacific Telephone
	CITTY SHAWN	Pacific Telephone
	CUNNINGHAM GORDON	Pacific Telephone
	GERMAN MICHAEL DR	Pacific Telephone
	MASSNICK BILL	Pacific Telephone
1970	HARRIS WM H III	Pacific Telephone
	CHILDS STEPHEN A	Pacific Telephone

3811 OCEAN FRONT WALK

Year	Uses	Source
2008	AMERICAN RENEWABLE ENERGY CORP	Cole Information Services
2006	SCHUBERT Rubin	Haines Co., Inc.
	Bush Irving	Haines Co., Inc.
2000	SCHUBERT Rubin	Haines & Company
1985	KELLEY MARIE MARINA DEL REY	Pacific Bell
1980	Fine Dan	Pacific Telephone
	Kelley Marie	Pacific Telephone
	Stucker C	Pacific Telephone
	Stucker Betty	Pacific Telephone
1975	FINE DAN	Pacific Telephone
	HUMISTON DARRELL	Pacific Telephone
1970	DEL AMA TOMAS M	Pacific Telephone
	FISHER JOHN	Pacific Telephone
	FISHER SAM	Pacific Telephone

3815 OCEAN FRONT WALK

Year	Uses	Source
2008	PACIFIC MANAGED CARE INC	Cole Information Services
2006	VASILE Charles	Haines Co., Inc.
2000	VASILE Charles	Haines & Company

3817 OCEAN FRONT WALK

Year	Uses	Source
2006	SEIGER Eric	Haines Co., Inc.
2000	XXXX	Haines & Company

FINDINGS

3819 OCEAN FRONT WALK

Year	Uses	Source
2006	WHITFIELDW	Haines Co., Inc.
2000	STONE Elaine	Haines & Company
	X HURRICANE	Haines & Company

3821 OCEAN FRONT WALK

Year	Uses	Source
1980	Fdney Alan	Pacific Telephone
	Fordney Lois J	Pacific Telephone
	Fordney Robt	Pacific Telephone

3901 OCEAN FRONT WALK

Year	Uses	Source
2006	TENAN Lawrence	Haines Co., Inc.
2000	TENAN Lawrence	Haines & Company
1985	PIKEN R	Pacific Bell
1970	RABOFF AARON	Pacific Telephone

3902 OCEAN FRONT WALK

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	POZZI Emilio	Haines & Company

3903 OCEAN FRONT WALK

Year	Uses	Source
2006	RACINE Eari	Haines Co., Inc.
2000	RACINE Earl	Haines & Company
1980	Yellin Ira	Pacific Telephone
1970	ROUSE GEO	Pacific Telephone
	ROUSE VERNON	Pacific Telephone

3905 OCEAN FRONT WALK

Year	Uses	Source
2000	FUJIEKI Patrick	Haines & Company
1980	Lands Mona	Pacific Telephone
1962	SWEARENGIN EARL V	Pacific Telephone
1958	ROCHON JOS E OIL	Pacific Telephone
1954	KELLY L C AND KELLY M V OIL	R. L. Polk & Co.
	KELLY M V AND KELLY L C OIL	R. L. Polk & Co.

FINDINGS

3907 OCEAN FRONT WALK

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	MEYERS Eugene	Haines & Company
1991	Mefers Eugene J	Pacific Bell

4001 OCEAN FRONT WALK

Year	Uses	Source
2006	o SATTLER Robert	Haines Co., Inc.
	o SATTLERRobt	Haines Co., Inc.
	o SATTLER Robt	Haines Co., Inc.
2000	1/2 SATTLER Robert	Haines & Company
	SATTLER Robt	Haines & Company
	SATTLER Robt	Haines & Company
1991	Or 8226287	Pacific Bell
	Solomon Terry R	Pacific Bell
	SOLOMON TERRYR	Pacific Bell
1985	WEINSTEIN STANLEY	Pacific Bell
1975	MANTHORNE GARY	Pacific Telephone

4003 OCEAN FRONT WALK

Year	Uses	Source
2006	GROSS Kenneth	Haines Co., Inc.
	PIOVANO Rubns	Haines Co., Inc.
	VELEZ Martha	Haines Co., Inc.
	FRANKEL Martha	Haines Co., Inc.
2000	VIOLI Alessandro	Haines & Company
	KERBL Guntmar	Haines & Company
	MONTAGNA Alessandra	Haines & Company
1991	Sattler Robt	Pacific Bell
1975	CONSUMER CONCEPTS CORP	Pacific Telephone

4005 OCEAN FRONT WALK

Year	Uses	Source
2006	SOLERD	Haines Co., Inc.
2000	X IRONSIDES	Haines & Company
	SOLER D	Haines & Company
1991	SOLERD	Pacific Bell
	Soler D	Pacific Bell
1985	SOLER D	Pacific Bell

FINDINGS

Year	Uses	Source
1980	Solor D	Pacific Telephone
1976	Winston Lou	Pacific Telephone
	Weinstein Lou	Pacific Telephone
1975	PAULS FREDERICK E	Pacific Telephone

4007 OCEAN FRONT WALK

Year	Uses	Source
2006	HALPIN Seller	Haines Co., Inc.
	LERAJudy	Haines Co., Inc.
1991	Katz Milton J	Pacific Bell
	Katz Roslyn MSW	Pacific Bell
1980	Blenenfeld Danny	Pacific Telephone
	Katz Milton J	Pacific Telephone

4009 OCEAN FRONT WALK

Year	Uses	Source
2013	NEW URBAN WEST INC	Cole Information Services
2006	MILLS Marcia	Haines Co., Inc.
	NEILLP	Haines Co., Inc.
1985	WILSON GABRIEL H	Pacific Bell
1980	Wilson Gabriel H	Pacific Telephone

4011 OCEAN FRONT WALK

Year	Uses	Source
2006	AMENSHarold J	Haines Co., Inc.
	NIKZAD David	Haines Co., Inc.
2000	1/2 AMENS Harold J	Haines & Company
	X JIB	Haines & Company
1991	Amens Harold J	Pacific Bell
1985	RICKEY DAVID CHARNA	Pacific Bell
1980	Hankins Gary	Pacific Telephone
	From Los Angeles Telephones Ca	Pacific Telephone
	Rickey David Charna	Pacific Telephone

4001 1/2 OCEAN FRONT WALK

Year	Uses	Source
1985	PARADOR PRODUCE INC	Pacific Bell

FINDINGS

4007 1/2 OCEAN FRONT WALK

Year	Uses	Source
1991	KATZ ROSLYN MSW	Pacific Bell
	KATZMILTONJ	Pacific Bell

4009 1/2 OCEAN FRONT WALK

Year	Uses	Source
1975	NEWS-AID	Pacific Telephone
	HUDDLESTON J PAUL	Pacific Telephone

4011 1/2 OCEAN FRONT WALK

Year	Uses	Source
1985	HANKINS GARY	Pacific Bell
1975	GILBERT GIL	Pacific Telephone

PACIFIC

3715 PACIFIC

Year	Uses	Source
1929	Dell Otto L r	Los Angeles Directory Co.

3717 PACIFIC

Year	Uses	Source
1929	Reinken LA Lt r	Los Angeles Directory Co.

3732 PACIFIC

Year	Uses	Source
1929	Bennett Mose r	Los Angeles Directory Co.

3738 PACIFIC

Year	Uses	Source
1929	Bailey TC r	Los Angeles Directory Co.

3813 PACIFIC

Year	Uses	Source
1929	Henderson Fred r	Los Angeles Directory Co.

3921 PACIFIC

Year	Uses	Source
1929	Hummelis Grocery	Los Angeles Directory Co.

FINDINGS

3931 PACIFIC

Year	Uses	Source
1929	Cryderman Frank R r	Los Angeles Directory Co.

4007 PACIFIC

Year	Uses	Source
1929	Wickersham Howard H r	Los Angeles Directory Co.

4016 PACIFIC

Year	Uses	Source
1935	Sanfordi Ciourt	Los Angeles Directory Co.

4029 PACIFIC

Year	Uses	Source
1929	Thomas J W r	Los Angeles Directory Co.
	Mc Ateer lone r	Los Angeles Directory Co.

PACIFIC AVE

3600 PACIFIC AVE

Year	Uses	Source
2006	TSEDavid w	Haines Co., Inc.

3604 PACIFIC AVE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	XXXX	Haines & Company

3606 PACIFIC AVE

Year	Uses	Source
2006	ELLIS James	Haines Co., Inc.
2000	GASPER Jason	Haines & Company
	ELLIS James	Haines & Company

3607 PACIFIC AVE

Year	Uses	Source
2006	REDDISH Chrs	Haines Co., Inc.
2000	PERRY Mark	Haines & Company
1991	Haggerty Gisele	Pacific Bell
	Brenner Fredric MARINA DEL REY 8216559	Pacific Bell
	Brenner F WESTWOOD 4742039	Pacific Bell

FINDINGS

Year	Uses	Source
1991	Brenner Evan	Pacific Bell
	HAGGERTY GISELE	Pacific Bell
	BRENNEREVAN	Pacific Bell
1985	FISK V	Pacific Bell
	CHRISTENSEN GARY	Pacific Bell
1980	Sedgeman Victoria	Pacific Telephone
	Plelffer Evelyn	Pacific Telephone
	Ptlfer Michael	Pacific Telephone
	Kelly Dan I J	Pacific Telephone
	Burnett Jas A	Pacific Telephone
1975	GLUCK STEPHEN	Pacific Telephone
	LEYER M	Pacific Telephone
	CARLSON J	Pacific Telephone
	BRUNON JOS	Pacific Telephone
	BERKHEMER BETSY	Pacific Telephone
1970	HOFFMAN ROBT E	Pacific Telephone

3608 PACIFIC AVE

Year	Uses	Source
2008	INTEL FINANCIAL INC	Cole Information Services
2006	MILLER Barry	Haines Co., Inc.
2000	MILLER Barry	Haines & Company
1975	MEHRING A	Pacific Telephone

3610 PACIFIC AVE

Year	Uses	Source
2006	o OQASAWARAJ	Haines Co., Inc.
2000	MENCK Jeanine	Haines & Company
1970	COHEN LEONARD N	Pacific Telephone
	EVANS ROBT A	Pacific Telephone

3612 PACIFIC AVE

Year	Uses	Source
2006	APARTMENTS	Haines Co., Inc.
	ATKINSONOBRIEN	Haines Co., Inc.
	Shenie	Haines Co., Inc.
	BRATCHERDoug	Haines Co., Inc.
	HAYNIEArt	Haines Co., Inc.
	LASKI Benjamin	Haines Co., Inc.

FINDINGS

Year	Uses	Source
2006	LAURA Mrs	Haines Co., Inc.
	LIFSHITZ Benjamin	Haines Co., Inc.
	LIFSHITZJenna	Haines Co., Inc.
	FRAZIER Jacqueline	Haines Co., Inc.
	No Current Listing	Haines Co., Inc.
	STROBEL Desmond	Haines Co., Inc.
	PResl ERSpencer	Haines Co., Inc.
2000	XXXX	Haines & Company
1991	Coate Chas	Pacific Bell
	ROESSLER KIRK	Pacific Bell
	GETER MARK	Pacific Bell
	COATECHAS	Pacific Bell
	Roessler Kirk	Pacific Bell
	Gethner S	Pacific Bell
	Geter Mark	Pacific Bell
1975	JOYNES C D	Pacific Telephone

3614 PACIFIC AVE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	XXXX	Haines & Company
1985	ANSHUS JOHN S	Pacific Bell
1980	Clark Fredirick	Pacific Telephone
1975	BREEN P A	Pacific Telephone

3618 PACIFIC AVE

Year	Uses	Source
2006	GARNER Karen	Haines Co., Inc.
	GARNER Karen	Haines Co., Inc.
	BRATCHER Douglas	Haines Co., Inc.
2000	MORRIS Robert	Haines & Company
1991	MORRIS ROBT	Pacific Bell
	ALLEN-MORRIS PAULINE	Pacific Bell
	Allen Morris Pauline	Pacific Bell
	Morris Robt	Pacific Bell
1985	MORRIS ROBT	Pacific Bell
	ALIEN-MORRIS PAULINE	Pacific Bell
1980	Morris Robt	Pacific Telephone
1975	JONES KITTY	Pacific Telephone

FINDINGS

3620 PACIFIC AVE

Year	Uses	Source
2006	SATTLER L	Haines Co., Inc.
2000	X FLEET	Haines & Company
	SATTLER L	Haines & Company
1980	Sa Uler Mary Beth Welme	Pacific Telephone
	Or	Pacific Telephone
	Sattler L	Pacific Telephone
1975	MERRILL R THOS	Pacific Telephone

3700 PACIFIC AVE

Year	Uses	Source
2013	POWER CLEAN PRODUCTS INC	Cole Information Services
2008	RUSSELL BROTHERS	Cole Information Services
2006	RUSSELL BROS	Haines Co., Inc.
	REPLACEMENT	Haines Co., Inc.
	PARTS	Haines Co., Inc.
2000	DUFF James E	Haines & Company
	RUSSELL BROS REPLACEMENT PARTS	Haines & Company
1991	BAUS STEVE	Pacific Bell
	HYBEL JEANNE M	Pacific Bell
	MOHRLETAYLOR	Pacific Bell
	Baus Steve	Pacific Bell
	Bauss HC LOS ANGELES 3900334	Pacific Bell
	Hybel Jeanne M	Pacific Bell
	Mohrle Taylor	Pacific Bell
1985	EDMONDS JOHN	Pacific Bell
	LAWSON SUE	Pacific Bell
	WHEELAND KENNETH	Pacific Bell
	KUDERA J ROBTMARINA DEL REY	Pacific Bell
1980	Lawson Sue	Pacific Telephone
	Wheeland lenneth	Pacific Telephone
	Wittern Michael S	Pacific Telephone
1975	MC KEON J M	Pacific Telephone
1970	FELL RONALD D	Pacific Telephone
	GAGE STEVE	Pacific Telephone
	GRANER ROBT B	Pacific Telephone
	HUGHES ROBERTS V	Pacific Telephone
1965	ANDERSEN MERLE	Pacific Telephone

FINDINGS

Year	Uses	Source
1965	BEEHOER A J	Pacific Telephone
	BAEHAIE RON	Pacific Telephone
	CALHOUN ODIS	Pacific Telephone
	GONZALES ANSELMO	Pacific Telephone
	NORBERG DON G	Pacific Telephone
1962	SAEHNER A J	Pacific Telephone
	OAEHNER RON	Pacific Telephone
	CLEARWATER ROBT E	Pacific Telephone
	HOBSON JOE	Pacific Telephone
	NORTHRIDGEBORG DON G	Pacific Telephone
1924	Eikenberry Lena B tchr r	Los Angeles Directory Co.

3707 PACIFIC AVE

Year	Uses	Source
2006	LITT Helen	Haines Co., Inc.
2000	LITT Helen	Haines & Company
1980	Farris Frances	Pacific Telephone
1970	FINGER FAUNA	Pacific Telephone
	BUSCH BARBARA	Pacific Telephone
1965	FINGER FAUNA	Pacific Telephone
	BISCH BARBARA	Pacific Telephone
1962	FINGER FAUNA	Pacific Telephone

3710 PACIFIC AVE

Year	Uses	Source
2008	THOMAS NEAD	Cole Information Services
	SCOTTCRAFT	Cole Information Services
2006	MCGRATH Bradley	Haines Co., Inc.
	PFETZING Scott	Haines Co., Inc.
2000	PFETZING Scott	Haines & Company
	STANTON Jeffrey W	Haines & Company
	FITZHUGH Daniel	Haines & Company
1991	ANDERSEN KEITH	Pacific Bell
	STANTON JEFFREY W	Pacific Bell
	Andersen Keith	Pacific Bell
	Andersen L LOS ANGELES 4798379	Pacific Bell
	Stanton Jeffrey W	Pacific Bell
	Stanton Jill VENICE 3921918	Pacific Bell
	Stanton John MAR VISTA 3131700	Pacific Bell

FINDINGS

Year	Uses	Source
1991	Ziman Byron	Pacific Bell
1985	KARPELES STEVE	Pacific Bell
	STANTON JEFFREY W	Pacific Bell
	ZIMAN BYRON	Pacific Bell
1980	Edmonds John	Pacific Telephone
	Fleck Daryl	Pacific Telephone
	Karpeles Steve	Pacific Telephone
	Karpen J	Pacific Telephone
	Me Laughlin John D	Pacific Telephone
	Stanton Jeffrey W	Pacific Telephone
	Stone Scott A	Pacific Telephone
	Ziman Byron C	Pacific Telephone
1975	BONAR BONNIE	Pacific Telephone
	CORRIERE T	Pacific Telephone
	ELLIS ROGER	Pacific Telephone
	GOAR PHILLIP L	Pacific Telephone
	PATTISON KURRY	Pacific Telephone
	PIGOVAT IRWIN	Pacific Telephone
1970	BARDY PETER	Pacific Telephone
	BONAR BONNIE	Pacific Telephone
	BOURDON CHAS	Pacific Telephone
	CARR JAS W	Pacific Telephone
	DISALVO DOMINIC	Pacific Telephone
	PATTISON KERRY	Pacific Telephone
	PIGOVAT IRWIN	Pacific Telephone
1965	BAKER DAVE	Pacific Telephone
	BRANDNER CROSBY J	Pacific Telephone
	LUCAS CLARK P	Pacific Telephone
	MACKENCIE MICHAEL G	Pacific Telephone
	MAGOUN JAS W	Pacific Telephone
	PRATT THEODORA	Pacific Telephone
1962	DOBRIN JAS L DR	Pacific Telephone

3715 PACIFIC AVE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	X GALLEON	Haines & Company
	WURM Moses	Haines & Company
	MILDENBERGER Robert	Haines & Company

FINDINGS

Year	Uses	Source
2000	JAEGER Annegret	Haines & Company
1991	DUDINYAK LINDA	Pacific Bell
	Luciano Mary LOS ANGELES 3912462	Pacific Bell
	Luciano Kathleen	Pacific Bell
	Jaeger Corp 028506	Pacific Bell
	Jaeger Arthur 2747859	Pacific Bell
	LUCIANO KATHLEEN	Pacific Bell
	JAEGER ANNEGRET	Pacific Bell
	Jaeger Annegret	Pacific Bell
	Dudinyak Linda	Pacific Bell
1985	LOCKHART CT	Pacific Bell
1980	Wurm Mark	Pacific Telephone
1975	LEGGAT E F	Pacific Telephone

3806 PACIFIC AVE

Year	Uses	Source
2006	CARTWRIGHTErnest	Haines Co., Inc.
	A VOSSLER Brandon	Haines Co., Inc.
2000	FITZGERALD Jeffrey	Haines & Company
	GLASPER Jo	Haines & Company
	VICTOR Mark	Haines & Company
1991	FRIEL L	Pacific Bell
	LOCASNATHALIE	Pacific Bell
	MEDLOCK KEN	Pacific Bell
	Friel L	Pacific Bell
	Friel Mark Holland BEL AIR 472665	Pacific Bell
	Locas Nathalie	Pacific Bell
	Location Cellular Systems LOS ANGELES	Pacific Bell
	Medlock Ken	Pacific Bell
	Rebman Claudia	Pacific Bell
	REBMANCLAUDIA	Pacific Bell
1985	DYER FRED W	Pacific Bell
	ECKHARDT LARRY	Pacific Bell
	JOY B A	Pacific Bell
	MCLAUGHLIN S AUTO WINDOW TINTING	Pacific Bell
	MEDLOCK KEN	Pacific Bell
	SELNICK M	Pacific Bell
1980	Dyer Fred W	Pacific Telephone

FINDINGS

Year	Uses	Source
1980	Hochberg Rochelle	Pacific Telephone
	Posten Douglas	Pacific Telephone
	VIP SECURITY	Pacific Telephone
	Wellins Sue	Pacific Telephone
	Welllns W	Pacific Telephone
	Joy B A	Pacific Telephone
	Joy Bee Design	Pacific Telephone
	Katz Rutberg Agency	Pacific Telephone
1975	LEE JOYCE R	Pacific Telephone
	MAMUIA C	Pacific Telephone
	MARTIN STONE	Pacific Telephone
	MC GRATH T W	Pacific Telephone
	MC KONE COLLEEN	Pacific Telephone
1970	OLSON ELLIOTT D	Pacific Telephone
	CROSS J E	Pacific Telephone
	CROSSMAN JOEN	Pacific Telephone
	GAMALERL P J	Pacific Telephone
	HOLLLNGSWORTH DAVID	Pacific Telephone
	HOLLINGSWORTH J F	Pacific Telephone
	LEE JOYCE R	Pacific Telephone
	LOUITZ B J	Pacific Telephone
	POSTEN DOUGLAS	Pacific Telephone
	SMILEY INGRID	Pacific Telephone
1965	SKLUT ISRAEL	Pacific Telephone
	LEWI PETERH	Pacific Telephone
	LEWIS BILL	Pacific Telephone
	MARGOZENWITZ THOS J	Pacific Telephone
	MORGAN DOUGLAS	Pacific Telephone
	PARKER I W	Pacific Telephone

3812 PACIFIC AVE

Year	Uses	Source
2006	MULEI David	Haines Co., Inc.
	MEGGERSAlbert w	Haines Co., Inc.
2000	XXXX	Haines & Company
1991	CIGNARAE ANTHONY	Pacific Bell
	ZEZUTO STEVE	Pacific Bell
	Zezuto Steve	Pacific Bell
	Cignarae Anthony	Pacific Bell

FINDINGS

Year	Uses	Source
1991	Heoter Richard	Pacific Bell
1985	SUNDBLAD BILL	Pacific Bell
	WHITE CANDI	Pacific Bell
1980	Oberman Mark	Pacific Telephone
	Kofsky S	Pacific Telephone
	Greene Molley	Pacific Telephone
1975	LARSEN KAY	Pacific Telephone
	MUMNM S	Pacific Telephone
	BEWS JANE K	Pacific Telephone
1970	HART A	Pacific Telephone
	LINNIAN KATHLEEN	Pacific Telephone
	CHUPA TERRIE	Pacific Telephone

3818 PACIFIC AVE

Year	Uses	Source
2006	o PARRENT Mathew	Haines Co., Inc.
2000	SCHWARTZ Ron	Haines & Company
	X HURRICANE	Haines & Company
1991	Palmer Bruce	Pacific Bell
	PALMERBRUCE	Pacific Bell
1985	C	Pacific Bell
	PARRENT JACK	Pacific Bell
	POLA JULIE	Pacific Bell
1980	Bearer Danl F III	Pacific Telephone
	Coufal Eugene	Pacific Telephone
	Mazzei Michael	Pacific Telephone
	Parrent Jack	Pacific Telephone
	Parrent Joanne	Pacific Telephone
	Pola Janet	Pacific Telephone
1975	COUFAL EUGENE	Pacific Telephone
	MULSING RAND H	Pacific Telephone
	MAZZEI MICHAEL	Pacific Telephone
	PALAJAC MARK	Pacific Telephone
	PARRENT JACK	Pacific Telephone
1970	SCHUHSLER F	Pacific Telephone
	GREENWOOD T B	Pacific Telephone
	MUMBY D	Pacific Telephone

FINDINGS

3838 PACIFIC AVE

Year	Uses	Source
1924	YOUNG Juliet M Mrs tchr Leland St School r	Los Angeles Directory Co.
	LEE Ethel tchr r	Los Angeles Directory Co.
	Way Jess tchr r	Los Angeles Directory Co.

3852 PACIFIC AVE

Year	Uses	Source
1980	LYON JEFFREY JDGE LONG BEACH	Pacific Telephone
1975	JAMES GORDON F JR LONG BEACH	Pacific Telephone

3900 PACIFIC AVE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	BOOKER Brad	Haines & Company
	LEONHARDT John	Haines & Company
1991	LEONHARDTJOHNJ	Pacific Bell
	Leonhardt John JJr	Pacific Bell
	Leonhardt John J	Pacific Bell
	LEONHARDTJOHNJJR	Pacific Bell
1985	LEONHARDT JOHN J	Pacific Bell
	LEONHARDT JOHN J JR	Pacific Bell
1980	Leonhardt John J	Pacific Telephone
	Btiekleibach J	Pacific Telephone
1975	LEONHARDT JOHN J	Pacific Telephone
	LARSON KAREN	Pacific Telephone
	GRIZEL DENISE	Pacific Telephone
	FRASH JULIE ANNE	Pacific Telephone
1970	SALCEDA DANI A	Pacific Telephone

3906 PACIFIC AVE

Year	Uses	Source
2006	BACKEKaga	Haines Co., Inc.
2000	GORTON Amy	Haines & Company
	MAJEK JACK	Haines & Company
	MAJEK John	Haines & Company
	MAYJACK CONSTRUCTION CO	Haines & Company
	X IRONSIDES	Haines & Company
1991	Breeze Maureen	Pacific Bell
	Levine Eric	Pacific Bell

FINDINGS

Year	Uses	Source
1991	Majek Jack	Pacific Bell
	Mayjack Construction Co	Pacific Bell
	May Bei LOS ANGELES 3981335	Pacific Bell
	BREEZE MAUREEN	Pacific Bell
	LEVINE ERIC	Pacific Bell
	MAJEK JACK	Pacific Bell
	MAYJACK CONSTRUCTION CO	Pacific Bell
1985	HAYS TERRY	Pacific Bell
	MAJEK JACK	Pacific Bell
	MAYJACK CONSTRUCTION CO	Pacific Bell
1980	Bloom Chris	Pacific Telephone
	MAYJACK CONSTRUCTION CO	Pacific Telephone
	Abbott S J	Pacific Telephone
	Abbott Sherrie A LA	Pacific Telephone
	Brown Michael D	Pacific Telephone
	Jachacz Jill	Pacific Telephone
	Majek Jack	Pacific Telephone
1975	HAYS TERRY	Pacific Telephone
	JAMES A	Pacific Telephone
	MA EK JACK	Pacific Telephone
1970	BROWN DOUGLAS MI	Pacific Telephone
	MAJE JACK	Pacific Telephone
	STEWART MICHAEL B	Pacific Telephone

4000 PACIFIC AVE

Year	Uses	Source
2008	RISK REDUCTION SERVICES LLC	Cole Information Services
2006	MARCHESE David	Haines Co., Inc.
2000	FLEXON Robt	Haines & Company
	X JIB	Haines & Company
1991	DORSEYJASF	Pacific Bell
	Dorsey Jas F	Pacific Bell
1985	AL-SHAAR MOHAMMAD	Pacific Bell
	BECKER STANLEY	Pacific Bell
	BRANNAN G BRYAN	Pacific Bell

4004 PACIFIC AVE

Year	Uses	Source
1970	PATTON BARBARA	Pacific Telephone

FINDINGS

Year	Uses	Source
1970	PATTON BARBARA	Pacific Telephone

4077 PACIFIC AVE

Year	Uses	Source
1924	Phifer Clarence E carrier P O r	Los Angeles Directory Co.

4105 PACIFIC AVE

Year	Uses	Source
2006	APARTMENTS	Haines Co., Inc.
	DEBEVEC Paul	Haines Co., Inc.
	KRUTCHIK Barry	Haines Co., Inc.
	NAUGHTON Maria	Haines Co., Inc.
	STRASSBERG Nell	Haines Co., Inc.
	STRASSBERG Neil	Haines Co., Inc.
	STRASSBERG Nail	Haines Co., Inc.
	TURNERT	Haines Co., Inc.
	WAGNER Laura	Haines Co., Inc.
	WAGNERLaura	Haines Co., Inc.
	WOOLDRIDGEDavid	Haines Co., Inc.
2000	JOHNSON Stephen E	Haines & Company
1991	Block Mark	Pacific Bell
	Bower Kendall	Pacific Bell
	Bower LIndsay WESTLOS ANGELES 4711053	Pacific Bell
	Bower M	Pacific Bell
	Bower Paul G &Elreen PACIFIC PALISADES 4543966	Pacific Bell
	Bower Philip	Pacific Bell
	Bower R MAR VISTA 3971553	Pacific Bell
	Bower SJA PACIFIC PALISADES 4542846	Pacific Bell
	Dizenfeld Bruce E	Pacific Bell
	Maltz Margaret	Pacific Bell
	Pachino Barton	Pacific Bell
	Pachodylo P WESTLOS ANGELES 3932279	Pacific Bell
	Tebbe C Graham	Pacific Bell
	Tebbe Robert Corporation The contr	Pacific Bell
	BLOCK MARK	Pacific Bell
	BOWERKENDALL	Pacific Bell
	BOWER PHILIP	Pacific Bell

FINDINGS

Year	Uses	Source
1991	DIZENFELD BRUCE E	Pacific Bell
	MALTZ MARGARET	Pacific Bell
	PACHINOBARTON	Pacific Bell
	TEBBE C GRAHAM	Pacific Bell
1985	AMENS HAROLD J	Pacific Bell
	BLOCK MARK	Pacific Bell
	COHEN DANNY	Pacific Bell
	HEILIG DELIA	Pacific Bell
	LYON POPANZ & FORESTER LTD	Pacific Bell
	PACHINO BARTON	Pacific Bell
	WEISSMAN EDW	Pacific Bell
1980	Cohen Dan	Pacific Telephone
	Maslon P J	Pacific Telephone
	Amens Harold J	Pacific Telephone
	Berglass Robt	Pacific Telephone
	Cohen Dan	Pacific Telephone
	Hammond Sara	Pacific Telephone
	Heille Delia	Pacific Telephone
	Lyon Popanz & Forester Ltd	Pacific Telephone
	Meyer MIchael	Pacific Telephone
1975	HENRY WM	Pacific Telephone
	AMENS HAROLD J	Pacific Telephone
	GRIFFIN DONALD C	Pacific Telephone
	KEENAN WM E	Pacific Telephone
	MEYER MICHAEL	Pacific Telephone
	NORMANDIN R A	Pacific Telephone

4156 PACIFIC AVE

Year	Uses	Source
1980	LEOS DENTAL PRODUCTS	Pacific Telephone

4182 PACIFIC AVE

Year	Uses	Source
1924	DOUGLASS Neola clk P O r	Los Angeles Directory Co.

4194 PACIFIC AVE

Year	Uses	Source
1956	MICRO-PRECISION CO INC	Pacific Telephone

FINDINGS

4206 PACIFIC AVE

Year	Uses	Source
1980	SECURITY PACIFIC NATIONAL BANK TORRANCE OFFICES DEL AMO CENTER COUNTS	Pacific Telephone

4212 PACIFIC AVE

Year	Uses	Source
1970	LUBRICATION COMPANY OF AMERICA	Pacific Telephone
	LUBRICATION COMPANY OF AMERICA	Pacific Telephone
1962	LUBRICATION COMPANY OF AMERICA	Pacific Telephone

4250 PACIFIC AVE

Year	Uses	Source
1970	H & N TRANSFER	Pacific Telephone
	H & N TRANSFER	Pacific Telephone
1962	H & N TRANSFER	Pacific Telephone

4282 PACIFIC AVE

Year	Uses	Source
2000	WEALTH CODE	Haines

4300 PACIFIC AVE

Year	Uses	Source
2013	GAY & LESBIAN COMMUNITY YELLOW BOOK	Cole Information Services

PACIFIC BLVD

4018 PACIFIC BLVD

Year	Uses	Source
1976	Continental Coffee Co Of Calif	Pacific Telephone

PACIFIC CT

3700 PACIFIC CT

Year	Uses	Source
1962	RAVENS C E	Pacific Telephone

3710 PACIFIC CT

Year	Uses	Source
1962	GRAFTON NORMAN E	Pacific Telephone

FINDINGS

3806 PACIFIC CT

Year	*Uses*	*Source*
1965	WASSERMAN S H	Pacific Telephone
	WIRFFEL A R	Pacific Telephone
	BRAGG BILLY R	Pacific Telephone

PACIFIC DR

4000 PACIFIC DR

Year	*Uses*	*Source*
1991	Robin Willow	Pacific Bell

PACIFIC LN

3700 PACIFIC LN

Year	*Uses*	*Source*
1960	ADAMS BOB	Pacific Telephone

3721 PACIFIC LN

Year	*Uses*	*Source*
1960	FOULSTONE CHAS S	Pacific Telephone

3911 PACIFIC LN

Year	*Uses*	*Source*
1960	POYNTER GIACOMINA MRS	Pacific Telephone
1957	POYNTER GIACOMINA MRS	Pacific Telephone

3936 PACIFIC LN

Year	*Uses*	*Source*
1960	SMAWLEY JACK D	Pacific Telephone

ROMA

914 ROMA

Year	*Uses*	*Source*
1975	PONCE ASCENSION T	Pacific Telephone

1413 ROMA

Year	*Uses*	*Source*
1995	Shin Hyung W	Pacific Bell

FINDINGS

1417 ROMA

Year	Uses	Source
1995	Yang KY	Pacific Bell
	Yang KS	Pacific Bell

1509 ROMA

Year	Uses	Source
1995	Mon Wilson	Pacific Bell

ROMA CT

107 ROMA CT

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	ROME Clifford	Haines & Company
	ROME Shira	Haines & Company
1991	me Clifford	Pacific Bell
	MECLIFFORD	Pacific Bell

115 ROMA CT

Year	Uses	Source
2006	LEVYMoe	Haines Co., Inc.
2000	LEVY Maurice	Haines & Company

116 ROMA CT

Year	Uses	Source
2006	MANDEKICAnrhony	Haines Co., Inc.
2000	FRERER Bruce	Haines & Company

117 ROMA CT

Year	Uses	Source
2008	KRUTCHIE ENTERTAINMENT	Cole Information Services
2006	No Current Listing	Haines Co., Inc.
2000	EMMANUEL G	Haines & Company
	EMMANUEL G	Haines & Company

120 ROMA CT

Year	Uses	Source
2006	OHKim	Haines Co., Inc.

FINDINGS

121 ROMA CT

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	MASON Steven	Haines & Company

124 ROMA CT

Year	Uses	Source
2008	AAA VETERINARY CENTER INC	Cole Information Services
	REVLIS MARINE TRANSPORT	Cole Information Services
2006	o SILVER Roberta	Haines Co., Inc.
	o SILVER Larry	Haines Co., Inc.
2000	POPE Jan	Haines & Company

125 ROMA CT

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.
2000	WONG Ellis	Haines & Company

128 ROMA CT

Year	Uses	Source
2000	HERZOG James	Haines & Company

129 ROMA CT

Year	Uses	Source
2006	PASCALLonnle	Haines Co., Inc.
2000	BECKER Robt C	Haines & Company

131 ROMA CT

Year	Uses	Source
2006	MACKAY Marilyn Dr	Haines Co., Inc.
	MACKAY Ian Donald	Haines Co., Inc.
2000	MACKAY Marilyn	Haines & Company
	MACKAY Ian D Dr	Haines & Company

134 ROMA CT

Year	Uses	Source
2006	GILYolanda 3 e	Haines Co., Inc.
	KNIGHT Kevin a	Haines Co., Inc.
2000	SIEGEL Barry	Haines & Company
1991	HARMONDW&K	Pacific Bell
	Harmond W&K	Pacific Bell

Year	Uses	Source
1985	HARMOND W & K	Pacific Bell

135 ROMA CT

Year	Uses	Source
2000	KESSLER Edward	Haines & Company

137 ROMA CT

Year	Uses	Source
2006	o COONTheodore	Haines Co., Inc.
2000	COON Theodore	Haines & Company
	X VIA DOLCE	Haines & Company

4103 ROMA CT

Year	Uses	Source
2006	GARLAND Gary	Haines Co., Inc.
2000	POURAT Bijan	Haines & Company
	LAMB Seraphima H	Haines & Company

4119 ROMA CT

Year	Uses	Source
2006	ALEGRERoberto	Haines Co., Inc.
2000	KREINER Marc 00 g	Haines & Company
	X SPINNAKER CT	Haines & Company
1985	CONNER DAVID	Pacific Bell
	CONNER JOHN A	Pacific Bell

SPEEDWAY

3715 SPEEDWAY

Year	Uses	Source
1962	LAREM R A	Pacific Telephone
1958	LARSON RONALD L	Pacific Telephone

4019 SPEEDWAY

Year	Uses	Source
1965	KIMBALL REID L	Pacific Telephone
1962	KIMBALL REID L	Pacific Telephone
1958	HUNTZINGER C IVI	Pacific Telephone
	CARMAN-RYLES ETHEL FRASER	Pacific Telephone
	PRENTISS A FRASER	Pacific Telephone
1954	HUNTZINGER C NI	R. L. Polk & Co.

FINDINGS

3715 1/2 SPEEDWAY

Year	*Uses*	*Source*
1958	COOK ADALAIDE	Pacific Telephone

SPEEDWAY ALY

3715 1/2 SPEEDWAY ALY

Year	*Uses*	*Source*
1970	COOK ADALAIDE	Pacific Telephone

VIA DOLCE

3721 VIA DOLCE

Year	*Uses*	*Source*
2006	SCHAFFELGary	Haines Co., Inc.

3722 VIA DOLCE

Year	*Uses*	*Source*
2006	GAERTNER John	Haines Co., Inc.

3726 VIA DOLCE

Year	*Uses*	*Source*
2006	o STJAMES Morgan	Haines Co., Inc.

3736 VIA DOLCE

Year	*Uses*	*Source*
2006	LUNDIN Michael	Haines Co., Inc.

3742 VIA DOLCE

Year	*Uses*	*Source*
2006	No Current Listing	Haines Co., Inc.

3746 VIA DOLCE

Year	*Uses*	*Source*
2006	o ZAK Judy	Haines Co., Inc.

3762 VIA DOLCE

Year	*Uses*	*Source*
2006	KIRSHBAUM Randi	Haines Co., Inc.

FINDINGS

3766 VIA DOLCE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

3772 VIA DOLCE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

3776 VIA DOLCE

Year	Uses	Source
2006	BELLACI Christopher	Haines Co., Inc.

3782 VIA DOLCE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

3786 VIA DOLCE

Year	Uses	Source
2006	RAKOFF David	Haines Co., Inc.

3796 VIA DOLCE

Year	Uses	Source
2006	SEGAL Franklin	Haines Co., Inc.

3802 VIA DOLCE

Year	Uses	Source
2006	20	Haines Co., Inc.

3803 VIA DOLCE

Year	Uses	Source
2006	MARGOLIS Gail	Haines Co., Inc.

3807 VIA DOLCE

Year	Uses	Source
2006	LOVETT Robert	Haines Co., Inc.

3811 VIA DOLCE

Year	Uses	Source
2006	SWARTZBrmce	Haines Co., Inc.

3812 VIA DOLCE

Year	Uses	Source
2006	o FRASERRobert	Haines Co., Inc.

FINDINGS

3815 VIA DOLCE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

3816 VIA DOLCE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

3822 VIA DOLCE

Year	Uses	Source
2006	0 STEINBERG Josh	Haines Co., Inc.

3826 VIA DOLCE

Year	Uses	Source
2006	PARRISH David	Haines Co., Inc.

3828 VIA DOLCE

Year	Uses	Source
2006	MARTINEZEnrique	Haines Co., Inc.

3832 VIA DOLCE

Year	Uses	Source
2006	MARTINEZ Henry	Haines Co., Inc.

3836 VIA DOLCE

Year	Uses	Source
2006	STRONG Mark	Haines Co., Inc.

3842 VIA DOLCE

Year	Uses	Source
2006	GIAMBRONE Linda	Haines Co., Inc.

3846 VIA DOLCE

Year	Uses	Source
2006	MAGID Shed	Haines Co., Inc.

3852 VIA DOLCE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

3856 VIA DOLCE

Year	Uses	Source
2006	OSGOODJ	Haines Co., Inc.

FINDINGS

3862 VIA DOLCE

Year	Uses	Source
2006	MOUNAMargaret	Haines Co., Inc.

3866 VIA DOLCE

Year	Uses	Source
2006	o MERCADO Luis	Haines Co., Inc.

3872 VIA DOLCE

Year	Uses	Source
2006	o KATZ Havey	Haines Co., Inc.

3903 VIA DOLCE

Year	Uses	Source
2006	No Current Listing	Haines Co., Inc.

3950 VIA DOLCE

Year	Uses	Source
2006	MANAIGO Lorenzo	Haines Co., Inc.
	LASSITER Robert	Haines Co., Inc.
	HARRYMAN Marlene	Haines Co., Inc.
	BRIEDIS Robert	Haines Co., Inc.
	BRAGIN Wofe H	Haines Co., Inc.
	BOCK Owen	Haines Co., Inc.
	BILLOT Michel	Haines Co., Inc.
	ZAKS Leonid	Haines Co., Inc.
	e SMITH Calhedne	Haines Co., Inc.
	SLADE Kelli	Haines Co., Inc.
	PECTOR Jacquelyn	Haines Co., Inc.
	MINGAIL Elias	Haines Co., Inc.
	PAKFirooz	Haines Co., Inc.

4050 VIA DOLCE

Year	Uses	Source
2006	REPP Chades	Haines Co., Inc.
	KIM Michael	Haines Co., Inc.
	Newm AN Jay	Haines Co., Inc.
	PELEGRINO John	Haines Co., Inc.
	o MULLEN Madan	Haines Co., Inc.
	HOFFMAN Ronald	Haines Co., Inc.
	HAYNE Debah	Haines Co., Inc.

FINDINGS

Year	Uses	Source
2006	HARNER Sean	Haines Co., Inc.
	FRIEDMAN Jos	Haines Co., Inc.
	ESPYClarke	Haines Co., Inc.
	BECK Dwight	Haines Co., Inc.
	ASAHARA Frands	Haines Co., Inc.

4051 VIA DOLCE

Year	Uses	Source
2006	AYAD Ihab	Haines Co., Inc.

FINDINGS

TARGET PROPERTY: ADDRESS NOT IDENTIFIED IN RESEARCH SOURCE

The following Target Property addresses were researched for this report, and the addresses were not identified in the research source.

Address Researched	Address Not Identified in Research Source
128 Hurricane Street	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

ADJOINING PROPERTY: ADDRESSES NOT IDENTIFIED IN RESEARCH SOURCE

The following Adjoining Property addresses were researched for this report, and the addresses were not identified in research source.

Address Researched	Address Not Identified in Research Source
1 IRONSIDES	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
1 IRONSIDES ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
1 IRONSIDES ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
1 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
10 HURRICANE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
107 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
109 EASTWIND	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
109 EASTWIND ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
109 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
109 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
109 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
109 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
11 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
11 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
110 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
110 GALLEON ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
110 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
110 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
111 EASTWIND	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
111 EASTWIND ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
112 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
112 FLEET ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
113 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
113 FLEET ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
113 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
113 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
113 HURRICANE ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
114 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
114 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
114 GALLEON ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
115 EASTWIND	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
115 EASTWIND ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
115 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
115 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
115 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
115 HURRICANE ST	2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
115 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
116 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
116 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
116 GALLEON ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
116 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
117 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
117 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
117 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
117 ROMA CT	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
119 1/2 HURRICANE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
119 EASTWIND ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
119 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
119 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
120 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
120 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
120 HURRICANE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
120 ROMA CT	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
121 1/2 HURRICANE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
121 1/4 HURRICANE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
121 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
121 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
121 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
121 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
121 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
121 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
122 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
123 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
123 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
124 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
124 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
124 FLEET ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
124 ROMA CT	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
124 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
125 EASTWIND	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
125 EASTWIND ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
125 EASTWIND ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
125 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
125 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
125 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
126 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
126 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
126 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
126 GALLEON ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
127 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
127 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
127 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
128 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
128 ROMA CT	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
129 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
129 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
129 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
129 HURRICANE ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
129 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
13 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
130 EASTWIND	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
130 EASTWIND ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
130 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
130 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
130 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
131 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
131 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
131 FLEET ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
131 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
131 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
131 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
132 1/2 GALLEON ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
132 FLEET ST	2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
132 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
132 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
133 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
133 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
134 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
135 ROMA CT	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
137 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
14 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
14 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
14 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
14 JIB ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
14 KETCH CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
14 KETCH ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
1413 ROMA	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
1417 ROMA	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 HURRICANE ST	2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 IRONSIDES	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 IRONSIDES ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 IRONSIDES ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
15 KETCH ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
150 GALLEON ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
1509 ROMA	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
16 FLEET ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
16 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
16 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
16 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
16 KETCH ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 1/2 FLEET ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
17 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 IRONSIDES	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 IRONSIDES ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
17 KETCH CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
171 HURRICANE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
2 KETCH ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
20 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 IRONSIDES	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 IRONSIDES ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 IRONSIDES ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 JIB ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
20 KETCH ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
21 FLEET ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
21 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
21 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
21 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
21 HURRICANE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
21 IRONSIDES	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
21 IRONSIDES ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
21 JIB ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
22 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
23 1/2 IRONSIDES ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
23 IRONSIDES ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
23 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
23 JIB ST	2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
24 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
24 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
24 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
24 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
24 HURRICANE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
24 IRONSIDES	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
24 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
25 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
25 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
25 GALLEON ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
25 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
25 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
25 IRONSIDES	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
25 IRONSIDES ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
25 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
26 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
27 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
27 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
27 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
27 IRONSIDES	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
27 IRONSIDES ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
27 KETCH ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
28 1/2 FLEET ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
28 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
28 KETCH ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
29 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
29 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
29 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
30 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
30 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
30 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
30 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
30 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
31 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
32 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
32 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
32 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3375 CANAL CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3380 CANAL CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
34 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
34 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
34 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
34 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3417 GRAND CANAL CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3419 GRAND CANAL CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
36 GALLEON	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
36 GALLEON ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
36 HURRICANE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
36 HURRICANE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3600 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3602 GRAND CANAL CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3604 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3606 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3607 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3608 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3608 PACIFIC AVE	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3610 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3612 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3614 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3618 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3620 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3700 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1923, 1921, 1920
3700 PACIFIC AVE	2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3700 PACIFIC CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3700 PACIFIC LN	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3701 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3705 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3707 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3710 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3710 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3710 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3710 PACIFIC AVE	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3710 PACIFIC CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3715 1/2 SPEEDWAY	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3715 1/2 SPEEDWAY ALY	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3715 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3715 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3715 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3715 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3715 SPEEDWAY	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1961, 1960, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3717 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3719 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3719 ESPLANADE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3719 OCEAN FRONT WALK	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1961, 1960, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3721 PACIFIC LN	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3721 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3722 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3726 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3732 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3736 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
3738 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3742 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3746 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3762 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3766 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3766 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3772 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3776 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3782 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3786 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3796 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3796 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3801 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3801 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3802 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3802 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3803 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3803 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3803 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3805 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3805 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3806 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3806 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3806 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3806 PACIFIC CT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3807 1/2 ESPLANADE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3807 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3807 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3807 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3809 1/2 ESPLANADE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3809 ESPLANADE ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3811 ESPLANADE	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3811 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3811 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3811 OCEAN FRONT WALK	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3811 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3812 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3812 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3813 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3814 GRAND CANAL	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3815 OCEAN FRONT ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3815 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3815 OCEAN FRONT WALK	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3815 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3816 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3817 OCEAN FRONT ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3817 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3818 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3819 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3821 OCEAN FRONT WALK	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3822 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3822 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3826 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3828 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3832 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3832 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3836 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3836 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3838 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1923, 1921, 1920
3842 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3842 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3846 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3846 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3852 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3852 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3856 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3856 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3862 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3862 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3866 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3872 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3872 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3900 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3901 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3902 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3903 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3903 ESPLANADA	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3903 OCEAN FRONT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3903 OCEAN FRONT ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3903 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3903 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3905 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3905 OCEAN FRONT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3905 OCEAN FRONT ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1932, 1931, 1930, 1929, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3905 OCEAN FRONT WALK	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1961, 1960, 1957, 1956, 1955, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3906 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3907 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3907 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3907 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3909 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3909 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3911 PACIFIC LN	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1958, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3921 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3929 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3929 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1962, 1961, 1960, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3931 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3933 ESPLANADE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3933 ESPLANADE	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3933 ESPLANADE ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

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Address Researched	Address Not Identified in Research Source
3936 PACIFIC LN	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3950 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
3950 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4 JIB	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4 JIB ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4 JIB ST	2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4000 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4000 PACIFIC AVE	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4000 PACIFIC DR	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4001 1/2 OCEAN FRONT WALK	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4001 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
4003 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4004 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4005 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4007 1/2 OCEAN FRONT WALK	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4007 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4007 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4009 1/2 OCEAN FRONT WALK	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4009 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4009 OCEAN FRONT WALK	2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4011 1/2 OCEAN FRONT WALK	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4011 OCEAN FRONT WALK	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
4015 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4016 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4018 PACIFIC BLVD	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4019 OCEAN FRONT	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4019 OCEAN FRONT ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1932, 1931, 1930, 1929, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4019 SPEEDWAY	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1964, 1963, 1961, 1960, 1957, 1956, 1955, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4029 PACIFIC	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4050 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4050 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4051 VIA DOLCE	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4077 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
4103 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4105 PACIFIC AVE	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4119 ROMA CT	2013, 2008, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4150 DOLCE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4156 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4182 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1923, 1921, 1920
4194 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4206 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4212 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4250 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
4282 PACIFIC AVE	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

FINDINGS

Address Researched	Address Not Identified in Research Source
4300 PACIFIC AVE	2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
6 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
6 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
7 FLEET	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
7 FLEET ST	2013, 2008, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1990, 1986, 1981, 1976, 1972, 1971, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
7 FLEET ST	2013, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
71 JIB	2013, 2008, 2006, 2004, 2003, 2001, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
84 GALLEON ST	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1981, 1976, 1975, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920
914 ROMA	2013, 2008, 2006, 2004, 2003, 2001, 2000, 1999, 1996, 1995, 1992, 1991, 1990, 1986, 1985, 1981, 1980, 1976, 1972, 1971, 1970, 1969, 1967, 1966, 1965, 1964, 1963, 1962, 1961, 1960, 1958, 1957, 1956, 1955, 1954, 1952, 1951, 1950, 1949, 1948, 1947, 1946, 1945, 1944, 1942, 1940, 1939, 1938, 1937, 1936, 1935, 1934, 1933, 1932, 1931, 1930, 1929, 1928, 1927, 1926, 1925, 1924, 1923, 1921, 1920

128 Hurricane Street

128 Hurricane Street

Marina Del Rey, CA 90292

Inquiry Number: 4591455.4

April 13, 2016

EDR Historical Topo Map Report

with QuadMatch™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Historical Topo Map Report

04/13/16

Site Name:	Client Name:
128 Hurricane Street	Ninyo & Moore
128 Hurricane Street	475 Goddard
Marina Del Rey, CA 90292	Irvine, CA 92618
EDR Inquiry # 4591455.4	Contact: Dennis Fee

EDR Topographic Map Library has been searched by EDR and maps covering the target property location as provided by Ninyo & Moore were identified for the years listed below. EDR's Historical Topo Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topo Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the late 1800s.

Search Results:

P.O.# 209666001

Project: Phase I ESA

Coordinates:

Latitude:	33.975736 33° 58' 33" North
Longitude:	-118.461332 -118° 27' 41" West
UTM Zone:	Zone 11 North
UTM X Meters:	365005.26
UTM Y Meters:	3760427.82
Elevation:	0.00' above sea level

Maps Provided:

2012	1896
1981	
1972	
1964	
1950	
1934	
1924	
1923	

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Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

2012 Source Sheets



Venice
2012
7.5-minute, 24000

1981 Source Sheets



Venice
1981
7.5-minute, 24000
Photo Revised 1981
Aerial Photo Revised 1978

1972 Source Sheets



Venice
1972
7.5-minute, 24000
Photo Revised 1972
Aerial Photo Revised 1972

1964 Source Sheets



Venice
1964
7.5-minute, 24000
Aerial Photo Revised 1963
Edited 1964

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1950 Source Sheets



Venice
1950
7.5-minute, 24000
Aerial Photo Revised 1947

1934 Source Sheets



Venice
1934
7.5-minute, 24000

1924 Source Sheets



Venice
1924
7.5-minute, 24000

1923 Source Sheets



Venice
1923
7.5-minute, 24000

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

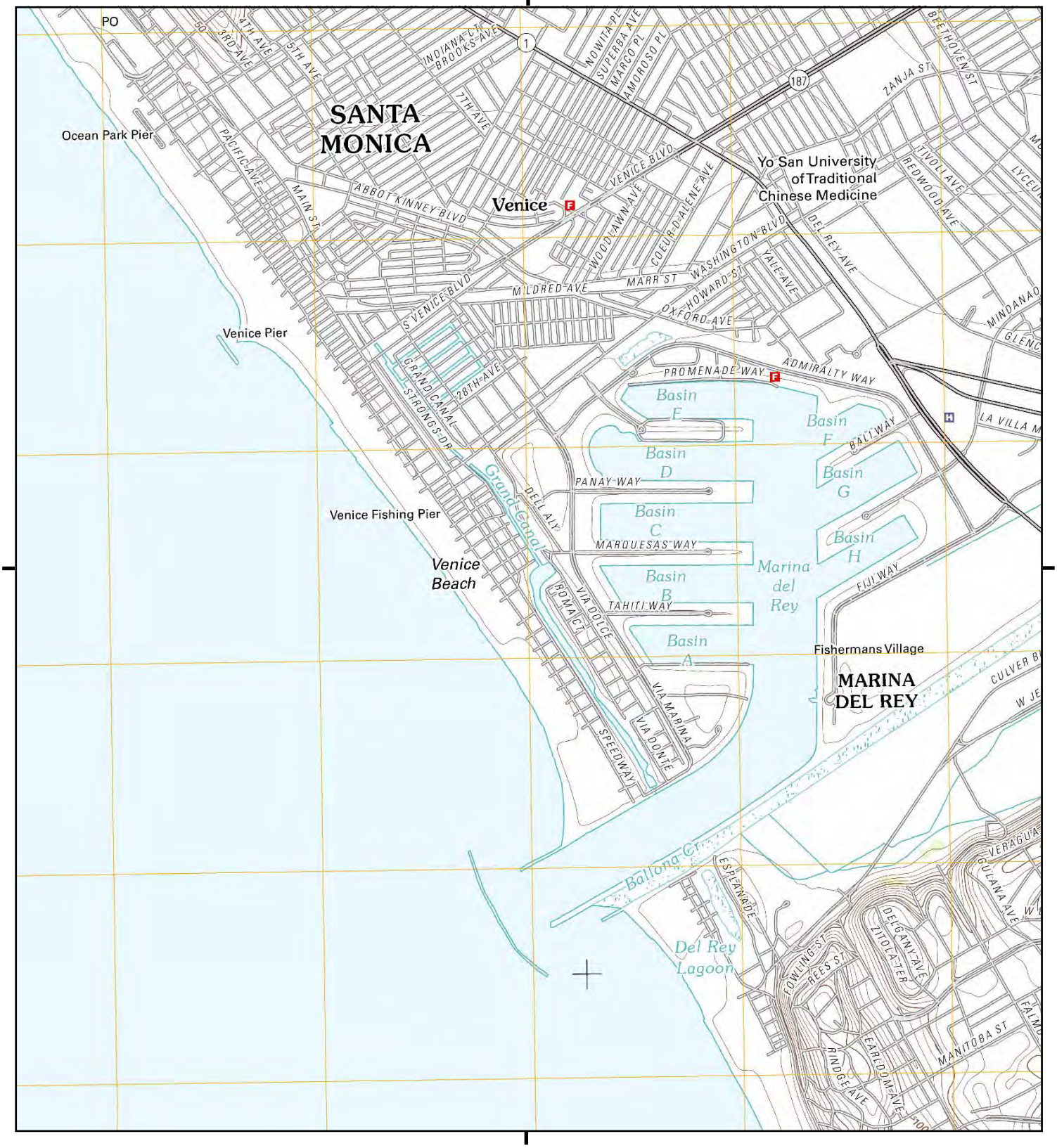
1896 Source Sheets



Redondo
1896
15-minute, 62500

Historical Topo Map

2012



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

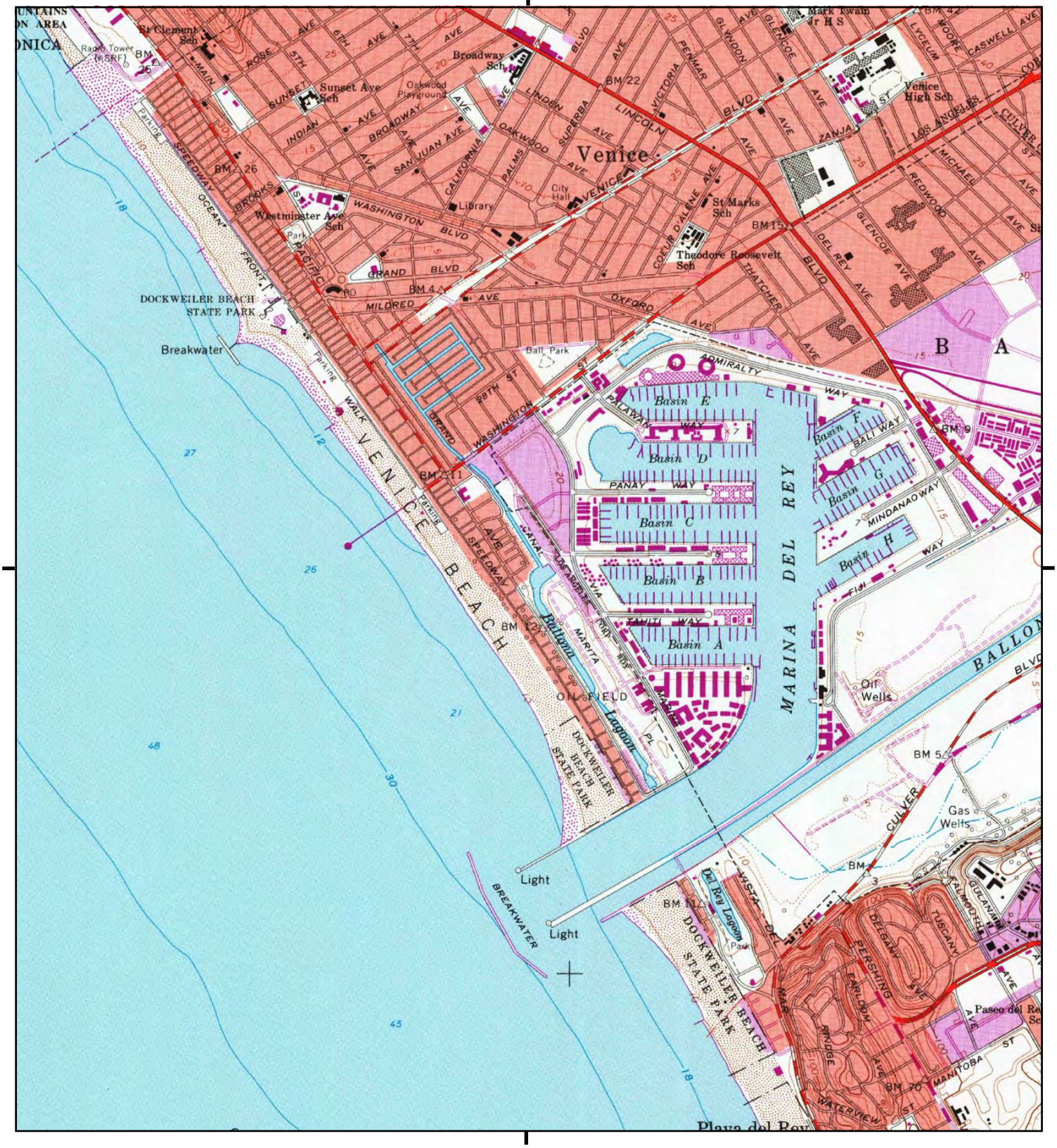
TP, Venice, 2012, 7.5-minute

SITE NAME: 128 Hurricane Street
ADDRESS: 128 Hurricane Street
Marina Del Rey, CA 90292
CLIENT: Ninyo & Moore

N

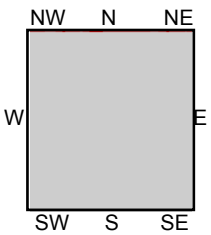
Historical Topo Map

1981



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5



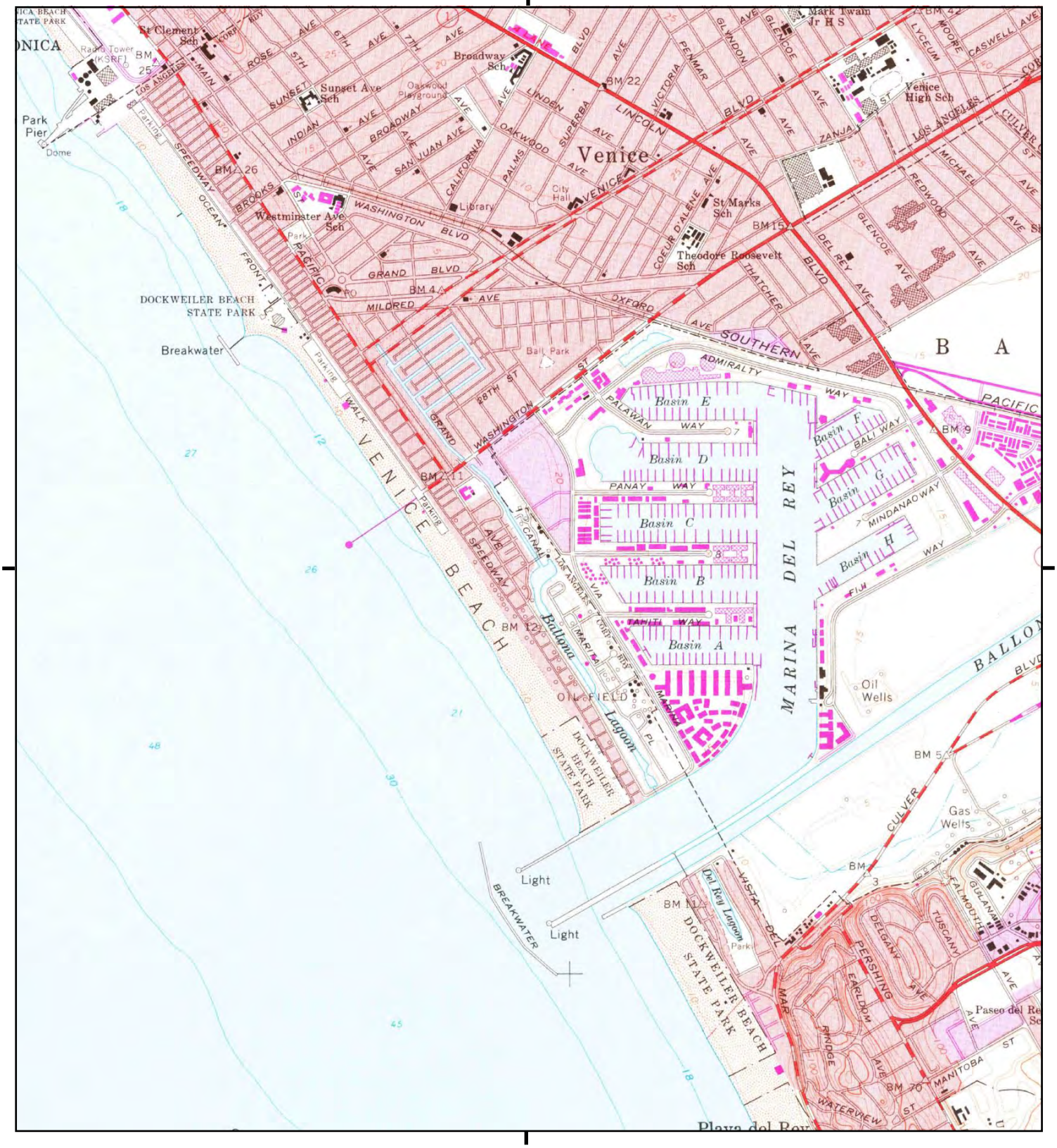
TP, Venice, 1981, 7.5-minute

SITE NAME: 128 Hurricane Street
ADDRESS: 128 Hurricane Street
Marina Del Rey, CA 90292
CLIENT: Ninyo & Moore

N

Historical Topo Map

1972



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

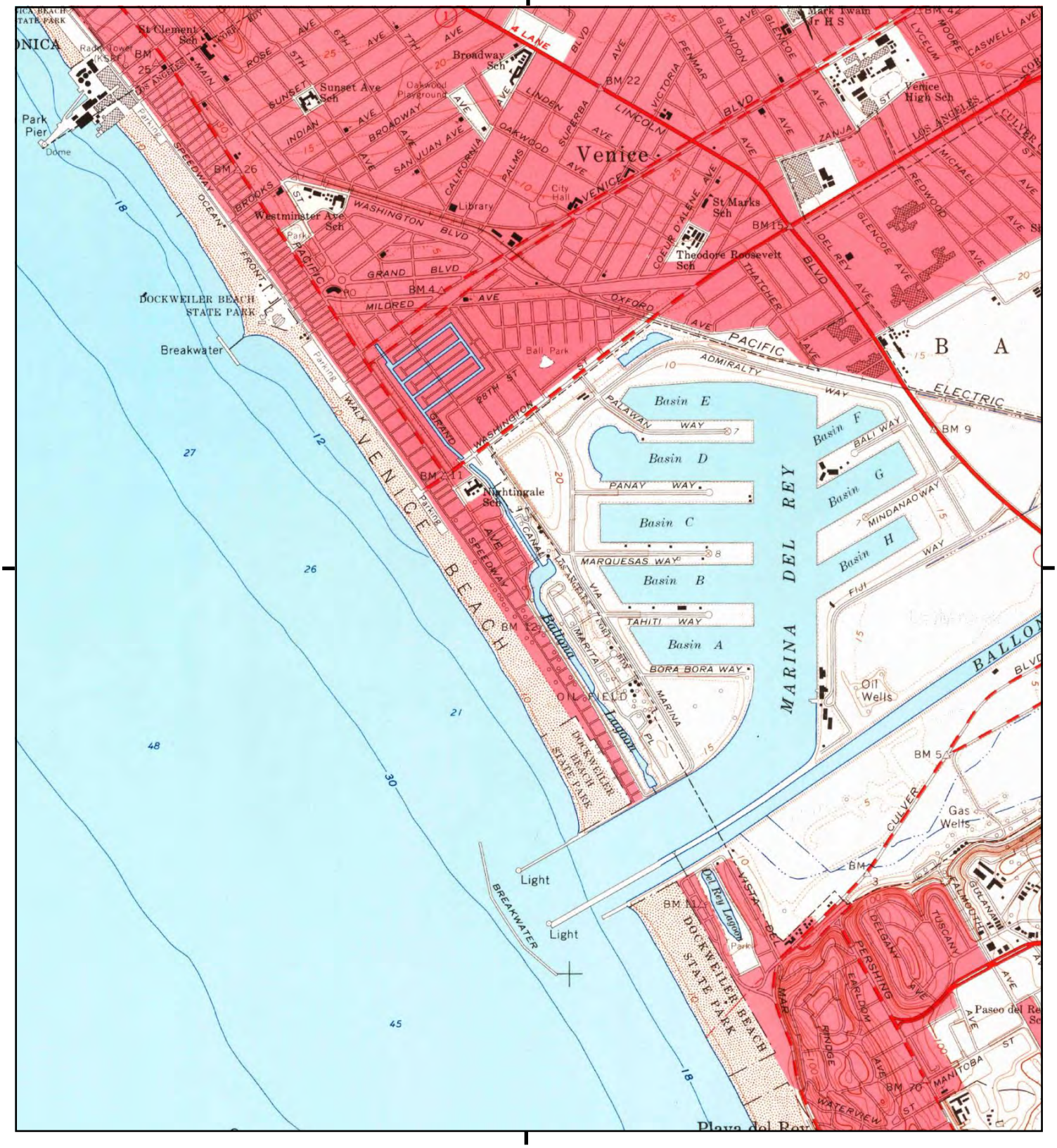
TP, Venice, 1972, 7.5-minute

SITE NAME: 128 Hurricane Street
ADDRESS: 128 Hurricane Street
Marina Del Rey, CA 90292
CLIENT: Ninyo & Moore

N

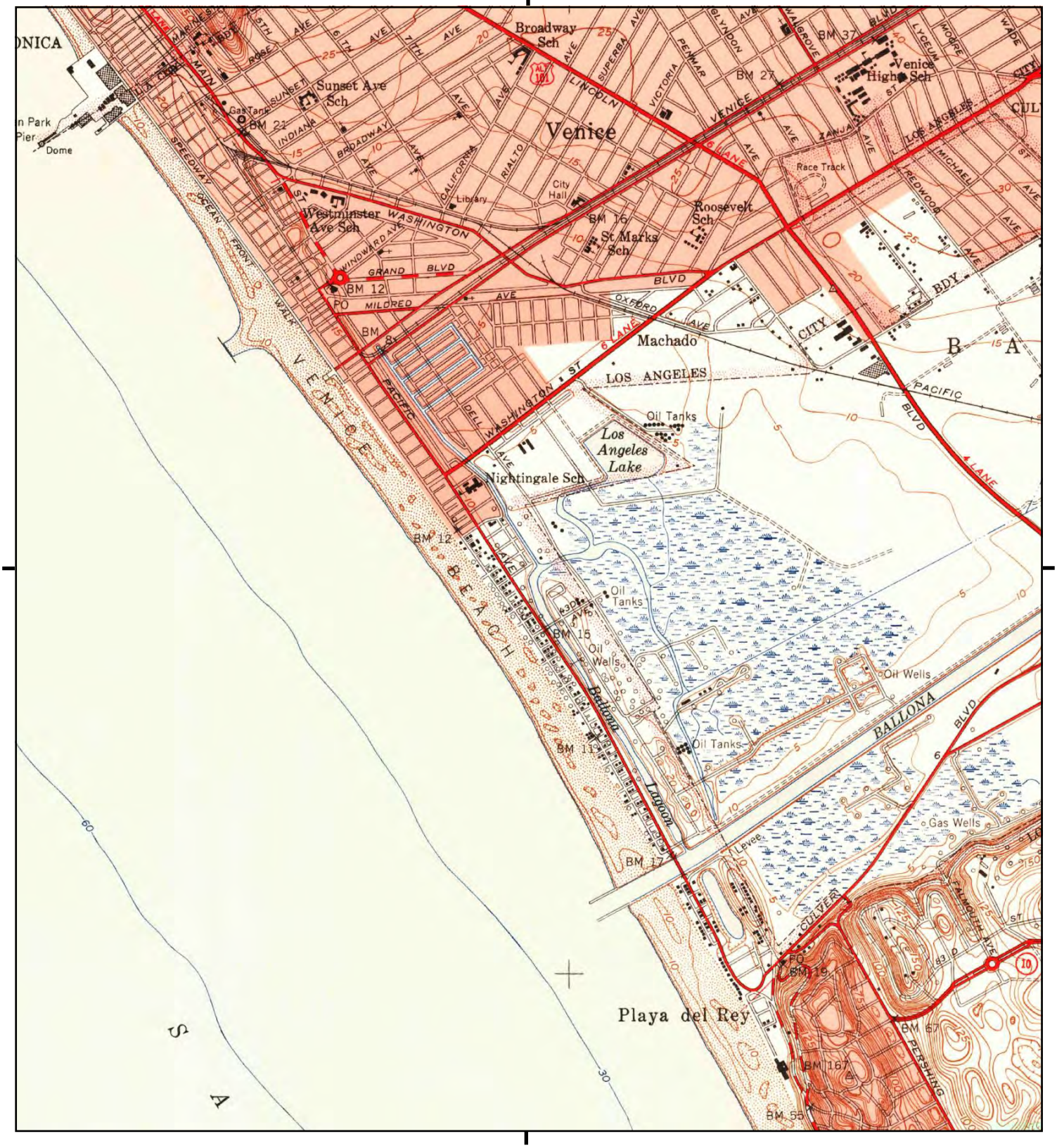
Historical Topo Map

1964


Venice
Marina Del Rey
Basin A
Basin B
Basin C
Basin D
Basin E
Basin F
Basin G
Basin H
Ballona Oil Field
Ballona Lagoon
Del Rey Lagoon
Dockweiler Beach State Park
Venice Beach
Breakwater
Light
Light
Park Pier
Dome
Oil Wells
Gas Wells
Broadway Sch
Sunset Ave Sch
Westminster Ave Sch
St Marks Sch
Theodore Roosevelt Sch
Venice High Sch
Mark Twain Jr H S
St Clement Sch
Nightingale Sch
Library
City Hall
Ball Park
Oakwood Playground
Radio Tower (KSAT)
Marina Del Rey Ent Ch
Marina Del Rey Ent Ch
Marina Del Rey Ent Ch

Historical Topo Map

1950



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Venice, 1950, 7.5-minute

SITE NAME: 128 Hurricane Street
ADDRESS: 128 Hurricane Street
Marina Del Rey, CA 90292
CLIENT: Ninyo & Moore

N

Historical Topo Map

1934



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Venice, 1934, 7.5-minute

SITE NAME: 128 Hurricane Street
ADDRESS: 128 Hurricane Street
Marina Del Rey, CA 90292
CLIENT: Ninyo & Moore

N

Historical Topo Map

1924



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Venice, 1924, 7.5-minute

SITE NAME: 128 Hurricane Street
ADDRESS: 128 Hurricane Street
Marina Del Rey, CA 90292
CLIENT: Ninyo & Moore

N

Historical Topo Map

1923



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

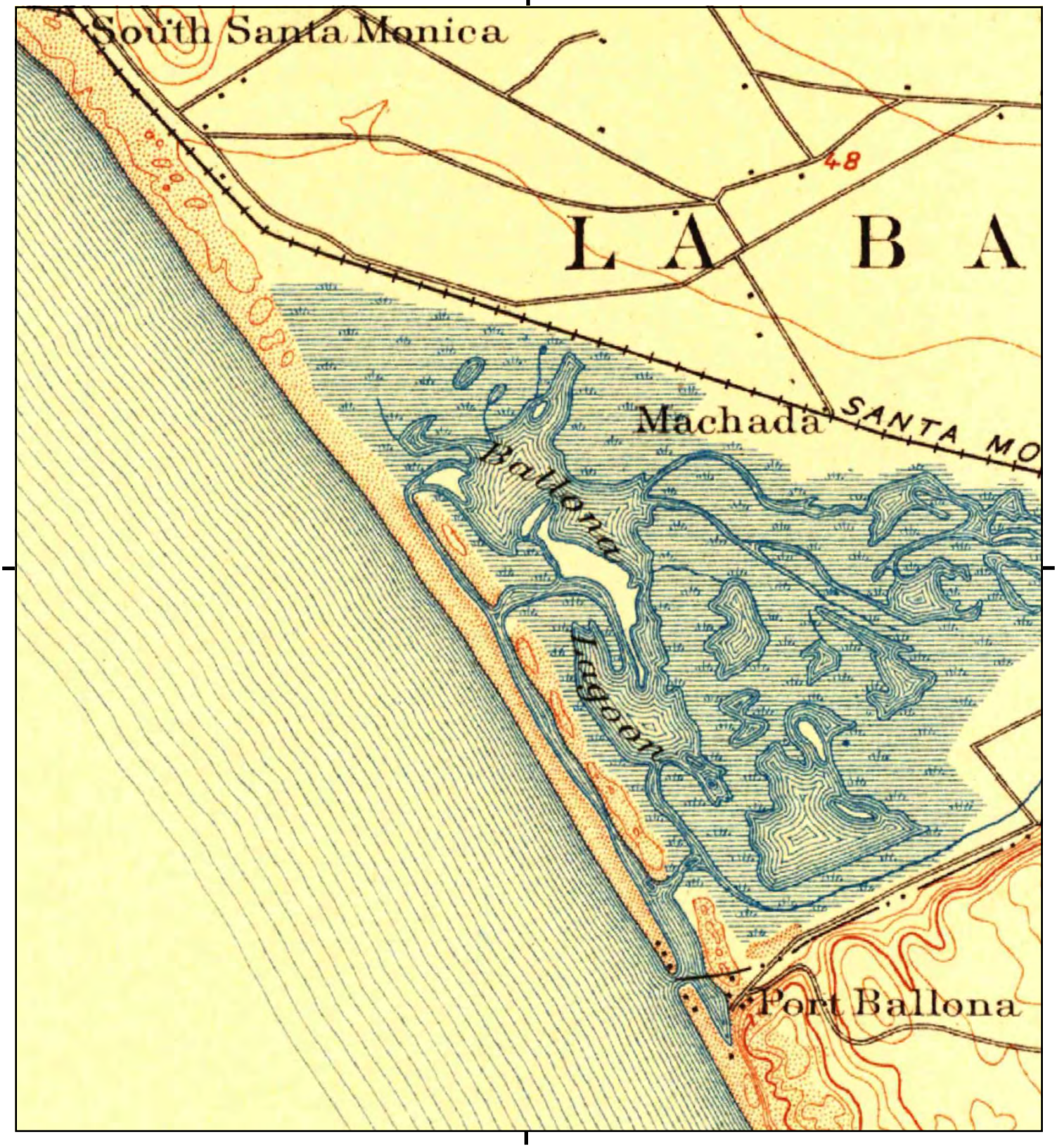
TP, Venice, 1923, 7.5-minute

SITE NAME: 128 Hurricane Street
ADDRESS: 128 Hurricane Street
Marina Del Rey, CA 90292
CLIENT: Ninyo & Moore

N

Historical Topo Map

1896



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Redondo, 1896, 15-minute

SITE NAME: 128 Hurricane Street
ADDRESS: 128 Hurricane Street
Marina Del Rey, CA 90292
CLIENT: Ninyo & Moore

N

128 Hurricane Street
128 Hurricane Street
Marina Del Rey, CA 90292

Inquiry Number: 4591455.11
April 15, 2016

EDR Environmental Lien and AUL Search

Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

EDR Environmental Lien and AUL Search

The EDR Environmental Lien and AUL Search Report provides results from a search of available current land title records for environmental cleanup liens and other activity and use limitations, such as engineering controls and institutional controls.

A network of professional, trained researchers, following established procedures, uses client supplied address information to:

- search for parcel information and/or legal description;
- search for ownership information;
- research official land title documents recorded at jurisdictional agencies such as recorders' offices, registries of deeds, county clerks' offices, etc.;
- access a copy of the deed;
- search for environmental encumbering instrument(s) associated with the deed;
- provide a copy of any environmental encumbrance(s) based upon a review of key words in the instrument(s) (title, parties involved, and description); and
- provide a copy of the deed or cite documents reviewed.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EDR Environmental Lien and AUL Search

TARGET PROPERTY INFORMATION

ADDRESS

128 Hurricane Street
128 Hurricane Street
Marina Del Rey, CA 90292

RESEARCH SOURCE

Source 1:

LA Recorder
Los Angeles, CA

PROPERTY INFORMATION

Deed 1:

Type of Deed:	deed
Title is vested in:	Sharon R McQueen Daniel P Whalen Trustees
Title received from:	John Morgan Herbelin Trustee
Deed Dated	5/22/2002
Deed Recorded:	7/5/2002
Book:	NA
Page:	na
Volume:	na
Instrument:	na
Docket:	NA
Land Record Comments:	
Miscellaneous Comments:	
Legal Description:	See Exhibit
Legal Current Owner:	Sharon R McQueen Daniel P Whalen Trustees
Parcel # / Property Identifier:	4225-010-016
Comments:	See Exhibit

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

AULs: Found ☐ Not Found ☒

Deed Exhibit 1

LEAD SHEET

02-1523510

RECORDED/FILED IN OFFICIAL RECORDS
RECORDER'S OFFICE
LOS ANGELES COUNTY
CALIFORNIA
JUL 05 2002 AT 8 A.M.

SPACE ABOVE THIS LINE FOR RECORDERS USE

TITLE(S)

DEED

FEE

FEE $10 MM
2

D.T.T.
$440.00
$1800.00

CODE 20

CODE 19

CODE 9___

NOTIFICATION SENT-SA

Assessor's Identification Number (AIN)
To Be Completed By Examiner OR Title Company In Black Ink

4225 018 016

Number of Parcels Shown

001

THIS FORM IS NOT TO BE DUPLICATED

Investors Title Company

RECORDING REQUESTED BY:
INVESTORS LAND TITLE COMPANY

AND WHEN RECORDED MAIL TO:

McQueen-Whalen Revocable Trust U/D/T 07-26-2000
3011 Thatcher Avenue
Venice , CA 90291

Order No.: 119218-91
Escrow No.: MA-11676-KM
A.P.N.: 4225-018-016

2

02 1523510

SPACE ABOVE THIS LINE IS FOR RECORDER'S USE

GRANT DEED

THE UNDERSIGNED GRANTOR(S) DECLARE(S)
DOCUMENTARY TRANSFER TAX IS $440.00 CITY TRANSFER TAX IS $1,800.00
[XX] computed on full value of property conveyed, or
[ ] computed on full value less value of liens or encumbrances remaining at time of sale.
[ ] unincorporated area [XX] City of **Los Angeles** AND

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

John Morgan Herbelin, Successor Trustee of Raymond C. Herbelin 1992 Trust

hereby GRANT(S) to

Sharon R. McQueen, Trustee and Daniel P. Whalen, Trustee of McQueen-Whalen Revocable Trust U/D/T 07-26-2000

the following described real property in the County of **Los Angeles**, State of California:

See Exhibit "A" attached hereto and made a part hereof.

Dated: **May 22, 2002**

STATE OF ~~CALIFORNIA~~ New Mexico
COUNTY OF Bernalillo] ss.

On 6/7/02 before me

a Notary Public in and for said County and State, personally appeared

personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies) and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s), acted, executed the instrument.

WITNESS my hand and official seal.

Signature _____
Signature of Notary

Commission Expiration Date: _____

Raymond C. Herbelin 1992 Trust

By: John Morgan Herbelin, Successor Trustee

(This area for official notarial seal)

MAIL TAX STATEMENTS TO: **McQueen-Whalen Revocable Trust U/D/T 07-26-2000, 3011 Thatcher Avenue , Venice , CA 90291**

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

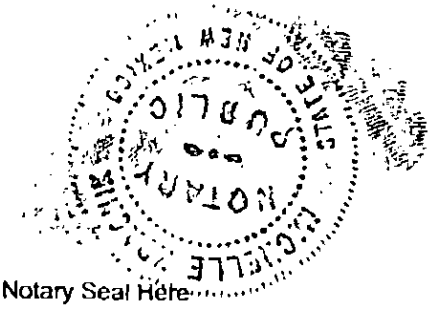
STATE OF ~~CALIFORNIA~~ New Mexico
COUNTY OF Bernalillo

On June 27, 2002 before me Michelle Zbacnik
a Notary Public in and for said County and State, personally appeared
John Morgan Herbelin

☒ personally known to me - **OR** - ☐ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Michelle Zbacnik
Expires 7-5-2005



Affix Notary Seal Here

02 1523510

APPENDIX E

EDR ENVIRONMENTAL DATABASE REPORT

128 Hurricane Street
128 Hurricane Street
Marina Del Rey, CA 90292

Inquiry Number: 4591455.2s
April 13, 2016

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

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Overview Map	2
Detail Map	3
Map Findings Summary	4
Map Findings	8
Orphan Summary	17
Government Records Searched/Data Currency Tracking	GR-1

GEOCHECK ADDENDUM

Physical Setting Source Addendum	A-1
Physical Setting Source Summary	A-2
Physical Setting Source Map	A-12
Physical Setting Source Map Findings	A-13
Physical Setting Source Records Searched	PSGR-1

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

128 HURRICANE STREET
MARINA DEL REY, CA 90292

COORDINATES

Latitude (North):	33.9757360 - 33° 58' 32.64''
Longitude (West):	118.4613320 - 118° 27' 40.79''
Universal Tranverse Mercator:	Zone 11
UTM X (Meters):	365002.2
UTM Y (Meters):	3760233.5
Elevation:	8 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	5640438 VENICE, CA
Version Date:	2012

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20120428
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
128 HURRICANE STREET
MARINA DEL REY, CA 90292

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
1	LA PUMPING PLANT #46	140 HURRICANE ST	RCRA-SQG	Higher	23, 0.004, NNE
2	VENICE PUMPING PLANT	HURRICANE & PACIFIC	Notify 65	Higher	268, 0.051, WSW
3	TIMBERLAKE GROUP INT	4100-5000 PACIFIC	SLIC	Higher	620, 0.117, South
A4	VIA DOLCE ACQUISITIO	3700-3706 CANAL	SLIC	Higher	722, 0.137, NNW
5	VIA DOLCE ACQUISITIO	3602 PACIFIC AVE	SLIC	Higher	764, 0.145, NW
A6	VIA DOLCE ACQUISITIO	3600-3615 CANAL	SLIC	Higher	791, 0.150, NNW
7	WESTERN CIRCUITS INC	4136 DEL REY AVE	ENVIROSTOR, HWP	Lower	2017, 0.382, NNW
8	BARON'S CLEANERS	510 WASHINGTON	SLIC, DRYCLEANERS	Lower	2521, 0.477, North
9	NIKE BTY 70		ENVIROSTOR	Higher	3698, 0.700, SE
10	MARINA DEL REY	13837 FIJI	ENVIROSTOR, LA Co. Site Mitigation	Higher	5011, 0.949, East

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL ---------- National Priority List
Proposed NPL ---------- Proposed National Priority List Sites
NPL LIENS ---------- Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL ---------- National Priority List Deletions

Federal CERCLIS list

FEDERAL FACILITY ---------- Federal Facility Site Information listing
SEMS ---------- Superfund Enterprise Management System

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE ---------- Superfund Enterprise Management System Archive

Federal RCRA CORRACTS facilities list

CORRACTS ---------- Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF ---------- RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG ---------- RCRA - Large Quantity Generators
RCRA-CESQG ---------- RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

LUCIS ---------- Land Use Control Information System
US ENG CONTROLS ---------- Engineering Controls Sites List
US INST CONTROL ---------- Sites with Institutional Controls

EXECUTIVE SUMMARY

Federal ERNS list

ERNS ---------- Emergency Response Notification System

State- and tribal - equivalent NPL

RESPONSE ---------- State Response Sites

State and tribal landfill and/or solid waste disposal site lists

SWF/LF ---------- Solid Waste Information System

State and tribal leaking storage tank lists

LUST ---------- Geotracker's Leaking Underground Fuel Tank Report
INDIAN LUST ---------- Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

FEMA UST ---------- Underground Storage Tank Listing
UST ---------- Active UST Facilities
AST ---------- Aboveground Petroleum Storage Tank Facilities
INDIAN UST ---------- Underground Storage Tanks on Indian Land

State and tribal voluntary cleanup sites

INDIAN VCP ---------- Voluntary Cleanup Priority Listing
VCP ---------- Voluntary Cleanup Program Properties

State and tribal Brownfields sites

BROWNFIELDS ---------- Considered Brownfieds Sites Listing

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS ---------- A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

WMUDS/SWAT ---------- Waste Management Unit Database
SWRCY ---------- Recycler Database
HAULERS ---------- Registered Waste Tire Haulers Listing
INDIAN ODI ---------- Report on the Status of Open Dumps on Indian Lands
ODI ---------- Open Dump Inventory
DEBRIS REGION 9 ---------- Torres Martinez Reservation Illegal Dump Site Locations

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL ---------- Delisted National Clandestine Laboratory Register
AOCONCERN ---------- San Gabriel Valley Areas of Concern
HIST Cal-Sites ---------- Historical Calsites Database

SCH School Property Evaluation Program
CDL Clandestine Drug Labs
Toxic Pits Toxic Pits Cleanup Act Sites
US CDL National Clandestine Laboratory Register

Local Lists of Registered Storage Tanks

SWEEPS UST SWEEPS UST Listing
HIST UST Hazardous Substance Storage Container Database
CA FID UST Facility Inventory Database

Local Land Records

LIENS Environmental Liens Listing
LIENS 2 CERCLA Lien Information
DEED Deed Restriction Listing

Records of Emergency Release Reports

HMIRS Hazardous Materials Information Reporting System
CHMIRS California Hazardous Material Incident Report System
LDS Land Disposal Sites Listing
MCS Military Cleanup Sites Listing
SPILLS 90 SPILLS 90 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR RCRA - Non Generators / No Longer Regulated
FUDS Formerly Used Defense Sites
DOD Department of Defense Sites
SCRD DRYCLEANERS State Coalition for Remediation of Drycleaners Listing
US FIN ASSUR Financial Assurance Information
EPA WATCH LIST EPA WATCH LIST
2020 COR ACTION 2020 Corrective Action Program List
TSCA Toxic Substances Control Act
TRIS Toxic Chemical Release Inventory System
SSTS Section 7 Tracking Systems
ROD Records Of Decision
RMP Risk Management Plans
RAATS RCRA Administrative Action Tracking System
PRP Potentially Responsible Parties
PADS PCB Activity Database System
ICIS Integrated Compliance Information System
FTTS FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
MLTS Material Licensing Tracking System
COAL ASH DOE Steam-Electric Plant Operation Data
COAL ASH EPA Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER PCB Transformer Registration Database
RADINFO Radiation Information Database
HIST FTTS FIFRA/TSCA Tracking System Administrative Case Listing
DOT OPS Incident and Accident Data
CONSENT Superfund (CERCLA) Consent Decrees
INDIAN RESERV Indian Reservations
FUSRAP Formerly Utilized Sites Remedial Action Program

UMTRA - Uranium Mill Tailings Sites
LEAD SMELTERS - Lead Smelter Sites
US AIRS - Aerometric Information Retrieval System Facility Subsystem
US MINES - Mines Master Index File
FINDS - Facility Index System/Facility Registry System
CA BOND EXP. PLAN - Bond Expenditure Plan
Cortese - "Cortese" Hazardous Waste & Substances Sites List
CUPA Listings - CUPA Resources List
DRYCLEANERS - Cleaner Facilities
EMI - Emissions Inventory Data
ENF - Enforcement Action Listing
Financial Assurance - Financial Assurance Information Listing
HAZNET - Facility and Manifest Data
HIST CORTESE - Hazardous Waste & Substance Site List
LOS ANGELES CO. HMS - HMS: Street Number List
HWT - Registered Hazardous Waste Transporter Database
MINES - Mines Site Location Listing
MWMP - Medical Waste Management Program Listing
NPDES - NPDES Permits Listing
PEST LIC - Pesticide Regulation Licenses Listing
PROC - Certified Processors Database
LA Co. Site Mitigation - Site Mitigation List
UIC - UIC Listing
WASTEWATER PITS - Oil Wastewater Pits Listing
WDS - Waste Discharge System
WIP - Well Investigation Program Case List
FUELS PROGRAM - EPA Fuels Program Registered Listing
ECHO - Enforcement & Compliance History Information

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP - EDR Proprietary Manufactured Gas Plants
EDR Hist Auto - EDR Exclusive Historic Gas Stations
EDR Hist Cleaner - EDR Exclusive Historic Dry Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF - Recovered Government Archive Solid Waste Facilities List
RGA LUST - Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

EXECUTIVE SUMMARY

STANDARD ENVIRONMENTAL RECORDS

Federal RCRA generators list

RCRA-SQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

A review of the RCRA-SQG list, as provided by EDR, and dated 12/09/2015 has revealed that there is 1 RCRA-SQG site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
LA PUMPING PLANT #46	140 HURRICANE ST	NNE 0 - 1/8 (0.004 mi.)	1	8

State- and tribal - equivalent CERCLIS

ENVIROSTOR: The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites.

A review of the ENVIROSTOR list, as provided by EDR, and dated 02/01/2016 has revealed that there are 3 ENVIROSTOR sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
NIKE BTY 70 Facility Id: 80000281 Status: Inactive - Needs Evaluation		SE 1/2 - 1 (0.700 mi.)	9	14
MARINA DEL REY Facility Id: 19490183 Status: Refer: Other Agency	***13837 FIJI***	***E 1/2 - 1 (0.949 mi.)***	***10***	***15***

Lower Elevation	Address	Direction / Distance	Map ID	Page
WESTERN CIRCUITS INC Facility Id: 80001443 Status: * Inactive	***4136 DEL REY AVE***	***NNW 1/4 - 1/2 (0.382 mi.)***	***7***	***11***

State and tribal leaking storage tank lists

SLIC: SLIC Region comes from the California Regional Water Quality Control Board.

A review of the SLIC list, as provided by EDR, and dated 12/14/2015 has revealed that there are 5 SLIC sites within approximately 0.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
TIMBERLAKE GROUP INT Facility Status: No further action required	4100-5000 PACIFIC	S 0 - 1/8 (0.117 mi.)	3	9
VIA DOLCE ACQUISITIO Facility Status: Completed - Case Closed Facility Status: No further action required Global Id: SLT43285283	3700-3706 CANAL	NNW 1/8 - 1/4 (0.137 mi.)	A4	9
VIA DOLCE ACQUISITIO Facility Status: Completed - Case Closed Facility Status: No further action required Global Id: SLT43283281	3602 PACIFIC AVE	NW 1/8 - 1/4 (0.145 mi.)	5	10
VIA DOLCE ACQUISITIO Facility Status: Completed - Case Closed Facility Status: No further action required Global Id: SLT43284282	3600-3615 CANAL	NNW 1/8 - 1/4 (0.150 mi.)	A6	11

Lower Elevation	Address	Direction / Distance	Map ID	Page
BARON'S CLEANERS Facility Status: Completed - Case Closed Facility Status: Site Assessment Global Id: SL0603778434	***510 WASHINGTON***	***N 1/4 - 1/2 (0.477 mi.)***	***8***	***13***

ADDITIONAL ENVIRONMENTAL RECORDS

Other Ascertainable Records

HWP: Detailed information on permitted hazardous waste facilities and corrective action ("cleanups") tracked in EnviroStor.

A review of the HWP list, as provided by EDR, and dated 02/22/2016 has revealed that there is 1 HWP site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
WESTERN CIRCUITS INC EPA Id: CAD062092259 Cleanup Status: KNOWN GENERATORS	***4136 DEL REY AVE***	***NNW 1/4 - 1/2 (0.382 mi.)***	***7***	***11***

EXECUTIVE SUMMARY

Notify 65: Listings of all Proposition 65 incidents reported to counties by the State Water Resources Control Board and the Regional Water Quality Control Board. This database is no longer updated by the reporting agency.

A review of the Notify 65 list, as provided by EDR, and dated 09/10/2015 has revealed that there is 1 Notify 65 site within approximately 1 mile of the target property.

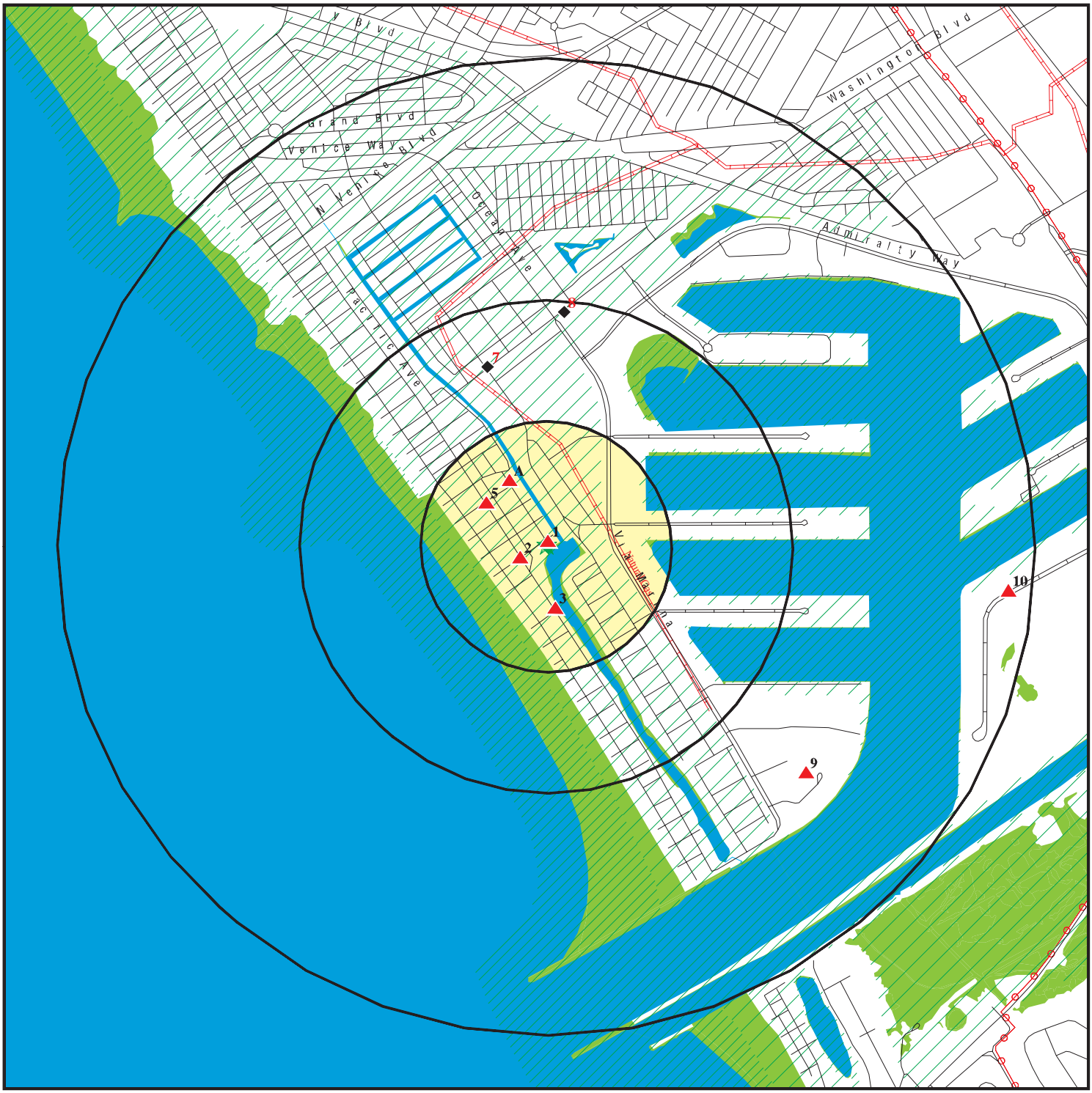
Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
VENICE PUMPING PLANT	HURRICANE & PACIFIC	WSW 0 - 1/8 (0.051 mi.)	2	9

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 1 records.

Site Name	Database(s)
DOW CHEMICAL CO VENICE	SEMS-ARCHIVE

OVERVIEW MAP - 4591455.2S



0 1/4 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Areas of Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: 128 Hurricane Street ADDRESS: 128 Hurricane Street Marina Del Rey CA 90292 LAT/LONG: 33.975736 / 118.461332	CLIENT: Ninyo & Moore CONTACT: Dennis Fee INQUIRY #: 4591455.2s DATE: April 13, 2016 5:04 pm

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DETAIL MAP - 4591455.2S



0 1/16 1/8 1/4 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Areas of Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: 128 Hurricane Street	CLIENT: Ninyo & Moore
ADDRESS: 128 Hurricane Street Marina Del Rey CA 90292	CONTACT: Dennis Fee
LAT/LONG: 33.975736 / 118.461332	INQUIRY #: 4591455.2s DATE: April 13, 2016 5:05 pm

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		1	0	NR	NR	NR	1
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
RESPONSE	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
ENVIROSTOR	1.000		0	0	1	2	NR	3
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
INDIAN LUST	0.500		0	0	0	NR	NR	0
SLIC	0.500		1	3	1	NR	NR	5
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal voluntary cleanup sites								
INDIAN VCP	0.500		0	0	0	NR	NR	0
VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
WMUDS/SWAT	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
HAULERS	TP		NR	NR	NR	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	TP		NR	NR	NR	NR	NR	0
AOCONCERN	1.000		0	0	0	0	NR	0
HIST Cal-Sites	1.000		0	0	0	0	NR	0
SCH	0.250		0	0	NR	NR	NR	0
CDL	TP		NR	NR	NR	NR	NR	0
Toxic Pits	1.000		0	0	0	0	NR	0
US CDL	TP		NR	NR	NR	NR	NR	0
Local Lists of Registered Storage Tanks								
SWEEPS UST	0.250		0	0	NR	NR	NR	0
HIST UST	0.250		0	0	NR	NR	NR	0
CA FID UST	0.250		0	0	NR	NR	NR	0
Local Land Records								
LIENS	TP		NR	NR	NR	NR	NR	0
LIENS 2	TP		NR	NR	NR	NR	NR	0
DEED	0.500		0	0	0	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
CHMIRS	TP		NR	NR	NR	NR	NR	0
LDS	TP		NR	NR	NR	NR	NR	0
MCS	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
CA BOND EXP. PLAN	1.000		0	0	0	0	NR	0
Cortese	0.500		0	0	0	NR	NR	0
CUPA Listings	0.250		0	0	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
EMI	TP		NR	NR	NR	NR	NR	0
ENF	TP		NR	NR	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
HAZNET	TP		NR	NR	NR	NR	NR	0
HIST CORTESE	0.500		0	0	0	NR	NR	0
LOS ANGELES CO. HMS	TP		NR	NR	NR	NR	NR	0
HWP	1.000		0	0	1	0	NR	1
HWT	0.250		0	0	NR	NR	NR	0
MINES	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
MWMP	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
PEST LIC	TP		NR	NR	NR	NR	NR	0
PROC	0.500		0	0	0	NR	NR	0
Notify 65	1.000		1	0	0	0	NR	1
LA Co. Site Mitigation	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
WASTEWATER PITS	0.500		0	0	0	NR	NR	0
WDS	TP		NR	NR	NR	NR	NR	0
WIP	0.250		0	0	NR	NR	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
ECHO	TP		NR	NR	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0
- Totals --		0	3	3	3	2	0	11

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

1
NNE
< 1/8
0.004 mi.
23 ft.

LA PUMPING PLANT #46
140 HURRICANE ST
VENICE, CA 90292

RCRA-SQG **1000350178** **CAD981987415**

Relative:
Higher

Actual:
8 ft.

RCRA-SQG:

Date form received by agency:	03/25/1987
Facility name:	LA PUMPING PLANT #46
Facility address:	140 HURRICANE ST VENICE, CA 90292
EPA ID:	CAD981987415
Mailing address:	200 N MAIN RM EIGHTH HUNDREDCH LOS ANGELES, CA 90012
Contact:	ENVIRONMENTAL MANAGER
Contact address:	140 HURRICANE ST VENICE, CA 90292
Contact country:	US
Contact telephone:	(213) 485-7527
Contact email:	Not reported
EPA Region:	09
Classification:	Small Small Quantity Generator
Description:	Handler: generates more than 100 and less than 1000 kg of hazardous waste during any calendar month and accumulates less than 6000 kg of hazardous waste at any time; or generates 100 kg or less of hazardous waste during any calendar month, and accumulates more than 1000 kg of hazardous waste at any time

Owner/Operator Summary:

Owner/operator name:	CITY OF LOS ANGELES
Owner/operator address:	NOT REQUIRED NOT REQUIRED, ME 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(415) 555-1212
Legal status:	Municipal
Owner/Operator Type:	Owner
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Owner/operator name:	NOT REQUIRED
Owner/operator address:	NOT REQUIRED NOT REQUIRED, ME 99999
Owner/operator country:	Not reported
Owner/operator telephone:	(415) 555-1212
Legal status:	Municipal
Owner/Operator Type:	Operator
Owner/Op start date:	Not reported
Owner/Op end date:	Not reported

Handler Activities Summary:

U.S. importer of hazardous waste:	No
Mixed waste (haz. and radioactive):	No
Recycler of hazardous waste:	No
Transporter of hazardous waste:	No
Treater, storer or disposer of HW:	No
Underground injection activity:	No
On-site burner exemption:	No
Furnace exemption:	No

LA PUMPING PLANT #46 (Continued) **1000350178**

Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Violation Status: No violations found

2
WSW
< 1/8
0.051 mi.
268 ft.

VENICE PUMPING PLANT **Notify 65** **S100178392**
HURRICANE & PACIFIC AVE. **N/A**
VENICE, CA

Relative:
Higher

Actual:
12 ft.

NOTIFY 65:
Date Reported: Not reported
Staff Initials: Not reported
Board File Number: Not reported
Facility Type: Not reported
Discharge Date: Not reported
Issue Date: Not reported
Incident Description: Not reported

3
South
< 1/8
0.117 mi.
620 ft.

TIMBERLAKE GROUP INT'L **SLIC** **S104404902**
4100-5000 PACIFIC **N/A**
VENICE, CA 90292

Relative:
Higher

Actual:
11 ft.

SLIC REG 4:
Region: 4
Facility Status: No further action required
SLIC: 0485A
Substance: TPH
Staff: PR

A4
NNW
1/8-1/4
0.137 mi.
722 ft.

VIA DOLCE ACQUISITION AREA 3 **SLIC** **S103546846**
3700-3706 CANAL **N/A**
VENICE, CA 90292

Site 1 of 2 in cluster A

Relative:
Higher

Actual:
8 ft.

SLIC:
Region: STATE
Facility Status: **Completed - Case Closed**
Status Date: 10/02/1999
Global Id: SLT43285283
Lead Agency: LOS ANGELES RWQCB (REGION 4)
Lead Agency Case Number: Not reported
Latitude: 33.977528
Longitude: -118.462579
Case Type: Cleanup Program Site
Case Worker: PR
Local Agency: Not reported

VIA DOLCE ACQUISITION AREA 3 (Continued) **S103546846**

RB Case Number: 0485D
File Location: Not reported
Potential Media Affected: Not reported
Potential Contaminants of Concern: Not reported
Site History: Not reported

Click here to access the California GeoTracker records for this facility:

SLIC REG 4:
Region: 4
Facility Status: No further action required
SLIC: 0485D
Substance: TPH
Staff: PR

5
NW
1/8-1/4
0.145 mi.
764 ft.

VIA DOLCE ACQUISITION AREA 1 **SLIC** **S102002387**
3602 PACIFIC AVE **N/A**
VENICE, CA 90292

Relative:
Higher

Actual:
13 ft.

SLIC:
Region: STATE
Facility Status: **Completed - Case Closed**
Status Date: 10/02/1999
Global Id: SLT43283281
Lead Agency: LOS ANGELES RWQCB (REGION 4)
Lead Agency Case Number: Not reported
Latitude: 33.976933
Longitude: -118.463448
Case Type: Cleanup Program Site
Case Worker: PR
Local Agency: Not reported
RB Case Number: 0485B
File Location: Not reported
Potential Media Affected: Not reported
Potential Contaminants of Concern: Not reported
Site History: Not reported

Click here to access the California GeoTracker records for this facility:

SLIC REG 4:
Region: 4
Facility Status: No further action required
SLIC: 0485B
Substance: TPH
Staff: PR

A6
NNW
1/8-1/4
0.150 mi.
791 ft.

VIA DOLCE ACQUISITION AREA 2
3600-3615 CANAL
VENICE, CA 90292

Site 2 of 2 in cluster A

SLIC **S103546845**
N/A

Relative:
Higher

Actual:
8 ft.

SLIC:

Region:	STATE
Facility Status:	**Completed - Case Closed**
Status Date:	10/02/1999
Global Id:	SLT43284282
Lead Agency:	LOS ANGELES RWQCB (REGION 4)
Lead Agency Case Number:	Not reported
Latitude:	33.977681
Longitude:	-118.462702
Case Type:	Cleanup Program Site
Case Worker:	PR
Local Agency:	Not reported
RB Case Number:	0485C
File Location:	Not reported
Potential Media Affected:	Not reported
Potential Contaminants of Concern:	Not reported
Site History:	Not reported

Click here to access the California GeoTracker records for this facility:

SLIC REG 4:

Region:	4
Facility Status:	No further action required
SLIC:	0485C
Substance:	TPH
Staff:	PR

7
NNW
1/4-1/2
0.382 mi.
2017 ft.

WESTERN CIRCUITS INC
4136 DEL REY AVE
VENICE, CA 90291

ENVIROSTOR **S109548320**
HWP **N/A**

Relative:
Lower

Actual:
6 ft.

ENVIROSTOR:

Facility ID:	80001443
Status:	* Inactive
Status Date:	01/01/2008
Site Code:	Not reported
Site Type:	Corrective Action
Site Type Detailed:	Corrective Action
Acres:	0
NPL:	NO
Regulatory Agencies:	NONE SPECIFIED
Lead Agency:	NONE SPECIFIED
Program Manager:	Not reported
Supervisor:	* Unknown
Division Branch:	Cleanup Chatsworth
Assembly:	54
Senate:	26
Special Program:	Not reported
Restricted Use:	NO
Site Mgmt Req:	NONE SPECIFIED
Funding:	Not reported

WESTERN CIRCUITS INC (Continued) **S109548320**

Latitude: 33.98804
Longitude: -118.4437
APN: 4230005048
Past Use: NONE SPECIFIED
Potential COC: NONE SPECIFIED
Confirmed COC: NONE SPECIFIED
Potential Description: NONE SPECIFIED
Alias Name: 4230005048
Alias Type: APN
Alias Name: CAD062092259
Alias Type: EPA Identification Number
Alias Name: 110002140692
Alias Type: EPA (FRS #)
Alias Name: 80001443
Alias Type: Envirostor ID Number

Completed Info:
Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Preliminary Assessment Report
Completed Date: 04/10/1991
Comments: Not reported

Future Area Name: Not reported
Future Sub Area Name: Not reported
Future Document Type: Not reported
Future Due Date: Not reported
Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

HWP:
EPA Id: CAD062092259
Cleanup Status: KNOWN GENERATORS
Latitude: 33.98835
Longitude: -118.4449
Facility Type: Historical - Non-Operating
Facility Size: Not reported
Team: Not reported
Supervisor: Not reported
Site Code: Not reported
Assembly District: 62
Senate District: 26
Public Information Officer: Not reported
Public Information Officer: Not reported

8
North
1/4-1/2
0.477 mi.
2521 ft.

BARON'S CLEANERS
510 WASHINGTON
MARINA DEL RAY, CA 90292

SLIC
DRYCLEANERS

S105911542
N/A

Relative:
Lower

Actual:
7 ft.

SLIC:

Region:	STATE
Facility Status:	**Completed - Case Closed**
Status Date:	06/11/2012
Global Id:	SL0603778434
Lead Agency:	LOS ANGELES RWQCB (REGION 4)
Lead Agency Case Number:	Not reported
Latitude:	33.9825110650465
Longitude:	-118.460614085197
Case Type:	Cleanup Program Site
Case Worker:	ACJ
Local Agency:	Not reported
RB Case Number:	1120
File Location:	Not reported
Potential Media Affected:	Other Groundwater (uses other than drinking water), Soil, Soil Vapor
Potential Contaminants of Concern:	Tetrachloroethylene (PCE), Trichloroethylene (TCE)
Site History:	Not reported

Click here to access the California GeoTracker records for this facility:

SLIC REG 4:

Region:	4
Facility Status:	Site Assessment
SLIC:	1120
Substance:	PCE,CIS-1,2,DCE
Staff:	Not reported

DRYCLEANERS:

EPA Id:	CAL000275739
NAICS Code:	81232
NAICS Description:	Drycleaning and Laundry Services (except Coin-Operated)
SIC Code:	7211
SIC Description:	Power Laundries, Family and Commercial
Create Date:	10/27/2003
Facility Active:	No
Inactive Date:	Not reported
Facility Addr2:	Not reported
Owner Name:	HERMAN CICEKCI
Owner Address:	566 WASHINGTON BLVD
Owner Address 2:	Not reported
Owner Telephone:	3108238003
Contact Name:	HERMAN CICEKCI
Contact Address:	566 WASHINGTON BLVD
Contact Address 2:	Not reported
Contact Telephone:	3108238003
Mailing Name:	Not reported
Mailing Address 1:	510 WASHINGTON BLVD
Mailing Address 2:	Not reported
Mailing City:	MARINA DEL REY
Mailing State:	CA
Mailing Zip:	90292
Owner Fax:	3

BARON'S CLEANERS (Continued) **S105911542**

Region Code: 3108232527

9
SE
1/2-1
0.700 mi.
3698 ft.

NIKE BTY 70 **ENVIROSTOR** **S107736898**
N/A

LOS ANGELES, CA

Relative:
Higher

Actual:
20 ft.

ENVIROSTOR:

Facility ID:	80000281
Status:	Inactive - Needs Evaluation
Status Date:	07/01/2005
Site Code:	Not reported
Site Type:	Military Evaluation
Site Type Detailed:	FUDS
Acres:	1
NPL:	NO
Regulatory Agencies:	SMBRP
Lead Agency:	SMBRP
Program Manager:	Not reported
Supervisor:	Douglas Bautista
Division Branch:	Cleanup Cypress
Assembly:	62
Senate:	26
Special Program:	Not reported
Restricted Use:	NO
Site Mgmt Req:	NONE SPECIFIED
Funding:	DERA
Latitude:	33.96898
Longitude:	-118.4520
APN:	NONE SPECIFIED
Past Use:	NONE SPECIFIED
Potential COC:	NONE SPECIFIED
Confirmed COC:	NONE SPECIFIED
Potential Description:	NONE SPECIFIED
Alias Name:	CA99799F547900
Alias Type:	Federal Facility ID
Alias Name:	J09CA0419
Alias Type:	INPR
Alias Name:	80000281
Alias Type:	Envirostor ID Number

Completed Info:

Completed Area Name:	Not reported
Completed Sub Area Name:	Not reported
Completed Document Type:	Not reported
Completed Date:	Not reported
Comments:	Not reported

Future Area Name:	Not reported
Future Sub Area Name:	Not reported
Future Document Type:	Not reported
Future Due Date:	Not reported
Schedule Area Name:	Not reported
Schedule Sub Area Name:	Not reported
Schedule Document Type:	Not reported
Schedule Due Date:	Not reported
Schedule Revised Date:	Not reported

10
East
1/2-1
0.949 mi.
5011 ft.

MARINA DEL REY
13837 FIJI
VENICE, CA 90291

ENVIROSTOR **S100198460**
LA Co. Site Mitigation **N/A**

Relative:
Higher

Actual:
15 ft.

ENVIROSTOR:

Facility ID:	19490183
Status:	Refer: Other Agency
Status Date:	03/22/1984
Site Code:	Not reported
Site Type:	Historical
Site Type Detailed:	* Historical
Acres:	Not reported
NPL:	NO
Regulatory Agencies:	NONE SPECIFIED
Lead Agency:	NONE SPECIFIED
Program Manager:	Not reported
Supervisor:	Referred - Not Assigned
Division Branch:	Cleanup Chatsworth
Assembly:	62
Senate:	26
Special Program:	* RCRA 3012 - Past Haz Waste Disp Inven Site
Restricted Use:	NO
Site Mgmt Req:	NONE SPECIFIED
Funding:	Not reported
Latitude:	33.97
Longitude:	-118.4455
APN:	NONE SPECIFIED
Past Use:	NONE SPECIFIED
Potential COC:	* HOUSEHOLD WASTES
Confirmed COC:	NONE SPECIFIED
Potential Description:	NONE SPECIFIED
Alias Name:	VENICE DUMP (TILL 1949)
Alias Type:	Alternate Name
Alias Name:	CAD980636310
Alias Type:	EPA Identification Number
Alias Name:	19490183
Alias Type:	Envirostor ID Number

Completed Info:

Completed Area Name:	PROJECT WIDE
Completed Sub Area Name:	Not reported
Completed Document Type:	* Discovery
Completed Date:	09/28/1983
Comments:	FACILITY IDENTIFIED ID FROM ERRIS
Completed Area Name:	PROJECT WIDE
Completed Sub Area Name:	Not reported
Completed Document Type:	Preliminary Assessment Report
Completed Date:	03/22/1984
Comments:	PRIOR TO 1940'S MARSHLAND. PRIVATE REFUS HAULING & DISP FIRM OPERATED LDFL. IN 1960S MARINA DEL REY WAS DEVELOPED. THE GENERAL AREA OF WASHINGTON/OXFORD HAS BEEN DEVELOPED SUBMIT TO EPA PRELIM ASSESS DONE RCRA 3012
Future Area Name:	Not reported
Future Sub Area Name:	Not reported
Future Document Type:	Not reported
Future Due Date:	Not reported

MARINA DEL REY (Continued) **S100198460**

Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

LA Co. Site Mitigation:
Facility ID: Not reported
Site ID: SD0011179
Jurisdiction: County
Case ID: RO0000994
Abated: Not reported
Assigned To: Not reported
Entered Date: 05/11/2004

Count: 1 records. ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
VENICE	1003878627	DOW CHEMICAL CO VENICE	43RD & PACIFIC AVE	90291	SEMS-ARCHIVE

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 10/30/2015
Date Data Arrived at EDR: 11/07/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 58

Source: EPA
Telephone: N/A
Last EDR Contact: 04/05/2016
Next Scheduled EDR Contact: 04/18/2016
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 6
Telephone: 214-655-6659

EPA Region 3
Telephone 215-814-5418

EPA Region 7
Telephone: 913-551-7247

EPA Region 4
Telephone 404-562-8033

EPA Region 8
Telephone: 303-312-6774

EPA Region 5
Telephone 312-886-6686

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 10/30/2015
Date Data Arrived at EDR: 11/07/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 58

Source: EPA
Telephone: N/A
Last EDR Contact: 04/05/2016
Next Scheduled EDR Contact: 04/18/2016
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal Delisted NPL site list

Delisted NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 10/30/2015
Date Data Arrived at EDR: 11/07/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 58

Source: EPA
Telephone: N/A
Last EDR Contact: 04/05/2016
Next Scheduled EDR Contact: 04/18/2016
Data Release Frequency: Quarterly

Federal CERCLIS list

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 03/26/2015
Date Data Arrived at EDR: 04/08/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 64

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 04/08/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Varies

SEMS: Superfund Enterprise Management System

SEMS (Superfund Enterprise Management System) tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program across the United States. The list was formerly know as CERCLIS, renamed to SEMS by the EPA in 2015. The list contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This dataset also contains sites which are either proposed to or on the National Priorities List (NPL) and the sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 01/11/2016
Date Data Arrived at EDR: 01/22/2016
Date Made Active in Reports: 03/18/2016
Number of Days to Update: 56

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 04/05/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Quarterly

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE: Superfund Enterprise Management System Archive

SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site.

Date of Government Version: 01/11/2016
Date Data Arrived at EDR: 01/22/2016
Date Made Active in Reports: 03/18/2016
Number of Days to Update: 56

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 04/05/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 12/09/2015
Date Data Arrived at EDR: 03/02/2016
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 34

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 12/09/2015
Date Data Arrived at EDR: 03/02/2016
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 34

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/09/2015
Date Data Arrived at EDR: 03/02/2016
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 34

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 12/09/2015
Date Data Arrived at EDR: 03/02/2016
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 34

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/09/2015
Date Data Arrived at EDR: 03/02/2016
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 34

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Varies

Federal institutional controls / engineering controls registries

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 05/28/2015
Date Data Arrived at EDR: 05/29/2015
Date Made Active in Reports: 06/11/2015
Number of Days to Update: 13

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 02/16/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: Varies

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 09/10/2015
Date Data Arrived at EDR: 09/11/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 53

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 02/29/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 09/10/2015
Date Data Arrived at EDR: 09/11/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 53

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 02/29/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 06/22/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 82

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Annually

State- and tribal - equivalent NPL

RESPONSE: State Response Sites

Identifies confirmed release sites where DTSC is involved in remediation, either in a lead or oversight capacity. These confirmed release sites are generally high-priority and high potential risk.

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/03/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 48

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 02/03/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Quarterly

State- and tribal - equivalent CERCLIS

ENVIROSTOR: EnviroStor Database

The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites.

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/03/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 48

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 02/03/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Quarterly

State and tribal landfill and/or solid waste disposal site lists

SWF/LF (SWIS): Solid Waste Information System

Active, Closed and Inactive Landfills. SWF/LF records typically contain an inve ntory of solid waste disposal facilities or landfills. These may be active or i nactive facilities or open dumps that failed to meet RCRA Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 02/15/2016
Date Data Arrived at EDR: 02/17/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 44

Source: Department of Resources Recycling and Recovery
Telephone: 916-341-6320
Last EDR Contact: 02/17/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: Quarterly

State and tribal leaking storage tank lists

LUST REG 3: Leaking Underground Storage Tank Database

Leaking Underground Storage Tank locations. Monterey, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz counties.

Date of Government Version: 05/19/2003
Date Data Arrived at EDR: 05/19/2003
Date Made Active in Reports: 06/02/2003
Number of Days to Update: 14

Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-542-4786
Last EDR Contact: 07/18/2011
Next Scheduled EDR Contact: 10/31/2011
Data Release Frequency: No Update Planned

LUST REG 2: Fuel Leak List

Leaking Underground Storage Tank locations. Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma counties.

Date of Government Version: 09/30/2004
Date Data Arrived at EDR: 10/20/2004
Date Made Active in Reports: 11/19/2004
Number of Days to Update: 30

Source: California Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-622-2433
Last EDR Contact: 09/19/2011
Next Scheduled EDR Contact: 01/02/2012
Data Release Frequency: Quarterly

LUST REG 1: Active Toxic Site Investigation

Del Norte, Humboldt, Lake, Mendocino, Modoc, Siskiyou, Sonoma, Trinity counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/01/2001
Date Data Arrived at EDR: 02/28/2001
Date Made Active in Reports: 03/29/2001
Number of Days to Update: 29

Source: California Regional Water Quality Control Board North Coast (1)
Telephone: 707-570-3769
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

LUST: Geotracker's Leaking Underground Fuel Tank Report

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state. For more information on a particular leaking underground storage tank sites, please contact the appropriate regulatory agency.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 56

Source: State Water Resources Control Board
Telephone: see region list
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Quarterly

LUST REG 4: Underground Storage Tank Leak List

Los Angeles, Ventura counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/07/2004
Date Data Arrived at EDR: 09/07/2004
Date Made Active in Reports: 10/12/2004
Number of Days to Update: 35

Source: California Regional Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6710
Last EDR Contact: 09/06/2011
Next Scheduled EDR Contact: 12/19/2011
Data Release Frequency: No Update Planned

LUST REG 6V: Leaking Underground Storage Tank Case Listing

Leaking Underground Storage Tank locations. Inyo, Kern, Los Angeles, Mono, San Bernardino counties.

Date of Government Version: 06/07/2005
Date Data Arrived at EDR: 06/07/2005
Date Made Active in Reports: 06/29/2005
Number of Days to Update: 22

Source: California Regional Water Quality Control Board Victorville Branch Office (6)
Telephone: 760-241-7365
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: No Update Planned

LUST REG 6L: Leaking Underground Storage Tank Case Listing
For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/09/2003
Date Data Arrived at EDR: 09/10/2003
Date Made Active in Reports: 10/07/2003
Number of Days to Update: 27

Source: California Regional Water Quality Control Board Lahontan Region (6)
Telephone: 530-542-5572
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: No Update Planned

LUST REG 9: Leaking Underground Storage Tank Report
Orange, Riverside, San Diego counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 03/01/2001
Date Data Arrived at EDR: 04/23/2001
Date Made Active in Reports: 05/21/2001
Number of Days to Update: 28

Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-637-5595
Last EDR Contact: 09/26/2011
Next Scheduled EDR Contact: 01/09/2012
Data Release Frequency: No Update Planned

LUST REG 8: Leaking Underground Storage Tanks
California Regional Water Quality Control Board Santa Ana Region (8). For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/14/2005
Date Data Arrived at EDR: 02/15/2005
Date Made Active in Reports: 03/28/2005
Number of Days to Update: 41

Source: California Regional Water Quality Control Board Santa Ana Region (8)
Telephone: 909-782-4496
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: Varies

LUST REG 7: Leaking Underground Storage Tank Case Listing
Leaking Underground Storage Tank locations. Imperial, Riverside, San Diego, Santa Barbara counties.

Date of Government Version: 02/26/2004
Date Data Arrived at EDR: 02/26/2004
Date Made Active in Reports: 03/24/2004
Number of Days to Update: 27

Source: California Regional Water Quality Control Board Colorado River Basin Region (7)
Telephone: 760-776-8943
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

LUST REG 5: Leaking Underground Storage Tank Database
Leaking Underground Storage Tank locations. Alameda, Alpine, Amador, Butte, Colusa, Contra Costa, Calveras, El Dorado, Fresno, Glenn, Kern, Kings, Lake, Lassen, Madera, Mariposa, Merced, Modoc, Napa, Nevada, Placer, Plumas, Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Yolo, Yuba counties.

Date of Government Version: 07/01/2008
Date Data Arrived at EDR: 07/22/2008
Date Made Active in Reports: 07/31/2008
Number of Days to Update: 9

Source: California Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-4834
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: No Update Planned

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 01/07/2016
Date Data Arrived at EDR: 01/08/2016
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 41

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 01/08/2015
Date Data Arrived at EDR: 01/08/2015
Date Made Active in Reports: 02/09/2015
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 01/27/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Quarterly

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 10/13/2015
Date Data Arrived at EDR: 10/23/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 118

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Quarterly

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 03/30/2015
Date Data Arrived at EDR: 04/28/2015
Date Made Active in Reports: 06/22/2015
Number of Days to Update: 55

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 08/20/2015
Date Data Arrived at EDR: 10/30/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 111

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 11/24/2015
Date Data Arrived at EDR: 12/01/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 34

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Semi-Annually

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 10/27/2015
Date Data Arrived at EDR: 10/29/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 67

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 11/04/2015
Date Data Arrived at EDR: 11/13/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 52

Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

SLIC: Statewide SLIC Cases

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 56

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Varies

SLIC REG 1: Active Toxic Site Investigations

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/03/2003
Date Data Arrived at EDR: 04/07/2003
Date Made Active in Reports: 04/25/2003
Number of Days to Update: 18

Source: California Regional Water Quality Control Board, North Coast Region (1)
Telephone: 707-576-2220
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

SLIC REG 2: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/30/2004
Date Data Arrived at EDR: 10/20/2004
Date Made Active in Reports: 11/19/2004
Number of Days to Update: 30

Source: Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-286-0457
Last EDR Contact: 09/19/2011
Next Scheduled EDR Contact: 01/02/2012
Data Release Frequency: Quarterly

SLIC REG 3: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 05/18/2006
Date Data Arrived at EDR: 05/18/2006
Date Made Active in Reports: 06/15/2006
Number of Days to Update: 28

Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-549-3147
Last EDR Contact: 07/18/2011
Next Scheduled EDR Contact: 10/31/2011
Data Release Frequency: Semi-Annually

SLIC REG 4: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 11/17/2004
Date Data Arrived at EDR: 11/18/2004
Date Made Active in Reports: 01/04/2005
Number of Days to Update: 47

Source: Region Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6600
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: Varies

SLIC REG 5: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing

The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/01/2005
Date Data Arrived at EDR: 04/05/2005
Date Made Active in Reports: 04/21/2005
Number of Days to Update: 16

Source: Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-3291
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: Semi-Annually

SLIC REG 6V: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 05/24/2005
Date Data Arrived at EDR: 05/25/2005
Date Made Active in Reports: 06/16/2005
Number of Days to Update: 22

Source: Regional Water Quality Control Board, Victorville Branch
Telephone: 619-241-6583
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: Semi-Annually

SLIC REG 6L: SLIC Sites
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/07/2004
Date Data Arrived at EDR: 09/07/2004
Date Made Active in Reports: 10/12/2004
Number of Days to Update: 35

Source: California Regional Water Quality Control Board, Lahontan Region
Telephone: 530-542-5574
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

SLIC REG 7: SLIC List
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 11/24/2004
Date Data Arrived at EDR: 11/29/2004
Date Made Active in Reports: 01/04/2005
Number of Days to Update: 36

Source: California Regional Quality Control Board, Colorado River Basin Region
Telephone: 760-346-7491
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

SLIC REG 8: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/03/2008
Date Data Arrived at EDR: 04/03/2008
Date Made Active in Reports: 04/14/2008
Number of Days to Update: 11

Source: California Region Water Quality Control Board Santa Ana Region (8)
Telephone: 951-782-3298
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: Semi-Annually

SLIC REG 9: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/10/2007
Date Data Arrived at EDR: 09/11/2007
Date Made Active in Reports: 09/28/2007
Number of Days to Update: 17

Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-467-2980
Last EDR Contact: 08/08/2011
Next Scheduled EDR Contact: 11/21/2011
Data Release Frequency: Annually

State and tribal registered storage tank lists

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 04/11/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

UST: Active UST Facilities
Active UST facilities gathered from the local regulatory agencies

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 56

Source: SWRCB
Telephone: 916-341-5851
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Semi-Annually

AST: Aboveground Petroleum Storage Tank Facilities
A listing of aboveground storage tank petroleum storage tank locations.

Date of Government Version: 08/01/2009
Date Data Arrived at EDR: 09/10/2009
Date Made Active in Reports: 10/01/2009
Number of Days to Update: 21

Source: California Environmental Protection Agency
Telephone: 916-327-5092
Last EDR Contact: 03/11/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 12/14/2014
Date Data Arrived at EDR: 02/13/2015
Date Made Active in Reports: 03/13/2015
Number of Days to Update: 28

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 01/27/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Quarterly

INDIAN UST R8: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 10/13/2015
Date Data Arrived at EDR: 10/23/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 118

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Quarterly

INDIAN UST R7: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 09/23/2014
Date Data Arrived at EDR: 11/25/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 65

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 08/20/2015
Date Data Arrived at EDR: 10/30/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 111

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Semi-Annually

INDIAN UST R1: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 10/20/2015
Date Data Arrived at EDR: 10/29/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 67

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 11/24/2015
Date Data Arrived at EDR: 12/01/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 34

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Semi-Annually

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 11/05/2015
Date Data Arrived at EDR: 11/13/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 52

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

INDIAN UST R10: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 01/07/2016
Date Data Arrived at EDR: 01/08/2016
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 41

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Quarterly

State and tribal voluntary cleanup sites

VCP: Voluntary Cleanup Program Properties

Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC's costs.

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/03/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 48

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 02/03/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Quarterly

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

INDIAN VCP R1: Voluntary Cleanup Priority Listing
A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 07/27/2015
Date Data Arrived at EDR: 09/29/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 142

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 04/01/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Varies

State and tribal Brownfields sites

BROWNFIELDS: Considered Brownfieds Sites Listing
A listing of sites the SWRCB considers to be Brownfields since these are sites have come to them through the MOA Process.

Date of Government Version: 12/04/2015
Date Data Arrived at EDR: 12/08/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 44

Source: State Water Resources Control Board
Telephone: 916-323-7905
Last EDR Contact: 03/07/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Varies

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites
Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 12/22/2015
Date Data Arrived at EDR: 12/23/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 57

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 03/22/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

WMUDS/SWAT: Waste Management Unit Database
Waste Management Unit Database System. WMUDS is used by the State Water Resources Control Board staff and the Regional Water Quality Control Boards for program tracking and inventory of waste management units. WMUDS is composed of the following databases: Facility Information, Scheduled Inspections Information, Waste Management Unit Information, SWAT Program Information, SWAT Report Summary Information, SWAT Report Summary Data, Chapter 15 (formerly Subchapter 15) Information, Chapter 15 Monitoring Parameters, TPCA Program Information, RCRA Program Information, Closure Information, and Interested Parties Information.

Date of Government Version: 04/01/2000
Date Data Arrived at EDR: 04/10/2000
Date Made Active in Reports: 05/10/2000
Number of Days to Update: 30

Source: State Water Resources Control Board
Telephone: 916-227-4448
Last EDR Contact: 02/08/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: No Update Planned

SWRCY: Recycler Database
A listing of recycling facilities in California.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/17/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 53

Source: Department of Conservation
Telephone: 916-323-3836
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Quarterly

HAULERS: Registered Waste Tire Haulers Listing
A listing of registered waste tire haulers.

Date of Government Version: 11/23/2015
Date Data Arrived at EDR: 11/24/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 58

Source: Integrated Waste Management Board
Telephone: 916-341-6422
Last EDR Contact: 02/14/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 02/01/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Varies

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations
A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory
An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL: National Clandestine Laboratory Register
A listing of clandestine drug lab locations that have been removed from the DEAs National Clandestine Laboratory Register.

Date of Government Version: 09/17/2015
Date Data Arrived at EDR: 12/04/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 76

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/01/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: No Update Planned

HIST CAL-SITES: Calsites Database
The Calsites database contains potential or confirmed hazardous substance release properties. In 1996, California EPA reevaluated and significantly reduced the number of sites in the Calsites database. No longer updated by the state agency. It has been replaced by ENVIROSTOR.

Date of Government Version: 08/08/2005
Date Data Arrived at EDR: 08/03/2006
Date Made Active in Reports: 08/24/2006
Number of Days to Update: 21

Source: Department of Toxic Substance Control
Telephone: 916-323-3400
Last EDR Contact: 02/23/2009
Next Scheduled EDR Contact: 05/25/2009
Data Release Frequency: No Update Planned

SCH: School Property Evaluation Program

This category contains proposed and existing school sites that are being evaluated by DTSC for possible hazardous materials contamination. In some cases, these properties may be listed in the CalSites category depending on the level of threat to public health and safety or the environment they pose.

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/03/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 48

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 02/03/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Quarterly

CDL: Clandestine Drug Labs

A listing of drug lab locations. Listing of a location in this database does not indicate that any illegal drug lab materials were or were not present there, and does not constitute a determination that the location either requires or does not require additional cleanup work.

Date of Government Version: 09/30/2015
Date Data Arrived at EDR: 01/19/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 63

Source: Department of Toxic Substances Control
Telephone: 916-255-6504
Last EDR Contact: 04/11/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Varies

TOXIC PITS: Toxic Pits Cleanup Act Sites

Toxic PITS Cleanup Act Sites. TOXIC PITS identifies sites suspected of containing hazardous substances where cleanup has not yet been completed.

Date of Government Version: 07/01/1995
Date Data Arrived at EDR: 08/30/1995
Date Made Active in Reports: 09/26/1995
Number of Days to Update: 27

Source: State Water Resources Control Board
Telephone: 916-227-4364
Last EDR Contact: 01/26/2009
Next Scheduled EDR Contact: 04/27/2009
Data Release Frequency: No Update Planned

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/17/2015
Date Data Arrived at EDR: 12/04/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 76

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/01/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Quarterly

Local Lists of Registered Storage Tanks

SWEEPS UST: SWEEPS UST Listing

Statewide Environmental Evaluation and Planning System. This underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1990's. The listing is no longer updated or maintained. The local agency is the contact for more information on a site on the SWEEPS list.

Date of Government Version: 06/01/1994
Date Data Arrived at EDR: 07/07/2005
Date Made Active in Reports: 08/11/2005
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: N/A
Last EDR Contact: 06/03/2005
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

UST MENDOCINO: Mendocino County UST Database
A listing of underground storage tank locations in Mendocino County.

Date of Government Version: 11/25/2015
Date Data Arrived at EDR: 12/01/2015
Date Made Active in Reports: 12/17/2015
Number of Days to Update: 16

Source: Department of Public Health
Telephone: 707-463-4466
Last EDR Contact: 03/28/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Annually

HIST UST: Hazardous Substance Storage Container Database
The Hazardous Substance Storage Container Database is a historical listing of UST sites. Refer to local/county source for current data.

Date of Government Version: 10/15/1990
Date Data Arrived at EDR: 01/25/1991
Date Made Active in Reports: 02/12/1991
Number of Days to Update: 18

Source: State Water Resources Control Board
Telephone: 916-341-5851
Last EDR Contact: 07/26/2001
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CA FID UST: Facility Inventory Database
The Facility Inventory Database (FID) contains a historical listing of active and inactive underground storage tank locations from the State Water Resource Control Board. Refer to local/county source for current data.

Date of Government Version: 10/31/1994
Date Data Arrived at EDR: 09/05/1995
Date Made Active in Reports: 09/29/1995
Number of Days to Update: 24

Source: California Environmental Protection Agency
Telephone: 916-341-5851
Last EDR Contact: 12/28/1998
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Local Land Records

LIENS: Environmental Liens Listing
A listing of property locations with environmental liens for California where DTSC is a lien holder.

Date of Government Version: 12/17/2015
Date Data Arrived at EDR: 12/22/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 48

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 03/07/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Varies

LIENS 2: CERCLA Lien Information
A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/18/2014
Date Data Arrived at EDR: 03/18/2014
Date Made Active in Reports: 04/24/2014
Number of Days to Update: 37

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 03/11/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

DEED: Deed Restriction Listing

Site Mitigation and Brownfields Reuse Program Facility Sites with Deed Restrictions & Hazardous Waste Management Program Facility Sites with Deed / Land Use Restriction. The DTSC Site Mitigation and Brownfields Reuse Program (SMBRP) list includes sites cleaned up under the program's oversight and generally does not include current or former hazardous waste facilities that required a hazardous waste facility permit. The list represents deed restrictions that are active. Some sites have multiple deed restrictions. The DTSC Hazardous Waste Management Program (HWMP) has developed a list of current or former hazardous waste facilities that have a recorded land use restriction at the local county recorder's office. The land use restrictions on this list were required by the DTSC HWMP as a result of the presence of hazardous substances that remain on site after the facility (or part of the facility) has been closed or cleaned up. The types of land use restriction include deed notice, deed restriction, or a land use restriction that binds current and future owners.

Date of Government Version: 12/07/2015
Date Data Arrived at EDR: 12/08/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 44
Source: DTSC and SWRCB
Telephone: 916-323-3400
Last EDR Contact: 03/08/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Semi-Annually

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 06/24/2015
Date Data Arrived at EDR: 06/26/2015
Date Made Active in Reports: 09/02/2015
Number of Days to Update: 68
Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Annually

CHMIRS: California Hazardous Material Incident Report System

California Hazardous Material Incident Reporting System. CHMIRS contains information on reported hazardous material incidents (accidental releases or spills).

Date of Government Version: 12/16/2015
Date Data Arrived at EDR: 01/27/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 55
Source: Office of Emergency Services
Telephone: 916-845-8400
Last EDR Contact: 01/27/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

LDS: Land Disposal Sites Listing

The Land Disposal program regulates of waste discharge to land for treatment, storage and disposal in waste management units.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 56
Source: State Water Qualilty Control Board
Telephone: 866-480-1028
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Quarterly

MCS: Military Cleanup Sites Listing

The State Water Resources Control Board and nine Regional Water Quality Control Boards partner with the Department of Defense (DoD) through the Defense and State Memorandum of Agreement (DSMOA) to oversee the investigation and remediation of water quality issues at military facilities.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 56
Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Quarterly

SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 06/06/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/22/2013
Number of Days to Update: 50

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 12/09/2015
Date Data Arrived at EDR: 03/02/2016
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 34

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Varies

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 01/31/2015
Date Data Arrived at EDR: 07/08/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 97

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 03/11/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 01/15/2016
Next Scheduled EDR Contact: 04/25/2016
Data Release Frequency: Semi-Annually

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 01/15/2016
Next Scheduled EDR Contact: 04/25/2016
Data Release Frequency: N/A

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54
Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 02/19/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 09/01/2015
Date Data Arrived at EDR: 09/03/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 61
Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 02/16/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88
Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 02/09/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 04/22/2013
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 6
Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 02/12/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Varies

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 01/15/2015
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 14
Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 03/24/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: Every 4 Years

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 11/24/2015
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 133

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 02/24/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Annually

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Annually

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 11/25/2013
Date Data Arrived at EDR: 12/12/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 74

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 03/08/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Annually

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 08/01/2015
Date Data Arrived at EDR: 08/26/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 69

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

PRP: Potentially Responsible Parties
A listing of verified Potentially Responsible Parties

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 10/17/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 3
Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 02/12/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

PADS: PCB Activity Database System
PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 10/15/2014
Date Made Active in Reports: 11/17/2014
Number of Days to Update: 33
Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/12/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System
The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 01/23/2015
Date Data Arrived at EDR: 02/06/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 31
Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 04/08/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Quarterly

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25
Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25
Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Quarterly

MLTS: Material Licensing Tracking System
MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 06/26/2015
Date Data Arrived at EDR: 07/10/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 95
Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 02/08/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

COAL ASH DOE: Steam-Electric Plant Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76
Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 01/13/2016
Next Scheduled EDR Contact: 04/25/2016
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 40
Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 03/11/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83
Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 01/29/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

RADINFO: Radiation Information Database
The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 07/07/2015
Date Data Arrived at EDR: 07/09/2015
Date Made Active in Reports: 09/16/2015
Number of Days to Update: 69
Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 04/08/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40
Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 02/03/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 04/17/2015
Date Made Active in Reports: 06/02/2015
Number of Days to Update: 46

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 03/24/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 09/30/2015
Number of Days to Update: 218

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 02/26/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Biennially

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 01/15/2016
Next Scheduled EDR Contact: 04/25/2016
Data Release Frequency: Semi-Annually

FUSRAP: Formerly Utilized Sites Remedial Action Program

DOE established the Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1974 to remediate sites where radioactive contamination remained from Manhattan Project and early U.S. Atomic Energy Commission (AEC) operations.

Date of Government Version: 11/23/2015
Date Data Arrived at EDR: 11/24/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 86

Source: Department of Energy
Telephone: 202-586-3559
Last EDR Contact: 02/08/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Varies

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 03/28/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

LEAD SMELTER 1: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 11/25/2014
Date Data Arrived at EDR: 11/26/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 64

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 04/07/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)

The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/20/2015
Date Data Arrived at EDR: 10/27/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 69

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 03/24/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data

A listing of minor source facilities.

Date of Government Version: 10/20/2015
Date Data Arrived at EDR: 10/27/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 69

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 03/24/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Annually

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/18/2015
Date Data Arrived at EDR: 09/01/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 125

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 03/02/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Semi-Annually

US MINES 2: Ferrous and Nonferrous Metal Mines Database Listing

This map layer includes ferrous (ferrous metal mines are facilities that extract ferrous metals, such as iron ore or molybdenum) and nonferrous (Nonferrous metal mines are facilities that extract nonferrous metals, such as gold, silver, copper, zinc, and lead) metal mines in the United States.

Date of Government Version: 12/05/2005
Date Data Arrived at EDR: 02/29/2008
Date Made Active in Reports: 04/18/2008
Number of Days to Update: 49

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 03/04/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Varies

US MINES 3: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 03/04/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Varies

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 07/20/2015
Date Data Arrived at EDR: 09/09/2015
Date Made Active in Reports: 11/03/2015
Number of Days to Update: 55

Source: EPA
Telephone: (415) 947-8000
Last EDR Contact: 03/08/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Quarterly

CA BOND EXP. PLAN: Bond Expenditure Plan

Department of Health Services developed a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Act funds. It is not updated.

Date of Government Version: 01/01/1989
Date Data Arrived at EDR: 07/27/1994
Date Made Active in Reports: 08/02/1994
Number of Days to Update: 6

Source: Department of Health Services
Telephone: 916-255-2118
Last EDR Contact: 05/31/1994
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CORTESE: "Cortese" Hazardous Waste & Substances Sites List

The sites for the list are designated by the State Water Resource Control Board (LUST), the Integrated Waste Board (SWF/LS), and the Department of Toxic Substances Control (Cal-Sites).

Date of Government Version: 12/28/2015
Date Data Arrived at EDR: 12/29/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 23

Source: CAL EPA/Office of Emergency Information
Telephone: 916-323-3400
Last EDR Contact: 03/30/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Quarterly

DRYCLEANERS: Cleaner Facilities

A list of drycleaner related facilities that have EPA ID numbers. These are facilities with certain SIC codes: power laundries, family and commercial; garment pressing and cleaner's agents; linen supply; coin-operated laundries and cleaning; drycleaning plants, except rugs; carpet and upholster cleaning; industrial launderers; laundry and garment services.

Date of Government Version: 02/08/2016
Date Data Arrived at EDR: 02/24/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 37

Source: Department of Toxic Substance Control
Telephone: 916-327-4498
Last EDR Contact: 02/05/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Annually

EMI: Emissions Inventory Data
Toxics and criteria pollutant emissions data collected by the ARB and local air pollution agencies.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 09/25/2015
Date Made Active in Reports: 11/05/2015
Number of Days to Update: 41
Source: California Air Resources Board
Telephone: 916-322-2990
Last EDR Contact: 03/22/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: Varies

ENF: Enforcement Action Listing
A listing of Water Board Enforcement Actions. Formal is everything except Oral/Verbal Communication, Notice of Violation, Expedited Payment Letter, and Staff Enforcement Letter.

Date of Government Version: 01/26/2016
Date Data Arrived at EDR: 01/29/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 53
Source: State Water Resoruces Control Board
Telephone: 916-445-9379
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

Financial Assurance 1: Financial Assurance Information Listing
Financial Assurance information

Date of Government Version: 01/28/2016
Date Data Arrived at EDR: 01/29/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 53
Source: Department of Toxic Substances Control
Telephone: 916-255-3628
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

Financial Assurance 2: Financial Assurance Information Listing
A listing of financial assurance information for solid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 02/17/2016
Date Data Arrived at EDR: 02/23/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 38
Source: California Integrated Waste Management Board
Telephone: 916-341-6066
Last EDR Contact: 02/16/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: Varies

HAZNET: Facility and Manifest Data
Facility and Manifest Data. The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000 - 1,000,000 annually, representing approximately 350,000 - 500,000 shipments. Data are from the manifests submitted without correction, and therefore many contain some invalid values for data elements such as generator ID, TSD ID, waste category, and disposal method. This database begins with calendar year 1993.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 10/14/2015
Date Made Active in Reports: 12/11/2015
Number of Days to Update: 58
Source: California Environmental Protection Agency
Telephone: 916-255-1136
Last EDR Contact: 01/11/2016
Next Scheduled EDR Contact: 04/25/2016
Data Release Frequency: Annually

HIST CORTESE: Hazardous Waste & Substance Site List
The sites for the list are designated by the State Water Resource Control Board [LUST], the Integrated Waste Board [SWF/LS], and the Department of Toxic Substances Control [CALSITES]. This listing is no longer updated by the state agency.

Date of Government Version: 04/01/2001
Date Data Arrived at EDR: 01/22/2009
Date Made Active in Reports: 04/08/2009
Number of Days to Update: 76
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 01/22/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

HWP: EnviroStor Permitted Facilities Listing
Detailed information on permitted hazardous waste facilities and corrective action ("cleanups") tracked in EnviroStor.

Date of Government Version: 02/22/2016
Date Data Arrived at EDR: 02/24/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 37
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 02/24/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Quarterly

HWT: Registered Hazardous Waste Transporter Database
A listing of hazardous waste transporters. In California, unless specifically exempted, it is unlawful for any person to transport hazardous wastes unless the person holds a valid registration issued by DTSC. A hazardous waste transporter registration is valid for one year and is assigned a unique registration number.

Date of Government Version: 01/11/2016
Date Data Arrived at EDR: 01/13/2016
Date Made Active in Reports: 02/22/2016
Number of Days to Update: 40
Source: Department of Toxic Substances Control
Telephone: 916-440-7145
Last EDR Contact: 04/12/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Quarterly

MINES: Mines Site Location Listing
A listing of mine site locations from the Office of Mine Reclamation.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/17/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 53
Source: Department of Conservation
Telephone: 916-322-1080
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Varies

MWMP: Medical Waste Management Program Listing
The Medical Waste Management Program (MWMP) ensures the proper handling and disposal of medical waste by permitting and inspecting medical waste Offsite Treatment Facilities (PDF) and Transfer Stations (PDF) throughout the state. MWMP also oversees all Medical Waste Transporters.

Date of Government Version: 11/10/2015
Date Data Arrived at EDR: 12/08/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 44
Source: Department of Public Health
Telephone: 916-558-1784
Last EDR Contact: 03/08/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Varies

NPDES: NPDES Permits Listing
A listing of NPDES permits, including stormwater.

Date of Government Version: 02/16/2016
Date Data Arrived at EDR: 02/17/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 44
Source: State Water Resources Control Board
Telephone: 916-445-9379
Last EDR Contact: 02/17/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: Quarterly

PEST LIC: Pesticide Regulation Licenses Listing
A listing of licenses and certificates issued by the Department of Pesticide Regulation. The DPR issues licenses and/or certificates to: Persons and businesses that apply or sell pesticides; Pest control dealers and brokers; Persons who advise on agricultural pesticide applications.

Date of Government Version: 12/07/2015
Date Data Arrived at EDR: 12/08/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 44
Source: Department of Pesticide Regulation
Telephone: 916-445-4038
Last EDR Contact: 03/08/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Quarterly

PROC: Certified Processors Database
A listing of certified processors.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/17/2015
Date Made Active in Reports: 03/01/2016
Number of Days to Update: 75
Source: Department of Conservation
Telephone: 916-323-3836
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Quarterly

NOTIFY 65: Proposition 65 Records
Listings of all Proposition 65 incidents reported to counties by the State Water Resources Control Board and the Regional Water Quality Control Board. This database is no longer updated by the reporting agency.

Date of Government Version: 09/10/2015
Date Data Arrived at EDR: 01/05/2016
Date Made Active in Reports: 02/12/2016
Number of Days to Update: 38
Source: State Water Resources Control Board
Telephone: 916-445-3846
Last EDR Contact: 04/04/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: No Update Planned

UIC: UIC Listing
A listing of wells identified as underground injection wells, in the California Oil and Gas Wells database.

Date of Government Version: 07/23/2015
Date Data Arrived at EDR: 09/15/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 28
Source: Deaprtment of Conservation
Telephone: 916-445-2408
Last EDR Contact: 03/16/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Varies

WASTEWATER PITS: Oil Wastewater Pits Listing
Water officials discovered that oil producers have been dumping chemical-laden wastewater into hundreds of unlined pits that are operating without proper permits. Inspections completed by the Central Valley Regional Water Quality Control Board revealed the existence of previously unidentified waste sites. The water board?s review found that more than one-third of the region?s active disposal pits are operating without permission.

Date of Government Version: 04/15/2015
Date Data Arrived at EDR: 04/17/2015
Date Made Active in Reports: 06/23/2015
Number of Days to Update: 67
Source: RWQCB, Central Valley Region
Telephone: 559-445-5577
Last EDR Contact: 01/15/2016
Next Scheduled EDR Contact: 04/25/2016
Data Release Frequency: Varies

WDS: Waste Discharge System
Sites which have been issued waste discharge requirements.

Date of Government Version: 06/19/2007
Date Data Arrived at EDR: 06/20/2007
Date Made Active in Reports: 06/29/2007
Number of Days to Update: 9
Source: State Water Resources Control Board
Telephone: 916-341-5227
Last EDR Contact: 02/19/2016
Next Scheduled EDR Contact: 06/16/2016
Data Release Frequency: Quarterly

WIP: Well Investigation Program Case List
Well Investigation Program case in the San Gabriel and San Fernando Valley area.

Date of Government Version: 07/03/2009
Date Data Arrived at EDR: 07/21/2009
Date Made Active in Reports: 08/03/2009
Number of Days to Update: 13
Source: Los Angeles Water Quality Control Board
Telephone: 213-576-6726
Last EDR Contact: 03/28/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Varies

ECHO: Enforcement & Compliance History Information
ECHO provides integrated compliance and enforcement information for about 800,000 regulated facilities nationwide.

Date of Government Version: 09/20/2015
Date Data Arrived at EDR: 09/23/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 103

Source: Environmental Protection Agency
Telephone: 202-564-2280
Last EDR Contact: 03/23/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: Quarterly

FUELS PROGRAM: EPA Fuels Program Registered Listing

This listing includes facilities that are registered under the Part 80 (Code of Federal Regulations) EPA Fuels Programs. All companies now are required to submit new and updated registrations.

Date of Government Version: 11/23/2015
Date Data Arrived at EDR: 11/24/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 86

Source: EPA
Telephone: 800-385-6164
Last EDR Contact: 02/24/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Quarterly

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR Hist Auto: EDR Exclusive Historic Gas Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR Hist Cleaner: EDR Exclusive Historic Dry Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Resources Recycling and Recovery in California.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/13/2014
Number of Days to Update: 196

Source: Department of Resources Recycling and Recovery
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the State Water Resources Control Board in California.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 12/30/2013
Number of Days to Update: 182

Source: State Water Resources Control Board
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

COUNTY RECORDS

ALAMEDA COUNTY:

Contaminated Sites

A listing of contaminated sites overseen by the Toxic Release Program (oil and groundwater contamination from chemical releases and spills) and the Leaking Underground Storage Tank Program (soil and ground water contamination from leaking petroleum USTs).

Date of Government Version: 01/11/2016
Date Data Arrived at EDR: 01/12/2016
Date Made Active in Reports: 02/22/2016
Number of Days to Update: 41

Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
Last EDR Contact: 04/11/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Semi-Annually

Underground Tanks

Underground storage tank sites located in Alameda county.

Date of Government Version: 01/11/2016
Date Data Arrived at EDR: 01/14/2016
Date Made Active in Reports: 03/01/2016
Number of Days to Update: 47

Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
Last EDR Contact: 04/11/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Semi-Annually

AMADOR COUNTY:

CUPA Facility List
Cupa Facility List

Date of Government Version: 11/16/2015
Date Data Arrived at EDR: 12/10/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 42

Source: Amador County Environmental Health
Telephone: 209-223-6439
Last EDR Contact: 03/21/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Varies

BUTTE COUNTY:

CUPA Facility Listing
Cupa facility list.

Date of Government Version: 02/19/2016
Date Data Arrived at EDR: 02/23/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 38

Source: Public Health Department
Telephone: 530-538-7149
Last EDR Contact: 04/11/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: No Update Planned

CALVERAS COUNTY:

CUPA Facility Listing
Cupa Facility Listing

Date of Government Version: 02/02/2016
Date Data Arrived at EDR: 02/04/2016
Date Made Active in Reports: 02/22/2016
Number of Days to Update: 18

Source: Calveras County Environmental Health
Telephone: 209-754-6399
Last EDR Contact: 03/28/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Quarterly

COLUSA COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 02/22/2016
Date Data Arrived at EDR: 02/24/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 37

Source: Health & Human Services
Telephone: 530-458-0396
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Varies

CONTRA COSTA COUNTY:

Site List
List includes sites from the underground tank, hazardous waste generator and business plan/2185 programs.

Date of Government Version: 02/24/2016
Date Data Arrived at EDR: 02/26/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 35

Source: Contra Costa Health Services Department
Telephone: 925-646-2286
Last EDR Contact: 02/01/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Semi-Annually

DEL NORTE COUNTY:

CUPA Facility List
Cupa Facility list

Date of Government Version: 01/22/2016
Date Data Arrived at EDR: 02/05/2016
Date Made Active in Reports: 03/07/2016
Number of Days to Update: 31

Source: Del Norte County Environmental Health Division
Telephone: 707-465-0426
Last EDR Contact: 02/01/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Varies

EL DORADO COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 02/22/2016
Date Data Arrived at EDR: 02/24/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 37

Source: El Dorado County Environmental Management Department
Telephone: 530-621-6623
Last EDR Contact: 02/01/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Varies

FRESNO COUNTY:

CUPA Resources List
Certified Unified Program Agency. CUPA's are responsible for implementing a unified hazardous materials and hazardous waste management regulatory program. The agency provides oversight of businesses that deal with hazardous materials, operate underground storage tanks or aboveground storage tanks.

Date of Government Version: 01/05/2016
Date Data Arrived at EDR: 01/08/2016
Date Made Active in Reports: 02/22/2016
Number of Days to Update: 45

Source: Dept. of Community Health
Telephone: 559-445-3271
Last EDR Contact: 04/04/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Semi-Annually

HUMBOLDT COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 12/02/2015
Date Data Arrived at EDR: 12/04/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 48

Source: Humboldt County Environmental Health
Telephone: N/A
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

IMPERIAL COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 01/25/2016
Date Data Arrived at EDR: 01/27/2016
Date Made Active in Reports: 02/22/2016
Number of Days to Update: 26

Source: San Diego Border Field Office
Telephone: 760-339-2777
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

INYO COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 09/10/2013
Date Data Arrived at EDR: 09/11/2013
Date Made Active in Reports: 10/14/2013
Number of Days to Update: 33

Source: Inyo County Environmental Health Services
Telephone: 760-878-0238
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

KERN COUNTY:

Underground Storage Tank Sites & Tank Listing
Kern County Sites and Tanks Listing.

Date of Government Version: 05/19/2015
Date Data Arrived at EDR: 06/18/2015
Date Made Active in Reports: 07/22/2015
Number of Days to Update: 34

Source: Kern County Environment Health Services Department
Telephone: 661-862-8700
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

KINGS COUNTY:

CUPA Facility List
A listing of sites included in the county's Certified Unified Program Agency database. California's Secretary for Environmental Protection established the unified hazardous materials and hazardous waste regulatory program as required by chapter 6.11 of the California Health and Safety Code. The Unified Program consolidates the administration, permits, inspections, and enforcement activities.

Date of Government Version: 02/23/2016
Date Data Arrived at EDR: 02/25/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 36

Source: Kings County Department of Public Health
Telephone: 559-584-1411
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

LAKE COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 02/09/2016
Date Data Arrived at EDR: 02/12/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 49

Source: Lake County Environmental Health
Telephone: 707-263-1164
Last EDR Contact: 01/19/2016
Next Scheduled EDR Contact: 05/02/2016
Data Release Frequency: Varies

LOS ANGELES COUNTY:

San Gabriel Valley Areas of Concern
San Gabriel Valley areas where VOC contamination is at or above the MCL as designated by region 9 EPA office.

Date of Government Version: 03/30/2009
Date Data Arrived at EDR: 03/31/2009
Date Made Active in Reports: 10/23/2009
Number of Days to Update: 206

Source: EPA Region 9
Telephone: 415-972-3178
Last EDR Contact: 03/21/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: No Update Planned

HMS: Street Number List
Industrial Waste and Underground Storage Tank Sites.

Date of Government Version: 11/24/2014
Date Data Arrived at EDR: 01/30/2015
Date Made Active in Reports: 03/04/2015
Number of Days to Update: 33
Source: Department of Public Works
Telephone: 626-458-3517
Last EDR Contact: 04/01/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Semi-Annually

List of Solid Waste Facilities
Solid Waste Facilities in Los Angeles County.

Date of Government Version: 01/19/2016
Date Data Arrived at EDR: 01/20/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 62
Source: La County Department of Public Works
Telephone: 818-458-5185
Last EDR Contact: 01/20/2016
Next Scheduled EDR Contact: 05/02/2016
Data Release Frequency: Varies

City of Los Angeles Landfills
Landfills owned and maintained by the City of Los Angeles.

Date of Government Version: 01/01/2016
Date Data Arrived at EDR: 01/26/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 56
Source: Engineering & Construction Division
Telephone: 213-473-7869
Last EDR Contact: 01/19/2016
Next Scheduled EDR Contact: 05/02/2016
Data Release Frequency: Varies

Site Mitigation List
Industrial sites that have had some sort of spill or complaint.

Date of Government Version: 01/15/2015
Date Data Arrived at EDR: 01/29/2015
Date Made Active in Reports: 03/10/2015
Number of Days to Update: 40
Source: Community Health Services
Telephone: 323-890-7806
Last EDR Contact: 03/28/2016
Next Scheduled EDR Contact: 05/02/2016
Data Release Frequency: Annually

City of El Segundo Underground Storage Tank
Underground storage tank sites located in El Segundo city.

Date of Government Version: 03/30/2015
Date Data Arrived at EDR: 04/02/2015
Date Made Active in Reports: 04/13/2015
Number of Days to Update: 11
Source: City of El Segundo Fire Department
Telephone: 310-524-2236
Last EDR Contact: 02/16/2016
Next Scheduled EDR Contact: 05/02/2016
Data Release Frequency: Semi-Annually

City of Long Beach Underground Storage Tank
Underground storage tank sites located in the city of Long Beach.

Date of Government Version: 11/04/2015
Date Data Arrived at EDR: 11/13/2015
Date Made Active in Reports: 12/17/2015
Number of Days to Update: 34
Source: City of Long Beach Fire Department
Telephone: 562-570-2563
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Annually

City of Torrance Underground Storage Tank
Underground storage tank sites located in the city of Torrance.

Date of Government Version: 01/12/2016
Date Data Arrived at EDR: 01/15/2016
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 24
Source: City of Torrance Fire Department
Telephone: 310-618-2973
Last EDR Contact: 01/11/2016
Next Scheduled EDR Contact: 04/25/2016
Data Release Frequency: Semi-Annually

MADERA COUNTY:

CUPA Facility List

A listing of sites included in the county's Certified Unified Program Agency database. California's Secretary for Environmental Protection established the unified hazardous materials and hazardous waste regulatory program as required by chapter 6.11 of the California Health and Safety Code. The Unified Program consolidates the administration, permits, inspections, and enforcement activities.

Date of Government Version: 12/11/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 03/07/2016
Number of Days to Update: 84

Source: Madera County Environmental Health
Telephone: 559-675-7823
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

MARIN COUNTY:

Underground Storage Tank Sites

Currently permitted USTs in Marin County.

Date of Government Version: 10/05/2015
Date Data Arrived at EDR: 10/08/2015
Date Made Active in Reports: 10/15/2015
Number of Days to Update: 7

Source: Public Works Department Waste Management
Telephone: 415-499-6647
Last EDR Contact: 04/04/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Semi-Annually

MERCED COUNTY:

CUPA Facility List

CUPA facility list.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/18/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 34

Source: Merced County Environmental Health
Telephone: 209-381-1094
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

MONO COUNTY:

CUPA Facility List

CUPA Facility List

Date of Government Version: 11/24/2015
Date Data Arrived at EDR: 12/01/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 51

Source: Mono County Health Department
Telephone: 760-932-5580
Last EDR Contact: 02/29/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Varies

MONTEREY COUNTY:

CUPA Facility Listing

CUPA Program listing from the Environmental Health Division.

Date of Government Version: 12/10/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 02/12/2016
Number of Days to Update: 60

Source: Monterey County Health Department
Telephone: 831-796-1297
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

NAPA COUNTY:

Sites With Reported Contamination
A listing of leaking underground storage tank sites located in Napa county.

Date of Government Version: 12/05/2011
Date Data Arrived at EDR: 12/06/2011
Date Made Active in Reports: 02/07/2012
Number of Days to Update: 63
Source: Napa County Department of Environmental Management
Telephone: 707-253-4269
Last EDR Contact: 02/29/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: No Update Planned

Closed and Operating Underground Storage Tank Sites
Underground storage tank sites located in Napa county.

Date of Government Version: 01/15/2008
Date Data Arrived at EDR: 01/16/2008
Date Made Active in Reports: 02/08/2008
Number of Days to Update: 23
Source: Napa County Department of Environmental Management
Telephone: 707-253-4269
Last EDR Contact: 02/29/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: No Update Planned

NEVADA COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 01/27/2016
Date Data Arrived at EDR: 02/04/2016
Date Made Active in Reports: 02/22/2016
Number of Days to Update: 18
Source: Community Development Agency
Telephone: 530-265-1467
Last EDR Contact: 02/01/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Varies

ORANGE COUNTY:

List of Industrial Site Cleanups
Petroleum and non-petroleum spills.

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/12/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 49
Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/09/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Annually

List of Underground Storage Tank Cleanups
Orange County Underground Storage Tank Cleanups (LUST).

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/12/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 49
Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/09/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

List of Underground Storage Tank Facilities
Orange County Underground Storage Tank Facilities (UST).

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/10/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 51
Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 02/10/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

PLACER COUNTY:

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Master List of Facilities
List includes aboveground tanks, underground tanks and cleanup sites.

Date of Government Version: 12/09/2015
Date Data Arrived at EDR: 12/11/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 41
Source: Placer County Health and Human Services
Telephone: 530-745-2363
Last EDR Contact: 03/07/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Semi-Annually

RIVERSIDE COUNTY:

Listing of Underground Tank Cleanup Sites
Riverside County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 01/20/2016
Date Data Arrived at EDR: 01/22/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 60
Source: Department of Environmental Health
Telephone: 951-358-5055
Last EDR Contact: 03/21/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: Quarterly

Underground Storage Tank Tank List
Underground storage tank sites located in Riverside county.

Date of Government Version: 01/20/2016
Date Data Arrived at EDR: 01/22/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 60
Source: Department of Environmental Health
Telephone: 951-358-5055
Last EDR Contact: 03/21/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: Quarterly

SACRAMENTO COUNTY:

Toxic Site Clean-Up List
List of sites where unauthorized releases of potentially hazardous materials have occurred.

Date of Government Version: 11/02/2015
Date Data Arrived at EDR: 01/05/2016
Date Made Active in Reports: 02/12/2016
Number of Days to Update: 38
Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Last EDR Contact: 04/06/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Quarterly

Master Hazardous Materials Facility List
Any business that has hazardous materials on site - hazardous material storage sites, underground storage tanks, waste generators.

Date of Government Version: 11/02/2015
Date Data Arrived at EDR: 01/05/2016
Date Made Active in Reports: 02/12/2016
Number of Days to Update: 38
Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Last EDR Contact: 04/06/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Quarterly

SAN BERNARDINO COUNTY:

Hazardous Material Permits
This listing includes underground storage tanks, medical waste handlers/generators, hazardous materials handlers, hazardous waste generators, and waste oil generators/handlers.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/18/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 52

Source: San Bernardino County Fire Department Hazardous Materials Division
Telephone: 909-387-3041
Last EDR Contact: 02/08/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

SAN DIEGO COUNTY:

Hazardous Materials Management Division Database

The database includes: HE58 - This report contains the business name, site address, business phone number, establishment 'H' permit number, type of permit, and the business status. HE17 - In addition to providing the same information provided in the HE58 listing, HE17 provides inspection dates, violations received by the establishment, hazardous waste generated, the quantity, method of storage, treatment/disposal of waste and the hauler, and information on underground storage tanks. Unauthorized Release List - Includes a summary of environmental contamination cases in San Diego County (underground tank cases, non-tank cases, groundwater contamination, and soil contamination are included.)

Date of Government Version: 09/23/2013
Date Data Arrived at EDR: 09/24/2013
Date Made Active in Reports: 10/17/2013
Number of Days to Update: 23

Source: Hazardous Materials Management Division
Telephone: 619-338-2268
Last EDR Contact: 03/07/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Quarterly

Solid Waste Facilities

San Diego County Solid Waste Facilities.

Date of Government Version: 10/31/2015
Date Data Arrived at EDR: 11/07/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 58

Source: Department of Health Services
Telephone: 619-338-2209
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

Environmental Case Listing

The listing contains all underground tank release cases and projects pertaining to properties contaminated with hazardous substances that are actively under review by the Site Assessment and Mitigation Program.

Date of Government Version: 03/23/2010
Date Data Arrived at EDR: 06/15/2010
Date Made Active in Reports: 07/09/2010
Number of Days to Update: 24

Source: San Diego County Department of Environmental Health
Telephone: 619-338-2371
Last EDR Contact: 03/03/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: No Update Planned

SAN FRANCISCO COUNTY:

Local Oversite Facilities

A listing of leaking underground storage tank sites located in San Francisco county.

Date of Government Version: 09/19/2008
Date Data Arrived at EDR: 09/19/2008
Date Made Active in Reports: 09/29/2008
Number of Days to Update: 10

Source: Department Of Public Health San Francisco County
Telephone: 415-252-3920
Last EDR Contact: 02/08/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

Underground Storage Tank Information

Underground storage tank sites located in San Francisco county.

Date of Government Version: 11/29/2010
Date Data Arrived at EDR: 03/10/2011
Date Made Active in Reports: 03/15/2011
Number of Days to Update: 5

Source: Department of Public Health
Telephone: 415-252-3920
Last EDR Contact: 02/08/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Quarterly

SAN JOAQUIN COUNTY:

San Joaquin Co. UST
A listing of underground storage tank locations in San Joaquin county.

Date of Government Version: 12/18/2015
Date Data Arrived at EDR: 12/22/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 48
Source: Environmental Health Department
Telephone: N/A
Last EDR Contact: 04/04/2016
Next Scheduled EDR Contact: 07/04/2016
Data Release Frequency: Semi-Annually

SAN LUIS OBISPO COUNTY:

CUPA Facility List
Cupa Facility List.

Date of Government Version: 02/22/2016
Date Data Arrived at EDR: 02/24/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 37
Source: San Luis Obispo County Public Health Department
Telephone: 805-781-5596
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/21/2016
Data Release Frequency: Varies

SAN MATEO COUNTY:

Business Inventory
List includes Hazardous Materials Business Plan, hazardous waste generators, and underground storage tanks.

Date of Government Version: 10/14/2015
Date Data Arrived at EDR: 10/15/2015
Date Made Active in Reports: 11/16/2015
Number of Days to Update: 32
Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
Last EDR Contact: 03/28/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Annually

Fuel Leak List
A listing of leaking underground storage tank sites located in San Mateo county.

Date of Government Version: 12/14/2015
Date Data Arrived at EDR: 12/17/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 53
Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
Last EDR Contact: 03/14/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Semi-Annually

SANTA BARBARA COUNTY:

CUPA Facility Listing
CUPA Program Listing from the Environmental Health Services division.

Date of Government Version: 09/08/2011
Date Data Arrived at EDR: 09/09/2011
Date Made Active in Reports: 10/07/2011
Number of Days to Update: 28
Source: Santa Barbara County Public Health Department
Telephone: 805-686-8167
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

SANTA CLARA COUNTY:

Cupa Facility List
Cupa facility list

Date of Government Version: 11/18/2015
Date Data Arrived at EDR: 11/24/2015
Date Made Active in Reports: 12/11/2015
Number of Days to Update: 17

Source: Department of Environmental Health
Telephone: 408-918-1973
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

HIST LUST - Fuel Leak Site Activity Report

A listing of open and closed leaking underground storage tanks. This listing is no longer updated by the county. Leaking underground storage tanks are now handled by the Department of Environmental Health.

Date of Government Version: 03/29/2005
Date Data Arrived at EDR: 03/30/2005
Date Made Active in Reports: 04/21/2005
Number of Days to Update: 22

Source: Santa Clara Valley Water District
Telephone: 408-265-2600
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

LOP Listing

A listing of leaking underground storage tanks located in Santa Clara county.

Date of Government Version: 03/03/2014
Date Data Arrived at EDR: 03/05/2014
Date Made Active in Reports: 03/18/2014
Number of Days to Update: 13

Source: Department of Environmental Health
Telephone: 408-918-3417
Last EDR Contact: 02/29/2016
Next Scheduled EDR Contact: 06/13/2016
Data Release Frequency: Annually

Hazardous Material Facilities

Hazardous material facilities, including underground storage tank sites.

Date of Government Version: 02/05/2016
Date Data Arrived at EDR: 02/10/2016
Date Made Active in Reports: 04/01/2016
Number of Days to Update: 51

Source: City of San Jose Fire Department
Telephone: 408-535-7694
Last EDR Contact: 02/08/2016
Next Scheduled EDR Contact: 05/23/2016
Data Release Frequency: Annually

SANTA CRUZ COUNTY:

CUPA Facility List

CUPA facility listing.

Date of Government Version: 11/18/2015
Date Data Arrived at EDR: 11/23/2015
Date Made Active in Reports: 12/11/2015
Number of Days to Update: 18

Source: Santa Cruz County Environmental Health
Telephone: 831-464-2761
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

SHASTA COUNTY:

CUPA Facility List

Cupa Facility List.

Date of Government Version: 12/09/2015
Date Data Arrived at EDR: 12/10/2015
Date Made Active in Reports: 01/21/2016
Number of Days to Update: 42

Source: Shasta County Department of Resource Management
Telephone: 530-225-5789
Last EDR Contact: 02/22/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Varies

SOLANO COUNTY:

Leaking Underground Storage Tanks
A listing of leaking underground storage tank sites located in Solano county.

Date of Government Version: 10/30/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 56

Source: Solano County Department of Environmental Management
Telephone: 707-784-6770
Last EDR Contact: 03/14/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Quarterly

Underground Storage Tanks
Underground storage tank sites located in Solano county.

Date of Government Version: 10/30/2015
Date Data Arrived at EDR: 12/14/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 56

Source: Solano County Department of Environmental Management
Telephone: 707-784-6770
Last EDR Contact: 03/14/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Quarterly

SONOMA COUNTY:

Cupa Facility List
Cupa Facility list

Date of Government Version: 01/11/2016
Date Data Arrived at EDR: 01/14/2016
Date Made Active in Reports: 02/22/2016
Number of Days to Update: 39

Source: County of Sonoma Fire & Emergency Services Department
Telephone: 707-565-1174
Last EDR Contact: 03/28/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Varies

Leaking Underground Storage Tank Sites
A listing of leaking underground storage tank sites located in Sonoma county.

Date of Government Version: 01/05/2016
Date Data Arrived at EDR: 01/07/2016
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 32

Source: Department of Health Services
Telephone: 707-565-6565
Last EDR Contact: 03/28/2016
Next Scheduled EDR Contact: 07/11/2016
Data Release Frequency: Quarterly

SUTTER COUNTY:

Underground Storage Tanks
Underground storage tank sites located in Sutter county.

Date of Government Version: 12/07/2015
Date Data Arrived at EDR: 12/08/2015
Date Made Active in Reports: 12/17/2015
Number of Days to Update: 9

Source: Sutter County Department of Agriculture
Telephone: 530-822-7500
Last EDR Contact: 03/07/2016
Next Scheduled EDR Contact: 06/20/2016
Data Release Frequency: Semi-Annually

TUOLUMNE COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 10/29/2015
Date Data Arrived at EDR: 10/30/2015
Date Made Active in Reports: 12/11/2015
Number of Days to Update: 42

Source: Divison of Environmental Health
Telephone: 209-533-5633
Last EDR Contact: 03/04/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Varies

VENTURA COUNTY:

Business Plan, Hazardous Waste Producers, and Operating Underground Tanks

The BWT list indicates by site address whether the Environmental Health Division has Business Plan (B), Waste Producer (W), and/or Underground Tank (T) information.

Date of Government Version: 12/28/2015
Date Data Arrived at EDR: 01/29/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 53

Source: Ventura County Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Quarterly

Inventory of Illegal Abandoned and Inactive Sites

Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites.

Date of Government Version: 12/01/2011
Date Data Arrived at EDR: 12/01/2011
Date Made Active in Reports: 01/19/2012
Number of Days to Update: 49

Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 04/04/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Annually

Listing of Underground Tank Cleanup Sites

Ventura County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 05/29/2008
Date Data Arrived at EDR: 06/24/2008
Date Made Active in Reports: 07/31/2008
Number of Days to Update: 37

Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 02/14/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: Quarterly

Medical Waste Program List

To protect public health and safety and the environment from potential exposure to disease causing agents, the Environmental Health Division Medical Waste Program regulates the generation, handling, storage, treatment and disposal of medical waste throughout the County.

Date of Government Version: 12/28/2015
Date Data Arrived at EDR: 01/29/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 53

Source: Ventura County Resource Management Agency
Telephone: 805-654-2813
Last EDR Contact: 01/25/2016
Next Scheduled EDR Contact: 05/09/2016
Data Release Frequency: Quarterly

Underground Tank Closed Sites List

Ventura County Operating Underground Storage Tank Sites (UST)/Underground Tank Closed Sites List.

Date of Government Version: 11/30/2015
Date Data Arrived at EDR: 12/17/2015
Date Made Active in Reports: 02/08/2016
Number of Days to Update: 53

Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 03/17/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Quarterly

YOLO COUNTY:

Underground Storage Tank Comprehensive Facility Report

Underground storage tank sites located in Yolo county.

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/05/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 46

Source: Yolo County Department of Health
Telephone: 530-666-8646
Last EDR Contact: 04/04/2016
Next Scheduled EDR Contact: 07/18/2016
Data Release Frequency: Annually

YUBA COUNTY:

CUPA Facility List
CUPA facility listing for Yuba County.

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/05/2016
Date Made Active in Reports: 02/22/2016
Number of Days to Update: 17

Source: Yuba County Environmental Health Department
Telephone: 530-749-7523
Last EDR Contact: 02/01/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data
Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 07/30/2013
Date Data Arrived at EDR: 08/19/2013
Date Made Active in Reports: 10/03/2013
Number of Days to Update: 45

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 02/18/2016
Next Scheduled EDR Contact: 05/30/2016
Data Release Frequency: No Update Planned

NJ MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 07/17/2015
Date Made Active in Reports: 08/12/2015
Number of Days to Update: 26

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 04/12/2016
Next Scheduled EDR Contact: 07/25/2016
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data
Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 02/01/2016
Date Data Arrived at EDR: 02/03/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 48

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 02/03/2016
Next Scheduled EDR Contact: 05/16/2016
Data Release Frequency: Annually

PA MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 07/24/2015
Date Made Active in Reports: 08/18/2015
Number of Days to Update: 25

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 01/19/2016
Next Scheduled EDR Contact: 05/02/2016
Data Release Frequency: Annually

RI MANIFEST: Manifest information
Hazardous waste manifest information

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 06/19/2015
Date Made Active in Reports: 07/15/2015
Number of Days to Update: 26

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 03/21/2016
Next Scheduled EDR Contact: 06/06/2016
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 03/19/2015
Date Made Active in Reports: 04/07/2015
Number of Days to Update: 19

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 03/14/2016
Next Scheduled EDR Contact: 06/27/2016
Data Release Frequency: Annually

Oil/Gas Pipelines
Source: PennWell Corporation
Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Electric Power Transmission Line Data
Source: PennWell Corporation
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Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Licensed Facilities
Source: Department of Social Services
Telephone: 916-657-4041

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetland Inventory
Source: Department of Fish & Game
Telephone: 916-445-0411

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

STREET AND ADDRESS INFORMATION

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GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

128 HURRICANE STREET
128 HURRICANE STREET
MARINA DEL REY, CA 90292

TARGET PROPERTY COORDINATES

Latitude (North):	33.975736 - 33° 58' 32.65''
Longitude (West):	118.461332 - 118° 27' 40.80''
Universal Tranverse Mercator:	Zone 11
UTM X (Meters):	365002.2
UTM Y (Meters):	3760233.5
Elevation:	8 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	5640438 VENICE, CA
Version Date:	2012

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

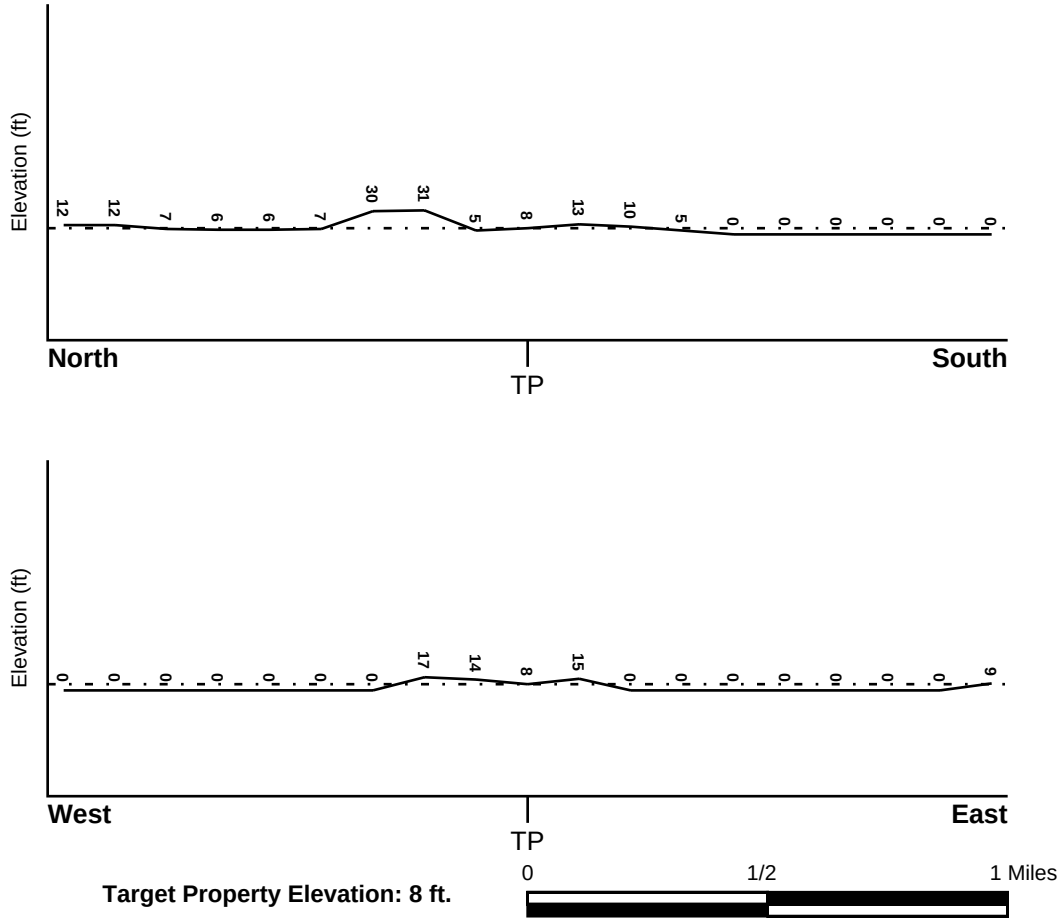
TOPOGRAPHIC INFORMATION

Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General SSE

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
LOS ANGELES, CA	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 06037C - FEMA DFIRM Flood data

Additional Panels in search area: Not Reported

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
VENICE	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius:	1.25 miles
Status:	Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
2	1/2 - 1 Mile North	S

For additional site information, refer to Physical Setting Source Map Findings.

* ©1996 Site−specific hydrogeological data gathered by CERCLIS Alerts, Inc., Bainbridge Island, WA. All rights reserved. All of the information and opinions presented are those of the cited EPA report(s), which were completed under a Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) investigation.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

Era:	Cenozoic
System:	Quaternary
Series:	Quaternary
Code:	Q *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratifed Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps. The following information is based on Soil Conservation Service STATSGO data.

Soil Component Name:	DELHI
Soil Surface Texture:	sand
Hydrologic Group:	Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.
Soil Drainage Class:	Somewhat excessive. Soils have high hydraulic conductivity and low water holding capacity. Depth to water table is more than 6 feet.

Hydric Status: Soil does not meet the requirements for a hydric soil.

Corrosion Potential - Uncoated Steel:	MODERATE
Depth to Bedrock Min:	> 60 inches
Depth to Bedrock Max:	> 60 inches

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Soil Layer Information							
	Boundary			Classification			
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil	Permeability Rate (in/hr)	Soil Reaction (pH)
1	0 inches	10 inches	sand	Granular materials (35 pct. or less passing No. 200), Stone Fragments, Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 20.00 Min: 6.00	Max: 7.80 Min: 6.10
2	10 inches	30 inches	sand	Granular materials (35 pct. or less passing No. 200), Stone Fragments, Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 20.00 Min: 6.00	Max: 7.80 Min: 6.10
3	30 inches	50 inches	loamy sand	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 20.00 Min: 6.00	Max: 7.80 Min: 6.10
4	50 inches	70 inches	sand	Granular materials (35 pct. or less passing No. 200), Stone Fragments, Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 20.00 Min: 6.00	Max: 7.80 Min: 6.10

OTHER SOIL TYPES IN AREA

Based on Soil Conservation Service STATSGO data, the following additional subordinant soil types may appear within the general area of target property.

Soil Surface Textures: coarse sand
silt loam
sandy loam
gravelly - sand
loamy sand
clay

Surficial Soil Types: coarse sand
silt loam
sandy loam
gravelly - sand
loamy sand

clay

Shallow Soil Types: fine sandy loam
gravelly - loam
sandy clay loam
sandy clay

Deeper Soil Types: coarse sand
silty clay loam
gravelly - fine sandy loam
stratified
gravelly - sandy loam
weathered bedrock
clay loam

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	CA3301522	1/2 - 1 Mile ENE

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

OTHER STATE DATABASE INFORMATION

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
A1	CAOG11000209843	0 - 1/8 Mile SSW

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
A2	CAOG11000210093	0 - 1/8 Mile ENE
A3	CAOG11000210017	0 - 1/8 Mile WNW
A4	CAOG11000210063	0 - 1/8 Mile NW
A5	CAOG11000209839	0 - 1/8 Mile WNW
A6	CAOG11000209566	0 - 1/8 Mile South
A7	CAOG11000209955	0 - 1/8 Mile West
A8	CAOG11000209576	0 - 1/8 Mile West
A9	CAOG11000209945	0 - 1/8 Mile SW
A10	CAOG11000210067	0 - 1/8 Mile WNW
A11	CAOG11000209840	0 - 1/8 Mile NNE
A12	CAOG11000209953	0 - 1/8 Mile WNW
A13	CAOG11000209558	0 - 1/8 Mile WSW
A14	CAOG11000209567	0 - 1/8 Mile NE
A15	CAOG11000210038	0 - 1/8 Mile SSW
A16	CAOG11000209780	0 - 1/8 Mile NW
A17	CAOG11000210027	0 - 1/8 Mile NNE
A18	CAOG11000209578	0 - 1/8 Mile WNW
A19	CAOG11000211723	0 - 1/8 Mile NW
A20	CAOG11000209557	0 - 1/8 Mile West
A21	CAOG11000210079	0 - 1/8 Mile SSW
A22	CAOG11000209774	0 - 1/8 Mile SW
A23	CAOG11000210091	0 - 1/8 Mile WSW
A24	CAOG11000210094	0 - 1/8 Mile SE
A25	CAOG11000209961	0 - 1/8 Mile SW
B26	CAOG11000209580	0 - 1/8 Mile NNW
C27	CAOG11000210074	0 - 1/8 Mile SSW
C28	CAOG11000210046	0 - 1/8 Mile South
B29	CAOG11000209888	0 - 1/8 Mile WNW
B30	CAOG11000209842	0 - 1/8 Mile NNW
D31	CAOG11000209772	0 - 1/8 Mile ESE
B32	CAOG11000210069	0 - 1/8 Mile NW
C33	CAOG11000210041	0 - 1/8 Mile South
B34	CAOG11000209598	0 - 1/8 Mile NNW
E35	CAOG11000209773	0 - 1/8 Mile West
36	CAOG11000209807	0 - 1/8 Mile NE
C37	CAOG11000209949	0 - 1/8 Mile SW
C38	CAOG11000210092	0 - 1/8 Mile WSW
B39	CAOG11000209952	0 - 1/8 Mile NW
B40	CAOG11000210009	0 - 1/8 Mile North
C41	CAOG11000209771	0 - 1/8 Mile SSW
E42	CAOG11000209779	0 - 1/8 Mile WSW
D43	CAOG11000209865	0 - 1/8 Mile SSE
C44	CAOG11000210060	1/8 - 1/4 Mile SW
B45	CAOG11000209575	1/8 - 1/4 Mile NNW
B46	CAOG11000209563	1/8 - 1/4 Mile North
E47	CAOG11000209889	1/8 - 1/4 Mile WNW
E48	CAOG11000209763	1/8 - 1/4 Mile West
C49	CAOG11000209886	1/8 - 1/4 Mile SW
C50	CAOG11000209884	1/8 - 1/4 Mile SW
B51	CAOG11000209878	1/8 - 1/4 Mile NW
E52	CAOG11000209863	1/8 - 1/4 Mile WSW
B53	CAOG11000209845	1/8 - 1/4 Mile WNW
D54	CAOG11000209782	1/8 - 1/4 Mile ESE
E55	CAOG11000209946	1/8 - 1/4 Mile West
E56	CAOG11000210057	1/8 - 1/4 Mile WSW
C57	CAOG11000209783	1/8 - 1/4 Mile South

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
E58	CAOG11000210056	1/8 - 1/4 Mile WSW
C59	CAOG11000210039	1/8 - 1/4 Mile SSW
B60	CAOG11000209867	1/8 - 1/4 Mile NW
F61	CAOG11000209852	1/8 - 1/4 Mile SSE
C62	CAOG11000209885	1/8 - 1/4 Mile SSW
E63	CAOG11000209960	1/8 - 1/4 Mile West
F64	CAOG11000209762	1/8 - 1/4 Mile South
E65	CAOG11000209964	1/8 - 1/4 Mile NW
C66	CAOG11000210018	1/8 - 1/4 Mile SSW
B67	CAOG11000209572	1/8 - 1/4 Mile NNW
B68	CAOG11000209573	1/8 - 1/4 Mile NW
E69	CAOG11000209784	1/8 - 1/4 Mile West
G70	CAOG11000209561	1/8 - 1/4 Mile NW
C71	CAOG11000209767	1/8 - 1/4 Mile South
H72	CAOG11000210025	1/8 - 1/4 Mile NNW
E73	CAOG11000202100	1/8 - 1/4 Mile WNW
G74	CAOG11000209849	1/8 - 1/4 Mile NW
G75	CAOG11000210047	1/8 - 1/4 Mile NW
F76	CAOG11000209781	1/8 - 1/4 Mile SE
H77	CAOG11000209806	1/8 - 1/4 Mile North
F78	CAOG11000209850	1/8 - 1/4 Mile South
E79	CAOG11000209862	1/8 - 1/4 Mile West
H80	CAOG11000209564	1/8 - 1/4 Mile NNW
I81	CAOG11000209761	1/8 - 1/4 Mile South
G82	CAOG11000210066	1/8 - 1/4 Mile WNW
E83	CAOG11000209892	1/8 - 1/4 Mile WNW
F84	CAOG11000209846	1/8 - 1/4 Mile SE
G85	CAOG11000210090	1/8 - 1/4 Mile NW
F86	CAOG11000210058	1/8 - 1/4 Mile South
G87	CAOG11000209880	1/8 - 1/4 Mile NW
E88	CAOG11000209778	1/8 - 1/4 Mile West
H89	CAOG11000209826	1/8 - 1/4 Mile NNW
I90	CAOG11000210019	1/8 - 1/4 Mile South
G91	CAOG11000210015	1/8 - 1/4 Mile NNW
J92	CAOG11000209792	1/8 - 1/4 Mile WNW
G93	CAOG11000210073	1/8 - 1/4 Mile NW
G94	CAOG11000209790	1/8 - 1/4 Mile WNW
I95	CAOG11000209965	1/8 - 1/4 Mile South
F96	CAOG11000210050	1/8 - 1/4 Mile SSE
G97	CAOG11000210048	1/8 - 1/4 Mile NW
G98	CAOG11000210087	1/8 - 1/4 Mile WNW
F99	CAOG11000209760	1/8 - 1/4 Mile South
G100	CAOG11000209853	1/8 - 1/4 Mile NNW
G101	CAOG11000209789	1/8 - 1/4 Mile WNW
I102	CAOG11000210020	1/8 - 1/4 Mile South
G103	CAOG11000209577	1/8 - 1/4 Mile NW
G104	CAOG11000209565	1/8 - 1/4 Mile NW
F105	CAOG11000210037	1/8 - 1/4 Mile SE
K106	CAOG11000209799	1/8 - 1/4 Mile ESE
H107	CAOG11000209804	1/8 - 1/4 Mile NNW
H108	CAOG11000209795	1/8 - 1/4 Mile NNW
G109	CAOG11000210086	1/8 - 1/4 Mile NNW
K110	CAOG11000210028	1/8 - 1/4 Mile SE
G111	CAOG11000209574	1/8 - 1/4 Mile NW
I112	CAOG11000210021	1/8 - 1/4 Mile South
G113	CAOG11000210088	1/8 - 1/4 Mile NW

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
J114	CAOG11000209873	1/8 - 1/4 Mile WNW
G115	CAOG11000210064	1/8 - 1/4 Mile NW
K116	CAOG11000209855	1/8 - 1/4 Mile SE
L117	CAOG11000210013	1/8 - 1/4 Mile SE
G118	CAOG11000209560	1/8 - 1/4 Mile NW
M119	CAOG11000210065	1/8 - 1/4 Mile NW
120	CAOG11000209803	1/8 - 1/4 Mile North
J121	CAOG11000209872	1/8 - 1/4 Mile WNW
L122	CAOG11000209764	1/8 - 1/4 Mile SSE
M123	CAOG11000209579	1/8 - 1/4 Mile WNW
N124	CAOG11000210022	1/4 - 1/2 Mile South
N125	CAOG11000209759	1/4 - 1/2 Mile SSE
L126	CAOG11000210029	1/4 - 1/2 Mile SE
L127	CAOG11000210010	1/4 - 1/2 Mile SE
M128	CAOG11000210082	1/4 - 1/2 Mile NW
K129	CAOG11000209813	1/4 - 1/2 Mile ESE
M130	CAOG11000210061	1/4 - 1/2 Mile NW
L131	CAOG11000209893	1/4 - 1/2 Mile SSE
M132	CAOG11000210049	1/4 - 1/2 Mile WNW
M133	CAOG11000209944	1/4 - 1/2 Mile WNW
L134	CAOG11000209891	1/4 - 1/2 Mile SSE
N135	CAOG11000209758	1/4 - 1/2 Mile SSE
L136	CAOG11000209838	1/4 - 1/2 Mile SE
O137	CAOG11000210030	1/4 - 1/2 Mile SE
L138	CAOG11000210016	1/4 - 1/2 Mile SSE
N139	CAOG11000210023	1/4 - 1/2 Mile South
M140	CAOG11000209851	1/4 - 1/2 Mile NW
O141	CAOG11000209777	1/4 - 1/2 Mile SE
N142	CAOG11000210059	1/4 - 1/2 Mile SSE
O143	CAOG11000209810	1/4 - 1/2 Mile SE
P144	CAOG11000209857	1/4 - 1/2 Mile SSE
N145	CAOG11000210024	1/4 - 1/2 Mile South
O146	CAOG11000209841	1/4 - 1/2 Mile SE
P147	CAOG11000209890	1/4 - 1/2 Mile SSE
P148	CAOG11000209883	1/4 - 1/2 Mile SSE
Q149	CAOG11000209887	1/4 - 1/2 Mile SSE
O150	CAOG11000210031	1/4 - 1/2 Mile SE
P151	CAOG11000209876	1/4 - 1/2 Mile SSE
P152	CAOG11000209958	1/4 - 1/2 Mile SE
O153	CAOG11000210070	1/4 - 1/2 Mile SE
P154	CAOG11000209775	1/4 - 1/2 Mile SSE
P155	CAOG11000209753	1/4 - 1/2 Mile SSE
156	CAOG11000210089	1/4 - 1/2 Mile NNW
Q157	CAOG11000209963	1/4 - 1/2 Mile SSE
Q158	CAOG11000209768	1/4 - 1/2 Mile SSE
P159	CAOG11000209854	1/4 - 1/2 Mile SSE
P160	CAOG11000209864	1/4 - 1/2 Mile SE
P161	CAOG11000210044	1/4 - 1/2 Mile SSE
O162	CAOG11000209798	1/4 - 1/2 Mile SE
Q163	CAOG11000210036	1/4 - 1/2 Mile SSE
R164	CAOG11000209959	1/4 - 1/2 Mile SE
Q165	CAOG11000209755	1/4 - 1/2 Mile SSE
P166	CAOG11000209765	1/4 - 1/2 Mile SE
R167	CAOG11000210032	1/4 - 1/2 Mile SE
S168	CAOG11000209787	1/4 - 1/2 Mile SSE
R169	CAOG11000210045	1/4 - 1/2 Mile SE

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
Q170	CAOG11000209752	1/4 - 1/2 Mile SSE
S171	CAOG11000209571	1/4 - 1/2 Mile SSE
R172	CAOG11000210080	1/4 - 1/2 Mile SE
R173	CAOG11000210076	1/4 - 1/2 Mile SE
S174	CAOG11000209788	1/4 - 1/2 Mile SSE
T175	CAOG11000209814	1/4 - 1/2 Mile SE
S176	CAOG11000209756	1/4 - 1/2 Mile SSE
S177	CAOG11000209757	1/4 - 1/2 Mile SSE
R178	CAOG11000209811	1/4 - 1/2 Mile SE
S179	CAOG11000209559	1/4 - 1/2 Mile SSE
S180	CAOG11000209754	1/4 - 1/2 Mile SSE
R181	CAOG11000210033	1/4 - 1/2 Mile SE
U182	CAOG11000209956	1/4 - 1/2 Mile SSE
R183	CAOG11000209861	1/4 - 1/2 Mile SE
R184	CAOG11000210043	1/4 - 1/2 Mile SE
R185	CAOG11000209858	1/4 - 1/2 Mile SE
S186	CAOG11000209791	1/4 - 1/2 Mile SSE
S187	CAOG11000210078	1/4 - 1/2 Mile SSE
U188	CAOG11000209794	1/4 - 1/2 Mile SSE
U189	CAOG11000210042	1/4 - 1/2 Mile SE
S190	CAOG11000209785	1/4 - 1/2 Mile SSE
S191	CAOG11000209870	1/4 - 1/2 Mile SSE
U192	CAOG11000209856	1/4 - 1/2 Mile SSE
S193	CAOG11000209776	1/4 - 1/2 Mile SSE
U194	CAOG11000210052	1/4 - 1/2 Mile SE
V195	CAOG11000210014	1/4 - 1/2 Mile SSE
U196	CAOG11000209871	1/4 - 1/2 Mile SSE
U197	CAOG11000210077	1/4 - 1/2 Mile SE
T198	CAOG11000209812	1/4 - 1/2 Mile SE
W199	CAOG11000210026	1/4 - 1/2 Mile SE
V200	CAOG11000210012	1/4 - 1/2 Mile SSE
U201	CAOG11000209569	1/4 - 1/2 Mile SSE
V202	CAOG11000209882	1/4 - 1/2 Mile SSE
V203	CAOG11000209942	1/4 - 1/2 Mile SSE
U204	CAOG11000209860	1/2 - 1 Mile SSE
V205	CAOG11000209962	1/2 - 1 Mile SSE
V206	CAOG11000209879	1/2 - 1 Mile SSE
W207	CAOG11000209859	1/2 - 1 Mile SE
X208	CAOG11000209786	1/2 - 1 Mile SSE
W209	CAOG11000209766	1/2 - 1 Mile SE
W210	CAOG11000209948	1/2 - 1 Mile SE
W211	CAOG11000210034	1/2 - 1 Mile SE
X212	CAOG11000210084	1/2 - 1 Mile SSE
W213	CAOG11000209809	1/2 - 1 Mile SE
W214	CAOG11000209808	1/2 - 1 Mile SE
W215	CAOG11000210035	1/2 - 1 Mile SE
W216	CAOG11000209947	1/2 - 1 Mile SE
W217	CAOG11000210053	1/2 - 1 Mile SE
218	CAOG11000209817	1/2 - 1 Mile SE
X219	CAOG11000210083	1/2 - 1 Mile SSE
X220	CAOG11000210085	1/2 - 1 Mile SSE
X221	CAOG11000209943	1/2 - 1 Mile SSE
X222	CAOG11000210011	1/2 - 1 Mile SSE
X223	CAOG11000210040	1/2 - 1 Mile SSE
X224	CAOG11000210081	1/2 - 1 Mile SSE
Y225	CAOG11000209933	1/2 - 1 Mile SE

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
X226	CAOG11000209932	1/2 - 1 Mile SSE
X227	CAOG11000209940	1/2 - 1 Mile SSE
228	CAOG11000209816	1/2 - 1 Mile ESE
229	CAOG11000209805	1/2 - 1 Mile NE
X230	CAOG11000209847	1/2 - 1 Mile SSE
Y231	CAOG11000209831	1/2 - 1 Mile SE
Z232	CAOG11000209881	1/2 - 1 Mile SSE
233	CAOG11000209818	1/2 - 1 Mile ESE
X234	CAOG11000209935	1/2 - 1 Mile SSE
Y235	CAOG11000209934	1/2 - 1 Mile SSE
Y236	CAOG11000209832	1/2 - 1 Mile SE
Z237	CAOG11000209570	1/2 - 1 Mile SSE
Z238	CAOG11000209957	1/2 - 1 Mile SSE
Z239	CAOG11000210054	1/2 - 1 Mile SSE
240	CAOG11000209913	1/2 - 1 Mile SE
Z241	CAOG11000210072	1/2 - 1 Mile SSE
Z242	CAOG11000210055	1/2 - 1 Mile SSE
AA243	CAOG11000209936	1/2 - 1 Mile SSE
Z244	CAOG11000209770	1/2 - 1 Mile SSE
Z245	CAOG11000210071	1/2 - 1 Mile SSE
AA246	CAOG11000209950	1/2 - 1 Mile SSE
247	CAOG11000209939	1/2 - 1 Mile SE
248	CAOG11000209914	1/2 - 1 Mile ESE
AA249	CAOG11000209907	1/2 - 1 Mile SSE
AA250	CAOG11000210068	1/2 - 1 Mile SSE
AA251	CAOG11000209937	1/2 - 1 Mile SSE
AB252	CAOG11000210051	1/2 - 1 Mile SSE
AA253	CAOG11000209908	1/2 - 1 Mile SSE
254	CAOG11000209915	1/2 - 1 Mile ESE
AB255	CAOG11000209568	1/2 - 1 Mile SSE
AB256	CAOG11000210075	1/2 - 1 Mile SSE
AC257	CAOG11000209938	1/2 - 1 Mile SSE
AC258	CAOG11000209793	1/2 - 1 Mile SSE
AB259	CAOG11000209866	1/2 - 1 Mile SSE
AB260	CAOG11000209844	1/2 - 1 Mile SSE
AD262	CAOG11000191915	1/2 - 1 Mile SE
AD261	CAOG11000191914	1/2 - 1 Mile SE
AD263	CAOG11000191916	1/2 - 1 Mile SE
AE264	CAOG11000209796	1/2 - 1 Mile SSE
AE265	CAOG11000209797	1/2 - 1 Mile SSE
AC266	CAOG11000209836	1/2 - 1 Mile SE
267	CAOG11000204846	1/2 - 1 Mile NW
268	CAOG11000209802	1/2 - 1 Mile East
AF269	CAOG11000191926	1/2 - 1 Mile ESE
AF270	CAOG11000191927	1/2 - 1 Mile ESE
AG271	CAOG11000191928	1/2 - 1 Mile ESE
AG272	CAOG11000191929	1/2 - 1 Mile ESE
273	CAOG11000224253	1/2 - 1 Mile NW

PHYSICAL SETTING SOURCE MAP - 4591455.2s



- County Boundary
- Major Roads
- Contour Lines
- Earthquake Fault Lines
- Airports
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons

- Groundwater Flow Direction
- GI Indeterminate Groundwater Flow at Location
- GV Groundwater Flow Varies at Location
- HD Closest Hydrogeological Data
- Oil, gas or related wells

SITE NAME:	128 Hurricane Street	CLIENT:	Ninyo & Moore
ADDRESS:	128 Hurricane Street Marina Del Rey CA 90292	CONTACT:	Dennis Fee
LAT/LONG:	33.975736 / 118.461332	INQUIRY #:	4591455.2s
		DATE:	April 13, 2016 5:05 pm

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance
Elevation | Database | EDR ID Number

1
ENE
1/2 - 1 Mile
Higher | **FRDS PWS** | **CA3301522**

Epa region:	09	State:	CA
Pwsid:	CA3301522		
Pwsname:	Quail Ranch Golf Club		
City served:	Not Reported	State served:	CA
Zip served:	Not Reported	Fips county:	06065
Status:	Closed	Pop srvd:	150
Pwssvcconn:	1	Source:	Groundwater
Pws type:	TNCWS	Owner:	Private
Contact:	Gary Root		
Contactor gname:	LPA-Riverside		
Contact phone:	9093585316	Contact address1:	P.O. Box 7600
Contact address2:	4065 County Circle Dr.	Contact city:	Riverside
Contact state:	CA	Contact zip:	92513
Activity code:	I		

Facid:	2		
Facname:	RO AND CL PLANT		
Facility type:	Treatment_plant	Activity code:	A
Treatment obj:	disinfection	Treatment process:	hypochlorination, post
Treatment obj:	inorganics removal	Treatment process:	reverse osmosis

Facid:	CA3301522002		
Facname:	RO AND CL PLANT		
Facility type:	Treatment_plant	Activity code:	I
Treatment obj:	disinfection	Treatment process:	hypochlorination, post
Treatment obj:	inorganics removal	Treatment process:	reverse osmosis

Location Information:

Name:	QUAIL RANCH GOLF CLUB		
Pwstypcd:	TNCWS	Primsrccd:	GW
Popserved:	150		
Add1:	P.O. BOX 7600		
Add2:	4065 COUNTY CIRCLE DR.		
City:	RIVERSIDE	State:	CA
Zip:	92513	Phone:	9093585316
Cityserv:	Not Reported	Cntyserv:	Riverside
Stateserv:	CA	Zipserv:	Not Reported

Enforcement Information:

Violation id:	0300004	Orig cd:	S
Enf fy:	2003	Enf act date:	06/07/2003
Enf act detail:	St Public Notif requested	Enf act cat:	Informal

Enforcement Information:

Violation id:	0300004	Orig cd:	S
Enf fy:	2003	Enf act date:	06/09/2003
Enf act detail:	St Public Notif received	Enf act cat:	Informal

Enforcement Information:

Violation id:	0300004	Orig cd:	S
Enf fy:	2003	Enf act date:	06/07/2003
Enf act detail:	St Formal NOV issued	Enf act cat:	Informal

Enforcement Information:

Violation id:	0000001	Orig cd:	S
Enf fy:	2001	Enf act date:	07/12/2001
Enf act detail:	St Formal NOV issued	Enf act cat:	Informal

Violations Information:

Violoation id:	0300004	Orig cd:	S
State:	CA	Viol fy:	2003
Contamcd:	3100		
Contamnm:	Coliform (TCR)		
Viol code:	22		
Viol name:	MCL, Monthly (TCR)		
Rule code:	110		
Rule name:	TCR		
Violmeasur:	Not Reported	Unitmeasur:	Not Reported
State mcl:	Not Reported	Cmpbdt:	04/01/2003
Cmpedt:	06/06/2003		

Violations Information:

Violoation id:	0300002	Orig cd:	S
State:	CA	Viol fy:	2003
Contamcd:	3100		
Contamnm:	Coliform (TCR)		
Viol code:	22		
Viol name:	MCL, Monthly (TCR)		
Rule code:	110		
Rule name:	TCR		
Violmeasur:	Not Reported	Unitmeasur:	Not Reported
State mcl:	Not Reported	Cmpbdt:	04/01/2003
Cmpedt:	06/06/2003		

Violations Information:

Violoation id:	0000001	Orig cd:	S
State:	CA	Viol fy:	2001
Contamcd:	3100		
Contamnm:	Coliform (TCR)		
Viol code:	23		
Viol name:	Monitoring, Routine Major (TCR)		
Rule code:	110		
Rule name:	TCR		
Violmeasur:	Not Reported	Unitmeasur:	Not Reported
State mcl:	Not Reported	Cmpbdt:	04/01/2001
Cmpedt:	06/30/2001		

PWS ID: CA3301522
Date Initiated: 7706 Date Deactivated: Not Reported
PWS Name: QUAIL RANCH RESORT AND
QUAIL DEVELOPMENT COMPANY
ST RTE BOX 115
MORENO, CA 92360

Addressee / Facility: System Owner/Responsible Party
QUAIL DEVELOPMENT COMPANY
13400 MAXELLA AVENUE
MARINA DEL REY, CA 90292

Facility Latitude:	33 58 48	Facility Longitude:	118 26 42
City Served:	Not Reported		
Treatment Class:	Untreated	Population:	00000025

Violations information not reported.

ENFORCEMENT INFORMATION:

Truedate:	03/31/2009	Pwsid:	CA3301522
Pwsname:	QUAIL RANCH GOLF CLUB		
Retpopsrvd:	150	Pwstypecod:	NC
Vioid:	0000001	Contaminant:	COLIFORM (TCR)
Viol. Type:	Monitoring, Routine Major (TCR)		
Complperbe:	4/1/2001 0:00:00		
Complperen:	6/30/2001 0:00:00	Enfdate:	7/12/2001 0:00:00
Enf action:	State Formal NOV Issued		
Violmeasur:	Not Reported		

Truedate:	03/31/2009	Pwsid:	CA3301522
Pwsname:	QUAIL RANCH GOLF CLUB		
Retpopsrvd:	150	Pwstypecod:	NC
Vioid:	0300004	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Monthly (TCR)		
Complperbe:	4/1/2003 0:00:00		
Complperen:	6/6/2003 0:00:00	Enfdate:	6/7/2003 0:00:00
Enf action:	State Public Notif Requested		
Violmeasur:	Not Reported		

Truedate:	03/31/2009	Pwsid:	CA3301522
Pwsname:	QUAIL RANCH GOLF CLUB		
Retpopsrvd:	150	Pwstypecod:	NC
Vioid:	0300004	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Monthly (TCR)		
Complperbe:	4/1/2003 0:00:00		
Complperen:	6/6/2003 0:00:00	Enfdate:	6/9/2003 0:00:00
Enf action:	State Public Notif Received		
Violmeasur:	Not Reported		

Truedate:	03/31/2009	Pwsid:	CA3301522
Pwsname:	QUAIL RANCH GOLF CLUB		
Retpopsrvd:	150	Pwstypecod:	NC
Vioid:	0300004	Contaminant:	COLIFORM (TCR)
Viol. Type:	MCL, Monthly (TCR)		
Complperbe:	4/1/2003 0:00:00		
Complperen:	6/6/2003 0:00:00	Enfdate:	6/7/2003 0:00:00
Enf action:	State Formal NOV Issued		
Violmeasur:	Not Reported		

System Name:	QUAIL RANCH GOLF CLUB		
Violation Type:	Monitoring, Routine Major (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	4/1/2001 0:00:00 - 6/30/2001 0:00:00		
Violation ID:	0000001		
Enforcement Date:	7/12/2001 0:00:00	Enf. Action:	State Public Notif Requested

System Name:	QUAIL RANCH GOLF CLUB		
Violation Type:	Monitoring, Routine Major (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	04/01/01 - 06/30/01		
Violation ID:	0000001		
Enforcement Date:	07/12/01	Enf. Action:	State Public Notif Requested

ENFORCEMENT INFORMATION:

System Name:	QUAIL RANCH GOLF CLUB		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	4/1/2003 0:00:00 - 6/6/2003 0:00:00		
Violation ID:	0300004		
Enforcement Date:	6/9/2003 0:00:00	Enf. Action:	State Public Notif Received
System Name:	QUAIL RANCH GOLF CLUB		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	4/1/2003 0:00:00 - 6/6/2003 0:00:00		
Violation ID:	0300004		
Enforcement Date:	6/7/2003 0:00:00	Enf. Action:	State Formal NOV Issued
System Name:	QUAIL RANCH GOLF CLUB		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	4/1/2003 0:00:00 - 6/6/2003 0:00:00		
Violation ID:	0300004		
Enforcement Date:	6/7/2003 0:00:00	Enf. Action:	State Public Notif Requested
System Name:	QUAIL RANCH GOLF CLUB		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	04/01/03 - 06/06/03		
Violation ID:	0300004		
Enforcement Date:	06/07/03	Enf. Action:	State Public Notif Requested
System Name:	QUAIL RANCH GOLF CLUB		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	04/01/03 - 06/06/03		
Violation ID:	0300004		
Enforcement Date:	06/07/03	Enf. Action:	State Formal NOV Issued
System Name:	QUAIL RANCH GOLF CLUB		
Violation Type:	MCL, Monthly (TCR)		
Contaminant:	COLIFORM (TCR)		
Compliance Period:	04/01/03 - 06/06/03		
Violation ID:	0300004		
Enforcement Date:	06/09/03	Enf. Action:	State Public Notif Received

CONTACT INFORMATION:

Name:	QUAIL RANCH GOLF CLUB	Population:	150
Contact:	Gary Root	Phone:	9093585316
Address:	P.O. Box 7600		
Address 2:	4065 County Circle Dr. Riverside, CA 92513		

2
North
1/2 - 1 Mile
Higher

Site ID:	902910161
Groundwater Flow:	S
Shallow Water Depth:	8.61
Deep Water Depth:	10.30
Average Water Depth:	Not Reported
Date:	03/31/1999

AQUIFLOW **70404**

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

A1
SSW **OIL_GAS** **CAOG11000209843**
0 - 1/8 Mile

District nun:	1	Api number:	03713842
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	McQueen-Whalen Revocable Trust		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Mcdonald	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209843		

A2
ENE **OIL_GAS** **CAOG11000210093**
0 - 1/8 Mile

District nun:	1	Api number:	03714349
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Conservative Petro. Corp. Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Herbert R. Gage	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210093		

A3
WNW **OIL_GAS** **CAOG11000210017**
0 - 1/8 Mile

District nun:	1	Api number:	03714207
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	20
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210017		

A4
NW **OIL_GAS** **CAOG11000210063**
0 - 1/8 Mile

District nun:	1	Api number:	03714319
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Allied Petroleum Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Rawco-Woodford	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210063		

A5
WNW **OIL_GAS** **CAOG11000209839**
0 - 1/8 Mile

District nun:	1	Api number:	03713838
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	M. C. R. R. Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	M.C.R.R.	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209839		

A6
South
0 - 1/8 Mile

OIL_GAS **CAOG11000209566**

District nun:	1	Api number:	03713385
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	E. G. Curtis		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Jones & Prentiss	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209566		

A7
West
0 - 1/8 Mile

OIL_GAS **CAOG11000209955**

District nun:	1	Api number:	03714088
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Ventura Oil syndicate #1		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209955		

Map ID
Direction
Distance

Database EDR ID Number

A8
West
0 - 1/8 Mile

OIL_GAS **CAOG11000209576**

District nun:	1	Api number:	03713395
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	A
Operator name:	Duncan Oil Corp., Ltd.		
County name:	Los Angeles	Fieldname:	Inglewood
Area name:	Any Area	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	AOG
Site id:	CAOG11000209576		

A9
SW
0 - 1/8 Mile

OIL_GAS **CAOG11000209945**

District nun:	1	Api number:	03714078
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Stanton Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209945		

A10
WNW
0 - 1/8 Mile

OIL_GAS **CAOG11000210067**

District nun:	1	Api number:	03714323
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Banks and Hansmeyer		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Simmons	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210067		

A11
NNE **OIL_GAS** **CAOG11000209840**
0 - 1/8 Mile

District nun:	1	Api number:	03713839
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Marathon Oil Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Edgar K. Brown	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209840		

A12
WNW **OIL_GAS** **CAOG11000209953**
0 - 1/8 Mile

District nun:	1	Api number:	03714086
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	United States Oil & Royalties Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Joann	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209953		

A13
WSW
0 - 1/8 Mile

OIL_GAS **CAOG11000209558**

District nun:	1	Api number:	03713377
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Conservative Petro. Corp. Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	King	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209558		

A14
NE
0 - 1/8 Mile

OIL_GAS **CAOG11000209567**

District nun:	1	Api number:	03713386
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	E. G. Curtis		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Morrison	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209567		

Map ID
Direction
Distance

Database EDR ID Number

A15
SSW
0 - 1/8 Mile

OIL_GAS **CAOG11000210038**

District nun:	1	Api number:	03714228
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210038		

A16
NW
0 - 1/8 Mile

OIL_GAS **CAOG11000209780**

District nun:	1	Api number:	03713779
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Imperial Gypsum & Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Playa Del Rey	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209780		

A17
NNE
0 - 1/8 Mile

OIL_GAS **CAOG11000210027**

District nun:	1	Api number:	03714217
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210027		

A18
WNW **OIL_GAS** **CAOG11000209578**
0 - 1/8 Mile

District nun:	1	Api number:	03713397
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	El Jemaro Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209578		

A19
NW **OIL_GAS** **CAOG11000211723**
0 - 1/8 Mile

District nun:	1	Api number:	03716552
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Allied Petroleum Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Rawco-Gans	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000211723		

A20
West
0 - 1/8 Mile

OIL_GAS **CAOG11000209557**

District nun:	1	Api number:	03713376
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Conservative Petro. Corp. Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Jones	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209557		

A21
SSW
0 - 1/8 Mile

OIL_GAS **CAOG11000210079**

District nun:	1	Api number:	03714335
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Block Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	8
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210079		

Map ID
Direction
Distance

Database EDR ID Number

A22
SW
0 - 1/8 Mile

OIL_GAS **CAOG11000209774**

District nun:	1	Api number:	03713773
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Capp	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209774		

A23
WSW
0 - 1/8 Mile

OIL_GAS **CAOG11000210091**

District nun:	1	Api number:	03714347
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Coloma Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Coloma	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210091		

A24
SE
0 - 1/8 Mile

OIL_GAS **CAOG11000210094**

District nun:	1	Api number:	03714350
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Stanley-Lieber	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210094		

A25
SW **OIL_GAS** **CAOG11000209961**
0 - 1/8 Mile

District nun:	1	Api number:	03714094
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	West Coast Pet. Combinations, Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	West Coast	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209961		

B26
NNW **OIL_GAS** **CAOG11000209580**
0 - 1/8 Mile

District nun:	1	Api number:	03713399
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Fiske & Curtis		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Cerrito	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209580		

C27
SSW **OIL_GAS** **CAOG11000210074**
0 - 1/8 Mile

District nun:	1	Api number:	03714330
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Black Gold Petro. Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Frances J. Heney	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210074		

C28
South **OIL_GAS** **CAOG11000210046**
0 - 1/8 Mile

District nun:	1	Api number:	03714236
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Jones & Prentiss	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210046		

Map ID
Direction
Distance

Database EDR ID Number

B29
WNW
0 - 1/8 Mile

OIL_GAS **CAOG11000209888**

District nun:	1	Api number:	03713987
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Austin C. Sherman		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209888		

B30
NNW
0 - 1/8 Mile

OIL_GAS **CAOG11000209842**

District nun:	1	Api number:	03713841
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	McDonald Petro., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Mcdonald	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209842		

D31
ESE
0 - 1/8 Mile

OIL_GAS **CAOG11000209772**

District nun:	1	Api number:	03713771
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Marcell Black	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209772		

B32
NW
0 - 1/8 Mile

OIL_GAS **CAOG11000210069**

District nun:	1	Api number:	03714325
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Anna Baumgartner et al		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	NO. 1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210069		

C33
South
0 - 1/8 Mile

OIL_GAS **CAOG11000210041**

District nun:	1	Api number:	03714231
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Graner	Wellnumber:	5V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210041		

B34
NNW
0 - 1/8 Mile

OIL_GAS **CAOG11000209598**

District nun:	1	Api number:	03713523
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	E. G. Curtis		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	El Camino	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209598		

E35
West
0 - 1/8 Mile

OIL_GAS **CAOG11000209773**

District nun:	1	Api number:	03713772
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Booth	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209773		

Map ID
Direction
Distance

Database EDR ID Number

36
NE **OIL_GAS** **CAOG11000209807**
0 - 1/8 Mile

District nun:	1	Api number:	03713806
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209807		

C37
SW **OIL_GAS** **CAOG11000209949**
0 - 1/8 Mile

District nun:	1	Api number:	03714082
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. W. Todd Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209949		

C38
WSW **OIL_GAS** **CAOG11000210092**
0 - 1/8 Mile

District nun:	1	Api number:	03714348
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Coloma Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Coloma	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210092		

B39
NW **OIL_GAS** **CAOG11000209952**
0 - 1/8 Mile

District nun:	1	Api number:	03714085
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Twin Buttes Oil Corp. Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burns	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209952		

B40
North **OIL_GAS** **CAOG11000210009**
0 - 1/8 Mile

District nun:	1	Api number:	03714199
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	V	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210009		

C41
SSW **OIL_GAS** **CAOG11000209771**
0 - 1/8 Mile

District nun:	1	Api number:	03713770
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Black Gold	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209771		

E42
WSW **OIL_GAS** **CAOG11000209779**
0 - 1/8 Mile

District nun:	1	Api number:	03713778
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	San Vicente	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209779		

Map ID
Direction
Distance

Database EDR ID Number

D43
SSE **OIL_GAS** **CAOG11000209865**
0 - 1/8 Mile

District nun:	1	Api number:	03713964
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P & W Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	P & W	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209865		

C44
SW **OIL_GAS** **CAOG11000210060**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714250
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	21
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210060		

B45
NNW **OIL_GAS** **CAOG11000209575**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713394
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Paul J. Donavan & E. L. Brace		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209575		

B46
North **OIL_GAS** **CAOG11000209563**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713382
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	E. G. Curtis		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Deuel	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209563		

E47
WNW **OIL_GAS** **CAOG11000209889**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713988
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Smith and Davidson		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209889		

E48
West
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209763**

District nun:	1	Api number:	03713762
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	J-1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209763		

C49
SW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209886**

District nun:	1	Api number:	03713985
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Jesse R. Schones		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Schones	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209886		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

C50
SW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209884**

District nun:	1	Api number:	03713983
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Jesse R. Schones		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Schones	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209884		

B51
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209878**

District nun:	1	Api number:	03713977
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	George W. Rankin		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209878		

E52
WSW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209863**

District nun:	1	Api number:	03713962
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	14-A
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209863		

B53
WNW **OIL_GAS** **CAOG11000209845**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713844
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Metropolitan Oil Corp., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209845		

D54
ESE **OIL_GAS** **CAOG11000209782**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713781
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	International Petro. Corp., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209782		

E55
West
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209946**

District nun:	1	Api number:	03714079
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Stanton Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209946		

E56
WSW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210057**

District nun:	1	Api number:	03714247
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	15
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210057		

Map ID
Direction
Distance

Database EDR ID Number

C57
South
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209783**

District nun:	1	Api number:	03713782
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	International Petro. Corp., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209783		

E58
WSW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210056**

District nun:	1	Api number:	03714246
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	11
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210056		

C59
SSW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210039**

District nun:	1	Api number:	03714229
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210039		

B60
NW **OIL_GAS** **CAOG11000209867**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713966
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Pacific-Venice Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Cerrito	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209867		

F61
SSE **OIL_GAS** **CAOG11000209852**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713951
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Nelson Petro. Co., Ltd. Tyler, Rec.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209852		

C62
SSW **OIL_GAS** **CAOG11000209885**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713984
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Jesse R. Schones		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Schones	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209885		

E63
West **OIL_GAS** **CAOG11000209960**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714093
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	West Coast Drilling Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209960		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

F64
South **OIL_GAS** **CAOG11000209762**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713761
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	G-1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209762		

E65
NW **OIL_GAS** **CAOG11000209964**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714097
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	George Wolfe		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Wolfe	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209964		

C66
SSW **OIL_GAS** **CAOG11000210018**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714208
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Block H	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210018		

B67
NNW **OIL_GAS** **CAOG11000209572**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713391
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	John B. De Maria, Jr.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209572		

B68
NW **OIL_GAS** **CAOG11000209573**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713392
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Dennis & Palmer		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209573		

E69
West
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209784**

District nun:	1	Api number:	03713783
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Kashm Oil Corp., Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209784		

G70
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209561**

District nun:	1	Api number:	03713380
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Corrigan Petro. Corp., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Babe Allison	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209561		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

C71
South
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209767**

District nun:	1	Api number:	03713766
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	S & W	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209767		

H72
NNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210025**

District nun:	1	Api number:	03714215
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210025		

E73
WNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000202100**

District nun:	1	Api number:	03701978
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	E. G. Curtis		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burkett	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000202100		

G74
NW **OIL_GAS** **CAOG11000209849**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713848
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Alfred D. Mitchell		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Booth	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209849		

G75
NW **OIL_GAS** **CAOG11000210047**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714237
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	H. L. J. Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000210047		

F76
SE **OIL_GAS** **CAOG11000209781**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713780
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Inland Petro. Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209781		

H77
North **OIL_GAS** **CAOG11000209806**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713805
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209806		

Map ID
Direction
Distance

Database EDR ID Number

F78
South
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209850**

District nun:	1	Api number:	03713849
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Mohawk Petro. Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	I2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209850		

E79
West
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209862**

District nun:	1	Api number:	03713961
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	13B
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209862		

H80
NNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209564**

District nun:	1	Api number:	03713383
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	E. G. Curtis		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Deuel	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209564		

I81
South **OIL_GAS** **CAOG11000209761**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713760
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	C8
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209761		

G82
WNW **OIL_GAS** **CAOG11000210066**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714322
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Banks and Hansmeyer		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Knickerbocker	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210066		

E83
WNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209892**

District nun:	1	Api number:	03713991
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Smith & Graham		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209892		

F84
SE
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209846**

District nun:	1	Api number:	03713845
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Metropolitan Oil Corp., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209846		

Map ID
Direction
Distance

Database EDR ID Number

G85
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210090**

District nun:	1	Api number:	03714346
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Carbon Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000210090		

F86
South
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210058**

District nun:	1	Api number:	03714248
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	16
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210058		

G87
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209880**

District nun:	1	Api number:	03713979
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Rockwell & Hansmeyer		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209880		

E88
West
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209778**

District nun:	1	Api number:	03713777
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Robertson	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209778		

H89
NNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209826**

District nun:	1	Api number:	03713825
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	P. H. & B.	Wellnumber:	17
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209826		

I90
South
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210019**

District nun:	1	Api number:	03714209
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Block I	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210019		

G91
NNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210015**

District nun:	1	Api number:	03714205
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Goldsmith Bros. Inc. Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000210015		

Map ID
Direction
Distance

Database EDR ID Number

J92
WNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209792**

District nun:	1	Api number:	03713791
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	La Bara Oil Co. (R. B. Seymour, Trustee)		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Strain	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209792		

G93
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210073**

District nun:	1	Api number:	03714329
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Bishop Oil Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Venice	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000210073		

G94
WNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209790**

District nun:	1	Api number:	03713789
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Knight Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209790		

I95
South **OIL_GAS** **CAOG11000209965**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714098
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	George Wolfe		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Wolfe	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209965		

F96
SSE **OIL_GAS** **CAOG11000210050**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714240
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210050		

G97
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210048**

District nun:	1	Api number:	03714238
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	E. A. Hall		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210048		

G98
WNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210087**

District nun:	1	Api number:	03714343
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	California Prod. Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210087		

Map ID
Direction
Distance

Database EDR ID Number

F99
South
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209760**

District nun:	1	Api number:	03713759
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	C7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209760		

G100
NNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209853**

District nun:	1	Api number:	03713952
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209853		

G101
WNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209789**

District nun:	1	Api number:	03713788
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Knickerbocker Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209789		

I102
South **OIL_GAS** **CAOG11000210020**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714210
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Block I	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210020		

G103
NW **OIL_GAS** **CAOG11000209577**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713396
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Eagle Oil & Varnish Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209577		

G104
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209565**

District nun:	1	Api number:	03713384
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	E. G. Curtis		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Geffeney-Cahn	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209565		

F105
SE
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210037**

District nun:	1	Api number:	03714227
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Graner	Wellnumber:	1V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210037		

Map ID
Direction
Distance

Database EDR ID Number

K106
ESE
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209799**

District nun:	1	Api number:	03713798
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Dow R.G.C.	Wellnumber:	10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209799		

H107
NNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209804**

District nun:	1	Api number:	03713803
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio Dickinson	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209804		

H108
NNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209795**

District nun:	1	Api number:	03713794
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Calstar	Wellnumber:	V-3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209795		

G109
NNW **OIL_GAS** **CAOG11000210086**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714342
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	California Northern Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	California Northern	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210086		

K110
SE **OIL_GAS** **CAOG11000210028**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714218
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210028		

G111
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209574**

District nun:	1	Api number:	03713393
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Joseph M. Devere		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Baby Jo	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209574		

I112
South
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210021**

District nun:	1	Api number:	03714211
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Block J	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210021		

Map ID
Direction
Distance

Database EDR ID Number

G113
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210088**

District nun:	1	Api number:	03714344
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	California Prod. Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210088		

J114
WNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209873**

District nun:	1	Api number:	03713972
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	The Petrol Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Bergman-Albright	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209873		

G115
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210064**

District nun:	1	Api number:	03714320
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Charles Bailey, Trustee		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Tettelbach	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210064		

K116
SE **OIL_GAS** **CAOG11000209855**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713954
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3-A
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209855		

L117
SE **OIL_GAS** **CAOG11000210013**
1/8 - 1/4 Mile

District nun:	1	Api number:	03714203
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	V	Wellnumber:	6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210013		

G118
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209560**

District nun:	1	Api number:	03713379
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Corrigan Petro. Corp., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Babe Allison	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209560		

M119
NW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000210065**

District nun:	1	Api number:	03714321
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Banks and Hansmeyer		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Allstate	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210065		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

120
North
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209803**

District nun:	1	Api number:	03713802
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio Dickinson	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209803		

J121
WNW
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209872**

District nun:	1	Api number:	03713971
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	The Petrol Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209872		

L122
SSE
1/8 - 1/4 Mile

OIL_GAS **CAOG11000209764**

District nun:	1	Api number:	03713763
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	P-1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209764		

M123
WNW **OIL_GAS** **CAOG11000209579**
1/8 - 1/4 Mile

District nun:	1	Api number:	03713398
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	The Elmer Company, Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209579		

N124
South **OIL_GAS** **CAOG11000210022**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714212
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Block K	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210022		

N125
SSE **OIL_GAS** **CAOG11000209759**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713758
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	C6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PWF
Site id:	CAOG11000209759		

L126
SE **OIL_GAS** **CAOG11000210029**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714219
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	8
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210029		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

L127
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210010**

District nun:	1	Api number:	03714200
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	V	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210010		

M128
NW
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210082**

District nun:	1	Api number:	03714338
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. W. Bonneville		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Grafton	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210082		

K129
ESE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209813**

District nun:	1	Api number:	03713812
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Dow R.G.C.	Wellnumber:	9
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209813		

M130
NW **OIL_GAS** **CAOG11000210061**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714317
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Acme Royalties Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000210061		

L131
SSE **OIL_GAS** **CAOG11000209893**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713992
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	A
Operator name:	Smith & Graham		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	AOG
Site id:	CAOG11000209893		

M132
WNW
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210049**

District nun:	1	Api number:	03714239
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Estate of Hampton & Co., Inc. Bankrupt		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210049		

M133
WNW
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209944**

District nun:	1	Api number:	03714077
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Speedway Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Bradley King	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209944		

Map ID
Direction
Distance

Database EDR ID Number

L134
SSE **OIL_GAS** **CAOG11000209891**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713990
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Smith & Graham		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209891		

N135
SSE **OIL_GAS** **CAOG11000209758**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713757
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	C5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209758		

L136
SE **OIL_GAS** **CAOG11000209838**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713837
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Hugh Ward Lutz		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209838		

O137
SE **OIL_GAS** **CAOG11000210030**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714220
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	9
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210030		

L138
SSE **OIL_GAS** **CAOG11000210016**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714206
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	18
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210016		

N139
South **OIL_GAS** **CAOG11000210023**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714213
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Block L	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210023		

M140
NW **OIL_GAS** **CAOG11000209851**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713850
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Mohawk Petro. Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Tuttle	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209851		

Map ID
Direction
Distance

Database EDR ID Number

O141
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209777**

District nun:	1	Api number:	03713776
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Nelson	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209777		

N142
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210059**

District nun:	1	Api number:	03714249
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	19
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210059		

O143
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209810**

District nun:	1	Api number:	03713809
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209810		

P144
SSE **OIL_GAS** **CAOG11000209857**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713956
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209857		

N145
South **OIL_GAS** **CAOG11000210024**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714214
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Block L	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210024		

O146
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209841**

District nun:	1	Api number:	03713840
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Marcell Oil & Gas Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Black	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209841		

P147
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209890**

District nun:	1	Api number:	03713989
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Smith and Davidson		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Cal-State Venice	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209890		

Map ID
Direction
Distance

Database EDR ID Number

P148
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209883**

District nun:	1	Api number:	03713982
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Jesse R. Schones		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Schones	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209883		

Q149
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209887**

District nun:	1	Api number:	03713986
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Jesse R. Schones		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Schones	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209887		

O150
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210031**

District nun:	1	Api number:	03714221
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210031		

P151
SSE **OIL_GAS** **CAOG11000209876**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713975
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Philco Petro. Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209876		

P152
SE **OIL_GAS** **CAOG11000209958**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714091
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	George Walters Ind Oil & Gas		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209958		

O153
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210070**

District nun:	1	Api number:	03714326
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Beaudette-Dunn Petro. Co. Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210070		

P154
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209775**

District nun:	1	Api number:	03713774
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Langley	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209775		

Map ID
Direction
Distance

Database EDR ID Number

P155
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209753**

District nun:	1	Api number:	03713752
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	B5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209753		

156
NNW
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210089**

District nun:	1	Api number:	03714345
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Calstar Petroleum Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	V	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210089		

Q157
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209963**

District nun:	1	Api number:	03714096
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	George Wolfe		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209963		

Q158
SSE **OIL_GAS** **CAOG11000209768**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713767
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	JK Pacific Group, LLC		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	opr		
Comments:	Not Reported		
Leasename:	Venice	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209768		

P159
SSE **OIL_GAS** **CAOG11000209854**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713953
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209854		

P160
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209864**

District nun:	1	Api number:	03713963
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	P & W	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209864		

P161
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210044**

District nun:	1	Api number:	03714234
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Graner	Wellnumber:	8V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210044		

Map ID
Direction
Distance

Database EDR ID Number

O162
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209798**

District nun:	1	Api number:	03713797
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Dow R.G.C.	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209798		

Q163
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210036**

District nun:	1	Api number:	03714226
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Culver	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210036		

R164
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209959**

District nun:	1	Api number:	03714092
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	George Walters Ind Oil & Gas		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209959		

Q165
SSE **OIL_GAS** **CAOG11000209755**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713754
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. C. Hansmeyer Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	C2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209755		

P166
SE **OIL_GAS** **CAOG11000209765**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713764
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	P-6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209765		

R167
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210032**

District nun:	1	Api number:	03714222
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	11
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210032		

S168
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209787**

District nun:	1	Api number:	03713786
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Thomas Kelly & Sons, Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Rohde	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209787		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

R169
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210045**

District nun:	1	Api number:	03714235
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Graner	Wellnumber:	9V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210045		

Q170
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209752**

District nun:	1	Api number:	03713751
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. C. Hansmeyer Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	B4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209752		

S171
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209571**

District nun:	1	Api number:	03713390
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	B
Operator name:	W. G. Davis Production & Refinery Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	AOG
Site id:	CAOG11000209571		

R172
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210080**

District nun:	1	Api number:	03714336
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Block Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	9
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210080		

R173
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210076**

District nun:	1	Api number:	03714332
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Block Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210076		

S174
SSE **OIL_GAS** **CAOG11000209788**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713787
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Kerry Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209788		

T175
SE **OIL_GAS** **CAOG11000209814**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713813
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	11
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209814		

Map ID
Direction
Distance

Database EDR ID Number

S176
SSE **OIL_GAS** **CAOG11000209756**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713755
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. C. Hansmeyer Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	C3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209756		

S177
SSE **OIL_GAS** **CAOG11000209757**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713756
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	C4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209757		

R178
SE **OIL_GAS** **CAOG11000209811**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713810
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209811		

S179
SSE **OIL_GAS** **CAOG11000209559**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713378
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Considine Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209559		

S180
SSE **OIL_GAS** **CAOG11000209754**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713753
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. C. Hansmeyer Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	B6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209754		

R181
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210033**

District nun:	1	Api number:	03714223
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	12
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210033		

U182
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209956**

District nun:	1	Api number:	03714089
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Vicar Petro. Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209956		

Map ID
Direction
Distance

Database EDR ID Number

R183
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209861**

District nun:	1	Api number:	03713960
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	13-A
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209861		

R184
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210043**

District nun:	1	Api number:	03714233
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Graner	Wellnumber:	7V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210043		

R185
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209858**

District nun:	1	Api number:	03713957
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	6-A
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209858		

S186
SSE **OIL_GAS** **CAOG11000209791**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713790
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Ella M, Krouskop, H. G. Triplett & Roof		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Pacific Shore	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209791		

S187
SSE **OIL_GAS** **CAOG11000210078**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714334
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Block Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210078		

U188
SSE **OIL_GAS** **CAOG11000209794**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713793
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	A. W. Lindberg & F. B. Donnelly		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209794		

U189
SE **OIL_GAS** **CAOG11000210042**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714232
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Graner	Wellnumber:	6V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210042		

Map ID
Direction
Distance

Database EDR ID Number

S190
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209785**

District nun:	1	Api number:	03713784
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Thomas Kelly & Sons, Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	KG	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209785		

S191
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209870**

District nun:	1	Api number:	03713969
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	The Petrol Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209870		

U192
SSE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209856**

District nun:	1	Api number:	03713955
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	4-A
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209856		

S193
SSE **OIL_GAS** **CAOG11000209776**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713775
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	ExxonMobil Corporation		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Moore	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209776		

U194
SE **OIL_GAS** **CAOG11000210052**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714242
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210052		

V195
SSE **OIL_GAS** **CAOG11000210014**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714204
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	V	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210014		

U196
SSE **OIL_GAS** **CAOG11000209871**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713970
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	The Petrol Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209871		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

U197
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210077**

District nun:	1	Api number:	03714333
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Block Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210077		

T198
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000209812**

District nun:	1	Api number:	03713811
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	8
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209812		

W199
SE
1/4 - 1/2 Mile

OIL_GAS **CAOG11000210026**

District nun:	1	Api number:	03714216
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210026		

V200
SSE **OIL_GAS** **CAOG11000210012**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714202
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	V	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210012		

U201
SSE **OIL_GAS** **CAOG11000209569**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713388
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	James Davidson		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	7R
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209569		

V202
SSE **OIL_GAS** **CAOG11000209882**
1/4 - 1/2 Mile

District nun:	1	Api number:	03713981
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. D. Rush Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	V	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209882		

V203
SSE **OIL_GAS** **CAOG11000209942**
1/4 - 1/2 Mile

District nun:	1	Api number:	03714075
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southwest Oil and Dev. Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209942		

Map ID
Direction
Distance

Database EDR ID Number

U204
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209860**

District nun:	1	Api number:	03713959
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	12
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209860		

V205
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209962**

District nun:	1	Api number:	03714095
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Williams Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209962		

V206
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209879**

District nun:	1	Api number:	03713978
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	A
Operator name:	Rich Petroleum Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Swartz	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	AOG
Site id:	CAOG11000209879		

W207
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209859**

District nun:	1	Api number:	03713958
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	P. H. & B. Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	10B
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209859		

X208
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209786**

District nun:	1	Api number:	03713785
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Thomas Kelly & Sons, Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	PE	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209786		

W209
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209766**

District nun:	1	Api number:	03713765
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	P-9
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209766		

W210
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209948**

District nun:	1	Api number:	03714081
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Tideland Oil Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209948		

Map ID
Direction
Distance

Database EDR ID Number

W211
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000210034**

District nun:	1	Api number:	03714224
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	13
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210034		

X212
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000210084**

District nun:	1	Api number:	03714340
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	M. H. Bush & W. M. Webb		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210084		

W213
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209809**

District nun:	1	Api number:	03713808
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209809		

W214
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209808**

District nun:	1	Api number:	03713807
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209808		

W215
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000210035**

District nun:	1	Api number:	03714225
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Burks	Wellnumber:	13-A
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210035		

W216
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209947**

District nun:	1	Api number:	03714080
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	The Superior Oil Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Moses	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209947		

W217
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000210053**

District nun:	1	Api number:	03714243
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Venezia Oil Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210053		

Map ID
Direction
Distance

Database EDR ID Number

218
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209817**

District nun:	1	Api number:	03713816
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	14
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209817		

X219
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000210083**

District nun:	1	Api number:	03714339
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Florence M. Brauer		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000210083		

X220
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000210085**

District nun:	1	Api number:	03714341
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	M. H. Bush & W. M. Webb		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210085		

X221
SSE **OIL_GAS** **CAOG11000209943**
1/2 - 1 Mile

District nun:	1	Api number:	03714076
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southwest Oil and Dev. Corp.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	9
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209943		

X222
SSE **OIL_GAS** **CAOG11000210011**
1/2 - 1 Mile

District nun:	1	Api number:	03714201
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	V	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210011		

X223
SSE **OIL_GAS** **CAOG11000210040**
1/2 - 1 Mile

District nun:	1	Api number:	03714230
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Graner Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Graner	Wellnumber:	4V
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210040		

X224
SSE **OIL_GAS** **CAOG11000210081**
1/2 - 1 Mile

District nun:	1	Api number:	03714337
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Blue Ridge Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Bland	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210081		

Map ID
Direction
Distance

Database EDR ID Number

Y225
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209933**

District nun:	1	Api number:	03714048
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Townsite	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209933		

X226
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209932**

District nun:	1	Api number:	03714047
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Townsite	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209932		

X227
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209940**

District nun:	1	Api number:	03714056
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Troxel	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209940		

228
ESE **OIL_GAS** **CAOG11000209816**
1/2 - 1 Mile

District nun:	1	Api number:	03713815
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	13
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209816		

229
NE **OIL_GAS** **CAOG11000209805**
1/2 - 1 Mile

District nun:	1	Api number:	03713804
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	21
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Ohio Howland	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209805		

X230
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209847**

District nun:	1	Api number:	03713846
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Midway Supply Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209847		

Y231
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209831**

District nun:	1	Api number:	03713830
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Union D.R.	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209831		

Map ID
Direction
Distance

Database EDR ID Number

Z232
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209881**

District nun:	1	Api number:	03713980
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. D. Rush Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	V	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209881		

233
ESE
1/2 - 1 Mile

OIL_GAS **CAOG11000209818**

District nun:	1	Api number:	03713817
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio R.G.C.	Wellnumber:	15
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209818		

X234
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209935**

District nun:	1	Api number:	03714050
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Townsite	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209935		

Y235
SSE **OIL_GAS** **CAOG11000209934**
1/2 - 1 Mile

District nun:	1	Api number:	03714049
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Townsite	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209934		

Y236
SE **OIL_GAS** **CAOG11000209832**
1/2 - 1 Mile

District nun:	1	Api number:	03713831
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Union D.R.	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209832		

Z237
SSE **OIL_GAS** **CAOG11000209570**
1/2 - 1 Mile

District nun:	1	Api number:	03713389
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Davidson Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209570		

Z238
SSE **OIL_GAS** **CAOG11000209957**
1/2 - 1 Mile

District nun:	1	Api number:	03714090
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	George Walters		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209957		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

Z239
SSE **OIL_GAS** **CAOG11000210054**
1/2 - 1 Mile

District nun:	1	Api number:	03714244
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. C. Hansmeyer Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	8
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210054		

240
SE **OIL_GAS** **CAOG11000209913**
1/2 - 1 Mile

District nun:	1	Api number:	03714011
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Del Rey	Wellnumber:	6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209913		

Z241
SSE **OIL_GAS** **CAOG11000210072**
1/2 - 1 Mile

District nun:	1	Api number:	03714328
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Birch-Royer Oil Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Lovell Comm.	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210072		

Z242
SSE **OIL_GAS** **CAOG11000210055**
1/2 - 1 Mile

District nun:	1	Api number:	03714245
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. C. Hansmeyer Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210055		

AA243
SSE **OIL_GAS** **CAOG11000209936**
1/2 - 1 Mile

District nun:	1	Api number:	03714051
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Townsite	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209936		

Z244
SSE **OIL_GAS** **CAOG11000209770**
1/2 - 1 Mile

District nun:	1	Api number:	03713769
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Lyman C. Hisey		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Hunter	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209770		

Z245
SSE **OIL_GAS** **CAOG11000210071**
1/2 - 1 Mile

District nun:	1	Api number:	03714327
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	David D. Behr		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Hunter	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210071		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

AA246
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209950**

District nun:	1	Api number:	03714083
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Transcalifornia Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209950		

247
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000209939**

District nun:	1	Api number:	03714054
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Townsite	Wellnumber:	11
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209939		

248
ESE
1/2 - 1 Mile

OIL_GAS **CAOG11000209914**

District nun:	1	Api number:	03714012
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Del Rey	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209914		

AA249
SSE **OIL_GAS** **CAOG11000209907**
1/2 - 1 Mile

District nun:	1	Api number:	03714004
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Block	Wellnumber:	10-R
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209907		

AA250
SSE **OIL_GAS** **CAOG11000210068**
1/2 - 1 Mile

District nun:	1	Api number:	03714324
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Banks and Hansmeyer		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Wood	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210068		

AA251
SSE **OIL_GAS** **CAOG11000209937**
1/2 - 1 Mile

District nun:	1	Api number:	03714052
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Townsite	Wellnumber:	6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209937		

AB252
SSE **OIL_GAS** **CAOG11000210051**
1/2 - 1 Mile

District nun:	1	Api number:	03714241
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. C. Hansmeyer Oil Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210051		

Map ID
Direction
Distance

Database EDR ID Number

AA253
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209908**

District nun:	1	Api number:	03714005
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Block	Wellnumber:	11
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209908		

254
ESE
1/2 - 1 Mile

OIL_GAS **CAOG11000209915**

District nun:	1	Api number:	03714013
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Del Rey	Wellnumber:	8
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209915		

AB255
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209568**

District nun:	1	Api number:	03713387
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. D. Dalton & E. F. Sharkey		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209568		

AB256
SSE **OIL_GAS** **CAOG11000210075**
1/2 - 1 Mile

District nun:	1	Api number:	03714331
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Harry Blank		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Cain	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000210075		

AC257
SSE **OIL_GAS** **CAOG11000209938**
1/2 - 1 Mile

District nun:	1	Api number:	03714053
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Townsite	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209938		

AC258
SSE **OIL_GAS** **CAOG11000209793**
1/2 - 1 Mile

District nun:	1	Api number:	03713792
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	J. D. Langford & Co.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209793		

AB259
SSE **OIL_GAS** **CAOG11000209866**
1/2 - 1 Mile

District nun:	1	Api number:	03713965
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Pacific Oil Investment Co. Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209866		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

AB260
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209844**

District nun:	1	Api number:	03713843
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Meier Oil Co., Ltd.		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Not Reported	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209844		

AD262
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000191915**

District nun:	1	Api number:	03714015
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	28.34
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	55411258.ssf		
Leasename:	Del Rey	Wellnumber:	10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POB
Site id:	CAOG11000191915		

AD261
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000191914**

District nun:	1	Api number:	03714015
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	28.34
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	55411258.ssf		
Leasename:	Del Rey	Wellnumber:	10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POB
Site id:	CAOG11000191914		

AD263
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000191916**

District nun:	1	Api number:	03714015
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Venice	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	28.34
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	55411258.ssf		
Leasename:	Del Rey	Wellnumber:	10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POB
Site id:	CAOG11000191916		

AE264
SSE
1/2 - 1 Mile

OIL_GAS **CAOG11000209796**

District nun:	1	Api number:	03713795
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Davidson	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209796		

AE265
SSE **OIL_GAS** **CAOG11000209797**
1/2 - 1 Mile

District nun:	1	Api number:	03713796
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Davidson	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209797		

AC266
SE **OIL_GAS** **CAOG11000209836**
1/2 - 1 Mile

District nun:	1	Api number:	03713835
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	28
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Union T.S.	Wellnumber:	10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	POG
Site id:	CAOG11000209836		

Map ID
Direction
Distance

Database EDR ID Number

267
NW
1/2 - 1 Mile

OIL_GAS **CAOG11000204846**

District nun:	1	Api number:	03705687
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Venice Beach (ABD)
Area name:	Onshore	Section:	20
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	South Canal Corehole	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000204846		

268
East
1/2 - 1 Mile

OIL_GAS **CAOG11000209802**

District nun:	1	Api number:	03713801
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	County of Los Angeles		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	22
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Ohio D.R.L. & W.	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000209802		

AF269
ESE
1/2 - 1 Mile

OIL_GAS **CAOG11000191926**

District nun:	1	Api number:	03714022
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	A
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	27
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	24.484
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	55411258.ssf		
Leasename:	Del Rey	Wellnumber:	17
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	AOG
Site id:	CAOG11000191926		

AF270
ESE
1/2 - 1 Mile

OIL_GAS **CAOG11000191927**

District nun:	1	Api number:	03714022
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	A
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	27
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	24.484
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	55411258.ssf		
Leasename:	Del Rey	Wellnumber:	17
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	AOG
Site id:	CAOG11000191927		

AG271
ESE
1/2 - 1 Mile

OIL_GAS **CAOG11000191928**

District nun:	1	Api number:	03714023
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	A
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	27
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	20.953
Locationde:	Not Reported		
Gissourcec:	gps		

Comments:	55411258.ssf		
Leasename:	Del Rey	Wellnumber:	18
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	AOG
Site id:	CAOG11000191928		

AG272
ESE
1/2 - 1 Mile

OIL_GAS **CAOG11000191929**

District nun:	1	Api number:	03714023
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	A
Operator name:	Southern California Gas Company		
County name:	Los Angeles	Fieldname:	Playa Del Rey
Area name:	Del Rey Hills	Section:	27
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	20.953
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	55411258.ssf		
Leasename:	Del Rey	Wellnumber:	18
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	AOG
Site id:	CAOG11000191929		

273
NW
1/2 - 1 Mile

OIL_GAS **CAOG11000224253**

District nun:	1	Api number:	23705688
Blm well:	N	Redrill can:	Not Reported
Dryhole:	N	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles Offshore	Fieldname:	Venice Beach (ABD)
Area name:	Offshore	Section:	20
Township:	02S	Range:	15W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Windward Comm. Corehole	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Unknown	Gissymbol:	PDH
Site id:	CAOG11000224253		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

State Database: CA Radon

Radon Test Results

Zipcode	Num Tests	> 4 pCi/L
90292	25	2

Federal EPA Radon Zone for LOS ANGELES County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for LOS ANGELES COUNTY, CA

Number of sites tested: 63

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.711 pCi/L	98%	2%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	0.933 pCi/L	100%	0%	0%

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetland Inventory
Source: Department of Fish & Game
Telephone: 916-445-0411

HYDROGEOLOGIC INFORMATION

AQUIFLOW^{R} Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Service, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Water Well Database
Source: Department of Water Resources
Telephone: 916-651-9648

California Drinking Water Quality Database
Source: Department of Public Health
Telephone: 916-324-2319
The database includes all drinking water compliance and special studies monitoring for the state of California since 1984. It consists of over 3,200,000 individual analyses along with well and water system information.

OTHER STATE DATABASE INFORMATION

California Oil and Gas Well Locations
Source: Department of Conservation
Telephone: 916-323-1779
Oil and Gas well locations in the state.

RADON

State Database: CA Radon
Source: Department of Health Services
Telephone: 916-324-2208
Radon Database for California

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

California Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary fault lines, prepared in 1975 by the United State Geological Survey. Additional information (also from 1975) regarding activity at specific fault lines comes from California's Preliminary Fault Activity Map prepared by the California Division of Mines and Geology.

STREET AND ADDRESS INFORMATION

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APPENDIX F

REGULATORY AGENCY DOCUMENTATION

Dennis Fee

From: Gallardo, Laura@Waterboards <Laura.Gallardo@waterboards.ca.gov> on behalf of WB-RB4-PublicRecords <RB4-PublicRecords@waterboards.ca.gov>
Sent: Thursday, April 28, 2016 9:59 AM
To: Dennis Fee
Cc: Gallardo, Laura@Waterboards
Subject: RE: Records Request/Tracking No 2016041307

Follow Up Flag: Follow Up
Due By: Thursday, April 28, 2016 4:43 PM
Flag Status: Flagged

The Regional Board has reviewed its files and has concluded that it does not have any records that are responsive to your request.

From: Dennis Fee [mailto:dfee@ninyoandmoore.com]
Sent: Wednesday, April 13, 2016 2:32 PM
To: WB-RB4-PublicRecords
Subject: Records Request

I would like to review files that your agency may have regarding the following addresses:

- **128 Hurricane Street, Marine del Rey, CA 90292**

Please contact me to set up an appointment to review any available files.

Thanks,

Dennis Fee
Staff Environmental Engineer
Ninyo & Moore
Geotechnical & Environmental Sciences Consultants
475 Goddard, Suite 200 | Irvine, CA 92618
(949) 753-7070 (**x12274**) | (949) 697-2093 (Cell)
www.ninyoandmoore.com

30 Years of Quality Service

Department of Toxic Substances Control

Matthew Rodriquez
Secretary for
Environmental Protection

Barbara A. Lee, Director
9211 Oakdale Avenue
Chatsworth, California 91311

Edmund G. Brown Jr.
Governor

April 14, 2016

Dennis Fee
Ninyo & Moore
475 Goddard, Suite 200
Irvine, CA 92618

128 Hurricane Street, Marina Del Rey, CA 90292

PR3-041416-01

Dear Mr. Fee:

We have received your Public Records Act Request for records from the Department of Toxic Substances Control.

After a thorough review of our files we have found that no such records exist at this office pertaining to the site/facility referenced above.

We would also like to inform you about Envirostor, a database that provides information and documents on over 5,000 DTSC cleanup sites. Envirostor can be accessed at: http://www.envirostor.dtsc.ca.gov/public. Also, a computer is available in the Central Files of each DTSC Regional Office for use by community members to view Envirostor.

If you have any questions or would like further information regarding your request, please contact me at (818) 717-6521.

Sincerely,

Vivien Tutaan/rh
Regional Records Coordinator

Printed on Recycled Paper

Matthew Rodriquez
Secretary for
Environmental Protection

Department of Toxic Substances Control

Barbara A. Lee, Director
5796 Corporate Avenue
Cypress, California 90630

Edmund G. Brown Jr.
Governor

April 13, 2016

Mrs. Dennis Fee
Ninyo & Moore
475 Goddard, Suite 200
Irvine, CA 92618

128 Hurricane St., Marina Del Rey
PR4-041316-04

Dear: Mrs. Fee:

We have received your Public Records Act Request for records from Department of Toxic Substances Control.

After a thorough review of our files we have found that, no such records exist at this office pertaining to the site/facility referenced above.

We would like to inform you about Envirostor, a database that provides information and documents on over 5,000 DTSC cleanup sites. Envirostor can be accessed at: http://www.envirostor.dtsc.ca.gov/public. Also, a computer is available in the Central Files of each DTSC Regional Office for use by community members to view Envirostor.

If you have any questions, would like further information regarding your request, please contact our Regional Records Coordinator at (714) 484-5336.

Sincerely,

Jone Barrio

Jone Barrio
Regional Records Coordinator
Cypress Administrative Services

Printed on Recycled Paper

Los Angeles City Fire Department

Telephone (213) 978-3691 **Fax** (213) 978-3615 **Email** lafdrfi@lacity.org
200 N. Main St., 17th Fl., Los Angeles, CA 90012

Request for Information
Hazardous Materials Records

***COMPLETE ONE FORM FOR EACH ADDRESS**

Request Date: 4/13/16 Email: dfee@ninyoandmoore.com

Requester's Name: Dennis Fee Fax#: (949) 753-7071

Company/ Agency: Ninyo & Moore PH.#: (949) 753-7070

Address: 475 Goddard Unit/Ste.: 200

City: State: CA Zip: 92618

Information is requested for

☐ Active Facilities Only

Check all that apply: ☑ Inventory Summary ☑ Review File

Business Name/ DBA:

Storage Address: 128 Hurricane Street Unit/Ste.:

City: Zip: 90292

Reason for Request: Phase I Environmental Site Assessment

FOR OFFICE USE ONLY

☑ **NO INFORMATION ON FILE**
☐ **HARD FILE DESTROYED**
☐ **INFORMATION AVAILABLE**

Fee Schedule:
*Inventory Summary** x $11.00

Facility I.D. No.:

Request Review File Copies:

Request No.: *Initial Fee** x $ 1.10

Processed Date: 04/14/2016 # of pgs. x $0.10 = $____

APPT. TO REVIEW FILE:

* *Per Fac. I.D.*

Processor Signature: **TOTAL:** **$**

Allow 10 working days for processing:

LOS ANGELES FIRE DEPARTMENT
UNDERGROUND TANKS REQUEST FOR FIRE PREVENTION RECORDS

ADDRESS: 200 NORTH MAIN ST., 17TH FLR.RM.1700

NEW OFFICE# - 213-978-3700 NEW EMAIL lafd.usttestnotify@lacity.org

PLEASE GIVE US 7 TO 10 BUSINESS DAYS TO HONOR YOUR REQUEST.

ONE ADDRESS ONLY - PER SHEET

↓ COMPLETE THIS BOX. ONE FOR EACH PROPERTY CONCERNED ↓

PHONE NO: (949) 753-7070 EMAIL: dfee@ninyoandmoore.com

NAME OF REQUESTER (PLEASE PRINT): Dennis Fee

REPRESENTING (COMPANY NAME): Ninyo & Moore

SIGNATURE: _____ DATE: 4/13/2016

DRIVER LIC NO: _____ EXP: _____

ADDRESS FOR WHICH RECORDS ARE REQUESTED: 128 Hurricane Street, Marina del Rey, CA 90292

REASON FOR REQUEST: Phase I Environmental Site Assessment

NO COPY SERVICES ALLOWED

FOR OFFICE USE ONLY:

☐ REVIEW ONLY (NO COPIES)

☐ REQUEST COPIES

NUMBER OF PAGES: _____

X .10 ¢

= _____

+ $11.00

TOTAL FEE AMOUNT: _____

BILLING & ACCOUNTS RECEIVABLE
16TH FL, Rm. 1620, 200 N. MAIN (REV CODE #3887)

NO FILE FOUND

COUNTY OF LOS ANGELES
Public Health

CYNTHIA A. HARDING, M.P.H.
Interim Director

JEFFREY D. GUNZENHAUSER, M.D., M.P.H.
Interim Health Officer

Public Health Investigation Administration
LEOLA MERCADEL
Chief, Public Health Investigation

5555 Ferguson Drive, Suite 120-04
Commerce, California 90022
TEL (323) 890-7801 • FAX (323) 728-0217

www.publichealth.lacounty.gov

BOARD OF SUPERVISORS

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Fifth District

April 14, 2016

NINYO & MOORE
Dennis Fee
475 Goddard, Ste. 200
Irvine, CA 92618

RE: 128 Hurricane St., Marina Del Rey, CA 90292

I, the undersigned, being the Custodian or the Keeper of Records, certify that a thorough search for the records you requested was carried out under my direction and control.

This search revealed no records.

It should be understood that this does not mean that the records you requested do not exist. It is possible that such records may be misfiled; exist under another spelling, another name, or under another classification. However, with the information furnished to our office, and to the best of our knowledge, no records were located.

If you have any questions regarding your request, please contact our office at (323) 890-7806.

Sincerely,

Jorge Perez, Deputy Health Officer
Public Health Investigation

COR ID No.162531

APPENDIX G

VAPOR ENCROACHMENT SCREENING

Phase I Environmental Site Assessment (ESA) Vapor Encroachment Conditions (VEC) matrix includes a (1) Search Radius Test, (2) Chemicals of Concern (COC) Test, and (3) a Critical Distance Test [1].

(1) Search Radius Test: Are there known or suspect contaminated properties in the primary area of concern within the corresponding search radii?

☒ Yes ☐ No — If ***No***, then screening for a VEC is complete and no VEC *currently* exists, go to #4. If ***Yes***, then:

(2) Chemicals of Concern Test: Are COCs likely to be present within the area of concern for those known or suspect contaminated sites identified based on the Search Distance Test?

☒ Yes ☐ No — If ***No***, then screening for a VEC is complete and no VEC *currently* exists, go to #4. If ***Yes***, then:

(3) Critical Distance Test: A plume test to determine whether or not COCs in the contaminated plume(s) may be within the critical distance.

☐ Yes ☒ No — (3a) Is information related to the contaminated plume(s) available (i.e. isoconcentration maps, site drawings, etc.)?
(3b) If ***No***, then a VEC cannot be ruled out; check ***Yes*** in #4 below indicating it is likely a VEC exists. If ***Yes***, then:

☐ Yes ☐ No — (3c) Is the site less than 100 feet to the nearest edge of a contaminated [non-petroleum hydrocarbon] plume(s)? If ***Yes***, then check ***Yes*** in #4 below indicating it is likely a VEC exists.

☐ Yes ☐ No — (3d) Is the site less than 30 feet to the nearest edge of a dissolved petroleum hydrocarbon plume(s)? If ***Yes***, then check ***Yes*** in #4 below indicating it is likely a VEC exists.

If the distance from the nearest edge of a contaminated plume to the nearest existing or planned structure on the site is less than 100 feet for non-petroleum hydrocarbon COC, or less than 30 feet for dissolved petroleum hydrocarbons, then it is presumed that a VEC *currently* exists beneath the site. If the distance from the nearest edge of the contaminated plume is greater than or equal to 100 feet for non-petroleum hydrocarbons, or 30 feet for dissolved petroleum hydrocarbon chemicals of concern, then it is presumed unlikely that a VEC *currently* exists beneath the site.

(4) Is it likely that a VEC *currently* exists beneath the site?

☒ Yes ☐ No — If ***No***, then the VEC screening is complete and no further investigation is recommended at this time. If ***Yes***, Ninyo & Moore recommends performing additional assessment, such as a Tier 2 VEC assessment according to ASTM E 2600-10.

[1] Based on guidance presented in the ASTM E 2600-10 Standard.