APPLICATIONS

APPEAL APPLICATION
Instructions and Checklist

PURPOSE

This application is for the appeal of Los Angeles Department of City Planning determinations, as authorized by the LAMC. For California Environmental Quality Act Appeals, use form CP13-7840. For Building and Safety Appeals and Housing Department Appeals, use form CP13-7854.

RELATED CODE SECTION

Refer to the Letter of Determination (LOD) for the subject case to identify the applicable Los Angeles Municipal Code (LAMC) Section for the entitlement and the appeal procedures.

APPELLATE BODY

Check only one. If unsure of the Appellate Body, check with City Planning staff before submission.

☐ Area Planning Commission (APC) ☐ City Planning Commission (CPC) ☑ City Council

☐ Zoning Administrator (ZA)

CASE INFORMATION

Case Number: CPC-2024-5548-DB-PR-HCA

APN: 4251003032

Project Address: 2930 - 2936 South Sepulveda Boulevard, Los Angeles CA 90064

Final Date to Appeal: January 30, 2026

APPELLANT

Check all that apply.

☑ Person, other than the Applicant, Owner or Operator claiming to be aggrieved

☐ Representative ☐ Property Owner ☐ Applicant ☐ Operator of the Use/Site

APPELLANT INFORMATION

Appellant Name: Pam Rieder

Company/Organization: 2990 S. Sepulveda, LLC

Mailing Address: 16835 Algonquin St. #458

City: Huntington Beach **State:** CA **Zip Code:** 92649

Telephone: _____ **E-mail:** prieder1@icloud.com

Is the appeal being filed on your behalf or on behalf of another party, organization, or company?

☐ Self ☑ Other: 2990 S. Sepulveda, LLC

Is the appeal being filed to support the original applicant's position? ☐ **YES** ☐ **NO**

REPRESENTATIVE / AGENT INFORMATION

Name: Elizabeth Klebaner

Company/Organization: Nossaman LLP

Mailing Address: 777 South Figueroa Street, 34th Floor

City: Los Angeles **State:** CA **Zip Code:** 90017

Telephone: 949-344-9129 **E-mail:** lklebaner@nossaman.com

JUSTIFICATION / REASON FOR APPEAL

Is the decision being appealed in its entirety or in part? ☐ **Entire** ☑ **Part**

Are specific Conditions of Approval being appealed? ☑ **YES** ☐ **NO**

If Yes, list the Condition Number(s) here: 43

On a separate sheet provide the following:

☑ Reason(s) for the appeal

☑ Specific points at issue

☑ How you are aggrieved by the decision

APPLICANT'S AFFIDAVIT

I certify that the statements contained in this application are complete and true.

Appellant Signature: _____ **Date:** 12/26/2025

GENERAL NOTES

A Certified Neighborhood Council (CNC) or a person identified as a member of a CNC or as representing the CNC may not file an appeal on behalf of the Neighborhood Council; persons affiliated with a CNC may only file as an individual on behalf of self.

The appellate body must act on the appeal within a time period specified in the LAMC Section(s) pertaining to the type of appeal being filed. Los Angeles City Planning will make its best efforts to have appeals scheduled prior to the appellate body's last day to act in order to provide due process to the appellant. If the appellate body is unable to come to a consensus or is unable to hear and consider the appeal prior to the last day to act, the appeal is automatically deemed denied, and the original decision will stand. The last day to act as defined in the LAMC may only be extended if formally agreed upon by the applicant.

THIS SECTION FOR CITY PLANNING STAFF USE ONLY

Base Fee: $218.94

Reviewed & Accepted by (DSC Planner): Maira Sanchez

Receipt No.: Invoice No. 106963 **Date:** 1/28/2026

☐ Determination authority notified ☐ Receipt Number

GENERAL APPEAL FILING REQUIREMENTS

If dropping off an appeal at a Development Services Center (DSC), the following items are required. See also additional instructions for specific case types. To file online, visit our [Application System]

APPEAL DOCUMENTS

1. Hard Copy

Provide three sets (one original, two duplicates) of the listed documents for each appeal filed.

☐ Appeal Application

☐ Justification/Reason for Appeal

☐ Copy of Letter of Determination (LOD) for the decision being appealed

2. Electronic Copy

☐ Provide an electronic copy of the appeal documents on a USB flash drive. The following items must be saved as individual PDFs and labeled accordingly (e.g., "Appeal Form", "Justification/Reason Statement", or "Original Determination Letter"). No file should exceed 70 MB in size.

3. Appeal Fee

☐ *Original Applicant.* The fee charged shall be in accordance with LAMC Section 19.01 B.1(a) of Chapter 1 or LAMC Section 15.1.1.F.1.a. (Appeal Fees) of Chapter 1A as applicable, or a fee equal to 85% of the original base application fee. Provide a copy of the original application receipt(s) to calculate the fee.

☐ *Aggrieved Party.* The fee charged shall be in accordance with LAMC Section 19.01 B.1(b) of Chapter 1 or LAMC Section 15.1.1.F.1.b. (Appeal Fees) of Chapter 1A as applicable

4. Noticing Requirements (Applicant Appeals Only)

☐ *Copy of Mailing Labels.* All appeals require noticing of the appeal hearing per the applicable LAMC Section(s). Original Applicants must provide noticing per the LAMC for all Applicant appeals. See the Mailing Procedures Instructions (CP13-2074) for applicable requirements.

SPECIFIC CASE TYPES
ADDITIONAL APPEAL FILING REQUIREMENTS AND / OR LIMITATIONS

DENSITY BONUS (DB) / TRANSIT ORIENTED COMMUNITES (TOC)

Appeal procedures for DB/TOC cases are pursuant to LAMC Section 13B.2.5. (Director Determination) of Chapter 1A or LAMC Section 13B.2.3. (Class 3 Conditional Use) of Chapter 1A as applicable.

- Off-Menu Incentives or Waiver of Development Standards are not appealable.
- Appeals of On-Menu Density Bonus or Additional Incentives for TOC cases can only be filed by adjacent owners or tenants and is appealable to the City Planning Commission.

☐ Provide documentation confirming adjacent owner or tenant status is required (e.g., a lease agreement, rent receipt, utility bill, property tax bill, ZIMAS, driver's license, bill statement).

WAIVER OF DEDICATION AND / OR IMPROVEMENT

Procedures for appeals of Waiver of Dedication and/or Improvements (WDIs) are pursuant to LAMC Section 12.37 I of Chapter 1 or LAMC Section 10.1.10. (Waiver and Appeals) of Chapter 1A as applicable.

- WDIs for by-right projects can only be appealed by the Property Owner.
- If the WDI is part of a larger discretionary project, the applicant may appeal pursuant to the procedures which govern the main entitlement.

[VESTING] TENTATIVE TRACT MAP

Procedures for appeals of [Vesting] Tentative Tract Maps are pursuant LAMC Section 13B.7.3.G. of Chapter 1A.

- Appeals must be filed within 10 days of the date of the written determination of the decision-maker.

NUISANCE ABATEMENT / REVOCATIONS

Appeal procedures for Nuisance Abatement/Revocations are pursuant to LAMC Section 13B.6.2.G. of Chapter 1A. Nuisance Abatement/Revocations cases are only appealable to the City Council.

Appeal Fee

☐ *Applicant (Owner/Operator).* The fee charged shall be in accordance with the LAMC Section 19.01 B.1(a) of Chapter 1 or LAMC Section 15.1.1.F.1.a. (Appeal Fees) of Chapter 1A as applicable.

For appeals filed by the property owner and/or business owner/operator, or any individuals/agents/representatives/associates affiliated with the property and business, who files the appeal on behalf of the property owner and/or business owner/operator, appeal application fees listed under LAMC Section 19.01 B.1(a) of Chapter 1 shall be paid, at the time the appeal application is submitted, or the appeal application will not be accepted.

☐ *Aggrieved Party.* The fee charged shall be in accordance with the LAMC Section 19.01 B.1(b) of Chapter 1 or LAMC Section 15.1.1.F.1.b. (Appeal Fees) of Chapter 1A as applicable.

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Admitted only in California

Refer To File # 505368-0001

VIA CITY OF LOS ANGELES ONLINE APPLICATION SYSTEM
https://planning.lacity.gov/oas

January 27, 2026

Hon. Mayor and Members of the City Council
City of Los Angeles
200 N. Spring Street, Room 401
Los Angeles, CA 90012

Re: Appeal of City Planning Commission Approval of Project Review and CEQA Statutory Exemption Determination for Proposed Residential Project at 2930-2936 South Sepulveda Boulevard, Case Numbers CPC-2024-5548-DB-PR-HCA and ENV-2024-5549-SE

Dear Mayor Bass and Councilmembers:

Nossaman LLP is land use counsel to 2990 S. Sepulveda, LLC (referred to herein also as "Appellant"), which owns the Mullikin Medical Center, located at 2990 South Sepulveda Boulevard, at the northeast corner of the intersection of South Sepulveda Boulevard and National Boulevard. Proof of ownership is attached here as **Attachment 8**. We are writing on behalf of 2990 S. Sepulveda, LLC to appeal the City Planning Commission's approval of the Project Review and CEQA exemption determination for the proposed residential project proposed at 2930-2936 South Sepulveda Boulevard ("Project"). The tenants of Mullikin Medical Center include a pediatric clinic that treats children with autism. Besides being a medical facility, the Mullikin Medical Center is a telecommunications center with multiple wireless carriers as tenants. There is extensive infrastructure present at the medical center, including backup systems and power.

2990 S. Sepulveda, LLC supports the lawful development of well-planned, high-density and affordable housing in the City of Los Angeles. The Project is not that project.

APPEAL JUSTIFICATION.

Summary of Grounds for Appeal of Project Review.

In approving a Project Review, the City must find that a project "consists of building and structures … **including height** … that is or will be **compatible with existing** and future **development on adjacent properties and neighboring properties**." (Los Angeles Municipal Code, § 13.B.2.4(E)(2), emphasis added.) The City Planning Commission's finding that the Project is consistent with adjacent uses is not supported by the proceeding record, which conclusively demonstrates that the Project would interfere with telecommunications facilities that the City approved, finding that the telecommunications facilities were needed to be sited at the Mullikin Medical Center in order to ensure adequate public safety and emergency response in the community. For the reasons discussed more fully below, the Project is, in fact, incompatible with adjacent properties.

As has been extensively documented by 2990 S. Sepulveda, LLC in prior submittals and interactions with the City, the Project will interference with telecommunications infrastructure sited at 2990 S. Sepulveda, LLC which the City has repeatedly found to be necessary to "provide the public and emergency service organizations with access to mobile telephone service within the community." (2990 S. Sepulveda, LLC Comment Letter, Aug. 4, 2025, Exh. 1-A, Findings 3, 6, 7, 11, see also Exhs. 1-B. 1-C, 1-D, fully incorporated herein by reference and attached as **Attachment 1**.) As discussed in further detail below, the proceeding record before the City Planning Commission reflects that:

1. the Project, constructed to a height of 71 feet, will **block coverage of existing wireless antennas sited at 2990 S. Sepulveda Boulevard serving wireless customers located north of 2990 S. Sepulveda**, resulting in dropped service in areas that currently receive service with a signal power of -95 dBm or greater, including the 405/10 interchange;

2. The reduction in signal power will result in a significant change in the existing line-of-sight radio wave transmission path, **creating gap areas** in reliable wireless service for both T-Mobile and Verizon, resulting in signal disconnects and lower data transmission speeds; and

3. **First Responders utilizing the Verizon Frontline Network or the T-Mobile T-Priority Network, who are in the shadow of the proposed structure at 2930 S Sepulveda will have their communications interfered with and interrupted at the intersection of the I-405 and I-10 freeway and north and east along I-405**.

(Letter from Lee Afflerbach Professional Engineer ("PE") to Liz Klebaner, Dec. 24, 2025, attached as **Attachment 2**; see also Letter from Liz Klebaner to Commissioner President and Commissioners, Dec. 1, 2025, at pp. 7-8, attached as **Attachment 3**; Comments from 2990 S. Sepulveda, LLC to Kyle Winston, May 15, 2025, at pp. 11-17, attached **Attachment 4**.) 2990 S. Sepulveda, LLC and its tenants are aggrieved by these impacts. Further, as detailed in the Los Angeles City Fire Department After-Action Review Report relating to the Palisades Fire, Jan. 7, 2025, cellular service is critical to the City's ability to deliver adequate fire safety response. (See, e.g., Comments from 2990 S. Sepulveda, LLC to Kyle Winston, May 15, 2025, at p. 51 ["Cellular service was reduced quickly during the incident due to power outages and eventually became obsolete for hours, delaying critical messages for resource orders, tactical direction, and coordination with other agencies."].)

The City Council should grant the appeal and remand the Project Review to the City Planning Commission with directions to:

Add the following condition to the Project Conditions of Approval in order to ensure the Project's compatibility with adjacent land uses and non-interference with the City's emergency response capabilities:

> *Prior to issuance of demolition, grading or building permits for the Project, the Project proponent shall fund the design, construction, and installation of a monopole, or other telecommunications facilities at 2990 South Sepulveda Boulevard, not exceeding the cost of*

> *$300,000, such that said monopole or facilities are capable of maintaining the existing wireless signal strength of the telecommunications facilities located at 2990 South Sepulveda Boulevard. Compliance with this condition shall be demonstrated through a fully executed agreement with 2990 S. Sepulveda, LLC.*

And, further, direct the City Planning Commission to amend Project Condition of Approval 43 (iii) [Indemnification and Reimbursement of Litigation Costs] as follows:

> *Submit an initial deposit for the City's litigation costs to the City within 10* days' *notice of the City tendering defense to the Applicant and requesting a deposit. The initial deposit shall be in an amount set by the City Attorney's Office, in its sole discretion, based on the nature and scope of action, but in no event shall the initial deposit be less than ~~$50,000,~~ $350,000.*

Appellant's recommended revisions to Condition of Approval (43) represent a more realistic estimate of initial fees and costs associated with the City's defense in the event of a third-party challenge to the City's Project approvals.

Summary of Grounds for Appeal of CEQA Determination.

In reviewing the Project, the City has taken the novel position that Public Resources Code section 21080.66, which sets forth a qualified statutory exemption for eligible infill housing projects, overrides the City's general police powers to condition the Project to avoid public health and safety risks. This legal conclusion is evident from City staff's responses to the City Planning Commission's questions regarding the public safety concerns posed by the Project, including the following:

> [F]or the record, the statutory exemptions that the Project applicant is using, AB 130, **does not require further review for telecommunications facilities**.

(December 11, 2025, City Planning Commission meeting audio, Item No. 7, at 23:04 and 25:22, emphasis added.) And also:

> AB 130 has certain criteria for size, urban uses, general planning, consistency, density, and some environmental and historic factors, but **none of it requires the City to look at public services, public utilities or wireless facilities**.

(*Ibid.* at 24.03, emphasis added.)

Public Resources Code section 21080.66, however, does not abrogate the City's general police powers. (See Pub. Resources Code, § 21004 ["In mitigating or avoiding a significant effect …a public agency may exercise only those express or implied powers provided by law other than [CEQA]. . .a public agency may use discretionary powers provided by such other law for the purpose of mitigating or avoiding a significant effect on the environment subject to the express or implied constraints or limitations that may be provided by law"]; see also CEQA Guidelines, § 15040, subd. (a)-(e).) "The source of [the City's] authority to enact and enforce land use laws is the police power. The police power is the well-established, broad, and evolving right of cities to protect public health, safety, and welfare. In enacting and enforcing land use laws, California cities do not rely on authority delegated by the general land use laws of the state or the federal

government." (Lindgren, Cal. Land Use Practice, (Cont.Ed.Bar 2025) Overview of Land Use Regulation, §1.1, citing *DeVita v County of Napa* (1995) 9 C4th 763, 782; *Candid Enters., Inc. v Grossmont Union High Sch. Dist.* (1985) 39 Cal.3d 878, 885.)

Nor should Public Resources Code section 21080.66 abrogate CEQA's general purpose to inform government decision-makers and the public about the potential significant environmental effects of development proposed within a jurisdiction. (See Cal. Code Regs., tit. 14 ["CEQA Guidelines"], 15002, subd. (a)(4).) This goal is implicit in the CEQA statute. (See, e.g., Pub. Resources Code, §§ 21000-21001.) Here, the City has, at every juncture, declined to both acknowledge and evaluate the Project's interference with wireless communication and its associated adverse public safety impacts. This is evident from the extensive proceeding record, which commenced with the Project proponent's **failure to even identify** the Mullikin Medical Center as a land use that is adjacent to the Project site. Despite clear and consistent evidence provided by 2990 S. Sepulveda, LLC that adjacent land use include a telecommunications center, the functions of which would be disrupted by the Project, the City has dug into its initial conclusion that the Project is CEQA-exempt. Indeed, the City has lurched at every possible rationale to ***avoid*** addressing the public safety risks of the Project, revising its initial and now withdrawn CEQA exemption rationale in an apparent effort to abdicate its duties to protect the public health, safety and welfare.

The City's determination that the Project is eligible for the new statutory infill housing exemption, further, is contrary to law and should be set aside because the Project fails to satisfy the threshold eligibility requirements of Public Resources Code section 21080.66, as the Project is inconsistent with the City' General Plan.

For the above reasons, the City Council should grant the appeal and direct City staff to prepare an Initial Study for the Project in accordance with CEQA Guidelines section 15063.

PROCEDURAL BACKGROUND.

The Project Proponent Seeks a Building Permit Without First Applying for Necessary Entitlements.

On March 28, 2023, the Project proponent applied for a building permit with the Los Angeles Department of Building and Safety for a new six-story 77-unit affordable housing projects. (Department of City Planning Project Recommendation Report, prepared for Dec. 11, 2025, City Planning Commission Hearing ["Recommendation Report"], at p. A-2.) That permit application is still pending. (*Ibid*.)

The Project Proponent and the City Fail to Identify the Mullikin Medical Center Telecommunications Center as an Adjacent Land Use.

As reflected in documentation in the Project file, **the Project proponent informed the City that 2290 S. Sepulveda is improved with an apartment building**. This, of course, is incorrect. The City initially recommended exempting the Project from environmental review requirements under the so-called Class 32 infill regulatory exemption from CEQA, found at CEQA Guidelines section 15332, subd. (a). The City staff prepared a Class 32 Exemption Report which correctly identifies building as a medical center but, among other errors, failed to identify the telecommunications infrastructure sited at the Mullikin Medical Center.

The May 16, 2025 Notice of CEQA Exemption and Project Informational Hearing.

The first public hearing on the Project was held by a Hearing Officer, City Planner Kyle Winston, on behalf of the City Planning Commission on May 16, 2025. The purpose of the hearing was to obtain testimony from affected and/or interested parties regarding the Project's application and consider the environmental analysis of the Project. On May 15, 2025, 2990 S. Sepulveda, LLC submitted comments to be considered at this hearing. (See, generally, Comments from 2990 S. Sepulveda, LLC to Kyle Winston, May 15, 2025, attached as **Attachment 4**.) The comments explained that, for multiple reasons, the Project is not subject to the Class 32 exemption from CEQA.

During the hearing, the community raised several questions and concerns regarding potential noise impacts to the adjacent Mullikin Medical Center, the proposed height and privacy concerns related to the R-1 zoned properties to the rear of the subject site, and impacts to the telecommunications center at the Mullikin Medical Center.

Following the public hearing, the Project applicant requested the case be placed on hold for further environmental review. (See Recommendation Report, at p. A-4.) The City subsequently withdrew its recommendation to rely on the Class 32 CEQA exemption. (See *Ibid.* at p. A-5.) The matter was subsequently referred to the full City Planning Commission for review.

The City Continues the Initially Scheduled August 14, 2025, City Planning Commission Hearing at the Project Proponent's Request.

The Project was anticipated to come before the City Planning Commission on August 14, 2025. (Email from City Planner Kyle Winston, dated July 16, 2025, attached as **Attachment 5**.) On August 4, 2025, 2990 S. Sepulveda, LLC submitted additional comments for consideration by the Project applicant and City Planning Department. (Comments from Liz Klebaner to City Planning Commission, Aug. 4, 2025, attached as **Attachment 1**.) On August 5, 2025, DISH Wireless, on behalf of the other wireless providers located at 2990 S. Sepulveda Blvd., also submitted comments requesting that the City deny the Project as proposed due to the expected interference with wireless communications. 2990 S. Sepulveda, LLC was subsequently informed that the City Planning Commission took the Project off the August 14, 2025, meeting agenda.

The December 11, 2025, City Planning Commission Hearing on the Project.

On November 17, 2025, the City posted notice of a City Planning Commission hearing on the Project. As the City admits in the Recommendation Report, a second public hearing was required due to the need for the City to prepare an "updated environmental analysis." (Recommendation Report, Exhibit F, at p. F-14.) 2990 S. Sepulveda, LLC submitted comments to the City Planning Commission on December 1, 2025 and on December 9, 2025 that are fully incorporated by reference herein. The City Planning Commission conducted a hearing on December 11, 2025.

At this hearing, Commissioners acknowledged the public's concerns regarding wireless communication interference and associated public safety concerns, all of which were summarily dismissed by Staff and the Project proponent. Commissioner Diaz stated, "I do have a question, and it's related to I believe…the public comment that was made with regards to the federal requirements for the adjacent properties for telecommunications…I recognize that the commenter ran out of time but I want to make sure that we acknowledge their concern and if that has been addressed". (December 11, 2025, City Planning Commission meeting audio, Item No. 7, at 23:04.)

In response, City staff stated that under the infill housing CEQA exemption, impacts on public safety and utilities need not be examined. (*Ibid.*)

Commissioner Klein also expressed concerns regarding telecommunications impacts on emergency services, asking that City staff and/or the Project applicant address the issue further. (*Ibid.*, at 25:22.) She stated "it concerned me that this Project was blocking [emergency services]. I know you are not required…to address it. However, it's still a concern when I see the emergency element." (*Ibid.*) In response, the Project applicant stated that it examined the issue and that the potential impacts to cell service coverage would be minimal because this area already has overlapping coverage from other nearby sites, with little to no impact on the City's emergency response communication capabilities. (*Ibid.*) However, this representation was misleading at best. As discussed further below, there is no "overlapping" wireless coverage.

Based on this record, the Commission unanimously approved the Project and granted the requested Height Waivers, Project Review and On-Menu and Off-Menu Density Bonus Incentives to the Project proponent.

THE CITY CANNOT APPROVE THE PROJECT REVIEW BECAUSE THE PROJECT IS INCONSISTENT WITH ADJACENT USES.

In approving a Project Review, the City must find that a project "consists of building and structures … **including height** … that is or will be compatible with existing and future development on adjacent properties and neighboring properties." (Los Angeles Municipal Code, § 13.B.2.4(E)(2), emphasis added.) The City cannot make that finding here. By approving the Project, the City would preclude uses the City has approved through multiple entitlements it granted to T-Mobile (which incorporates Sprint PCS), Verizon (formerly known as AirTouch), and DISH Wireless (incorporating Boost Network, part of Sprint PCS) (collectively, "Carriers") for installation of telecommunications infrastructure at 2990 S. Sepulveda Blvd., such as the following:

Entitlement	**Date**
Metro PCS	
Case No. ZA 90-1236 (CUZ) Conditional Use and Area Height Variance	April 4, 1991
T-Mobile	
Case No. ZA 96-0686 (CUZ) Conditional Use Permit	October 10, 1996
Case No. ZA 96-0686 (CUZ) Conditional Use Permit	March 6, 2009
Case No. ZA 96-0686 (CUZ) Approval of Plans	June 28, 2002
Verizon	
Case No. ZA 91-0204 (CUZ) Conditional Use Permit	May 10, 1991
Case No. ZA 91-0204 (CUZ) Approval of Plans	July 2, 1997
Case No. ZA 91-0204 (CUZ) (PAD) Approval of Plans	May 5, 1999
DISH Wireless	
Case No. ZA 2001-5488 (CU) Conditional Use Permit	August 8, 2001

Substantial evidence in the record demonstrates conclusively that the Project is inconsistent with the existing use of the adjacent property at 2990 S. Sepulveda, which currently serves as a vital telecommunications center for both commercial cellular service and first responder networks.

The Project proponent's land use counsel represented to the City that "potential cell services coverage impacts resulting from the Project's new building along I-10 will be minimal, as this area already has overlapping coverage from other sites in the area" and, further that "[t]his continuation of existing coverage is demonstrated by the coverage plots included in the Integer Report." (See, e.g., Letter from Todd Nelson, dated December 1, 2025.) Similarly, counsel has advised the City that the Project proponent's modeling of signal strength in the vicinity of the Project "illustrate[s] that the impact of obstruction from the new building along I-10 will be minimal as this area has overlapping coverage from other sites in the area." (Integer Telecom Services Report, dated July 25, 2025, at p. 6, Report Synopsis, Finding 2.) **These representations have been rebutted**.

As fully explained by Mr. Afflerbach in his December 24, 2025 rebuttal:

- The above statements are misleading; **there is no significant "overlapping coverage from other nearby sites."**

- The Project, constructed to a height of 71 feet, will effectively **block coverage of existing wireless antennas sited at 2990 S. Sepulveda Blvd. serving wireless customers located north of 2990 S. Sepulveda**, resulting in dropped service in areas that currently receive service with a signal power of -95 dBm or greater, including the 405/10 interchange.

- The reduction in signal power will result in a significant change in the existing line-of-sight radio wave transmission path, **creating gap areas** in reliable wireless service for both T-Mobile and Verizon, resulting in signal disconnects and lower data transmission speeds.

- **First Responders utilizing the Verizon Frontline Network or the T-Mobile T-Priority Network, who are in the shadow of the proposed structure at 2930 S Sepulveda will have their communications interfered with and interrupted at the intersection of the I-405 and I-10 freeway and north and east along I-405.**

(**Attachment 2**, Letter from Lee Afflerbach PE to Liz Klebaner, Dec. 24, 2025, at pp. 1-2.)

While the Project's proponent's land use attorney has asserted that the potential impacts to cell service coverage in the vicinity of the Project site would be minimal because this area already has overlapping coverage from other nearby sites, with little to no impact on the City's emergency response communication capabilities, this assertion refers only to FirstNet which is utilized by less than one third of agencies nationwide. (See *ibid.* at p. 2.)

Additionally, as documented by Mr. Afflerbach, there is **no "overlapping" coverage,** as urged by the Project proponent's land use counsel. (*Ibid.* at p. 3.) Each carrier cell site in the Project vicinity is located to service a specific geographic area. (*Ibid.*) The antennas at 2990 S Sepulveda are focused on a target service area north of 2990 S Sepulveda Blvd. (*Ibid.*) The wireless carriers' network engineers meticulously design the antenna pattern to minimize interference with the co-channel neighboring sites. (*Ibid.*) Industry best practice recommendations for designing new cell sites target co-channel interference level for adjacent sites to be at least 10 dB or less than the -

95 dBm coverage service contour. Redundancy is provided by installing multiple radios in the carrier's low-band and mid-band FCC-licensed radio spectrum **in the same location**, not alternative locations in the antenna vicinity. (*Ibid.*) **This is not overlapping coverage**. (*Ibid.*) The Project proponent's consultant has not mapped the coverage loss that would occur north of 2990 South Sepulveda Blvd. (*Ibid.*) Areas where signal levels fall below the -95dBm target power level will exhibit lost calls, disconnects and/or significantly slower data transfer rates. (*Ibid.*)

In addition, the disruption caused by the Project would not be remedied by simply relocating antennas, as the process to permit and install a new facility typically takes 18 months to several years, during which time coverage gaps would persist. (*Ibid.*) Testimony from DISH Network further reinforces these points, indicating that the Project would require relocation or expansion of telecommunications facilities to maintain required standards and avoid compromising wireless communications, including emergency services. (*Ibid.*) Relocation of telecommunications infrastructure to the Project site is also infeasible. (Email from Liz Klebaner to City of Los Angeles Planning Deputy Jennifer Torres, Dec. 4, 2025, attached hereto as **Attachment 6**.)

The Project as currently conditioned is inconsistent with adjacent land uses, precluding the City from approving the Project Review application. (See Los Angeles Municipal Code, § 13.B.2.4(E)(2), emphasis added.)

PUBLIC RESOURCES CODE SECTION 21080.66 DOES NOT ABROGATE THE CITY'S AUTHORITY TO CONSIDER PUBLIC SAFETY IMPACTS.

At the December 11, 2025, City Planning Commission meeting, although Commissioners Diaz and Klein both expressed concerns regarding telecommunications impacts on emergency services, City staff made several conclusory statements regarding public safety impacts.

Commissioner Diaz stated, "I do have a question, and it's related to I believe…the public comment that was made with regards to the federal requirements for the adjacent properties for telecommunications…I recognize that the commenter ran out of time but I want to make sure that we acknowledge their concern and if that has been addressed." (December 11, 2025, City Planning Commission meeting audio, Item No. 7, at 23:04.) Commissioner Klein further stated, "it concerned me that this Project was blocking [emergency services]. I know you are not required…to address it. However, it's still a concern when I see the emergency element." (December 11, 2025, City Planning Commission meeting audio, Item No. 7, at 25:22.)

City staff asserted, "there is no need for any other environmental impacts, including noise, telecommunications and public utilities" (see *ibid*. at 16:24), "for the record, the statutory exemptions that the Project applicant is using, AB 130, does not require further review for telecommunications facilities. The CEQA is automatically approved if you fit the qualifications of the AB 130 bill" (*Ibid.* at 23:36), and "AB 130 has certain criteria for size, urban uses, general planning, consistency, density, and some environmental and historic factors, but none of it requires the City to look at public services, public utilities or wireless facilities." (*Ibid.* at 24.03.)

However, contrary to the City and the Project proponent, the recently enacted statutory infill housing exemption at Public Resources Code 21080.66 does **not** override the City's inherent power to regulate development within its jurisdiction to protect the public health, safety, and welfare. This power is recognized in article XI, section 7 of the California Constitution, which confers on the City the power to "make and enforce within its limits all local, police, sanitary, and other ordinances and regulations no in conflict with the general laws." Furthermore, as a charter city, the City of Los Angeles enjoys broader powers than general law cities, as regulations of a charter city that exclusively relate to the city's municipal affairs predominate when they conflict with

general state law. (*Cal. Fed. Sav. & Loan Assn' v. City of Los Angeles* (1991) 54 Cal.3d 1, 17.) "It has been uniformly held that the organization, maintenance and operation of a police and fire department by a chartered city is a municipal affair and as such not subject to the control of the legislature." (*Brown v. City of Berkeley* (1976) 57 Cal.App.3d 223, 236, quoting *Armas v. City of Oakland* (1933) 135 Cal.App. 411, 420.)

Additionally, in prior communications with 2990 S. Sepulveda, LLC, City representatives incorrectly asserted that impacts to public utility service delivered by private telecommunications networks are not within CEQA's purview and that CEQA does not require mitigation for these types of impacts. In an email to our office, City of Los Angeles Planning Deputy Jennifer Torres asserted that, "impacts to private telecommunications networks are not considered environmental impacts under CEQA." (See Email from City of Los Angeles Planning Deputy Jennifer Torres to Liz Klebaner, Nov. 22, 2025, attached hereto as **Attachment 7**.)

There is no question that CEQA requires public agencies to identify and mitigate potentially significant impacts to utilities. (See CEQA Guidelines, App. G XIX [relocation or construction of new or expanded telecommunications facilities is a potentially significant environmental impact]; see also *ibid*. at XX [impairment of adopted emergency response plan or emergency evacuation plan is a potentially significant environmental impact]; see, e.g., *Save North Petaluma River & Wetlands v. City of Petaluma* (2022) 86 Cal.App.5th 207, 226-230 [CEQA requires evaluation of significant impacts on adopted emergency plans and hazardous conditions].) The City routinely analyzes impacts to telecommunications services in CEQA documents. (See, generally, Environmental Impact Reports | Los Angeles City Planning (last visited Dec. 22, 2025).)

The fact that public utility service in this case is delivered by private companies is irrelevant. The question is whether a project will affect the environment of persons in general, regardless of whether that interference involves private property interests. (*Bowman v. City of Berkeley* (2004) 122 Cal.App.4th 572, 586-587 ["A project that interferes with scenic views has an adverse aesthetic effect on the environment."].) Here, the City and the Project proponent have admitted that telecommunications facilities may have to be relocated in order to maintain wireless service for the general public. (See Email from City of Los Angeles Planning Deputy Jennifer Torres to Liz Klebaner, Nov. 22, 2025.) This constitutes a per se environmental impact.

THE CITY'S DETERMINATION THAT THE PROJECT IS EXEMPT FROM CEQA IS UNSUPPORTED.

In order to qualify for the infill housing statutory exemption, Public Resources Code section 21080.66, subdivision (a)(4), requires that a project be consistent with the City's General Plan and zoning. The City cannot find that the Project complies with this requirement. As further discussed above, the Project is inconsistent with adjacent land uses and is therefore noncompliant with the City's General Plan and zoning. The adjacent property at 2990 S. Sepulveda is a critical telecommunications hub, providing essential services for both commercial and emergency communications. The proposed development would obstruct these services, leading to significant coverage gaps.

This interference directly contradicts goals stated in the City's General Plan, to be "[a] city that responds with the maximum feasible speed and efficiency to disaster events so as to minimize injury, loss of life, property damage and disruption of the social and economic life of the City and its immediate environs." (City of Los Angeles 2025 General Plan, Safety Element, Chapter 3, Goal No. 2.) The disruption also directly impedes the City's policy to "[d]evelop, implement and continue to improve the City's ability to respond to emergency events. Participate in regularly scheduled

disaster exercises to better prepare Police, Fire, Public Works and other City employees with disaster responsibilities." (*Ibid.* at Policy No. 2.1.5.) The City's zoning regulations prioritize ensuring compatible transitions between existing and new developments, safeguarding essential services, and promoting public health, safety, and welfare in alignment with the General Plan. (See Los Angeles Municipal Code, § 1.4.1.) The Project is inconsistent with General Plan Policy Number 2.1.5 and implementing zoning provisions because it compromises essential telecommunications infrastructure.

CONCLUSION.

For the above reasons, we respectively request that the City Council grant the appeal, direct staff to prepare an Initial Study for the Project and condition the City's Project approvals as recommended herein.

Sincerely,

Liz Klebaner
Nossaman LLP

LK:jb7

ATTACHMENTS

Attachment 1 – 2025-08-04 2990 S. Sepulveda, LLC Comment Letter to Planning Commissioner
Attachment 2 – 2025-12-24 Letter from L. Afflerbach to L. Klebaner
Attachment 3 – 2025-12-01 Letter from L. Klebaner to Commission
Attachment 4 – 2025-05-15 2990 S. Sepulveda, LLC Comment Letter to City Planner K. Winston
Attachment 5 – 2026-07-16 Email from City Planner K. Winston
Attachment 6 – 2025-12-04 Email from L. Klebaner to City of Los Angeles Planning Deputy J. Torres
Attachment 7 – 2025-11-22 Email from City of Los Angeles Planning Deputy J. Torres to L. Klebaner
Attachment 8 – Proof of Ownership - Mullikin Medical Center, 2990 South Sepulveda Boulevard

ATTACHMENT 1

NOSSAMAN LLP

ATTORNEYS AT LAW

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Admitted only in California

Refer To File # 505368-0001

VIA EMAIL AND HAND DELIVERY
CPC@LACITY.ORG

August 4, 2025

Hon. Commission President and Commissioners
c/o Commission Executive Assistant
City Planning Commission
City of Los Angeles
200 N. Spring Street, Room 272
Los Angeles, CA 90012

Re: Comments on Proposed Residential Project at 2930-2936 South Sepulveda Boulevard, Case Numbers CPC-2024-5548-DB-PR-HCA and ENV-2024-5549-CE

Dear President Lawshe and Commissioners:

Nossaman LLP is land use counsel to 2990 S. Sepulveda, LLC, which owns the Mullikin Medical Center, located at 2990 South Sepulveda Boulevard, at the northwest corner of the intersection of South Sepulveda Boulevard and National Boulevard. We are writing on behalf of 2990 S. Sepulveda, LLC to provide comments on the proposed construction, use, and maintenance of a 71-foot high, six-story, 77-unit residential development with one subterranean and one street-level parking area, including 84 parking spaces, at 2930-2935 South Sepulveda Boulevard ("Project"). We respectfully request a copy of these comments together with the referenced attachments be provided to each of the Commissioners, concurrently with the City Staff Report.

By providing 12 affordable housing units, the Project applicant seeks to benefit from development incentives and waivers of development standards available under the City's Density Bonus Program. Specifically, the Project proponent seeks approval of two on-menu incentives, one off-menu incentive, and two waivers of otherwise applicable development standards in the C2-1 VL Zone. The first waiver would eliminate the transitional height requirement in the C2-1 VL Zone. The second waiver would allow an increase in height limitation in the C2-1 VL Zone from 45 to 71 feet.

2990 S. Sepulveda, LLC supports the lawful development of critically needed high-density and low-income housing in the City. However, the City cannot approve the Project as proposed because waivers of the transitional height requirement and the increase of the Project height to 71 feet are not authorized by state and local housing density bonus laws because the waivers would have **a specific adverse effect upon public health and safety.**

The Project site and the Mullikin Medical Center are separated by a narrow alley (20 feet) and are located less than one half mile southeast of the Interstate Highway 405/Interstate Highway 10 interchange. The tenants of Mullikin Medical Center include a pediatric clinic that treats and educates children with autism. Besides being a medical facility, the Mullikin Medical Center is a telecommunications center with T-Mobile (which incorporates Sprint PCS), Verizon (formerly known as AirTouch), and DISH Wireless (incorporating Boost Network, part of Sprint PCS) (collectively, "Carriers") as tenants. The Carriers maintain extensive infrastructure at the Mullikin Medical Center, including backup systems and power. As documented in the attached materials, when the City approved this telecommunications infrastructure, the City made specific findings that the infrastructure was necessary to protect public health and safety by maintaining adequate cellular signal, including for emergency evacuations and other critical communication services.

As is further documented below and in the supporting expert testimony of Lee Afflerbach, Professional Engineer ("PE"), the Project's interference with cellular signal constitutes a specific adverse impact on public health and safety under state law and precludes the City from granting waivers of development standards. (See Los Angeles Municipal Code, § 12.22.A.37.(d)(3)(i)(b); see also Gov. Code, § 65589.5, subd. (d)(2) [defining "specific, adverse effect"].) Additionally, the waivers may not be granted because the Project as currently proposed will block cellular and emergency service communications north on the I-10 freeway and interfere with the City's emergency response plans, in violation of federal law. (See Los Angeles Municipal Code, § 12.22.A.37(d)(3)(i)(d) [prohibiting granting of waivers that violate federal and state law].)

Although the Milliken Medical Center is the Project site's immediate neighbor, the Project applicant has made **no efforts** to contact 2990 S. Sepulveda, LLC or to propose reasonable modifications to address the adverse public health and safety impacts of the Project. As another example of the Project applicant's lack of diligence, the proposed Project Review Findings prepared by W Baker Consulting on behalf of the applicant, contained in the City's Project file, wrongly characterize the Milliken Medical Center as a "…stacked 2-story over parking garage **apartment building**." (Emphasis added.)

2990 S. Sepulveda, LLC put the Project applicant and the City on notice of the Project's interference with the City's emergency response capabilities, including in the event of wildfires and other natural disasters, medical and other emergencies three months ago. 2990 S. Sepulveda, LLC provided written comments identifying the above concerns to the City Planning Department. If the Project applicant contends that there are no feasible methods to satisfactorily mitigate or avoid the Project's public safety impacts, the City must reject the Project applicant's request for the two waivers. (See Los Angeles Municipal Code, § 12.22.A.37.(d)(3)(i)(b)[a waiver for which there is no feasible method to satisfactorily mitigate or avoid a specific adverse impact may not be granted].)

Finally, as 2990 S. Sepulveda, LLC previously advised the City, the Class 32 Categorical Exemption Report ("Exemption Report") prepared for the Project by Meridian Consultants is flawed. The Exemption Report and 2990 S. Sepulveda, LLC's May 15, 2025 comments, which we incorporate by reference herein, document that the Class 32 regulatory exemption for multiple reasons **does not** apply to the Project. Accordingly, and unless the City can point to another applicable exemption, the Project must undergo environmental review under the

California Environmental Quality Act, Pub. Resources Code, §§ 21000 et seq., ("CEQA") before the Commission may approve the Project.

I. THE PROJECT IS NOT ENTITLED TO DEVELOPMENT STANDARD WAIVERS UNDER STATE LAW AND THE CITY'S DENSITY BONUS ORDINANCE.

As discussed above, the Project applicant seeks affordable housing-based waivers from applicable transitional height and the 45-foot height limitation in the C2-1 VL Zone to increase the proposed building height to 71 feet. This amounts to a 57% increase in the permitted height of the otherwise applicable development standards for the Project site. Under the City's density bonus ordinance and state housing laws, the City may not approve a waiver of development standards if "[t]he Waiver would have a Specific Adverse Impact, as defined in California Government Code Section 65589.5(d)(2), upon public health and safety and for which there is no feasible method to satisfactorily mitigate or avoid the Specific, Adverse Impact." (Los Angeles Municipal Code, § 12.22.A.37.(d)(3)(i)(b).)

A specific, adverse impact is defined by state law as "a significant, quantifiable, direct, and unavoidable impact, based on objective, identified written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete." (Gov. Code, § 65595.5, subd. (d)(2).)

The City has previously found that the telecommunications facilities at Mullikin Medical Center are needed to "provide the public and emergency service organizations with access to mobile telephone service within the community," are "needed in the vicinity of National and Sepulveda Boulevards," and "of vital importance during times of emergency." (**Exhibit 1-A**, Metro PCS [now T-mobile] 1991.04.04 Conditional Use and Area Heigh Variance Determination Letter.) The City has also previously found that the telecommunications facilities are "necessary to upgrade service in the general area to industry standards" and needed to provide "a viable service to the public." (**Exhibit 1-B**, 1996 PacBell. [now Verizon] T-Mobile Conditions of Approval; 2009.03.06 PacBell. TMobile Approval of Plans Determination Letter; see also **Exhibit 1-C**, 1991.05.10. PacTel.AirTouch CUP Determination Letter ["Pac Tel Cellular is a public utility needing a site to complete the communication network and is serving the mobile telephone needs of the community"] and 1999.05.05_PacTelAirTouch Second Approval of Plans Determination Letter [infrastructure needed to address "projected communication deficiencies"]; see also **Exhibit 1-D**, 2012.08.8 Sprint PCS CUP Determination Letter ["[T]he proposed site, as part of the larger PCS network, will provide improved access to wireless communications in the event of emergencies…and natural disasters … [and] will provide both public safety entities and citizens with reliable, portable communications in the event of such emergencies."]; see *id*. ["project…would promote public health, safety, and welfare by providing wireless telecommunications services to the area"] and ["PCS mobile phones are becoming a necessary emergency service device"].)

The Project would cause the existing telecommunication facilities located at the Mullikin Medical Center to fail objective, **identified written public health or safety standards**, **policies**, and **conditions**, including those stated above, as they existed on the Project application was complete. (See also Los Angeles Municipal Code, § 12.21.A.20(b)(7) [requiring telecom facilities to document adequate coverage].) Specifically, in the attached analysis prepared by CTC Media Group, Inc., Mr. Lee Afflerbach, P.E. has shown, based on his review of the Project materials

and the construction plans of the telecommunication facilities located at 2990 South Sepulveda Boulevard, a 10-12 dB of degradation of wireless signal north of Interstate Highway I-10. (See Letter from Lee Afflerbach to Jonathan Kramer dated May 13, 2025, p. 5 and *id*. at Figures 4 and 5, attached hereto as **Exhibit 2**.) A degradation of this magnitude would cause wireless signal in the impacted areas (shown in Figures 4 and 5 of Mr. Afflerbach's letter), including vehicles traveling on the nearby I-10 /I-405 freeway intersection corridor, to fall below industry standards for urban areas and interfere with emergency notifications for evacuation for natural disasters or emergency response plans. (*Id*. at pp. 2, 6.) Mr. Afflerbach's analysis documents, based on 2022 California Department of Transportation traffic counts, that the wireless signal interference from the Project would impact over one million drivers every day. (*Id*. at p. 6.) Accordingly, the Project waivers would result in "a significant, quantifiable, direct, and unavoidable impact, based on objective, identified written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete" and may not be approved under state law or the City's density bonus program. (See Gov. Code, § 65595.5, subd. (d)(2).) There is ample substantial evidence in the record to support the City's denial of the waivers. (See Gov. Code, § 65915, subd. (d).)

The City's Emergency Operations Master Plan and Master Procedures, available on the City's website, provides that cellular communication provided through private vendors are used primarily for emergency situations by various City departments.[1] The City's early warning and notifications strategy relies on voicemail, text, and email as a form of rapid dissemination of time sensitive information in an emergency.[2] For example, the City uses the platform NotifyLA, irrespective of Carrier origin, as a mass notification system to provide emergency information regarding necessary protective actions, such as evacuation orders, to Los Angeles residents, businesses, and visitors.[3] The alerts are sent via recorded telephone messages, text messages, and emails, in the event of emergencies or critical situations.[4]

As the City's prior findings show -- which are further corroborated by Mr. Afflerbach's independent analysis of current conditions -- the City may not grant the requested waivers to the Project proponent as they would cause a degradation of wireless service in the Project vicinity that falls below industry standards and the standards and policies set forth in the City of Los Angeles Municipal Code and result in specific adverse impact on public health and safety. (See Gov. Code, § 65589.5(d)(2); Los Angeles Municipal Code, § 12.22.A.37(d)(5)(ii).) Additionally, and consistent with the City's prior findings relating to the Carrier facilities, the City also may not interpret its density bonus ordinance in a manner that limits or interferes with the operation and maintenance of public utilities or public services. (See *id*. § 12.22.A.2 [Exceptions].)

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[1] City of Los Angeles Emergency Operations Plan, Communications Functional Support Annex (June 2008), at pp. 5, 21, 22, 26 *available at* https://emergency.lacity.gov/sites/g/files/wph1791/files/2021-04/communications_annex_2018_1.pdfhttps://emergency.lacity.gov/sites/g/files/wph1791/files/2021-04/communications_annex_2018_1.pdf.

[2] City of Los Angeles Emergency Operations Plan, Emergency Alert and Warning Functional Support Annex (Jan. 2022), at pp. 15-16, *available at* https://emergency.lacity.gov/sites/g/files/wph1791/files/2022-09/Emergency%20Alert%20and%20Warning%20Annex%202022%20.pdf.

[3] City of Los Angeles Emergency Management Department, *NotifyLA, the City of LA's Emergency Alert System*, *available at* https://emergency.lacity.gov/notifyla.

[4] *Ibid*.

II. THE PROJET WOULD RESULT IN A VIOLATION OF THE FEDERAL TELECOMMUNICATIONS ACT.

The Project's height would result in a violation of the Federal Telecommunications Act by impacting the coverage provided by the telecommunications facilities located at the Mullikin Medical Center. Congress recognized the national public interest of having uninterrupted wireless service and rapid technological advancement of wireless communications when it passed the Telecommunications Act of 1996 ("TCA").[5] Since the TCA's passage, there has been a sea of change in the growth of wireless services. According to the Federal Communications Commission ("FCC"), "[m]obile wireless services are an essential part of Americans' daily lives."[6] Further, "mobile wireless serves a critical role in public safety, enabling uses to summon lifesaving help, receive timely alerts, and access pertinent information. These developments have made mobile wireless one of the most important sectors in the national economy."[7]

The wireless telecommunications facilities located at the Mullikin Medical Center enable carriers to broadcast signals over frequencies licensed by the FCC to provide wireless cellular service to customers in the vicinity of the property. As required by the FCC, and discussed above, the wireless facilities service municipal emergency personnel and allow the public to access emergency 911 services in the event of an emergency, and permit emergency service first responders to communicate in the performance of life-saving activities. Any interference with the wireless Carriers' continued operation of its equipment would impact its ability to provide continuous wireless coverage in the area, including emergency 911 services, and result in a violation of federal law.

Not only does the interference shown by Mr. Afflerbach violate federal laws prohibiting the interference with telecommunications and utility services, but such actions also raise issues of nuisance and trespass. (See *Goshgarian v. George* (1984) 161 Cal.App.3d 1214, 1224-1225; *Herzog v. Grosso* (1953) 41 Cal.2d 219, 224.)

Additionally, any interference with the Carriers' ability to provide wireless services, and in particular emergency 911 services, may also violate the United States Code and could result in the imposition of criminal penalties:

> Whoever willfully or maliciously injures or destroys any of the works, property, or material of any radio, telegraph, telephone or cable, line, station, or system, or other means of communication, operated or controlled by the United States, or used or intended to be used for military or civil defense functions of the United States, whether constructed or in process of construction, or **willfully or maliciously interferes in any way with the working or use of any such line, or system, or willfully or maliciously obstructs, hinders, or delays the transmission of any communication over any such line, or system**, or attempts or conspires to do

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[5] Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (1996), codified throughout Title 47 of the United States Code.

[6] Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Eighteenth Report, WT Docket No. 15-125 (Dec. 23, 2015), at p. 2, *available at https://docs.fcc.gov/public/attachments/DA-15-1487A1.pdf*.

[7] *Ibid*.

> such an act, **shall be fined under this title or imprisoned not more than ten years, or both.**

(18 U.S.C. § 1362, emphasis added.)

III. THE CEQA REGULATORY EXEMPTION FOR INFILL PROJECTS DOES NOT APPLY TO THE PROJECT.

The Infill Exemption to environmental review does not apply where a project cannot be adequately served by all required utilities and public services. (See Cal. Code Regs., tit. 14 ["CEQA Guidelines"], § 15332, subds. (e).) The City bears the burden to establish that a project is eligible for the Infill Exemption. (See *Davidson Homes v. City of San Diego* (1997) 54 Cal.App.4th 106, 115; see also *Banker's Hill, Hillcrest, Park West Community Preservation Group v. City of San Diego* (2006) 139 Cal.App.4th 249, 268-269 [the Infill Exemption "calls on the agency to make a definitive finding, at the preliminary review stage, as to whether or not there will be a significant environmental effect"].) The City cannot meet its burden because, as discussed in section I above, the Project will preclude adequate cellular service and inhibit the City's emergency response capabilities.

IV. THE PROJECT DOES NOT QUALIFY FOR THE REGULATORY INFILL EXEMPTION ALSO BECAUSE IT WILL RESULT IN SIGNIFICANT NOISE IMPACTS.

A bedrock principle of CEQA is that public agencies may not qualify a project for a categorical exemption by applying mitigation measures to reduce the project's potentially significant impacts to below a level of significance. (See *Salmon Protection & Watershed Network v. County of Marin* (2004) 125 Cal.App.4th 1098, 1102.) Where a lead agency conditions the project on the implementation of specific, tailored measures to avoid potentially significant impacts, a categorical exemption is inappropriate. (*Azusa Land Reclamation Co. v. Main San Gabriel Basin Watermaster* (1997) 52 Cal.App.4th 1165, 1200.)

The Exemption Report identifies the following objective standards for assessing the significance of the Project's construction noise:

> An exceedance of existing ambient exterior noise levels **by 5 dBA or more at a noise-sensitive use** between the hours of 9:00 PM and 7:00 AM Monday through Friday, before 8:00 AM or after 6:00 PM on Saturday, or at any time on Sunday; or
>
> Construction activities lasting more than one day that would exceed existing ambient exterior sound levels **by 10 dBA or more at a noise-sensitive use**; or
>
> Construction activities lasting more than 10 days in a three-month period that would exceed existing ambient exterior noise levels **by 5 dBA or more at a noise-sensitive use.**

(Exemption Report, at p. 24, emphasis added.)

It is undisputed that the Project is located in the vicinity of several noise sensitive uses in the Project vicinity. (See *id.* at p. 24.)

Prior to the implementation of any mitigation measures, the Exemption Report states the Project's "**average noise levels during construction would result in a maximum increase of 16.9 dBA above the significance threshold of 5 dBA over ambient noise levels**." (*Id.* at p. 25, emphasis added.) Thus, the Exemption Report documents that the Project **will** result in significant noise impacts during Project construction. The Exemption Report reaches a less than significant construction noise impact conclusion only after imposing a suite of noise reduction measures specifically tailored to result in a quantitative reduction of Project construction noise to avoid a significance finding. (Exemption Report, Appendix B [Noise Technical Study], at pp. 19-20.) The City, however, may not mitigate the Project into a categorical exemption. (See *Salmon Protection & Watershed Network*, *supra*, 125 Cal.App.4th at p. 1102.)

The Exemption Report **incorrectly** states that the suite of mitigation measures recommended in the Noise Technical Report are "required to comply with the [measures] through State and local regulations." (*Id.* at p. 1.) The Project's suite of noise mitigation measures is distinguishable from generally applicable regulatory standards because here the Project proponent specifically stacked mitigation measures to achieve an overall reduction in noise that is below the City's adopted CEQA significance thresholds. (See *Walters v. City of Redondo Beach* (2016) 1 Cal.App.5th 809, 824 [involving a generally applicable condition of approval requiring compliance with city's objective noise limit of 60 dBA].) The Los Angeles Municipal Code sections cited in the Exemption Report do not require implementation of any noise reduction measures, nor do they reference the quantitative CEQA significance thresholds relied on by the City in the Exemption Report. (See Exemption Report, at p. 16, citing Los Angeles Municipal Code sections 41.40 and 112.05.) The Association of Environmental Professionals, which broadly includes legal and technical professionals practicing under CEQA considers the construction noise measures relied on in the Exemption Report to be "mitigation measures."[8]

Unlike in *Walters*, where a project was designed to stay **within** the City's established noise ordinance during operation, here Project construction **will exceed the applicable CEQA significance thresholds** relative to ambient noise levels. CEQA does not permit the City to rely on noise mitigation to shoehorn this Project into a categorical exemption.

V. UNUSUAL CIRCUMSTANCES TAKE THE PROJECT OUT OF CATEGORIES OF PROJECTS NORMALLY SUBJECT TO THE REGULATORY INFILL EXEMPTION.

The Infill Exemption does not apply if "there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances." (CEQA Guidelines, § 15300.2, subd. (c); see also *Berkeley Hillside Preservation v. City of Berkeley* (2016) 60 Cal.4th 1086, 1104; *Banker's Hill*, *supra*, 139 Cal.App.4th at p. 268 [same].) Where a project **will** result in a significant impact to the environment, however, that finding **necessarily** establishes

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[8] See Association of Environmental Professionals, *2025 CEQA California Environmental Quality Act Statute and Guidelines* (2025), *available at* https://www.califaep.org/docs/CEQA_Handbook_2025combined.pdf.

that the project is unusual and not subject to any categorical exemption. (*Berkeley Hillside Preservation*, *supra*, 60 Cal.4th at p. 1105.)

A. The Project Will Have a Significant Effect on the Environment Due to the Project's Height.

(i) The Project's height presents an unusual circumstance.

The Exemption Report improperly concludes that there are "no unusual circumstances associated with the Project site or the Proposed project" that would exclude the Project from using the Infill Exemption. (Exemption Report, at p. 37.) The Project's height of 71 feet is a 57% increase over what is permitted by the applicable zoning in the front portion of the lot and its proximity to telecommunications facilities is unusual for residential projects in the vicinity and will result in potentially significant wildfire and utilities impacts. Accordingly, even if the Infill Exemption did apply to the Project (it does **not**), the City's reliance on the Infill Exemption is barred by the presence of unusual circumstances that will result in significant impacts to the environment.

(ii) The Project's height will result in potentially significant wildfire impacts.

A project that "[s]ubstantially impair[s] an emergency response plan or emergency evacuation plan may result in a potentially significant impact under CEQA. (CEQA Guidelines, Appendix G, XX [Wildfire], threshold (a).) As discussed in Section I above, the Project would interfere with the City's emergency response plan by causing a degradation of wireless service in the Project vicinity that falls below industry and regulatory standards. Further, as documented by Mr. Lee Afflerbach, the signal interference would impact millions of drivers in the Project vicinity and substantially impair the City's emergency response plans. The Project's wildfire impacts are potentially significant. The cities of Los Angeles and Pasadena have recently experienced the unfortunate outcomes when cellular services fail in an emergency.

(iii) The Project's height will result in potentially significant impacts on utilities and service systems.

A project that will result in the relocation or construction of new or expanded telecommunications facilities may result in a potentially significant impact. (CEQA Guidelines, Appendix G, XIX [Utilities and Service Systems], threshold (a).) As shown by Mr. Afflerbach, if the Project is constructed, the telecommunications facilities located at the Mullikin Medical Center will have to be modified or relocated as they will cease to meet industry and regulatory standards for cell coverage. The Project's impacts on utilities and service systems are potentially significant.

VI. CONCLUSION.

The Project as proposed is not entitled to waivers of height restrictions because it will result in a significant, quantifiable, direct, and unavoidable impact on public health and safety and would also violate federal and state law and City ordinances by interfering with adequate cell signal for millions of Angelenos. In the interest of allowing housing projects to move forward

responsibly and expeditiously, we respectfully request the Commission to defer taking action on the Project. The Commission should further encourage the Project applicant to identify feasible methods to mitigate the Project's public safety impacts relating to cellular signal interference and the Project's significant noise impacts. 2990 S. Sepulveda, LLC is ready and eager to work with the Project applicant to identify feasible mitigation.

Sincerely,

Liz Klebaner
Nossaman LLP

LK:LK
Attachments

EXHIBIT 1-A

ROBERT JANOVICI
CHIEF ZONING ADMINISTRATOR

ASSOCIATE ZONING ADMINISTRATORS
JAMES J. CRISP
DARRYL L. FISHER
DANIEL GREEN
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HORACE E. TRAMEL, JR.

CITY OF LOS ANGELES
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TOM BRADLEY
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DEPARTMENT OF
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April 4, 1991

Sepulveda Pacific Limited
Partners
c/o S. Misra
Los Angeles Cellular Telephone Co.
6045 Slauson Avenue
Commerce, CA 90040

Ray Connors
Los Angeles Cellular Telephone Co.
6045 Slauson Avenue
Commerce, CA 90040

Jerome Buckmelter (R)
2354 Aetna Street
Woodland Hills, CA 91367

Re: CASE NO. ZA 90-1236(CUZ)
CONDITIONAL USE AND AREA
HEIGHT VARIANCE
2990 South Sepulveda Boulevard
West Los Angeles-Century City-
Rancho Park Planning Area
Zone: C2-1VL
D. M.: 7332
C. D.: 11
EIR: Exempt, CE 90-1553
Legal Description: See
attached

Department of Building and Safety

Approved (as further conditioned herein) is the above-noted request seeking:

Conditional use permit, pursuant to the provisions of Section 12.24-C,1.1(s) of the Municipal Code, to permit the establishment, use, and maintenance of a cellular telephone, cell-site facility in the C2-1VL Zone consisting of an office suite on the first floor and three sets of four antel type antennas on triangular steel frames located 10 feet above the roof deck of an existing three-story building,

a variance from the provisions of Section 12.21.1-A,1 of the Municipal Code to permit three sets of four antel type antennas at a maximum height of 52 feet in the 1VL Height District in lieu of the permitted 45-foot height limit,

upon the following additional terms and conditions:

1. That the use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibit "A".

2. That all other use, height and area regulations of the Municipal Code be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

3. That the authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to impose additional corrective conditions, if, in the Administrator's opinion, such conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

4. That the exterior equipment and antennas shall be painted a neutral color or in a manner to harmonize with the building.

5. That the antennas and other electronic equipment be installed and constructed by a valid City of Los Angeles Building Permit.

The use hereby authorized is conditional upon the privileges being utilized (i.e., the use approved being lawfully conducted on the site) within 180 days after the effective date hereof, and if they are not utilized or construction work (i.e., actual substantial physical improvements installed) is not begun within said time and carried on diligently to completion this authorization shall become void and any privilege or use granted hereby shall be deemed to have lapsed unless a Zoning Administrator has granted an extension of the time limit (the request for the extension having been submitted prior to the expiration of the grant and accompanied by the appropriate fee), after sufficient evidence has been submitted indicating that there was unavoidable delay in taking advantage of the grant. Once any portion of the privilege hereby granted is utilized, the other conditions thereof become immediately operative and must be strictly observed. Furthermore, this conditional use approval shall be subject to revocation in the manner as provided under Section 12.24-I of the Municipal Code if the conditions imposed are not strictly observed.

The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent that you advise them regarding the conditions of this grant. The Zoning Administrator's determination in this matter will become effective after April 19, 1991, unless an appeal therefrom is filed with the Board of Zoning Appeals. Any appeal must be filed on the prescribed forms, accompanied by the required fee and received and receipted at a Public Office of the Department of City Planning on or before the above date or the appeal will not be accepted.

THE APPLICANT IS FURTHER ADVISED THAT ALL SUBSEQUENT CONTACT WITH THE ZONING ADMINISTRATOR REGARDING THIS DETERMINATION, INCLUDING

CLARIFICATION, SIGN-OFFS OF CONDITIONS AND PLANS OR FOR BUILDING PERMIT APPLICATIONS, ETC., SHALL BE ACCOMPLISHED BY APPOINTMENT ONLY.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, the report of the Zoning Analyst thereon, the statements made at the public hearing before the Zoning Administrator on March 11, 1991, all of which are by reference made a part hereof, as well as knowledge of the property and the surrounding district, I find that the requirements for authorizing a conditional use under the provisions of Section 12.24-C of the Municipal Code have been established by the following facts:

1. The subject property is a level, irregular-shaped, corner lot with approximately 100 feet of frontage on National Boulevard and approximately 100 feet of frontage on Sepulveda Boulevard. The lot depth varies between 115.09 and 125.03 feet and adjoins a 20-foot-wide improved east/west alley. The site is improved with a three-story commercial building with ground floor parking. The upper floors are utilized as medical office space. The main pedestrian accessway is located at the intersecting southerly and westerly sides of the building. Vehicular ingress/egress is via the 20-foot improved alley. The site is additionally improved with attached brick planter boxes along the Sepulveda Boulevard frontage and shrubs/trees approximately 25 to 30 feet high near the pedestrian entrance and along the National Boulevard frontage.

   The project is within a commercial hub in the vicinity of the National Boulevard/Sepulveda Boulevard intersection and serves a large number of apartments to the south and single-family dwellings to the northeast.

   Properties across the 20-foot-wide alley in the C2-1VL Zone are improved with a one-story bank building. Beyond that to the north is improved with a two-story bank building and associated parking.

   Properties to the south across National Boulevard in the C2-1VL Zone is improved with a large one-story shopping center and a home improvement store located on the southwest corner of Sepulveda and National Boulevards.

   Adjoining properties to the east are zoned C2-1VL and improved with a one-story commercial building with uses that include a cleaners and two shoe stores.

   Properties to the west across Sepulveda Boulevard in the C2-1VL Zone are improved with a one-story, L-shaped mini-shopping center with uses that include a restaurant, yogurt parlor, florist, box store, photo store, restaurant, and a music/video store. Beyond that to the north is improved with a corner newsstand. Beyond that to the north is improved with a restaurant and a cleaners.

Sepulveda Boulevard, adjoining the subject property, is a designated Major Highway and is dedicated 100 feet in width and improved with curbs, gutters, sidewalks, fully improved.

National Boulevard, adjoining the subject property, is a designated Secondary Highway and is dedicated 80 to 88 feet in width and improved with curbs, gutters, sidewalks, fully improved.

Previous Cases, Affidavits, Permits, Etc.:

The Data Automated File System (DAFS) indicate no building permits or affidavits that are applicable to the project.

Case No. ZV 83-143, a request to permit the conversion of 8,800 square feet of a 22,000-square-foot building to medical offices with 12 of the required 68 parking spaces to be secured by a 10 year lease agreement, instead of by required covenant. Granted on July 6, 1983.

2. The applicant is seeking a conditional use permit, pursuant to the provisions of Section 12.24-C,1.1(s) of the Municipal Code, to permit the establishment, use, and maintenance of cellular, telephone, cell-site facility in the C2-1VL Zone consisting of an office suite on the first floor and three sets of four antel type antennas on triangular steel frames located 10 feet above the roof deck of an existing three-story building.

The applicant's Plot Plan/Inset Floor Plan indicates the existing commercial building is approximately 42 feet high to the top of the parapet. The three sets of four antel type antennas mounted on a triangular-shaped steel frame 10 feet higher than the roof deck will have appurtenances 52 feet above the street grade.

Field investigation indicates the existing three-story building is one of the tallest commercial buildings in and around the general area south of the Santa Monica; easterly of the San Diego Freeway; westerly of Westwood Boulevard and northerly of Palms Boulevard.

One letter of opposition was received. One request of the Zoning Administrator's determination was received.

The public hearing on this matter was held on February 25, 1991. The applicant's representatives stated that the Los Angeles Cellular Telephone Company intended to place a cellular "cell site" on the property that would provide a necessary link in the operating cellular telephone network. He further explained that on this site the project would involve utilizing an existing office suite for cellular equipment on the first floor and locating three sets of four antel type antennas on triangular steel frames located 10 feet above the roof deck (at a height of 52 feet) on an existing three-story building.

One letter in opposition was received from an owner of a condominium in the 204 unit complex on Sepulveda Boulevard approximately 500 feet northwesterly of the proposed antennas.

Conditional Use

3. The location is proper in relation to adjacent uses or the development of the community and to the various elements of the General Plan.

The applicant's installation will provide the public and emergency service organizations with access to mobile telephone service within the community. The location factor of installation is determined by cellular technology which requires spatial consistency within an interlocking grid system dictated by existing disbursement and other system demand elements. The minimal physical presence of the system will not materially impact the utility or quality of surrounding land uses.

4. The adopted West Los Angeles-Century City-Rancho Park District Plan designates the subject property for Community Commercial with corresponding zones of C2, C4, CR, P, PB.

5. The use will not be materially detrimental to the character of the immediate neighborhood.

The proposed location will not interfere or bother adjacent uses. The operating equipment will be completely enclosed within a building. The roof mounted antennas will be painted a neutral color or a color to blend in with the overall background of the existing structure. In addition, the antennas will be located on the roof at a point where they will be minimally visible.

At the public hearing there was no one in attendance other than the applicant's representative. However, from time to time, concerns are raised regarding the impacts of radiation resulting from the subject use within the community.

As to the health hazards from radiation, it has been stated in a letter to the Office of Zoning Administration that these types of facilities have been found to have the following types of characteristics.

Regarding the safety aspects of cellular facilities, the FCC has adopted the American National Standards Institute (ANSI) standards for radio-frequency radiation in lieu of the OSHA, since the ANSI are applicable to the general population in all situation, whereas the OSHA standards were designed only as occupational standards. In addition, the ANSI standards are stricter than OSHA standards.

Absent any other evidence to the contrary, these statements have led the Zoning Administrator to the conclusion that there is no potential health hazard to the general public resulting from the use of this type of installation.

Area Height Variance

6. The strict application of provisions of the zoning ordinance would result in practical difficulties or unnecessary hardships inconsistent with the general purpose and intent of the zoning regulation. Section 12.2 1-A,1 of the Planning and Zoning Code establishes Height District "1VL" which applies to the subject property. That is, "no building or structure.....shall exceed three stories, nor shall it exceed 45 feet in height."

Los Angeles Cellular Telephone Company is a public utility which has the responsibility of providing quality cellular telephone service throughout the greater Los Angeles Area. Cellular technology has stringent locational and elevational requirements. The cellular antennas need to be elevated to a height of 50 feet in the vicinity of the subject property.

The strict application of the Code would limit the antenna height to 45 feet. This would necessitate the development of a 45-foot monopole to provide service. This pole would be more noticeable than the proposed "roof mount". Moreover, the 45-foot monopole would provide a degraded level of service in the community, especially since the 49-foot subject building would create a "null" in one of the sectors. That is, the subject building would obstruct transmission and reception of signals to a 45-foot monopole developed nearby.

The Code never intended to unduly restrict needed public utility benefits; however, strict application of the Code would do this.

7. There are special circumstances applicable to the subject property such as size, shape, topography, location, or surroundings, that do not apply generally to other property in the same zone and vicinity.

The proposed "cell site" is a public utility. In contrast to other public utility use or any other uses in general, it has stringent locational requirements. Due to the location of surrounding cell sites and the need to provide additional cellular capacity to cellular users traversing the 405 Freeway, a "cell site" is needed in the vicinity of National and Sepulveda Boulevards. Therefore, it is the special circumstance of the surroundings, i.e. other cell sites and the proximity of major thoroughfares with high cellular demand, that requires a cell site at the subject property.

Moreover, the fact that the subject site has an existing building with the requisite height for the cellular antennas is also a special circumstance.

8. Such variance is necessary for the preservation and enjoyment of a substantial property right or use generally possessed by other property in the same zone and vicinity but which, because of such special circumstances and practical difficulties or unnecessary hardships is denied to the property in question.

Los Angeles Cellular Telephone Company is a public utility. Other public utilities such as the Department of Water and Power and the "land-line" telephone company have utility poles in the immediate vicinity which well exceed 45 feet. These poles are placed by the other utility companies virtually anywhere -- in public right-of-ways and on private properties without discretionary zoning entitlement review. Los Angeles Cellular Telephone Company also seeks the same property rights and uses in order to provide the best possible level of service, but in contrast to the other companies, Los Angeles Cellular Telephone Company submits to discretionary review at the request of the California Public Utilities Commission in order to provide a development which is most compatible with surrounding uses.

9. The granting of such variance will not be materially detrimental to the public welfare or injurious to the property or improvements in the same zone or vicinity in which the property is located.

10. The proposed development consists of two parts: electronic equipment and antennas. The equipment will be housed in a suite in the existing building on site. The antennas will be mounted on the roof. The existing top of the parapet is at elevation 179.00. The proposed top of the antennas will be at elevation 182.00. Therefore, the antennas will extend only 3 feet above the parapet. It is important to note that the antenna array will be situated 12 feet from the south parapet wall, 12 feet from the east wall, 70 feet from the north wall, and 60 feet from the west wall. Due to the geometry of view angles and adjacent uses, the antennas will only be visible from the south. In fact, the top of the antennas will not be visible from the south within 120-feet of the building. As a result, the antennas will only be visible at a greater distance and, therefore, will be unobtrusive.

    Furthermore, cellular technology is designed to be environmentally safe and will not interfere with radio, television, etc.

11. The granting of the variance will not adversely affect any elements of the General Plan.

    The subject property is depicted on the West Los Angeles District Plan Commerce/Community. This land use designation is appropriate for the proposed use and its need to exceed the "1VL" Height District. "The Plan is intended to promote...the economic, social and physical health, safety, welfare and convenience of the District...". The use as proposed will contribute towards these goals. Cellular systems enhance commerce and provide a new dimension to private communications. Lastly, a viable cellular system can be of vital importance during times of emergency, as was experienced during the 1989 San Francisco earthquake and by reduced "911" response times.

12. The national flood insurance program, flood insurance rate maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance No. 154,405, have been

reviewed and it has been determined that this project is located in Zone C, areas of minimal flooding. (No shading)

13. On October 25, 1990, the subject project was issued a Notice of Exemption (Article III, Section 3, City CEQA Guidelines) a log reference CE 90-1553. The exemption status was Class 11, Category 6. City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. I hereby certify that action.

Andrew B. Sincosky

ANDREW B. SINCOSKY
Associate Zoning Administrator

ABS:hb

c: Director of Planning
County Assessor
Councilman Marvin Braude
Eleventh District
Adjoining Property Owners
Walter Gibson

EXHIBIT 1-B

CITY OF LOS ANGELES
CALIFORNIA

ROBERT JANOVICI
CHIEF ZONING ADMINISTRATOR

ASSOCIATE ZONING ADMINISTRATORS
EMILY J. GABEL-LUDDY
DANIEL GREEN
LOURDES GREEN
ALBERT LANDINI
WILLIAM LILLENBERG
JOHN J. PARKER, JR.
JON PERICA
HORACE E. TRAMEL, JR

RICHARD J. RIORDAN
MAYOR

DEPARTMENT OF
CITY PLANNING
CON HOWE
DIRECTOR

FRANKLIN P. EBERHARD
DEPUTY DIRECTOR

OFFICE OF
ZONING ADMINISTRATION
221 NORTH FIGUEROA STREET
ROOM 1500
LOS ANGELES, CA 90012-2601
(213) 580-5495
FAX: (213) 580-5569

October 10, 1996

Robert J. Berger (A)
Pacific Bell Mobile Services
5959 Century Boulevard, #200
Los Angeles, CA 90045

Jay McWhinney (O)
National Trust Bank of California
355 South Grand Avenue, #2600
Los Angeles, CA 90071

Jerome Buckmelter Associates,
Incorporated (R)
23534 Aetna Street
Woodland Hills, CA 91367

CASE NO. ZA 96-0686(CUZ)
CONDITIONAL USE
2990 South Sepulveda Boulevard
West Los Angeles Planning Area
Zone : C2-1VL
D. M.: 123B157
C. D.: 11
CEQA : CE 96-0751
Fish & Game: Exempt
Legal Description: Lot No. 24,
Tract No. 14252

Department of Building and Safety

Pursuant to Los Angeles Municipal Code Section 12.24-C,18, I hereby APPROVE:

a conditional use to permit the installation, use and maintenance of an unmanned telecommunications facility not to exceed a height of 50 feet 9 inches, in the C2-1VL Zone,

upon the following additional terms and conditions:

1. All other use, height and area regulations of the Municipal Code and all other applicable government/regulatory agencies shall be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

2. The use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibits "A-1" and "A-2", except as may be revised as a result of this action.

3. The authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to impose additional corrective conditions, if, in the Administrator's opinion, such conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

AN EQUAL EMPLOYMENT OPPORTUNITY - AFFIRMATIVE ACTION EMPLOYER

4. All graffiti on the site shall be removed or painted over in the same color as the wall surface to which it is applied within 24 hours of its occurrence.

5. The project shall consist of the following elements:

   a. Two equipment cabinets located on the roof of the existing structure not to exceed the height of the parapet;

   b. Three sectors consisting of two antennae each:

      - Sector A - north corner of roof;
      - Sector B - east corner of roof;
      - Sector C - southwest corner of roof.

   c. No antenna shall exceed a height of 50-feet 9-inches above finished grade.

6. All applicable laws, regulations and standards of all local, State and Federal government agencies shall be observed.

7. The applicant's facility shall not interfere with TV, radio or cordless phone reception or exceed limits established by the FCC.

8. The exterior equipment and sector screening material shall be painted in a manner to harmonize with the building.

9. The antennae and other electronic equipment shall be installed and constructed by valid City of Los Angeles Building Permit.

10. Should the use of the approved antennae and equipment boxes cease for more than one year, they shall be removed to the satisfaction of the Department of Building and Safety.

11. The grant clause and all conditions of approval shall be provided in the "notes" portion on the building plans submitted to the Zoning Administrator and the Department of Building and Safety.

12. Prior to the issuance of a final Certificate of Occupancy, the applicant may secure a Temporary Certificate for the purposes of testing the facilities.

OBSERVANCE OF CONDITIONS - TIME LIMIT - LAPSE OF PRIVILEGES - TIME EXTENSION

All terms and conditions of the approval shall be fulfilled before the use may be established. The instant authorization is further conditional upon the privileges being utilized within two years after the effective date of approval and, if such privileges are not utilized or substantial physical construction work is not begun within said time and carried on diligently to completion, the authorization shall terminate and become void. A Zoning Administrator may extend the termination date for one additional period not to exceed one year, if a written request is filed therefore with a public Office of the Department of City Planning setting forth the reasons for said request and a Zoning Administrator determines that good and reasonable cause exists therefore.

TRANSFERABILITY

This authorization runs with the land. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent that you advise them regarding the conditions of this grant.

VIOLATIONS OF THESE CONDITIONS, A MISDEMEANOR

Section 12.24-J,3 of the Los Angeles Municipal Code provides:

"It shall be unlawful to violate or fail to comply with any requirement or condition imposed by final action of the Zoning Administrator, Board or Council pursuant to this subsection. Such violation or failure to comply shall constitute a violation of this Chapter and shall be subject to the same penalties as any other violation of this Chapter."

Every violation of this determination is punishable as a misdemeanor and shall be punishable by a fine of not more than $1,000 or by imprisonment in the county jail for a period of not more than six months, or by both such fine and imprisonment.

APPEAL PERIOD - EFFECTIVE DATE

The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. THE ZONING ADMINISTRATOR'S DETERMINATION IN THIS MATTER WILL BECOME EFFECTIVE AFTER OCTOBER 25, 1996, UNLESS AN APPEAL THEREFROM IS FILED WITH THE BOARD OF ZONING APPEALS. IT IS STRONGLY ADVISED THAT APPEALS BE FILED EARLY DURING THE APPEAL PERIOD AND IN PERSON SO THAT IMPERFECTIONS/ INCOMPLETENESS MAY BE CORRECTED BEFORE THE APPEAL PERIOD EXPIRES. ANY APPEAL MUST BE FILED ON THE PRESCRIBED FORMS, ACCOMPANIED BY THE REQUIRED FEE AND RECEIVED AND RECEIPTED AT A PUBLIC OFFICE OF THE DEPARTMENT OF CITY PLANNING ON OR BEFORE THE ABOVE DATE OR THE APPEAL WILL NOT BE ACCEPTED. SUCH OFFICES ARE LOCATED AT:

Los Angeles City Hall
200 North Spring Street
Room 460, Counter S
Los Angeles, CA 90012
(213) 485-7826

6251 Van Nuys Boulevard
First Floor
Van Nuys, CA 91401
(818) 756-8596

NOTICE

THE APPLICANT IS FURTHER ADVISED THAT ALL SUBSEQUENT CONTACT WITH THIS OFFICE REGARDING THIS DETERMINATION MUST BE WITH THE ZONING ADMINISTRATOR WHO ACTED ON THE CASE. THIS WOULD INCLUDE CLARIFICATION, VERIFICATION OF CONDITION COMPLIANCE AND PLANS OR BUILDING PERMIT APPLICATIONS, ETC., AND SHALL BE ACCOMPLISHED BY APPOINTMENT ONLY, IN ORDER TO ASSURE THAT YOU

RECEIVE SERVICE WITH A MINIMUM AMOUNT OF WAITING. YOU SHOULD ADVISE ANY CONSULTANT REPRESENTING YOU OF THIS REQUIREMENT AS WELL.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, the report of the Zoning Analyst thereon, and the statements made at the public hearing before the Zoning Administrator on September 26, 1996, all of which are by reference made a part hereof, as well as knowledge of the property and the surrounding district, I find that the requirements for authorizing a conditional use permit under the provisions of Section 12.24-C of the Municipal Code have been established by the following facts:

BACKGROUND

The subject property is a level, irregularly-shaped corner lot with approximately 100 feet of frontage on both Sepulveda and National Boulevards. The lot depth varies from 113 feet and 123 feet and joins a 20-foot-wide improved east-west alley. The site is improved with a three-story commercial building with ground floor parking. Los Angeles Medical Group and the Westside Dental Associates occupied the upper floors being utilized as office space. There is landscaping on the street side of the building in the entrance way for a parking is from a fully improved 20-foot wide alleyway.

The subject property is within a Commercial Hub in the vicinity of National and Sepulveda Boulevards intersection and serves a large number of apartments to the south and single-family dwelling to the northeast.

The properties across the 20-foot wide alley in the C2-1VL Zone are improved with a one-story bank. Beyond that to the north is improvements with a two-story bank and associated parking.

Properties to the south across National Boulevard, in the C2-1VL Zone are improved with a large one-story shopping center. There is a very large parking lot fronting on Sepulveda Boulevard to serve a shopping center.

Adjoining properties to the east are zoned C2-1VL and improved with a one-story commercial building with uses which include a cleaners, shoe store and a specialty shoe store. Properties to the west across Sepulveda Boulevard, are in the C2-1VL Zone and are improved with a one-story, L-shaped mini-shopping center with several uses of a commercial nature.

Sepulveda Boulevard, adjoining the subject property, is a designated Major Highway and is dedicated to 100 feet in width and fully improved.

National Boulevard, adjoining the subject property, is a designated Secondary Highway and is dedicated with a varying width from 80 to 88 feet and improved fully.

Previous zoning related actions on the site/in the area include:

Subject Property:

Case No. ZA 90-1236(CUZ) was approved April 4, 1991 to permit the establishment, use and maintenance of a cellular telephone call site

facility with three sets of four antel type antennas on triangular frames and a variance to permit the three sets of antennas at a maximum height of 52 feet in the 1VL height district in lieu of the permitted 45-foot height limit. This was for L.A. Cellular Telephone Company which change names and became AirTouch Cellular Telephone Company.

Case No. ZA 91-0204(CUZ) was approved May 10, 1991 to authorize the installation and maintenance of a cellular telephone facility including an equipment room on a lower floor and with four sets of exterior antennas to be mounted on the building roof for the installation of four surface grip panels 2 by 3 feet each mounted on a roof mounted wall and four microwave dish antennae 2 feet in diameter similarly mounted on the south side of the building. This was an approval for PacTel Cellular Company.

No similar or relevant cases were found on surrounding properties in the immediate neighborhood.

At the public hearing, held September 26, 1996, three persons spoke: the applicant's representative, a representative of the building owner and the building owner. The owner noted for the record that his mailing address, 355 South Grand Avenue, Suite 2600, Los Angeles, CA 90071, should be corrected on all City correspondence on the matter. The representative indicated that the facility had been requested previously at a site to the north of the instant request, it had been approved (ZA 96-0297(CUZ)), appealed and withdrawn due to community opposition.

The instant request was a contingency site. It was noted that no letters of opposition were in the file, nor any opposition raised at the public hearing.

The subject site currently contains 12 antennas approved for AirTouch Cellular under ZA 90-1236(CUZ).

BASIS FOR CONDITIONAL USE PERMITS

A particular type of development is subject to the conditional use process because it has been determined that such use of property should not be permitted by right in a particular zone. All uses requiring a conditional use permit from the Zoning Administrator are located within Section 12.24-C of the Los Angeles Municipal Code. In order for a particular request to be authorized, certain designated findings have to be made. In certain cases, specific conditional use categories have additional or unique findings only applicable to that specific use beyond the four standard findings for other conditional use categories.

FINDINGS

In order for a conditional use permit for installation of an unmanned telecommunications facility to be approved the mandated findings delineated in Municipal Code Section 12.24-C must be made in the affirmative. Following (highlighted) is a delineation of the findings and the application of the relevant facts to same:

1. **The proposed location will be desirable to the public convenience or welfare and the location is proper in relation to adjacent uses or the development of the community.**

The subject property is located at 2990 South Sepulveda Boulevard. The property is zoned C2-1VL.

The subject site is currently improved with a three-story medical/dental office building which measures 44 feet 9 inches in height to the top of the roof parapet. Information from the applicant indicates that they intend to install three antennae sectors of two antennae each for a total of six.

Sector A is proposed for the north side of the roof; Sector B is proposed at the east side of the roof; and Sector C is proposed for the southwest section of the roof.

Surrounding properties to the north are zoned C2 with commercial office and restaurant; to the northeast, property is zoned R4P and used for parking. To the south and west property is zoned C2 and contains a supermarket, large clothing store, parking and other retail services. To the east, property is zoned multiple and single family residential (RD1.5, R3 and R1).

There are existing unmanned telecommunications facilities on the roof of the subject site (approved under ZA 90-1236(CUZ)). The applicant therefore would be adding to the existing facilities, or co-locating.

The new cellular transmitting facility is necessary to upgrade service in the general area to industry standards. Upgrading will provide a convenience to persons living or working in the area, or traveling through, and is consistent with the level and type of services which is currently standard in metropolitan areas. The service appears particularly appropriate for this area, given the proximity of the subject property to the intersection of the Santa Monica (Route 10) and San Diego (Route 405) Freeways and direct service to persons travelling Sepulveda Boulevard, a Major Highway and alternate route to the 405. The rooftop location of the proposed antennae affords signals to clear facade improvements.

2. **The use will not be materially detrimental to the character of the development in the immediate neighborhood.**

Property adjacent to the subject site is zoned C2. Improvements on the surrounding properties consist of commercial office, retail and parking.

No additional traffic will be generated by the proposed project other than periodic visits to properly maintain the equipment.

The proposed project will co-locate with existing similar facilities, which will reduce the number of rooftop unmanned telecommunications antennae in the surrounding area. Co-locating affords continuing competitive coverage from service providers without increasing the number of sites affected. Prior approvals for the subject property include: ZA 90-1236(CUZ) and ZA 91-0204(CUZ).

Finally, the applicant withdrew an approved request, ZA 96-0297(CUZ), at 2756 South Sepulveda Boulevard (one block north of the instant grant) due to community opposition while the case was pending before the Board of Zoning Appeals (BZA 5277, 5278 and 5279).

The instant grant permits a back up site to provide coverage in this section of West Los Angeles. No letters of opposition were received and no opposing testimony was heard at the public hearing.

The applicant has sought, unsuccessfully, other sites; is co-locating at the subject property where prior approvals exist, and no opposition has been received. Therefore, proposed use will not be materially detrimental to the character of the development in the immediate neighborhood.

3. **The proposed location will be in harmony with the various elements and objectives of the General Plan.**

The West Los Angeles District Plan designates the subject property for Community Commercial with corresponding zones of to C2, C4, CR, P and PB Zones.

The community plan does not specifically address wireless telecommunications facilities which are permitted in commercial zones by conditional use.

ADDITIONAL MANDATORY FINDINGS

4. The National Flood Insurance Program rate maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance No. 154,405, have been reviewed and it has been determined that this project is located in Zone C, areas of minimal flooding. (No shading)

5. On August 9, 1996, the subject project was issued a Notice of Exemption (Article III, Section 3, City CEQA Guidelines), log reference CE 96-0751, for a Categorical Exemption, Class 3, Category 4, City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. I hereby certify that action.

6. Fish and Game: The subject project, which is located in Los Angeles County, will not have an impact on fish or wildlife resources or habitat upon which fish and wildlife depend, as defined by California Fish and Game Code Section 711.2.

Emily Gabel-Luddy
EMILY GABEL-LUDDY
Associate Zoning Administrator

EGL:lmc

cc: Councilman Marvin Braude
Eleventh District
Adjoining Property Owners
County Assessor

CONDITIONS OF APPROVAL

T · · Mobile ·
Get more from life

4100 GUARDIAN STREET SUITE 101
SIMI VALLEY, CA 93063

PLANS PREPARED BY:

ACO
ARCHITECTS - INC.

26170 ENTERPRISE #600
LAKE FOREST, CA. 92630
PHONE: (949) 716-9940
FAX: (949) 297-4788

CONSULTING GROUP:

NO.	DATE:	DESCRIPTION:	BY:
1	08/28/07	PRELIMINARY	JY
2	09/20/07	CLIENT REVISION	MY
3	10/01/07	FINAL	MY
4	02/08/08	CLIENT REVISION	TW
5	05/30/08	CLIENT REVISION	TW
6	08/20/08	CLIENT REVISION	MY
7	11/20/08	CLIENT REVISION	TW

SITE INFORMATION:

MULLIKIN MEDICAL CTR.

LA02026

2990 1/2 S. SEPULVEDA BLVD.
LOS ANGELES CA 90064

SEAL:

EXHIBIT "A"
Page No. 2 of 5
Case No. ZA-96-0686-CUZ-PA2

SHEET TITLE:

CONDITIONS OF APPROVAL

SHEET NUMBER:

T-2

CITY OF LOS ANGELES
CALIFORNIA

ROBERT JANOVICI
CHIEF ZONING ADMINISTRATOR

ASSOCIATE ZONING ADMINISTRATORS
EMILY J. GABEL-LUDDY
DANIEL GREEN
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ALBERT LANDINI
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MAYOR

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(213) 580-5495
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October 10, 1996

Robert J. Berger (A)
Pacific Bell Mobile Services
5959 Century Boulevard, #200
Los Angeles, CA 90045

Jay McWhinney (O)
National Trust Bank of California
355 South Grand Avenue, #2600
Los Angeles, CA 90071

Jerome Buckmelter Associates,
Incorporated (R)
23534 Aetna Street
Woodland Hills, CA 91367

CASE NO. ZA 96-0686(CUZ)
CONDITIONAL USE
2990 South Sepulveda Boulevard
West Los Angeles Planning Area
Zone : C2-1VL
D. M.: 123B157
C. D.: 11
CEQA : CE 96-0751
Fish & Game: Exempt
Legal Description: Lot No. 24,
Tract No. 14252

Department of Building and Safety

Pursuant to Los Angeles Municipal Code Section 12.24-C,18, I hereby APPROVE:

a conditional use to permit the installation, use and maintenance of an unmanned telecommunications facility not to exceed a height of 50 feet 9 inches, in the C2-1VL Zone,

upon the following additional terms and conditions:

1. All other use, height and area regulations of the Municipal Code and all other applicable government/regulatory agencies shall be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

2. The use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibits "A-1" and "A-2", except as may be revised as a result of this action.

3. The authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to impose additional corrective conditions, if, in the Administrator's opinion, such conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

Recyclable and made from recycled waste.

4. All graffiti on the site shall be removed or painted over in the same color as the wall surface to which it is applied within 24 hours of its occurrence.

5. The project shall consist of the following elements:

   a. Two equipment cabinets located on the roof of the existing structure not to exceed the height of the parapet;

   b. Three sectors consisting of two antennae each:

      - Sector A - north corner of roof;
      - Sector B - east corner of roof;
      - Sector C - southwest corner of roof.

   c. No antenna shall exceed a height of 50-feet 9-inches above finished grade.

6. All applicable laws, regulations and standards of all local, State and Federal government agencies shall be observed.

7. The applicant's facility shall not interfere with TV, radio or cordless phone reception or exceed limits established by the FCC.

8. The exterior equipment and sector screening material shall be painted in a manner to harmonize with the building.

9. The antennae and other electronic equipment shall be installed and constructed by valid City of Los Angeles Building Permit.

10. Should the use of the approved antennae and equipment boxes cease for more than one year, they shall be removed to the satisfaction of the Department of Building and Safety.

11. The grant clause and all conditions of approval shall be provided in the "notes" portion on the building plans submitted to the Zoning Administrator and the Department of Building and Safety.

12. Prior to the issuance of a final Certificate of Occupancy, the applicant may secure a Temporary Certificate for the purposes of testing the facilities.

OBSERVANCE OF CONDITIONS - TIME LIMIT - LAPSE OF PRIVILEGES - TIME EXTENSION

All terms and conditions of the approval shall be fulfilled before the use may be established. The instant authorization is further conditional upon the privileges being utilized within two years after the effective date of approval and, if such privileges are not utilized or substantial physical construction work is not begun within said time and carried on diligently to completion, the authorization shall terminate and become void. A Zoning Administrator may extend the termination date for one additional period not to exceed one year, if a written request is filed therefore with a public Office of the Department of City Planning setting forth the reasons for said request and a Zoning Administrator determines that good and reasonable cause exists therefore.

TRANSFERABILITY

This authorization runs with the land. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent that you advise them regarding the conditions of this grant.

VIOLATIONS OF THESE CONDITIONS, A MISDEMEANOR

Section 12.24-J,3 of the Los Angeles Municipal Code provides:

> "It shall be unlawful to violate or fail to comply with any requirement or condition imposed by final action of the Zoning Administrator, Board or Council pursuant to this subsection. Such violation or failure to comply shall constitute a violation of this Chapter and shall be subject to the same penalties as any other violation of this Chapter."

Every violation of this determination is punishable as a misdemeanor and shall be punishable by a fine of not more than $1,000 or by imprisonment in the county jail for a period of not more than six months, or by both such fine and imprisonment.

APPEAL PERIOD - EFFECTIVE DATE

The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. THE ZONING ADMINISTRATOR'S DETERMINATION IN THIS MATTER WILL BECOME EFFECTIVE AFTER OCTOBER 25, 1996, UNLESS AN APPEAL THEREFROM IS FILED WITH THE BOARD OF ZONING APPEALS. IT IS STRONGLY ADVISED THAT APPEALS BE FILED EARLY DURING THE APPEAL PERIOD AND IN PERSON SO THAT IMPERFECTIONS/ INCOMPLETENESS MAY BE CORRECTED BEFORE THE APPEAL PERIOD EXPIRES. ANY APPEAL MUST BE FILED ON THE PRESCRIBED FORMS, ACCOMPANIED BY THE REQUIRED FEE AND RECEIVED AND RECEIPTED AT A PUBLIC OFFICE OF THE DEPARTMENT OF CITY PLANNING ON OR BEFORE THE ABOVE DATE OR THE APPEAL WILL NOT BE ACCEPTED. SUCH OFFICES ARE LOCATED AT:

Los Angeles City Hall
200 North Spring Street
Room 460, Counter S
Los Angeles, CA 90012
(213) 485-7826

6251 Van Nuys Boulevard
First Floor
Van Nuys, CA 91401
(818) 756-8596

NOTICE

THE APPLICANT IS FURTHER ADVISED THAT ALL SUBSEQUENT CONTACT WITH THIS OFFICE REGARDING THIS DETERMINATION MUST BE WITH THE ZONING ADMINISTRATOR WHO ACTED ON THE CASE. THIS WOULD INCLUDE CLARIFICATION, VERIFICATION OF CONDITION COMPLIANCE AND PLANS OR BUILDING PERMIT APPLICATIONS, ETC., AND SHALL BE ACCOMPLISHED BY APPOINTMENT ONLY, IN ORDER TO ASSURE THAT YOU

RECEIVE SERVICE WITH A MINIMUM AMOUNT OF WAITING. YOU SHOULD ADVISE ANY CONSULTANT REPRESENTING YOU OF THIS REQUIREMENT AS WELL.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, the report of the Zoning Analyst thereon, and the statements made at the public hearing before the Zoning Administrator on September 26, 1996, all of which are by reference made a part hereof, as well as knowledge of the property and the surrounding district, I find that the requirements for authorizing a conditional use permit under the provisions of Section 12.24-C of the Municipal Code have been established by the following facts:

BACKGROUND

The subject property is a level, irregularly-shaped corner lot with approximately 100 feet of frontage on both Sepulveda and National Boulevards. The lot depth varies from 115 feet and 125 feet and joins a 20-foot-wide improved east-west alley. The site is improved with a three-story commercial building with ground floor parking. Los Angeles Medical Group and the Westside Dental Associates occupied the upper floors being utilized as office space. There is landscaping on the street side of the building in the entrance way for a parking is from a fully improved 20-foot wide alleyway.

The subject property is within a Commercial Hub in the vicinity of National and Sepulveda Boulevards intersection and serves a large number of apartments to the south and single-family dwelling to the northeast.

The properties across the 20-foot wide alley in the C2-1VL Zone are improved with a one-story bank. Beyond that to the north is improvements with a two-story bank and associated parking.

Properties to the south across National Boulevard, in the C2-1VL Zone are improved with a large one-story shopping center. There is a very large parking lot fronting on Sepulveda Boulevard to serve a shopping center.

Adjoining properties to the east are zoned C2-1VL and improved with a one-story commercial building with uses which include a cleaners, shoe store and a specialty shoe store. Properties to the west across Sepulveda Boulevard, are in the C2-1VL Zone and are improved with a one-story, L-shaped mini-shopping center with several uses of a commercial nature.

Sepulveda Boulevard, adjoining the subject property, is a designated Major Highway and is dedicated to 100 feet in width and fully improved.

National Boulevard, adjoining the subject property, is a designated Secondary Highway and is dedicated with a varying width from 80 to 88 feet and improved fully.

Previous zoning related actions on the site/in the area include:

Subject Property:

Case No. ZA 90-1236(CUZ) was approved April 4, 1991 to permit the establishment, use and maintenance of a cellular telephone cell site

facility with three sets of four antel type antennas on triangular frames and a variance to permit the three sets of antennas at a maximum height of 52 feet in the 1VL height district in lieu of the permitted 45-foot height limit. This was for L.A. Cellular Telephone Company which change names and became AirTouch Cellular Telephone Company.

Case No. ZA 91-0204(CUZ) was approved May 10, 1991 to authorize the installation and maintenance of a cellular telephone facility including an equipment room on a lower floor and with four sets of exterior antennas to be mounted on the building roof for the installation of four surface grip panels 2 by 3 feet each mounted on a roof mounted wall and four microwave dish antennae 2 feet in diameter similarly mounted on the south side of the building. This was an approval for PacTel Cellular Company.

No similar or relevant cases were found on surrounding properties in the immediate neighborhood.

At the public hearing, held September 26, 1996, three persons spoke: the applicant's representative, a representative of the building owner and the building owner. The owner noted for the record that his mailing address, 355 South Grand Avenue, Suite 2600, Los Angeles, CA 90071, should be corrected on all City correspondence on the matter. The representative indicated that the facility had been requested previously at a site to the north of the instant request, it had been approved (ZA 96-0297(CUZ)), appealed and withdrawn due to community opposition.

The instant request was a contingency site. It was noted that no letters of opposition were in the file, nor any opposition raised at the public hearing.

The subject site currently contains 12 antennas approved for AirTouch Cellular under ZA 90-1236(CUZ).

BASIS FOR CONDITIONAL USE PERMITS

A particular type of development is subject to the conditional use process because it has been determined that such use of property should not be permitted by right in a particular zone. All uses requiring a conditional use permit from the Zoning Administrator are located within Section 12.24-C of the Los Angeles Municipal Code. In order for a particular request to be authorized, certain designated findings have to be made. In certain cases, specific conditional use categories have additional or unique findings only applicable to that specific use beyond the four standard findings for other conditional use categories.

FINDINGS

In order for a conditional use permit for installation of an unmanned telecommunications facility to be approved the mandated findings delineated in Municipal Code Section 12.24-C must be made in the affirmative. Following (highlighted) is a delineation of the findings and the application of the relevant facts to same:

1. **The proposed location will be desirable to the public convenience or welfare and the location is proper in relation to adjacent uses or the development of the community.**

The subject property is located at 2990 South Sepulveda Boulevard. The property is zoned C2-1VL.

The subject site is currently improved with a three-story medical/dental office building which measures 44 feet 9 inches in height to the top of the roof parapet. Information from the applicant indicates that they intend to install three antennae sectors of two antennae each for a total of six.

Sector A is proposed for the north side of the roof; Sector B is proposed at the east side of the roof; and Sector C is proposed for the southwest section of the roof.

Surrounding properties to the north are zoned C2 with commercial office and restaurant; to the northeast, property is zoned R4P and used for parking. To the south and west property is zoned C2 and contains a supermarket, large clothing store, parking and other retail services. To the east, property is zoned multiple and single family residential (RD1.5, R3 and R1).

There are existing unmanned telecommunications facilities on the roof of the subject site (approved under ZA 90-1236(CUZ)). The applicant therefore would be adding to the existing facilities, or co-locating.

The new cellular transmitting facility is necessary to upgrade service in the general area to industry standards. Upgrading will provide a convenience to persons living or working in the area, or traveling through, and is consistent with the level and type of services which is currently standard in metropolitan areas. The service appears particularly appropriate for this area, given the proximity of the subject property to the intersection of the Santa Monica (Route 10) and San Diego (Route 405) Freeways and direct service to persons travelling Sepulveda Boulevard, a Major Highway and alternate route to the 405. The rooftop location of the proposed antennae affords signals to clear facade improvements.

2. **The use will not be materially detrimental to the character of the development in the immediate neighborhood.**

Property adjacent to the subject site is zoned C2. Improvements on the surrounding properties consist of commercial office, retail and parking.

No additional traffic will be generated by the proposed project other than periodic visits to properly maintain the equipment.

The proposed project will co-locate with existing similar facilities, which will reduce the number of rooftop unmanned telecommunications antennae in the surrounding area. Co-locating affords continuing competitive coverage from service providers without increasing the number of sites affected. Prior approvals for the subject property include: ZA 90-1236(CUZ) and ZA 91-0204(CUZ).

Finally, the applicant withdrew an approved request, ZA 96-0297(CUZ), at 2756 South Sepulveda Boulevard (one block north of the instant grant) due to community opposition while the case was pending before the Board of Zoning Appeals (BZA 5277, 5278 and 5279).

The instant grant permits a back up site to provide coverage in this section of West Los Angeles. No letters of opposition were received and no opposing testimony was heard at the public hearing.

The applicant has sought, unsuccessfully, other sites; is co-locating at the subject property where prior approvals exist, and no opposition has been received. Therefore, proposed use will not be materially detrimental to the character of the development in the immediate neighborhood.

3. **The proposed location will be in harmony with the various elements and objectives of the General Plan.**

The West Los Angeles District Plan designates the subject property for Community Commercial with corresponding zones of to C2, C4, CR, P and PB Zones.

The community plan does not specifically address wireless telecommunications facilities which are permitted in commercial zones by conditional use.

ADDITIONAL MANDATORY FINDINGS

4. The National Flood Insurance Program rate maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance No. 154,405, have been reviewed and it has been determined that this project is located in Zone C, areas of minimal flooding. (No shading)

5. On August 9, 1996, the subject project was issued a Notice of Exemption (Article III, Section 3, City CEQA Guidelines), log reference CE 96-0751, for a Categorical Exemption, Class 3, Category 4, City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. I hereby certify that action.

6. Fish and Game: The subject project, which is located in Los Angeles County, will not have an impact on fish or wildlife resources or habitat upon which fish and wildlife depend, as defined by California Fish and Game Code Section 711.2.

EMILY GABEL-LUDDY
Associate Zoning Administrator

EGL:lmc

cc: Councilman Marvin Braude
Eleventh District
Adjoining Property Owners
County Assessor

MICHAEL LOGRANDE
CHIEF ZONING ADMINISTRATOR

ASSOCIATE ZONING ADMINISTRATORS
PATRICIA BROWN
R. NICOLAS BROWN
SUE CHANG
ANIK CHARRON
LARRY FRIEDMAN
LOURDES GREEN
ERIC RITTER
LINN K. WYATT
MICHAEL S.Y. YOUNG
MAYA E. ZAITZEVSKY

CITY OF LOS ANGELES
CALIFORNIA

ANTONIO R. VILLARAIGOSA
MAYOR

DEPARTMENT OF
CITY PLANNING

S. GAIL GOLDBERG, AICP
DIRECTOR

OFFICE OF
ZONING ADMINISTRATION
200 N. SPRING STREET, 7TH FLOOR
LOS ANGELES, CA 90012
(213) 978-1318
FAX: (213) 978-1334
www.lacity.org/PLN

March 6, 2009

Cia Parker (A)(R)
Omnipoint Communications
T-Mobile
4100 Guardian Street, #101
Simi Valley, CA 93063

Northern Trust Bank of California (O)
620 Newport Center
Newport Beach, CA 92660

CASE NO. ZA 96-0686(CUZ)(PA2)
APPROVAL OF PLANS
2990 South Sepulveda Boulevard
West Los Angeles Planning Area
Zone : C2-1VL
D. M. : 120B157
C. D. : 5
CEQA : ENV 2008-5010-CE
Legal Description : Fr. Lot 24, Tract 14252

Pursuant to Los Angeles Municipal Code Section 12.24-M, I hereby APPROVE:

a request for the construction, use and intensification of a previously approved cellular telecommunications site,

upon the following additional terms and conditions:

1. All other use, height and area regulations of the Municipal Code and all other applicable government/regulatory agencies shall be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

2. The use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibit "A", except as may be revised as a result of this action.

   A new Exhibit "A" shall be prepared to the satisfaction of the Zoning Administrator. That exhibit shall show the penthouse and the placement of the subject antennae on it. The exhibit shall also show the location of associated equipment cabinets. Submission of the new Exhibit "A" shall not be grounds for further intensification of the site. In reviewing the new Exhibit "A" the Zoning Administrator reserves the right to impose additional conditions, by Letter of Modification, as may be deemed necessary.

3. The authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to impose additional corrective Conditions, if, in the Administrator's opinion, such Conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

4. All graffiti on the site shall be removed or painted over to match the color of the surface to which it is applied within 24 hours of its occurrence.

5. A copy of the first page of this grant and all Conditions and/or any subsequent appeal of this grant and its resultant Conditions and/or letters of clarification shall be printed on the building plans submitted to the Zoning Administrator and the Department of Building and Safety for purposes of having a building permit issued.

6. The applicant shall defend, indemnify and hold harmless the City, its agents, officers, or employees from any claim, action, or proceeding against the City or its agents, officers, or employees to attack, set aside, void or annul this approval which action is brought within the applicable limitation period. The City shall promptly notify the applicant of any claim, action, or proceeding and the City shall cooperate fully in the defense. If the City fails to promptly notify the applicant of any claim action or proceeding, or if the City fails to cooperate fully in the defense, the applicant shall not thereafter be responsible to defend, indemnify, or hold harmless the City.

7. Approved herein is the modification of an existing wireless facility on the roof an existing commercial office building consisting of the removal and relocation of two panel antennas from the parapet with one new antenna on a tripod mount and two panel antennas to be located on the penthouse,

8. The subject penthouse shall not be increased in height. Antennae affixed to the penthouse shall not protrude above its roofline.

9. All rooftop antennae shall be no greater in height above the roof than 10 feet as measured from the flat of the roof.

10. All ancillary equipment shall be located either inside the subject building or on the rooftop. If located on the rooftop said equipment shall be fully screened from public view to the satisfaction of the Zoning Administrator. Said screening if required by the Zoning Administrator shall be painted and textured to match the subject building.

11. This wireless telecommunications facility shall operate in full compliance with all state and federal regulations including the Telecommunications Act of 1996.

12. All conditions as previously imposed on the subject site as relate to its use for cellular telecommunications shall remain in full force and effect except as expressly modified herein. ZA Note: At the time the applicant seeks sign-off of plans from the Zoning Administrator for purposes of obtaining a building permit, they shall bring with them copies of <u>all</u> previous cases dealing with the subject matter of cellular telecommunications and stand ready to demonstrate compliance with same.

<u>OBSERVANCE OF CONDITIONS - TIME LIMIT - LAPSE OF PRIVILEGES - TIME EXTENSION</u>

All terms and Conditions of the approval shall be fulfilled <u>before</u> the use may be established. The instant authorization is further conditional upon the privileges being utilized within two years after the effective date of approval and, if such privileges are not utilized or substantial physical construction work is not begun within said time and carried on diligently to completion, the authorization shall terminate and become void. A Zoning

Administrator may extend the termination date for one additional period not to exceed one year, prior to the termination date of the period, if a written request on appropriate forms, accompanied by the applicable fee is filed therefore with a public Office of the Department of City Planning setting forth the reasons for said request and a Zoning Administrator determines that good and reasonable cause exists therefore.

TRANSFERABILITY

This authorization runs with the land. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent upon you to advise them regarding the conditions of this grant.

VIOLATIONS OF THESE CONDITIONS, A MISDEMEANOR

Section 12.29 of the Los Angeles Municipal Code provides:

> "A variance, conditional use, adjustment, public benefit or other quasi-judicial approval, or any conditional approval granted by the Director, pursuant to the authority of this chapter shall become effective upon utilization of any portion of the privilege, and the owner and applicant shall immediately comply with its Conditions. The violation of any valid Condition imposed by the Director, Zoning Administrator, Area Planning Commission, City Planning Commission or City Council in connection with the granting of any action taken pursuant to the authority of this chapter, shall constitute a violation of this chapter and shall be subject to the same penalties as any other violation of this Code."

Every violation of this determination is punishable as a misdemeanor and shall be punishable by a fine of not more than $1,000 or by imprisonment in the county jail for a period of not more than six months, or by both such fine and imprisonment.

APPEAL PERIOD - EFFECTIVE DATE

The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any Condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these Conditions the same as for any violation of the requirements contained in the Municipal Code. The Zoning Administrator's determination in this matter will become effective after MARCH 23, 2009, unless an appeal therefrom is filed with the City Planning Department. It is strongly advised that appeals be filed early during the appeal period and in person so that imperfections/incompleteness may be corrected before the appeal period expires. Any appeal must be filed on the prescribed forms, accompanied by the required fee, a copy of the Zoning Administrator's action, and received and receipted at a public office of the Department of City Planning on or before the above date or the appeal will not be accepted. **Forms are available on-line at www.lacity.org/pln**. Public offices are located at:

Figueroa Plaza
201 North Figueroa Street,
4th Floor
Los Angeles, CA 90012
(213) 482-7077

Marvin Braude San Fernando
Valley Constituent Service Center
6262 Van Nuys Boulevard, Room 251
Van Nuys, CA 91401
(818) 374-5050

If you seek judicial review of any decision of the City pursuant to California Code of Civil Procedure Section 1094.5, the petition for writ of mandate pursuant to that section must be filed no later than the 90th day following the date on which the City's decision became final pursuant to California Code of Civil Procedure Section 1094.6. There may be other time limits which also affect your ability to seek judicial review.

NOTICE

The applicant is further advised that all subsequent contact with this office regarding this determination must be with the Zoning Administrator who acted on the case. This would include clarification, verification of condition compliance and plans or building permit applications, etc., and shall be accomplished **BY APPOINTMENT ONLY**, in order to assure that you receive service with a minimum amount of waiting. You should advise any consultant representing you of this requirement as well.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, and the plans submitted therewith, all of which are by reference made a part hereof, as well as knowledge of the property and surrounding district, I find that the requirements for authorizing a conditional use plan approval under the provisions of Section 12.24-M have been established by the following facts:

BACKGROUND

On October 10, 1996, Associate Zoning Administrator Emily Gabel-Luddy acted under Case No. ZA 96-0686(CUZ) and pursuant to then Los Angeles Municipal Code Section 12.24-C,18 to approve a request for a conditional use permit to allow the installation, use, and maintenance of an unmanned telecommunications facility not to exceed a height of 50 feet 9 inches in the C2-1VL Zone. Her determination was made subject to additional terms and 12 conditions.

On June 28, 2002, Associate Zoning Administrator Albert Landini acted under Case No. ZA 96-0686(CUZ)(PA1) and pursuant to Los Angeles Municipal Code Section 12.24-M to approve a request for the addition of two electronic cabinets to a previously approved cellular telecommunications site subject to additional terms and 7 conditions.

APPLICANT'S OVERALL STATEMENTS

Applicant's 1st Statement

This application is being filed at this time to modify an existing wireless faculty to enhance the coverage to T-Mobile customers in the immediate vicinity and those who are in the surrounding area.

The site is an office building. The wireless telecom facility is located on the rooftop. The proposed modification is removal and relocation of two antenna and the addition of additional antennae.

Lastly, the location of the wireless facility is located on top of a rooftop and will serve customers in the adjacent areas on National and Sepulveda. The location is desirable to

the public convenience and welfare. Due to the rooftop location of the modification of the project is (in) proper relation to the adjacent wireless and commercial uses of the community and is not detrimental to the character of development in the immediate neighborhood and will be in harmony with the various elements and objectives of the general plan.

Applicant's 2nd Statement

Project Overview. T-Mobile is proposing to modify an existing wireless telecommunications facility that was originally permitted under case ZA 91-0204 and modified under case #ZA 96-0686(CUZ). The modification consists of the removal of two panel antennas and the relocation of them flesh mounted to the back of roof access penthouse side with one of the antennas being reconfigured. Additionally, one new panel antenna will be on new tripod pole.

Project Benefits. The proposed project will provide the following community benefits.

- Alternative emergency response communications for police, fire, paramedic and other emergency region
- Better voice reception quality through use of enhanced use of digital technologies.
- Higher security and privacy for telephone users.
- More affordable service due to increased competition to the market area.

It is important to point out that the actual placement of this facility increases the health and welfare of the surrounding community, as well as commuters. A perfect example of this is that a more reliable emergency network to handle the growing number of wireless Enhanced 9-1-1 calls is being developed. Enhanced 9-1-1 or E9111 as it is being referred to, is being deployed in communities across the county.

The number of 911 calls placed from wireless phones is increasing rapidly. For example, CTIA reports that more than 224,000 emergency 9011 calls are made from wireless phones each day in the United States. T-Mobile alone handled an approximate average of 50,000 calls each day during the summer of 2006. Most calls in the US are now made on wireless phones.

E911 is an emergency service designed to provide additional protections for wireless phone users. E 9-1-1 does three major things:

1. Ensures that a wireless 9-1-1 call is routed to the nearest emergency dispatch call center;
2. Provides emergency dispatchers with the call-back number of the distressed caller; and
3. Provides the approximate location of the distressed caller.

The technology used to determine a distressed caller's location varies from carrier to carrier. Regardless of the technical differences, a caller's location is determined by measuring the time it takes the wireless signal to reach nearby wireless facilities. Measuring that time difference -whether from GPS satellites or from wireless facilities - allows emergency operators to more accurately determine the location of the distressed caller.

T-Mobile must pace enough facilities throughout communities to ensure a distressed caller's wireless phone has adequate signal available to make an emergency call, stay connected with the 9-1-1 operator, and be found by emergency services personnel.

All in all, the added safety and security brought to your community cannot be overlooked when taking into consideration the greater benefits that this technology brings to the table.

You may remember recent events whereby a little girl was kidnapped and placed underground in a pit. Not only was this little girl found by using this technology, but very likely her life was saved.

These types of occurrences where people are rescued or saved are sure to happen more and more. The best way to insure this safety net can be used in your community is to help support its placement.

We request that your support our project and help to bring greater security to your community.

Applicant's Suggested Findings

1. The requested modification to the wireless telecommunication facility complies with section 12.24 of the Los Angeles Municipal Code. The rooftop of the wireless facility ahs several carriers located on it. The requested modification to the T-Mobile facility will improve capacity and coverage to the heavy traffic area along Sepulveda and National and the surrounding areas.

   The proposed location will be desirable to the public convenience or welfare is proper in relation to the adjacent uses or the development of the community.

   The subject property is located at 2990 Sepulveda and the property is zoned C2-1. The building currently is a there story commercial facility that consists of medical and dental offices and other commercial offices.

   There are existing wireless facilities on the rooftop of the subject property and we are asking to add to the existing T-Mobile facility, or co-locate on the rooftop.

2. The use will not be materially detrimental to the character of the development of the immediate neighborhood. The adjacent uses are commercial and retail parking lots. The wireless telecom facility will not increase traffic and the equipment will be access via the entrance through the building and through a rooftop access door on a periodic basis.

   Additionally, the modification to an existing facility and an effort to co-locate with existing similar facilities which will reduce the number of wireless facilities in the surrounding areas.

3. The proposed location is in harmony with the various elements and objectives of the general plan.

   The West Los Angeles designates the property as community commercial and the subject property is in harmony with the general plan vision. The wireless facility is on

top of a three story building and is out of the way and minimally visible from the surrounding properties.

ZONING ADMINISTRATOR'S OVERALL DISCUSSION

Now in the instant situation the Zoning Administrator has reviewed the prior actions and the case file, the applicant's submittal and the plans for the proposed expansion and in so doing finds that the prior Zoning Administrator's findings of fact remain valid in light of the requested expansion and intensification of use. Thus, the modification of an existing wireless facility on the roof an existing commercial office building consisting of the removal and relocation of two panel antennas from the parapet with one new antenna on a tripod mount and two panel antennal to be located on the penthouse, has been conditionally approved with no time limit set on the duration of the grant.

AUTHORITY FOR PLAN APPROVAL

Section 12.24-M of the Los Angeles Municipal Code provides in part:

"M. Development, Change or Discontinuance of Uses:

1. Development of Site. On any lot or portion thereof on which a conditional use is permitted pursuant to the provisions of this section, new buildings or structures may be erected, enlargements may be made to existing buildings, existing uses may be extended on an approved site, and existing institutions or school developments may be expanded as permitted in Subsection L of this Section, provided plans therefore are submitted to and approved by the Commission or by a Zoning Administrator, whichever has jurisdiction at that time ...".

BASIS FOR CONDITIONAL USE PERMITS

A particular type of development is subject to the conditional use plan approval process because it has been determined that such use of property should not be permitted by right in a particular zone. All uses requiring a conditional use permit from the Zoning Administrator are located within Section 12.24-W of the Los Angeles Municipal Code. In order for a wireless telecommunications facility to be authorized, certain designated findings have to be made. In these cases, there are additional findings in lieu of the four standard findings for most other conditional use categories.

FINDINGS

Following (highlighted) is a delineation of the findings and the application of the relevant facts to same:

1. **The proposed location will be desirable to the public convenience or welfare.**

Wireless communications are expanding. To provide a viable service to the public a network of antennae need to be installed. The installation of such antennae and the upgrading of ancillary equipment further the clear and reliable use of these wireless services. The antennae are usually located atop poles or the roofs or sides of tall buildings. The equipment cabinets associated with such installations are usually located in close proximity to said antennae and are, like in the instant situation, out of view of the public. Height is a critical element in the location of such antennae

and rooftop installation of equipment cabinets is not unusual. Installation of the approved antennae at this location and the associated equipment cabinets under consideration here will hence be desirable to the public convenience or welfare.

2. **The location is proper in relation to adjacent uses or the development of the community**.

The building to which the antennae are attached is taller than its neighbors. As such, it provides good clear lines of sight for the transmission of the involved radio signals. These clear lines of sight appear to be critical for the use of the subject equipment. The project has previously been well conditioned. The proposed antennae will not in any way disturb the prior installation's visual impacts on the surrounding area. Thus, the Zoning Administrator can determine that the location is proper in relation to adjacent uses or the development of the community.

3. **The use will not be materially detrimental to the character of the development in the immediate neighborhood.**

In viewing the proposed plans the Zoning Administrator has considered:

- That the requirement for public hearing had been waived by the Chief Zoning Administrator.
- No staff report was prepared and the Zoning Administrator has relied on the application and other materials found in the file.
- Copies of prior cases were in the file.
- Plans submitted with the application were reviewed and found to be unclear in that they 1) did not show the penthouse in elevation view, 2) did not illustrate the proposed location of the antennae on the penthouse, and 3) did not show the location and number and type and size of the associated equipment cabinets.
- A new Exhibit "A" has been required, the Zoning Adrninistrator has retained the right to impose additional conditions on the project after a review of the new Exhibit "A".

Nonetheless, the Zoning Administrator has determined that the subject building is large, the subject antennae and other equipment in comparison are small. The key element here is to insure a design of the antennae and ancillary equipment installation that will not detract from the architectural quality of the building.

With this review and determination the Zoning Administrator can find that the use will not be materially detrimental to the character of the development in the immediate neighborhood.

4. **The proposed location will be in harmony with the various elements and objectives of the General Plan**.

This project is in harmony with the goals and intent of the General Plan Elements adopted for this geographical area in that it will allow for optimum use of this commercial site without detriment to adjacent or nearby properties.

ADDITIONAL MANDATORY FINDINGS

5. The National Flood Insurance Program rate maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance No. 172,081, have been reviewed and it has been determined that this project is located in Zone C, areas of minimal flooding.

6. On December 24, 2008, the subject project was issued a Notice of Exemption (Article III, Section 3, City CEQA Guidelines), log reference ENV 2008-5010-CE, for a Categorical Exemption, Class 3, Category 4. City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. I hereby adopt that action.

ALBERT LANDINI
Associate Zoning Administrator
Direct Telephone No. (213) 369-0552

AL:lmc

cc: Councilmember Jack Weiss
Fifth District
Adjoining Property Owners
County Assessor

ZA 1996 686

T-Mobile®

SITE NUMBER: LA02026 **CITY:** LOS ANGELES
SITE NAME: MULLIKIN MEDICAL CENTER **COUNTY:** LOS ANGELES
SITE TYPE: ROOFTOP **JURISDICTION:** CITY OF LOS ANGELES

PROJECT SUMMARY:

SITE ADDRESS:
2990 1/2 S. SEPULVEDA BLVD.
LOS ANGELES, CA 90064

PROPERTY OWNER:
NORTHERN TR BK/CA (TE)
620 NEWPORT CENTER DRIVE #200
NEWPORT BEACH, CA 92660

APPLICANT:
T-MOBILE USA
4100 GUARDIAN STREET
SUITE 101
SIMI VALLEY, CA 93063
ZONING MANAGER: CIA PARKER
CONSTRUCTION MANAGER: PAT HASKINS
CONSTRUCTION INSPECTOR: XXX
PRECON MANAGER: XXX
A&E PROJECT MANAGER: XXX
DEVELOPMENT MANAGER: XXX

PROJECT DESCRIPTION:
THIS PROJECT CONSISTS OF THE REMOVAL OF (2) EXISTING PANEL ANTENNAS MOUNTED ON AN EXISTING PARAPET WALL, (2) NEW PANEL ANTENNAS MOUNTED ON AN EXISTING PENTHOUSE, (1) NEW PANEL ANTENNA MOUNTED ON A NEW TRIPOD POLE, AND THE RECONFIGURATION OF (1) EXISTING PANEL ANTENNA, TO BE LOCATED ON AN EXISTING PENTHOUSE.

BUILDING SUMMARY:

OCCUPANCY CLASSIFICATION:	B-2
TYPE OF CONSTRUCTION:	V
ZONING:	C2-1 1A
AREA OF CONSTRUCTION:	0 SQ. FT.
ASSESSORS PARCEL NUMBER:	4261-003-033

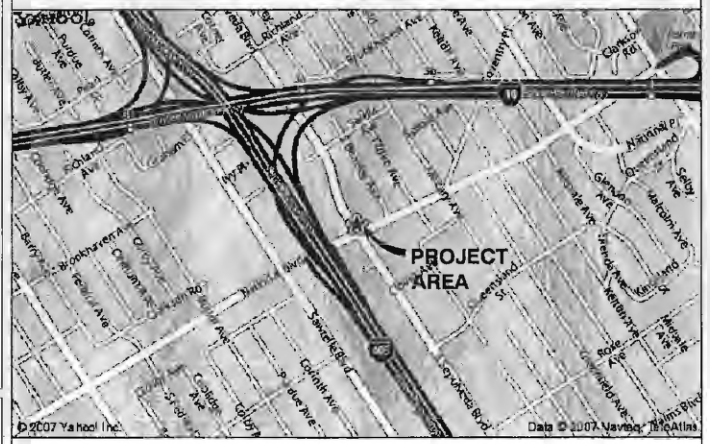
SHEET INDEX:

SHEET NUMBER:		DESCRIPTION:
T-1	(Z)	TITLE SHEET
T-2	(Z)	CONDITIONS OF APPROVAL
A-1	(Z)	SITE PLAN
A-2	(Z)	ENLARGED SITE PLAN
A-3	(Z)	ARCHITECTURAL ELEVATIONS

LEGAL DESCRIPTION:
SEE SHEET A-2

(Z) DENOTES SHEETS REQUIRED FOR ZONING SUBMITTAL

VICINITY MAP:



DIRECTIONS FROM T-MOBILE SIMI VALLEY OFFICE:
START AT 4100 GUARDIAN ST. SIMI VALLEY GOING TOWARD GUARDIAN ST. CONTINUE ON TAPO CANYON RD. TURN RIGHT TO TAKE RAMP ONTO CA-118 E. TAKE THE SACRAMENTO/SANTA MONICA EXIT ONTO I-405 S TOWARD SANTA MONICA. TAKE THE OLYMPIC BLVD/PICO BLVD EXIT. TURN LEFT ON SANTELLE BLVD. TURN LEFT ON NATIONAL BLVD. TURN LEFT ON S SEPULVEDA BLVD. ARRIVE AT 2990 S SEPULVEDA BLVD, LOS ANGELES

THOMAS GUIDE PAGE: 632 REGION: LOS ANGELES GRID #: G-7

CONSULTING TEAM:

SAC/ZONING/PERMITTING:
T-MOBILE USA
4100 GUARDIAN STREET
SUITE 101
SIMI VALLEY, CA 93063

SITE ACQUISITION:
ROBERT DORIA
805-584-8754

CONSTRUCTION MANAGER:
PAT HASKINS
805-584-0297

ZONING MANAGER:
CIA PARKER
310-920-8374

SURVEY:
ACO ARCHITECTS INC.
26170 ENTERPRISE #600
LAKE FOREST, CA 92630
PHONE: (949) 716-9940
FAX: (949) 297-4788
CONTACT: NICK SANCHEZ

ARCHITECTURAL & ENGINEERING:
ACO ARCHITECTS INC.
26170 ENTERPRISE #600
LAKE FOREST, CA 92630
PHONE: (949) 716-9940
FAX: (949) 297-4788
CONTACT: TIM WOLFE

ELECTRICAL ENGINEER:
B&F ENGINEERING
1321 NEWPORT BLVD., SUITE C
COSTA MESA, CA 92627
PHONE: (949) 515-4670
FAX: (949) 515-4675

STRUCTURAL ENGINEER:
NEXT STEP DESIGN, INC.
26170 ENTERPRISE WAY, STE. 400
LAKE FOREST, CA 92630
PHONE: (949) 215-3339
FAX: (949) 457-9375
CONTACT: SCOTT BETANCOURT

APPROVALS:

THE FOLLOWING PARTIES HEREBY APPROVE AND ACCEPT THESE DOCUMENTS AND AUTHORIZE THE CONTRACTOR TO PROCEED WITH THE CONSTRUCTION DESCRIBED HEREIN. ALL CONSTRUCTION DOCUMENTS ARE SUBJECT TO REVIEW BY THE LOCAL BUILDING DEPARTMENT AND ANY CHANGES AND MODIFICATIONS THEY MAY IMPOSE.

	PRINT NAME	SIGNATURE	DATE
LANDLORD			
PRECON. MGR			
DEVELOP. MGR			
CONST. INSP.			
A&E MGR			
RF ENGINEER			
OPERATIONS			
SAC/ZONING REP			
UTILITIES			

POWER & TELCO UTILITY CONTACTS

POWER:
LADWP
TEL: (818) 342-5397
CONTACT: CUSTOMER SERVICE

TELCO:
TIME WARNER CABLE
TEL: (800) 892-2253
CONTACT: CUSTOMER SERVICE

APPLICABLE CODES

BUILDING CODE: UNIFORM BUILDING CODE 1997

ALL WORK IS TO COMPLY WITH THE 2001 CALIFORNIA BUILDING CODE (CBC), AMENDMENTS AND STANDARDS, INCLUDING THE FOLLOWING CODES IN ORDER OF PRECEDENCE; THE 1997 UNIFORM BLDG., CODE STANDARDS AND AMENDMENTS; UNIFORM MECHANICAL CODE STANDARDS AND AMENDMENTS; UNIFORM FIRE CODE STANDARDS AND AMENDMENTS; UNIFORM PLUMBING CODE STANDARDS AND AMENDMENTS; LOCAL BUILDING CODES; CITY/COUNTY ORDINANCES.

TIA/EIA-222-1996-F LIFE SAFETY CODE NFPA-101, 807 COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS
AISC - CONSTRUCTION MANUAL, 9TH EDITION OR LATER.
NEC (NATIONAL ELECTRIC CODE) 2002 (NFPA 70)

T-Mobile
4100 GUARDIAN STREET SUITE 101
SIMI VALLEY, CA 93063

PLANS PREPARED BY:
ACO ARCHITECTS - INC.
26170 ENTERPRISE #600
LAKE FOREST, CA 92630
PHONE: (949) 716-9940
FAX: (949) 297-4788

CONSULTING GROUP:

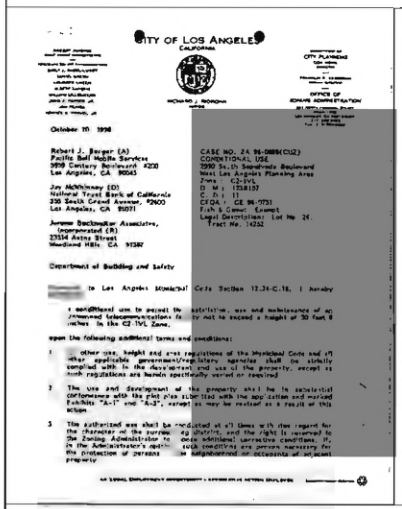
NO.	DATE:	DESCRIPTION:	BY:
1	08/28/07	PRELIMINARY	JY
2	09/20/07	CLIENT REVISION	MY
3	10/01/07	FINAL	MY
4	02/08/08	CLIENT REVISION	TW
5	05/30/08	CLIENT REVISION	TW
6	08/20/08	CLIENT REVISION	MY
7	11/20/08	CLIENT REVISION	TW

SITE INFORMATION:
MULLIKIN MEDICAL CTR.
LA02026
2990 1/2 S. SEPULVEDA BLVD.
LOS ANGELES CA 90064

SEAL:

SHEET TITLE:
TITLE SHEET

SHEET NUMBER:
T-1



CITY OF LOS ANGELES
CALIFORNIA

October 20, 1998

Robert J. Berger (A)
Pacific Bell Mobile Services
3939 Century Boulevard #200
Los Angeles, CA 90045

Jim McMillinney (O)
National Trust Bank of California
350 South Grand Avenue, 42600
Los Angeles, CA 90071

Jerome Dackmeister Associates, Incorporated (R)
23534 Aetna Street
Woodland Hills, CA 91367

CASE NO. ZA 96-0889(CUZ)
CONDITIONAL USE
2990 So. th Sepulveda Boulevard
West Los Angeles Planning Area
Zone : C2-1VL
D. M. : 1758157
C. D. : 11
CEQA : CE 96-9751
Fish & Game: Exempt
Legal Description: Lot No. 24, Tract No. 14252

Department of Building and Safety

to Los Angeles Municipal Code Section 12.24-C.16, I hereby

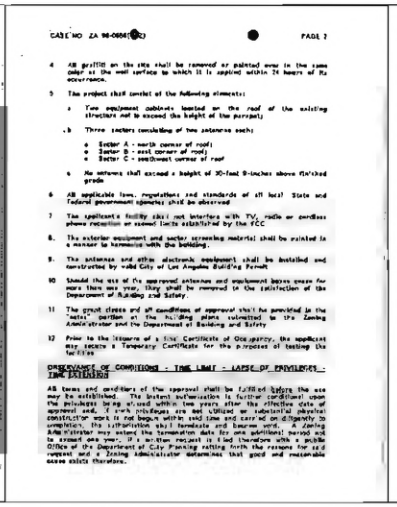
a conditional use to permit the installation, use and maintenance of an unmanned telecommunications facility not to exceed a height of 50 feet 8 inches in the C2-1VL Zone;

upon the following additional terms and conditions:

1. All other use, height and area regulations of the Municipal Code and all other applicable government/regulatory agencies shall be strictly complied with in the development and use of the property, except as herein specifically varied or required.

2. The use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibits "A-1" and "A-2", except as may be revised as a result of this action.

3. The authorized use shall be rechecked at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to revoke this grant if, in the Administrator's opinion, such conditions are not complied with or the use is conducted in such a manner as to be detrimental to the character of the development of adjacent property or the neighborhood or otherwise constitutes a public nuisance.



4. All graffiti on the site shall be removed or painted over in the same color as the wall surface to which it is applied within 24 hours of its occurrence.

5. The project shall consist of the following elements:

   a. Two equipment cabinets located on the roof of the existing structure not to exceed the height of the parapet;

   b. Three sectors consisting of two antennas each:

      - Sector A - north corner of roof;
      - Sector B - east corner of roof;
      - Sector C - southwest corner of roof.

   c. No antennas shall exceed a height of 90-feet 8-inches above finished grade.

6. All applicable laws, regulations and standards of all local State and Federal governmental agencies shall be observed.

7. The applicant's facility shall not interfere with TV, radio or cordless phone reception or transmission as established by the FCC.

8. The exterior equipment and sector screening material shall be painted in a manner to harmonize with the building.

9. The antennas and other electronic equipment shall be installed and constructed by valid City of Los Angeles Building Permit.

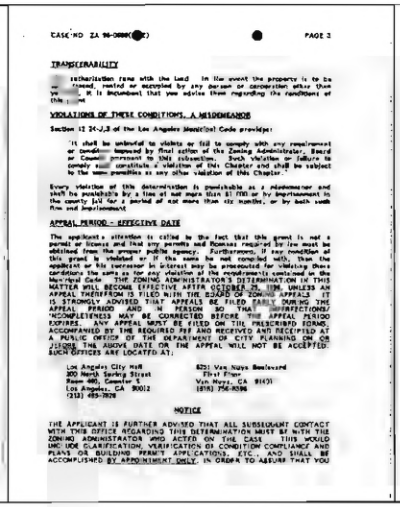
10. Should the use of the approved antennas and equipment become unused for more than one year, they shall be removed to the satisfaction of the Department of Building and Safety.

11. The grant clears and all conditions of approval shall be permitted in the "notes" portion of the building plans submitted to the Zoning Administrator and the Department of Building and Safety.

12. Prior to the issuance of a final Certificate of Occupancy, the applicant may receive a Temporary Certificate for the purposes of testing the facilities.

OBSERVANCE OF CONDITIONS - TIME LIMIT - LAPSE OF PRIVILEGES - TIME EXTENSION

All terms and conditions of the approval shall be fulfilled before the use may be established. The instant authorization is further conditioned upon the privileges being utilized within two years after the effective date of approval and, if such privileges are not utilized or substantial physical construction work is not begun within said time and carried on diligently to completion, this authorization shall terminate and become void. A Zoning Administrator may extend the termination date for one additional period not to exceed one year. If a written request is filed therefore with a public office of the Department of City Planning setting forth the reasons for said request and a Zoning Administrator determines that good and reasonable cause exists therefore.



TRANSFERABILITY

This authorization runs with the land. In the event the property is to be sold, leased or occupied by any person or corporation other than yourself, it is incumbent that you advise them regarding the conditions of this grant.

VIOLATIONS OF THESE CONDITIONS, A MISDEMEANOR

Section 12.24-J,2 of the Los Angeles Municipal Code provides:

"It shall be unlawful to violate or fail to comply with any requirement or condition imposed by final action of the Zoning Administrator, Board or Council pursuant to this subsection. Such violation or failure to comply shall constitute a violation of this Chapter and shall be subject to the same penalties as any other violation of this Chapter."

Every violation of this determination is punishable as a misdemeanor and shall be punishable by a fine of not more than $1,000 or by imprisonment in the county jail for a period of not more than six months, or by both such fine and imprisonment.

APPEAL PERIOD - EFFECTIVE DATE

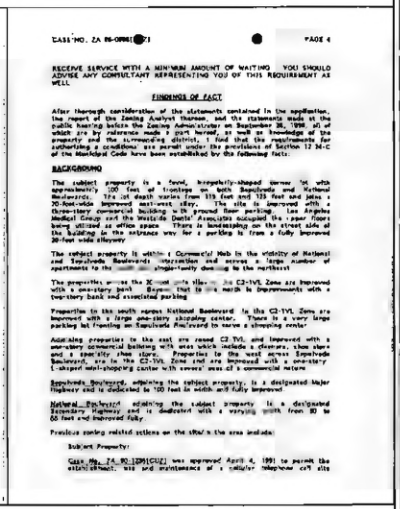
The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. THE ZONING ADMINISTRATOR'S DETERMINATION IN THIS MATTER WILL BECOME EFFECTIVE AFTER OCTOBER 29, 1998, UNLESS AN APPEAL THEREFROM IS FILED WITH THE BOARD OF ZONING APPEALS. IT IS STRONGLY ADVISED THAT APPEALS BE FILED EARLY DURING THE APPEAL PERIOD AND IN PERSON SO THAT INCORRECTIONS/INCOMPLETENESS MAY BE CORRECTED BEFORE THE APPEAL PERIOD EXPIRES. ANY APPEAL MUST BE FILED ON THE PRESCRIBED FORMS, ACCOMPANIED BY THE REQUIRED FEE AND RECEIVED AND RECEIPTED AT A PUBLIC OFFICE OF THE DEPARTMENT OF CITY PLANNING ON OR BEFORE THE ABOVE DATE OR THE APPEAL WILL NOT BE ACCEPTED. SUCH OFFICES ARE LOCATED AT:

Los Angeles City Hall
200 North Spring Street
Room 460, Counter 5
Los Angeles, CA 90012
(213) 485-3926

6251 Van Nuys Boulevard
First Floor
Van Nuys, CA 91401
(818) 756-8596

NOTICE

THE APPLICANT IS FURTHER ADVISED THAT ALL SUBSEQUENT CONTACT WITH THIS OFFICE REGARDING THIS DETERMINATION MUST BE WITH THE ZONING ADMINISTRATOR WHO ACTED ON THE CASE. THIS SHOULD INCLUDE CLARIFICATION, VERIFICATION OF CONDITION COMPLIANCE AND PLANS OR BUILDING PERMIT APPLICATIONS, ETC., AND SHALL BE ACCOMPLISHED BY APPOINTMENT ONLY, IN ORDER TO ASSURE THAT YOU



RECEIVE SERVICE WITH A MINIMUM AMOUNT OF WAITING. YOU SHOULD ADVISE ANY CONSULTANT REPRESENTING YOU OF THIS REQUIREMENT AS WELL.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, the report of the Zoning Analyst thereon, and the statements made at the public hearing before the Zoning Administrator on September 30, 1998 all of which are by reference made a part hereof, as well as knowledge of the property and the surrounding district, I find that the requirements for authorizing a conditional use permit under the provisions of Section 12.24-C of the Municipal Code have been established by the following facts:

BACKGROUND

The subject property is a level, trapezoidally-shaped corner lot with approximately 200 feet of frontage on both Sepulveda and National Boulevards. The lot depth varies from 115 feet and 125 feet and totals a 20,464-square foot gross lot area. The site is improved with a three-story commercial building with ground floor parking. Los Angeles Medical Group and the Westside Dental Associates occupied the upper floors being utilized as office space. There is landscaping on the street side of the building in the entrance way for a parking lot to form a fully improved 20-foot wide alleyway.

The subject property is within a Commercial Hub in the vicinity of National and Sepulveda Boulevards intersection and serves a large number of apartments to the south and single-family dwelling to the northeast.

The properties across the 30-foot wide alley to the C2-1VL Zone are improved with a one-story bank and associated parking.

Properties in the south across National Boulevard in the C2-1VL Zone are improved with a large one-story shopping center. There is a very large parking lot fronting on Sepulveda Boulevard to serve a shopping center.

Adjoining properties to the east are zoned C2-1VL and improved with a one-story commercial building with uses which include a cleaners, shoe store and a specialty shoe store. Properties to the west across Sepulveda Boulevard, are in the C2-1VL Zone and are improved with a one-story L-shaped mini-shopping center with several uses of a commercial nature.

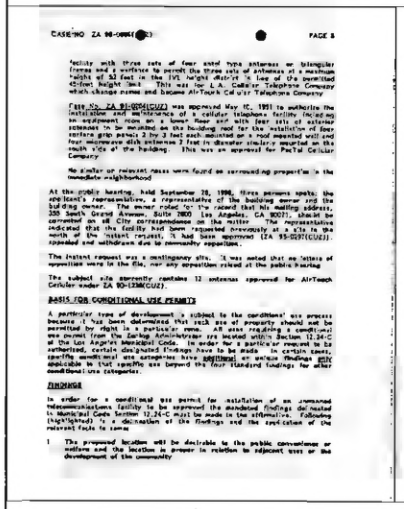
Sepulveda Boulevard, adjoining the subject property, is a designated Major Highway and is dedicated to 100 feet in width and fully improved.

National Boulevard adjoining the subject property is a designated Secondary Highway and is dedicated with a varying width from 80 to 86 feet and improved fully.

Previous zoning related actions on the site/in the area include:

Subject Property:

Case No. ZA 90-1291(CUZ) was approved April 4, 1991 to permit the establishment, use and maintenance of a cellular telephone cell site



facility with three sets of four panel type antennas or triangular frames and a partition to permit the three sets of antennas at a maximum height of 52 feet in the IVL height district (1 foot of the permitted 45-foot height limit). This was for L.A. Cellular Telephone Company which change names and became AirTouch Cellular Telephone Company.

Case No. ZA 91-0094(CUZ) was approved May 10, 1991 to authorize the installation and maintenance of a cellular telephone facility including an equipment room on a lower floor and with four sets of external antennas to be located on the building roof for the installation of four roofline grip poles; 2 by 2 feet each mounted on a roof mounted wall and four microwave dish antennas 2 feet in diameter similarly mounted on the south side of the building. This was an approval for PacTel Cellular Company.

No similar or relevant cases were found on surrounding properties in the immediate neighborhood.

At the public hearing, held September 30, 1998, three persons spoke; the applicant's representative, a representative of the building owner and the building owner. The owner noted for the record that his mailing address, 350 South Grand Avenue, Suite 2800 Los Angeles, CA 90071, should be converted on all City correspondence on the matter. The representative indicated that the facility had been requested previously at a site to the north of the instant request, it had been approved (ZA 95-0097(CUZ)) appealed and withdrawn due to community opposition.

The instant request was a contingency site. It was noted that no letters of opposition were in the file nor any opposition raised at the public hearing.

The subject site currently contains 12 antennas approved for AirTouch Cellular under ZA 90-1236(CUZ).

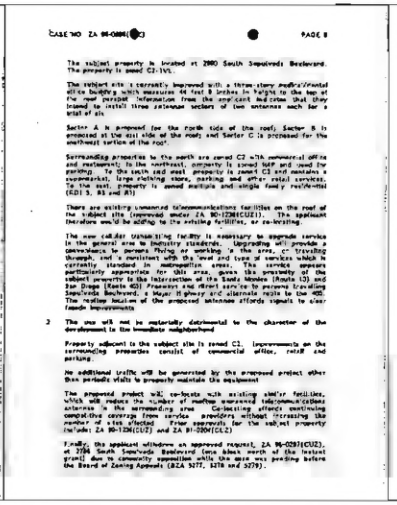
BASIS FOR CONDITIONAL USE PERMITS

A particular type of development is subject to the conditional use process because it has been determined that such use of property should not be permitted by right in a particular zone. All uses requiring a conditional use permit from the Zoning Administrator are listed within Section 12.24-C of the Los Angeles Municipal Code. In order for a particular request to be authorized, certain designated findings have to be made. In certain cases, specific conditional use categories have additional or unique findings only applicable to that specific use beyond the four standard findings for other conditional use categories.

FINDINGS

In order for a conditional use permit for installation of an unmanned telecommunications facility to be approved the detailed findings delineated in Municipal Code Section 12.24-C must be made in the affirmative. Following (highlighted) is a discussion of the findings and the application of the relevant facts to same:

1. The proposed location will be desirable to the public convenience or welfare and the location is proper in relation to adjacent uses or the development of the community.



The subject property is located at 2990 South Sepulveda Boulevard. The property is zoned C2-1VL.

The subject site is currently improved with a three-story medical/dental office building which measures 46 feet 8 inches in height to the top of the roof parapet. Information from the applicant indicates that they intend to install three antennae sectors of two antennas each for a total of six.

Sector A is proposed for the north side of the roof; Sector B is proposed at the east side of the roof; and Sector C is proposed for the southwest portion of the roof.

Surrounding properties to the north are zoned C2 with commercial offices and restaurants; to the northeast, property is zoned R4P and used for parking. To the south and west property is zoned C2 and contains a supermarket, large clothing store, parking and other retail services. To the east, property is zoned multiple and single family residential (R2U 3, R3 and R1).

There are existing unmanned telecommunications facilities on the roof of the subject site (approved under ZA 90-1236(CUZ)). The applicant therefore would be adding to the existing facilities, or co-locating.

The new cellular transmitting facility is necessary to upgrade service in the general area to industry standards. Upgrading will provide a convenience to persons living or working in the area, or traveling through, and is consistent with the level and type of services which is currently standard in metropolitan areas. The service appears particularly appropriate for this area, given the proximity of the subject property to the intersection of the Santa Monica (Route 10) and San Diego (Route 405) Freeways and direct service to persons traveling Sepulveda Boulevard, a Major Highway and alternate route to the 405. The roofline location of the proposed antennae affords signals to clear facade improvements.

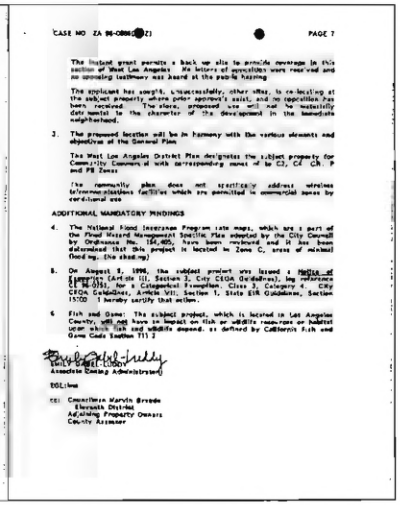
2. The use will not be materially detrimental to the character of the development in the immediate neighborhood.

Property adjacent to the subject site is zoned C2. Improvements on the surrounding properties consist of commercial office, retail and parking.

No additional traffic will be generated by the proposed project other than periodic visits to properly maintain the equipment.

The proposed project will co-locate with existing similar facilities, which will reduce the number of nearby unscreened telecommunications antennae in the surrounding area. Co-locating efforts continuing comparable coverage from service providers without increasing the number of sites affected. Prior approvals for the subject property include: ZA 90-1236(CUZ) and ZA 91-0009(CUZ).

Finally, the applicant withdrew an approved request, ZA 95-0097(CUZ), at 2784 South Sepulveda Boulevard (one block north of the instant grant) due to community opposition while the case was pending before the Board of Zoning Appeals (BZA 5277, 5278 and 5279).



The instant grant permits a back up site to provide coverage in this section of West Los Angeles. No letters of opposition were received and no opposing testimony was heard at the public hearing.

The applicant has sought, unsuccessfully, other sites, to co-locating at the subject property, where prior approval exist, and no opposition has been received. The above, proposed use will not be incompatible with the character of the development in the immediate neighborhood.

3. The proposed location will be in harmony with the various elements and objectives of the General Plan.

The West Los Angeles District Plan designates the subject property for Community Commercial with corresponding zones of C2, CR, CA, P and PB Zones.

The community plan does not specifically address wireless telecommunications facilities which are permitted in commercial zones by conditional use.

ADDITIONAL MANDATORY FINDINGS

4. The National Flood Insurance Program rate maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance No. 166,405, have been reviewed and it has been determined that this project is located in Zone C, areas of minimal flooding. (No shading)

5. On August 8, 1998, the subject project was issued a Notice of Exemption (Article III, Section 3, City CEQA Guidelines), log reference ENV 96-0751, for a Categorical Exemption, Class 3, Category 4. City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. I hereby certify that action.

6. Fish and Game: The subject project, which is located in Los Angeles County, will not have an impact on fish or wildlife resources or habitat upon which fish and wildlife depend, as defined by California Fish and Game Code Section 711.2.

Faisal Ghaly-Eddy
Associate Zoning Administrator

EGE:lmw

cc: Councilman Marvin Braude
Eleventh District
Adjoining Property Owners
County Assessor

CONDITIONS OF APPROVAL

T-Mobile
Get more from it
4100 GUARDIAN STREET SUITE 101
SIMI VALLEY, CA 93063

PLANS PREPARED BY:
ACO
ARCHITECTS - INC.
26170 ENTERPRISE #600
LAKE FOREST, CA. 92630
PHONE: (949) 716-9940
FAX: (949) 297-4788

CONSULTING GROUP:

NO.	DATE:	DESCRIPTION:	BY:
1	08/28/07	PRELIMINARY	JY
2	09/20/07	CLIENT REVISION	MY
3	10/01/07	FINAL	MY
4	02/08/08	CLIENT REVISION	TW
5	05/30/08	CLIENT REVISION	TW
6	08/20/08	CLIENT REVISION	MY
7	11/20/08	CLIENT REVISION	TW

SITE INFORMATION:
MULLIKIN MEDICAL CTR.
LA02026
2990 1/2 S. SEPULVEDA BLVD.
LOS ANGELES CA 90064

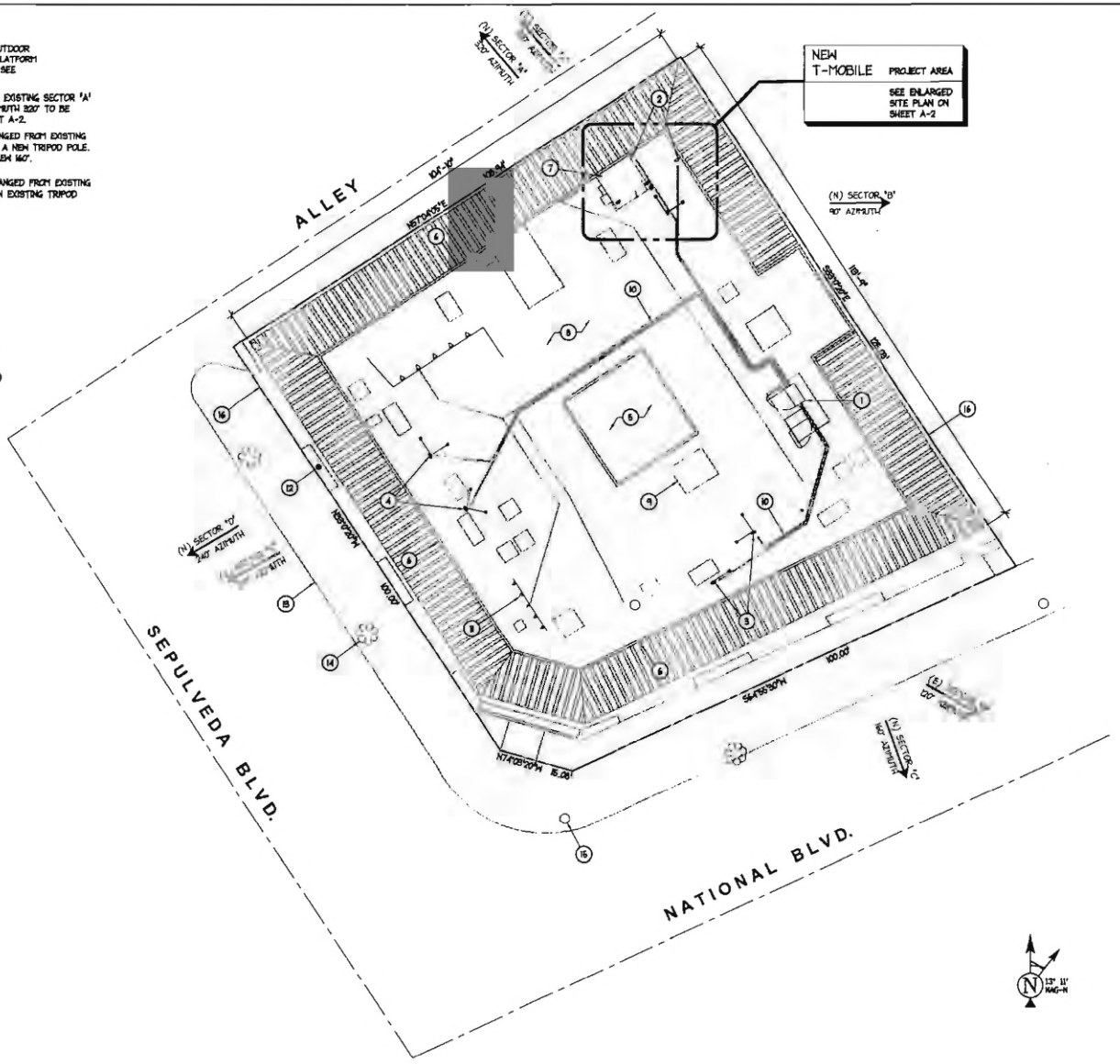
SEAL:

SHEET TITLE:
CONDITIONS OF APPROVAL

SHEET NUMBER:
T-2

NOTES:

1. EXISTING T-MOBILE (2) ERICSSON RBS 2106 OUTDOOR EQUIPMENT CABINETS MOUNTED ON A STEEL PLATFORM LOCATED ON ROOFTOP OF EXISTING BUILDING. SEE ENLARGED SITE PLAN ON SHEET A-2.
2. EXISTING T-MOBILE (2) PANEL ANTENNAS PER EXISTING SECTOR 'A' MOUNTED ON EXISTING PARAPET WALL AT AZIMUTH 320° TO BE REMOVED. SEE ENLARGED SITE PLAN ON SHEET A-2.
3. EXISTING T-MOBILE (2) PANEL ANTENNAS CHANGED FROM EXISTING SECTOR 'B' TO NEW SECTOR 'C' MOUNTED ON A NEW TRIPOD POLE. AZIMUTH TO CHANGE FROM EXISTING 120° TO NEW 160°.
4. EXISTING T-MOBILE (2) PANEL ANTENNAS CHANGED FROM EXISTING SECTOR 'C' TO NEW SECTOR 'D' MOUNTED ON EXISTING TRIPOD POLE. AZIMUTH TO REMAIN AT 240°.
5. EXISTING COURTYARD.
6. EXISTING BUILDING PARAPET.
7. EXISTING ROOF ACCESS PENTHOUSE.
8. EXISTING ROOFTOP SURFACE.
9. EXISTING A/C UNITS ON ROOF (TYP.)
10. EXISTING COAX CABLE TRAY ON ROOF (TYP.)
11. EXISTING ANTENNAS MOUNTED ON ROOF (TYP.)
12. EXISTING LANDSCAPE (TYP.).
13. EXISTING CURB.
14. EXISTING TREES (TYP.).
15. EXISTING UTILITY POLES (TYP.)
16. EXISTING PROPERTY LINE (TYP.).



SITE PLAN

SCALE: 1" = 10'-0"

1

T-MOBILE
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SIMI VALLEY, CA 93063

PLANS PREPARED BY:
ACO
ARCHITECTS - INC.
26170 ENTERPRISE #600
LAKE FOREST, CA 92630
PHONE: (949) 716-9340
FAX: (949) 297-4788

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4	02/08/08	CLIENT REVISION	TW
5	05/30/08	CLIENT REVISION	TW
6	05/20/08	CLIENT REVISION	MY
7	11/20/08	CLIENT REVISION	TW

SITE INFORMATION:

MULLIKIN MEDICAL CTR.

LA02026

2990 1/2 S. SEPULVEDA BLVD.
LOS ANGELES CA 90064

SEAL:

SHEET TITLE:

SITE PLAN

SHEET NUMBER:

A-1

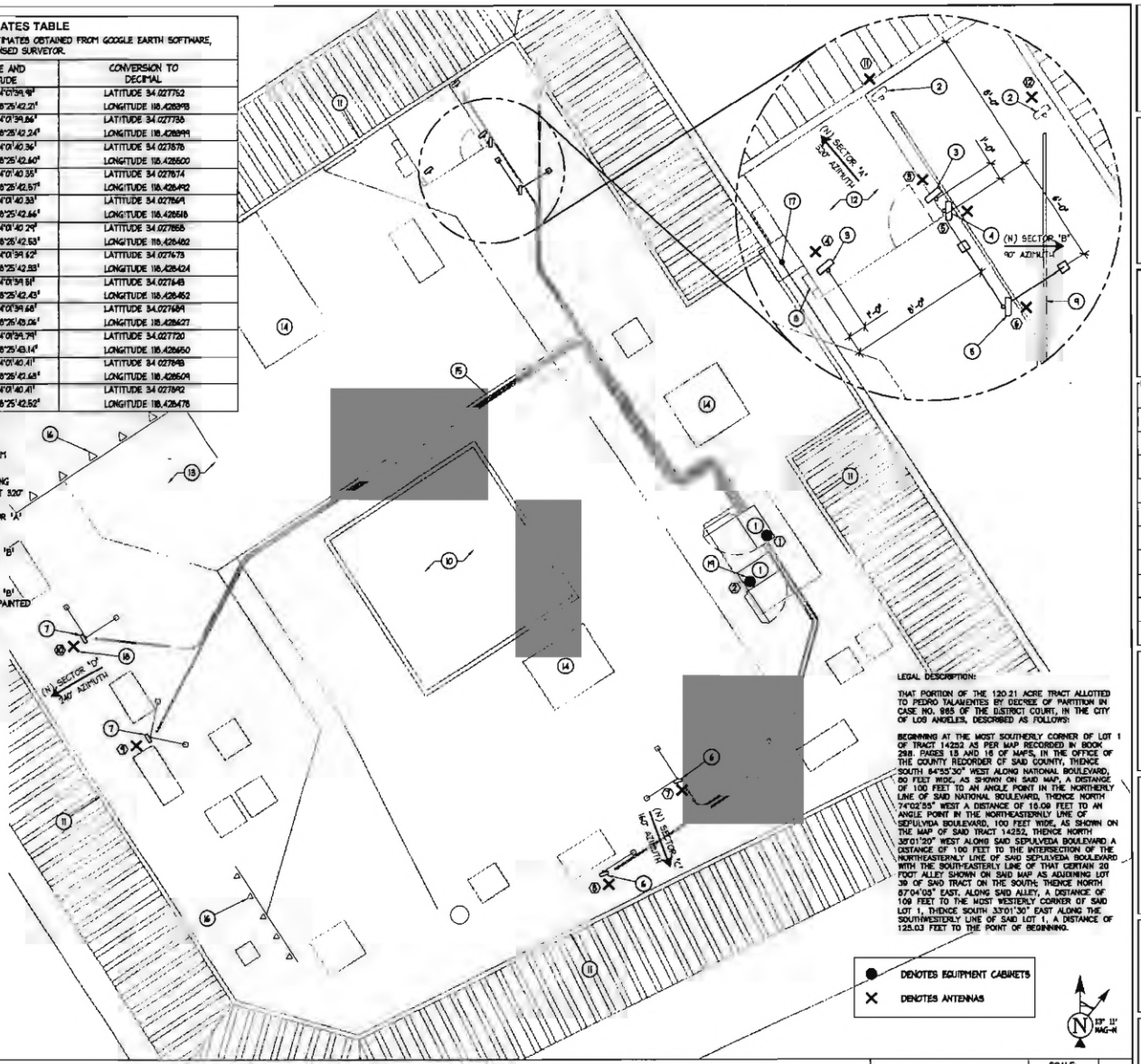
WTF COORDINATES TABLE

NOTE: ALL LATITUDE & LONGITUDE COORDINATES ARE ESTIMATES OBTAINED FROM GOOGLE EARTH SOFTWARE, VERSION 4.3.7204.0836 APR 24 2006, AND NOT BY A LICENSED SURVEYOR.

ITEM NUMBER	ITEM DESCRIPTION	LATITUDE AND LONGITUDE	CONVERSION TO DECIMAL
①	EXISTING EQUIPMENT CABINET	LATITUDE 34°01'39.49" LONGITUDE 118°25'42.21"	LATITUDE 34.027752 LONGITUDE 118.428393
②	EXISTING EQUIPMENT CABINET	LATITUDE 34°01'39.84" LONGITUDE 118°25'42.24"	LATITUDE 34.027735 LONGITUDE 118.428399
③	NEW ANTENNA 'A'	LATITUDE 34°01'40.36" LONGITUDE 118°25'42.60"	LATITUDE 34.027878 LONGITUDE 118.428500
④	NEW ANTENNA 'A'	LATITUDE 34°01'40.35" LONGITUDE 118°25'42.67"	LATITUDE 34.027874 LONGITUDE 118.428492
⑤	NEW ANTENNA 'B'	LATITUDE 34°01'40.33" LONGITUDE 118°25'42.66"	LATITUDE 34.027869 LONGITUDE 118.428518
⑥	NEW ANTENNA 'B'	LATITUDE 34°01'40.29" LONGITUDE 118°25'42.53"	LATITUDE 34.027855 LONGITUDE 118.428482
⑦	EXISTING ANTENNA 'C'	LATITUDE 34°01'39.62" LONGITUDE 118°25'42.53"	LATITUDE 34.027673 LONGITUDE 118.428424
⑧	EXISTING ANTENNA 'C'	LATITUDE 34°01'39.61" LONGITUDE 118°25'42.43"	LATITUDE 34.027669 LONGITUDE 118.428452
⑨	EXISTING ANTENNA 'D'	LATITUDE 34°01'39.68" LONGITUDE 118°25'43.06"	LATITUDE 34.027684 LONGITUDE 118.428627
⑫	EXISTING ANTENNA 'D'	LATITUDE 34°01'39.79" LONGITUDE 118°25'43.14"	LATITUDE 34.027720 LONGITUDE 118.428650
⑪	REMOVE EXISTING ANTENNA	LATITUDE 34°01'40.41" LONGITUDE 118°25'42.68"	LATITUDE 34.027848 LONGITUDE 118.428509
⑫	REMOVE EXISTING ANTENNA	LATITUDE 34°01'40.41" LONGITUDE 118°25'42.52"	LATITUDE 34.027892 LONGITUDE 118.428478

NOTES:

1. EXISTING T-MOBILE (2) ERICSSON RBS 2106 OUTDOOR EQUIPMENT CABINETS MOUNTED ON A STEEL PLATFORM LOCATED ON ROOFTOP OF EXISTING BUILDING.
2. EXISTING T-MOBILE (2) PANEL ANTENNAS PER EXISTING SECTOR 'A' MOUNTED ON EXISTING PARAPET WALL AT 320° AZIMUTH TO BE REMOVED.
3. NEW T-MOBILE (2) PANEL ANTENNAS PER NEW SECTOR 'A' MOUNTED ON EXISTING PENTHOUSE, AZIMUTH AT 320°. PAINTED TO MATCH EXISTING BUILDING.
4. NEW T-MOBILE (1) PANEL ANTENNA PER NEW SECTOR 'B' MOUNTED ON EXISTING PENTHOUSE, AZIMUTH AT 90°. PAINTED TO MATCH EXISTING BUILDING.
5. NEW T-MOBILE (1) PANEL ANTENNA PER NEW SECTOR 'B' MOUNTED ON A NEW TRIPOD POLE. AZIMUTH AT 90°. PAINTED TO MATCH EXISTING BUILDING.
6. EXISTING T-MOBILE (2) PANEL ANTENNAS CHANGED FROM EXISTING SECTOR 'B' TO NEW SECTOR 'C' MOUNTED ON EXISTING TRIPOD POLE. AZIMUTH TO CHANGE FROM EXISTING 120° TO NEW 180°.
7. EXISTING T-MOBILE (2) PANEL ANTENNAS CHANGED FROM EXISTING SECTOR 'C' TO NEW SECTOR 'D' MOUNTED ON EXISTING TRIPOD POLE. AZIMUTH TO REMAIN AT 240°.
8. EXISTING WALL MOUNTED ELECTRICAL PULL BOX.
9. EXISTING COAX CABLE TRAY MOUNTED ON EXISTING BUILDING ROOFTOP TO BE RECONFIGURED FOR INSTALLATION OF NEW T-MOBILE PANEL ANTENNAS.
10. EXISTING COURTYARD.
11. EXISTING BUILDING PARAPET.
12. EXISTING ROOF ACCESS PENTHOUSE.
13. EXISTING ROOFTOP SURFACE.
14. EXISTING A/C UNITS ON ROOF (TYP.)
15. EXISTING COAX CABLE TRAY ON ROOF (TYP.)
16. EXISTING ANTENNAS MOUNTED ON ROOF (TYP.)
17. EXISTING WALL MOUNTED PPC CABINET.
18. SEE WTF COORDINATE TABLE FOR NEW AND EXISTING ANTENNA COORDINATES. 'X' REPRESENTS ANTENNAS.
19. SEE WTF COORDINATE TABLE FOR NEW AND EXISTING EQUIPMENT CABINET COORDINATES. '●' REPRESENTS EQUIPMENT CABINETS.



LEGAL DESCRIPTION:

THAT PORTION OF THE 120.21 ACRE TRACT ALLOTTED TO PEDRO TALAMENTES BY DECREE OF PARTITION IN CASE NO. 965 OF THE DISTRICT COURT, IN THE CITY OF LOS ANGELES, DESCRIBED AS FOLLOWS:

BEGINNING AT THE MOST SOUTHERLY CORNER OF LOT 1 OF TRACT 14252 AS PER MAP RECORDED IN BOOK 298, PAGES 13 AND 16 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, THENCE SOUTH 64°55'30" WEST ALONG NATIONAL BOULEVARD, 80 FEET WIDE, AS SHOWN ON SAID MAP, A DISTANCE OF 100 FEET TO AN ANGLE POINT IN THE NORTHERLY LINE OF SAID NATIONAL BOULEVARD, THENCE NORTH 74°02'55" WEST A DISTANCE OF 15.06 FEET TO AN ANGLE POINT IN THE NORTHEASTERNLY LINE OF SEPULVEDA BOULEVARD, 100 FEET WIDE, AS SHOWN ON THE MAP OF SAID TRACT 14252, THENCE NORTH 35°01'20" WEST ALONG SAID SEPULVEDA BOULEVARD A DISTANCE OF 100 FEET TO THE INTERSECTION OF THE NORTHEASTERNLY LINE OF SAID SEPULVEDA BOULEVARD WITH THE SOUTHEASTERLY LINE OF THAT CERTAIN 20 FOOT ALLEY SHOWN ON SAID MAP AS ADJOINING LOT 39 OF SAID TRACT ON THE SOUTH; THENCE NORTH 87°04'05" EAST, ALONG SAID ALLEY, A DISTANCE OF 109 FEET TO THE MOST WESTERLY CORNER OF SAID LOT 1, THENCE SOUTH 33°01'30" EAST ALONG THE SOUTHWESTERLY LINE OF SAID LOT 1, A DISTANCE OF 125.03 FEET TO THE POINT OF BEGINNING.

● DENOTES EQUIPMENT CABINETS
× DENOTES ANTENNAS

N 13° 11' MAG-N

ENLARGED SITE PLAN

SCALE: 3/16"=1'-0" 1

T-Mobile
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4100 GUARDIAN STREET SUITE 101
SIMI VALLEY, CA 93063

PLANS PREPARED BY:
ACO ARCHITECTS - INC.
26170 ENTERPRISE #600
LAKE FOREST, CA. 92630
PHONE: (949) 716-9940
FAX: (949) 297-4788

CONSULTING GROUP:

NO.	DATE:	DESCRIPTION:	BY:
1	08/28/07	PRELIMINARY	JY
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3	10/01/07	FINAL	MY
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5	05/30/08	CLIENT REVISION	TW
6	08/20/08	CLIENT REVISION	MY
7	11/20/08	CLIENT REVISION	TW

SITE INFORMATION:

MULLIKIN MEDICAL CTR.

LA02026

2999 1/2 S. SEPULVEDA BLVD.
LOS ANGELES CA 90064

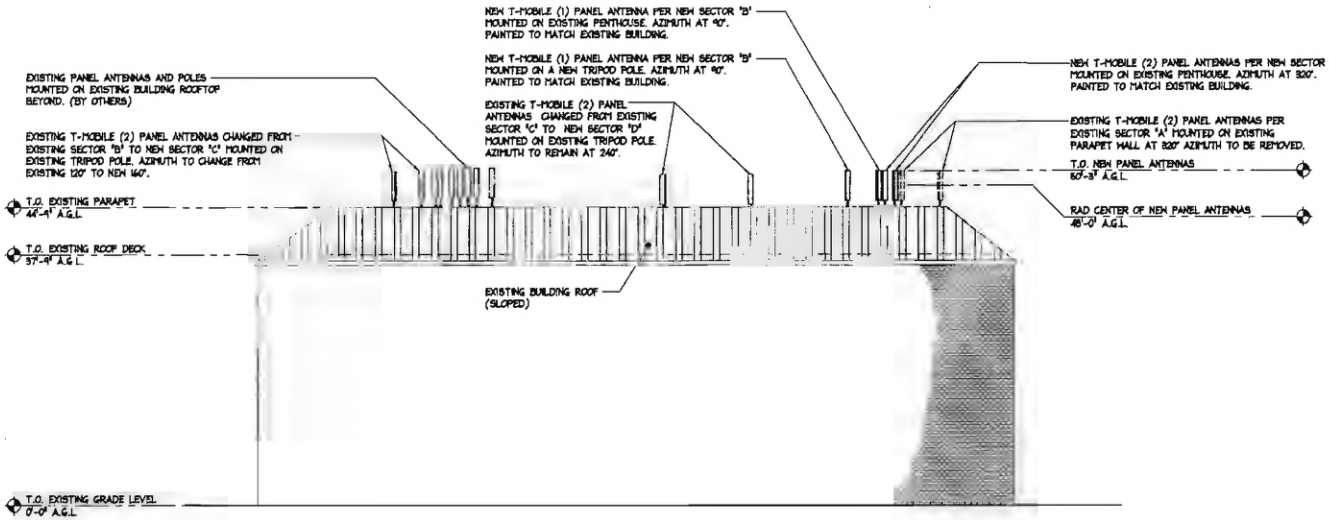
SEAL:

SHEET TITLE:

ENLARGED SITE PLAN

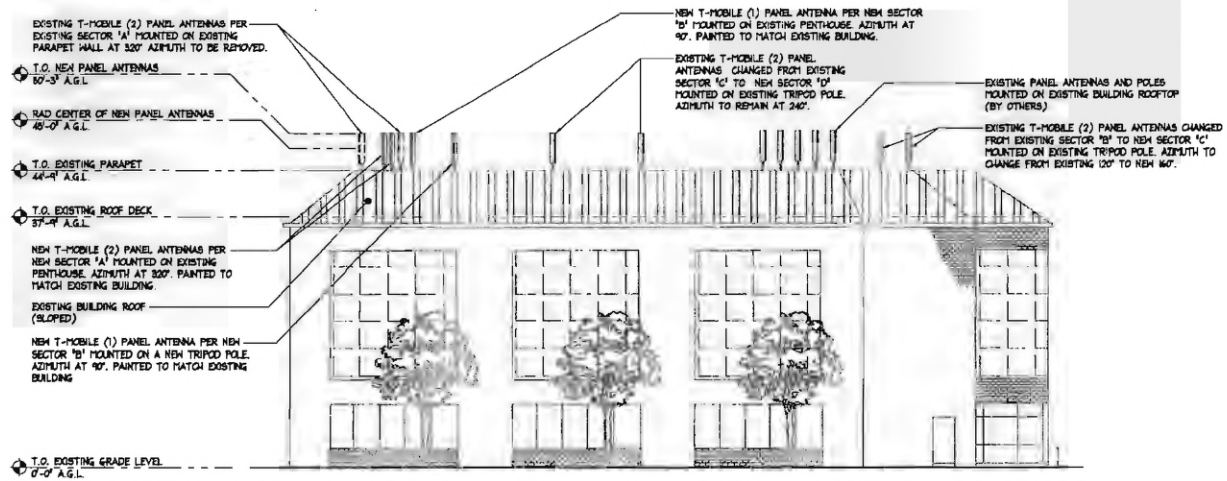
SHEET NUMBER:

A-2



NORTHEAST ELEVATION

SCALE: 1/8"=1'-0" 1



SOUTHWEST ELEVATION

SCALE: 1/8"=1'-0" 2

4100 GUARDIAN STREET SUITE 101
SIMI VALLEY, CA 93063

PLANS PREPARED BY:

ACO ARCHITECTS - INC.
26170 ENTERPRISE #600
LAKE FOREST, CA. 92630
PHONE: (949) 716-9940
FAX: (949) 247-4788

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5	05/30/08	CLIENT REVISION	TW
6	08/20/08	CLIENT REVISION	MY
7	11/20/08	CLIENT REVISION	TW

SITE INFORMATION:

MULLIKIN MEDICAL CTR.

LA02026

2990 1/2 S. SEPULVEDA BLVD.
LOS ANGELES CA 90064

SEAL:

SHEET TITLE:

ARCHITECTURAL ELEVATIONS

SHEET NUMBER:

A-3

[redacted] 1996 686

LA02026

Mullikin Medical Center 2990 1/2 S. Sepulveda Blvd., Los Angeles, CA 90064

T-Mobile





View 1

View Notes:
Looking south west toward proposed site from adjacent alley



T-Mobile USA
4100 Guardian St. Suite 101
Simi Valley, CA 93063
(805) 384-5746

Applicant

Photographic Simulations Provided By:

DREAMZ

LA02026

Mullikin Medical Center 2990 1/2 S. Sepulveda Blvd., Los Angeles, CA 90064

T-Mobile





View 2

View Not ...
Looking north west at proposed site from National Blvd



T-Mobile USA
4100 Guardian St. Suite 101
Simi Valley, CA 93063
(805) 584-5746

Applicant

Photographic Simulations Provided By:

DREAMZ

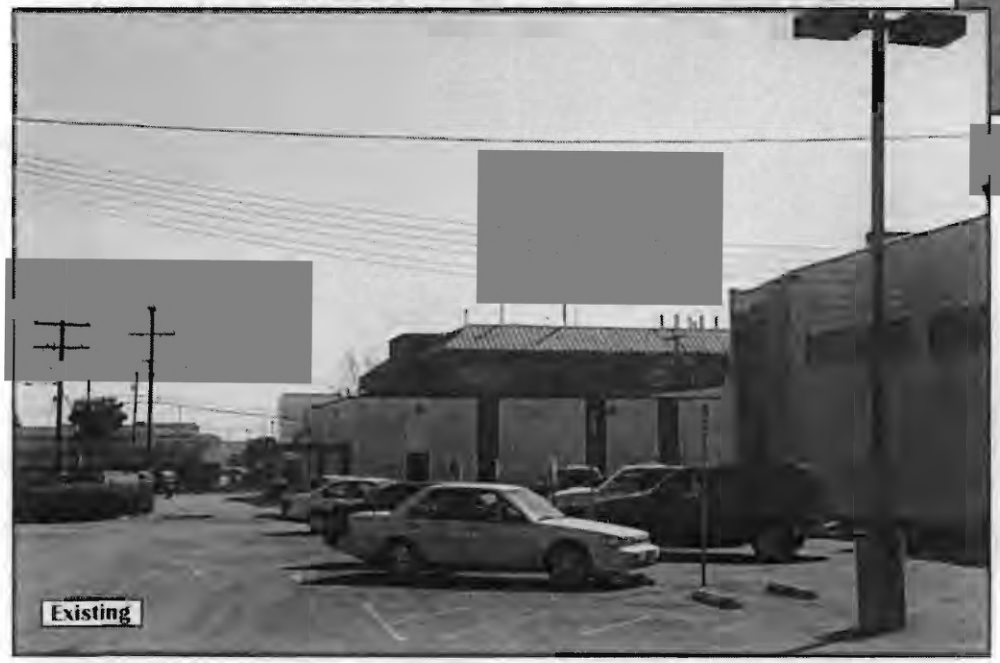
LA02026

Mullikin Medical Center 2990 1/2 S. Sepulveda Blvd., Los Angeles, CA 90064

T-Mobile







View 3

View Notes:
Looking south east toward proposed site from adjacent parking lot

T-Mobile USA
4100 Guardian St. Suite 101
Simi Valley, CA 93063
(805) 584-5746

Applicant

Photographic Simulations Provided By:

DREAMZ

CITY OF LOS ANGELES
CALIFORNIA

JAMES K. HAHN
MAYOR

ROBERT JANOVICI
CHIEF ZONING ADMINISTRATOR

ASSOCIATE ZONING ADMINISTRATORS
R. NICOLAS BROWN
ANIK CHARRON
EMILY J. GABEL-LUDDY
DANIEL GREEN
LOURDES GREEN
DAVID KABASHIMA
ALBERT LANDINI
JON PERICA
SARAH RODGERS

DEPARTMENT OF
CITY PLANNING
CON HOWE
DIRECTOR

FRANKLIN P. EBERHARD
DEPUTY DIRECTOR

OFFICE OF
ZONING ADMINISTRATION
200 N. SPRING STREET, 7TH FLOOR
LOS ANGELES, CA 90012
(213) 978-1318
FAX: (213) 978-1334

June 28, 2002

Mark Rivera (A)
Cingular Wireless
2521 Michelle Avenue, 2nd Floor
Tustin, CA 92780

Northern Trust Bank of California (O)
620 Newport Center Drive
Newport Beach, CA 92660

Stephen Garcia (R)
The Consulting Group, Inc.
18500 Von Karman Avenue, #870
Irvine, CA 92612

CASE NO. ZA 96-0686(CUZ)(PA)
APPROVAL OF PLANS
2990 South Sepulveda Boulevard
West Los Angeles Planning Area
Zone : C2-1VL
D. M. : 123B157
C. D. : 11
CEQA : CE 96-0751-CUZ
Fish and Game : Exempt
Legal Description : Lot No. 24, Tract No. 14252

Department of Building and Safety

Pursuant to Los Angeles Municipal Code Section 12.24-M, I hereby APPROVE:

a request for the addition of two electronic cabinets to a previously approved cellular telecommunications site,

upon the following additional terms and conditions:

1. All other use, height and area regulations of the Municipal Code and all other applicable government/regulatory agencies shall be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

2. The use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibit "A", except as may be revised as a result of this action.

3. The authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to impose additional corrective conditions, if, in the Administrator's opinion, such

conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

4. All graffiti on the site shall be removed or painted over to match the color of the surface to which it is applied within 24 hours of its occurrence.

5. A copy of the first page of this grant and all conditions and/or any subsequent appeal of this grant and its resultant conditions and/or letters of clarification shall be included in and printed on the "notes" portion of the building plans submitted to the Zoning Administrator and the Department of Building and Safety for purposes of having a building permit issued.

6. Approved herein is the installation of two additional cabinets approximately 65.21 inches height by 51.18 inches wide and 28.0 inches deep. Said cabinets are to be located on the rooftop and shall be painted or otherwise screened to minimize their view to the public at large. It should be noted that this grant does not authorize the installation of any additional antennae or modification of existing antennae as previously approved.

7. All conditions as previously imposed on the subject site as relate to its use for cellular telecommunications shall remain in full force and effect except as expressly modified herein.

   ZA Note: At the time the applicant seeks sign off of plans from the Zoning Administrator for purposes of obtaining a building permit, they shall bring with them copies of <u>all</u> previous cases dealing with the subject matter of cellular telecommunications and stand ready to demonstrate compliance with same.

<u>OBSERVANCE OF CONDITIONS - TIME LIMIT - LAPSE OF PRIVILEGES - TIME EXTENSION</u>

All terms and conditions of the approval shall be fulfilled <u>before</u> the use may be established. The instant authorization is further conditional upon the privileges being utilized within two years after the effective date of approval and, if such privileges are not utilized or substantial physical construction work is not begun within said time and carried on diligently to completion, the authorization shall terminate and become void. A Zoning Administrator may extend the termination date for one additional period not to exceed one year, prior to the termination date of the period, if a written request on appropriate forms, accompanied by the applicable fee is filed therefore with a public Office of the Department of City Planning setting forth the reasons for said request and a Zoning Administrator determines that good and reasonable cause exists therefore.

<u>TRANSFERABILITY</u>

This authorization runs with the land. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent upon you to advise them regarding the conditions of this grant.

VIOLATIONS OF THESE CONDITIONS, A MISDEMEANOR

Section 12.29 of the Los Angeles Municipal Code provides:

> "If any portion of a privilege authorized by a variance or conditional use is utilized, the conditions of the variance or conditional use authorization immediately become effective and must be strictly complied with. The violation of any valid condition imposed by the Administrator, Board or Commission in connection with the granting of any variance, approval of a conditional use or other action pursuant to the authority of this chapter, shall constitute a violation of this chapter and shall be subject to the same penalties as any other violation of this Code."

Every violation of this determination is punishable as a misdemeanor and shall be punishable by a fine of not more than $1,000 or by imprisonment in the county jail for a period of not more than six months, or by both such fine and imprisonment.

APPEAL PERIOD - EFFECTIVE DATE

The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. The Zoning Administrator's determination in this matter will become effective after JULY 15, 2002, unless an appeal therefrom is filed with the City Planning Department. It is strongly advised that appeals be filed early during the appeal period and in person so that imperfections/incompleteness may be corrected before the appeal period expires. Any appeal must be filed on the prescribed forms, accompanied by the required fee, a copy of the Zoning Administrator's action, and received and receipted at a public office of the Department of City Planning on or before the above date or the appeal will not be accepted. Such offices are located at:

Figueroa Plaza
201 North Figueroa Street, #300
Los Angeles, CA 90012
(213) 977-6083

6251 Van Nuys Boulevard
First Floor
Van Nuys, CA 91401
(818) 756-8596

The time in which a party may seek judicial review of this determination is governed by California Code of Civil Procedure Section 1094.6. Under that provision, a petitioner may seek judicial review of any decision of the City pursuant to California Code of Civil Procedure Section 1094.5, only if the petition for writ of mandate pursuant to that section is filed no later than the 90th day following the date on which the City's decision becomes final.

NOTICE

The applicant is further advised that all subsequent contact with this office regarding this determination must be with the Zoning Administrator who acted on the case. This would include clarification, verification of condition compliance and plans or building permit

applications, etc., and shall be accomplished **BY APPOINTMENT ONLY**, in order to assure that you receive service with a minimum amount of waiting. You should advise any consultant representing you of this requirement as well.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, the plans submitted therewith, all of which are by reference made a part hereof, as well as knowledge of the property and surrounding district, I find that the requirements for authorizing a conditional use plan approval under the provisions of Section 12.24-M have been established by the following facts:

BACKGROUND

On October 10, 1996, Associate Zoning Administrator Emily Gabel-Luddy acted under Case No. ZA 96-0686(CUZ) and pursuant to then Los Angeles Municipal Code Section 12.24-C,18 to approve a request for a conditional use permit to allow the installation, use, and maintenance of an unmanned telecommunications facility not to exceed a height of 50-feet, 9-inches in the C2-1VL zone. Her determination was made subject to additional terms and 12 conditions, which have been carried forward in this instant action by reference.

Further in reaching the instant determination to approve the applicant's request to "change out or add additional" cabinets to facilitate handling a greater number of calls and data transmission, the Zoning Administrator has read the prior case and finds that the site and situation dynamics have remained virtually unchanged since the time of the public hearing that Administrator Gabel-Luddy conducted on September 26, 1996.

Additionally the findings Ms. Gabel-Luddy made in her October 10, 1996 Letter of Determination remain valid for the instant situation as well, and those findings have been incorporated into this instant action by reference.

AUTHORITY FOR PLAN APPROVAL

Section 12.24-M of the Los Angeles Municipal Code provides in part:

> "M. Development, Change or Discontinuance of Uses:
>
> 1. Development of Site. On any lot or portion thereof on which a conditional use is permitted pursuant to the provisions of this section, new buildings or structures may be erected, enlargements may be made to existing buildings, existing uses may be extended on an approved site, and existing institutions or school developments may be expanded as permitted in Subsection L of this Section, provided plans therefore are submitted to and approved by the Commission or by a Zoning Administrator, whichever has jurisdiction at that time ...".

Now in the instant situation the Zoning Administrator has reviewed the prior action and the case file, the applicant's submittal and the plans for the proposed expansion and in so doing finds that the prior Zoning Administrator's findings of fact remain valid in light of the

requested expansion and intensification of use. Thus, the request for the two equipment cabinets has been conditionally approved with no time limit set on the duration of the grant, and in so approving the Zoning Administrator has determined that:

A particular type of development is subject to the conditional use process because it has been determined that such use of property should not be permitted by right in a particular zone. All uses requiring a conditional use permit from the Zoning Administrator are located within Section 12.24 of the Los Angeles Municipal Code. In order for addition to an existing wireless telecommunications facility to be authorized, certain designated findings have to be made.

MANDATED FINDINGS

Following (highlighted) is a delineation of the findings and the application of the relevant facts to same:

1. **The proposed location will be desirable to the public convenience or welfare.**

   Wireless communications are expanding. To provide a viable service to the public a network of antennae need to be installed. The installation of such antennae and the upgrading of ancillary equipment further the clear and reliable use of these wireless services. The antennae are usually located atop poles or the roofs or sides of tall buildings. The equipment cabinets associated with such installations are usually located in close proximity to said antennae and are, like in the instant situation, out of view of the public. Height is a critical element in the location of such antennae and rooftop installation of equipment cabinets is not unusual. Installation of the approved antennae at this location and the associated equipment cabinets under consideration here will hence be desirable to the public convenience or welfare.

2. **The location is proper in relation to adjacent uses or the development of the community.**

   The building to which the antennae are attached is taller than its neighbors. As such it provides good clear lines of sight for the transmission of the involved radio signals. These clear lines of sight appear to be critical for the use of the subject equipment. The project has previously been well conditioned. The proposed cabinets will not in any way disturb the prior installations visual impacts on the surrounding area. The previously imposed conditions have been carried for ward in this instant action. Thus the Zoning Administrator can determine that the location is proper in relation to adjacent uses or the development of the community.

3. **The use will not be materially detrimental to the character of the development in the immediate neighborhood.**

   The subject building is very large, the subject antennae and equipment boxes in comparison are small. The key element here is to insure a design of the antennae and ancillary equipment installation that will not detract from the architectural beauty

of the building. The subject building is a landmark at this location. In viewing the proposed plans the Zoning Administrator has considered:

- History of the site and its ownership
- Need for antennae at this location - propagation study
- Types of signal to be transmitted
- Alternative designs for the installation
- Requirement to install the equipment by valid City of Los Angeles Building Permit
- Visual impacts of installation on nearby properties
- Design integration of installation with existing improvements on site
- Justification for height of the antennae
- Use of architectural design to mask the visual impacts
- Signal interference on neighborhood activities - none

With that review the Zoning Administrator can determine that the use will not be materially detrimental to the character of the development in the immediate neighborhood.

4. **The proposed location will be in harmony with the various elements and objectives of the General Plan**.

This project is in harmony with the goals and the intents of the General Plan Elements adopted for this geographical area in that it will for optimum use of this commercial site without detriment to adjacent or nearby properties.

The West Los Angeles District Plan designates the subject property for Community commercial with corresponding zones of C2, C4, CR, P and PB Zones. The community plan does not specifically address wireless telecommunications facilities which are permitted in commercial zones by conditional use.

ADDITIONAL MANDATORY FINDINGS

5.. The National Flood Insurance Program rate maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance No. 154,405, have been reviewed and it has been determined that this project is located in Zone C, areas of minimal flooding. (No shading)

6. On August 9, 1996, the subject project was issued a Notice of Exemption (Article III, Section 3, City CEQA Guidelines), log reference CE 96-0751-CUZ, for a Categorical Exemption, Class 3, Category 4, City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. On March 12, 2002 a fee was paid for a more current environmental review. The receipt attached to the file indicates that the project was to be issued a categorical exemption, but no form was found in the subject file. I hereby adopt the August 9, 1996 action as being adequate for the instant purposes.

ZA Note: This proposed wireless telecommunications facility shall operate in full compliance with all state and federal regulations including the Telecommunications Act of 1996.

7. Fish and Game: The subject project, which is located in Los Angeles County, will not have an impact on fish or wildlife resources or habitat upon which fish and wildlife depend, as defined by California Fish and Game Code Section 711.2.

ALBERT LANDINI
Associate Zoning Administrator
Direct Telephone No. (213) 978-1467

AL:mg

cc: Councilmember Cindy Miscikowski
Eleventh District
Adjoining Property Owners
County Assessor

3 1 4 0 0 1 0 0 4 7

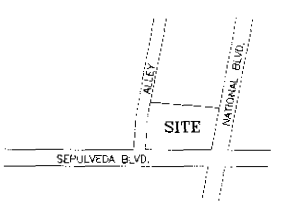
3 1 4 0 0 1 0 0 4 7 2

cingular WIRELESS

EXHIBIT A

LA-026-SM009686
3RD BTS INSTALLATION
MILLKEN MEDICAL CENTER

VINICITY MAP



THOMAS BROTHERS GUIDE
PAGE 562, SECTION A4, 1997 EDITION

N

CLIENT & CONSULTANT TEAM

CLIENTS REPRESENTATIVE:
THE CONSULTING GROUP, INC.
18500 VON KARMAN AVENUE
SUITE 870
IRVINE, CALIFORNIA 92612
PHONE: (714) 608-0863
FAX: (949) 477-3063
CONTACT: JACK ANDERSEN

APPLICANT:
MARK RIVERA
DIRECTOR OF DEPLOYMENT
CINGULAR WIRELESS
2521 MICHELLE AVENUE
SECOND FLOOR
TUSTIN, CALIFORNIA 92780
TELEPHONE: (714) 734-7300

ARCHITECT:
JRA
260 NEWPORT CENTER DRIVE
SUITE 360
NEWPORT BEACH, CA. 92660
PHONE: (949) 760-3929
FAX: (949) 760-3951
CONTACT: JEFF ROME

CUSTOMER CONTACT:
JEFF JACOBS
CONSTRUCTION MANAGER
CINGULAR WIRELESS
2521 MICHELLE AVENUE
SECOND FLOOR
TUSTIN, CALIFORNIA 92780
TELEPHONE: (714) 734-7404

LAND SURVEYOR:
E & S CONSULTANTS, INC.
35154 ORANGE STREET
WILDOMAR, CA. 92595
PHONE: (909) 245-4446
FAX: (909) 245-6927

ELECTRICAL ENGINEER:
EDS, INC.
3845 LA SIERRA AVENUE
SUITE B
RIVERSIDE, CALIFORNIA 92505
PHONE: (909) 351-1800
FAX: (909) 351-0852
CONTACT: ROBERT CASTRO

SHEET INDEX

T-1 TITLE SHEET
A-1 SITE & ROOF PLAN, ENLARGED ROOF PLAN AND BTS DETAIL.
A-2 ELEVATIONS
C-1 SITE SURVEY

PROJECT SUMMARY

THE PROPOSED PROJECT ENTAILS:

1. INSTALLATION OF 3RD BASE TRANCEIVER STATION (BTS).
2. NEW PLATFORM FOR NEW AND FUTURE EQUIPMENT.
3. NEW COAX CABLE RUNS FROM NEW AND EXISTING BTS'S TO EXISTING ANTENNAS.
4. NEW TELEPHONE SERVICE RUN TO NEW BTS.
5. UPGRADE ELECTRICAL SERVICE FROM 100A TO 200A

OWNER:
NORTHERN TR (BUCA (TE)
SITE CONTACT: TBD
620 NEWPORT CENTER DR #200
NEWPORT BEACH, CALIFORNIA 92660

LEGAL DESCRIPTION:
SEE TOPOGRAPHIC SURVEY SHEET C-1

ZONING:
TBD

CONSTRUCTION TYPE:
TBD

OCCUPANCY:
1997 UBC: U-2

ADA COMPLIANCE:
NOT APPLICABLE PER UBC 1108.1.1.

UTILITY PURVEYORS

TELEPHONE SERVICE
PROVIDER: TBD
CONTACT: BOB HOLTE (714) 734-7626

ELECTRICAL SERVICE
PROVIDER: TBD
CONTACT: TBD

APPROVALS

	PRINT NAME	SIGNATURE	DATE
LANDLORD			
CW MANAGER			
RF MANAGER			
SITE ACQUISITION			
AEC			
CW PLANNER			
INTERCONNECT			
CONSTRUCTION COORDINATOR			

GENERAL NOTES:

AN UNMANNED, WIRELESS COMMUNICATION PCS EQUIPMENT INSTALLATION & FACILITY.

1. THIS EXHIBIT MAY BE REPLACED BY A LAND SURVEY OR SITE PLAN OF THE PREMISES ONCE IT IS RECEIVED BY LESSEE.
2. SETBACK OF THE PREMISES FROM THE LESSOR'S BOUNDARIES SHALL BE THE DISTANCE REQUIRED BY THE APPLICALE GOVERNMENTAL AUTHORITIES.
3. WIDTH OF THE ACCESS ROAD SHALL BE THE WIDTH REQUIRED BY THE APPLICALE AUTHORITIES, INCLUDING POLICE AND FIRE.
4. THE TYPE, NUMBER AND MOUNTING POSITIONS AND LOCATIONS OF ANTENNAS AND TRANSMISSION LINES ARE ILLUSTRATIVE ONLY. ACTUAL TYPES, NUMBERS, AND MOUNTING POSITIONS MAY VARY FROM WHAT IS SHOWN ABOVE.

PROPRIETARY INFORMATION
THE INFORMATION CONTAINED IN THIS SET OF CONSTRUCTION DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO CINGULAR WIRELESS IS STRICTLY PROHIBITED.

DATE: 01-02-02
ARCHITECT: JR
DRAWN BY: RN
CHECKED BY: JR

REVISIONS

REV	DATE	DESCRIPTION	BY
1			
2			
3			
4			
5			

cingular WIRELESS
2521 MICHELLE AVENUE
SECOND FLOOR
TUSTIN, CALIFORNIA 92780

The Consulting Group, Inc.
PROJECT OFFICE:
18500 Von Karman Avenue
Suite 870
Irvine, California 92612
(714) 608-0863
(949) 477 3063 Fax

JRA
Jeffrey Rome & Associates, Inc.
Architecture & Telecommunications
260 Newport Center Drive, Suite 360
Newport Beach, California 92660
Phone (949) 760-3929
Fax (949) 760-3931

SITE NUMBER:
LA-026-SM009686

SITE TYPE:
PROPOSED 3RD BTS INSTALLATION

LOCATION:
MILLKEN MEDICAL CENTER
2990 SOUTH SEPULVEDA BOULEVARD
LOS ANGELES, CALIFORNIA 90064

TITLE:
TITLE SHEET

SHEET NUMBER:
T-1

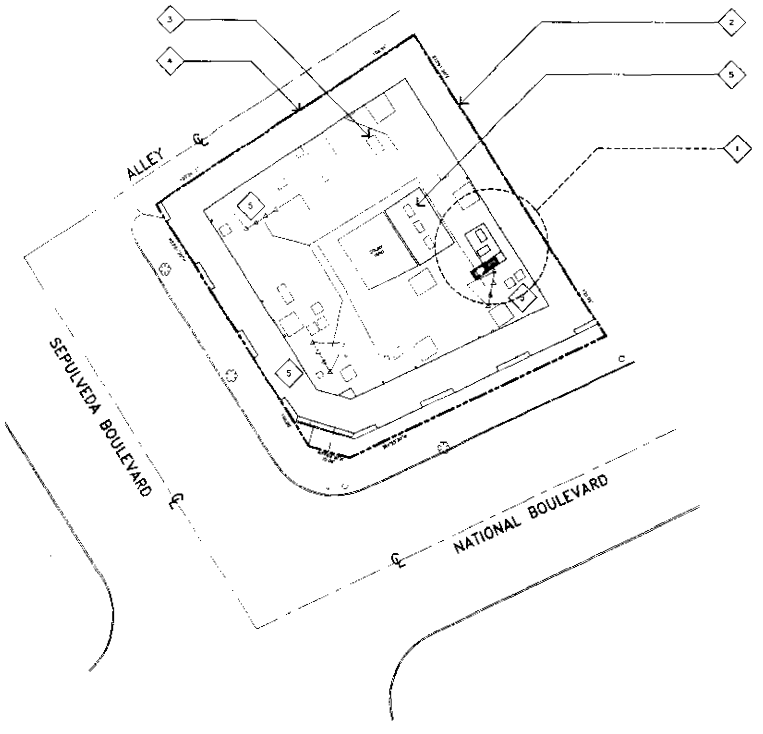
LAST PLOTTED: 01/03/01 @ 3:00 PM JRA 012-

ZA - 1996 686

3140010047

SITE & ROOF PLAN KEYNOTES

1. (E) & (N) GH LEASE AREA WITH PROPOSED 3RD BTS INSTALLATION; SEE ENLARGED SITE PLAN 1/A-1.
2. (E) COMMERCIAL BUILDING.
3. (E) BUILT-UP ROOFING AND ROOF TOP EQUIPMENT.
4. (E) PROPERTY LINE.
5. (E) OTHER CARRIER ANTENNAS & EQUIPMENT.

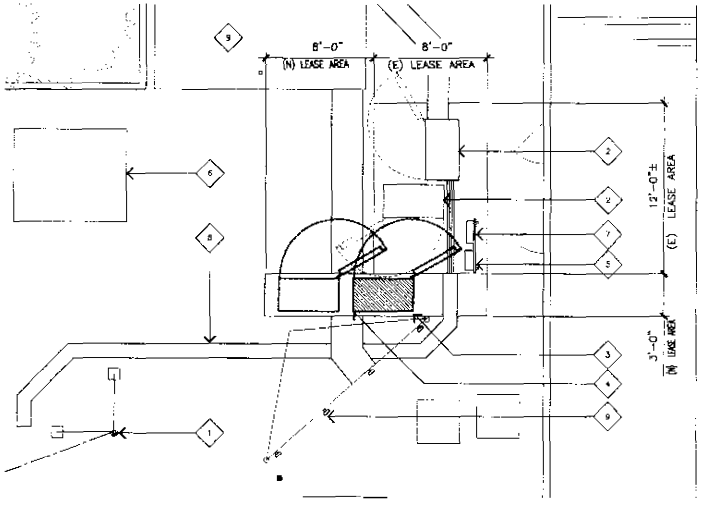


SITE & ROOF PLAN

SCALE: 1"=20' | 0 10' 20' | 3

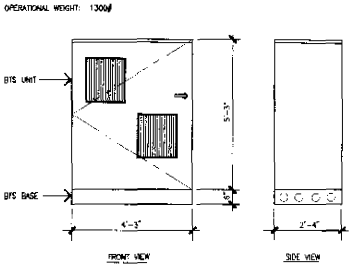
ENLARGED ROOF PLAN KEYNOTES

1. (E) GH ANTENNAS POLE MOUNTED.
2. (E) GH BTS EQUIPMENT CABINET ON (E) FRAMED PLATFORM.
3. PROPOSED GH 3RD BTS EQUIPMENT CABINET ON (N) FRAMED PLATFORM.
4. PROPOSED GH FUTURE BTS EQUIPMENT ON (N) FRAMED PLATFORM
5. (E) ELECTRICAL PANEL REMOVED AND REPLACED WITH (N) 200 AMP PANEL.
6. (E) ROOF MOUNED MECHANICAL UNITS.
7. (E) TELCO PANEL.
8. (E) COAX CONDUITS & CABLE TRAY. REROUTE AS REQUIRED.
9. (E) OTHER CARRIER ANTENNAS & EQUIPMENT



ENLARGED ROOF PLAN

SCALE: 1/4"=1'-0" | 0 2' 4' | 1



BTS CABINET

SCALE: 1/2"=1'-0" | 0 1' 2' | 2

PROPRIETARY INFORMATION

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DATE: 01-02-02
ARCHITECT: JR
DRAWN BY: RN
CHECKED BY: JR

REVISIONS

REV.	DATE	DESCRIPTION	BY
1			
2			
3			
4			
5			

cingular WIRELESS

2521 MICHELLE AVENUE
SECOND FLOOR
TUSTIN, CALIFORNIA 92780

The Consulting Group, Inc.
PROJECT OFFICE:
18500 Von Karman Avenue
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(714) 606-0883
(949) 477-3063 Fax

JRA
Jeffrey Rome & Associates, Inc.
Architecture & Telecommunications
260 Newport Center Drive, Suite 380
Newport Beach, California 92660
Phone: (949) 760-2929
Fax: (949) 760-2931

SITE NUMBER: LA-026-SM009686

SITE TYPE: PROPOSED 3RD BTS INSTALLATION

LOCATION: WILLKEN MEDICAL CENTER
2900 SOUTH SEPULVEDA BOULEVARD
LOS ANGELES, CALIFORNIA 90064

TITLE: SITE PLAN, ENLARGED ROOF PLAN & BTS CABINET

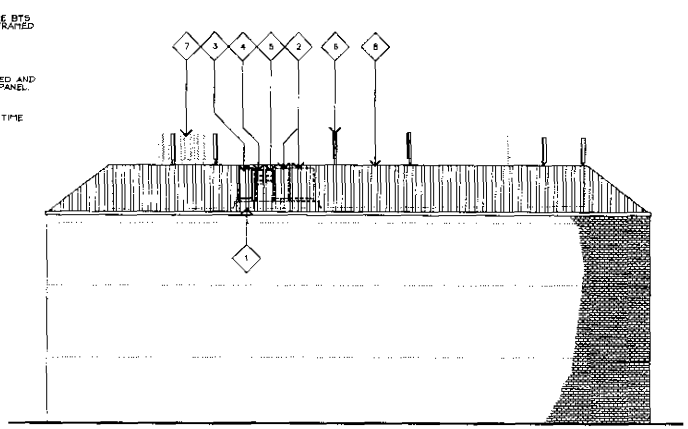
SHEET NUMBER: A-1

LAST PLOTTED: 01/02/02 @ 8:00 PM JRA 012

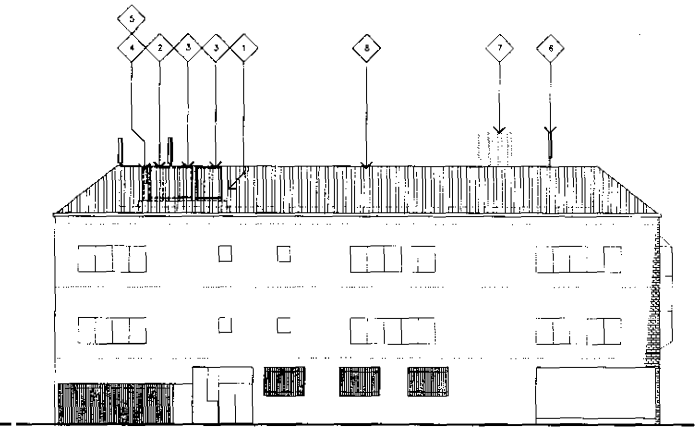
3 1 4 0 0 1 [illegible]

ELEVATION KEYNOTES

1. (E) ON LEASE AREA WITH PROPOSED 3RD BTS INSTALLATION; SEE ENLARGED SITE PLAN I/A-1.
2. (E) ON BTS EQUIPMENT CABINETS.
3. PROPOSED ON 3RD AND FUTURE BTS EQUIPMENT CABINETS ON (N) FRAMED PLATFORM BEYOND.
4. (E) TELCO PANEL.
5. (E) ELECTRICAL PANEL REMOVED AND REPLACED WITH (N) 200 AMP PANEL.
6. (E) ON ANTENNAS. NO WORK PROPOSED TO THESE AT THIS TIME
7. (E) OTHER CARRIER ANTENNAS
8. (E) MEDICAL BUILDING.



EAST ELEVATION

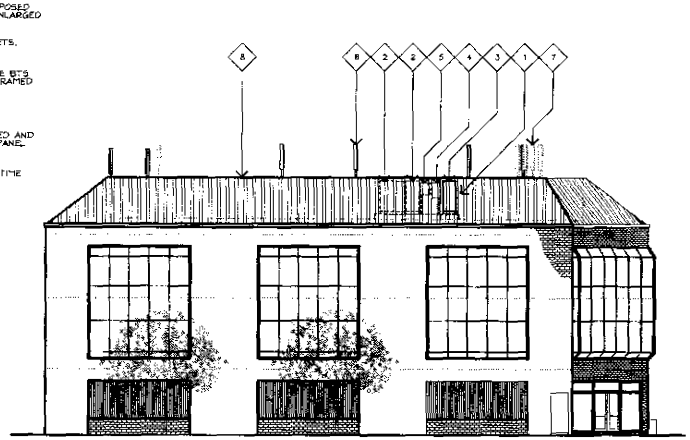


NORTH ELEVATION

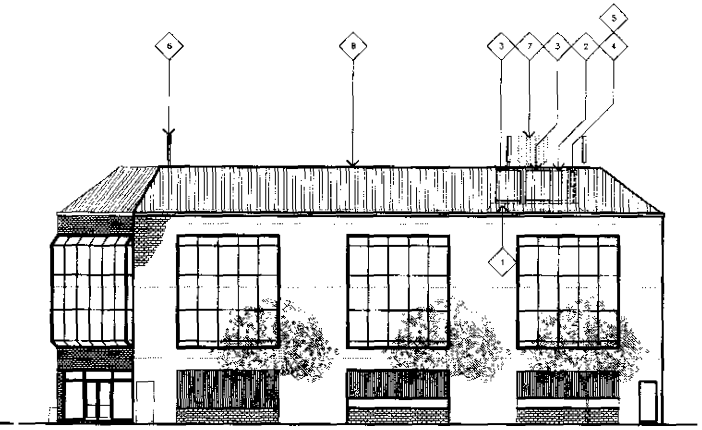
SCALE: 1"=10' 0 5' 10' 1

ELEVATION KEYNOTES

1. (E) ON LEASE AREA WITH PROPOSED 3RD BTS INSTALLATION; SEE ENLARGED SITE PLAN I/A-1.
2. (E) ON BTS EQUIPMENT CABINETS.
3. PROPOSED ON 3RD AND FUTURE BTS EQUIPMENT CABINETS ON (N) FRAMED PLATFORM BEYOND.
4. (E) TELCO PANEL.
5. (E) ELECTRICAL PANEL REMOVED AND REPLACED WITH (N) 200 AMP PANEL.
6. (E) ON ANTENNAS. NO WORK PROPOSED TO THESE AT THIS TIME
7. (E) OTHER CARRIER ANTENNAS
8. (E) MED CA. BUILDING.



WEST ELEVATION



SOUTH ELEVATION

SCALE: 1"=10' 0 5' 10' 2

PROPRIETARY INFORMATION

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DATE:	01-02-02
ARCHITECT:	JR
DRAWN BY:	RN
CHECKED BY:	JR

REVISIONS

REV	DATE	DESCRIPTION	BY
1			
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cingular WIRELESS

2521 MICHELLE AVENUE
SECOND FLOOR
TUSTIN, CALIFORNIA 92780

The Consulting Group, Inc.

PROJECT OFFICE:
18500 Von Karman Avenue
Suite 870
Irvine, California 92612
(714) 506-0863
(949) 477-3063 Fax

JRA
Jeffrey Rome & Associates, Inc.
Architecture & Telecommunications
260 Newport Center Drive, Suite 360
Newport Beach, California 92660
Phone: (949) 760-3929
Fax: (949) 760-3951

SITE NUMBER: LA-026-SM009686

SITE TYPE: PROPOSED 3RD BTS INSTALLATION

LOCATION: WILLKEN MEDICAL CENTER
2990 SOUTH SEPULVEDA BOULEVARD
LOS ANGELES, CALIFORNIA 90064

TITLE: ELEVATIONS

SHEET NUMBER: A-2

LAST PLOTTED: 01/02/02 @ 5:00 PM JRA 0126

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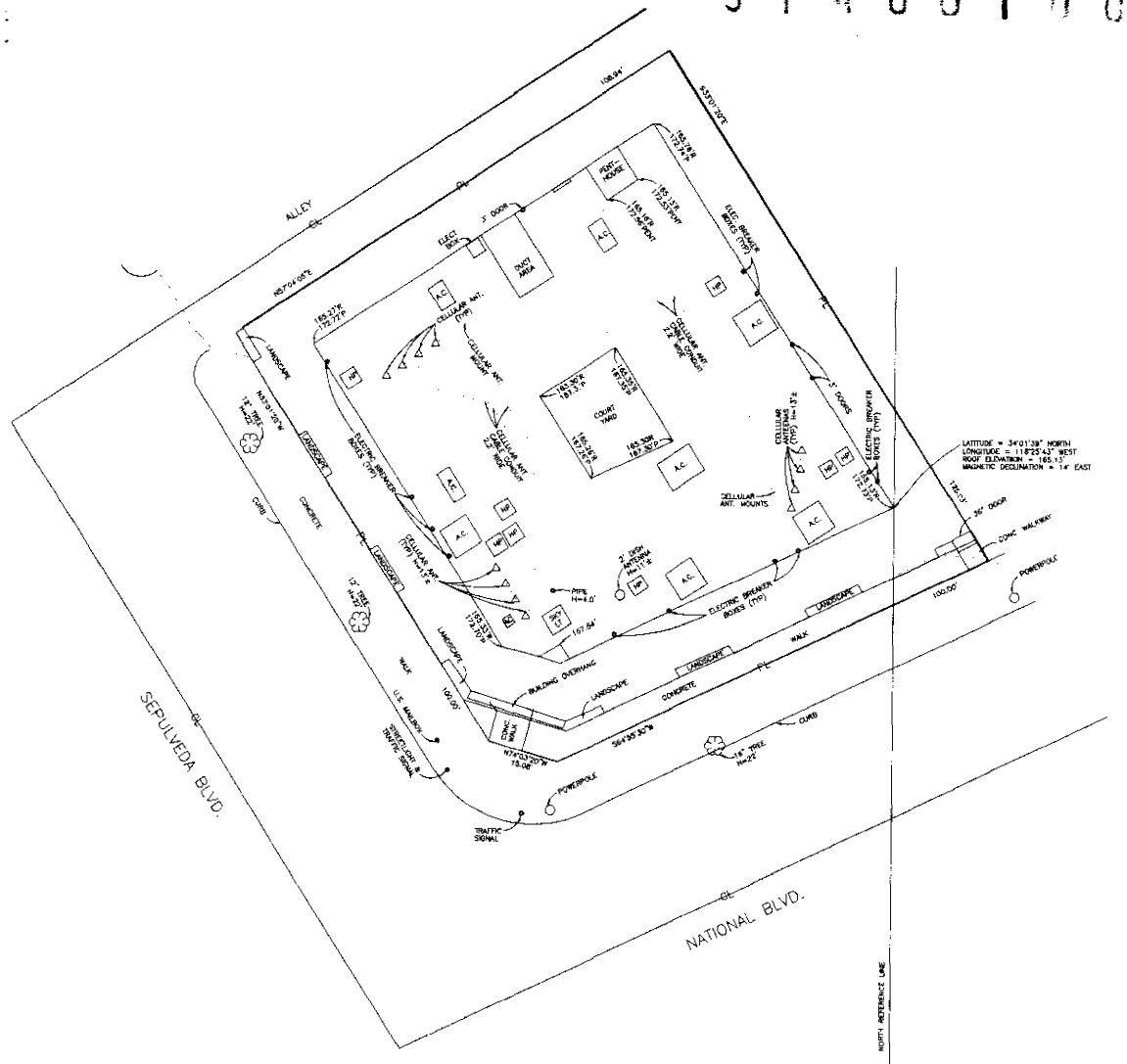
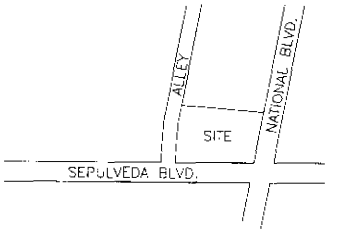


SITE SURVEY

SCALE: 1" = 10'



VICINITY MAP

NOT TO SCALE

PROPRIETARY INFORMATION
THE INFORMATION CONTAINED IN THIS SET OF CONSTRUCTION DOCUMENTS IS PROPRIETARY BY NATURE. ANY USE OR DISCLOSURE OTHER THAN THAT WHICH RELATES TO PACIFIC BELL MOBILE SERVICES IS STRICTLY PROHIBITED.

LEGAL DESCRIPTION

THAT PORTION OF THE 130.71 ACRE TRACT ALLOTED TO PEDRO TALAMENTES BY DECREE OF PARTITION IN CASE NO. 965 OF THE DISTRICT COURT, IN THE CITY OF LOS ANGELES, DESCRIBED AS FOLLOWS:

BEGINNING AT THE MOST SOUTHERLY CORNER OF LOT 1 OF TRACT 14252, AS PER MAP RECORDED IN BOOK 298, PAGES 15 AND 16 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY; THENCE SOUTH 64°55'30" WEST ALONG NATIONAL BOULEVARD, 80 FEET WIDE, AS SHOWN ON SAID MAP, A DISTANCE OF 100 FEET TO AN ANGLE POINT IN THE NORTHERLY LINE OF SAID NATIONAL BOULEVARD; THENCE NORTH 74°02'58" WEST A DISTANCE OF 15.09 FEET TO AN ANGLE POINT IN THE NORTHEASTERLY LINE OF SEPULVEDA BOULEVARD, 100 FEET WIDE, AS SHOWN ON THE MAP OF SAID TRACT 14252; THENCE NORTH 33°01'20" WEST ALONG SAID SEPULVEDA BOULEVARD A DISTANCE OF 100 FEET TO THE INTERSECTION OF THE NORTHEASTERLY LINE OF SAID SEPULVEDA BOULEVARD WITH THE SOUTHEASTERLY LINE OF THAT CERTAIN 20 FOOT ALLEY SHOWN ON SAID MAP AS ADJOINING LOT 39 OF SAID TRACT ON THE SOUTH; THENCE NORTH 57°04'05" EAST, ALONG SAID ALLEY, A DISTANCE OF 108 FEET TO THE MOST WESTERLY CORNER OF SAID LOT 1; THENCE SOUTH 33°01'20" EAST ALONG THE SOUTHWESTERLY LINE OF SAID LOT 1, A DISTANCE OF 125.03 FEET TO THE POINT OF BEGINNING.

TITLE REPORT DATA

TITLE COMPANY:
FIRST AMERICAN TITLE COMPANY OF LOS ANGELES
520 N. CENTRAL AVE.
GLENDALE, CA 91203
TITLE OFFICER:
SANDI DAVIS (818) 242-5800 X-5433
TITLE REPORT:
PRELIMINARY
ORDER NO. 9518125-26
EASEMENTS:
ITEM 2: ROAD EASEMENT RECORDED JANUARY 21, 1982 AS INSTRUMENT NO. 82-72565. AS SHOWN.

BASIS OF BEARINGS

THE BASIS OF BEARING FOR THIS SURVEY IS SOUTH 33°01'20" EAST BEING THE CENTERLINE OF SEPULVEDA BOULEVARD AS PER MAP OF TRACT NO. 14252 IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, RECORDED IN BOOK 298, PAGES 15 AND 16 OF MAPS, FILED ON THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

BENCH MARK

STANDARD SURVEY MONUMENT (SAW L-9C), ON THE CENTERLINE INTERSECTION OF NATIONAL BOULEVARD AND SAWTELLE BOULEVARD.
ELEVATION = 123.185' (1979) BM# 13-10040

EASEMENTS

ITEM 2: ROAD EASEMENT RECORDED JANUARY 21, 1982 AS INSTRUMENT NO. 82-72565 AS SHOWN.

TITLE DATA

OWNER:
NORTHERN TR BK/CA (TC)
620 NEWPORT CENTER DR. #200
NEWPORT BEACH, CA 92660
SITE ADDRESS:
2990 S SEPULVEDA BLVD
LOS ANGELES, CA 90064-3913
APN# 4251-003-033

DATE: 09-28-95
DRAWN BY: IA
CHECKED BY: GP

REVISIONS

DATE	DESCRIPTION	INITIAL

E & S Consultants, CARAWAY COMMUNICATIONS
Civil Engineers x Land Surveyors
35154 Orange Street
Wildomar, CA 92595
Tel: (909) 245-4445, Fax: (909) 245-6927

9601 WHITE ROCK TRAIL, SUITE 210
DALLAS, TEXAS 75238
(214) 340-9693 FAX (214) 340-9694

PBMS PROJECT OFFICE
5959 W. CENTURY BLVD. SUITE 200
LOS ANGELES, CALIFORNIA 90045
(310) 342-1626 FAX (310) 342-1615

FWY 405/FWY 10
2990 S SEPULVEDA BLVD
LOS ANGELES, CA 90064
90064

LA 026-06

AC2806.DWG

PREPARED UNDER THE SUPERVISION OF:

GORDON N. POWERS
L.S. #4629 EXPIRES 9-30-96
DATE:

SITE SURVEY

C-1

cingular WIRELESS

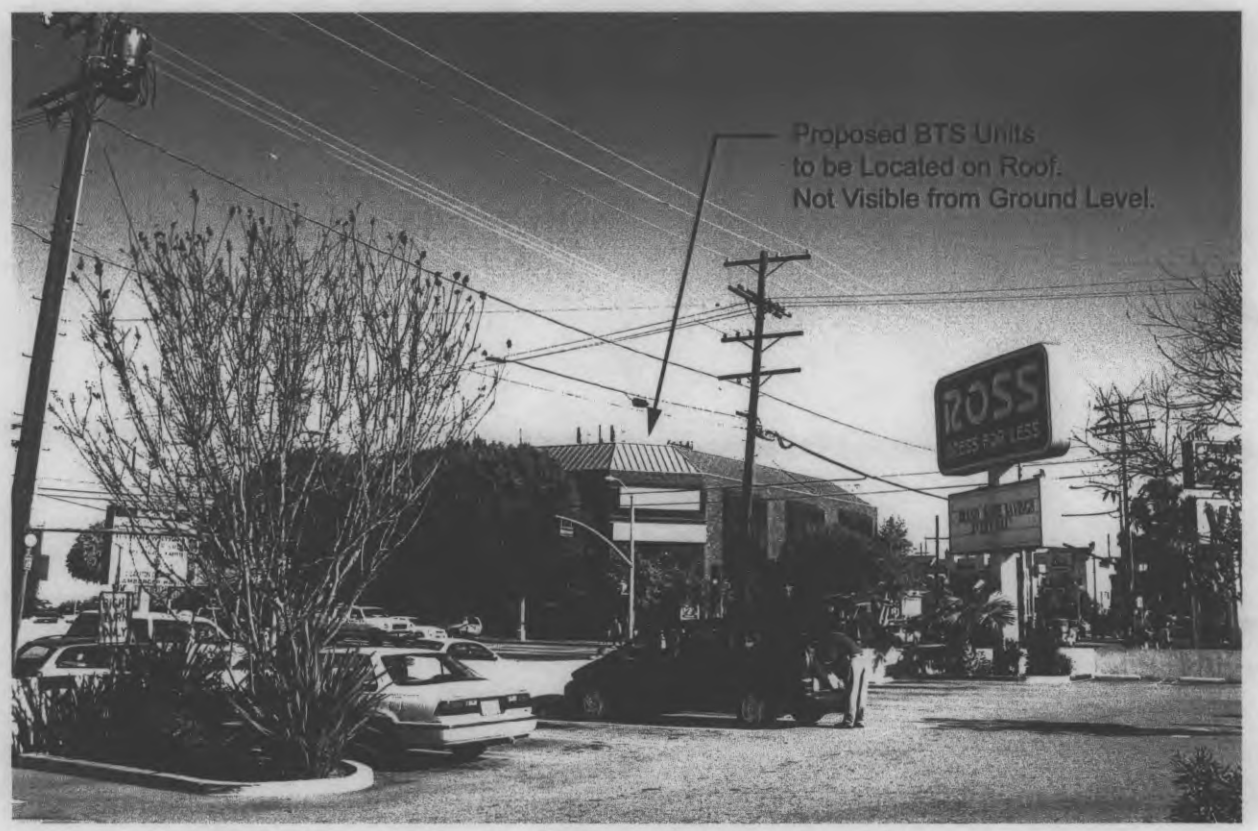
Cellular Science

Address: 2990 1/2 S. Sepulveda Blvd.
Los Angeles, California

Site: LA-026-06
W.O.: SM009686

3140010047 6

Proposed / Existing



ZA - 1996 686

EXHIBIT 1-C

CITY OF LOS ANGELES
DEPARTMENT OF CITY PLANNING
OFFICE OF ZONING ADMINISTRATION

STAFF REPORT

April 18, 1991

Sepulveda Pacific Limited
Partnership (Owner)
Edward Anderson
924 Indian Peak Road, #110
Rolling Hills, CA 90270

PACTEL (Lessee)
Lorry Levine
P.O. Box 19707
Irvine, CA 92714

Re: CASE NO. ZA 91-0204(CUZ)
CONDITIONAL USE
2990 Sepulveda Boulevard
West Los Angeles-Century City-
Rancho Park Planning Area
Zone: C2-1VL
D. M.: 7232
C. D.: 5
EIR: CE 91-0307
Legal Description: A portion
of Lot 1, Tract No. 14252

ZONING ANALYST: PAUL MULLIS

REQUEST:

A conditional use permit, pursuant to the provisions of Section 12.24-C,1(s) of the Municipal Code, to permit the installation, use, and maintenance of a cellular telephone facility, consisting of electronic equipment to be housed in a suite of an existing three-story commercial building and four panel antennas and one microwave dish mounted on the roof. (Reprinted from public hearing notice)

SUBJECT PROPERTY: (Excerpts from staff report of Case No. ZV 83-143)

The subject property is an irregular-shaped, level, record, corner lot, having a frontage of 100 feet on the north side of National Boulevard and a 100-foot frontage on the east side of Sepulveda Boulevard in the C2-1 (commercial) Zone. The property is developed with a two-story, commercial/office building having a total of 21,676 square feet and a parking area for 56 cars within said building.

SURROUNDING PROPERTY:

The surrounding property is primarily developed with office/commercial uses with adjacent surface parking areas.

Northerly

The northerly adjacent property, across a 20-foot-wide improved alley, is developed with a one-story bank building, with adjacent surface parking in the C2-1 (commercial) and R4-P-1 (multiple-family parking) Zones.

Southerly

The adjacent southerly property, across National Boulevard, is developed with a small one-story commercial center and adjacent surface parking area in the C2-1 (commercial) Zone.

Easterly

The easterly adjacent property is developed with a one-story commercial building and parking area in the C2-1 Zone.

Westerly

The westerly adjacent property, across Sepulveda Boulevard, is developed with a one-story gas station in the C2-1 (commercial) Zone.

STREETS AND CIRCULATION:

Sepulveda Boulevard is a designated major highway dedicated 100 feet in width and is fully improved with curbs, gutters and sidewalks.

National Boulevard is a designated secondary highway dedicated 85 feet in width and is improved with curbs, gutters and sidewalks.

A fully improved 20-foot-wide alley extends along the northerly property line of the subject property.

PREVIOUS CASES, AFFIDAVITS, PERMITS, ETC.:

Case No. ZV 83-143 was granted July 6, 1983 to permit the conversion of 8,800 square feet of a 22,000-square-foot office building to medical offices with 12 of the required 68 parking spaces secured by a 10-year lease agreement instead by agreement.

The Department of Building and Safety issued a building permit on the subject property in 1982 for the construction of a two-story, office building (approximately 22,000 feet) with 56 parking spaces.

Case No. ZAI 82-142E was approved by the Zoning Administrator in 1982 to allow the sale and consumption of alcoholic beverages on the property where the lease parking spaces are.

GENERAL PLAN, PLAN ELEMENTS, SPECIFIC PLANS AND MORATORIUMS:

Community Plan:

The adopted West Los Angeles-Century City-Rancho Park designates the subject property for Community commercial land uses corresponding to the C2 (commercial) Zone.

Flood Hazard Management Specific Plan:

The national flood insurance program, flood insurance rate maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance No. 154,405, have been reviewed and it has been determined that this project is located in Zone C, areas of minimal flooding. (No shading)

Environmental:

CE 91-0307 was issued February 6, 1991.

GENERAL COMMENTS:

The applicant, PACTEL, has acquired a lease for a 608.60-square-foot suite no. 208 (see copy attached to file) for the purpose of developing the cellular telephone facility. There are three positions on the roof structure where the 4 feet by 1 inch by 10 feet antennas and one 2-foot microwave dish will be located. The antennas extend approximately 3 feet 6 inches above the roof parapet. The location of the antennas will not obstruct the views of the surrounding properties nor should the antennas present any other problem related to the General Plan that is silent on the issue or be detrimental to the immediate neighborhood. A review of the surrounding properties shows many structures, e.g., pole signs, other signage, that are similar in height and are accepted as part of the urban environment.

PAUL MULLIS
Zoning Analyst

PM:esr

ROBERT JANOVICI
CHIEF ZONING ADMINISTRATOR

ASSOCIATE ZONING ADMINISTRATORS
JAMES J. CRISP
DARRYL L. FISHER
DANIEL GREEN
ALBERT LANDINI
WILLIAM LILLENBERG
JON PERICA
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HORACE E. TRAMEL, JR.

CITY OF LOS ANGELES
CALIFORNIA

TOM BRADLEY
MAYOR

DEPARTMENT OF
CITY PLANNING
MELANIE S. FALLON
DIRECTOR

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CHIEF DEPUTY DIRECTOR

OFFICE OF
ZONING ADMINISTRATION
ROOM 600, CITY HALL
LOS ANGELES, CA 90012-4801
(213) 485-3851

BL

May 10, 1991

Sepulveda Pacific Limited
Partnership
Edward Anderson
924 Indian Peak Road, #110
Rolling Hills, CA 90270

Pac Tel Cellular
Lorry Levine
P.O. Box 19707
Irvine, CA 92714

Re: CASE NO. ZA 91-0204(CUZ)
CONDITIONAL USE
2990 Sepulveda Boulevard
West Los Angeles-Century City-
Rancho Park Planning Area
Zone: C2-1VL
D. M.: 7232
C. D.: 5
EIR: CE 91-0307
Legal Description: A portion
of Lot 1, Tract No. 14252

Department of Building and Safety

In the matter of the application of Edward Anderson for Sepulveda Pacific Limited for conditional use approval on a site located in the C2-1VL Zone, please be advised that based upon the findings of fact hereinafter set forth and by virtue of the authority contained in Section 12.24-C of the Municipal Code, the Zoning Administrator hereby authorizes as a conditional use, on a site described as a portion of Lot 1, Tract No. 14252, located at 2990 Sepulveda Boulevard, West Los Angeles-Century City-Rancho Park Planning Area, for:

> the installation and maintenance of a cellular telephone facility (for transmitting and receiving) within an enclosed, unmanned 608 square-foot mechanical equipment room on the second floor of an existing three-story office building, and with four sets of exterior antennas mounted on the building's roof for the installation of four surface grid panels 2 by 3 feet each mounted on the roof parapet wall and one microwave dish antenna, 2 feet in diameter similarly mounted on the south side of a record site within the C2-1VL (Commercial) Zone,

upon the following additional terms and conditions:

1. That the use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibit "A".

2. That all other use, height and area regulations of the Municipal Code be strictly complied with in the development and use of the

property, except as such regulations are herein specifically varied or required.

3. that the subject antel type antennas and microwave dish shall be located toward Sepulveda and National Boulevards within the roof and mounted on the side of the 7-foot high parapet wall so as not to extend above the roof line.

4. That the newer small type antel antennas shall be used at this site if engineeringly possible to better blend as an architectural feature of the building.

5. That the antenna mast, surface and grid panels and mounting frame shall be of a color to blend in with the building and not cause a glare or reflection from the sun.

6. That installation, maintenance and operation shall be in conformance with applicable Federal (FCC), State and local regulations.

7. That the cellular telephone service technician shall use the parking lot of the office building when making routine visits to the site.

The use hereby authorized is conditional upon the privileges' being utilized (i.e., the use approved being lawfully conducted on the site) within 180 days after the effective date hereof, and if they are not utilized or construction work (i.e., actual substantial physical improvements installed) is not begun within said time and carried on diligently to completion this authorization shall become void and any privilege or use granted hereby shall be deemed to have lapsed unless a Zoning Administrator has granted an extension of the time limit (the request for the extension having been submitted prior to the expiration of the grant and accompanied by the appropriate fee), after sufficient evidence has been submitted indicating that there was unavoidable delay in taking advantage of the grant. Once any portion of the privilege hereby granted is utilized, the other conditions thereof become immediately operative and must be strictly observed. Furthermore, this conditional use approval shall be subject to revocation in the manner as provided under Section 12.24-I of the Municipal Code if the conditions imposed are not strictly observed.

The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent that you advise them regarding the conditions of this grant. The Zoning Administrator's determination in this matter will become effective after May 28, 1991, unless an appeal therefrom is filed with the Board of Zoning Appeals. Any appeal must be

filed on the prescribed forms, accompanied by the required fee and received and receipted at a Public Office of the Department of City Planning on or before the above date or the appeal will not be accepted.

THE APPLICANT IS FURTHER ADVISED THAT ALL SUBSEQUENT CONTACT WITH THE ZONING ADMINISTRATOR REGARDING THIS DETERMINATION, INCLUDING CLARIFICATION, SIGN-OFFS OF CONDITIONS AND PLANS OR FOR BUILDING PERMIT APPLICATIONS, ETC., SHALL BE ACCOMPLISHED BY APPOINTMENT ONLY.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, the report of the Zoning Analyst thereon, the statements made at the public hearing before the Zoning Administrator on April 18, 1991, all of which are by reference made a part hereof, as well as knowledge of the property and the surrounding district, I find that the requirements for authorizing a conditional use under the provisions of Section 12.24-C of the Municipal Code have been established by the following facts:

1. The subject property is an irregular-shaped, level, record, corner lot, having a frontage of 100 feet on the north side of National Boulevard and a 100-foot frontage on the east side of Sepulveda Boulevard in the C2-1 (commercial) Zone. The property is developed with a three-story, commercial/office building having a total of 21,676 square feet and a parking area for 56 cars within said building.

   Land use in the immediate area is neighborhood shopping centers at the intersection of Sepulveda and National Boulevards. The San Diego Freeway is to the west a half block. Single-family dwellings are to the northeast on Bentley Avenue.

   The northerly adjacent property, across a 20-foot-wide improved alley, is developed with a one-story bank building, with adjacent surface parking in the C2-1 (commercial) and R4-P-1 (multiple-family parking) Zones.

   The adjacent southerly property, across National Boulevard, is developed with a small one-story commercial center and adjacent surface parking area in the C2-1 (commercial) Zone.

   The easterly adjacent property is developed with a one-story commercial building and parking area in the C2-1 Zone.

   The westerly adjacent property, across Sepulveda Boulevard, is developed with a one-story gas station in the C2-1 (commercial) Zone.

   Sepulveda Boulevard is a designated major highway dedicated 100 feet in width and is fully improved with curbs, gutters and sidewalks.

National Boulevard is a designated secondary highway dedicated 85 feet in width and is improved with curbs, gutters and sidewalks.

A fully improved 20-foot-wide alley extends along the northerly property line of the subject property.

Previous cases, affidavits, permits, etc.:

Case No. ZV 83-143 was granted July 6, 1983 to permit the conversion of 8,800 square feet of a 22,000-square-foot office building to medical offices with 12 of the required 68 parking spaces secured by a 10-year lease agreement instead by agreement.

The Department of Building and Safety issued a building permit on the subject property in 1982 for the construction of a two-story, office building (approximately 22,000 feet) with 56 parking spaces.

Case No. ZAI 82-142E was approved by the Zoning Administrator in 1982 to allow the sale and consumption of alcoholic beverages on the property where the lease parking spaces are.

It is the applicant's intent to establish and maintain an unmanned cellular telephone facility to transmit and receive signals from remote cellular telephone clients in the Los Angeles basin. The facility will consist of a 608 square-foot office situated on the second floor of an existing three-story commercial office building.

Sixteen grid panel antennas, consisting of four banks of four antennas each, will be located on the roof of the structure with a group directed to the north, south, east and west, a 2-foot microwave dish is on the south side. All the antennas are directed toward the two major streets away from the residential area.

Cellular technology has stringent locational requirements. For the cellular network to be viable and to service the community, City and region, cell sites must be placed in strategic locations. The subject site is needed to help complete the network and to provide additional coverage to the West Los Angeles and Century City communities.

The proposal to use an area in a three-story office building as a remote transmitter site with antenna mounted on the roof is only permitted in the industrial zone or by a conditional use permit under Section 12.24-C,1.0 of the Los Angeles Municipal Code. The property is in the C2-1VL Zone and has subterranean parking.

It is recognized that due to the unique service of a quasi public use in the establishing of a mobile telephone communication system, it is not always possible to locate the necessary antennas (with the transmission range) in the proper zone classification.

The adopted West Los Angeles-Century City-Rancho Park designates the subject property for Community commercial land uses corresponding to the C2 (commercial) Zone. The said communication will not affect the use of the office building nor change the facility except for rectangular antennas on the side of the building along the parapet.

Pac Tel Cellular is a public utility needing a site to complete the communication network and is serving the mobile telephone needs of the community. Since conditional uses are special needs not indicated on the General Plan, it is determined that having an unmanned relay electronic system in the office building will not adversely affect any element of the General Plan inasmuch as the basic use of the property is consistent with the General Plan and the matter at issue is not dealt with directly in any adopted General Plan element.

2. The applicant has submitted plans indicating that the four grid panel (antel) antenna units located on the roof and directed in each of the four directions. The antennas would extend above the roof line 3-1/2 feet. At the public hearing on April 18, 1991 there was concern about the height and obvious appearance of the antennas extended above the roof line. The applicant explained that the 7-foot high parapet wall sloped inward, but could attach the antennas on the parapet below the parapet line to minimize their appearance.

One back up small microwave dish antenna 2 feet in diameter will also be mounted on the parapet for emergency purposes on the south side facing National Boulevard.

The cellular telephone facility on the site will be unmanned except for periodic equipment checks and maintenance; and, in these circumstances, will not increase the number of employees or traffic generated by the existing use on the site to any significant degree.

The proposed cellular telephone facility will have the electronic equipment housed within the one office, near the antenna. The electronic equipment will not be visible from other properties or even from within the subject building. The grid panel's 3-1/2 by 2-foot antennas by necessity must be visible. However, these small antennas will be located on the roof toward the street and away from the single-family homes and along the parapet will not be noticeable other than as a roof decoration. The microwave will be the most identifiable, but will be directed toward the shopping center (Savon/Vons) across the street.

The applicant, Pac Tel Cellular, has acquired a lease for a 608.60-square-foot suite no. 208 (see copy attached to file) for the purpose of developing the cellular telephone facility. There are three positions on the roof structure where the 4 feet by 1 inch by 10 feet antennas and one 2-foot microwave dish will be located. The antennas extend approximately 3 feet 6 inches above

the roof parapet. The location of the antennas will not obstruct the views of the surrounding properties nor should the antennas present any other problem related to the General Plan that is silent on the issue or be detrimental to the immediate neighborhood.

Therefore, as described previously the antennas not being above the height of the building and with the conditions imposed, it is determined that the grantinfg of such variance will not be materially detrimental to the public welfare, or injurious to the property or improvements in the same zone or vicinity in which the property is located.

On February 6, 1991, it was determined that the herein-involved request is categorically exempt from the environmental review process under the guidelines adopted for the implementation of the California Environmental Quality Act.

The Los Angeles flood hazard maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance 154,405, have been reviewed and it has been determined that this project is not located within one of the special hazard areas as defined therein.

William E. Lillenberg P.T.

WILLIAM E. LILLENBERG
Associate Zoning Administrator

WEL:lmc

cc: Director of Planning
County Assessor
Councilman Marvin Braude
Eleventh District
Adjoining Property Owners

CITY OF LOS ANGELES
CALIFORNIA

ROBERT JANOVICI
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RICHARD J. RIORDAN
MAYOR

DEPARTMENT OF
CITY PLANNING
CON HOWE
DIRECTOR

FRANKLIN P. EBERHARD
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221 NORTH FIGUEROA STREET
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LOS ANGELES, CA 90012-2601
(213) 580-5495
FAX: (213) 580-5569

July 2, 1997

AirTouch Cellular (A)
P.O. Box 19707
Irvine, CA 92713-9707

Jay McWhinney (O)
355 South Grand Avenue, #2600
Los Angeles, CA 90071

Stuart Courtice (R)
3 Park Plaza
Irvine, CA 92714

CASE NO. ZA 91-0204(CUZ)(PAD)
APPROVAL OF PLANS
2990 South Sepulveda Boulevard
West Los Angeles Planning Area
Zone : C2-1VL
D. M. : 120B157
C. D. : 11
CEQA : CE 97-0468
Fish and Game: Exempt
Legal Description: Portion of Lot 1,
Tract 14252

Department of Building and Safety

Pursuant to Los Angeles Municipal Code Sections 12.24-G and 12.24-D,5, I hereby APPROVE:

the intensification of an existing conditional use site to permit the construction, use and maintenance of additional wireless telecommunications facilities above 45 feet in height,

upon the following additional terms and conditions:

1. All other use, height and area regulations of the Municipal Code and all other applicable government/regulatory agencies shall be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

2. The use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibits "B" and "C", except as may be revised as a result of this action.

3. The authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to impose additional corrective conditions, if, in the Administrator's opinion, such conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

Recyclable and made from recycled waste

4. The approved facility shall consist of a fourth panel antennae approximately 4.5 feet in height and 6 inches in width on each of three existing sectors. The antennae shall not exceed a maximum height of 48 feet above grade and shall be maintained in a uniform white or grey color.

5. One GPS and one Loran antenna are authorized on the roof.

6. The applicant shall install the facility only after obtaining applicable building permits.

7. The facility shall comply with Federal Communication Commission regulations concerning radio frequency emissions.

8. Upon termination of the use, the facility shall be removed.

9. The grant clause and all conditions of approval shall be provided in the "Notes" portion on the building plans submitted to the Zoning Administrator and the Department of Building and Safety.

10. Prior to the issuance of any permits relative to this matter, an acknowledgement and agreement to comply with all the terms conditions established herein shall be recorded in the County Recorder's Office. The agreement shall run with the land and shall be binding on any subsequent owners, heirs or assigns. The agreement must be submitted to the Zoning Administrator for approval before being recorded. After recordation, a copy bearing the Recorder's number and date shall be provided to the Zoning Administrator for attachment to the subject case file.

OBSERVANCE OF CONDITIONS - TIME LIMIT - LAPSE OF PRIVILEGES - TIME EXTENSION

All terms and conditions of the approval shall be fulfilled before the use may be established. The instant authorization is further conditional upon the privileges being utilized within two years after the effective date of approval and, if such privileges are not utilized or substantial physical construction work is not begun within said time and carried on diligently to completion, the authorization shall terminate and become void. A Zoning Administrator may extend the termination date for one additional period not to exceed one year, if a written request is filed therefore with a public Office of the Department of City Planning setting forth the reasons for said request and a Zoning Administrator determines that good and reasonable cause exists therefore.

TRANSFERABILITY

This authorization runs with the land. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent that you advise them regarding the conditions of this grant.

VIOLATIONS OF THESE CONDITIONS, A MISDEMEANOR

Section 12.24-J,3 of the Los Angeles Municipal Code provides:

> "It shall be unlawful to violate or fail to comply with any requirement or condition imposed by final action of the Zoning Administrator, Board or Council pursuant to this subsection. Such violation or failure to comply shall constitute a violation of this Chapter and shall be subject to the same penalties as any other violation of this Chapter."

Every violation of this determination is punishable as a misdemeanor and shall be punishable by a fine of not more than $1,000 or by imprisonment in the county jail for a period of not more than six months, or by both such fine and imprisonment.

APPEAL PERIOD - EFFECTIVE DATE

The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. THE ZONING ADMINISTRATOR'S DETERMINATION IN THIS MATTER WILL BECOME EFFECTIVE AFTER JULY 17, 1997, UNLESS AN APPEAL THEREFROM IS FILED WITH THE BOARD OF ZONING APPEALS. IT IS STRONGLY ADVISED THAT APPEALS BE FILED EARLY DURING THE APPEAL PERIOD AND IN PERSON SO THAT IMPERFECTIONS/ INCOMPLETENESS MAY BE CORRECTED BEFORE THE APPEAL PERIOD EXPIRES. ANY APPEAL MUST BE FILED ON THE PRESCRIBED FORMS, ACCOMPANIED BY THE REQUIRED FEE AND RECEIVED AND RECEIPTED AT A PUBLIC OFFICE OF THE DEPARTMENT OF CITY PLANNING ON OR BEFORE THE ABOVE DATE OR THE APPEAL WILL NOT BE ACCEPTED. SUCH OFFICES ARE LOCATED AT:

Los Angeles City Hall
200 North Spring Street
Room 460, Counter S
Los Angeles, CA 90012
(213) 485-7826

6251 Van Nuys Boulevard
First Floor
Van Nuys, CA 91401
(818) 756-8596

NOTICE

THE APPLICANT IS FURTHER ADVISED THAT ALL SUBSEQUENT CONTACT WITH THIS OFFICE REGARDING THIS DETERMINATION MUST BE WITH THE ZONING ADMINISTRATOR WHO ACTED ON THE CASE. THIS WOULD INCLUDE CLARIFICATION, VERIFICATION OF CONDITION COMPLIANCE AND PLANS OR BUILDING PERMIT APPLICATIONS, ETC., AND SHALL BE ACCOMPLISHED BY APPOINTMENT ONLY, IN ORDER TO ASSURE THAT YOU RECEIVE SERVICE WITH A MINIMUM AMOUNT OF WAITING. YOU SHOULD ADVISE ANY CONSULTANT REPRESENTING YOU OF THIS REQUIREMENT AS WELL.

BASIS FOR CONDITIONAL USE PERMITS

A particular type of development is subject to the conditional use process because it has been determined that such use of property should not be permitted by right in a particular zone. All uses requiring a conditional use permit from the Zoning Administrator are located within Section 12.24-C of the Los Angeles Municipal Code. Expansions or intensifications of such conditional use are permitted pursuant to the provisions of Section 12.24-G of the Code. In order for a particular request to be authorized, certain designated findings have to be made.

FINDINGS

In order for an intensification of an existing conditional use permit for wireless telecommunications facilities to be approved the mandated findings delineated in Municipal Code Section 12.24-C must be made in the affirmative. Following (highlighted) is a delineation of the findings and the application of the relevant facts to same:

1. **The proposed location will be desirable to the public convenience or welfare.**

   The applicant provides cellular telephone service throughout the Los Angeles area. The proposed location was originally selected by the applicant in 1991 due to ideal distances between other existing and proposed telecommunications facilities in the applicant's network, projected communication deficiencies in the general vicinity and limitations imposed by alternative sites such as height, line of sight or buildings which may shadow the signals. In the interim period of time, cellular telephone volume has increased significantly and the facility no longer has the capacity to accommodate continued growth.

   The three proposed panel antennae are infill among the existing 12 antennae so that they will be substantially insignificant as viewed from ground level.

   The site provides a desirable location which has met the locational criteria until now. The modest grant authorized herein is responsive to the scale and character of the area and recognizes a limit to what can be termed "appropriate" development. The proposed location is therefore as good a location as may be available in the area given the low building heights which are typical of the neighborhood.

   The proposed facilities will not interfere with other telephone or electrical operations on the property or in the area. Access to the equipment room within the second floor of the building by maintenance personnel will be no different than access to any other mechanical facility on the property and not likely to occur more than once each month. Likewise, any inspection of the three proposed antennae will not interfere with the daily activities of the general public.

2. **The location is proper in relation to adjacent uses or the development of the community.**

The limited grant herein will not be offensive to the general public nor to the customers or employees of the subject building. There will be no impact to adjacent uses in terms of traffic generation, television reception nor should visual impacts be as significant. The specific locations approved herein will not result in visual distraction to motorists nor substantial architectural blemish.

There should be no cause for health concerns as the Federal Telecommunications Act of 1996, effective February 8, 1996, has legislated that radio frequency emissions are not within the purview of local or state agencies as long as the facility complies with Federal Communication Commission regulations concerning such emissions. As a land use and zoning matter, the Zoning Administrator hereby determines that the location is proper based upon the slender design of the antennae, their required setbacks on the roof and the application of an unobtrusive color paint.

3. **The use will not be materially detrimental to the character of the development in the immediate neighborhood**.

The project as proposed by the applicant will intensify the communications facilities already in place on the roof of the building and will be visible as shown in elevation drawings. The grant, as conditioned, provides sufficient physical parameters to make the desired upgrade of the site worthwhile. There does not appear to be a more effective resolution of disguising the antennae.

The minimal anticipated traffic generation and the lack of any known health or other hazards associated with such use render it non-detrimental to the area's character. As conditioned, there should be minimal diminution of views from surrounding properties. Minimizing the antennae from view is important as there are an increasing number of such installations throughout the city and the visual clutter produced by such facilities, if not mitigated, will be substantial. The equipment room is internal to the building and is therefore not a land use issue.

4. **The proposed location will be in harmony with the various elements and objectives of the General Plan**.

The subject building is three stories in height and measures 42 feet in height. The West Los Angeles Plan Map designates the subject property for Commercial land uses; the existing C2-1VL Zone classification of the property is consistent with this designation. The proposed use is not referenced in the Plan Text but is permitted, pursuant to the Municipal Code, as a conditional use in the "C" Zones where the Zoning Administrator can make the appropriate findings. As conditioned, I hereby find that the location and use are sensitive to the scale of development in the neighborhood and will not detract from maintaining economic stability in the commercial frontage along Sepulveda Boulevard as well as the low density residential area abutting the property which is consistent with the articulated goals and objectives of the Plan. The proposed antennae will not exceed the height of the 12 existing antennae.

ADDITIONAL MANDATORY FINDINGS

5. The subject property is not located in an area for which a flood insurance rate map has been prepared.

6. On June 2, 1997, the subject project was issued a Notice of Exemption (Article III, Section 3, City CEQA Guidelines), log reference CE 97-0468, for a Categorical Exemption, Class 11, Category 6. City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. I hereby certify that action.

7. Fish and Game: The subject project, which is located in Los Angeles County, will not have an impact on fish or wildlife resources or habitat upon which fish and wildlife depend, as defined by California Fish and Game Code Section 711.2.

DANIEL GREEN
Associate Zoning Administrator

DG:lmc

cc: Councilmember Cindy Miscikowski
Eleventh District
Adjoining Property Owners
County Assessor

CITY OF LOS ANGELES
CALIFORNIA

ROBERT JANOVICI
CHIEF ZONING ADMINISTRATOR

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RICHARD J. RIORDAN
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May 5, 1999

Dennis Lowry (A)
AirTouch Cellular
3 Park Plaza
Irvine, CA 92713

Northern Trust Bank,
Trustee of MF Trust #1 (O)
355 South Grand Avenue, #2800
Los Angeles, CA 90071

Gil Castro (R)
711 Mission Street, #B
South Pasadena, CA 91030

CASE NO. ZA 91-0204(CUZ)(PAD)
SECOND APPROVAL OF PLANS
2990 South Sepulveda Boulevard
West Los Angeles Planning Area
Zone : C2-1VL
D. M. : 120B157
C. D. : 11
CEQA : CE 99-0268-PAD
Fish and Game: Exempt
Legal Description: See attached on Site Plan

Department of Building and Safety

Pursuant to Los Angeles Municipal Code Sections 12.24-D,5, F and G, I hereby APPROVE:

an Approval of Plans to permit the modification of an existing conditional use site for wireless telecommunications facilities originally approved under Case No. ZA 91-0204(CUZ) on May 10, 1991, and modified on July 2, 1997, under Case No. ZA 91-0204(CUZ)(PAD),

upon the following additional terms and conditions:

1. All other use, height and area regulations of the Municipal Code and all other applicable government/regulatory agencies shall be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

2. The use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibit "B", except as may be revised as a result of this action.

Recyclable and made from recycled waste.

3. The authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to impose additional corrective conditions, if, in the Administrator's opinion, such conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

4. All graffiti on the roof shall be removed or painted over in the same color as the surface to which it is applied within 24 hours of its occurrence.

5. The instant grant authorizes the existing 2-foot diameter microwave dish antenna to be replaced with a 4-foot diameter microwave dish antenna at the same location.

6. The antenna shall match the color of the parapet walls.

7. The applicant shall install the facility only after obtaining applicable building permits.

8. The facility shall comply with Federal Communication Commission regulations concerning radio frequency emissions.

9. Upon termination of the use authorized herein, the approved facilities shall be completely removed.

10. Page 1 of the grant and all conditions of approval shall be printed on the building plans submitted to the Zoning Administrator and the Department of Building and Safety.

11. Prior to the issuance of any permits relative to this matter, a covenant acknowledging and agreeing to comply with all the terms conditions established herein shall be recorded in the County Recorder's Office. The agreement shall run with the land and shall be binding on any subsequent owners, heirs or assigns. The agreement must be submitted to the Zoning Administrator for approval before being recorded. After recordation, a copy bearing the Recorder's number and date shall be provided to the Zoning Administrator for attachment to the subject case file.

OBSERVANCE OF CONDITIONS - TIME LIMIT - LAPSE OF PRIVILEGES - TIME EXTENSION

All terms and conditions of the approval shall be fulfilled before the use may be established. The instant authorization is further conditional upon the privileges being utilized within two years after the effective date of approval and, if such privileges are not utilized or substantial physical construction work is not begun within said time and carried on diligently to completion, the authorization shall terminate and become void. A Zoning Administrator may extend the termination date for one additional period not to

exceed one year, if a written request on appropriate forms, accompanied by the applicable fee is filed therefore with a public Office of the Department of City Planning setting forth the reasons for said request and a Zoning Administrator determines that good and reasonable cause exists therefore.

TRANSFERABILITY

This authorization runs with the land. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent that you advise them regarding the conditions of this grant.

VIOLATIONS OF THESE CONDITIONS, A MISDEMEANOR

Section 12.24-J,3 of the Los Angeles Municipal Code provides:

> "It shall be unlawful to violate or fail to comply with any requirement or condition imposed by final action of the Zoning Administrator, Board or Council pursuant to this subsection. Such violation or failure to comply shall constitute a violation of this Chapter and shall be subject to the same penalties as any other violation of this Chapter."

Every violation of this determination is punishable as a misdemeanor and shall be punishable by a fine of not more than $1,000 or by imprisonment in the county jail for a period of not more than six months, or by both such fine and imprisonment.

APPEAL PERIOD - EFFECTIVE DATE

The applicant's attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. THE ZONING ADMINISTRATOR'S DETERMINATION IN THIS MATTER WILL BECOME EFFECTIVE AFTER MAY 20, 1999, UNLESS AN APPEAL THEREFROM IS FILED WITH THE BOARD OF ZONING APPEALS. IT IS STRONGLY ADVISED THAT APPEALS BE FILED EARLY DURING THE APPEAL PERIOD AND IN PERSON SO THAT IMPERFECTIONS/ INCOMPLETENESS MAY BE CORRECTED BEFORE THE APPEAL PERIOD EXPIRES. ANY APPEAL MUST BE FILED ON THE PRESCRIBED FORMS, ACCOMPANIED BY THE REQUIRED FEE AND RECEIVED AND RECEIPTED AT A PUBLIC OFFICE OF THE DEPARTMENT OF CITY PLANNING ON OR BEFORE THE ABOVE DATE OR THE APPEAL WILL NOT BE ACCEPTED. SUCH OFFICES ARE LOCATED AT:

Figueroa Plaza
201 North Figueroa Street, #300

6251 Van Nuys Boulevard
First Floor

Los Angeles, CA 90012
(213) 977-6083

Van Nuys, CA 91401
(818) 756-8596

NOTICE

THE APPLICANT IS FURTHER ADVISED THAT ALL SUBSEQUENT CONTACT WITH THIS OFFICE REGARDING THIS DETERMINATION MUST BE WITH THE ZONING ADMINISTRATOR WHO ACTED ON THE CASE. THIS WOULD INCLUDE CLARIFICATION, VERIFICATION OF CONDITION COMPLIANCE AND PLANS OR BUILDING PERMIT APPLICATIONS, ETC., AND SHALL BE ACCOMPLISHED BY APPOINTMENT ONLY, IN ORDER TO ASSURE THAT YOU RECEIVE SERVICE WITH A MINIMUM AMOUNT OF WAITING. YOU SHOULD ADVISE ANY CONSULTANT REPRESENTING YOU OF THIS REQUIREMENT AS WELL.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, all of which are by reference made a part hereof, as well as knowledge of the property and the surrounding district, I find as follows:

BASIS FOR CONDITIONAL USE PERMITS

A particular type of development is subject to the conditional use process because it has been determined that such use of property should not be permitted by right in a particular zone. Wireless telecommunications facilities require a conditional use permit from the Zoning Administrator pursuant to Section 12.24-C,18 of the Los Angeles Municipal Code. In order for a modification of a previously granted conditional use permit to be considered, the applicant may file an Approval of Plans request in which the same findings have to be made as for the original approval.

FINDINGS

Following (highlighted) is a delineation of the findings and the application of the relevant facts to same:

1. **The proposed location will be desirable to the public convenience or welfare.**

   The property was originally granted a conditional use permit for the construction, use and maintenance of a wireless telecommunications facility on the roof of the building pursuant to Case No. ZA 91-0204(CUZ) on May 10, 1991. The subject location was selected by the applicant due to ideal distances between other existing and proposed facilities in the applicant's network, projected communication deficiencies in the general vicinity and limitations imposed by alternative sites such as height, line of sight or buildings which may shadow the signals. The instant request is intended by the applicant to upgrade the

communications system to adequately handle telephone volume and connectivity between this and other sites. The underlying grant authorized a 2-foot diameter microwave dish and four sets of panel antennae. The applicant seeks only to replace the existing dish with a 4-foot diameter dish at the same location. There are no buildings of sufficient height in the neighborhood which provide a superior alternative to the roof of this three-story office building roof site. While the antenna will be 2 feet greater in diameter than previously approved, it will be set back 8 feet from the inside parapet and 18 from the vertical edge of the building wall adjacent to National Boulevard, and 26 feet and 36, respectively, from the Sepulveda Boulevard frontage. The proposed facilities will not interfere with other telephone or electrical operations on the property or in the area. Access to existing equipment will not be affected and is not likely to occur any more often than in the past. Likewise, any inspection of the antenna will not interfere with the daily activities of the general public and is not expected to occur on a frequent basis.

2. **The location is proper in relation to adjacent uses or the development of the community**.

The applicant's request will not be offensive to the general public nor to the tenants of the building. There will be no impact to adjacent uses in terms of traffic generation, television reception nor should visual impacts be significant. The specific location proposed for the antennae will not result in any visual distraction to motorists nor substantial architectural blemish. The current antenna setbacks remain. The matching color of the parapet should mitigate any distant views of the antenna.

There should be no cause for health concerns as the Federal Telecommunications Act of 1996, effective February 8, 1996, has legislated that radio frequency emissions are not within the purview of local or state agencies as long as the facility complies with Federal Communication Commission regulations concerning such emissions. As a land use and zoning matter, the Zoning Administrator hereby determines that the location is proper based upon the location, size and camouflage of the antenna.

3. **The use will not be materially detrimental to the character of the development in the immediate neighborhood**.

The minimal anticipated traffic generation and the lack of any known health or other hazards associated with such use render it non-detrimental to the area's character. The C2-1VL Zone establishes a 45-foot height limit. The top of the antenna will be 46 feet in height, or 1-foot over the height limit. This is minimal, given the size of the antenna with respect to the 104-foot length of the building. There does not appear to be any loss of scenic view from surrounding properties. Minimizing the antenna from view is important as there are an

increasing number of such installations throughout the city and the visual clutter produced by such facilities, if not mitigated, could be substantial.

4. **The proposed location will be in harmony with the various elements and objectives of the General Plan.**

The West Los Angeles Plan Map designates the subject property for Community Commercial land uses for which the C2 Zone is a corresponding zone. The Plan limits height to Height District No. 1 which is a floor area limitation; absolute height is not restricted. The proposed use is not referenced in the Plan Text but is permitted, pursuant to the Municipal Code, as a conditional use in the C2 Zone where the Zoning Administrator can make the appropriate findings. As conditioned, I hereby find that the proposed enlarged antenna is sensitive to the subject and adjacent land uses and to the articulated goals and objectives of the Plan.

ADDITIONAL MANDATORY FINDINGS

5. The subject property is not located in an area for which a flood insurance rate map has been prepared.

6. On March 25, 1999, the subject project was issued a Notice of Exemption (Article III, Section 3, City CEQA Guidelines), log reference CE 99-0268-PAD, for a Categorical Exemption, Class 3, Category 4. City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. I hereby certify that action.

7. Fish and Game: The subject project, which is located in Los Angeles County, will not have an impact on fish or wildlife resources or habitat upon which fish and wildlife depend, as defined by California Fish and Game Code Section 711.2.

DANIEL GREEN
Associate Zoning Administrator
Direct Telephone No. (213) 580-5489

DG:lmc

cc: Councilmember Cindy Miscikowski
Eleventh District
Adjoining Property Owners
County Assessor

EXHIBIT 1-D

CITY OF LOS ANGELES
CALIFORNIA

ROBERT JANOVICI
CHIEF ZONING ADMINISTRATOR

ASSOCIATE ZONING ADMINISTRATORS
R. NICOLAS BROWN
EMILY J. GABEL-LUDDY
DANIEL GREEN
LOURDES GREEN
DAVID KABASHIMA
ALBERT LANDINI
LEONARD S. LEVINE
JON PERICA
SARAH RODGERS

RICHARD J. RIORDAN
MAYOR

DEPARTMENT OF
CITY PLANNING
CON HOWE
DIRECTOR

FRANKLIN P. EBERHARD
DEPUTY DIRECTOR

OFFICE OF
ZONING ADMINISTRATION
221 NORTH FIGUEROA STREET
ROOM 1500
LOS ANGELES, CA 90012-2601
(213) 580-5495
FAX: (213) 580-5569

August 8, 2001

Cox PCS (A)
Sprint PCS
4683 Chabot Drive, #100
Pleasanton, CA 94588

Robert Carlblom, 2nd V.P. (0)
Northern Trust Bank of California, N.A.
620 Newport Beach, CA 92660
Newport Beach, CA 92660

Vance Pomeroy (R)
JM Consulting Group
2716 Ocean Park Boulevard, #3088
Santa Monica, CA 90405

Department of Building and Safety

CASE NO. ZA 2001-5488(CU)
CONDITIONAL USE
2990 South Sepulveda Boulevard
West Los Angeles Planning Area
Zone : C2-1VL
D. M. : 120B157
C.D. : 11
CEQA : ENV 2001-5489-CE
Fish and Game : Exempt
Legal Description : A part of 120.17 ac. Allotment of Pedro Talamantes/ RO. La Ballona

Pursuant to Los Angeles Municipal Code Section 12.24-W,49, I hereby APPROVE:

a Conditional Use Permit, to permit the installation, use and maintenance of an unmanned wireless telecommunications facility on the roof of an existing three-story office building,

upon the following additional terms and conditions:

1. All other use, height and area regulations of the Municipal Code and all other applicable government/regulatory agencies shall be strictly complied with in the development and use of the property, except as such regulations are herein specifically varied or required.

2. The use and development of the property shall be in substantial conformance with the plot plan submitted with the application and marked Exhibit "A", except as may be revised as a result of this action.

3. The authorized use shall be conducted at all times with due regard for the character of the surrounding district, and the right is reserved to the Zoning Administrator to

impose additional corrective conditions, if, in the Administrator's opinion, such conditions are proven necessary for the protection of persons in the neighborhood or occupants of adjacent property.

4. All graffiti on the site shall be removed or painted over to match the color of the surface to which it is applied within 24 hours of its occurrence.

5. A copy of the first page of this grant and all conditions and/or any subsequent appeal of this grant and its resultant conditions and/or letters of clarification shall be included in the "notes" portion of the building plans submitted to the Zoning Administrator and the Department of Building and Safety for purposes of having a building permit issued.

6. The subject antennas and cabinets shall be subject to the following:

   a. There shall be a maximum of 12 panel antennas in three sectors not to exceed the height of the building parapet.

   b. The antennas on Sectors A and C shall be incorporated within the existing mansard roof and shall not be visible.

   c. The antennas on Sector B shall not be visible and shall be located within a dormer structure incorporated into the mansard roof constructed to match the materials of the mansard roof.

   d. The eight equipment cabinets and two GPS antennas shall be located east of the central light well on the roof and shall not exceed the height of the existing building parapet.

7. All applicable laws, regulations and standards of all local, State and Federal government agencies shall be observed.

8. The antennas and other electronic equipment shall be installed and constructed pursuant to a valid City of Los Angeles building permit.

9. The applicant's facility shall not interfere with TV, radio or cordless phone reception or exceed limits established by the FCC.

10. Should the use of the approved antennas and equipment cabinets cease, they shall be removed to the satisfaction of the Department of Building and Safety.

OBSERVANCE OF CONDITIONS ▪ TIME LIMIT ▪ LAPSE OF PRIVILEGES ▪ TIME EXTENSION

All terms and conditions of the approval shall be fulfilled before the use may be established. The instant authorization is further conditional upon the privileges being utilized within two years after the effective date of approval and, if such privileges are not utilized or substantial physical construction work is not begun within said time and carried on diligently to completion, the authorization shall terminate and become void. A Zoning

Administrator may extend the termination date for one additional period not to exceed one year, if a written request on appropriate forms, accompanied by the applicable fee is filed therefore with a public Office of the Department of City Planning setting forth the reasons for said request and a Zoning Administrator determines that good and reasonable cause exists therefore.

TRANSFERABILITY

This authorization runs with the land. In the event the property is to be sold, leased, rented or occupied by any person or corporation other than yourself, it is incumbent upon you advise them regarding the conditions of this grant.

VIOLATIONS OF THESE CONDITIONS, A MISDEMEANOR

Section 12.29 of the Los Angeles Municipal Code provides:

> "If any portion of a privilege authorized by a variance or conditional use is utilized, the conditions of the variance or conditional use authorization immediately become effective and must be strictly complied with. The violation of any valid condition imposed by the Administrator, Board or Commission in connection with the granting of any variance, approval of a conditional use or other action pursuant to the authority of this chapter, shall constitute a violation of this chapter and shall be subject to the same penalties as any other violation of this Code."

Every violation of this determination is punishable as a misdemeanor and shall be punishable by a fine of not more than $1,000 or by imprisonment in the county jail for a period of not more than six months, or by both such fine and imprisonment.

APPEAL PERIOD - EFFECTIVE DATE

The applicants attention is called to the fact that this grant is not a permit or license and that any permits and licenses required by law must be obtained from the proper public agency. Furthermore, if any condition of this grant is violated or if the same be not complied with, then the applicant or his successor in interest may be prosecuted for violating these conditions the same as for any violation of the requirements contained in the Municipal Code. The Zoning Administrator's determination in this matter will become effective after AUGUST 23, 2001, unless an appeal therefrom is filed with the City Planning Department. It is strongly advised that appeals be filed early during the appeal period and in person so that imperfections/incompleteness may be corrected before the appeal period expires. Any appeal must be filed on the prescribed forms, accompanied by the required fee, a copy of the Zoning Administrators action, and received and receipted at a public office of the Department of City Planning on or before the above date or the appeal will not be accepted. Such offices are located at:

Figueroa Plaza
201 North Figueroa Street, #300
Los Angeles, CA 90012
(213) 977-6083

6251 Van Nuys Boulevard
First Floor
Van Nuys, CA 91401
(818) 756-8596

The time in which a party may seek judicial review of this determination is governed by California Code of Civil Procedure Section 1094.6. Under that provision, a petitioner may seek judicial review of any decision of the City pursuant to California Code of Civil Procedure Section 1094.5, only if the petition for writ of mandate pursuant to that section is filed no later than the 90th day following the date on which the City's decision becomes final.

NOTICE

The applicant is further advised that all subsequent contact with this office regarding this determination must be with the Zoning Administrator who acted on the case. This would include clarification, verification of condition compliance and plans or building permit applications, etc., and shall beaccomplished **BY APPOINTMENT ONLY**, in ordertoassure that you receive service with a minimum amount of waiting. You should advise any consultant representing you of this requirement as well.

FINDINGS OF FACT

After thorough consideration of the statements contained in the application, the plans submitted therewith, the report of the Zoning Analyst thereon, the statements made at the public hearing on May 31, 2001, all of which are by reference made a part hereof, as well as knowledge of the property and surrounding district, I find that the requirements for authorizing a conditional use permit under the provisions of Section 12.24-W have been established by the following facts:

BACKGROUND

The subject property is a level, irregular-shaped, corner/through, parcel of land, consisting of .28 net acres, having a frontage of 100 feet on the east side of Sepulveda Boulevard and 100 feet on the north side of National Boulevard. The subject site is developedwith a three-story office building with subterranean parking.

Sprint PCS has chosen this location based on its requirements to provide seamless wireless telecommunications service in this area. The antenna installation as originally proposed would have located on the rooftop in and among the other previously installed wireless facilities. However, subsequent to the public hearing, the proposed facility has been modified to be to be incorporated within the building mansard roof and a new roof dormer so as to not be visible. Photo simulations illustrate that the antennas and equipment cabinets will not be visible.

Surrounding properties are within the C2-1VL and R4P-1 Zones and are characterized by level topography and improved streets. The surrounding properties are developed with a shopping center, Ross Department store and a variety of commercial retail stores.

Adjoining property to the north across the alley is zoned C2-1VL and is developed with a one-story commercial building occupied by the Bank of America. Beyond that is a vacant commercial building.

Adjoining property to the south across National Boulevard is zoned C2-1VL and developed with a shopping center.

Adjoining property to the east of the subject site is zoned C2-1VL and is developed with a one-story commercial building occupied by Crest Cleaners and Pet Depot.

Adjoining property to the west across Sepulveda Boulevard is zoned C2-1VL and is developed with a mini-shopping center.

National Boulevard, adjoining the subject property to the south, is a designated Collector Street dedicated to a variable width of 80 to 85 feet and improved with curb, gutter and sidewalk.

Sepulveda Boulevard, adjoining the subject property to the west, is a designated Major Highway dedicated to a width of 100 feet and improved with curb, gutter and sidewalk.

The alley, adjoining the subject property to the north, is a through alley and is improved with asphalt pavement within a 20-foot dedication.

Previous zoning related actions on the site/in the area include:

Subject Property:

Case No. ZA 96-0686(CUZ) - On October 10, 1996, the Zoning Administrator approved a Conditional Use to permit the installation, use and maintenance of an unmanned telecommunications facility not to exceed a height of 50 feet 9 inches.

Case No. ZA 90-I 236(CUZ) - On April 4, 1991, the Zoning Administrator approved a Conditional Use to permit the establishment, use and maintenance of a cellular telephone cell site facility with three sets of four antennas on triangular frames and a variance to permit the three sets of antennas at a maximum height of 52 feet in the 1VL Height District in lieu of the permitted 45-foot height.

Case No. ZA 91-0204(CUZ) - On May 10, 1991, to authorize the installation and maintenance of a cellular telephone facility including an equipment room on a lower floor and with four sets of exterior antennas to be mounted on the building roof for the installation of four surface grip panels 2 by 3 feet each mounted on a roof mounted wall and four microwave dish antennae 2 feet in diameter similarly mounted on the south side of the building.

Surrounding Properties:

No similar or relevant cases were found on surrounding properties in the immediate neighborhood.

PUBLIC HEARING

A public hearing on the matter was held on May 31, 2001. The applicant's representative described the nature of the project and commented as follows:

- He does not have a copy of the propagation study but can submit it later.
- This is a facility to remedy a lack of coverage problem.
- They may be able to locate the antennas within the mansard structure but he would have to check with their engineers.

The representative of the Council Office commented as follows:

- The antennas should be wall mounted as there are already enough antennas on the roof.
- This especially applies to Sector C as it is most visible and cluttered with existing antennas.
- Sector B could be located within a dormer not to exceed the permitted height.

There was no public testimony for or against the subject request.

At the close of the public hearing, the Zoning Administrator indicated his intent to conditionally approve the request with the following requirements:

- Sector C and Sector A shall be located behind or within the mansard.
- Sector B will be located within a dormer to be built into the mansard roof,
- The applicant will submit elevations for Council Office and Zoning Administrator review.
- The applicant shall submit a propagation study.

The record was left open for three weeks to give the applicant an opportunity to submit the propagation study, new plans, photographic simulation and transmission angles. Subsequently, the applicant submitted revised plans and photo simulations with the antennas completely screened from visibility and not exceeding the 45-foot height limit. Later, the applicant also transmitted a propagation study showing the coverage deficiency in this area.

BASIS FOR CONDITIONAL USE PERMITS

A particular type of development is subject to the conditional use process because it has been determined that such use of property should not be permitted by right in a particular zone. All uses requiring a conditional use permit from the Zoning Administrator are located within Section 12.24-W of the Los Angeles Municipal Code. In order for to be authorized, certain designated findings have to be made.

FINDINGS

Following (highlighted) is a delineation of the findings and the application of the relevant facts to same:

1. **The proposed location will be desirable to the public convenience or welfare.**

   The requested use at the proposed location will provide reliable wireless telecommunications services to the businesses, patrons and residents in both the immediate and surrounding areas, as well as to the entire region. The proposed site, as part of the larger PCS network, will provide improved access to wireless communications in the event of emergencies (traffic accidents, crime reporting, etc.) and natural disasters (earthquakes, fires, etc.) by providing reliable wireless telecommunications in these situations. This service will provide both public safety entities and citizens with reliable, portable communications in the event of such emergencies. The proposed use will also provide a reliable and convenient means of communication for everyday personal and business use.

   The facility will serve its intended function without being unsightly or causing adverse impacts to surrounding properties. This site is critical to establishing a seamless high quality network for providing wireless telecommunications services to the region by correcting a coverage problem in that area.

2. **The location is proper in relation to adjacent uses or the development of the community.**

   The proposed location is completely surrounded by retail, office and parking uses. It is located at the intersection of two busy streets and a nearby freeway. The antenna facilities will be located on the roof of a three-story office building along with other co-located antenna facilities. The nearest residential building is over 100 feet away and is separated from the subject property by two alleys.

3. **The use will not be materially detrimental to the character of the development in the immediate neighborhood.**

   The character of the development in the immediate area is defined with predominantly commercial uses. No adverse impact to the character of the existing neighborhood would occur as a result of this wireless telecommunications facility. The use will not generate any smoke, odor or other adverse impacts to the adjacent land uses. It is an acceptable use and being unmanned, the proposed use requires no parking, and has no impact on traffic circulation or density.

   The applicant had originally proposed to locate the antennas on the roof, unscreened, and exceeding the height limit of the zone. That proposal would have added to the clutter of antennas already co-located on that roof. The applicant has agreed to locate the antennas within the existing mansard and a new dormer structure within the mansard. The subject antennas will be lower in height than any of the existing co-located antennas and does not exceed the height limits of the zoning. The antennas are completely screened and not visible to the adjacent

properties. The equipment cabinets are located away from the perimeter of the building, below the level of the parapet and, consequently, also not visible.

4. **The proposed location will be in harmony with the various elements and objectives of the General Plan.**

The overall goal of the General Plan, as implemented through the Zoning Ordinance is to provide an arrangement of land uses, circulation and services which will encourage and contribute to the health, safety, welfare and convenience of the people who live and work in this area.

The proposed project would not be in conflict with any provisions in the General Plan and would promote public health, safety and welfare by providing wireless telecommunications services to the area. PCS mobile phones are becoming a necessary emergency service device and business tool, as well as being convenient for personal and family use. Additionally, the proposed project will not adversely affect any element of the General Plan in that primary use and appearance of the subject site will remain unchanged. The proposed wireless telecommunications facility will be ancillary to the primary established use.

ADDITIONAL MANDATORY FINDINGS

5. The National Flood Insurance Program rate maps, which are a part of the Flood Hazard Management Specific Plan adopted by the City Council by Ordinance No. 154,405, have been reviewed and it has been determined that this project is located in Zone C, areas of minimal flooding. (No shading)

6. On January 3.2001, the subject project was issued a Notice of Exemotion (Article III, Section 3, City CEQA Guidelines), log reference ENV 2001-5489-CE, for a Categorical Exemption, Class 3, Category 4. City CEQA Guidelines, Article VII, Section 1, State EIR Guidelines, Section 15100. I hereby adopt that action.

7. Fish and Game: The subject project, which is located in Los Angeles County, will not have an impact on fish or wildlife resources or habitat upon which fish and wildlife depend, as defined by California Fish and Game Code Section 711.2.

DAVID KABASHIMA
Associate Zoning Administrator
Direct Telephone No. (213) 978-l 312

DK:lmc

cc: Councilmember Cindy Miscikowski
Eleventh District
Adjoining Property Owners
County Assessor

EXHIBIT 2

May 13, 2025

Dr. Jonathan L. Kramer, Esq.
Telecom Law Firm, PC
2708 Wilshire Blvd #330
Santa Monica, CA 90403

Reference: Proposed New Construction at 2930 Sepulveda Boulevard and its Effect on Existing Wireless Telecommunications Sites at the Mullikin Medical Center at 2990 Sepulveda Boulevard

Dear Dr. Kramer:

We have completed our review of the effect that a proposed new 6 story, 71-foot high residential development at 2930-2936 South Sepulveda Boulevard will have on existing telecommunications sites located adjacent at the Mullikin Medical Center, located at 2990 South Sepulveda Boulevard, and the hundreds of thousands of cellular phone service users who rely on this specific site for routine and emergency cell phone services at the I404/I10 interchange.

In order to provide a proper technical review of the proposed project's impact on public safety, we used the following information:

- the Notice of Public Hearing provided by the Los Angeles City Planning department;
- the PZA Resubmittal 3 (dated April 2, 2024) compiled by TCA Architects which contains annotated site plans, floor plans, roof plans, elevations, as well as computer renderings of the proposed development at 2930 Sepulveda Boulevard;
- T-Mobile As-Built Construction Plans (most recently dated February 25, 2025) depicting T-Mobile and Sprint wireless facilities on the roof of the Mullikin Medical Center prepared by Smartlink;
- DISH Wireless Construction Plans (most recently dated April 30, 2024) depicting proposed DISH Wireless facilities on the roof of the Mullikin Medical Center prepared by MD7;
- Data provided by CalTrans for traffic counts on the nearby I-10 and I-405 Freeways;
- FCC database information on T-Mobile wireless licenses for Los Angeles market; and
- The International Telecommunication Union (ITU) Publication "Recommendations for Prediction of building entry loss" (dated 08/2023).

The Google Earth Satellite photo below (Figure 1) shows the current building heights that are in the area northwest of Mullikin Medical Center (which is the existing building at the Northeast corner of Sepulveda Blvd. and National Blvd, and which physically support the existing wireless sites). The current height of the roof of the Mullikin Center is at 44'9". The green and red dots indicate the existing antenna locations for Verizon and T-Mobile, respectively. The planned Dish antennas are indicated with the blue dots. Currently, next door at 2930 S. Sepulveda, the former

Bank of America building is 22’ feet high. That lower height allows the RF signals from the antennas on the northwest roof face of the Mullikin Center to propagate northwest toward the I-405/I-10 interchange and freeway segments used by around a million vehicles/drivers each day.

Figure 1: Google Earth Satellite Photo of Site



Figure 2 is a plot of the expected coverage for 3 sector T-Mobile wireless facilities located on 2990 South Sepulveda Blvd. The salmon-colored areas of the plot indicate locations where there is good in-building wireless coverage (-90 dBm or better is considered a typical industry standard for urban areas) for the existing T-Mobile 700 MHz band signal.

Figure 2:

Existing 700 MHz T-Mobile Wireless Coverage



Figure 3 is a portion of the TCA Architects' rendition of the southern elevation of the proposed development which is the side facing the Mullikin Center.

Figure 3:

Southern Elevation of Proposed 2930 S. Sepulveda Blvd.



The ITU publication mentioned above provides internationally-accepted tools to predict the attenuating effect of RF signal attempting to pass through a building. Obviously, there are opportunities for variation since there are various building materials (glass, wood, brick, steel, sheetrock, etc.) as well as building layout (number of walls, doors, courtyards, etc.), but the ITU publication's "Figure 2" (our Figure 4 below) details probabilities of the signal loss at various transmission frequencies.

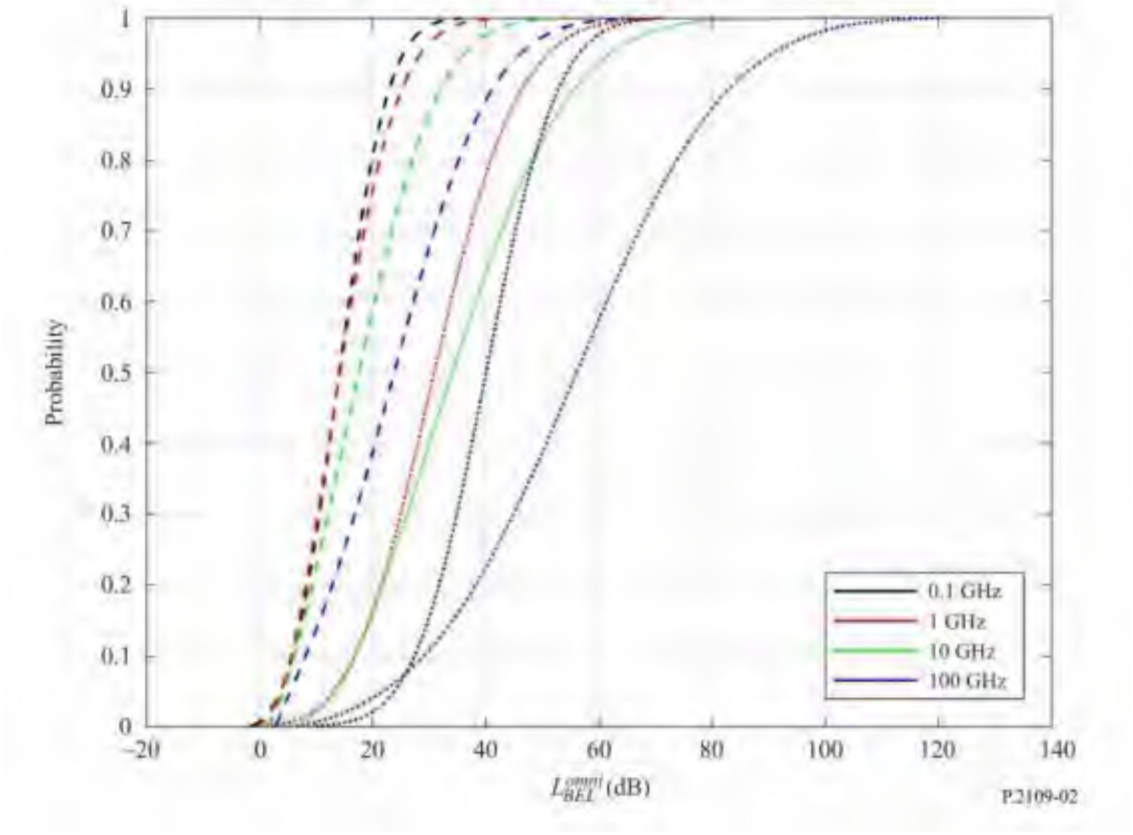
Figure 4:

"Figure 2" from ITUT-R P.2109-2

Rec. ITU-R P.2109-2

FIGURE 2

Building entry loss predicted at horizontal incidence
(Dashed line: Traditional, Dotted line: Thermally-efficient)

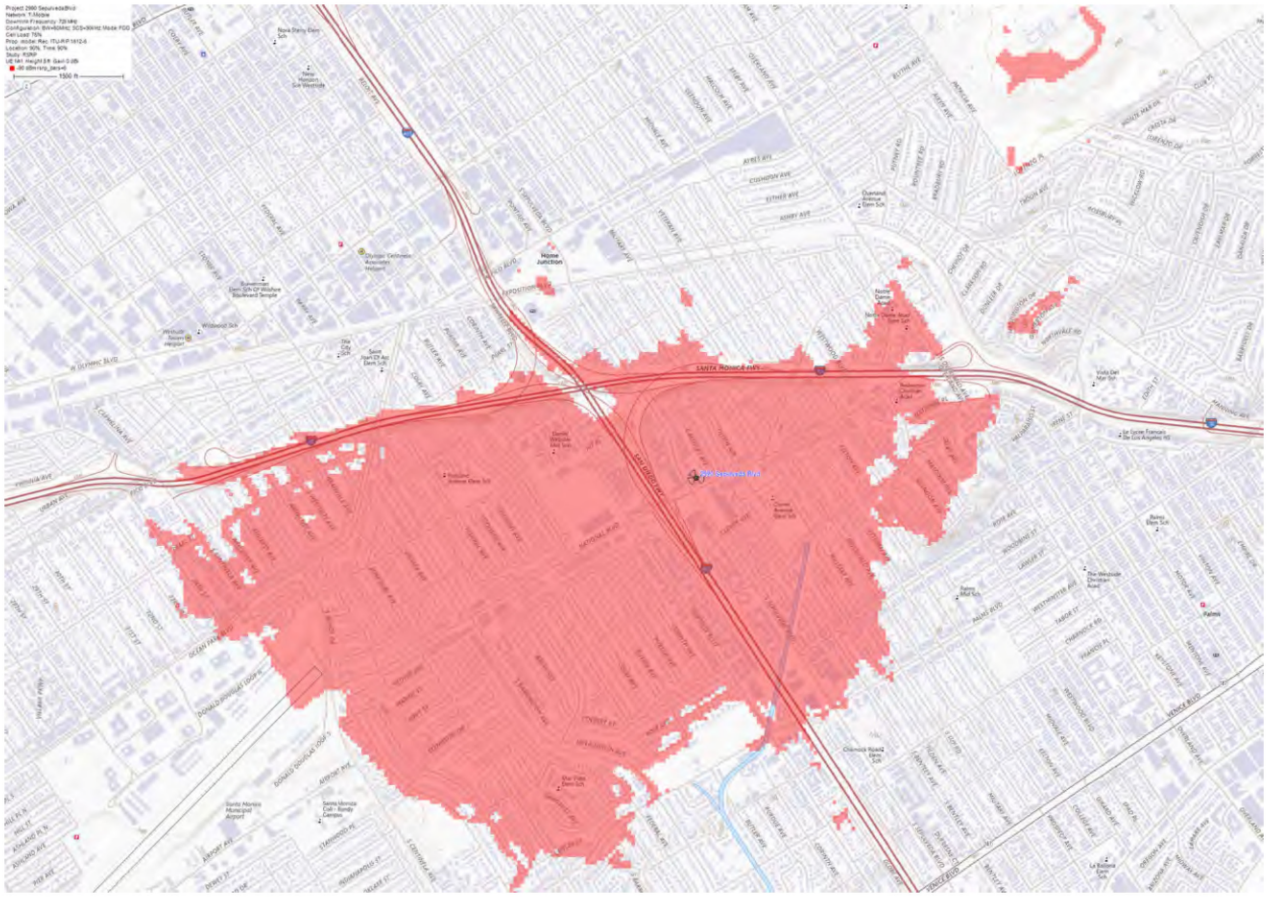


For the purposes of this review, and based on the frequencies used by T-Mobile (indicated by the dashed red line), the graph conservatively suggests that there is an even chance (50% or 0.5 probability) that the wireless spectrum (0.6-4 GHz) will have at least 10-12 dB of degradation of the signal which is sent in that direction. This means that for every 10 watts of power transmitted through a building, it is reasonable to expect that only a maximum of only 1 watt of power will remain after the transit. Thus, here is Figure 5, where we modified our existing 700 MHz T-Mobile Coverage with a 10 dB attenuation only in the northwest sector (which will be directly facing the 4th floor southern elevation of the proposed new development at 2930 Sepulveda).

Figure 5:

Projected 700 MHz T-Mobile Coverage with Proposed 2930 Sepulveda

(-10 dB Proposed Building Attenuation Loss in the Northwest Sector)



It is apparent that almost no signal meets -90 dBm requirement for good in-building coverage from the wireless site continues north past the I-10 freeway. This would also severely compromise wireless communications in-vehicle in the I-10 / I-405 freeway intersection corridor. According to CalTrans vehicle count data from 2022, the I405/I10 interchange handles over a million average vehicle trips a day, not to mention the associated arterial and local traffic, creating real possible public safety concerns in event of necessary emergency notifications for evacuation for natural disasters or emergency response plans.

If you have any questions regarding our findings or require additional analysis, please get in touch with me.

Regards,



Lee Afflerbach, P.E.
Project Manager and Principal Engineer



CTC MEDIA GROUP, INC

Wireless-LMR-Broadcast Engineering Services

Municipal Wireless Consultants

1202 Pollock Street | New Bern, NC 28560

CTC Media Group, INC
1202 Pollock Street • New Bern, NC 28560 • 252-633-1490

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Michael Breda | Systems Engineer 11
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CTC Media Group – Qualifications and Experience

CTC Media Group is an independent telecommunications consulting firm with over 20 years of experience assisting public sector clients with communications network and facilities engineering, design, and analysis. Our clients primarily are local governments, state agencies, public utilities, and nonprofits. CTC Media Group is independent of the industry and not affiliated with equipment manufacturers, cable operators, wireless providers, or tower companies.

Since 2002, CTC Media Group's wireless team has helped public agencies and utilities review and analyze applications for thousands of towers, colocations, small cells, and distributed antenna system deployments. Our expertise includes:

- Developing best practices in wireless siting to enable efficient deployment while protecting community interests.
- Reviewing and testing wireless facilities for compliance with FCC rules as well as the wireless industry's own best practices and standards in design and construction.
- Addressing technical challenges in wireless facility siting, including ADA violations, radio frequency (RF) interference, and unsightly deployment.
- Developing strategies to comply with state, federal, and local requirements and zoning considerations relating to wireless facilities.
- Reviewing wireless siting applications for zoning compliance, RF coverage, interference, and colocation opportunities.
- Developing local processes and standards that enable wireless facility deployment while protecting public interests and property.

Evaluating and vetting wireless facility siting applications

Our engineers analyze siting applications and RF studies to assess the accuracy of an applicant's-claimed technical service objectives, the extent to which proposed wireless sites are necessary to fill gaps in coverage or capacity, and the significance of such gaps. Analysis typically includes:

- Reviewing applications, including RF propagation studies or drive tests.
- Identifying colocation options in the vicinity of a proposed site.
- Considering options to minimize the visual or other community impact of a wireless facility, such as painting antennas to match a mounting location, requiring a stealth monopole design, or requiring that equipment meets local noise ordinances.

- Visiting and reviewing sites to evaluate community impact.
- Reviewing applications and requesting additional information, as necessary.
- Evaluating relevant reports, studies, public input, and other materials.
- Presenting findings to planning departments, counsel, and elected bodies.
- Preparing reports, maps, charts, documentation, or presentations to document findings and recommendations.

Developing technical and safety standards

Our engineering staff develops and helps enforce **technical standards to protect the public interest, public safety, public assets, and utility worker safety**, including through:

- Verifying compliance with FCC rules on RF emissions and related warning signage.
- Evaluating RF signal level to ensure non-interference with public safety, city, and utility wireless operations.

Developing processes to address preemption threats or comply with preemptive laws

In light of new and changing federal and state limitations on local authority over the placement of wireless facilities, including the FCC's 2018 *Small Cell Order*, CTC Media Group's analysts have developed pragmatic alternative siting strategies that address local policymakers' desire for facilitating new deployment while **protecting public assets, interests, and mission-critical public infrastructure**. We also work with local governments to identify and anticipate new deployment strategies by the major carriers as they densify and upgrade their wireless sites to newer 5G technologies as well as future upgrades in radio and antenna capabilities.

Some recent clients include the Village of Mill Neck, NY, Village of Pelham, NY, Yamhill County, OR, and Huntsville, Alabama.

We have also advised numerous California cities (including Campbell, Palo Alto, Monterey, Sonoma, Napa, Palos Verdes Estates, Dublin, Martinez, Novato, Piedmont, Arcadia, Hillsborough, and Rancho Palos Verdes) on wireless siting standards that minimize the visual impact of wireless facilities while improving mobile service coverage.

For Hillsborough, CA, we worked with the City Engineering staff to develop siting alternatives employed to negotiate a settlement of a case that reached litigation in the 9th Circuit Federal Court of Appeals.

Integrating Fiber Optics into Hybrid Wired/Wireless Broadband Networks

Our team has worked for 20 years with the Delaware Department of Transportation (DelDOT) in designing and overseeing a state-wide traffic management network. This network consists of thousands of Intelligent Transportation Services (ITS) monitoring and controlling devices for DelDOT's traffic management center in Smyrna, Delaware.

The DelDOT state-wide network employs a mix of Fiber Optic and Wireless transmission networks that provide seamless two-way data transmission to support traffic cameras, traffic sensors, and real-time data collection.

DelDOT Fiber Network Access Cabinet



Qualifications of Key Wireless Technology Staff

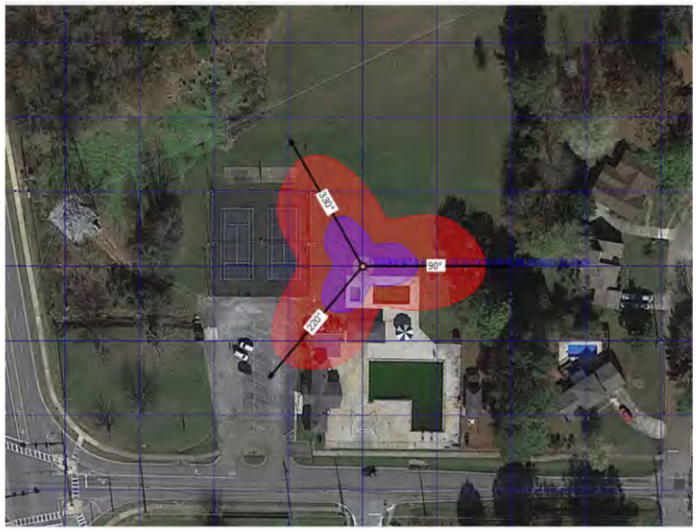
CTC Media Group provides expert, independent guidance and technical analysis support for our municipal clients seeking to defend their established zoning, land use, street use and construction codes and to protect the public interest while facilitating the deployment of new wireless services.

CTC Wireless Engineering Analysis Capabilities

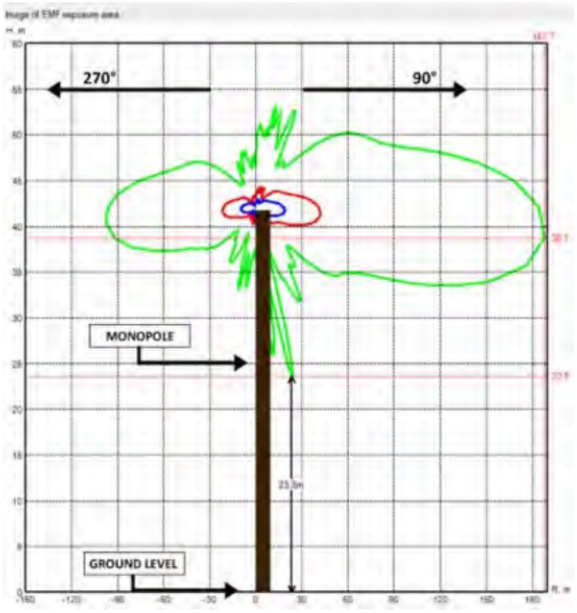
CTC Media Group stands ready to support government clients by providing the following on-call wireless telecommunications planning and commercial wireless application evaluation services:

- Review the technical application submission by the applicant within the framework of a local government's zoning and other code requirements.
- Examine applications with regard to all FCC technical standards, including RF exposure guidelines.[1]

Illustrated Examples of RF Exposure Modeling



RF Exposure at Antenna Height

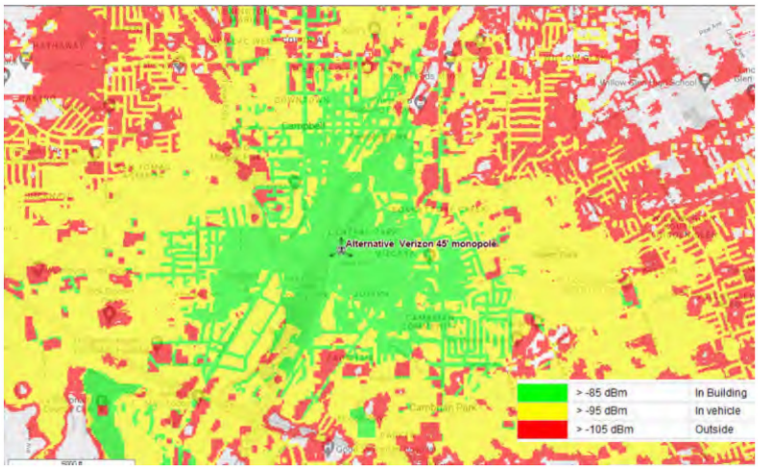


RF Exposure Above Ground

1 Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, OET Bulletin 65, Edition 97-01 August 1997 FCC, Washington, DC 20554

- Request, when necessary additional supporting information as needed to clarify/complete initial submissions.
- Independently evaluate, through computer-based radio propagation modeling, the predicted wireless coverage data submitted by an applicant in support of the wireless carrier's claimed need for the facilities to meet its stated service coverage objectives.[2]

Illustrated of Computer Coverage Modeling at 700 MHz



ITU Propagation Model 700MHz Coverage Map 43.5'

- Perform independent on-site measurements where required and as requested.

Illustrated Examples of Field Measurements Coverage



Drive Test Result Map Version One



Drive Test Result Map Version Two

2 Propagation data and prediction methods for planning of short-range outdoor radiocommunications systems and radio local area networks in the 300Mhz-100GHz, ITU-R p.14111-10 International Telecommunications Union, Geneva, 2019

- Examine whether there are viable, alternative, less-intrusive siting options to the facilities and/or locations proposed by the applicant-- including the use of existing support structures, based on the supporting engineering documentation provided by the applicant.
- Prepare project reports of our findings, conclusions, and recommendations as requested.
- Have qualified staff available to participate (onsite or remote) in briefings to municipal decision-makers at staff or public meetings.

Our project team includes:

- **Lee Afflerbach**, **P.E., Director of Engineering**, oversees our team of engineers reviewing wireless antenna siting applications. He has provided technical guidance on wireless deployment options for (among others) Montgomery County, Baltimore, County Carroll County, and Prince George County, Maryland, as well as the cities of Arcadia, Burlingame, Fremont, Hillsborough, Monterey, Napa, Palo Alto, Palos Verdes Estates, Piedmont, Rancho Palos Verdes, and Sonoma in California.

- **Michael Afflerbach**, **Senior Analyst,** has performed on-site testing and technical analysis for our Maryland clients and conducted site surveys and coverage testing for Palo Alto, Los Angeles, Monterey, Rancho Palos Verdes, and Petaluma, California.
- **Michael Breda, Senior Systems Engineer,** has reviewed and examined wireless applications to upgrade existing and new facilities in Prince George and Montgomery Counties in Maryland.
- **Carolina Olivares**, **Staff Analyst,** is responsible for assembling and preparing findings and recommendation reports for clients.

Fee Structure

The CTC Media Group team hourly billing rates:

Labor Category	Hourly Billing Rate
Director of Engineering	$200.00
Senior Communications Analyst	$185.00
Senior Systems Engineer	$125.00
Staff Analyst	$ 90.00

Local travel is billed at current standard mileage rates. Non-routine expenses and long-distance travel are recovered at direct cost with no mark-up.

CTC Wireless Team Resumes

Lee Afflerbach, P.E. | Principal Engineer

Lee is a communications systems engineer with over 50 years of experience advising federal, state, and local government clients. He is the founder of Columbia Telecommunications Corporation, a firm that has delivered independent telecommunications-related consulting services to federal, state, and local government clients since 1983.

His expertise covers a wide range of communications technologies, including commercial wireless deployment, broadcasting, and land mobile radio. His work involves radio frequency (RF) propagation modeling to determine the extent of coverage feasible from a given wireless facility siting. He also evaluates network capacity and examines alternative deployment strategies to address clients' needs.

Wireless siting expertise

For over three decades, Lee has supported local government clients in reviewing commercial wireless siting applications and examining options for siting commercial wireless communications facilities in a manner that is consistent with local zoning codes and federal regulations. This work routinely involves computer modeling to determine the extent of existing and proposed signal coverage for a wide range of commercial wireless applications prepared by commercial carriers. As part of these evaluations, when requested by the client, Lee identifies and then examines alternative, less intrusive locations for proposed wireless facility sitings. In addition to meeting the applicant's coverage requirements, these alternative sites are intended to meet local government planning and zoning code requirements.

Lee provides ongoing support to municipal clients, evaluating options for implementing advanced cellular technology in their respective communities. He serves as CTC Media Group's project leader for the team of engineers who are examining or have recently addressed deployment options for more than a dozen cities in California, including the cities of Arcadia, Burlingame, Fremont, Hillsborough, Los Altos, Monterey, Napa, Palo Alto, Palos Verdes Estates, Piedmont, Rancho Palos Verdes, and Sonoma. Over the past 30 years, he has reviewed several hundred site applications for new wireless facilities and existing facility modifications for numerous municipal clients in the Washington, DC, and Baltimore, MD, metropolitan areas.

He has supported local government clients in a variety of ways, including a comprehensive technical review of wireless facilities applications, oversight of field signal verification measurements, negotiations of technical options/issues with carriers, expert witness testimony in litigation, and presentations before local planning commissions and city councils.

Lee has served as an expert witness providing testimony in support of municipal clients in their ongoing litigation with commercial wireless carriers in State and Federal courts. His assignments have included the preparation of testimony and analysis of technical filings presented before the court by the cities of Wilmington, DE; Los Angles, Los Altos, Hillsborough, and Piedmont, CA; Pueblo County, CO; Wichita, KS; McKinney, TX; and North Buffalo Township, PA. As directed by the courts in some of these disputes, he has supported numerous communities in preparing technical alternatives to wireless carriers' initial wireless facility siting applications.

Licenses and Education

Licensed Professional Engineer, Delaware, District of Columbia, Maryland, North Carolina, and Washington.

Bachelor of Science, Electrical Engineering, Drexel University.

Michael Afflerbach | Senior Communications Analyst

Michael Afflerbach is a wireless communications consultant with over 20 years of experience serving clients in Montgomery, Prince George, and Baltimore Counties in Maryland. At CTC Media Group, he supports clients with reviews of applications to site wireless facilities and conducts extensive field measurements. Most recently, he has worked in this capacity for Los Angeles, Petaluma, Rancho Palos Verdes, Monterey, and Palos Verdes Estates in California. Mr. Afflerbach has worked with the FCC, FAA, and dozens of municipalities and counties to resolve tower and antenna construction and zoning issues with cellular/mobile providers and broadcasters.

Tower Regulatory Compliance

For more than 20 years, Michael has worked on communications towers and their federal, state, and local regulatory requirements. As a broadcaster, he owns three radio towers (including one built new in 2004) and is keenly aware of the hurdles that need to be addressed to develop or modify communications structures. Over the years, he has worked with other broadcasters and public safety entities to secure antenna placement (often through collocation) to maximize service coverage while dealing with the regulatory forces that limit possible locations.

Additionally, Michael consults regularly with local governments, such as Montgomery County, MD, Arlington County, VA, Carroll County, MD, Huntsville, AL, and Annapolis, MD, to help them determine the technical merits of communications towers and antennas for broadcast, wireless internet service providers (WISPs), cellular carriers and other wireless and microwave operators, including small cell and Distributed Antenna Systems deployment. Using sophisticated computer modeling and FCC databases, he has worked with local planning and zoning officials to verify coverage areas and identify possible alternative sites for non-conforming antenna placements.

Wireless Broadband Networking

Over the past four years, Michael has developed, and trained others to develop, wireless broadband networks (using both licensed and unlicensed spectrum) for a diverse clientele. Using different computer modeling and network management software, he has helped to deploy, or examined the feasibility for local and state government clients to deploy, wireless networks for the State of Delaware Department of Transportation (DelDOT); Garrett County, MD; Ellensburg, WA; Port Angeles, WA; Stafford County, VA; and Palo Alto, CA. Michael has served as a wireless specialist for private WISPs and marinas that need wide-area Wi-Fi service. He has worked to design and build his own wide-area wireless network in New Bern, NC.

Education

1994 B.A., St. John's College, Annapolis, Md
Member of the Society of Broadcast Engineers (SBE)

Michael Breda | Systems Engineer

Michael Breda is a systems engineer who reviews and processes wireless siting applications for Montgomery, Prince Georges, and Baltimore Counties in Maryland.

Before joining CTC Media Group, Mr. Breda was a Senior Systems / Software Engineer with over 20 years of experience serving technical innovators such as NDS Group, HIFN, TV/Com International, and General Instruments. Mr. Breda has performed various roles in the design, development, systems integration, and deployment of technical systems, focusing primarily on the satellite and cable television industries and eCommerce.

Mr. Breda's experience centers around developing and deploying systems for conditional access control and digital rights management employed in the cable and satellite broadcasting Industry worldwide. His focus has included subscriber management systems and the secure communication and key management technology used to meet the needs of customers operating in the digital media marketplace. He also has experience in secure internet communications systems employed in eCommerce.

Mr. Breda has participated in development efforts domestically and in Holland and Israel. He has also deployed technical systems at customer sites in the United States, Australia, Canada, and Germany.

Education

B.S., Computer Science, Louisiana State University.

Carolina Olivares | Staff Analyst/Publications Specialist

Carolina is responsible for the production of all documents associated with CTC Media's wireless client projects. She oversees preparation of all reports, technical graphic displays, and PowerPoint presentations.

She maintains our library of client technical documents and technical research reports used to support client litigation activities. For the past few years, Ms. Olivares' has created exhibits and schematic drawings for preferred placement of antennas and associated electronics on city poles. Her focus has included cleaning raw RF testing data and pin data markers on Google Earth. Ms. Olivares has also created keyhole markup language files for drive test maps and created other display maps using different formats to show target areas where carriers are proposing to increase coverage or improve network capacity.

Education

Bachelor of Technology: Graphic and Multimedia Design,
State University of New York at Canton, Canton, NY

ATTACHMENT 2

December 24, 2025

BY: Email

Liz Klebaner
Nossaman LLP
777 S Figueroa Street, 34 Floor
Los Angeles, CA 90017
lklebaner@nossaman.com

RE: Case No. CPC-2024-55448-DB-PR-HCA, 2930-2936 S. Sepulveda Blvd.

Dear Ms. Klebaner:

This letter regards the 77-unit housing development project proposed to be constructed at 2930-2936 S. Sepulveda Boulevard ("Project"). You have asked me to respond to statements of the Project proponent's land use counsel that "potential cell services coverage impacts resulting from the Project's new building along I-10 will be minimal, as this area already has overlapping coverage from other sites in the area" and, further that "[t]his continuation of existing coverage is demonstrated by the coverage plots included in the Integer Report." (See, e.g., Letter from Todd Nelson, dated December 1, 2025.) You have also asked me to resond to statements of Project proponent's consultant that the consultant's modeling of signal strength in the vicinity of the Project "illustrate that the impact of obstruction from the new building along I-10 will be minimal as this area has overlapping coverage from other sites in the area." (Integer Telecom Services Report, dated July 25, 2025, at p. 6, Report Synposis, Finding 2.)

As a Telecommunications engineer with decades of experience and having consulted for municipal governments on commercial wireless telecommunications networks nationwide, and based on my analysis of Project-specific data, I conclude that these statements are inaccurate.

Executive Summary:

- The above statements are misleading; **there is no significant "overlapping coverage from other nearby sites."**

- The proposed project at 2930 S Sepulveda, constructed to a height of 71 feet, will effectively **block coverage of existing wireless antennas sited at 2990 S. Sepulveda Blvd. serving wireless customers located north of 2990 S. Sepulveda**, resulting in dropped service in areas that currently receive service with a signal power of -95 dBm or greater, including the 405/10 interchange.

- The reduction in signal power, once the building is constructed, will result in a significant change in the existing line-of-sight radio wave transmission path, **creating gap areas** in reliable wireless

service for both T-Mobile and Verizon, resulting in signal disconnects and lower data transmission speeds.

- **First Responders utilizing the Verizon Frontline Network or the T-Mobile T-Priority Network, who are in the shadow of the proposed structure at 2930 S Sepulveda will have their communications interfered with and interrupted at the intersection of the I-405 and I-10 freeway and north and east along I-405.**

Discussion:

First and foremost, the cellular carriers located at 2990 S Sepulveda Blvd (20 feet south of the proposed development) will have **wireless transmission signals blocked** by the proposed 71-foot development at 2930 S Sepulveda. This construction will result in dropped calls and a significant reduction in data transmission speed immediately north of the cell towers, including the 405/10 interchange. More than 1 million vehicles pass through this interchange daily.

Secondly, and critically, **this interference and blocking of signals will affect first responders** who use the networks developed exclusively for first responders by Verizon (Verizon Frontline Network) and T-Mobile (T-Mobile T-Priority Network)**.**

Mr. Nelson is referring only to FirstNet; first responders on other networks will be affected, and their communications will be degraded or blocked (depending on their location). Since the Project proponent's consultant's, Integer Telecom Services, report referenced by Mr. Nelson refers to the 14,000+ agencies (police, fire, paramedics, etc.) that utilize FirstNet, I will note that over 45,000 agencies (more than 3 times the number of agencies using FirstNet) use Verizon Frontline Network.[1]

Third: The proponent's Integer Telecom Report dated July 25, 2025, states in part, "Antennas to the west, south, and east won't be obstructed, so there will be no impact on coverage from them."[2] While this specific point is correct, it ignores the northern sector discussed above; communications will be blocked for all carriers in this sector as shown in previously submitted engineering reports I submitted and further demonstrated at the end of this report. Additionally, submitted written testimony by DISH Network states: "The proposed project's height and massing will severely compromise wireless communications, including E-911, voice, messaging, and other in-vehicle services at one of the most heavily traveled interchanges in the United States, the I-10/I-405 freeway intersection corridor." Continuing, "If the Project is approved as proposed, the telecommunication facilities at 2990 South Sepulveda Boulevard would have to be relocated or expanded in order to maintain applicable federal, state, industry, and regulatory standards, including standards mandated by the City of Los Angeles for telecommunication facilities."[3]

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[1] https://www.verizon.com/business/resources/factsheets/verizon-frontline-public-safety-platform.pdf accessed December 17, 2025

[2] Integer Telecom Services Report dated July 25, 2025

[3] DISH Network letter August 5, 2025 to Commission President and Commissioners LA City Planning Commission.

No maps were provided by the Project's consultant Integer Telecom Services to illustrate the coverage loss that would occur if the 2990 South Sepulveda Blvd were taken out of service.

Integer recognized the wireless coverage problem and suggested that the wireless equipment needed to be relocated to the proposed building with the antennas be placed 75' above ground level. Their report includes coverage maps for both the Low Band and Mid Band at a 75' antenna height.

The Integer Report proposed solution to this is "…relocating the current site(s) [2990 S Sepulveda] to the new building's rooftop…" This Integer recommendation to move confirms our findings that significant coverage issues will result from the construction of the new building. If the Project's advocates are proposing to install a new cell site at their location, this process requires a minimum of 18 months to 2 years (discussed in attached Exhibits 1 and 2). Even if this proposed relocation were to occur, in the interim, cellular services for over 70% of commercial cellular service customers and first responders who subscribe to the above noted first responder networks (T-Mobile and Verizon) will have their cellular communications disrupted in the area to the north as described.

Responding to the statement from the proponent's attorney:

"Even if the Existing Cell Services were fully decommissioned (which is not being proposed), the potential impacts to cell service coverage in the vicinity of the Site would be minimal, as this area already has overlapping coverage from other nearby sites."

The above statement is misleading; **there is no significant "overlapping coverage from other nearby sites**." Each carrier cell site in the Project vicinity is located to service a specific geographic area. The antennas at 2990 S Sepulveda are focused on a target service area north of 2990 S Sepulveda Blvd. The wireless carriers' network engineers meticulously design the antenna pattern to minimize interference with the co-channel neighboring sites. Industry best practice recommendations for designing new cell sites target co-channel interference level for adajcent sites to be at least 10 dB or less than the -95 dBm coverage service contour. Redundancy is provided by installing multiple radios in the carrier's low-band and mid-band FCC-licensed radio spectrum **in the same location**, not alternative locations in the antenna vicinity. **This is not overlapping coverage**. As stated above, Integer has not mapped the coverage loss that would occur if the 2990 South Sepulveda Blvd northern sectors were taken out of service. Areas where signal levels fall below the -95dBm target power level will exhibit lost calls, disconnects and/or significantly slower data transfer rates.

We have prepared a set of computer-generated coverage maps to illustrate the impact that the Project will have on commercial wireless service north of the existing site. The coverage map plots assume a signal power of -95 dBm, a generation-accepted power level recognized by industry engineers, the same power level assumed by Integer in its report. The coverage model plot illustrates existing coverage (Figure 1), coverage assuming a reduction in power by a factor of 10 due to the building absorbing the wireless transmission energy (Figure 2, optimistic), and (most realistic) Figure 3, a reduction in power by a factor of 40.[4] This degree of signal attenuation would preclude personal wireless communication north of 2990 South Sepulveda Blvd., as we have shown in our May 2025 and December 2025 analyses.

[4] International Telecommunications Union, Radio propagation, Prediction of building entry loss Recommendation ITU-R P.2109-2, 2023, Geneva, Switzerland,

Figure 1 is a computer-generated 700 MHz Low-Band coverage map[5] prepared for the current existing T-Mobile radio equipment operating (cell tower) on the roof of the site at 2990 South Sepulveda Blvd. The -95 dBm coverage map closely matches the maps provided in the Integer study.

Figure 1

Existing T-Mobile Wireless -95 dBm Coverage

2990 South Sepulveda Blvd

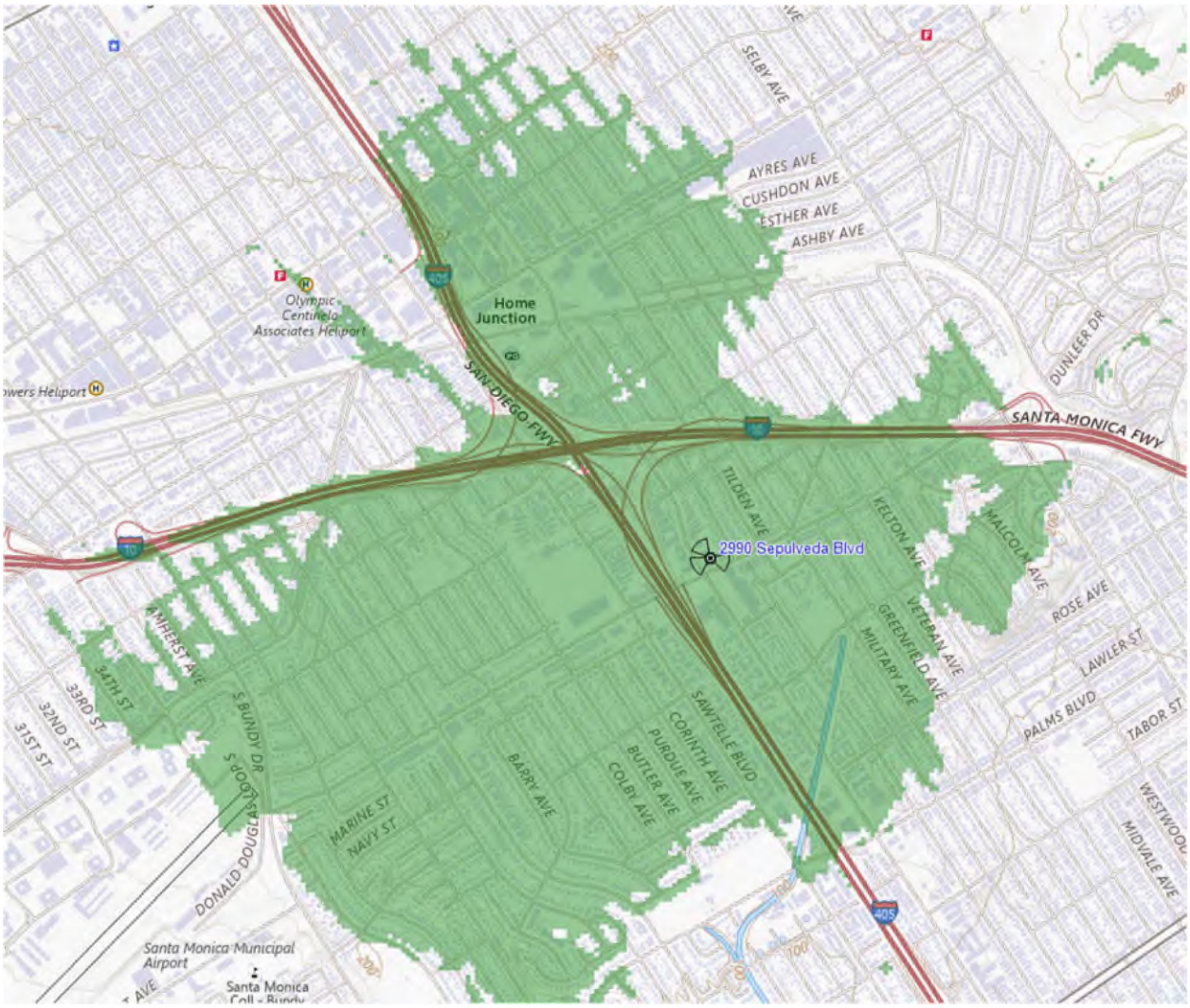


Figure 2 is a computer-generated Low-Band coverage map prepared for the same T-Mobile radio equipment operating on the roof of the site at 2990 South Sepulveda Blvd with the same -95 dBm

[5] The 700 MHz Low Band covers the largest wireless service area. Wireless carriers' Mid-Band frequencies (1,910 MHz, 2,150 MHz and higher frequencies) cover smaller areas than the Low Band but allow for faster data rates. Coverage distance decreases as the frequencies increase.

coverage, assuming 10 dB of the T-Mobile antenna power absorbed by the proposed building. This mapping assumes a signal strength of the -95 dBm and shows the North-pointing antenna sector extinguished. The residual areas of -95 dBm signal strength is a conservative assumption (shown here in green), as signal strength could be further reduced if thermally-efficient building materials[6] are used at the proposed building project.

Figure 2

T-Mobile Wireless -95 dBm Coverage

(North-West antenna assumed building loss of 10 dB)

2990 South Sepulveda Blvd



Figure 3 is a computer-generated Low-Band coverage map prepared for the T-Mobile radio equipment operating on the roof of the site at 2990 South Sepulveda Blvd with the -95 dBm coverage. It is clear from this coverage map that the minimum signal power of -95 dBm level will not cover the critical I-10/I-405 intersection.

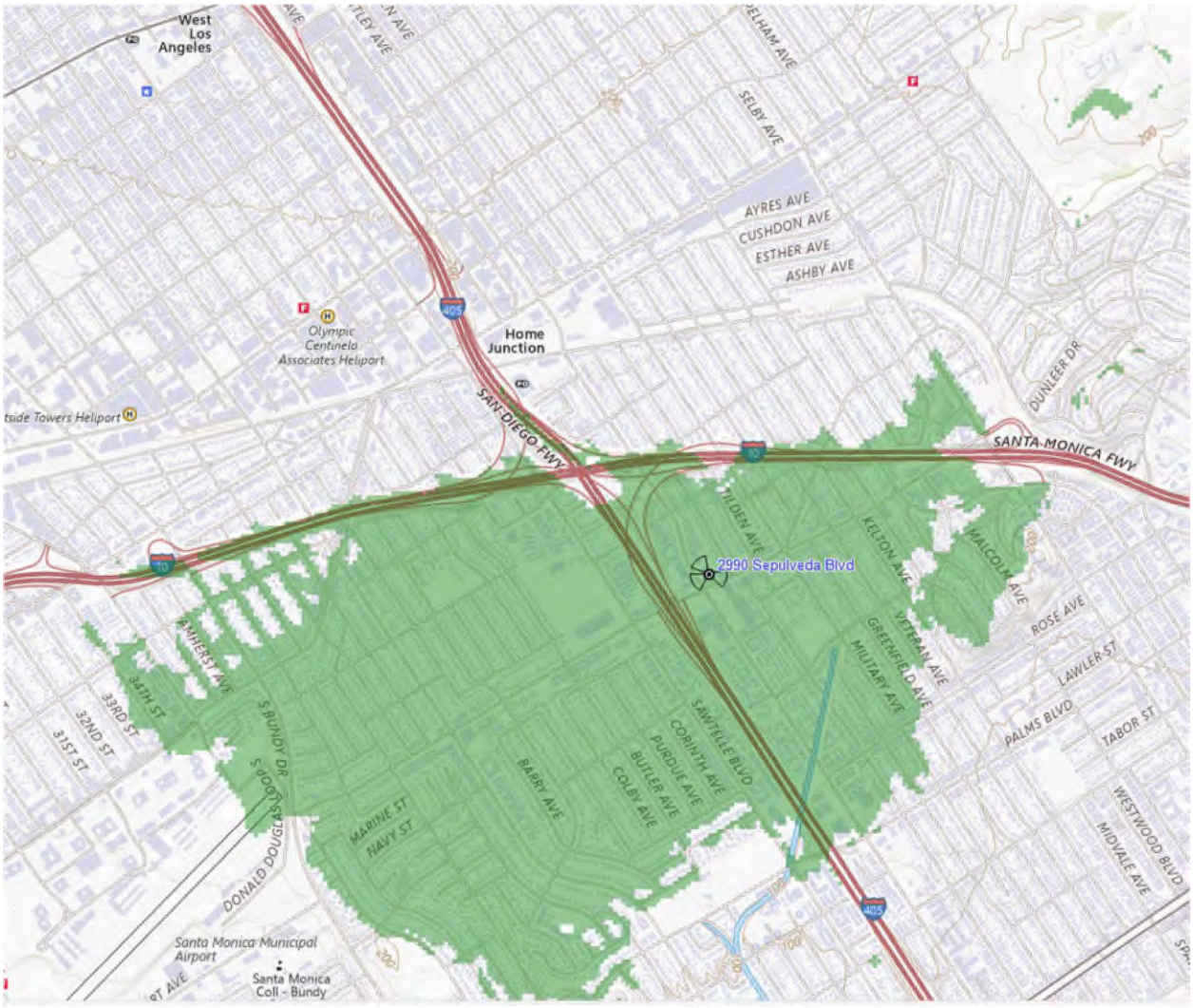
[6] ITU-R P.2109-2 page 6

Figure 3

T-Mobile Wireless -95 dBm Coverage

(North-West antenna assumed building loss of 16 dB)

2990 South Sepulveda Blvd



Summary

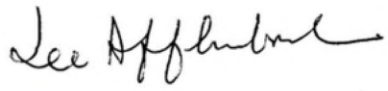
The proposed project at 2930 S Sepulveda, constructed to a height of 71 feet, will effectively:

- **Block coverage of existing wireless antennas serving wireless customers located north of 2990 S Sepulveda**, resulting in dropped service in areas that currently receive service with a signal power of -95 dBm or greater will be in the affected area, including the 405/10 interchange.

- The reduction in signal power, once the building is constructed, will result in a significant change in the existing line-of-sight radio wave transmission path, creating **gap areas** in reliable wireless service for wireless carrier antennas located at 2990 S. Sepulveda Blvd., resulting in signal disconnects and lower data transmission speeds.

- **First Responders utilizing the Verizon Frontline Network or the T-Mobile T-Priority Network, who are in the shadow (north) of the proposed structure at 2930 S Sepulveda, will have their communications interfered with and/or interrupted at the intersection of the I-405 and I-10 freeway and north and east along I-405.**

Respectfully submitted,



Lee Afflerbach, P.E.

Director of Engineering,

CTC Media Group, INC

Supplement

EXHIBIT 1 - Installation of new Commercial Wireless Transmission Facilities

If a new wireless transmission facility needs to be constructed, a substantial effort in planning and engineering design needs to be applied to address either replacing or constructing a new facility

To initiate the process, the wireless carrier's communication engineering staff identifies the areas requiring coverage enhancements and establishes the preliminary coverage boundary. At the same time, the engineers will define a preliminary search ring to locate the new site. The next step is to work with an experienced real estate agent familiar with wireless facilities to identify which areas or specific properties are both available and comply with local zoning codes for commercial wireless transmission facilities.

Typically, the real estate agent identifies multiple options, which the communications engineers review to assess suitability. The site selection process involves assessing lease costs and aligning with performance goals.

Once the site is agreed upon, the wireless carrier will engage an experienced consulting engineering firm to design the proposed facility and an architectural firm to ensure compliance with local zoning codes and stringent standards established for commercial wireless communications facilities.

On completion, the engineering design is submitted to the municipality for review and approval. Generally, a comprehensive review of these types of applications takes several months. Upon completion, the application is presented to the public. Issues typically reviewed in public form generally relate to compliance with the municipal code and the justification for the proposed facility. In some situations, the project is accepted as designed.

In many cases, the applicant is directed to revise the application and resubmit it, which restarts the process. Often, the applications are denied under pressure from neighborhood residents.

Based on my decades of experience working with municipal clients in the wireless industry, I've observed that securing a building permit typically takes at least 18 months. More often, the timing is measured in years.

Wireless carriers that secure approval generally require an additional three to six months to construct, install, and activate the system.

Summary of work tasks in steps:

Define the wireless Telecommunication deficiency (unreliable coverage, low capacity, or loss of existing site)

Preliminary steps for acquiring a new site involve a concept design and a search ring area for the location boundaries of the site

Select from the candidates the best site within budget and prepare an option on a lease.

Contracting a design engineer and an architect team to prepare the radio construction design documents

Submit the design documents and the wireless-specific technical information required in most municipal building codes.

After the municipal review, the applications will be reviewed and acted upon. Anticipate delays, requests for additional information, and modifications.

Once the building permit is granted, anticipate at least 6 months to construct, install, and activate the wireless network.

EXHIBIT 2 - FILING INSTRUCTIONS FOR WIRELESS TELECOMMUNICATION FACILITIES (City of Los Angeles – attached separately)

Lee Afflerbach, P.E. | Principal Engineer

Lee is a communications systems engineer with over 50 years of experience advising federal, state, and local government clients. He is the founder of Columbia Telecommunications Corporation, a firm that has delivered independent telecommunications-related consulting services to federal, state, and local government clients since 1983.

His expertise covers a wide range of communications technologies, including commercial wireless deployment, broadcasting, and land mobile radio. His work involves radio frequency (RF) propagation modeling to determine the extent of coverage feasible from a given wireless facility siting. He also evaluates network capacity and examines alternative deployment strategies to address clients' needs.

Wireless siting expertise

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Lee provides ongoing support to municipal clients, evaluating options for implementing advanced cellular technology in their respective communities. He serves as CTC Media Group's project leader for the team of engineers who are examining or have recently addressed deployment options for more than a dozen cities in California, including the cities of Arcadia, Burlingame, Fremont, Hillsborough, Los Altos, Monterey, Napa, Palo Alto, Palos Verdes Estates, Piedmont, Rancho Palos Verdes, and Sonoma. Over the past 30 years, he has reviewed several hundred site applications for new wireless facilities and existing facility modifications for numerous municipal clients in the Washington, DC, and Baltimore, MD, metropolitan areas.

He has supported local government clients in a variety of ways, including a comprehensive technical review of wireless facilities applications, oversight of field signal verification measurements, negotiations of technical options/issues with carriers, expert witness testimony in litigation, and presentations before local planning commissions and city councils.

Lee has served as an expert witness providing testimony in support of municipal clients in their ongoing litigation with commercial wireless carriers in State and Federal courts. His assignments have included the preparation of testimony and analysis of technical filings presented before the court by the cities of Wilmington, DE; Los Angles, Los Altos, Hillsborough, and Piedmont, CA; Pueblo County, CO; Wichita, KS; McKinney, TX; and North Buffalo Township, PA. As directed by the courts in some of these disputes, he has supported numerous communities in preparing technical alternatives to wireless carriers' initial wireless facility siting applications.

Licenses and Education

Licensed Professional Engineer, Delaware, District of Columbia, Maryland, North Carolina, and Washington.

Bachelor of Science, Electrical Engineering, Drexel University.

ATTACHMENT 3

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Admitted only in California

Refer To File # 505368-0001

VIA EMAIL
CPC@LACITY.ORG

December 1, 2025

Hon. Commission President and Commissioners
c/o Commission Executive Assistant
City Planning Commission
City of Los Angeles
200 N. Spring Street, Room 272
Los Angeles, CA 90012

Re: Comments on Proposed Residential Project at 2930-2936 South Sepulveda Boulevard, Case Numbers CPC-2024-5548-DB-PR-HCA and ENV-2024-5549-SE

Dear President Lawshe and Commissioners:

Nossaman LLP is land use counsel to 2990 S. Sepulveda, LLC, which owns the Mullikin Medical Center, located at 2990 South Sepulveda Boulevard, at the northeast corner of the intersection of South Sepulveda Boulevard and National Boulevard. We are writing on behalf of 2990 S. Sepulveda, LLC to provide comments on the proposed construction, use, and maintenance of a 71-foot high, six-story, 77-unit residential development with one subterranean and one street-level parking area, including 84 parking spaces, at 2930-2935 South Sepulveda Boulevard ("Project").

By providing 12 affordable housing units, the Project proponent seeks to benefit from development incentives and waivers of two height restrictions that would otherwise apply to development on the Project site. The first waiver would eliminate the transitional height requirement in the C2-1 VL Zone; the second waiver would allow an increase in height limitation in the C2-1 VL Zone from 45 to 71 feet.

2990 S. Sepulveda, LLC supports the lawful development of well-planned, high-density and low-income housing in the City. The Project is not that project. The City cannot lawfully approve the Project, because as has been extensively documented by 2990 S. Sepulveda, LLC in prior submittals and interactions with the City, the Project would block wireless communication in the Project vicinity. "Practically speaking . . . by approving the Project as proposed, the City would prohibit the provision of personal wireless communication service throughout the heavily traveled I-10/I-405 intersection areas." (Letter from Lee Afflerbach Professional Engineer ("PE") to Liz Klebaner, dated November 30, 2025, attached hereto as **Attachment 1**.) The City's approval of height waivers for the Project would cause wireless signal to fall below **the City's objective written standards and conditions** for public utility service, impede the City's emergency's response capabilities during wildfires and other natural disasters, is **not** authorized

by state or local density bonus laws, and further, is preempted by the federal Telecommunications Act and would expose the City to tort liability.

The Project proponent has made **no effort** to propose Project modifications to address their Project's obvious adverse public health and safety impacts.

We urge the City to, in accordance with Government Code section 65950, subdivision (b), extend the City's time limit to act on the Project. In the absence of an extension, this poorly planned Project would be deemed approved today by operation of state law. (See Gov. Code, § 65956, subd. (b) and 65950, subd. (a)(7).)

These comments supplement and incorporate by reference the comments of 2990 S. Sepulveda LLC previously submitted to the Planning Department and the City Planning Commission on May 15, 2025 and August 4, 2025, respectively.

We respectfully request a copy of these comments, together with the referenced attachments, as well as our prior correspondence, be provided to each of the Commissioners concurrently with the City Staff Report.

I. PROJECT SETTING.

The Project site and the Mullikin Medical Center are separated by a narrow alley (20 feet) and are located less than one half mile southeast of the Interstate Highway 405/Interstate Highway 10 interchange. The tenants of Mullikin Medical Center include a pediatric clinic that treats and educates children with autism. Besides being a medical facility, the Mullikin Medical Center is a telecommunications center with T-Mobile (which incorporates Sprint PCS), Verizon (formerly known as AirTouch), and DISH Wireless (incorporating Boost Network, part of Sprint PCS) (collectively, "Carriers") as tenants.

The Carriers maintain extensive infrastructure at the Mullikin Medical Center, including backup systems and power. As is documented in 2990 S. Sepulveda LLC's August 4, 2025 comments, when the City approved this telecommunications infrastructure, the City made specific findings that the infrastructure was necessary to protect public health and safety by maintaining adequate cellular signal, including for emergency evacuations and other critical communication services.

II. THE PROJECT PROPONENT CAN FEASIBLY MITIGATE AND AVOID THE PROJECT'S ADVERSE IMPACTS ON SURROUNDING LAND USES.

Representatives of 2990 S. Sepulveda, LLC have, on multiple occasions, requested to meet with City representatives and the Project proponent to assist the Project proponent in presenting a sound development proposal for the Commission's consideration. The Project proponent has consistently declined these requests.

The City is authorized and should **require** the Project proponent to incorporate feasible methods into the Project to avoid the specific adverse impacts of the Project. (See Los Angeles Municipal Code, § 12.22.A.37(d)(3)(i)(b).) In particular, the City should either deny the Project or condition the City's approval of the height waivers on the Project proponent's agreement to fund

the design and installation of a monopole, or other telecommunications facilities on the Mullikin Medical Center parcel, that are capable based on engineering analyses acceptable to the Carriers, of maintaining existing wireless signal strength at the Mullikin Medical Center telecommunications center.

III. THE PROJECT IS NOT ENTITLED TO DEVELOPMENT STANDARD WAIVERS UNDER STATE LAW AND THE CITY'S DENSITY BONUS ORDINANCE.

Under the City's density bonus ordinance and state housing laws, the City may not approve a waiver of development standards if:

> The Waiver would have a Specific Adverse Impact, as defined in California Government Code Section 65589.5(d)(2), upon public health and safety and for which there is no feasible method to satisfactorily mitigate or avoid the Specific, Adverse Impact.

(Los Angeles Municipal Code, § 12.22.A.37.(d)(3)(i)(b).) A specific, adverse impact is defined by state law as "a significant, quantifiable, direct, and unavoidable impact, based on objective, identified written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete." (Gov. Code, § 65595.5, subd. (d)(2).)

The Project would cause the existing telecommunication facilities located at the Mullikin Medical Center to fail objective, **identified written public health or safety standards**, **policies**, and **conditions**, as they existed on the Project application was complete. (See Los Angeles Municipal Code, § 12.21.A.20(b)(7) [requiring telecom facilities to document adequate coverage].) These include conditions that the City required the Carriers to meet when it authorized the development of telecommunications infrastructure at the Mullikin Medical Center and, specifically, that the installations "provide the public and emergency service organizations with access to mobile telephone service within the community" and, further that they meet "stringent locational requirements" due to the "need to provide additional cellular capacity to cellular users traversing the 405 Freeway." (Letter from Liz Klebaner to City Planning Commission, Aug. 4, 2025, Exhibits 1-A, Conditional Use Findings 3, 6, 7, and 11; see also *id*. Exhibits 1-B through 1-D.) There is ample substantial evidence in the record to support the City's denial of the waivers. (See, generally, **Attachment 1**; see also Letter from Liz Klebaner to City Planning Commission, Aug. 4, 2025; Letter from Liz Klebaner to Kyle Winston, May 15, 2025.)

IV. THE PROJET WOULD RESULT IN VIOLATIONS OF THE FEDERAL TELECOMMUNICATIONS ACT.

The Project's height would result in violations of the Federal Telecommunications Act by impacting the coverage provided by the telecommunications facilities located at the Mullikin Medical Center. Congress recognized the national public interest of having uninterrupted wireless service and rapid technological advancement of wireless communications when it passed the Telecommunications Act of 1996 ("the Act").[1] Since the Act's passage, there has been a sea of change in the growth of wireless services. According to the Federal

[1] Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (1996), codified throughout Title 47 of the United States Code.

Communications Commission ("FCC"), "[m]obile wireless services are an essential part of Americans' daily lives."[2] Further, "mobile wireless serves a critical role in public safety, enabling uses to summon lifesaving help, receive timely alerts, and access pertinent information. These developments have made mobile wireless one of the most important sectors in the national economy."[3]

Section 332 of the Act prohibits local land use agencies from adopting any regulation or taking any action that "prohibit[s] or ha[s] the effect of prohibiting the provision of personal wireless services." (47 U.S.C. § 332(c)(7)(B)(i)(II); see also *APT Pittsburgh L.P. v. Penn Township Butler County* (3d Cir. 1999) 196 F.3d 469, 480; see also *Sprint Spectrum, L.P. v. Willoth* (2d Cir. 1999) 176 F.3d 630, 643.) The City granted permits for the telecommunications facilities at Mullikin Medical Center based upon the finding that these facilities were needed for wireless communication by the public and emergency service organizations and were of "vital importance" during times of emergency. (See, generally, 2990 S. Sepulveda LLC Comments, dated Aug. 4, 2025, Exhibit 1-A through Exhibit 1-D.) By approving the Project, the City would risk interfering with vested rights and violating the Act's prohibition on interference with personal wireless communication.

V. APPROVING THE PROEJCT AS PROPOSED EXPOSES THE CITY TO TORT LIABILITY.

The City's approval of the Project as proposed exposes the City to tort liability. (See *Rincon Band of Luiseno Mission Indians etc. v. Flynt* (2021) 70 Cal. App. 5th 1059, 1112 [tortious interference with business advantage and contractual relations].) Additionally, a municipality may be held liable for creating or maintaining a nuisance. (Cal. Civ. Code § 3479; *City of Norwalk v. City of Cerritos* (2024) 99 Cal.App.5th 473 [no immunity from public or private nuisance liability where governmental activity is unauthorized].)

City representatives have already admitted that 2990 S. Sepulveda, LLC maintains ongoing economic relationships with Carriers as tenants operating extensive telecommunications infrastructure at the Mullikin Medical Center. Accordingly, the City cannot claim that it was acting without knowledge of the fact that the City would impede wireless communication as a proximate cause of the City's approval of the Project.

VI. THE CITY ERRONEOUSLY CONCLUDED THAT UTILITY IMPACTS ARE NOT SUBJECT TO CEQA.

In communications with 2990 S. Sepulveda, LLC, City representatives have taken the position that impacts to public utility service delivered by private telecommunications networks are not within CEQA's purview and that CEQA does not require mitigation for these types of impacts. The City's position contravenes well established authority, the City's own CEQA-implementing procedures and repeated City Zoning Administrator findings that the telecommunications center at the Mullikin Medical Center is an essential **public** utility.

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[2] Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Eighteenth Report, WT Docket No. 15-125 (Dec. 23, 2015), at p. 2, *available at https://docs.fcc.gov/public/attachments/DA-15-1487A1.pdf*.

[3] *Ibid*.

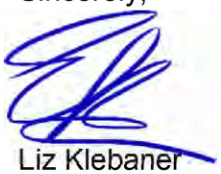
There is no question that CEQA requires public agencies to identify and mitigate potentially significant impacts to utilities. (See Cal. Code Regs., tit. 14, div. 6 ch. 3, App. G XIX [relocation or construction of new or expanded telecommunications facilities is a potentially significant environmental impact]; see also *id*. at XX [impairment of adopted emergency response plan or emergency evacuation plan is a potentially significant environmental impact]; see, e.g., *Save North Petaluma River & Wetlands v. City of Petaluma* (2022) 86 Cal.App.5th 207, 226-230 [CEQA requires evaluation of significant impacts on adopted emergency plans and hazardous conditions].) The City routinely analyzes impacts to telecommunications services in CEQA documents. (See, generally, Environmental Impact Reports | Los Angeles City Planning (last visited Nov. 30, 2025).)

The fact that public utility service in this case is delivered by private companies is irrelevant. Under CEQA, the question is whether a project will affect the environment of persons in general, regardless of whether that interference involves private property interests. (*Bowman v. City of Berkeley* (2004) 122 Cal.App.4th 572, 586-587 ["A project that interferes with scenic views has an adverse aesthetic effect on the environment."].) Here, the City has admitted that telecommunications facilities may have to be relocated in order to maintain wireless service for the general public. This constitutes a per se environmental impact under CEQA.

VII. CONCLUSION.

For the above reasons, we respectively request the City Planning Commission to deny the Project as currently proposed.

Sincerely,



Liz Klebaner
Nossaman LLP

LK:LK
Attachments
Cc: Jennifer Torres, Charles Turner, and Kyle Winston

ATTACHMENT 1

November 30, 2025

Liz Klebaner
Nossaman LLP
777 S. Figueroa, 34th Floor
Los Angeles, CA 90017

Re: Proposed New Construction at 2930 South Sepulveda Boulevard and its Effects on Existing Wireless Telecommunications Sites located at 2990 South Sepulveda Boulevard (previously referred to as the Mullikin Medical Center)

Dear Ms. Klebaner:

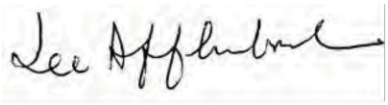
This letter serves to supplement my letter to Dr. Jonathan L. Kramer, dated May 13, 2025, regarding the proposed development at 2930 S. Sepulveda Boulevard ("Project").

Based on my review of the Project file, and as detailed in my May 13, 2025 letter, if the Project is constructed as proposed, it is apparent that satisfactory wireless signal currently received from the multiple telecommunications facilities at Mullikin Medical Center, located at 2990 South Sepulveda Boulevard, would **not** meet the -90 dBm minimum signal power currently established for reliable in-vehicle urban coverage and that wireless communications in-vehicle at the I-10/I-405 freeway intersection corridor would be severely compromised. Construction of the new building will block the direct path and drastically reduce the signal power from the telecommunications antennas located on the Mullikin Medical Center building to a signal power of a mere 1/100th (1%) of the current signal power or less, resulting in a signal level too low to support reliable communications. Practically speaking, this means that by approving the Project as proposed, the City would prohibit the provision of personal wireless communication service throughout the heavily traveled I-10/I-405 intersection area.

In addition to T-Mobile, telecommunications equipment operated by Verizon and Dish, also located at the Mullikin Medical Center, will have a similar coverage deficiency issue. The coverage calculations we prepared are based on standards developed by the *International Telecommunications Union (ITU), published in "Handbook of Terrestrial Land Mobile radiowave propagation in the VHF/UHF bands" and "ITU-R P.2109-2 Prediction of Building entry loss" (attached).*

I trust this supplemental information will provide additional clarification on the significant negative impact on wireless communication that will result from the Project as proposed.

Regards,



Lee Afflerbach

Director of Engineering

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International Telecommunication Union

HANDBOOK

Terrestrial land mobile radiowave propagation in the VHF/UHF bands

Radiocommunication Bureau

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FOREWORD

Much of modern life, in developing and developed countries, is predicated on the expectation that radiocommunication will be available, mobile, and immediate. Telecommunication agencies and businesses around the world have to be able to establish and maintain mobile communication infrastructure that will meet the quality of communication required.

An understanding of the propagation mechanisms through natural and man-made environments is a basic element of the culture of a telecommunications engineer. That knowledge is needed in planning and optimizing the technical support for mobile radiocommunications to meet customer needs. Natural variability, both spatial and temporal, and the effects of terrain and topography cannot be controlled but they can be accommodated provided that the effect they have on systems is known.

In the case of terrestrial land mobile services, recent years have seen an extraordinary increase in customer demand and use. In establishing terrestrial mobile networks many technical innovations have been developed, one of these being an increase in the understanding of radiowave propagation. The International Telecommunication Union (ITU-R) is dedicated to providing standard methods (Recommendations) for calculating the performance of radio systems within a variable environment. This ITU-R Handbook gives the technical basis for predicting the radio propagation in point-to-point, point-to-area, and point-to-multipoint mobile networks. The Handbook focuses on the use of ITU-R Recommendations for the regulating, planning, engineering and deployment of land mobile services. The reader is encouraged to seek further information from the ITU-R (http://www.itu.int/ITU-R).

David G. Cole
Chairman, Radiocommunication Study Group 3,
Radiowave Propagation

ACKNOWLEDGEMENTS

The material in this Handbook was developed by a group of participants in ITU-R Working Party 3K. The Rapporteur for this work wishes to thank the following individuals who made substantial contributions to the Handbook:

Mr. Richard Biby, United States of America

Mr. Eldon J. Haakinson, United States of America

Dr. Thomas Kürner, Germany

Mr. Paul McKenna, United States of America

Dr. Artūras Medeišis, Lithuania

Mr. Ian Pullen, United Kingdom

Prof. Mauro Soares de Assis, Brazil

Dr. James Whitteker, Canada

In addition, the Rapporteur wishes to thank Mr. Eldon J. Haakinson and Mr. Rainer Großkopf in their capacities as successive Chairmen of Working Party 3K for their support and encouragement.

Thomas N. Rubinstein
Rapporteur

CHAPTER 1

INTRODUCTION

1.1 Purpose

The purpose of this Handbook is to introduce the engineer or network designer who has little or no experience in radiowave propagation to those concepts that are necessary to understand how radiowave propagation principles are applied to the design of terrestrial land mobile radio systems.

1.2 How to use this Handbook

The primary intended audience for this Handbook is users of ITU-R electromagnetic propagation Recommendations who require additional information concerning the background and application of the methods found in these Recommendations, particularly the Recommendations applying to terrestrial, land mobile services in the VHF and UHF bands. The ITU-R radiowave propagation Recommendations are delineated by a Recommendation number and a version number (e.g. P.1144-2). In this Handbook Recommendation will generally be referenced without the latest version number but the reader is advised to use the latest version for practical work. The Working Parties of Study Group 3 are constantly engaged in studies intended to improve and broaden existing Recommendations, as well as the development of new Recommendations. Therefore, additional materials have been included with a view toward the future.

Chapter 2 of the Handbook discusses common land mobile radio system applications, broadly subdivided into vehicular- and hand-portable systems. The emphasis of this Chapter is to place these applications within the context of the expected communication range(s), environment(s) and channel characteristics of each application. The final section of the Chapter addresses the choices of method by which information is transmitted, i.e., modulation methods, and the impacts of the channel characteristics on these methods. A user can place the land mobile system that he is designing or planning within the framework of these applications and identify the important considerations that affect his system by reading this Chapter.

Chapter 3 discusses the fundamentals of terrestrial electromagnetic wave propagation. The first section of the Chapter introduces the deterministic concepts of electromagnetic wave reflection, refraction, diffraction and multipath. For the case of a fixed transmitter and receiver and a well-mixed atmosphere, these govern the long-term (hourly) median signal strengths. The remaining two sections of this Chapter then introduce the seemingly random nature of the fluctuations of the signal strength about the long-term median as the mobile transmitter or receiver (or both) move about over short distances. A user should read this Chapter to become acquainted with the fundamental concepts of a broad range of radio propagation models.

Chapter 4 discusses modelling techniques for outdoor radio propagation predictions. These are broadly subdivided into site-general, empirically-based models and more deterministic, site-specific models. Also included in this Chapter are brief sections on modelling techniques such as ray tracing, GTD-UTD methods and parabolic equation and integral equation methods. Due to their importance, diffraction modelling methods are revisited and finally, a section on the considerations on the choice of which propagation models to use is included. The user should read this section to obtain details of the various modelling methods available for use in propagation predictions.

Chapter 5 discusses the availability and use of terrain and land-use/land-cover databases. These are particularly helpful when using a site-specific propagation model, but also useful for some types of site-general models.

Chapter 6 discusses considerations for propagation within and into/out of buildings. Here again, models are subdivided into site-general and site-specific models. Users desiring methods for propagation predictions for these increasingly important cases should read this Chapter.

Chapter 7 covers antenna considerations as these relate to the propagation problem, while **Chapter 8** covers the effects of environmental radio noise on radio system performance. Both are important in designing or planning a detailed radio communication system. **Chapter 9** treats the important case of the channel transfer function/channel impulse response for digital modulation methods. These are very important in determining the expected performance of a digitally modulated system bit error ratio or symbol error rate in the presence of noise and/or interference. The Handbook concludes with a Bibliography and two Appendices on practical examples and unit conversions.

1.3 Applicable ITU-R texts

The following ITU-R texts cover areas relevant to the scope of this Handbook. A bibliography of non-ITU-R texts follows Chapter 9.

Recommendation ITU-R P.833-3 – Attenuation in vegetation, International Telecommunication Union, Geneva, 2001.

Recommendation ITU-R P.525-2 – Calculation of free space attenuation, International Telecommunication Union, Geneva, 2000.

Recommendation ITU-R P.341-5 – The concept of transmission loss for radio links, International Telecommunication Union, Geneva, 2000.

Recommendation ITU-R P.1058-2 – Digital topographic databases for propagation studies, International Telecommunication Union, Geneva, 2000.

Recommendation ITU-R P.368-7 – Ground-wave propagation curves for frequencies between 10 kHz and 30 MHz, International Telecommunication Union, Geneva, 2000.

Recommendation ITU-R P.1144-2 – Guide to the application of the propagation methods of Radiocommunication Study Group 3, International Telecommunication Union, Geneva, 2001.

Handbook on radiowave propagation information for predictions for terrestrial path communications, International Telecommunication Union, Geneva, in preparation.

Handbook on radio spectrum monitoring, International Telecommunication Union , Geneva, 1995.

Recommendation ITU-R P.1407 – Multipath propagation and parameterization of its characteristics, International Telecommunication Union, 2000.

Recommendation ITU-R P.529-3 – Prediction methods for the terrestrial land mobile service in the VHF and UHF bands, International Telecommunication Union, Geneva, 2000. (Superseded by Recommendation ITU-R P.1546)

Recommendation ITU-R P.452-10 – Prediction procedure for the evaluation of microwave interference between stations on the surface of the Earth at frequencies above about 0.7 GHz, International Telecommunication Union, Geneva, 2001.

Volume 2 of Handbook on Land Mobile – Principles and approaches on evolution to IMT-2000/FPLMTS, International Telecommunication Union, Geneva, 1997.

Recommendation ITU-R P.1057-1 – Probability distributions relevant to radiowave propagation modelling, International Telecommunication Union, Geneva, 2001.

Recommendation ITU-R P.526-7 – Propagation by diffraction, International Telecommunication Union, Geneva, 2001.

Recommendation ITU-R P.1411-1 – Propagation data and prediction methods for the planning of short range outdoor radiocommunication systems and radio local area networks in the frequency range 300 MHz to 100 GHz, International Telecommunication Union, Geneva, 2001.

Recommendation ITU-R P.1238-2 – Propagation data and prediction models for the planning of indoor radiocommunication systems and radio local area networks in the frequency range 900 MHz to 100 GHz, International Telecommunication Union, Geneva, 2001.

Recommendation ITU-R P.1406 – Propagation effects relating to terrestrial land mobile service in the VHF and UHF bands, International Telecommunication Union, Geneva, 2000.

Ex-CCIR Report 902 – Radiating/leaky cable systems in the land mobile service.

Handbook on land mobile (Volume 3) – Radio dispatch systems, International Telecommunication Union, Geneva (in preparation).

ITU-R P.372-7 – Radio noise, International Telecommunication Union, Geneva, 2001.

Recommendation ITU-R P.453-8 – The radio refractive index: Its formula and refractivity data, International Telecommunication Union, Geneva, 2001.

Ex-CCIR Report 880-1 – Short distance radio-wave propagation in special environments.

Report ITU-R M.2014 – Spectrum efficient digital land mobile systems for dispatch traffic, International Telecommunication Union, Geneva, 1998.

Recommendation ITU-R P.1546 – Method for point-to-area predictions for terrestrial services in the frequency range 30 to 3 000 MHz, Geneva, 2001.

Handbook on land mobile (Volume 1) – Wireless access local loop, International Telecommunication Union, Geneva, 1997.

CHAPTER 2

APPLICATIONS TO LAND MOBILE RADIO SYSTEMS

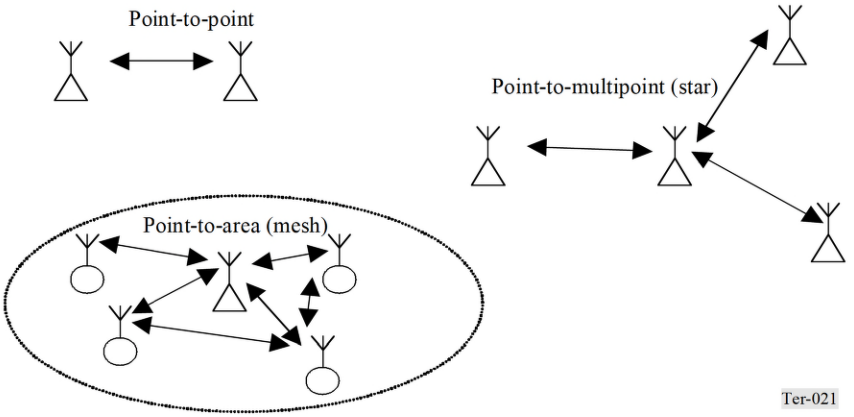
This Chapter provides a brief overview of typical applications in the land mobile services. Giving only a general presentation of system structure, it highlights those system features which may impact upon the scope, aims or choice of relevant propagation studies. Special attention is paid to the necessary coverage and communication range considerations.

2.1 General network architecture

One of the primary points to consider when discussing any radiocommunication system is its general network architecture. This describes the way in which communication links are established in the network and which terminals are actually communicating among themselves. Such consideration gives very important ideas on necessary propagation paths, ranges and directivities. Three of the most typical radiocommunication network architectures are shown in Fig. 2.1.

FIGURE 2.1

Typical network architectures of radiocommunication systems



It may be noted, that from the three architectures shown in Fig. 2.1, a point-to-area network may be considered as most representative of land mobile systems. However the other two architectures are also relevant for certain modes of operation in land mobile systems.

Point-to-point operation is most typical for fixed radiocommunication networks but may be used also in land mobile networks when mobile (transportable) terminals operate while not in motion, from some temporary fixed locations. Examples of such applications include mobile tactical radio-relay links, temporary electronic news gathering systems, etc. It is also likely that such a mode of operation may further spread within mobile systems with the introduction of advanced steerable antennas. This technique allows the tracking of a mobile remote terminal while in motion with a rotating beam of a base station antenna.

The exceptional advantage of such point-to-point mode of operation is that it allows the use of highly directional antennas, which increases the range of communication and reduces multipath effects. In such cases the propagation path is well defined, so it is often possible and advisable to use path-specific propagation prediction models.

Point-to-multipoint network architecture, also known as a star configuration, contains a central node which acts as a managing and switching point for communication with the remote stations, as well as for communications between remote stations. When only one-way communication is involved, such networks become what is well known as a broadcasting network. Although primarily a domain of fixed networks, star architectures are now often employed in radiocommunication systems, which stand on the boundary between fixed and mobile services. A good example of such application may be the so called wireless local loop (WLL) systems, often having both fixed and mobile user terminals in their structure. But even fixed terminals in WLL systems are being deployed in a simplified flexible way (sometimes even by the end subscribers themselves), without prior knowledge of terminal locations and appropriate path consideration.

Due to heavy traffic load expectations in WLL systems, they are usually planned in the frequency bands above the UHF range. However in sparsely populated areas WLL systems are often deployed at UHF frequencies, typically around 900 MHz, 1.5 GHz or 2 GHz frequency bands. In such cases, it is expected that communication ranges will be comparable with those of land mobile systems and possibly even greater, up to some 50-100 km. Therefore, if circular coverage is necessary, UHF band WLL systems employ directional antennas at base stations, arranged in several sectors over the whole 360°.

Therefore in coverage prediction of such WLL point-to-multipoint systems it is often possible to use point-to-area coverage prediction methods, but care should be taken to account for the higher antenna gain at base and remote stations. The height of remote antennas is usually taken as 10 m above ground, because they are often mounted on rooftops along with antennas for broadcast reception.

Point-to-area architecture is the essential mode of operation of traditional land mobile systems. It provides coverage of an entire area from one or more base stations on the assumption that mobile stations may appear at any time in any point of a given coverage area and may maintain a communication channel while moving within the limits of that entire coverage area. Such architecture may become a mesh network, when mobile stations may communicate directly among themselves. This is the case in traditional private mobile radio networks. In public cellular networks mobile terminals may communicate only via the central node (actually via the relevant base station and central network switching facility), hence from a pure network perspective they act as if in a star configuration. But even in the latter case, from a radio planning perspective they should be treated as point-to-area systems.

Planning of coverage areas in the point-to-area mode is a difficult task, because it is in principle impossible to foresee the exact path that radiowaves will travel. Therefore path-general models are usually employed for propagation prediction, with the assumption that the field strength will be subject to variations which may be described using statistical methods. In such planning, it is important to plan for the most reliable coverage of the entire intended coverage area, minimizing the number of "shadow" areas.

2.2 Private mobile radio (dispatch) systems

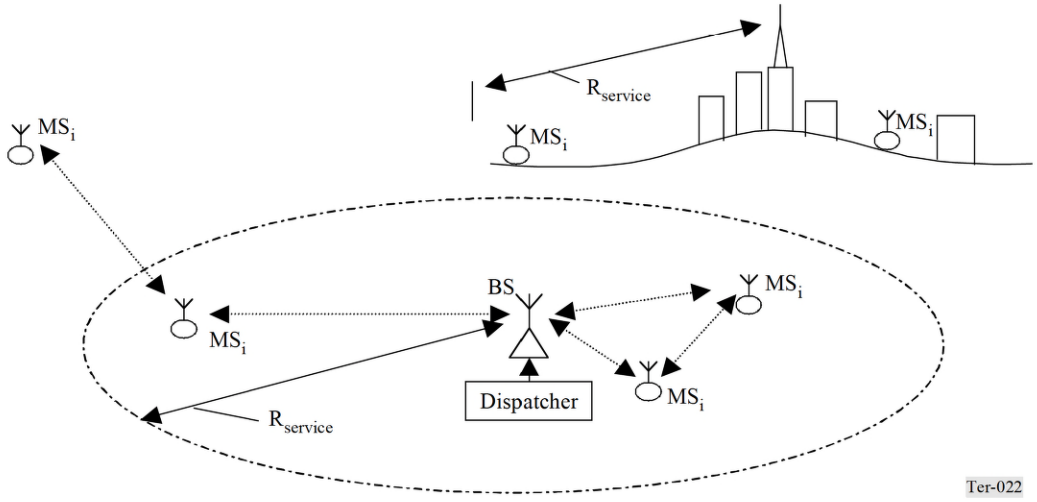
Private mobile radio (PMR) systems, also known as private dispatch systems, are the oldest and still most widely used type of land mobile applications. Deployed for the first time in 1929 as the means of communications with police patrol cars, the RF architecture of these systems remains essentially unchanged until today, although trunking has added another dimension.

The major feature of the PMR systems is that they provide instant access to a radio channel (so called push-to-talk principle) and allow communication in a mesh architecture. From the radio planning point of view, PMR systems usually represent one city or a somewhat larger administrative subdivision such as a county, a department, etc. If the area is sufficiently small and unshadowed by topographic obstacles, a single site can be used as shown in Fig. 2.2. When the number of mobile and portable radios increases or when it is necessary to cover larger territories, then additional base stations can be introduced.

Because of their simplicity and comparatively low initial and running cost, such PMR systems are a favourite choice for private mobile communications and today are widely used by emergency services, utility, transportation and taxi companies, and other companies requiring affordable mobile communications. Additionally, their dispatch-oriented operating characteristics frequently match user requirements better than would a "one-to-one" system like a public mobile telephone system.

FIGURE 2.2

PMR system in its basic principal architecture



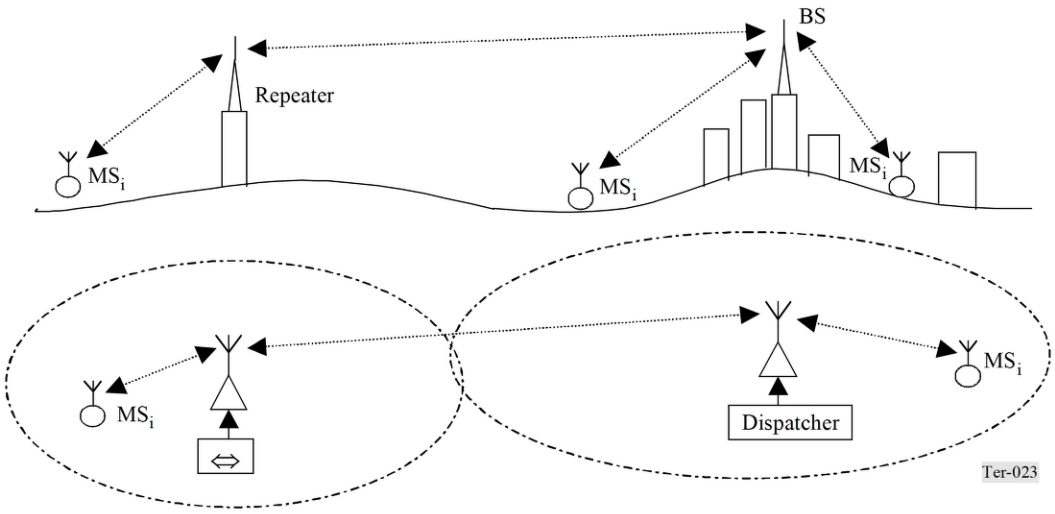
Initially working mostly at VHF frequencies, PMR systems today use many parts of the VHF/UHF frequency range, e.g. around 40 MHz, 160 MHz, 450 MHz and 900 MHz frequency bands. The typical power of base stations is 25-400 W and the power of mobile stations 2-100 W. In areas with flat topography, it is common to install base station antennas in the middle of the service area, usually on the top of high standing buildings in city centres, etc. In cities surrounded by mountains, it is common to install base stations on top of a mountain peak. Most commonly, base stations deploy omnidirectional antennas, although those in surrounding mountain ranges may use directional antennas with wide horizontal beamwidth. With the aforementioned power of transmitters, the expected radius of coverage areas ranges from 25 to 100 km.

Because of their mesh architecture, communications in the PMR systems are very sustainable. Even when a given mobile happens to be in a non-coverage spot, another nearby mobile station may act as a relay to pass a message to the central dispatch office, as shown in Fig. 2.2. Nevertheless, and especially in applications that are sensitive to overall reaction time such as emergency services, the coverage area of PMR systems should be carefully planned with a view to guaranteeing the necessary extent of coverage area and to eliminating any possible shadowed spots.

Since basic PMR systems use a simple protocol for access to a radio channel (which is only one or a few manually selectable channels per network), for extension of coverage areas the option of a repeater station configuration is usually chosen, as shown in Fig. 2.3. However, such repeater stations should be considered in the planning exercise in the same way as the central base station.

FIGURE 2.3

Use of repeater to extend coverage of PMR system



Modern large PMR networks today often use the so-called trunking technologies, which are designed to provide mobile terminals with seamless access to a larger set of available frequency channels, while retaining the essential "push-to-talk" principle of communication. At the same time, this more advanced mode of channel selection introduces the cellular principle of multiple base station deployment over larger territories. However, even in the cellularly-organized trunked PMR networks the individual base stations usually retain the same features as in a single-station network, such as omnidirectional antennas, power and communication range.

Trunking technologies also allowed the development of such systems as PAMR (public access mobile radio) networks, which are usually the same trunked PMR networks with selective calling, in which available airtime capacity is leased by network operators as virtual PMR to small businesses.

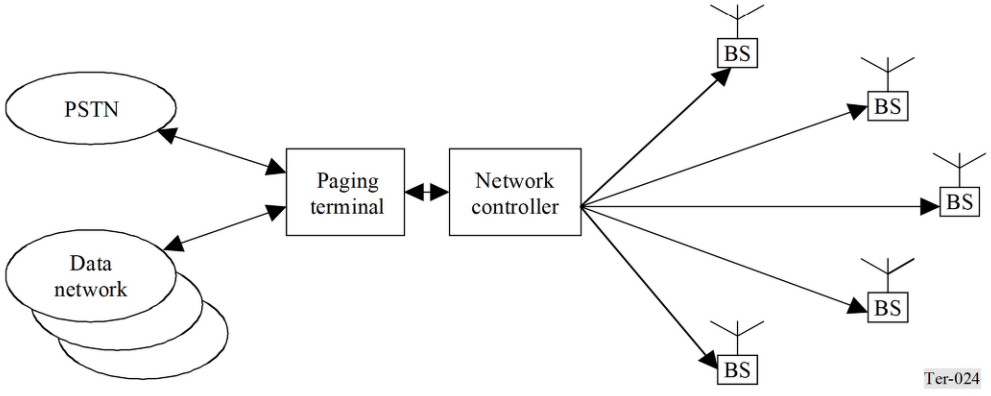
Because PMR systems are mostly used for voice communications, they usually employ narrow frequency channels with channel widths of 33/25 kHz and smaller. This means that the propagation statistics are not frequency selective and are usually considered in terms of field strength variation (fading) characterization over time and over area, that is time and location variability.

2.3 Public radio paging networks

Radio paging networks were the first widely available public mobile networks. They are intended for one-way transmission of alphanumeric messages. The basic structure of a paging network is shown in Fig. 2.4. Pages are initiated either via the public switched telephone network (PSTN) or via a direct connection to a data network or both. The paging terminal handles the page requests and queues and re-formats into a form suitable for transmission. The network controller is the interface to the paging base stations.

FIGURE 2.4

Basic structure of public radio paging network



Since paging networks work essentially in a broadcasting mode of operation, they are planned in a manner that is similar to that of broadcasting networks. Base stations usually operate at VHF or UHF frequencies, usually with one frequency per entire network, with typical power of transmitters 100-400 W and omnidirectional antennas. The expected radius of base station coverage areas for reliable outdoor reception is 50 km or more. Indoor coverage is severely reduced due to building penetration losses. For that reason, quasi-synchronous "simulcast" techniques are frequently employed. To ensure proper reception when moving between neighbouring coverage areas, the base stations in a given network transmit in a quasi-synchronous mode. This also alleviates the need for interference assessment, so network planners need only to ensure proper coverage.

Because of its broadcasting nature, path-general propagation prediction methods are very suitable for planning coverage areas in paging networks, including those methods used with conventional radio and TV broadcasting services. However, care should be taken to make an adjustment for reduced height of receiver antennas (pagers are usually worn on the belt, at approximately 1 m above ground) as well as for associated body loss which is significant for paging receivers. See the discussion on this in Chapter 7 of this Handbook.

2.4 Public cordless telephony systems

The public cordless telephony (CT) systems are derived from the previously mentioned wireless local loop systems. The characteristic feature of CT systems is that they are intended for very short communication distances and are suited for mobile as well as for fixed user terminals. While WLL typically works in a point-to-multipoint mode with the base station installed at the telephone exchange premises and covering a wide service area, the CT systems usually employ radio transmission only in the so called "last mile" of the telephone infrastructure, thus replacing local drop parts of some 0.1-1 km from the street cabinet to the subscriber premises, as shown in Fig. 2.5.

FIGURE 2.5

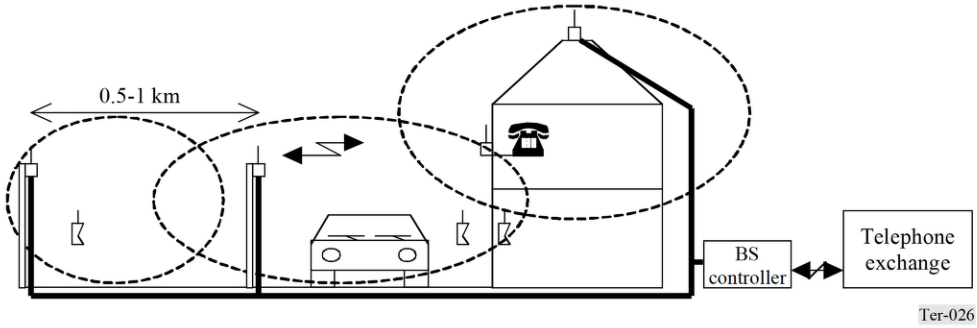
Wireless local loop system in cordless telephony mode



Such an architecture utilize base stations with transmitter powers of some 10-100 mW (sometimes up to 0.5 W) and intended communication ranges of not more than 0.5-2 km. Normally some kind of automatic channel selection protocol is used, which allows dynamic assignment of free channels. Therefore CT systems become perfectly suited for network deployment in the highly dense cellular structures with the "lamp-post" principle of base station installations at 0.5-1 m intervals, see Fig. 2.6

FIGURE 2.6

Public CT system installation in urban areas



Public CT networks are intended primarily for installation in urban areas and may cope with traffic loads of up to 10 000 E/km^2/floor. Notice that the traffic load is given per floor, because it is assumed that low power base stations create coverage zones only on the same level of multi-storey buildings. The typical power of a user terminal transmitter is around 10 mW in both fixed and mobile versions. Omnidirectional antennas are used on both sides. Due to the small size of the cells and optimization of radio access protocol for toll-quality connections, CT networks usually provide some means of subscriber hand-off between the cells but only for a slow speed of the mobile, e.g. limited to the pedestrians' speed of 4-5 km/h.

Ultimately public CT networks should allow seamless roaming of CT terminals between the privately owned home cordless telephones and their public counterpart network. It is also foreseen that public and private CT networks may form part of the universal international mobile telecommunication systems family, known as IMT-2000.

From the radio planning perspective CT networks usually do not require extensive propagation modelling because of the very dense installation of base stations with overlapping coverage areas. Usually it is sufficient to develop some general rules of expected propagation distance, based on operating frequency, typical height of antennas and propagation conditions. These rules may be then used in determining maximum separation distances between base stations and other guidelines for their typical installations.

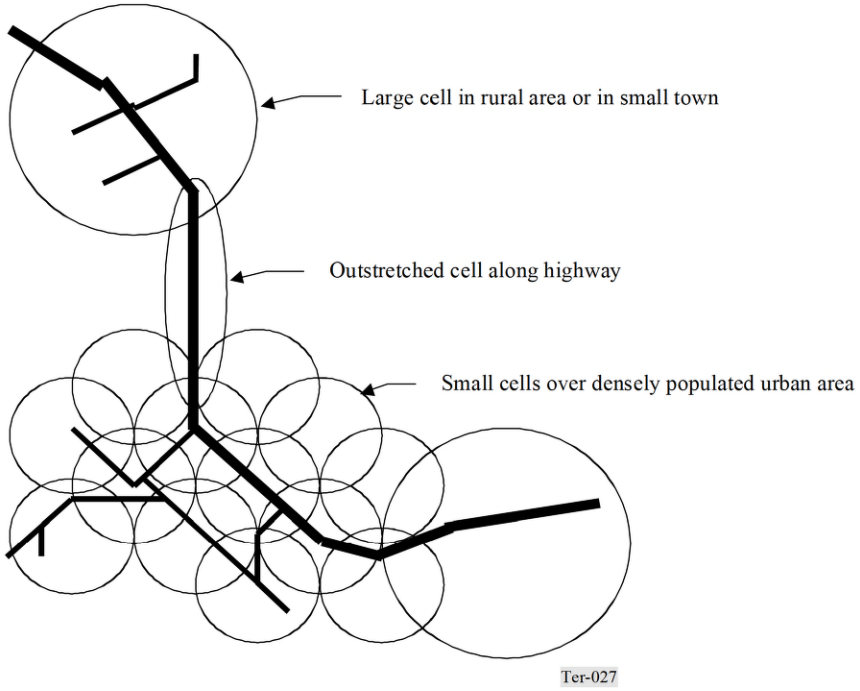
2.5 Public cellular mobile telephony systems

Mobile telephony systems gradually developed from PMR systems, first providing the possibility for mobile users to connect to the PSTN network by means of manual switching at the dispatcher office, then creating specialized PMR-like mobile telephony systems with the dispatch office being replaced with a manned commutator, and finally with the automatic exchange that was directly connected with the PSTN network.

Such public mobile telephony networks featuring automated switching centres and deploying single base stations with radial coverage of metropolitan areas were in operation in many countries from 1960-1980 (and are sometimes still in operation today). However low efficiency of channel utilization and hence very limited traffic capacity in the PMR-type of architecture did not allow wide development of such systems until the concept of cellular deployment was introduced to mobile telephony networks around the 1980s. A basic example of cellular network deployment is shown in Fig. 2.7.

FIGURE 2.7

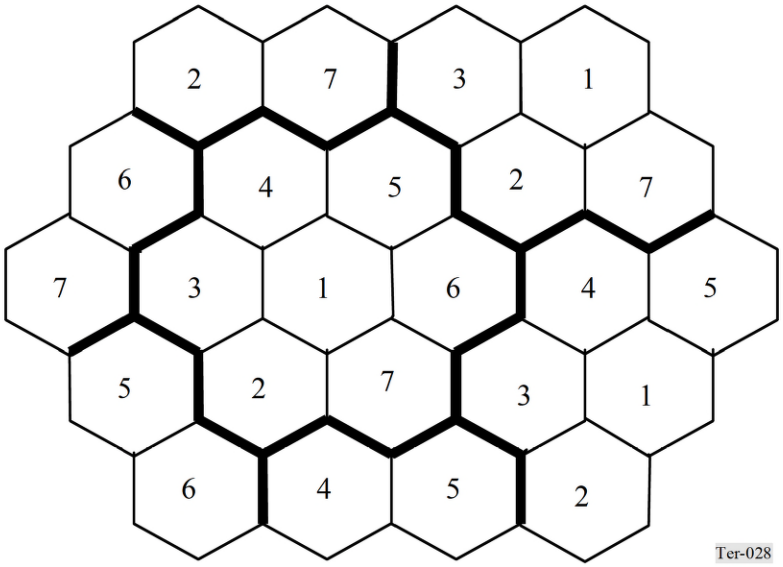
Example of cellular network architecture



The example in Fig. 2.7 shows how the density and shapes of the cells are adjusted to account for different subscriber density and adapt to the most likely routes of subscriber mobility. Essentially, individual cells in the cellular mobile network are planned as units limited by traffic capacity. This allows enormous flexibility for operators to deploy their networks gradually, first starting with large cells and then splitting them down to smaller and smaller cells as traffic grows. The initial problem of limited spectrum capacity in cellular structures is alleviated by significant frequency reuse, because small coverage areas allow the reuse of the same frequency at small distances, as shown in Fig. 2.8.

FIGURE 2.8

Example of frequency reuse pattern with 7 groups of frequencies in cellular structure



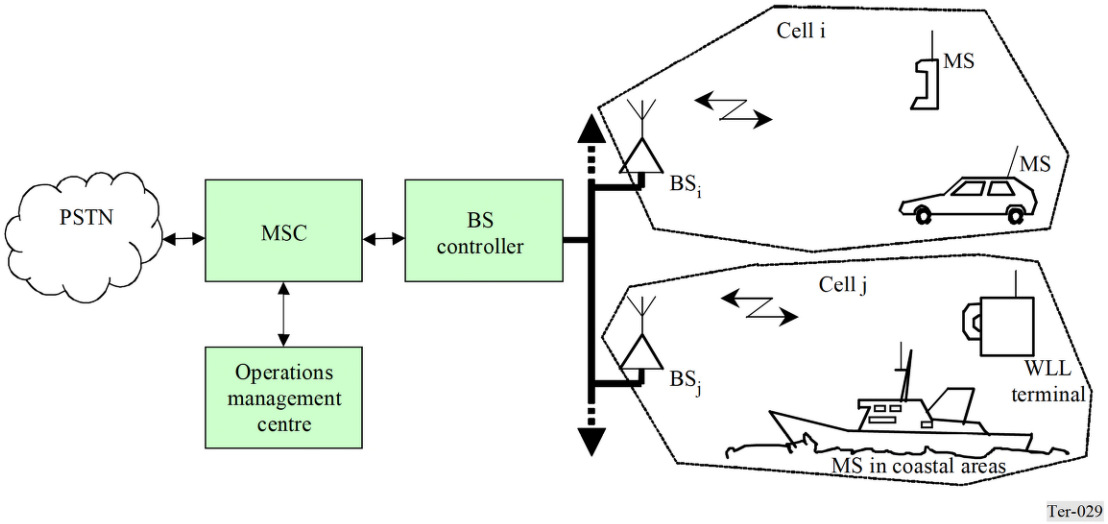
Later, code division multiple access (CDMA) technologies allowed the establishment of networks on a single frequency basis, although the capacity-limited principle of cell formation remained unaffected.

It may be noted that today the three generations of cellular public mobile telephony systems exist: First generation systems are analogue systems, employing some kind of frequency division multiple access (FDMA) protocols with usual narrow-band FM channels. Second generation systems are digital systems, which are largely used today. These employ some kind of digital modulation technology and either time division multiple access (TDMA) in combination with FDMA or CDMA mode of operation. Third generation systems are expected to start commercial operation gradually and are described as a family of various standards, primarily CDMA with frequency division duplex (FDD) or time division duplex (TDD), but also FDMA/TDMA standards. Together they are known under the ITU name of IMT-2000 (International Mobile Telecommunications).

Differences between various systems and different generations lie in the area of the variety of services offered and their quantitative and quality characteristics, different inter-network and inter-system roaming capabilities, etc. However, essentially all cellular telephony networks are similar in so far as the networks themselves and all communications within the networks are managed centrally from the so-called mobile switching centre (MSC), and all interconnections between mobile stations and the network, as well as between mobile stations, are routed through the nearest base station and MSC. A basic network architecture of cellular land mobile telephony systems is shown in Fig. 2.9.

FIGURE 2.9

Basic network architecture of cellular mobile telephony systems



Cellular systems usually employ directive antennas to form the required shape of the cells and also to reduce interference into neighbouring cells in FDMA/TDMA networks. Typical communication distance ranges are 100-300 m for pico-cells in dense urban areas, 0.5-1 km in urban micro-cells, 1-5 km in macro-cells employed in cities with low population densities and suburbs, and 5-25 km in rural areas, along highways, etc. Digital systems often have their maximum communication range tied into the timing structures of communication protocol, e.g. TDMA packet timing in a GSM system provides a maximum communication range of about 35 km. It may also be noted that the communication protocols and channel models in cellular telephony systems should assume a relatively high speed of vehicular mobile stations, in the range of 150-200 km/h.

Cellular mobile systems provide an extremely difficult task for networks planners, and propagation modelling is an important part of it. Because of the need to account for a large number of transmitters and because of high susceptibility to modelling errors, the network and coverage planning of a cellular mobile system usually requires application of dedicated sophisticated software tools that make extensive use of high resolution terrain and clutter databases.

It may be noted that significant differences exist between the planning of cellular networks that employ FDMA/TDMA and CDMA technologies. In the FDMA/TDMA networks, one of the major goals is frequency planning that is based on projected traffic forecasts (which leads to an estimate of cell size and its location) to position base stations and assign them frequencies so that mutual interference within the network is kept to a minimum. At the same time in CDMA networks, where co-frequency operation of neighbouring base stations is normal, the problem of interference is replaced with the problem of power management. This is because in a single frequency operation of a CDMA network a mobile station may distinguish between the different base stations and associate

itself with the nearest only through the estimation of power of received signals. Therefore the task of a CDMA network planner is to ensure that in the service area of a given cell a signal from its base station is dominant over the signals arriving from other cells.

Another characteristic which ought to be addressed is the channel width of the system. First generation systems usually use narrow channels (25/33 kHz) with analogue FM modulation, and they may be modelled as non-frequency selective. Second and third generation systems employ digitally modulated signals in much wider channels, for which delay spread and frequency selectivity aspects need to be considered in the propagation studies.

2.6 Useful references

[2-1] Handbook on land mobile (Volume 1) – Wireless action local loop, International Telecommunication Union, Geneva, 1997.

[2-2] Handbook on land mobile (Volume 2) – Principles and approaches on evolution to IMT-2000/FPLMTS, International Telecommunication Union, Geneva, 1997.

[2-3] Handbook on land mobile (Volume 3) – Radio dispatch systems, International Telecommunication Union, Geneva, (in preparation).

[2-4] Report ITU-R M.2014 – Spectrum efficient digital land mobile systems for dispatch traffic, International Telecommunication Union, Geneva.

CHAPTER 3

FUNDAMENTAL PROPAGATION PRINCIPLES

3.1 Propagation mechanisms

3.1.1 Free space

If there are no obstacles to propagation, the field strength follows the well-known inverse-square law, i.e. the received power varies as $1/d^2$. In logarithmic terms, the basic transmission loss between isotropic antennas is $L_{bf} = 32.45 + 20 \log f + 20 \log d$, where f is frequency in megahertz and d is distance in kilometres. The dependence on frequency occurs because the physical size and hence the capture area of the receiving antenna decreases with increasing frequency for an antenna of a given design. For the hypothetical isotropic antenna that is used as the basis of this formula, the capture area is $\lambda^2/4\pi$. For other antenna designs, the capture area is also proportional to λ^2, but the multiplying constant is different. The free-space formula is sometimes used as a very conservative estimate for interference purposes, and also for comparison with total path loss. That is, the difference between the total path loss on a given path and the free-space loss is the attenuation due to blockage by terrain or other obstacles.

3.1.2 Reflections

The Fresnel reflection coefficients for reflection of a plane wave by a plane surface are:

$$R_h = \frac{\sin\psi - \sqrt{n^2 - \cos^2\psi}}{\sin\psi + \sqrt{n^2 - \cos^2\psi}} \tag{3-1}$$

for horizontal polarization, and

$$R_v = \frac{n^2 \sin\psi - \sqrt{n^2 - \cos^2\psi}}{n^2 \sin\psi + \sqrt{n^2 - \cos^2\psi}} \tag{3-2}$$

for vertical polarization, where ψ is the complement of the angle of incidence and $n^2 = \varepsilon - j60\sigma\lambda$, where ε and σ are respectively the permittivity and conductivity of the reflecting material. For grazing incidence, i.e. $\psi << 1$, the second term in the numerators and denominators dominate, and the reflection coefficient tends toward –1. This is true for both polarizations, with the result that in most circumstances, the difference in the effect of the ground on the two polarizations is not great. However, for reflections on buildings, the angle of incidence can have any value.

If the ground is curved (convex upward) with radius of curvature a, a factor to multiply R_h or R_v that accounts for the defocusing of the wave is [3-1, p. 224]:

$$D = \left[1 + \frac{2d_1 d_2}{a(d_1 + d_2)\sin\psi}\right]^{-1/2} \tag{3-3}$$

where d_1 and d_2 are the distances from the antennas to the point of reflection. If the ground is concave upward ($a < 0$), this formula accounts for a focusing effect, but such focusing is usually not realized in practice, because the ground does not have the precise shape required.

If the reflecting surface is rough with a Gaussian height distribution, the coherently reflected wave is attenuated by the factor [3-1, p. 246]:

$$\rho_s = e^{-(\Delta\Phi)^2/2} \tag{3-4}$$

where $\Delta\Phi = 4\pi\, \Delta h \sin\psi/\lambda$, where Δh is the standard deviation of the normal distribution of heights. Equation (3-4) is a quantitative expression of the Rayleigh criterion for specular reflection on a rough surface. The derivation of this formula neglects the shadowing of one peak in the rough surface by the next one, and so is not valid for extremely rough surfaces.

3.1.3 Reflection from ground

Ground reflections are most important on water or smooth Earth. The direct and ground-reflected waves may interfere constructively or destructively, depending on the difference Δr between the lengths of the direct and reflected paths. If the base-station antenna is located at height h_b above flat reflecting ground, and the mobile antenna is at height h_m, the difference between the lengths of the direct and reflected paths is $\Delta r = 2\ h_b h_m/d$, where d is the horizontal distance between antennas. This formula is valid if $d >> h_b$ and $d >> h_m$, as is usually the case. As d increases, Δr decreases from perhaps several times the wavelength λ to $\Delta r >> \lambda$. Since reflection from the ground introduces a phase shift corresponding to approximately one-half wavelength (a reflection coefficient of approximately –1), destructive interference occurs for $\Delta r = n\lambda$, where n is an integer. Constructive interference occurs where n is a half-integer. As d increases, the last of these points is at $\Delta r = \lambda/2$, i.e. at $d = 4\ h_b h_m/\lambda$, sometimes referred to as a breakpoint [3-2]. For greater distances, the field strength decays as $1/d^4$. For $d >> 4\ h_b h_m/\lambda$, on a plane highly-reflecting Earth, the path loss is given by:

$$L_b = 120 + 40 \log d - 20 \log h_b - 20 \log h_m \tag{3-5}$$

Besides the fourth-power distance dependence, this equation also shows a linear dependence of field amplitude (20 log h) on the height of either antenna. Although this equation is derived from a highly idealized situation, the dependence on distance and height found in non-ideal terrain is roughly similar. Another manifestation of ground reflections is that in mountainous areas, reflections from a steep slope can illuminate a region that would otherwise be in deep shadow, for example along a curved valley with steep sides.

3.1.4 Reflection from buildings

In built-up areas, reflections from buildings are important. Unlike ground reflections, building reflections can occur at all angles of incidence, and it is usually not a good approximation to consider the surface to be perfectly reflecting. The electrical properties of the ground and of building materials are fairly well known. However, the construction of buildings involves different material mixed together or close together (e.g. reinforced concrete), or hollow materials

(e.g. concrete blocks) [3-3]. The surface of buildings can be rough enough to reduce specular reflection and to scatter waves. Since the detailed properties of building walls are usually not known, empirically determined effective values may be used. Results of one study [3-4] suggest that the effective values of relative permittivity of residential building walls range between three and six. Reflection among buildings tends to fill in shadows to some degree.

3.1.5 Diffraction

Diffraction is the mechanism by which waves of any kind propagate around obstacles. On obstructed paths, diffraction is usually the most important propagation mechanism.

Fresnel zones and ellipsoids are often used to visualize diffraction at VHF and UHF. The first Fresnel ellipsoid is the volume for which the excess length of a line from the antennas to any point in the volume is less than $\lambda/2$, where λ is the wavelength. Any cross section of the first Fresnel ellipsoid is a first Fresnel zone. The radius R_1 of a first Fresnel zone perpendicular to the line of sight is given by $R_1 = \sqrt{\lambda d_1 d_2 / (d_1 + d_2)}$. A propagation path is considered obstructed if the first Fresnel ellipsoid is not clear. This is the conventional criterion, although it is a conservative one, since obstacles can penetrate to about 0.6 of the first Fresnel-zone radius without reducing the field strength significantly. The attenuation due to obstacles penetrating the first Fresnel ellipsoid depends on how much of it is blocked and on the shapes of the obstacles. The simplest example is a sharp transverse ridge (modelled as a knife-edge) that blocks exactly half of the first Fresnel zone. In that case, the field amplitude is reduced by half, with a power loss of 6 dB. An obstacle that is broad in the direction of propagation causes greater attenuation than a narrow obstacle. This is an important effect in diffraction over terrain, in which a broad rounded hill or the curvature of the Earth can cause an attenuation that is much greater than a narrow obstacle of the same height. These issues are covered in more detail, for example, in [3-5].

Buildings in a built-up area present something like a very rough surface to a wave propagating over them, but since the buildings certainly shadow each other, it is not a rough surface that can be represented accurately by the rough-surface reflection coefficient of equation (3.4). A single or a few buildings can be represented as solid shapes, but many buildings are reasonably represented as knife-edges. If these are of uniform height and spacing, propagation over them resembles somewhat propagation over ordinary terrain, with a $1/d^4$ dependence on distance [3-6].

In the land-mobile service, waves propagating over buildings must eventually find their way to street level. They do this by diffracting from the nearest rooftops, and reflecting from nearby buildings. If the buildings are arranged in rows without large gaps in the rows, the wave simply diffracts down from the nearest rooftop in the direction of the base station. There may also be a reflection back from the nearest building in the other direction. If the size and placement of

buildings is more complex, several diffractions and reflections may be involved. In urban areas where there are large buildings, the wave is channelled along streets that are oriented along the nominal propagation direction, and the field strength on such streets is usually higher than on perpendicular streets. In suburban areas where there are fewer large buildings, these channelling effects are less important, but absorption by trees becomes important [3-5].

If the base station antenna is located below the nearby roof tops, as is common in microcells, then the predominant propagation is along streets rather than over roof tops, although propagation over roof tops may make some contribution. Propagation along a street is primarily that of a wave over the plane earth, with $1/d^2$ attenuation punctuated with interference fades as far as a break point, and $1/d^4$ attenuation at greater distances. The wave in perpendicular streets is much weaker, but some energy is diffracted into these streets by the corners of buildings.

3.1.6 Refraction

Refractive effects become important only on paths of a few tens of kilometres or more. Therefore, in the land-mobile service, refractive effects are primarily important in estimating interference and frequency reuse rather than in coverage calculations. The usual way of allowing for standard atmospheric refraction is to assume that the radius of the Earth is larger than its real value by a factor $k = 4/3$. This allows for the refractive bending of radio waves toward the Earth. When the Earth's radius is increased by this factor, rays bent due to refraction become straight lines, and calculations can proceed as if there were no atmosphere. A simple way of allowing for the possibility of enhanced signal strength due to non-standard atmospheric conditions is to change the value of k, increasing it to simulate the greater refraction and greater signal strengths to be expected for small percentages of time. However, for very small percentages of time, it is better [3-7] to use statistical empirical methods [3-8] to estimate the increased signal strength.

3.2 Shadowing and rapid fading

3.2.1 Shadowing

The field-strength attenuation in the shadow of large obstacles (hills, mountains) can be estimated deterministically. Below some size, which might be tens or hundreds of metres, and which depends on the resolution of the terrain data and the method used, this cannot be done. The shadowing due to objects smaller than the terrain-data resolution (small terrain features, individual trees and buildings) must be treated statistically. Field-strength values in the shadows of many small obstacles follow a log-normal distribution, once the rapid fading due to multipath propagation has been filtered out. The median of the distribution can be estimated by deterministic methods, while the standard deviation must ordinarily be obtained by large numbers of measurements made in typical situations. Standard deviation values range between 3 and 10 dB [3-5, p. 151]. They tend to increase with frequency, and with the local irregularity of the clutter and terrain. Formulae for estimating the standard deviation are given in [3-9].

3.2.2 Rapid fading

Multipath propagation leads to fading on the scale of a few wavelengths on narrow-band channels, and leads to time dispersion of pulses on wideband signals. These effects can be produced by waves reflected from steep mountainsides, but more often are due to scattering and reflections from buildings and other clutter. Waves arrive at the receiver from different directions, creating an interference pattern that can give rise to rapid fading as a mobile receiver moves through the pattern. The distance Δr between successive fades is given by $\Delta r = \lambda/[2 \sin(\theta/2)]$, where θ is the angle between the propagation directions of the two waves, i.e. varying from one-half wavelength upward. The half-wave spacing results from interference between two oppositely directed waves. If there are many waves of comparable amplitudes coming from all directions, the received amplitude follows a Rayleigh probability distribution. If there is also a single wave (usually the direct wave) with amplitude much greater than that of all the others, the received amplitude follows a Rician distribution. The effects of multipath fading can be mitigated by increasing the transmitted power or by various diversity schemes, or in the case of digital transmission by coding and error correction.

If digital information is to be sent at a high data rate, then the delay spread of a transmitted pulse is of concern. The effect is similar to speaking in a room with a long reverberation time. After speaking each word or syllable, the speaker must wait until the echoes die down before speaking the next one, if the message is to be understood. The radio analogue of the reverberation time is the delay spread, which is a measure of the time during which strong echoes are received. If the delay spread is T, then information bits can be sent no faster than some rate of order $1/T$. This rate cannot be increased by increasing the power, since the power in the echoes also increases. If there is no diversity or coding to correct for the fading, the maximum rate is $1/8T$ [3-10, p. 340]. For a fuller description of this issue, see Section 9.1 of this Handbook.

A number of measurements of delay spreads have been made. Reference [3-10, p. 42] suggests mean delay spreads of 1.3 μs in urban areas and 0.5 μs in suburban areas. The larger buildings in an urban area are more likely to reflect signals strongly from a distance of a few hundred metres, translating to delays of more than a microsecond to a maximum of about 7 μs, but smaller values (< 1 μs) are observed when the base-station antenna is low, at street-lamp level [3-11]. Much longer delay times can sometimes be found, typically at low amplitude. For example, delays in a mountain valley of up to 30-40 μs have been measured [3-12].

3.3 The statistics of location variability

If the direct line of sight between the two antennas is blocked, and if the signal arrives by way of many reflections of comparable strength, the received power follows a Rayleigh distribution. The

probability density of the instantaneous signal power being $r^2/2$ (i.e., r is proportional to signal amplitude, not in decibels) when the mean power is a^2, is given by the following function [3-5]:

$$P_r(r) = \frac{r}{a^2} \exp\left(-\frac{r^2}{2a^2} \right) \tag{3-6}$$

This function is not symmetrical about its peak at $r = a$. As a consequence, the mean, median, and root-mean-square are not equal. The median, for example, can be obtained by integrating to obtain the cumulative probability function, and setting that probability to 0.5, to arrive at a median of $\sqrt{\ln 2}\,a \approx 1.1774a$. The formal standard deviation of the Rayleigh distribution is 5.57 dB, but a more appropriate value to use when combining with log-normal distributions is σr = 7.5 dB [3-13].

If the direct wave, or possibly a strong reflection, is substantially stronger than the other waves, the more general Nakagami-Rice distribution can be used. In this distribution, there is an added free parameter, namely the ratio K of the received power of the direct wave to the mean power of the remaining Rayleigh-distributed wave. This parameter can vary from zero to infinity, depending on whether the signal is pure Rayleigh or pure direct wave. The probability density function is [3-5]:

$$P_r(r) = \frac{r}{a^2} \exp\left[-\frac{r^2 + r_s^2}{2a^2} \right] I_0\left(\frac{r r_s}{a^2} \right) \tag{3-7}$$

where $r_s^2/2$ is the power of the strong steady signal. The function I_0 is the modified Bessel function of the first kind of zero order. The ratio K can be introduced into this equation by substituting $a^2 = r_s^2/(2 \cdot 10^{K/10})$.

In built-up areas, the distribution is considered to be Rayleigh (or Rice) over a small distance of say 20 m, but the small-distance median value of the signal varies over larger distances because of shadowing by various objects, and is random and log-normal up to perhaps 100 or 200 m. The log-normal distribution is:

$$p(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-\frac{x^2}{2\sigma^2} \right] \tag{3-8}$$

where x is the signal level in decibels, and σ is the standard deviation (also in decibels) of these levels. Over this larger distance, a combined Rayleigh-log-normal distribution might be used to represent the instantaneous signal, but a simpler alternative [3-13] is to combine standard deviations as if they were both log-normal, and to include other log-normal distributions as well. In this scheme, the overall standard deviation is combined as:

$$\sigma_{total} = \sqrt{\sigma_1^2 + \sigma_2^2 + \ldots} \tag{3-9}$$

where the various contributing standard deviations may be, as appropriate, those due to shadowing, prediction error, Rayleigh fading, and any other losses that it might be convenient to consider separately, such as vegetation or vehicles [3-13]. If the objective is to estimate the reliability of predicted coverage, the standard deviation of prediction error should be included. A combined distribution that includes prediction error provides an estimate of coverage over an ensemble of similar areas.

A still simpler alternative for dealing with Raleigh fading [3-14] is to use a log-normal distribution by itself for the median signal and to add a margin of 6 to 10 dB to allow for Rayleigh fading. Since the effect of Rayleigh fading depends on the communications system, it is not always appropriate to include it. Details on various distributions are given in [3-15].

3.4 References

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CHAPTER 4

MODELLING TECHNIQUES FOR PROPAGATION PREDICTION

Chapter 4 describes several techniques and actual models that are used to predict propagation of radiowaves. The first section (4.1) addresses the use of generalized empirical "point-to-area" models, sometimes also correctly referred to as "site-general" models. These models require only general information about the area (such as terrain roughness) in which the radiowaves propagate and do not consider characteristics of specific propagation paths. The method to extend the scope of application of empirical model by means of tuning (optimal parameter selection) is also presented.

Section 4.2 describes the use of terrain specific empirical models, which are also known as "point-to-point" or "site-specific" models. These models differ from the generalized models described in the first section in that they use detailed information about the particular propagation path involved. This information may be either a simple 2-dimensional path profile or very detailed terrain and ground cover (buildings, vegetation, etc.) database. If the path data are sufficiently accurate, the more exact point-to-point methods will usually produce more accurate results than the less accurate point-to-area methods, at the penalty of greatly increased computation time and complexity. It should be noted, however, that greater accuracy is not always necessary in the land mobile services, where typically the received signals suffer from significant fading fluctuations.

Section 4.3 gives a brief overview of various ray tracing techniques and other more rigorous techniques, that attempt to predict the field strength in a nearly deterministic manner by means of accounting all possible paths that radiowaves travel in a multipath mobile environment. Such techniques are suitable for the conditions usually met when transmitting antennas are installed below rooftop levels in cities or within buildings, when the number of ray paths to be considered is reduced by natural surrounding obstacles.

Section 4.4 describes diffraction modelling, which allows calculation of a loss in signal strength when radiowaves travel around obstacles. These obstacles are often approximated as simple knife-edges, cylinders or spheres.

Finally, Section 4.5 presents some useful guidance to potential users as to how to select the model which would be most appropriate in commonly encountered engineering practices, such as network planning, interference assessments, frequency assignment or re-use. Also, guidance is given on model selection to evaluate measurement campaigns for assessment of system performance.

4.1 Generalized point-to-area models

Generalized empirical models, such as those described in Recommendation ITU-R P.1546 [4-1], which has superseded Recommendations ITU-R P.370 [4-2] and ITU-R P.529 [4-3], provide engineers with very convenient tools for field strength prediction in the coverage areas of radio

stations. In their basic form, such models do not involve sophisticated calculations and do not require detailed knowledge about particular propagation paths, therefore they may be used without high-resolution terrain databases or advanced computational facilities.

The essence of most of the empirical propagation prediction models may be represented by a basic expression:

$$E_R = -\gamma \cdot \log(R) + K(P_{BS}, f, h_{BS}, h_{MS}, ...) \quad (4\text{-}1)$$

Equation (4-1) means that the received field strength E_R is presented in empirical models as a logarithmic function of distance R with slope parameter γ, plus an offset parameter K, which in itself is a function of some initial network design parameters: power of transmitter (P_{BS}), operating frequency (f), heights of antennae at base and mobile stations (h_{BS} and h_{MS}), etc. The differences between various empirical models arise mostly in establishing and treating those empirical parameters γ and K.

Recommendation ITU-R P.1546 [4-1] provides electric field strengths in dB(μV/m), referenced to 1 kW e.r.p., as functions of path distance ranging from 1 to 1 000 km, in both graphical (i.e., curves) and tabular (i.e., fixed precision numeric values) formats. The graphical results are presented at three discrete frequencies: 100, 600 and 2 000 MHz. Furthermore, the graphical and tabular presentations include eight transmitter/base antenna heights above the surrounding clutter, ranging from 10 to 1 200 m, for three different time percentages (50%, 10% and 1%) and for land, warm sea and cold sea paths, all for 50% of locations. Values of the maximum expected field strengths, as functions of distance, frequency, time percentage and path type, are also provided.

For general planning not requiring high predictive accuracy, Recommendation ITU-R P.1546 provides graphical curves of field strength for the frequency ranges 30-300 MHz, 300-1 000 MHz and 1 000-3 000 MHz, respectively. However, for users requiring increased predictive accuracy, Recommendation ITU-R P.1546 contains a step-by-step procedure for the proper sequential application of interpolation and/or extrapolation in distance, frequency, antenna height and time percentage, and also including location percentages other than 50% and the recommended nexus for the calculation of the associated basic transmission loss. A method for mixed-path (i.e., a combined land-sea path) field strength computation is also given within the context of the step-by-step procedure. Details of the various antenna height corrections, the interpolations, the extrapolations, the mixed-path field strength computation and the basic transmission loss are also provided in Recommendation ITU-R P.1546.

Some empirical models are presented graphically as a set of curves statistically derived from large sets of measurements. Recommendation ITU-R P.1546 [4-1] is the ITU-R recommended model for terrestrial mobile propagation at VHF/UHF and has been developed from the Recommendation ITU-R P.370 [4-2] model and the Okumura model [4-4].

4.1.1 Okumura and Hata models

The Okumura model is commonly used in planning of the land mobile services. It is the culmination of a careful analysis of a large set of signal strength measurement data gathered in a wide variety of terrain and vegetation and urban clutter environments at several different frequencies in the VHF and UHF bands. The model includes signal strength prediction graphs for bands centred at

150, 450, 900, and 1 500 MHz, based on propagation conditions found to be typical of areas in and around Tokyo, Japan during the early 1960s. Values are provided for several environments, such as dense urban, suburban and open. Additional corrections to the basic Okumura curves are provided for different types of terrain, degrees of terrain ruggedness, slope of the land, over land vs. over-water paths and so on, to such an extent that practical computer implementation of the model becomes difficult.

Hata later published a set of equations [4-5] based on a greatly simplified version of the Okumura model. The Hata model (referred to as the Okumura-Hata model) provides mathematical formulae that approximate the original Okumura curves. It also introduces limitations on the acceptable frequency range (100 to 1 500 MHz), distance from the transmitter site (1-20 km) and transmitter antenna heights (30-200 m above the surrounding terrain). The distance limitation, in particular, reduces the Hata equations' applicability to the design of terrestrial land mobile systems other than cellular systems. The height limitation also reduces the applicability of this model for the mountain top sites.

The Okumura-Hata and other generalized empirical models provide reasonably accurate predictions of coverage in land-mobile radio systems, when they are applied in an environment similar to that where the model was originally developed. The scope of application of general empirical models may be further extended by the means of fine tuning of the model to some specific environmental conditions. This technique is described in detail in the following section. Because the Okumura and Okumura-Hata models are "point-to-area" prediction models, they should not be used for point-to-point predictions. Other models, such as Longley-Rice (see Section 4.2), are better suited to the task of predicting radio system performance for specific paths.

The Okumura-Hata model does have the advantage of simplicity – the ability to predict system performance based on a very limited set of input data. Its simple, straightforward formulation lends itself to easy application on small computers or spreadsheets. The model's principal determinants of signal strength are the frequency, the effective radiated power, the transmit and receiver antenna heights, and the path length. It has become the "default" model for many types of planning tools.

Recommendation ITU-R P.529 [4-3] extended the applicability of the Hata equations to Okumura's original 100 km distance. It also included VHF propagation curves adapted to land mobile applications based on the methods described in Recommendation ITU-R P.370. This has now evolved into Recommendation ITU-R P.1546 which has extended the frequency, antenna height and distance ranges.

Possibly the most important advance contained in the original Okumura model [4-4] is the quantification of the effects of different types of urban and vegetation clutter. The differences between urban area and open area paths can be impressive. For example, at 200 MHz, the increase in signal strength for an open area path as compared with an urban area path is of the order of 20 dB. The model also attempts to account for the difference in signal attenuation as a function of the downward angle from source into the surface clutter.

One thing that can be lost by using a "simple" model is accuracy. A fundamental assumption of the Okumura-Hata model is that the transmitting antenna has an "effective height" above the surrounding terrain. The model also assumes a flat or smooth Earth between the terrain at the transmitter and the receiver. The model's Rolling Hilly Factor attempts to account for terrain

undulation in a statistical manner, but it should not be applied in a point-to-point situation. Okumura's Isolated Ridge factor can provide reasonably accurate results, provided that the path geometry closely matches the model's assumptions. However, this last assumption excludes most practical paths. More recent attempts [4-8] have been made to apply more conventional diffraction loss models to Okumura's curves with limited success.

As has been discussed, Okumura developed the model specifically to include the effects of surface clutter. The Hata version of the model follows suit by incorporating Recommendations (see Recommendation ITU-R P.529-3 [4-3]) regarding excess path losses which can be used in planning of systems.

In summary, the Okumura-Hata model is a widely used planning tool for land mobile radio systems. But careful consideration should be given to the differences that may exist between the situations and environments considered by the model's authors and those that exist for any particular system design case. The approach shown in the following sections describes a way of overcoming some of the problems in the application of empirical models.

However, there might be cases when application of empirical models is not appropriate in principle, e.g. in mountainous areas or other areas with highly irregular terrain.

4.1.2 Testing and tuning of generalized empirical point-to-area models

4.1.2.1 Necessity for tuning of empirical models

As the name implies, empirical models are developed from the results of practical field measurements and therefore become adjusted to the environment in which these original measurements were made. If then such models are applied blindly in environmental conditions notably differing from those of the original, the prediction errors may increase significantly. For example, the precision of a properly tuned empirical model in predicting median field strength may be expected to be in the order of ±5 dB. Such precision is adequate for many practical cases, especially when dealing with the land mobile services where it is comparable with normal signal variations due to fading and shadowing. If the same general model were applied blindly in the unspecified environment, its precision may sometimes drop down to some ±(15…20) dB, which is clearly not acceptable.

Therefore, the practical value and scope of application of general empirical models may be significantly increased by means of their testing and adapting to particular propagation conditions or to conditions in specific country or region. The following section describes how this testing may be performed in its simplest form and how the necessary changes may be introduced into a selected empirical model such as the Okumura-Hata model from Recommendation ITU-R P.529 [4-3].

4.1.2.2 Minimum set up for model testing

Before applying a general empirical model in the particular region of "unknown" properties, it is a good practice to test the performance of a selected model or to compare performances of several models. The testing is described below. It can make use of existing radio stations (e.g. base stations of land mobile systems: cellular, paging, etc.) as reference transmitters. On the measurement side, it is possible to use widely available calibrated handheld RF field monitors or, in restrictive

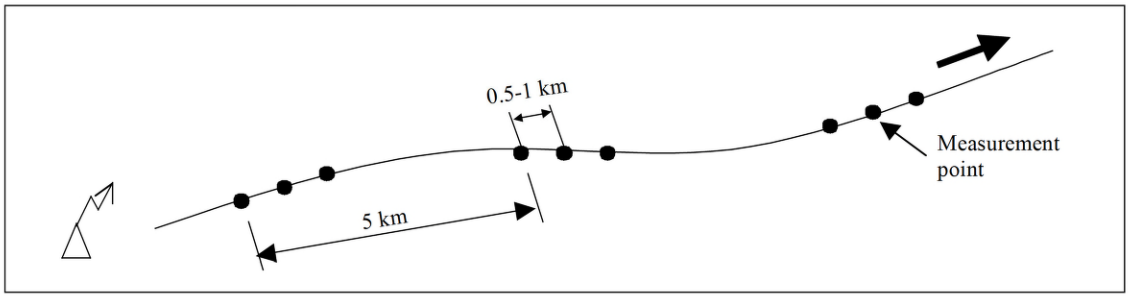
circumstances, even subscriber units of those land mobile systems-under-test with field monitoring functions. These arrangements mean that such measurements may be done fairly quickly and with very limited human and financial resources. For more formal and detailed description of the field measurements please refer to the ITU Spectrum Monitoring Handbook [4-16].

Although the more measurements the better the result, for a rough testing of the empirical model it may be sufficient to carry out static measurements in coverage areas of at least two or three existing radio transmitters. However it is important to ensure that these coverage areas are selected for testing so that they represent the most typical propagation conditions of that region (urban/suburban, vegetation density, irregularity of terrain, etc.). In each of the selected coverage areas it is advisable to take field measurements within at least 15-20 different distances from transmitter. For each of these distances the measurement sample should include at least 5-10 measurements, preferably taken at different directions from the transmitter, to ensure proper evaluation of the median field strength. If tested transmitters employ directional antennas, then care should be taken that the measurement points should all be within the main beam of the transmitter antenna. The antenna of the test receiver should be placed at an appropriate height, that is 1.5-2 m for the land mobile services.

It is most convenient to perform such measurements along the available radial route (such as a road) within the coverage area and at the points with certain given distances between them, say each 1 km. One of the possible setups for clustering such measurement points is shown in Fig. 4.1.

FIGURE 4.1

Example of clustering measurement points along the radial route from reference transmitter



Ter-041

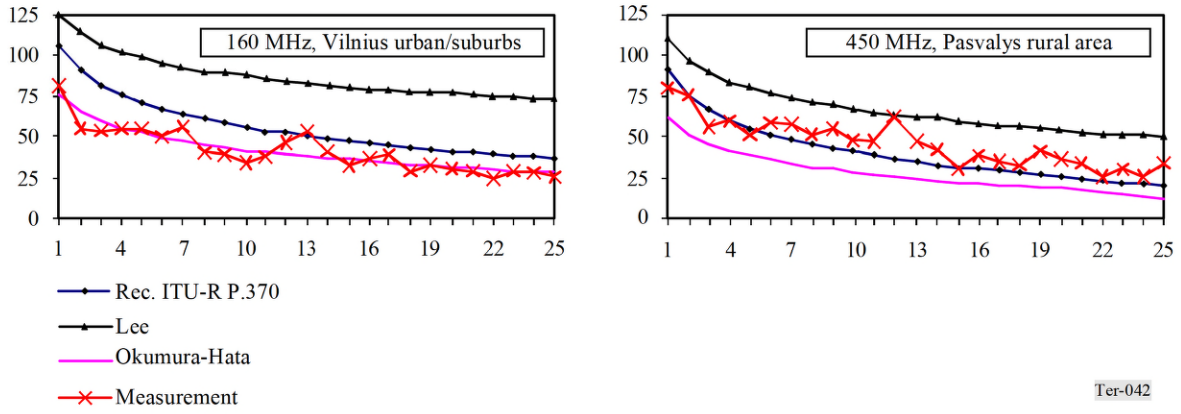
At each of the measurement points the median field strength should be recorded against the distance from the transmitter. Since the number of measurements is very limited in this case, they may be carried out without automation but with manual recording of measured field strength. The distances from the transmitter may be determined by any available means: a GPS receiver with differential distance measurement capabilities, the odometer of a car on a strictly radial route, or a map of a suitable scale.

As a result of such measurements, a set of measured field strength values for given distances will be obtained. These measurements may be then compared with the results of modelling, taking care to adjust model parameters (antenna height, radiated power, etc.) for each of the measurement routes, because they may differ, e.g. antenna gain and hence radiated power may be different in different

directions. If the model will be used in different frequency bands, then it is also advisable to perform testing in all those frequency bands concerned. Fig. 4.2 shows an example of comparing measurement and modelling results.

FIGURE 4.2

Examples of comparing measurement results with several empirical models, averaged field strength dB(μV/m) vs. distance from transmitting station, km



It is advisable to compare measurements with results obtained using several models, as shown in Fig. 4.2, where models from Recommendation ITU-R P.370 [4-2], Lee [4-7] and Okumura-Hata [4-3] were used. Then even subjective analyses of such comparisons can be used to decide which of the tested models performs best and whether it performs well enough.

For example, for that particular region where examples in Fig. 4.2 were derived, one may conclude that Okumura-Hata model is the best and sufficient model for modelling field strength in the 160 MHz VHF band in urban/suburban conditions. However, from the same example it may be seen that the Okumura-Hata model should be corrected before applying it for the propagation prediction in the 450 MHz band in rural areas.

However, it is dangerous to make such conclusions based on measurements at only one frequency band/coverage area. At least two or three coverage areas (transmitters) should be examined in each of the frequency bands and conclusions may be drawn only when they are similarly confirmed in all cases.

Performance of the models may be more formally evaluated and models may be compared among themselves by means of applying statistical analysis and measures, such as the least squares criterion. According to this criterion, a model best fitting some experimentally obtained results would give a minimum in the following expression [4-14]:

$$\sum_{i=1}^{n} [y_i' - \varphi(x_i, a, b, c, ...)]^2 = \min \qquad (4\text{-}2)$$

where:

y_i': experimental result for the point x_i

n: number of measurements in a set

$\varphi(x_i, a,b,c,...)$: model result for point x_i and transmitter parameters $a,b,c,...$

It is then clear, that by substituting the $\varphi(x_i,a,b,c,...)$ with various tested models in turn and computing results of equation (4-2) for these models for all sets of experimental measurements, one can evaluate the unbiased performance of each of the tested models in all cases. By combining all of these comparisons, the most suitable model may be selected as that providing the best fit with experimental results.

4.1.2.3 Model tuning

When testing shows that the precision of the selected empirical model is not sufficient, the model requires tuning. This may be done through a fine adjustment of the empirical parameters of the model. In preparing the selected model for tuning, its formula should be transformed to the basic form (4-1), so that the two basic empirical parameters: slope γ and initial offset K appear. The process of tuning the model is then a matter of modification of those two parameters.

The practical example below shows how the process may be applied to the Okumura-Hata model given in Recommendation ITU-R P.529 [4-3]. The Okumura-Hata model in this Recommendation provides the following expression for received field strength E_R dB(μV/m):

$$E_R = 39.82 + P_{BS} - 6.16\log f + 13.82\log h_{BS} + a(h_{MS}) - (44.9 - 6.55\log h_{BS})(\log R)^b \quad (4\text{-}3)$$

where:

P_{BS}: radiated power of the transmitter (dBW)

f: operating frequency (MHz)

h_{BS}: effective height of the transmitter antenna (m) above average terrain within 3-15 km

h_{MS}: height of receiver antenna (m)

$a(h_{MS}) = (1.1 * \log f - 0.7) * h_{MS} - (1.56 * \log f - 0.8)$

R: distance from the transmitter (km)

$b = 1$ for $R \le 20$ km

$b = 1 + (0.14 + 1.87 * 10^{-4} * f + 1.07 * 10^{-3} * h_{BS}) * (\log(R/20))^{0.8}$ for $20 \le R \le 100$ km

From equation (4-3) it may be seen that the offset parameter is expressed in the Okumura-Hata model as:

$$K = 39.82 + P_{BS} - 6.16\log f + 13.82\log h_{BS} + a(h_{MS}) \quad (4\text{-}4)$$

The necessary tuning may be introduced into the offset parameter (4-4) by adjusting the initially constant parameter $E_0 = 39.82$ dB(μV/m).

At the same time, the overall slope parameter in the Okumura-Hata model (4-3) may be represented as follows:

$$\gamma_{SYS} = -\gamma \cdot (44.9 - 6.55\log h_{BS}) \quad (4\text{-}5)$$

Equation (4-5) introduces the initial slope parameter γ, which initially equals one and which may be adjusted.

Thus the correction of the Okumura-Hata model (4-3) may be achieved by tuning of parameters E_0 and γ of the model. The most appropriate tool for such tuning may be the statistical method of least squares.

It may be shown [4-15] that using this method the following solution may be obtained for statistical estimates of parameters K and γ_{SYS}:

$$\widetilde{K} = \frac{\sum x_i^2 \cdot \sum y_i - \sum x_i \cdot \sum x_i y_i}{n \cdot \sum x_i^2 - \left(\sum x_i\right)^2}$$
$$\widetilde{\gamma}_{SYS} = \frac{n \cdot \sum x_i y_i - \sum x_i \cdot \sum y_i}{n \cdot \sum x_i^2 - \left(\sum x_i\right)^2} \qquad (4\text{-}6)$$

Equation (4-6) allows for very simple and formal calculation of parameters E_0 and γ of the Okumura-Hata model (4-3) from a given set of static experimental measurements $\{(x_i = \log R_i; y_i)\} i = 1 \ldots n$.

This means, that the particular offset and slope parameters in the original Okumura-Hata model may be calculated from equations (4-6), (4-4) and (4-5):

$$\widetilde{E}_0 = \widetilde{K} - P_{BS} + 6.16 \log f - 13.82 \log h_{BS} - a(h_{MS})$$
$$\widetilde{\gamma} = -\frac{\widetilde{\gamma}_{SYS}}{44.9 - 6.55 \cdot \log h_{BS}} \qquad (4\text{-}7)$$

For example, analysis performed using equations (4-6) and (4-7) with the measurement sets obtained during a measurement campaign in Lithuania [4-15], gave a number of E_0 and γ values for various coverage areas and different frequency bands for that particular Eastern European region. By grouping those results according to their urban or rural origin and frequency band, the resulting average values for the empirical model parameters were derived (see Table 4.1).

TABLE 4.1

Example of calculated modified empirical parameters of the Okumura-Hata model (4-3) for various area types and various frequency bands

	160 MHz		**450 MHz**		**900 MHz**	
	Urban	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**
E_0	40	40	40	50	35	60
γ	1.25	1.20	1.30	1.20	1.00	1.25

The values in Table 4.1 allow accurate prediction of the field strength using the Okumura-Hata model in that region with the accordingly modified empirical parameters. This example demonstrates how the practical calculation of modified model parameters may be summarized into a single reference table, convenient for further use.

4.2 Methods using terrain and ground cover information

One of the most widely used propagation prediction models that take account of the terrain irregularity is the Longley-Rice model [4-10]. It takes its origins in the electromagnetic theory and signal loss variability expressions derived from extensive sets of measurements as given by 'National Bureau of Standards Technical Note 101' [4-9] ("Tech Note 101"). Tech Note 101 develops an extensive compilation of mathematical formulae that can be applied to the task of predicting the performance of radiocommunications systems over a wide range of terrain and climatic conditions, but the manual application of those formulae is onerous, if not impossible, even for a single point-to-point propagation path.

However, two of the authors of Tech Note 101 developed a computer program, the Irregular Terrain Model (ITM) [4-10], which became popularly known as the "Longley-Rice Model". This computer model applies versions of the computational procedures developed in Tech Note 101, and is useful in the frequency range of 20 MHz to 20 GHz, in areas with varied terrain and climatic conditions, over a distance range from one to 2 000 km.

The ITM computer model actually consists of two different modules (or algorithms) which are to be used under different circumstances. The first of these is the "area prediction" model [4-11], which is meant to be used when only moderate information about the propagation paths is known. It is particularly useful in mobile and broadcast situations, in the design of generalized systems, and in discussing general problems of interference between types of systems. It is less accurate at short ranges, particularly when high antennas are involved, for it will predict lower signal levels (higher losses) than would typically be measured. For medium and long ranges it should give good results. The area prediction will ask for a terrain roughness factor (ΔH), surface refractivity (N_s), and average terrain heights depending upon the options chosen.

The second module in the ITM program is the "point-to-point prediction" model, which is designed to be used on a fixed path where certain gross features of the intervening terrain profile are known. This model is particularly good for evaluation of specific communication links and for solving special interference problems. It is not at all valid on the standard microwave line-of-sight links and should generally not be used for that situation. (The treatment of such links is normally quite different from the ITM approach. Median signal levels are usually at or near free space values, and variability around the median follows a different set of laws.)

While the Longley-Rice Model Version 1.2.2 does include an area prediction mode, the model is most often used in repetitive point-to-point predictions where a terrain database is available. Only the use of the model in its point-to-point mode will be discussed here.

In operation, the model examines the geometry of a radio path along a given profile of terrain data to determine several important parameters; the most important of which are the distances to the radio horizons from the path end-points and the total path length. Based on these data, a determination is made as to whether the path is line-of-sight (i.e. the end points are mutually

visible) or obstructed. If the path length is greater than the sum of the transmitter and receiver horizon distances, then a combination of knife-edge theory and smooth-Earth diffraction loss is used. Finally, for distances well beyond the "smooth Earth" radio horizon, scatter theory is applied.

Certain facets of the 1.2.2 Version of the Longley-Rice model are approximate. For example, even though it is assumed that a complete and accurate terrain profile is at hand for the path under consideration, the model does not determine a ground-reflection point through direct examination of the path. Rather, it performs a least-squares fit to the terrain data in the central 80% of the path and assumes a spectral reflection from that theoretical surface. Also, there are additional restrictions on the range of applicability for formulae used in the model. Additionally, there can be certain discontinuities in predicted path loss when the model switches between algorithms, particularly from the line-of-sight mode to the obstructed-path mode. Practical implementations of the model must allow for these conditions to occur and be addressed properly.

Also the model fails to explicitly address the effects of vegetation and buildings. It would appear that the model does make some allowance for such "clutter", but only to the extent that the data, against which the model's performance was confirmed, were themselves influenced by clutter. This issue was addressed in a paper [4-12] that developed empirical graphs to show the differences between Longley-Rice Model predictions and signal strength data gathered by Okumura, *et al.* [4-4]. The paper presents specific recommendations for additional modules that could be written to adjust the results of the Longley-Rice Model for different clutter environments. However, it does not directly compare Longley-Rice predictions with observed signal strength data. Rather, the comparisons were made against a graphical presentation of an area prediction model (the "Okumura Model") [4-4]. The Okumura model, in turn had been adjusted to portray the observed effects of vegetation and building clutter of a specific geographic region (the Tokyo urban area) and conditions far removed from those that exist elsewhere. Therefore the restrictions on the Okumura model carry over to this case as well. In sum, the point-to-point predictions of one model were compared with the predictions of another model whose purpose is to provide general estimates of signal performance over an area. A comprehensive discussion of the Longley-Rice model, as compared with one other known terrain based model TIREM, was published in Volume 37 of the IEEE Transactions on Vehicular Technology (February 1988) [4-13]. Discussion of some other path-specific propagation prediction methods may be found in [4-29] and [4-30].

To summarize, the Longley-Rice model is a widely recognized radiowave propagation prediction model that is available in the public domain. The above remarks are intended only to identify specific aspects of the model's performance that could and should be improved.

Currently the ITM model descriptions, algorithms, FORTRAN source codes and samples are available for access from the U.S. Administration at http://elbert.its.bldrdoc.gov/itm.html. The models require terrain elevation databases to extract terrain path profiles. One source of a worldwide terrain data base (GLOBE) is publicly available from the U.S. Administration at http://www.ngdc.noaa.gov/seg/topo/globe.shtml and the files needed to extract the terrain data are available from http://elbert.its.bldrdoc.gov/globe.html.

4.3 Ray tracing, GTD-UTD, parabolic and integral equation methods

The following material discusses Ray tracing, the geometric and uniform geometric theories of diffraction, and the parabolic and integral equation methods. For more practical information on these topics, see Recommendation ITU-R P.526 as well as Parsons [4-35] and Cátedra [4-36].

4.3.1 Ray tracing and geometric theory of diffraction (GTD) – uniform theory of diffraction (UTD) methods

These methods are applicable to electromagnetic propagation and scattering problems which can be said to be high-frequency. In this context, high-frequency means that the properties of the background medium and the scatterers' characteristic dimensions vary negligibly over intervals of the order of a wavelength of the electromagnetic wave. It is also typical that these methods are applied to problems where the background medium's material properties are isotropic, homogeneous and lossless, although these restrictions are not required by the theory. With these restrictions, however, it is possible to characterize the propagation of electromagnetic waves excited by certain sources as ray-like, i.e. in straight lines, from the source to an observation point. Furthermore, on each ray, the electromagnetic wave's propagation vector, electric field vector and magnetic field vector are mutually orthogonal. The direction of the propagation vector is parallel to the straight line from the source point to the observation point and the surfaces of constant amplitude and phase for the fields lie in planes orthogonal to this direction. The electromagnetic wave can thus be said to be locally planar, thereby allowing simplifications, akin to geometric optics, in the treatment of the problem.

In ray tracing's simplest form, as the name implies, one simplifies the electromagnetic problem to that of the geometric accessibility of rays emanating from the source point to (arbitrary) observation points. It follows that the problem then reduces to the locations of shadow boundaries. Shadow boundaries are the loci of points separating regions of space where rays from the source to an observation point are accessible and those regions where the rays are not (i.e. inaccessible). This particular instance of a shadow boundary is usually referred to as an incident shadow boundary. It is also possible for rays, incident from the source, to undergo one or more specular reflections from the surfaces of scatterers, when these are present. The loci of points separating regions of space where these rays are accessible from those regions of space where these rays are not referred to as reflection shadow boundaries. Observation points located in regions of space where only direct rays from the source to the observation point are accessible (i.e. lit regions) have a field strength calculable from the amplitude and phase of the source excitation and, where appropriate, the distance between the source and observation point. Observation points located in regions of space where specularly reflected rays are also present (accessible) have field strengths which are the sum of the direct wave and a reflected wave, suitably spread or focused, if the radius of curvature of the reflecting surface is finite. Observation points located in regions of space accessible to neither direct nor reflected rays have zero field strength.

The problem with all this, apart from the assumptions that the scatterers are all quite opaque and very large electrically, is that it neglects diffraction. This neglect is addressed by the geometric theory of diffraction (GTD) and its extension, the uniform (Geometric) theory of diffraction (UTD). GTD postulates that diffracted rays exist. These diffracted rays are produced when rays illuminate the edges, corners and vertices of scatterers that give rise to the shadow boundaries discussed

above. Scalar diffraction coefficients have been derived by asymptotic expansion of Sommerfeld's exact solution for wedge diffraction. However, these diffraction coefficients have the unhappy property of becoming singular on the incident and reflection shadow boundaries, which can contain observation points of interest. In order to remedy this shortcoming, UTD was developed. In UTD, the GTD scalar diffraction coefficients are multiplied by a transition function. The transition function vanishes at the same rate that the diffraction coefficient becomes unbounded at the shadow boundary. The product is bounded and uniform across the shadow boundary, allowing reliable computation of the diffracted field everywhere in space, when the other assumptions are valid. Recommendation ITU-R P.526 gives an example of UTD applied to a finitely conducting wedge obstacle. There have been numerous extensions to UTD.

4.3.2 Parabolic equation (PE) methods

The parabolic equation (PE) is an approximation of Maxwell's equations, the derivation of which is based on the notions that backscattered waves may be neglected, that vertical angles are always small and that variation in the coordinate transverse to the vertical plane containing the propagation direction can be taken care of by other means. One can then describe a functional variation of the field as:

$$\Phi = u(x,z) \cdot e^{ikx} \tag{4-8}$$

where u(x,z) is slowly varying in x. Given these assumptions, it can be shown that, applying the two-dimensional Helmholtz equation that Φ must satisfy and upon neglect of the second derivatives of u with respect to x (the principal direction of propagation), one obtains a parabolic differential equation for u. Solutions are obtained by applying appropriate boundary conditions at the source point and the upper and lower boundaries in z. One consequence of the neglect of the backscattered wave in the PE is, once the fields are known along a vertical plane at a given x location, the fields at all greater x locations are determined.

Solutions to the PE are generally obtained numerically for propagation problems involving actual terrain and/or variability of the refractive index lapse rate in x and/or z. Examples of the numerical solutions are implicit finite difference methods and split step spatial fast Fourier transform approximation methods. Because of the numerical approximations used to solve the PE, there are Nyquist-like criteria related to spatial discretization and the wavelength of the electromagnetic wave propagation being modelled, and these relate to numerical stability and accuracy considerations. Consequently, PE solutions are far more computationally intensive than GTD or UTD solutions.

4.3.3 Integral equation (IE) methods

Closely related to the parabolic equation method, the integral equation (IE) method starts from Green's theorem equating the volume and surface integrals of functions continuous throughout the volume, along with their Laplacian and normal derivative operators. After some manipulation, the volume integral reduces to the 4π times the free space field, that being the contribution to the field in the absence of the Earth, while the surface integral has three contributions: an integral over the surface of the Earth, an integral over an infinitesimal hemispherical surface surrounding the

singularity of the Green's function and a surface closing above the Earth at infinity. The integral over the infinitesimal closed surface yields 2π times the scalar function we seek. The integral over the surface at infinity vanishes. Finally, by appeal to the method of stationary phases, the contributions in the direction transverse to the propagation path are integrated out leaving only a line integral to evaluate. The method can be shown to give good results for the analytically accessible cases of a flat and smooth spherical Earth.

Solutions to the IE are found numerically. The integral equation is in the form of a linear Volterra integral equation of the second kind, using a method attributed to Wagner [4-34]. Practically speaking, it is calculated only for frequencies less that a few tens of MHz, due to the complications of solving the IE.

4.4 Diffraction modelling

4.4.1 Summary of earlier methods, spherical Earth, knife-edge, and cylinder models

Diffraction occurs when the direct path between the two terminals is blocked by one or more opaque obstacles. In such a situation, although the field-strength at the receiving terminal will be lower than it would be in the absence of the obstacles, some signal will still be received by means of the process of diffraction. In addition, obstacles that approach the line of sight but do not actually block it may still have a significant effect upon the received field strength.

Generally the obstacles to be considered will be land terrain features or the surface of the sea. Terrain features will often be quite irregular in shape. Thus, traditionally they have been approximated to various stylised shapes in order to make practical calculations of the expected loss due to diffraction. Such shapes include knife-edges, wedges, cylinders and spheres.

4.4.1.1 Knife-edge diffraction modelling

The simplest shape used for modelling terrain is the simple knife-edge. With this approach the terrain is approximated to a series of such edges. The method of Fresnel can then be conveniently used to calculate the diffraction loss of such a knife-edge. This involves constructing an imaginary surface known as a Huygens surface above the edge as shown in Fig. 4.3. Huygens' Principle then states that each point on this surface acts as a secondary radiator. Calculation of the diffracted field then involves integrating contributions from points on the surface from the top of the knife-edge to infinity. This integration is shown graphically by the Cornu Spiral shown in Fig. 4.4. The spiral is normalized in terms of a parameter ν, where:

$$\nu = 2\sqrt{(\Delta d/\lambda)}$$

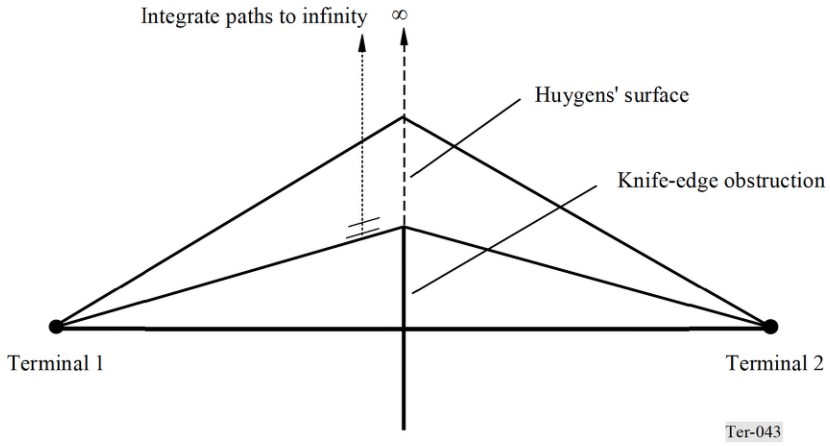
where:

Δd: the difference in length between the direct path between the terminals and that which just passes over the knife-edge.

The free space field strength is represented by the distance between the two asymptotic points, Z_1 and Z_2. When part of the wavefront is obstructed by the knife-edge, the value of the field strength is represented by the distance between the point on the spiral corresponding to the peak of the knife-edge and the appropriate asymptotic point (Z_1 or Z_2).

FIGURE 4.3

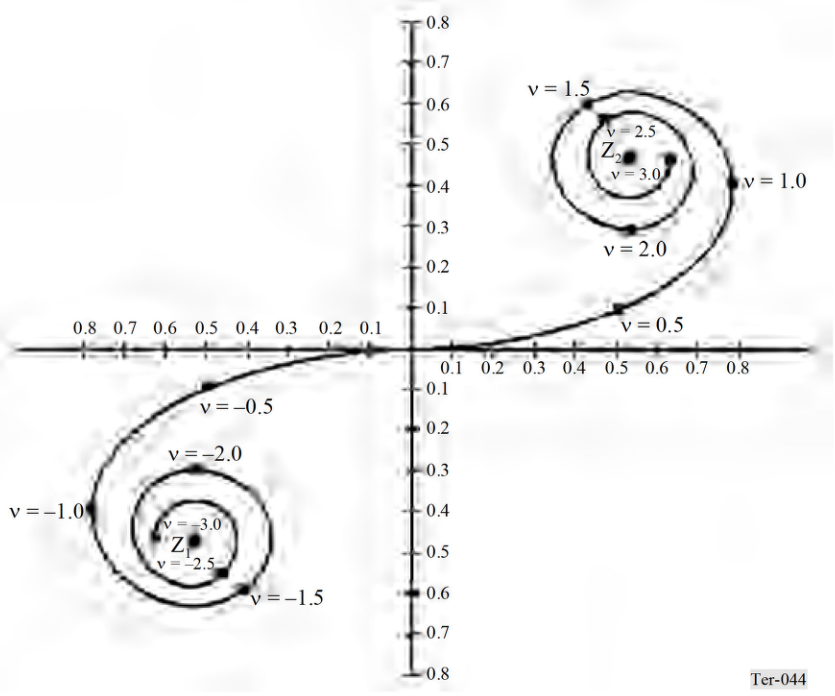
Knife-edge diffraction



Often a propagation path will contain several obstacles so that multiple knife-edges will be needed to model it completely. As described in the following Sections, there are a number of techniques that have been proposed for dealing with multiple knife-edges.

FIGURE 4.4

The Cornu Spiral representation of knife-edge diffraction



4.4.1.2 The Millington method

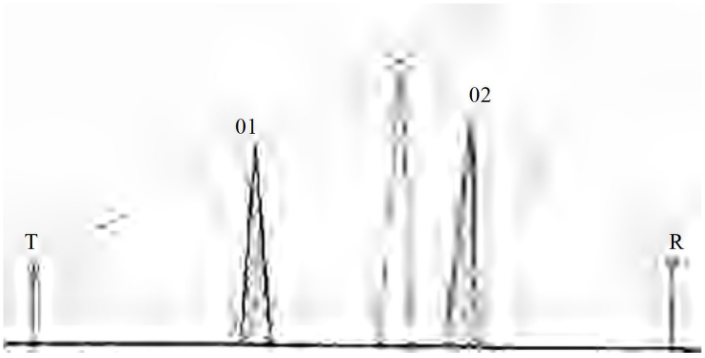
The Millington method [4-17] may be used to calculate diffraction by two knife-edge obstacles. It is rigorous and involves integration over both Fresnel surfaces. Thus it requires a double integral. In principle the technique could be extended to calculate any number of edges. However, each additional edge would require an additional integral. Such nested integrals are likely to be impractical for more than about 3-4 edges.

4.4.1.3 The Bullington method

The Bullington method [4-18] is also intended to deal with two knife-edges. However, the two edges are combined to form a single virtual edge. Thus only a single integration is needed. This simplification is at the expense of some accuracy. If the diffraction losses are small, such as at VHF, the errors can be less than 3 dB. However, as frequency increases and diffraction losses become greater, errors may increase to as much as 10 dB. The method underestimates the losses.

FIGURE 4.5

Bullington construction for multiple knife-edge diffraction calculation

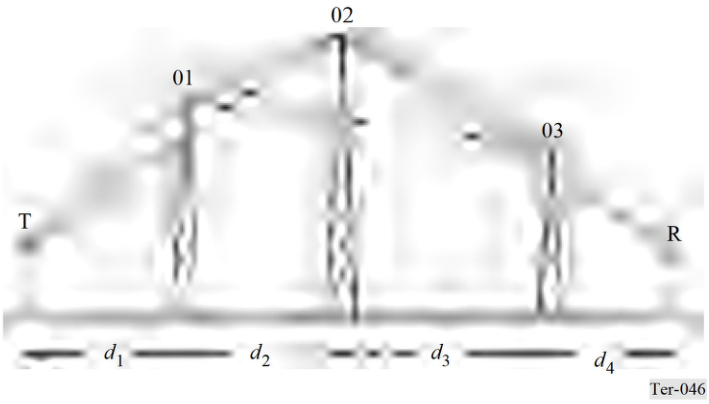


4.4.1.4 The Epstein-Peterson method

The Epstein-Peterson [4-19] method can easily be used for any number of knife-edges. The loss for each edge is calculated in turn, based on imaginary terminals placed at the top of the adjacent edges (or one of the real terminals for the first and last edge). The individual losses (dB) are then added to derive the overall loss. Millington showed that this method is subject to errors of up to 3 dB high or low. For two diffracting edges when the second edge and second terminal are deep in the shadow of the first edge, the loss is underestimated. Millington proposed a correction factor given in reference [4.17], which can be used with such paths to improve the accuracy. Millington's correction does not, however, apply to paths with three or more knife-edges.

FIGURE 4.6

Epstein-Peterson construction for multiple knife-edge diffraction calculation

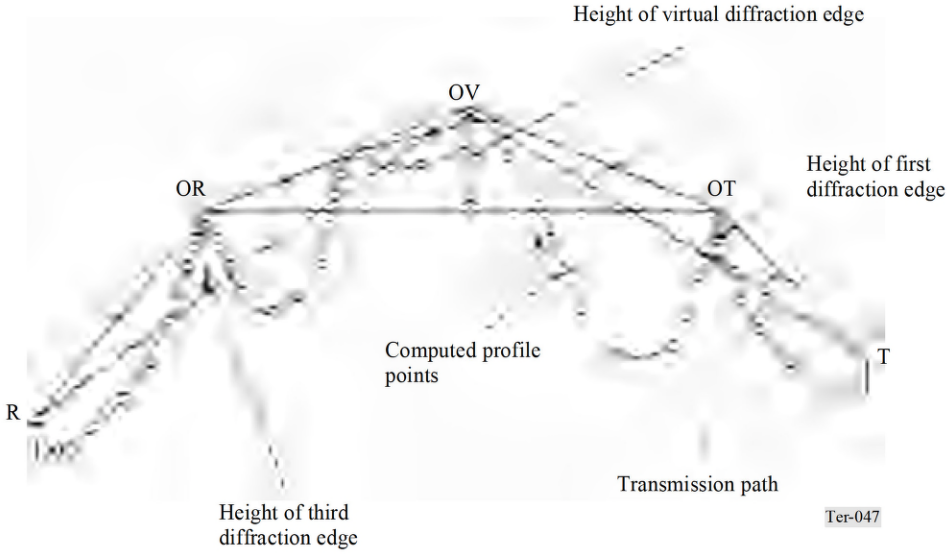


4.4.1.5 The Edwards-Durkin method

The Edwards-Durkin method [4-20] might be termed a hybrid between the Bullington method and the Epstein-Peterson method. For paths with up to three obstacles, it follows the Epstein-Peterson method. For paths with four or more obstacles, it identifies the two "outermost" obstacles; i.e. the two obstacles nearest the transmitting and receiving sites, respectively. We shall call them OT and OR, respectively. It then sets up a construction similar to the Bullington construction to create a "virtual obstacle" between. We shall call that obstacle OV. The diffraction calculation is then done for the path from T to OT to OV to OR to R, see Fig. 4.7.

FIGURE 4.7

Edwards-Durkin construction for multiple knife-edge diffraction calculation

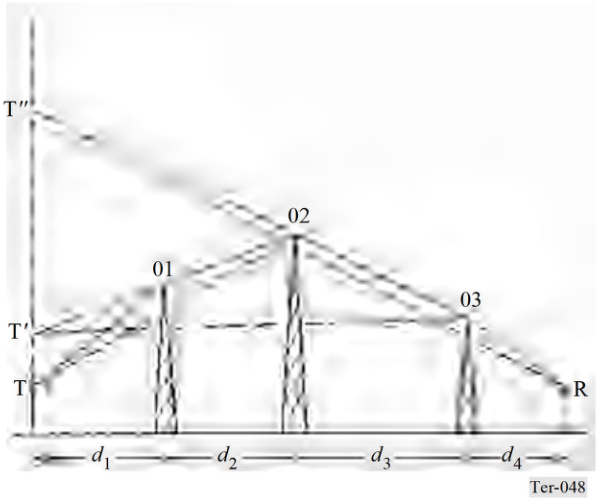


4.4.1.6 The Shibuya method

The Shibuya method [4-21] is similar to the Epstein Peterson method, except that in calculating the diffraction losses, the transmitting terminal is taken to be at a virtual point above the actual location, chosen so that the two terminals and the edge lie on a straight line (see Fig. 4.8). Generally, provided the losses at the individual edges are greater than 12 dB, this method is equivalent to the Epstein-Peterson method with the Millington correction.

FIGURE 4.8

Shibuya construction for multiple knife-edge diffraction calculation



4.4.1.7 The Deygout method

The Deygout method [4-22] involves calculating the loss for each edge in the absence of all other edges. The edge giving the highest loss is identified as the main edge and this loss value is taken to be the value for this edge. The main edge is then taken to be a terminal and the sub-paths each side are treated in the same way. The path is thus subdivided until all edges have been considered and the overall path loss is then taken to be the sum (dB) of all the losses of the individual edges. The Deygout method always overestimates the losses of a multiple knife-edge path. Correction factors are therefore possible. Causebrook [4-31] has proposed a method of correction that gives very good results with the Deygout method when restricted to a maximum of three knife-edges. López [4-23] has proposed a similar construction that overcomes the pessimism of the Deygout construction.

4.4.1.8 The López method

The López method [4-23] is very similar to that of Deygout. It overcomes the pessimism inherent in the Deygout method by changing the geometry of the calculation such that the diffraction angle of the main edge is based upon the actual path geometry rather than upon the assumption that the main edge is free standing. As seen in Fig. 4.9, the Deygout construction, the diffraction angle for the main obstacle is associated with T-O2-R. In Fig. 4-10, the López construction, the angle measurement includes the effect of the intervening obstacles.

FIGURE 4.9

Deygout construction for multiple knife-edge diffraction calculation

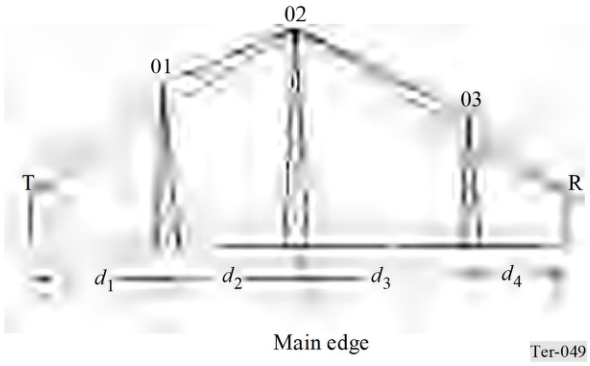
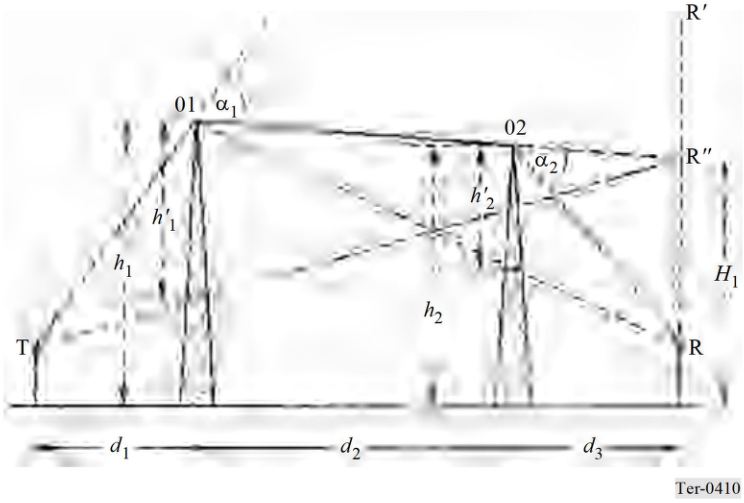


FIGURE 4.10

López construction for multiple knife-edge diffraction calculation



4.4.1.9 Spherical Earth and cylinder models

Although diffraction due to knife-edges can be accurately modelled and techniques such as that of Deygout can be used where there may be many such edges, real terrain does not closely resemble a series of such edges. In general since the knife-edges are placed at the high points of the terrain between the two terminals, no account is taken of the terrain between these points. This normally results in an underestimation of the resulting diffraction loss, giving a field-strength prediction higher than the measured value.

At the opposite extreme, obstacles can be approximated to a sphere or cylinder. The obvious application of this technique is when the obstacle is the surface of the sea. In order to calculate the diffraction loss over such a spherical surface we must solve Maxwell's equations in its presence. In

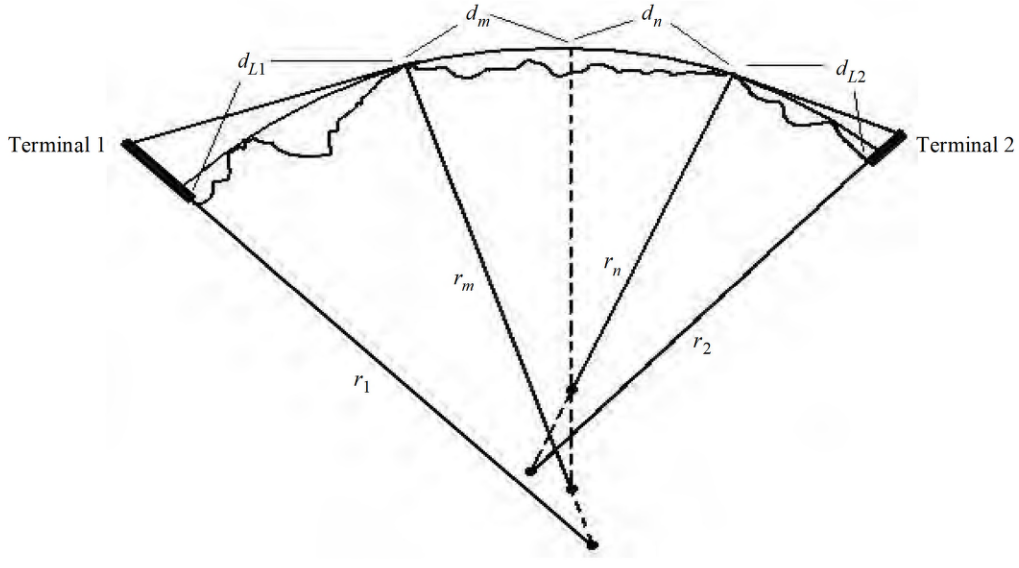
the late 19th century many scientists were working on such a solution, starting with Rayleigh in 1871. However, the first practical solution was provided by Van der Pol and Bremmer in 1937 [4-24]. This solution expressed the result in the form of a residue series. To reduce computation time it is normal to use a simplified form developed by Vogler which used only the first term of the residue series [4-25].

Curved surfaces, or cylinders, can also be used to approximate terrain features. Rounded hills may be approximated by means of individual cylinders. Where there are multiple rounded hills, techniques similar to those already described for multiple knife-edges may be adopted. However, it is known that this approach can give significant errors, particularly where the terrain is irregular.

Another method for using cylinders was proposed by Rice *et al*. [4-9] and is often used. With this approach the terrain is approximated to a series of four cascaded cylinders. Figure 4.11 shows how a typical propagation path can be modelled in such a way. The first cylinder, radius r_1 is chosen such that the horizon line from one terminal is a tangent and it just contains the terrain between this tangent point and the terminal. Similarly the final cylinder is chosen from the horizon of the other terminal and the terrain. The radii, r_m and r_n of the middle two cylinders and the distances d_m and d_n are chosen such that there are no slope discontinuities at the junctions between the spheres. From the various parameters shown in Fig. 4.10, are calculated overall effective values of the parameters r_1, r_2, r_m, r_n, d_n, d_{L1} and d_{L2}. These are then used with the same Vogler approximation to the residue series to calculate the path loss.

FIGURE 4.11

Cascaded cylinder approach



r_1, r_2, r_m, r_n: radii of cylinders
d_n: total path distance
d_{L1}: horizon distance from one terminal
d_{L2}: horizon distance from other terminal

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This then represents an alternative diffraction method to the various multiple knife-edge approaches outlined above. However, whereas the multiple knife-edge approach tends to underestimate the diffraction loss, the cascaded cylinder approach tends to overestimate. This has led to methods using both the multiple knife-edge and cascaded cylinder methods. A linear interpolation between the two results is then taken to be the true value. The weighting factor between the two methods is determined empirically using a set of profiles for which measured field-strength values are available. There is little scientific basis for this approach, but it does appear to give improved predictions in some situations.

While spherical Earth solutions are more accurate than cylindrical solutions, they are significantly more complex from an analytic standpoint. For realistic Earth radii and paths, the difference between the spherical Earth and cylindrical solutions is negligible.

4.4.1.10 Other models

Other types of stylized obstacle have been used in prediction methods. In particular, single obstacles have been modelled as wedge shapes [4-33]. Diffraction calculation over such a surface is essentially similar to that of a knife-edge, with a Huygens surface above the obstacle. A reflected wave from the surface of the wedge is, however, allowed on both sides. This gives rise to a four ray method by which the overall diffraction loss is calculated.

4.4.2 Recommendation ITU-R P.526

This ITU-R Recommendation deals with the problem of radiowave propagation over diffraction paths. Since, for practical applications, it is quite difficult to establish a general solution covering all types of terrain, prediction methods are provided for the diffraction over a smooth spherical Earth and the diffraction over terrain obstacles

In the case of a spherical Earth, Recommendation ITU-R P.526 presents two methods numerical and graphical, based on the same approximation, i.e., the dominance of the first term of the residue series [4-26]. In both methods, the attenuation relative to free-space is given by three separated terms, one containing the distance dependence and the two others corresponding to the antenna height-gain functions. The numerical method, which can be easily coded in a pocket calculator, is adequate for applications where repeated use is necessary, while the graphical method is better for a quick estimation of a given situation. The accuracy of these methods is acceptable even if the path profile is not exactly a smooth spherical Earth. However, the terrain irregularities must be small when compared to the first Fresnel zone radius in the middle path. A practical example is given in [4-27].

Regarding the diffraction over an irregular terrain, depending of the type of obstacle, different prediction methods are provided. The simplest one is the single knife-edge obstacle. This idealized model is relevant only in cases where the radius of curvature of the obstacle can be neglected. An approximate expression is given for the calculation in the diffraction region ($\nu > -0.7$) (see Section 4.4.1.1), avoiding the use of a more complicated formula associated with the Cornu Spiral shown in Fig. 4.4. Based also on the knife-edge model, Recommendation ITU-R P.526 describes a simplified solution for estimating the shielding effect of a finite-width screen such as a mountain range or a building.

A better approximation to the problem of the diffraction over an isolated obstacle should take into account its dimension along the longitudinal direction. The solution adopted in Recommendation ITU-R P.526 is to add an additional attenuation due to the curvature of the obstacle to the knife-edge loss. The accuracy of this method depends mainly on the procedure used to obtain the radius of curvature at the obstacle top.

Recommendation ITU-R P.526 also describes a method for predicting the diffraction loss due to a finitely conducting wedge. This may be applied to diffraction around the corner of a building or over the ridge of a roof, or where terrain may be characterized by a wedge-shaped hill.

The problem of multiple diffraction is much more complicated. For the diffraction over two knife-edges, two methods are given in Recommendation ITU-R P.526. The simplest one is due to Epstein and Peterson [4-19] with a correction based on Millington *et al*. [4-17]. However, if one edge is predominant, the Deygout method [4-22] should be used. Both methods may be applied to the case of rounded obstacles.

No rigorous method exists for the prediction of radiowave attenuation due to the diffraction over several rounded obstacles. However, Assis [4-32] proposed a simplified model that attempts to so. Recommendation ITU-R P.526 adopts a model based on Deygout method, limited to a maximum of three knife-edges, plus an empirical correction derived from measurements carried out on a large number of paths in United Kingdom.

Recommendation ITU-R P.526 does not cover the case of irregular terrain that has no pronounced features (rolling terrain), where neither the smooth Earth nor the multiple diffraction methods are applicable.

4.5 Propagation model considerations

The propagation prediction model and its parameters should be selected very carefully, so as to obtain the meaningful results from a modelling exercise. To select the most appropriate model, this section describes a few general rules and considerations on this subject.

Generally, a selected propagation model may range from the basic free-space loss formula to the sophisticated path-specific calculation engine. So the principal aim of a selection should be to choose the simplest and most readily available model that would be just sufficient to provide the necessary precision and meaning of the results in the prescribed propagation conditions. If the sophisticated path-specific models are not available, then one should first try to consider possibilities provided by the generalized point-to-area empirical models described at the beginning of Chapter 4.

Radiocommunication Study Group 3 has developed a set of models, which may be used in different conditions under the various circumstances. All these models are summarized in Recommendation ITU-R P.1144 [4-28]. This Recommendation provides a general guidance on selection of a suitable ITU-R propagation prediction model, based on the principal user requirements, such as the system to which a model is to be applied, frequency range, modelling distance and propagation data available. Table 4.2 provides a convenient recapitulation of Recommendation ITU-R P.1144, as regards the land mobile propagation at the VHF/UHF frequency ranges.

TABLE 4.2

Guide to the selection of ITU-R radiowave propagation prediction model for the land mobile applications at VHF/UHF frequencies

(extracted from Rec. ITU-R P.1144)

Method	Application	Type	Output	Frequency	Distance	% time	% location	Terminal height	Input data
Rec. ITU-R P.1546	Terrestrial services	Point-to-area	Field strength	30 to 3 000 MHz	1 to 1 000 km	1 to 50	1 to 99	Tx/base: effective height from less than 0 m to 3 000 m Rx/mobile: ≥ 1 m	Terrain heights and ground cover (optional) Path classification Distance Tx antenna height Frequency Percentage time Rx antenna height Terrain clearance angle Percentage locations
Rec. ITU-R P.534	Fixed Mobile Broadcasting	Point-to-point via sporadic E	Field strength	30 to 100 MHz	0 to 4 000 km	0 to 50	Not applicable	Not applicable	Distance Frequency
Rec. ITU-R P.843	Fixed Mobile Broadcasting	Point-to-point via meteor-burst	Received power Burst rate	30 to 100 MHz	100 to 1 000 km	0 to 5	Not applicable	Not applicable	Frequency Distance Tx power Antenna gains

4.5.1 System planning

Propagation prediction is one of the most important elements in the planning of radio-communication systems. Usually the task of a land mobile radio network planner is to cover the largest service area (or the entire prescribed service area) with the minimum necessary number of base stations. At the same time, the necessary minimum field strength and the signal-to-interference ratio, hence the communication quality, must be ensured over the entire projected service area.

For predicting the field strength of the wanted signal in system planning exercises it is, therefore, generally advisable to use a model that provides "worst-case" predictions of predicted field strength. This approach ensures that the model predicts "guaranteed" field strength of a signal, hence the system designers are assured of the proper coverage of service area.

To ensure a "worst-case prediction", a model and its parameters should be selected according to the following rules:

– model should be selected for the prescribed conditions of the use: frequency band, range, height of receiving antenna;

– if model is supplied with some correction factors, these should be tuned so as to account for the most severe constraints, e.g. lowest receiving antenna, depolarization effects, attenuation in vegetation, etc.;

– if model accounts for time and location variability statistics, the higher values of these should be used – at least 50% of time 50% of locations to obtain averaged results or higher (e.g. up to 90% or even 99% of locations) to obtain the most pessimistic results.

It should be also noted that radio signals are subject to severe fading in most typical conditions of land mobile service propagation. Therefore, it is usually a good practice to account also for the predicted depth of fading signal variations. The statistical models for fading are described in Section 3.3 of this Handbook. Using obtained estimates of fading (for given percentage of reliability), the fading may be conveniently taken into account by means of degrading the effective sensitivity of the mobile receiver and then estimating the edge of coverage area for this reduced value of threshold sensitivity. For example, if the sensitivity of a receiver is –105 dBm and it is estimated that the depth of fading for 99% does not exceed 15 dB, then, when calculating the projected coverage area, threshold sensitivity should be reduced to –105 dBm + 15 dB = –90 dBm.

4.5.2 Interference assessment and spectrum management

Unlike system planning, when propagation prediction models are used to assess unwanted interference and other similar spectrum management activities, they are usually used so as to provide "best case" results. This is because in such tasks it is important to take into account the strongest levels of possible interference, which naturally correspond to the most favourable propagation conditions of the unwanted (interfering) signal.

Therefore, for interference assessment, the propagation prediction model and its parameters are usually selected with the following criteria:

– model should be selected for conditions which are the most favourable to propagation of the unwanted signal; e.g. when considering interference at comparatively short ranges or with high antenna elevations, even the free-space loss formula may be used, which is otherwise considered to be unsuitable for land mobile applications;

– correction factors, if any, should be tuned towards the most favourable propagation conditions, e.g. highest receiving antenna height, line-of-sight allowances, etc.;

– if the model accounts for time and location variability statistics, the lower values of these should be used – typically 10% of time at 50% of locations or lower (e.g. down to 1% of time).

It should be noted that interference assessment often forms the part of international administrative spectrum management duties under the terms of the ITU Radio Regulations and related legal documents. Therefore the national radiocommunication administrations often use certain mutually agreed propagation models for interference assessment and international frequency coordination.

4.5.3 Comparison of measurements and predictions

Quite often system designers are required to verify the projected coverage areas with the actual measurements once the system is installed. If the base station is equipped with an omnidirectional antenna, then such verification is usually done by means of taking the field-strength measurements along 3-5 radial routes. If the base station antenna is directional or if the coverage zone contains certain specifically targeted service areas (e.g. highway, business centre, etc.), then the measurements are taken within those targeted areas.

In such verification measurement campaigns the test receiver is usually moved outwards from the base station and the received field strength is monitored and compared with the predicted values and with the prescribed value of receiver sensitivity threshold.

Sometimes it is also necessary to make a check of projected levels of interference. In such case measurements are usually carried out along some interference protection perimeter, e.g. along political boundaries.

4.6 References

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CHAPTER 5

TERRAIN DATABASES (AVAILABILITY AND USE)

Many propagation prediction algorithms for the VHF and UHF ranges of Radiocommunication Study Group 3 are terrain-based. That is, they rely on terrain data as one of the bases of their calculations. Generally speaking, there are two kinds of terrain data applicable to radio propagation calculations: hypsographic and morphologic. Hypsographic data describes the elevation characteristics of the terrain being described; i.e. terrain height. Morphologic data describes the ground cover characteristics.

Digital databases established for the purpose of propagation predictions need to contain information which is related to the type of prediction being undertaken. For frequencies above about 30 MHz, information about the terrain height and ground cover is currently needed. For detailed propagation predictions for frequencies above about 1 000 MHz, especially in urban areas, information about the location, size and orientation of individual buildings is currently needed in addition to terrain height information.

Statistically-based propagation prediction algorithms, such as those in Recommendation ITU-R P.1546 [5-1], do not require detailed hypsographic data because they are generally based upon an effective antenna height rather than on actual path geometry. More detailed prediction algorithms, such as those in Recommendation ITU-R P.526 [5-2], require somewhat more detailed data to perform adequately. Horizontal spacings of 200 m between data points and r.m.s. vertical accuracies of ±15 m have proven adequate for this sort of method. The accuracy of both statistical and path-geometry-based algorithms is improved if the morphologic characteristics of the area are taken into account.

It is to be expected that increasingly sophisticated prediction models will be developed which will permit more detailed propagation predictions but which will also demand more detailed information and, potentially, a reduced horizontal spacing for the data samples. Consult Recommendation ITU-R P.1058 [5-3] for further information.

5.1 Terrain height

A number of administrations, as well as private organizations, have made available hypsographic data of varying quality.

The horizontal spacing between data-points, which should be used in a topographic database, depends upon the use to which the data will be put. It is not practicable to recommend a particular value. In practice horizontal spacings in the approximate range 20 m to 1 km, or the equivalent in latitude-longitude, are typical. Various propagation-prediction models not only have different

requirements for horizontal resolution, but differing sensitivity to changes in horizontal resolution. It should not be assumed that improving horizontal resolution with a given propagation method always improves prediction accuracy.

The accuracy of propagation prediction models can be strongly affected by the accuracy of terrain height data in a topographic database. The accuracy of terrain heights is typically expressed as a root-mean-square (r.m.s.) error value. Horizontal resolution, vertical accuracy, and the propagation method in use, will all affect the calculated result. In general, the more detailed deterministic propagation methods require greater resolution and accuracy in topographic data, but details will vary in individual cases. An r.m.s. error of 15 m in terrain height data has been found acceptable for many purposes.

Most current topographic databases used for propagation prediction and radio planning have 2-dimensional arrays of data at equal intervals in the chosen coordinate system, referred to as "gridded data". This has the advantage that horizontal coordinates need only be provided for reference points, with most data consisting of self-indexing arrays of height values. For rectangular projections the horizontal data spacing will typically be the same throughout a complete database. For latitude-longitude coordinates the longitude spacing is sometimes increased in steps as latitude increases in order to keep the longitude scale-factor approximately constant.

When drawing a profile between two arbitrary locations, few or none of the data points in a grid-based database will coincide exactly with the profile. Various methods are available for extracting terrain height data in such cases. The following are recommended according to circumstances:

– when the height data are in some way representative of a square area of land, data should be placed in the profile for each square through which it passes. Each profile point may be placed on the normal from the profile line to the corresponding data point, although this will not in general produce equally-spaced profile points. If the propagation method requires equally-spaced points, it is acceptable to move profile points to accomplish this;

– when the height data represent only the height at each exact point, the preferred extraction method is to pre-determine equally spaced profile points and obtain the terrain height for each by bi-linear interpolation from the immediately-surrounding gridded-data values.

During the process of profile construction, the curvature of the Earth can be taken into account by increasing the interpolated terrain height values by a correction factor that is dependent on the effective Earth radius and on the position of the point along the profile. For a discussion of effective Earth radius, see Recommendation ITU-R P.452, § 4.3 [5-7].

The Global Land One-kilometre Base Elevation (GLOBE) digital elevation model (DEM) is a worldwide, multi-source-derived, open, digital elevation dataset in raster format. GLOBE 1.0 [5-4] has a horizontal resolution of 30" × 30" in latitude and longitude, referenced to the World Geodetic System 84 (WGS 84). These range from 90° N latitude to 90° S latitude and from 180° W longitude to 180° E longitude, respectively. The resulting rasterised complete dataset can be thought of as having 21 600 rows and 43 200 columns.

The "vertical" units are elevations in metres above mean sea level. On the land, these range from values of −407 to 8 752 m. On the sea, elevations are marked as no-data and assigned a value of −500. There is an associated file containing source information for the elevation data. The mask for sea elevations in the source/lineage file is 0. The user can then distinguish elevation values of 0 for land from sea values by resetting the sea values from −500 to 0, when using the source/lineage mask. This is particularly useful when considering mixed (land-sea) paths.

As mentioned above, GLOBE 1.0 elevation data are derived from a variety of sources [5-5]. In some cases, e.g., North America, they are derived from high resolution DTED's and can thus be assumed to have accuracies comparable to these datasets. In some other parts of the world, the sources of data may have coarser resolution. Users should consult [5-3] for a comprehensive discussion of the elevation accuracies. In the 2001-2002 timeframe, it is expected that data from the Space Shuttle's Imaging Radar Mission will be incorporated into GLOBE, providing 3" × 3" resolution data from 60° N latitude to 60° S latitude.

Software for terrain profile elevation extraction from the GLOBE 1.0 DEM is available. The Fortran source code for this software can be obtained from the World Wide Web: http://elbert.its.bldrdoc.gov/globe.html.

The software extracts the profile along the great circle between a transmitter and receiver. The terain height of a profile point on the great circle, PP, is calculated by bilinear interpolation on the GLOBE DEM, taking the elevations of the four terrain points, P1-P4, containing the latitude and longitude of the profile point.

5.2 Ground cover

The range of possible ground categories is very large and the full range is unlikely to be relevant to any individual geographic area. Table 5.1 (from Recommendation ITU-R P.1058 [5-3]) gives descriptive titles and a two-level coding scheme for a set of ground cover categories. A category describes the type of ground cover in a specified area (e.g. a 100 m square). Where more than one type of cover exists in the area under consideration the dominant category should be described. Categories in upper case may be used when a more detailed classification is not required, or more detailed information does not exist.

A category may be indicated by a two-digit code as indicated in the first column of Table 5.1. When available, up to three optional parameters may be supplied to add precision to the description implied by a category name:

– *Height* H_c: This should represent the characteristic height of ground cover in metres above ground, ignoring isolated objects of greater height. In mathematical terms this will most often be best approximated by the modal cover height, but the intention is to provide the most characteristic height of the ground-cover skyline above ground level.

– *Density* D_c: The percentage of the terrain in the area under consideration which is covered by any ground cover having a height equal to or greater than H_c.

– *Gap-width* G_c: This should represent the typical width (m) of gaps in the ground cover.

TABLE 5.1

Categories to be listed in a macroscopic ground cover database

00		Unknown
10	RURAL OPEN	
	11	Pastures, grassland
	12	Low crop fields
	13	High crop fields (e.g. vines, hops)
	19	Park land
20	TREE COVERED	
	21	Irregularly spaced sparse trees
	22	Orchard (regularly spaced)
	23	Deciduous trees (irregularly spaced)
	24	Deciduous trees (regularly spaced)
	25	Coniferous trees (irregularly spaced)
	26	Coniferous trees (regularly spaced)
	27	Mixed tree forest
	28	Tropical rain forest
30	BUILT-UP AREA	
	31	Sparse houses
	32	Village centre
	33	Suburban
	34	Dense suburban
	35	Urban
	36	Dense urban
	37	Industrial zone
40	DRY GROUND	
	42	Sand dunes
	43	Desert
50	WET TERRAIN (no trees)	
	52	Marshlands
	54	Mud flats
60	FRESH WATER	
70	SEA WATER	
80	CRYOSPHERE	
	82	Sea ice
	83	Freshwater ice
	84	Glacier
	86	Dry snow
	88	Wet snow
90	OTHER	(Specify)

Note that H_c must be supplied if D_c is supplied, and that D_c must be supplied if G_c is supplied.

In view of the wide variability of ground cover it will often only be possible to obtain estimates for the parameters H_c, D_c and G_c. Nevertheless they can be valuable in adding precision to the generic categories. This may be done for a complete data set as a whole, or may be supplied individually for each point of a data set, such as for a path profile.

These considerations may be extended to any special situations where detailed propagation predictions are required. Table 5.2 provides some examples of categories of ground cover together with a possible mechanism for recording their characteristics; this is basically an extension of the first approach.

TABLE 5.2

Additional categories and parameters for database of special structures

Ground cover category	Parameters
Row of buildings (A well defined row of buildings in isolation, typically a row of terraced houses along a road)	– Mean building height – Coordinates at end points of row
Isolated building (Isolated building within a square)	– Building height – Coordinates of building centre – Area covered by the building
Line of trees (Typically a tree-lined road)	– Mean tree height – Coordinates at ends of tree line
Towers (Electricity pylons, wind turbines, etc.)	– Height of feature – Coordinates at centre of feature

5.3 Use of databases in available modelling and planning methods

Radiocommunication Study Group 3 has several Recommendations that describe modelling and planning methods that are useful in planning terrestrial land mobile radio systems. See Recommendation ITU-R P.1144 [5-6]. Some of the algorithms described in those Recommendations (e.g. Recommendation ITU-R P.1546) are of a general ("point-to-area") nature, whereas others (e.g. Recommendation ITU-R P.452 [5-7]), the so-called "point-to-point" models, are based upon the geometry of the specific path under consideration. Propagation predictions made with algorithms falling into the former category, being independent of path geometry, do not require hypsographic data. With "point-to-point" predictions, on the other hand, hypsographic data are essential. It should be emphasized here that the term "point-to-point" as used here refers to predictions that are dependent upon path geometry and does not refer to fixed paths, such as those frequently encountered in microwave systems.

5.3.1 Area metaphor

A point-to-point prediction is begun by laying-out the required coverage area using some metaphor corresponding to the geometry of the area. Commonly used metaphors include "radial", "stepped radial", "grid mapped from radial data", and "tiled". These are described below:

– In the "radial" method, data are taken along radials at equal angular spacings. Each point along the radial represents an annular segment of area. This method has the advantages of simplicity and speed, but the disadvantages of (a) diverging so that calculations made at a long distance from the base station site are made at larger tangential distances between calculations, and (b) they are unsuitable for calculations where the overlay of data from multiple sites is required, such as interference or simulcast predictions.

– The "stepped radial" method is similar to the radial method, but it incorporates an increase in the number of radials as the distance from the site increases. For example, one program starts at 8 radials out to 2 km, increases to 16 radials from 2 to 4 km, increases to 32 radials from 4 to 8 km, etc. This overcomes disadvantage (a) discussed above for the "radial" method, but it does not overcome disadvantage (b).

– In the "grid mapped from radial data" method, the program sets up a grid of tiles, data are taken at equal angular spacings as in the "radial" method, then the program finds the radial that passes nearest the centre of each grid, using these data to represent the grid. This overcomes disadvantage (b) of the "radial" method and it allows re-use of radial data, but it makes for uneven radial spacing.

– The "tiled" method truly takes radials to the centres of all tiles in the area. This gives the most accurate representation of the available data and overcomes both disadvantages (a) and (b) of the "radial" method, above. However, it generally requires more radials because one radial is required to the centre of each and every tile. This results in longer run times.

5.3.2 Profile considerations

Regardless of which area metaphor is used, a point-to-point prediction over an area will require that numerous terrain profiles be extracted from the database. Each profile represents the profile of the terrain between the base station and a potential mobile station location. Profile data are typically extracted following either of two methods: (a) the interpolation method, and (b) the "nearest data point" method.

In the interpolation method, the program seeks to extract data points at equal intervals; for example, 200 m. In this example, profile data values would be determined for distances 200, 400, … m from the base site. Since the vast majority of radials will not run in the cardinal directions where data

already exist, some form of interpolation is used to find values corresponding to those distances. Studies have shown that complex forms of interpolation do not yield significantly more accurate results than does simple bi-linear interpolation (see Recommendation ITU-R P.1144).

In the "nearest data point" method, all points within a given tolerance (usually about half of the horizontal resolution of the database) of the radial line are extracted. Their database elevation values are used, rather than interpolated values. The position of each extracted value along the radial line is calculated based upon the position that a perpendicular drawn through the data point to the radial would lie on. This results in uneven spacings of elevation data points along the radial.

Neither method of profile consideration has an advantage over the other. However, some program implementations require even spacings. As to data resolution it should be borne in mind that taking data at a finer resolution than that available from the database will not result in greater accuracy; however, it will result in additional processing time.

5.4 References

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[5-2] Recommendation ITU-R P.526 – Propagation by diffraction. International Telecommunication Union, Geneva.

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[5-6] Recommendation ITU-R P.1144 – Guide to the application of the propagation methods of Radiocommunication Study Group 3. International Telecommunication Union, Geneva.

[5-7] Recommendation ITU-R P.452 – Prediction procedure for the evaluation of microwave interference between stations on the surface of the Earth at frequencies above about 0.7 GHz. International Telecommunication Union, Geneva.

CHAPTER 6

PROPAGATION WITHIN AND INTO BUILDINGS AND UNDERGROUND

The indoor wireless propagation problem is broadly distinguished from the outdoor wireless propagation problem by much shorter path lengths and the ubiquity and importance of multipath in almost all cases of interest. The mixed problems, outdoor-indoor and indoor-outdoor wireless propagation, which combine aspects of each, will be deferred to the last part of this section. For the indoor-indoor wireless propagation problem, two solution approaches are available, depending on the level of detailed knowledge of the propagation situation. As in the outdoor propagation problem, these subdivide neatly into site-specific and site-general approaches. In what follows, both are discussed.

6.1 Site-specific approaches

Confining our attention, for now, to the simple cases where both the transmitter and the receiver are indoors, within the same building and in the same room, then the indoor propagation problem reduces to the solution for a resonant cavity (perhaps loaded) with lossy (i.e., imperfectly electrically conducting) walls. The solutions of Maxwell's equations can then be obtained for an empty, regularly shaped resonant cavity (i.e., boundary conditions which are separable in a useful, three dimensional, coordinate system), with perfectly conducting walls.

When one departs from the fairly simple, regularly shaped indoor propagation situations of the previous paragraph, which are amenable to analytical techniques, it is usually necessary to appeal to fully three-dimensional numerical solutions of Maxwell's equations. Each is computationally intensive and each requires discretization of space down to fractions of a free-space wavelength at the highest frequency of interest, for accurate solutions to the problem in question.

However, having acknowledged the existence of rigorous, analytical/numerical solutions to ideal and quasi-ideal cases, it is also important to note that, for many practical situations of interest, either the frequency of operation is too high, the geometrical complexity and/or cavity size is too great and/or there is not enough detailed information or predictability to warrant such an approach. In these cases, one may use simpler concepts, while recognizing the limitations inherent in this approach. If one falls back to concepts such as free space path loss coupled with diffraction, reflection and/or transmission losses, which is the common practice in ray tracing solutions based on geometrical optics, it is important to recognize that this may lead to both underestimates and overestimates of the losses that can occur in the indoor propagation environment

Clearly, adoption of any site-specific solution approaches is contingent upon specific siting information, detailed building layout information and, at least moderate information about the dielectric and magnetic material properties of walls, etc. It is worth noting, with regard to the last point, that these material properties may be, in general, frequency dependent, even for homogeneous materials. The frequency dependency of material properties can be expected to be considerably more complex in cases where the building materials involve hybrids, such as steel

reinforced concrete, or other kinds of multi-layer slab configurations. Detailed building structural information is required for accurate simulation results. Some general guidance on the effects of building materials is referenced in Recommendation ITU-R P.1238. Furthermore, it is also important to know the locations, sizes and detailed compositions of important apertures, such as windows and doors, if these are present.

6.2 Site-general approaches

In contrast to the more detailed site-specific approaches described above, Recommendation ITU-R P.1238 provides for a site-general model of the indoor propagation loss. The model accounts for indoor propagation loss as a function of the frequency (MHz), the separation distance (m) between the base station (i.e., transmitter) and the mobile/portable (i.e., receiver) and the number of building floors between the base station and the mobile/portable. The formula for the indoor propagation loss, L_{total}, is:

$$L_{total} = 20 \log f + N \log d + L_f(n) - 28 \quad \text{dB} \tag{6-1}$$

where:

f: frequency (MHz)

N: path loss coefficient

d: separation distance between the base station and the portable (m) ($d > 1$ m)

L_f: floor penetration loss (dB)

n: number of building floors between the base station and the portable ($n \geq 1$).

Note, however, that both the path loss coefficient, N, and the floor penetration loss, L_f, are functions of the frequency and the building type, as one might expect, given the previous discussion of site-specific approaches. Note, also, that the floor penetration loss, L_f, is neglected when the base station and the portable are on the same building floor. Typical values for N and L_f are reproduced in Tables 6.1 and 6.2, respectively.

TABLE 6.1

Power loss coefficients, *N*, for indoor transmission loss calculation

Frequency	Residential	Office	Commercial
900 MHz	–	33	20
1.2-1.3 GHz	–	32	22
1.8-2.0 GHz	28	30	22
4 GHz	–	28	22
5.2 GHz	–	31	–
60 GHz(1)	–	22	17

(1) 60 GHz values assume propagation within a single room or space, and do not include any allowance for transmission through walls. Gaseous absorption around 60 GHz is also significant for distances greater than about 100 m which may influence frequency re-use distances. (See Recommendation ITU-R P.676.)

TABLE 6.2

Floor penetration loss factors, L_f (dB) with n being the number of floors penetrated, for indoor transmission loss calculation ($n \geq 1$)

Frequency	Residential	Office	Commercial
900 MHz	–	9 (1 floor) 19 (2 floors) 24 (3 floors)	–
1.8-2.0 GHz	$4\,n$	$15 + 4(n - 1)$	$6 + 3(n - 1)$
5.2 GHz	–	16 (1 floor)	–

The following general remarks pertain to the site-general model of Recommendation ITU-R P.1238, particularly for the 900-2 000 MHz band:

i) Paths dominated by a pure line-of-sight (LoS) component have a path loss coefficient of 20 (approximately). However, it is also necessary that the building walls, ceiling and floor be suitably distant for this condition to occur.

ii) For long unobstructed paths, the first Fresnel zone breakpoint may occur, particularly for lower frequencies, giving rise to sub-path diffraction. In these cases, the path loss coefficient will increase rapidly from a value of 20 to a value of roughly 40, in the vicinity of the breakpoint.

iii) For paths in long, narrow corridors or hallways on a single floor, the path loss coefficient may be less than 20. This is a result of the fact that the corridor behaves (roughly) as a resonant cavity. This is likewise true for paths in single rooms with moderately reflective walls and suitable dimensions.

iv) For paths in buildings in which the rooms are separated by full, floor-to-ceiling walls (e.g., closed plan office buildings), the path loss coefficient for room-to-room paths is typically found to be near in value to 40.

v) For paths traversing multiple floors, it is expected that the floor penetration loss will be limited by paths through multi-floor atria, stairwells or other lower loss mechanisms than direct transmission through the building's floors.

The alert reader will note an apparent change of tone in the discussions of site-general approaches to the indoor propagation problem vis-à-vis site-specific approaches. In particular, the terminology has reverted to references more familiar in the discussion of outdoor propagation problems. It is, however, wholly consistent with the approximate solution to the site-specific indoor problem using ray tracing combined with the Geometric and Uniform Theory of Diffraction (GTD-UTD), which has been discussed in Section 4.3.1.

To bring a modicum of closure to the discussion of site-general approaches to the indoor propagation problem, note that the site-specific approaches discussed above allow for the computation of the channel impulse response, $h(t)$, at least in principle, as well as the indoor propagation loss, L_{total}. (It is important to emphasize that, for the indoor propagation problem, the channel is really many different channels.) The channel impulse response is vital for link simulation studies in which one evaluates the choice of modulation and, in digital systems, symbol rates, encoding schemes, etc., on the overall (i.e., end-to-end) system performance. Such studies might yield, for example, predicted BER as a function of S/N or $S/(I + N)$. Clearly, then, a site-general model is needed for the (indoor) channel impulse response.

While many physical phenomena can influence the channel impulse response, for the indoor propagation problem the principal phenomenon of interest is the distribution and strength of the various multipath components arising from scattering by the relevant surfaces, etc., that populate the indoor problem. Using an analogy to resonant cavity theory, the "multipath" decay rate is characterized by equation (6-2).

$$h(t) = \exp(-t/T) \tag{6-2}$$

where:

t: time (s)

T: cavity characteristic decay time (s).

Recalling results from classical resonant cavity theory, the characteristic decay time, T, will be related to the cavity dimensions, the electrical and magnetic material properties of the cavity's walls, floor and ceiling and the cavity mode.

One interesting feature of the exponentially decaying model of the channel impulse response, $h(t)$, when suitably normalized, is that the square root of its second central moment on the time interval $[0,\infty]$ is T, the cavity's characteristic decay time. If one then simply measures the r.m.s. delay spreads for indoor channels of certain types (e.g., residential, office and commercial), then these delay spreads are easily related to the exponentially decaying channel impulse response model through this single parameter. This is precisely what is recommended in Recommendation ITU-R P.1238 if it is appropriate to use the exponentially decaying channel impulse response model. From the foregoing discussion, it would seem that the exponentially decaying channel impulse response models are appropriate for r.m.s. delay spreads corresponding to speed-of-light travel times of, perhaps, two to three characteristic dimensions of the indoor "cavity", or more.

Another, frequently invoked, channel impulse response model is the wide sense stationary uncorrelated scattering (WSSUS) model. The basic concept here idealizes the (indoor) channel impulse response as a multivariate function, $g(t,\tau)$, of time, t, and the multipath delay, τ. The

(possibly complex) received response, $w(t)$, due to a (possibly complex) transmitted signal, $z(t)$, modulating a time harmonic transmission at carrier frequency, f_c, which then propagates through the channel, is obtained by convolution over the continuum of multipath delays, viz.:

$$w(t) = \int z(t-\tau) g(t,\tau)\, \mathrm{d}\tau \tag{6-3}$$

For each multipath delay, τ, the time variation of the channel impulse response is assumed to be a random process, the statistics of which are (wide sense) stationary. Furthermore, different multipath delays are associated with rays having different paths from "different" scattering centres. Hence, for different delays, this scattering is assumed to be uncorrelated. It is further assumed that the probability distribution function (in delay) of the scattering amplitudes is that of a normally distributed random variable. Stationarity of the statistics of the time variation along with the uncorrelated nature of the scattering delays imply that the autocorrelation function of the channel impulse response, $R_g(t,s;\tau,\xi)$, obeys:

$$R_g(t,s;\tau,\xi) = P_g(\Delta t;\xi)\delta(\xi-\tau) \tag{6-4}$$

where:

t, s: time variables

ξ, τ: delay variables

$\Delta t = s - t$

P_g: power density.

When the fading is slow no variations occur in the impulse response of the channel as a function of time and the autocorrelation function reduces to:

$$R_g(t,s;\tau,\xi) = P_g(\xi)\delta(\xi-\tau) \tag{6-5}$$

where $P_g(\xi)$ is the power delay profile which gives the power density as a function of time delay and its Fourier transform gives the coherent bandwidth of the channel. When there is a dominant mode, i.e. some 10-12 dB above other mode amplitudes, the normal distribution assumption is no longer valid, and the channel statistics become Rician giving rise to a wider coherent bandwidth than can be estimated from the Fourier transform of the power delay profile. In this case the spaced frequency correlation function should be used.

Since the statistics of the channel impulse response constitute the only observables that need to be matched, it is possible to develop so-called "*N*-channel" models obeying the required auto-correlation function from measurement of the power delay spectrum, etc. An example of this appears in Recommendation ITU-R P.1238.

6.3 Combined (indoor-outdoor and outdoor-indoor) propagation

In situations involving propagation over combined paths, either indoor-to-outdoor or vice versa, it is usually appropriate to concentrate on the points-of-entry (or exit) that allow for the transmission of electromagnetic radiation between the two environments. Points-of-entry can be apertures such as windows, skylights and doors, ventilation intake and exhaust penetrations, other structural openings and, if the electromagnetic shielding provided by the building materials is low, even the exterior skin of the building itself. If the distributions of the electromagnetic fields across the points-of-entry are known or, alternatively, can be inferred, then these points-of-entry can replace the actual

sources of radiation (either indoor or outdoor) as equivalent radiation sources (i.e., either outwardly or inwardly, respectively). The total field at the desired observation point will then be the result of superposition of the fields at the observation point due to each of the equivalent sources, taken individually. If it happens that a single point-of-entry is expected, on physical grounds, to dominate the response at the observation point, then it is often sufficient to concentrate on obtaining the desired electromagnetic fields' distributions for this single point-of-entry, excluding the others. For additional detail on this subject, see Bethe [6-3].

An alternate, empirically based, approach is to use empirical data for building entry loss (defined in Recommendation ITU-R P.1411) and then account for the transmission effects of interior walls and panels, ignoring diffraction and reflection. Davidson [6-4] consolidated the results of several building entry loss measurement programmes and found that, for medium-sized office buildings, the building entry loss can be calculated from formula (6-6):

$$L_{be} = 37 - 7.9 \log f_{\mathrm{MHz}} \tag{6-6}$$

At 914 MHz, Seidel [6-5] found attenuation factors for soft partitions and interior walls to be approximately 1.4 and 2.4 dB, respectively. LaFortune [6-6] found the value for soft partitions to be 1.5 dB at 917 MHz. Galeitner [6-7] found the value for interior walls at 1 800 MHz to range between 5.8 and 6.7 dB, depending upon the composition of the interior walls. Interior attenuation factors are summarized in Table 6.3.

TABLE 6.3

Interior attenuation factors (dB)

Frequency (MHz)	~900	1 800
Soft partitions	1.4-1.5	
Interior walls	2.4	5.8-6.7

6.4 References

[6-1] Recommendation ITU-R P.1411 – Propagation data and prediction methods for the planning of short range outdoor radiocommunication systems and radio local area networks in the frequency range 300 MHz to 100 GHz. International Telecommunication Union, Geneva.

[6-2] Recommendation ITU-R P.1238 – Propagation data and prediction models for the planning of indoor radiocommunication systems and radio local area networks in the frequency range 900 MHz to 100 GHz. International Telecommunication Union, Geneva.

[6-3] BETHE, H. A. [1944] Theory of diffraction by small holes. *Phys. Rev.,* Vol. 66, p. 163-182.

[6-4] DAVIDSON, A. L. *et al*. [February 1997] Measurement of building penetration into medium buildings at 900 and 1500 MHz. *IEEE Trans. Veh. Tech*., 46(1), p. 161-168.

[6-5] SEIDEL, S. Y. and RAPPAPORT T. S. [February 1992] 914 MHz path loss prediction models for indoor wireless communications in multifloored buildings. *IEEE Trans. Ant. Prop*., 40(2), p. 207-217.

[6-6] LAFORTUNE, J.-F. and LECOURS M. [May 1990] Measurement and modelling of propagation losses in a building at 900 MHz. *IEEE Trans. Veh. Tech*., 39(2), p. 101-108.

[6-7] GALEITNER, R. and BONEK E. [1994] Radio wave penetration into urban buildings in small cells and microcells. 44th IEEE Veh. Tech. Conference Record, p. 887-891.

CHAPTER 7

ANTENNA CONSIDERATIONS

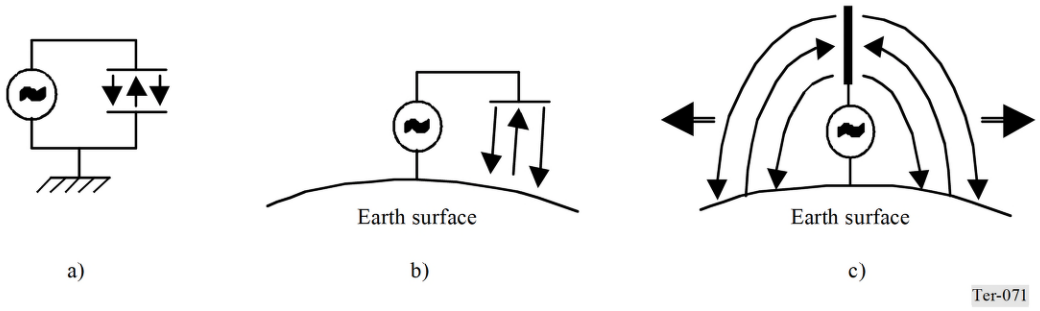
7.1 Emission of radiowaves

Antennas are a primary factor to consider in any study of propagation of radiowaves, because the antenna is that element of a radio system that emits electromagnetic radiowaves into the ether. At the receiving end, an antenna picks up the radiowaves from the ether and converts them back into the electric signals. Thus, the choice of the antennas as well as their installation will greatly affect the way the radiowaves will propagate and the overall quality of radiocommunication link.

The principle of antenna operation may be easily understood through the simple analogy with a conventional capacitor, where an alternating electric field is created between the plates by an external signal generator, as illustrated in Fig. 7.1a). If one now considers that the surface of the Earth is used as one capacitor plate and the other plate is gradually removed from that surface, see Fig. 7.1b), and then converted into a single standing wire, this releases the alternating field causing it to propagate in all directions from the antenna along the surface of the Earth, see Fig. 7.1c). This exactly explains the operation of the dipole antenna (also known as Hertzian antenna), which is a basic antenna in land mobile applications.

FIGURE 7.1

Principle of operation of the dipole antenna

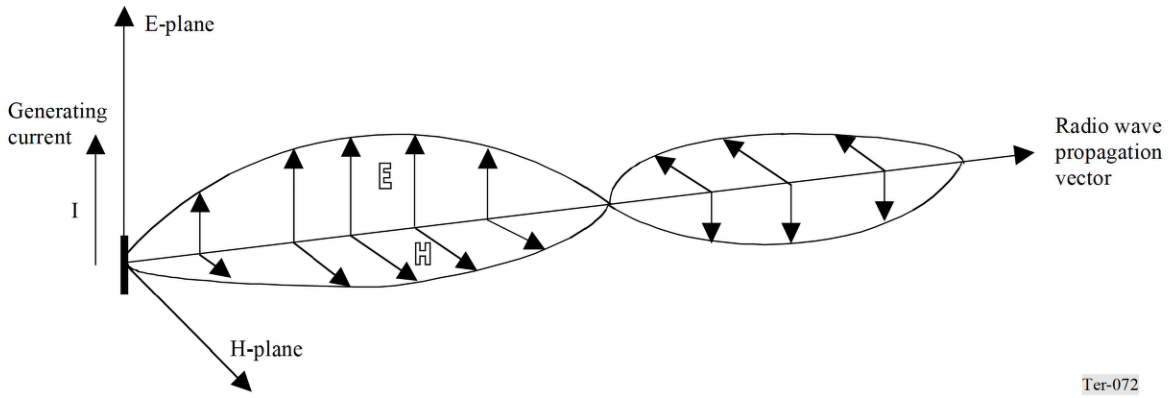


Radiowaves are essentially the combinations of two alternating fields – electric and magnetic, with their respective vectors being always normal to each other. Their multiplication produces the resulting propagation vector (power vector, called Pointing vector), which is normal to the wavefront and describes the direction of radio wave propagation, (see Fig. 7.2).

One important characteristic of electromagnetic waves is their polarization, which describes the orientation of electric and magnetic field vectors in relation to the ground plane. The orientation of the electric field vector is the reference used when describing the polarization of a radio wave. This means that whenever it is said that the radio wave is vertically or horizontally polarized, that implies that the electric field vector is oriented vertically or horizontally respectively to the ground plane (Earth surface). For example, the wave shown on Fig. 7.2 is vertically polarized.

FIGURE 7.2

Structure of electromagnetic (radio) wave



The polarization of a radiowave is normally determined by the orientation of the transmitting antenna and its structure. For example, a vertically installed singular dipole antenna, as illustrated on Fig. 7.1c), would emit vertically polarized radiowaves, of the type shown on Fig. 7.2.

The polarization property of radiowaves is important in two major aspects. First of all, it is a cardinal rule that the transmitting and receiving antennas should have the same polarization in order to guarantee maximum received signal strength. Similar logic suggests that the transmitting and receiving antennas should be of opposite polarization to achieve the best possible de-coupling, for example when protecting a receiver from a possible interfering transmitter of known polarization. However, in the land mobile services the polarization of radiowaves is often affected by numerous reflections and diffractions over the non-line-of-sight propagation path. The impact of this phenomenon is addressed in more detail later in this section.

Another major aspect of polarization is that it may directly affect the propagation of radiowaves. When a radiowave is travelling along the surface of the Earth (which possesses certain conductivity), currents are generated in the surface which cause absorption of power from the passing radiowave. Horizontally polarized waves are more severely affected by this absorption. Generally, surface absorption is less over water paths and also less profound at higher frequencies.

Other fundamental propagation effects are described in detail in Chapter 3 of this Handbook.

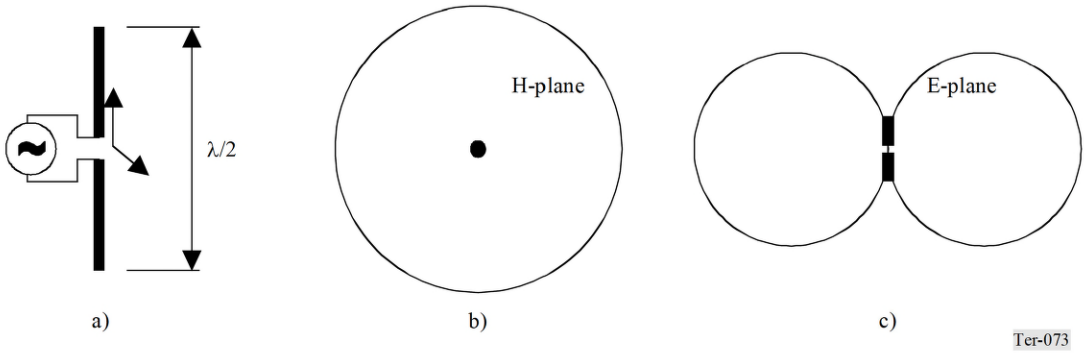
7.2 Reference isotropic radiator and dipole antenna

A hypothetical ideal radiator, called an isotropic radiator, is used in describing real antennas. It may be considered as an imaginary point, radiating equally in all directions through the sphere around it. Such a unity-gain (zero-gain on logarithmic scale, see details in Appendix B) elementary antenna provides a useful reference base for the uniform description of directivity of real antennas.

The simplest real antenna, which most closely resembles the isotropic radiator, is a half-wavelength dipole antenna, see Fig. 7.3a). It radiates equally in all directions in the horizontal plane (omnidirectional) (Fig. 7.3b)), but has non-uniform directivity in the vertical plane (Fig. 7.3c)).

FIGURE 7.3

Half-wavelength (λ/2) dipole antenna and its radiation patterns in two planes



Irregularity of the radiation pattern in the vertical plane means that the dipole antenna concentrates radiated energy in the direction normal to its central point, that is in the horizontal plane. Thus, the dipole antenna provides directional gain, which equals 1.64 times or 2.15 dB, relative to an isotropic radiator.

Formally, the power gain of an antenna is defined [7-1] as the ratio, usually expressed in decibels, of the power required at the input of a loss-free reference antenna (usually an ideal isotropic radiator) to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength or the same power flux-density at the same distance. When not specified otherwise, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarization.

Because of its simplicity and constructional convenience, dipole antennas are widely used in the land mobile services. The gains of some other (composite) antennas in land mobile applications are often expressed in relation to the standard half-wavelength dipole, to show the comparative improvement over a basic dipole antenna. In decibel units such gain is denoted as “dBd”, where “d” stands for “dipole”. To transform this into the gain relative to an isotropic radiator, add 2.15 dB to the dipole related gain.

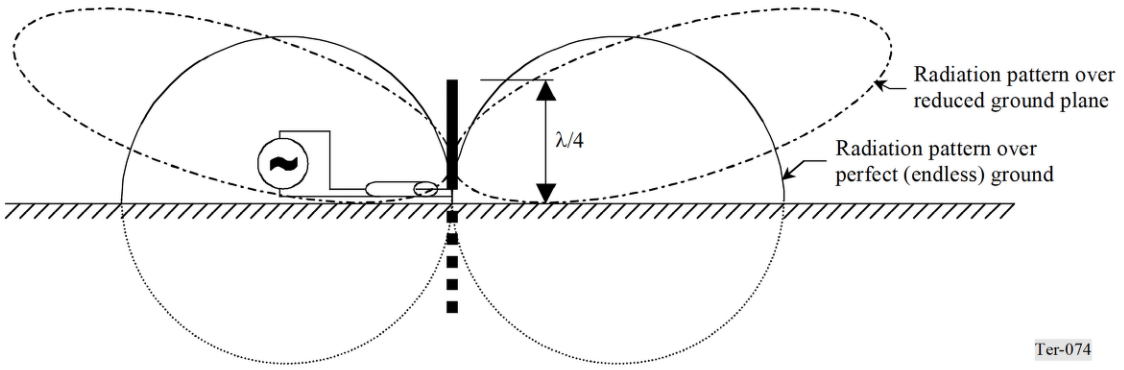
Some dipole antennas used in practice behave like a half-wavelength dipole but are in fact a quarter-wavelength (λ/4) in length. In such dipoles the second radiating leg is replaced with its virtual mirror over the perfectly conducting plane, which may be the Earth’s surface or a vehicle’s roof. Operation of the λ/4-dipole is illustrated in Fig. 7-4.

The radiation pattern of a λ/4-dipole in the E-plane resembles that of the reference λ/2-dipole when the ground plane is “perfect”, that is its conductivity and dimensions are sufficient. However, this is difficult to achieve in practice because usually the antenna is mounted high above the ground and it is difficult to achieve proper ground in mobile applications. One means of partially overcoming this problem is to mount fixed antennas or vehicular antennas over “virtual ground” elements, which may be a set of three to five conducting rods radially placed at the base of the dipole or it may be the surface of the vehicle body for vehicle mounted antennas. However, such virtual ground may not fully replace the perfect reflecting plane, therefore it is referred to as the “reduced ground”. In

such cases the radiation pattern of the λ/4-dipole rises slightly upwards in the E-plane, as shown in Fig. 7.4. In the H-plane the radiation pattern of the λ/4-dipole remains omnidirectional. The gain of the λ/4-dipole over a *perfect* ground is 5.2 dBi or 3.05 dBd. In reduced ground situations, gains of −1 dBd are typical at the horizon.

FIGURE 7.4

Quarter-wavelength (λ/4) dipole antenna and its radiation pattern in E-plane



7.3 Antenna characteristics

Some of the major antenna characteristics used in propagation studies in the land mobile services are briefly described below.

Directivity (power gain)

This parameter describes the ability of an antenna to concentrate radiated energy in the given direction. The formal description of the gain is given in Section 7.2.

Directivity of the antenna is usually described by polar plots, showing the comparison of power radiated over the 360° arc. Two diagrams are usually used, describing antenna directivity in the vertical and horizontal planes, which are marked as E- or H-plane

Polarization

The emitted radiowaves are considered to be polarized in the plane of the length of the conducting antenna elements, which is the plane of electric E-field.

Circular polarization may be used sometimes by employing crossed dipoles or helical-wound antennas to reduce the multipath propagation losses. See discussion on effects of cross-polarization in Section 7.6.

Design frequency and bandwidth

Since the physical dimensions of an antenna are related to its operating wavelength, the design is optimized to a particular frequency, called the design frequency. The design frequency is often considered as a centre frequency of the band of operating frequencies.

Acceptable limits of deviation of the operating frequency (frequency channel width) from the design frequency are defined by the bandwidth of an antenna. This bandwidth is normally given as a percentage of the design frequency and describes the band of frequencies over which antenna performance will not degrade to an unacceptable level. Otherwise, the operating frequency range of the antenna is stated.

These parameters are seldom used in the propagation modelling on the assumption that the antenna is tuned to the operating frequency, but it is important to observe them especially in practical field applications, such as test measurements or coverage verification measurements.

Beamwidth

The beamwidth parameter is closely linked to the directivity of an antenna and is usually used in a description of directional antennas. The beamwidth (also referred to as the half-power beamwidth) is specified as the total width, in degrees, of the main radiation lobe, limited by the angles at which the radiated power has decreased by half (–3 dB on logarithmic scale) from that of the main radiation direction. Directional antennas are very often used in base station installations, therefore their horizontal beamwidth should be taken into account when modelling the coverage areas of such base stations. Although directional antennas are seldom used on the mobile side in land mobile systems, this may occur, for example, when calibrated directional antennas are used for propagation measurements. In such cases the beamwidth of an antenna should be sufficiently wide to pick up most of the highly scattered multipath signal. On the other hand, directional antennas may be used at the remote terminal for the opposite reason, that is to limit the number of multipath rays.

7.4 Base station antennas

In most typical land mobile applications in the VHF/UHF ranges, such as PMR (private dispatch), paging and other similar systems with radial coverage, the base stations usually employ dipole antennas or collinear arrays of dipole antennas. Mounted vertically, such antennas produce omnidirectional vertically polarized fields. Ideally, a radiating dipole should be placed on top of a mast or other support to avoid affecting directivity because of reflections from metal surroundings. Placing the antenna more than one wavelength from metallic structures will reduce this effect.

Directional antennas are used in the PMR kind of land mobile systems only when it is necessary to avoid interference with other systems or when it is impractical to locate the base station close to a centre of the service area.

In public cellular systems, highly directional antennas (with beamwidths ranging in average from 60° to 120°) are used at the base stations commonly to form the necessary pattern of service cells and at the same time to reduce co-channel interference into neighbouring cells. In such systems, omnidirectional antennas are used only occasionally in remote rural installations with low subscriber density, often with local repeater stations.

In propagation studies the direction from the base station to the remote terminals is of primary concern, and the actual directivity of the antenna is an important element of the studies. Another important characteristic of base station antenna installation is the height of the antenna above the ground or effective height of the base station antenna. The latter is used to describe the height of the antenna over the average terrain height in the areas with irregular terrain. The precise definition of the effective height varies slightly from model to model, however in the ITU-R models it is usually the height of the antenna over the average height of terrain in the distance from 3 to 15 km from the transmitter in the direction of the receiver.

7.5 Mobile station antennas

The most common type of antenna used for the mobile stations, is the "whip" antenna, a metal rod, forming a quarter-wavelength dipole. The efficiency of such antennas is low because of the practical difficulties in establishing a proper reflecting ground plane at the mobile stations, especially for hand-held terminals. This situation is slightly better for vehicle mounted antennas when they are mounted over the centre of a metallic rooftop.

Although the actual height of a mobile station antenna is difficult to define, for propagation studies of land mobile applications 1.5 m antenna height is commonly used as a reference. However, in certain systems the actual height of a mobile station antenna may be considerably higher, e.g. when antennas are installed on top of large business-type vehicles, such as buses, railway cars, etc. For broadcasting or for point-to-point applications, the height of a receiving (remote) terminal antenna is considered to be 10 m above ground.

It is, therefore, important to ensure that the chosen propagation prediction model assumes the proper height of the mobile station antenna or that an appropriate antenna height correction factor is used. Such factors are supplied with most of the widely used models.

If the mobile station employs a directional antenna, care should be taken to account for its effects on the reception of arriving signals.

Where vehicular mobile antennas have a higher gain in the horizontal plane than the standard dipole antenna, the appropriate value of antenna gain should be used in modelling.

7.6 Impact of the land mobile environment

The following sub-sections describe in greater detail the impact that a typical land mobile environment may have to a general consideration of antennas and their characteristics. This text is largely based on the material in Recommendation ITU-R P.1406 [7-3].

7.6.1 Depolarization phenomena in the land mobile environment

In the land mobile environment some or all of the transmitted energy may be scattered out of the original polarization due to diffraction and reflection of the radiowave. It is convenient to take this depolarization effect into consideration by using a cross-polarization discrimination (XPD) factor, as defined in Recommendation ITU-R P.310.

It is reported, that XPD measurements at 900 MHz show that:

– XPD depends little on distance;

– the average XPD in urban and residential areas ranges from 5 dB to 8 dB;

– the average XPD in open areas is over 10 dB;

– the average correlation between vertical and horizontal polarization is 0.

It is also known, that XPD increases with decreasing frequency, to about 18 dB at 35 MHz.

The comparatively low values of XPD noted above are due to the considerable amount of scattering in typical conditions of land mobile services, especially in urban and residential areas. This phenomenon may, however, be turned into a useful technique for improving reception through polarization diversity. In this case, the most basic option would be to use two orthogonal linear polarizations at the base station.

As an alternative to diversity, circular polarization at the base station and linear polarization at the mobile terminal, while resulting in a 3 dB polarization mismatch, can take advantage of the depolarization due to scattering and provide a more constant received signal level in the mobile environment.

7.6.2 Antenna height gain: base and mobile

Height gain refers to a change in received signal strength with change of antenna height. Although usually increasing with height (positive height gain), it can also decrease with height (negative height gain) in certain point-to-point communication cases. For example, this may happen if, in the absence of local clutter, the direct signal can interact with a ground-reflected ray from the same transmitter. The resulting field strength variation, in a vertical direction, is a series of maxima and minima as the path geometry causes the two signals to go in and out of phase.

In practice, however, particularly in land mobile systems, clutter and other reflected signals tend to minimize this two-ray effect and it can be neglected in most situations at frequencies above 200 MHz. Instead, it is usually found that raising the antenna simply reduces the effective clutter loss causing the received signal to increase with height. Since antenna height is related to clutter loss in this way, this form of height gain can be categorized in terms of reference receiver antenna heights for the type of ground cover (dense urban, urban, suburban) as in Recommendation ITU-R P.1546 [7-4]. In other prediction methods, especially those that use a terrain data base, antenna height is frequently linked directly to the calculation of clutter loss.

For base stations, operating at frequencies below 200 MHz and located in open areas, 2-ray effects can sometimes be found so that re-positioning of the antenna may be required to avoid negative height gain. Such an effect is difficult to predict precisely, since a detailed knowledge of the terrain profile at the reflection point is required. Above 200 MHz, due to the smaller wavelength, this particular problem tends to diminish and at UHF and above it can be ignored.

7.6.3 Correlation/space diversity

Space diversity is practical for antennas having cross-correlations up to about 0.7. In general, this makes portable and mobile diversity reception nearly impractical. For the base station case, however, a number of techniques are possible for reducing the cross-correlation between antennas. The two most practical are vertical and horizontal separation.

To reduce the cross-correlation to 0.7 or less, vertically spaced antennas must be separated by approximately 17 wavelengths or more. Horizontal separation can be more effective, depending upon the relative orientations of the plane of the antennas versus the direction of motion of the mobile. If the vertical plane through the antennas is perpendicular to the direction of motion of the mobiles, the cross-correlation will be approximately the same as that for the vertical separation case. With optimum orientation, horizontal antennas can be separated by as little as 8 wavelengths. It should be borne in mind that nearly optimal orientations can be maintained only in special cases, such as systems using sectored antennas.

7.6.4 Realizable antenna gain of the vehicular mobile station

Since vehicular mobile stations usually operate in a multipath environment, it is not surprising that mobile antenna gain will not, in most cases, match that measured on the test range. Additionally, even in line-of-sight non-multipath conditions, the vertical angle of arrival is not necessarily horizontal. In fact, practical cases exist where the vertical angle of arrival can exceed 10°. In the latter case, the vertical angle of arrival could easily be on a null or a minor lobe, rather than the main lobe of the mobile antenna's vertical pattern.

For example, some test measurements with the mobile antennas rated at 3 dB and 5 dB gain relative to a $\lambda/4$ vertical monopole in practical situations have shown that their practical gain values rarely meet the values measured on an antenna range. In multipath situations or in clear situations with high angles of arrival (>2°), the practical gain of either antenna is approximately 1.5 dBd (that is relative to a $\lambda/4$ vertical monopole) over a distance range of up to at least 55 km. In clear situations with low elevation angles, full gain may be realizable.

7.6.5 Body loss

The presence of the human body in the field surrounding a portable transceiver, cellular phone, or paging receiver can degrade significantly the effective antenna performance – the closer the antenna to the body the greater the degradation. This effect is also frequency dependent, as the results of detailed studies on portable transceivers at four commonly used frequencies reveal. These results are given in Table 7.1, as derived from Recommendation ITU-R P.1406. A related study [7-5] showed similar, but not identical, results. Values of body loss for frequencies other than those shown in Table 7.1 may be estimated through a simple extrapolation.

TABLE 7.1

Typical body loss as related to the antenna efficiency of a portable transceiver

(based on Recommendation ITU-R P.1406)

Frequency (MHz)	Body loss at waist level (dB)	Body loss at head level (dB)
160	19.0	10.0
450	13.0	4.5
800	14.5	8.5
900	15.5	10.0

When an antenna of the mobile station is made as an integral part of an entire unit (as often is the case with hand-held stations in public systems: mobile phones, pagers), then its gain is not usually specified and it is not possible to correct it with the body loss factor. In such cases the body loss is accounted as a reduction of receiver sensitivity or radiated power of the transmitter. Alternatively, body loss may be introduced into the calculation of the overall signal loss in the power budget calculations.

7.7 References

[7-1] Recommendation ITU-R P.341 – The concept of transmission loss for radio links. International Telecommunication Union, Geneva.

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[7-3] Recommendation ITU-R P.1406 – Propagation effects relating to terrestrial land mobile service in the VHF and UHF bands. International Telecommunication Union, Geneva.

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CHAPTER 8

ENVIRONMENTAL NOISE

8.1 Radio system performance factors

There are many factors that contribute to the performance of radio systems. They include the following:

– selection of bandwidth, modulation, signal and channel coding;

– quality of the input signal as degraded by channel impairments, such as multipath;

– amount and types of interference signals that are present along with the desired signal; and

– level and characteristics of noise that are present with the desired signal at the receiver's detector, demodulator, or decoding circuits.

This section deals with the last factor, noise, and the ways to estimate the noise levels that may be present in a land mobile radio system. The section provides background on noise terms and noise power expressions, gives the sources of information on noise (relative to land mobile radio applications) that are contained in Recommendation ITU-R P.372, and suggests where new measurements indicate changes in historical noise levels.

8.2 Noise terms and background

8.2.1 Noise components

Radio system noise can be attributed to two types of source:

– receiver noise or internal noise due to the radio system itself, and

– environmental noise or external noise from sources outside the radio system.

Depending upon such factors as the receiver design, where in the radio spectrum the system operates, and the location where the system is used, either the receiver noise can dominate or the environmental noise can be the dominant source of noise.

8.2.2 Noise power and noise temperature

The random motion of free electrons in a resistive conductor creates a noise voltage across the conductor. The resistive circuit is shown in Fig. 8.1. The noise power, n, which would be measured in a resistor at an absolute temperature, t, in units of K (Kelvin), and within a bandwidth, b, (Hz), is called the thermal noise power. The mean thermal noise power, n (W), available in a resistor is:

$$n = k\,t\,b \tag{8-1}$$

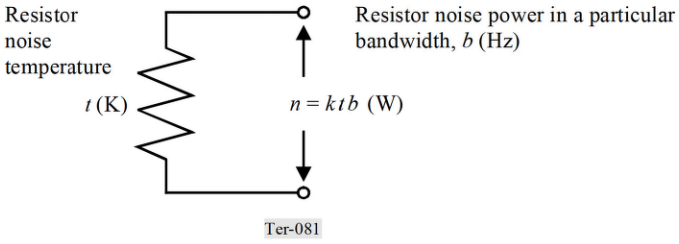
where $k = 1.38 \times 10^{-23}$ (W/(K · Hz) is Boltzmann's constant. If a standard room temperature (~17° C) of $t_0 = 290$ K is used as a reference temperature for the resistor, then the reference noise power, n_{ref}, in a 1 Hz bandwidth becomes

$$\begin{aligned} n_{ref} &= k\, t_0\, b \\ &= (1.38 \times 10^{-23}\ (\text{W/(K} \cdot \text{Hz)} \times (290\ \text{K}) \times (1\ \text{Hz}) \\ &= 4 \times 10^{-21}\ \text{W} \end{aligned}$$

In decibel form, the reference noise power, N_{ref}, equals –204 dBW (in a 1 Hz bandwidth).

FIGURE 8.1

Noise power from a resistive conductor at a specified temperature and within a given bandwidth



8.2.3 Noise factor

Consider an amplifier having a gain, g_{amp}, and bandwidth, b, in Hz. The amplifier circuit is shown in Fig. 8.2. Assume an input signal power, s_{in}, and an input noise power, n_{in}, due to a resistive load, are measured at the amplifier's input terminals. Assume an output signal power, s_{out}, and output noise power, n_{out}, are available at the amplifier's output terminals.

A term called noise factor, f, originally was defined [8-1] as the ratio of the input signal-to-noise ratio to the output signal-to-noise ratio.

$$f = \frac{\left(\frac{s_i}{n_i}\right)}{\left(\frac{s_o}{n_o}\right)} \tag{8-2}$$

An alternate term, noise figure, is denoted by capital F and is defined as the decibel expression of the noise factor; i.e. $F = 10 \log_{10} f$.

The output signal power is related to the input signal power by the amplifier gain:

$$s_{out} = g_{amp}\ s_{in} \tag{8-3}$$

and the input noise power is related to the noise temperature of the input termination, t_{in}:

$$n_{in} = k\, t_{in}\, b \tag{8-4}$$

When the input termination is at the reference temperature, t_0, the input noise power is:

$$n_{in} = k\, t_0\, b \tag{8-5}$$

The output signal-to-noise power ratio can be written as:

$$\frac{s_{out}}{n_{out}} = \frac{\dfrac{s_{in}}{k\, t_0\, b}}{f} \tag{8-6}$$

and the output noise factor can be related to the noise factor of the amplifier by:

$$n_{out} = f g_{amp} k\, t_0\, b \tag{8-7}$$

Consider the case when the amplifier is noiseless. The noise at the output of the amplifier would be the noise at the input, $k\, t_0\, b$, multiplied by the amplifier's gain:

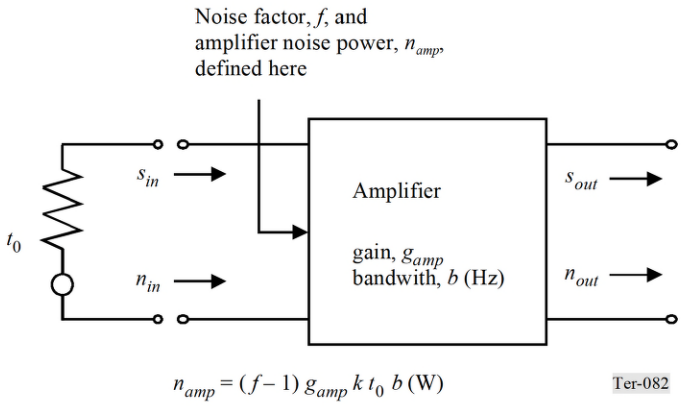
$$n_{noiseless\ amp} = g_{amp} k\, t_0\, b \tag{8-8}$$

Now to find the noise at the output due only to the amplifier itself, subtract the noiseless amplifier noise power from the total noise power:

$$\begin{aligned} n_{amp} &= n_{out} - n_{noiseless\ amp} \\ &= f g_{amp} k\, t_0\, b - g_{amp} k\, t_0\, b \\ &= (f-1) g_{amp} k\, t_0\, b \end{aligned} \tag{8-9}$$

FIGURE 8.2

Noise factor for a single device

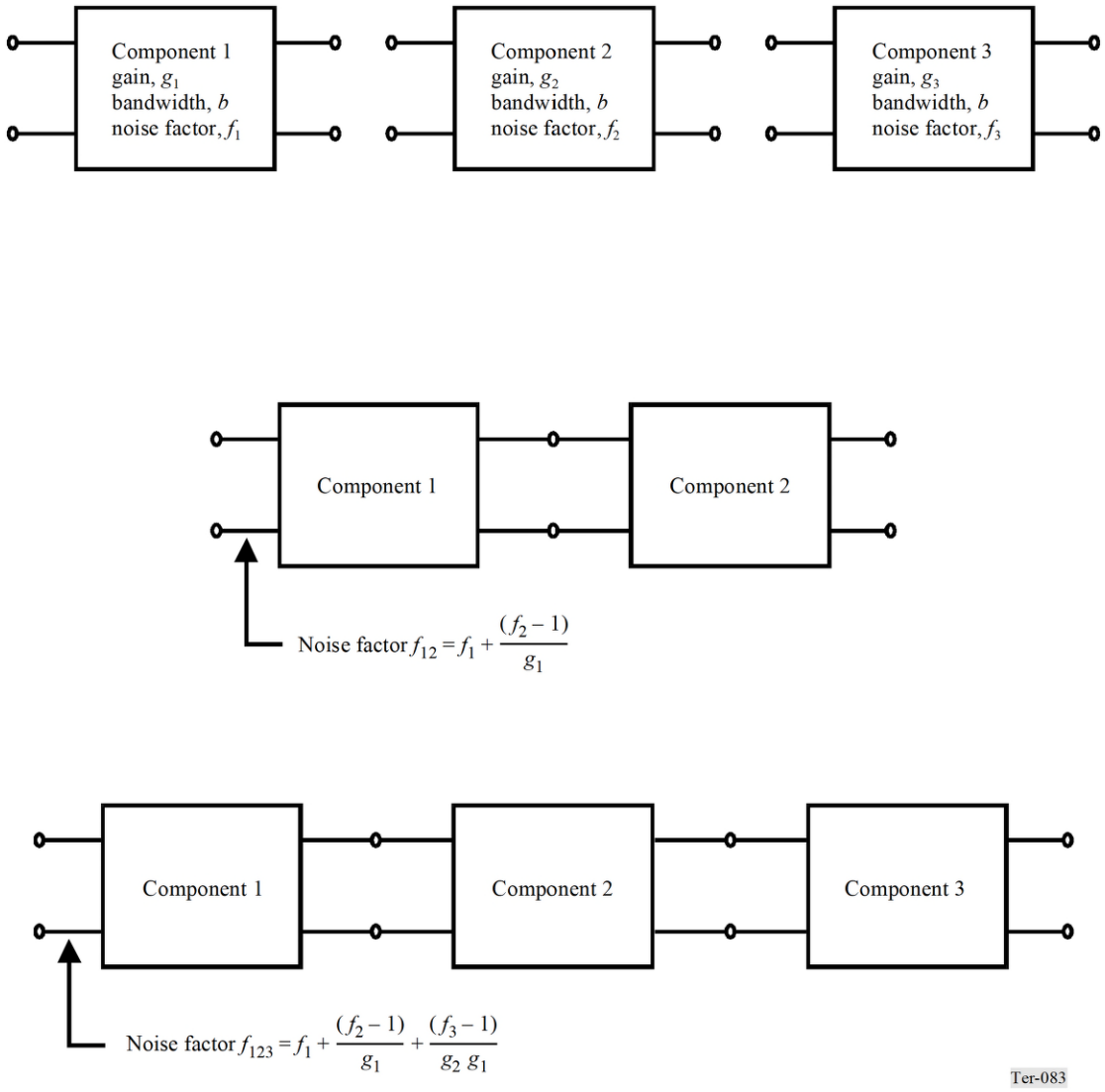


8.2.4 Noise factor for cascaded components

Consider the overall noise figure of two and three components cascaded together as in Fig. 8.3. Let the noise factors and gains of the three devices be defined as f_1, f_2, f_3, g_1, g_2, and g_3, respectively.

FIGURE 8.3

Noise factors for cascaded devices



Following the pattern set by the single component above, the total output noise power of the two-component circuit would be:

$$n_{out} = f_{12} g_1 g_2 k\, t_0\, b \tag{8-10}$$

but this is just the output noise of the first component multiplied by the gain of the second device with the additional noise created by the second component by itself:

$$n_{out} = n_1 g_2 + n_2 \tag{8-11}$$

Using the equations above, this becomes:

$$f_{12} g_1 g_2 k\, t_0\, b = f_1 g_1 k\, t_0\, b\, g_2 + (f_2 - 1) g_2 k\, t_0\, b \tag{8-12}$$

Thus, the overall noise factor, f_{12}, of the two-component network is:

$$f_{12} = f_1 + \frac{(f_2 - 1)}{g_1} \tag{8-13}$$

and the overall noise factor, f_{123}, of the three component network is:

$$f_{123} = f_1 + \frac{f_2 - 1}{g_1} + \frac{f_3 - 1}{g_1 g_2} \tag{8-14}$$

If the first two devices are passive with attenuation (l) rather than gain, then:

$$g_1 = \frac{1}{l_1} \tag{8-15}$$

$$g_2 = \frac{1}{l_2} \tag{8-16}$$

and

$$f_{12} = f_1 + l_1(f_2 - 1) \tag{8-17}$$

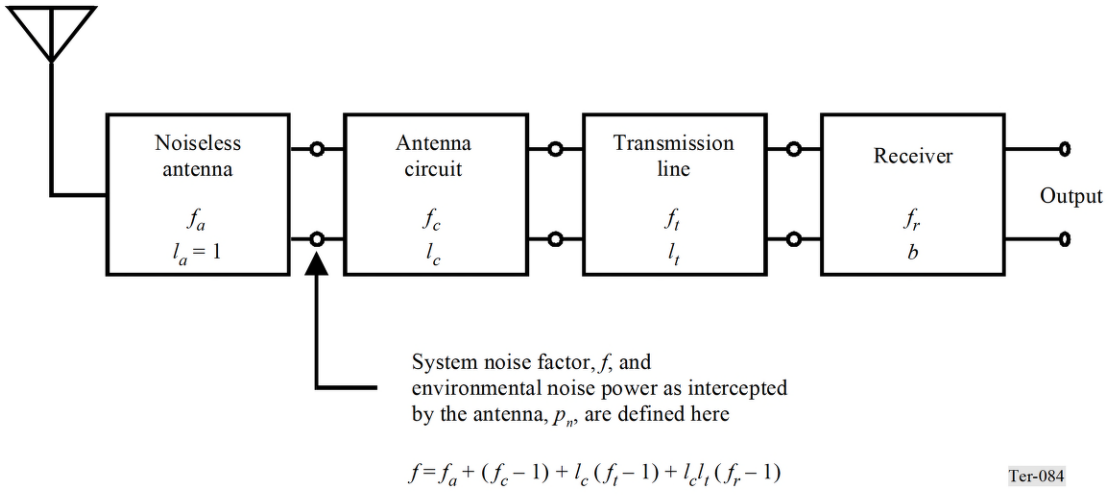
$$f_{123} = f_1 + l_1(f_2 - 1) + l_1 l_2(f_3 - 1) \tag{8-18}$$

8.2.5 Noise factor for receiving systems

Recommendation ITU-R P.372 defines the components of a receiving system and the parameters needed to specify the noise factor, f, of a receiving system. The block diagram of the receiving system and its parameters are shown in Fig. 8.4. While several references (e.g [8-9], [8-10], [8-11]), describe receiving system noise figure and antenna noise figure, the following development along with Fig. 8.4 apply to the information found in Recommendation ITU-R P.372.

FIGURE 8.4

Antenna noise factor and receiving system noise factor



The following definitions apply to the parameters used in the Recommendation:

p_n: available environmental noise power from an equivalent lossless antenna (W)

f_a: noise factor at the antenna associated with environmental noise as intercepted by the antenna

l_a: antenna loss (assumed to be lossless, $l_a = 1$)

k: Boltzmann's constant, 1.38×10^{-23} (W/(K · Hz)

t_0: reference temperature, assumed to be room temperature 290 K

b: noise power bandwidth of the receiving system (Hz)

f_c: noise factor associated with the antenna circuit losses

l_c: antenna circuit loss (available input power/available output power)

f_t: noise factor associated with the transmission line losses

l_t: :transmission line loss (available input power/available output power)

f_r: noise factor of the receiver.

Referring to Fig. 8.4, while the output of the antenna circuit is a location that can be used to measure signal-to-noise power ratios, it is not the desired location to reference the system performance. Instead, the output of the antenna is where it is desired to specify the system signal-to-noise power ratio, the antenna noise factor, f_a, and the system noise factor, f. Based upon the above equations, the system noise factor can be written

$$f = f_a + l_a(f_c - 1) + l_a l_c(f_t - 1) + l_a l_c l_t(f_r - 1) \tag{8-19}$$

With the assumption that the antenna itself is lossless ($l_a = 1$), the system noise factor becomes as equation (1) in Recommendation ITU-R P.372:

$$f = f_a + (f_c - 1) + l_c(f_t - 1) + l_c l_t(f_r - 1) \tag{8-20}$$

All parameters in the equation are dependent on the receiving system, except for the antenna noise factor, f_a, which indicates the amount of environmental noise that would be intercepted by an antenna in a particular environment and specified bandwidth.

The antenna noise figure, F_a, represents the antenna noise factor in decibels:

$$F_a = 10\log_{10}(f_a) \tag{8-21}$$

The environmental noise power, P_n, is the decibel form of p_n:

$$\begin{aligned} P_n &= 10\log_{10}(p_n) \\ &= F_a - 204 + B \end{aligned} \qquad \text{dBW} \tag{8-22}$$

where the noise bandwidth, B, is the decibel form of b:

$$B = 10\log_{10}(b) \qquad \text{dB(Hz)} \tag{8-23}$$

The noise bandwidth is often close in value to the receiver's 3 dB signal bandwidth.

Values for the antenna noise figure are contained in Recommendation ITU-R P.372.

8.3 Antenna noise figure information in Recommendation ITU-R P.372

Recommendation ITU-R P.372 provides antenna noise figure information for systems operating from 0.1 Hz to 100 GHz. Three types of environmental noise can be present at the receiving antenna: atmospheric noise, galactic noise, and man-made noise. Atmospheric noise levels vary diurnally with night time presenting the highest values. Man-made noise, as indicated in the Recommendation, is greatest in urban environments and least in quiet rural environments. (It is noted that the source of man-made noise estimates given in the Recommendation came from references [8-2, 8-3] whose measurement data were collected over 25 years ago.) Typically, the galactic noise is about 5 to 10 dB greater than quiet rural noise.

Most land mobile radio systems operate in the frequency range from about 30 MHz to 3 GHz; in this frequency range, atmospheric noise can be ignored. Figure 10 of the Recommendation presents the antenna noise figure, F_a, and the median antenna noise figure, F_{am}, values in this range where man-made and galactic noise sources dominate.

The Recommendation provides an estimate of the median noise figure within business areas using the expression for systems in the frequency range 200 MHz $< f_{MHz} <$ 900 MHz:

$$F_{am} = 44.3 - 12.3 \log_{10} f_{MHz} \qquad (8\text{-}24)$$

Table 8.1 compares the results of the overall system noise figure for two systems operating at 200 and 900 MHz by using the equation above to estimate F_{am} at the two operating frequencies. Typical values are selected for the noise figure of the receiver and the losses of the antenna circuit and the transmission line.

TABLE 8.1

Comparison of system noise figures for LMR systems at 200 and 900 MHz

		200 MHz system	**900 MHz system**
Antenna	F_{am}	16 dB	8 dB
	f_{am}	39.81	6.26
Antenna circuit	L_c	1 dB	1 dB
	l_c	1.26	1.26
Transmission line	L_t	1 dB	1 dB
	l_t	1.26	1.26
Receiver	F_r	9 dB	9 dB
	f_r	7.94	7.94
	b	6 kHz	6 kHz
System	***F***	**17.1 dB**	**12.5 dB**
	f	**51.42**	**17.86**
	$\boldsymbol{P_n}$	**–149.1 dBW**	**–153.7 dBW**

For these two particular situations, the system noise figure and the system noise power are dominated by environmental noise for the 200 MHz system and by the receiver noise for the 900 MHz system.

The median noise figure, F_{am}, represents the value expected for 50% of the time and 50% of the locations, in a particular environment. To estimate man-made noise at other periods of time, Recommendation ITU-R P.372 provides decile values relative to median. The man-made noise level that would be available for at least 90% of the time (taking account of "within the hour" variability) at a given location is found by subtracting the lower decile value, D_l, from the median, F_{am}. Similarly, the noise level for no more than 10% of the time is estimated by adding the upper decile value, D_u, to the median. Table 2 of the Recommendation suggests different upper decile values for the different environments of business, residential, and rural and only for operating frequencies up to 250 MHz. A revisit by researchers [8-4] of the original data indicated that the decile values should be modified to $D_u = 9.7$ dB and $D_l = 7$ dB, regardless of man-made environment and of frequency.

Within a given environment, the noise figure will change from location to location. The standard deviation of the median noise figure due to location variability, σ_L, is given [8-2] in Table 8.2, for one operating frequency, 250 MHz, that is within the land mobile radio spectrum under consideration.

TABLE 8.2

Standard deviation of location variability at 250 MHz

Environment	Business	Residential	Rural
σ_L	3.8 dB	2.9 dB	2.3 dB

An observation in [8-5] based on noise measurements made more recently than those of Recommendation ITU-R P.372 notes that man-made noise demonstrates a diurnal character, depending upon human activity. However, the measurements did not show the within-the-hour time variability as presented in Recommendation ITU-R P.372. Some indications were given that automotive noise is not the large contributor of man-made noise as it reportedly was when measurements were made for the man-made noise expressions found in the Recommendation. Unfortunately, there have been an insufficient number of noise measurements to demonstrate whether this conclusion has any basis.

Other contributors of broadband noise, for example, such as digital devices and switched mode power supplies may have become more significant. These sources have different characteristics, especially with respect to peak-to-mean levels and discrete spectral components at clock frequencies and harmonics.

8.4 Noise measurements for specific applications

For some land mobile radio applications, the signal levels may be near the system noise level. For those situations, noise measurements in the environments that the radios are to be used would provide better estimates of the noise levels than those estimates based upon historical data, such as from Recommendation ITU-R P.372.

An RF noise measurement methodology is given in [8-6] which identifies the trade-offs between using a communications receiver (designed for the land mobile service application) and a laboratory-grade measurement receiver. Another recent report [8-7] provides information and gives details on the noise measurement process used to collect noise measurement characteristics in the 136-138 MHz band. Mobile noise measurements were recently made and reported [8-8] that relate noise levels to a number of land use – land cover (LULC) categories. The same reference describes the process used to make the mobile measurements.

8.5 References

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CHAPTER 9

CHANNEL CHARACTERISTICS FOR DIGITAL MODULATION SCHEMES

In a radio link, a part of the energy radiated by the transmitting antenna reaches the receiving station through different paths. Along these paths, interaction may occur between the electromagnetic field and various objects. Possible interactions are specular reflection on long plane surfaces, diffuse scattering from surfaces exhibiting small irregularities or from objects of small size, transmission through dense material, shadowing by obstacles, etc. At the position of the receiving antenna, the resulting electric field is spread both in time delay and direction. In radio systems using digital modulation schemes the properties of the time-varying, frequency-dispersive radio channel are important to know. In such radio environments not only the narrow-band signal is relevant but also the time delays and angles-of-arrival of the individual multipath components are important. Multipath signals are not seen as interferers only; in some systems their energy is used to improve the signal level.

The dispersive nature of the propagation channel is described by the angle-resolved location-variant impulse response $h(\vec{x}, \tau, \varphi)$ of the electric field:

$$h(\vec{x}, \tau, \varphi) = \sum_{i=1}^{n} h_i(\vec{x}, \tau, \varphi) \tag{9-1}$$

where:

$\vec{x}$: denotes the MS position

τ: time delay

φ: angle-of-arrival

n: number of multipath signals.

Each of these components embodies a specular and a diffuse part.

9.1 Characterization in time domain

By considering the propagation channel between the transmit antenna and the antenna of a stationary receiver the field strength-delay spectrum (FDS) describes the complex impulse response $g(t)$ of the terrain in a narrow frequency band around f_0:

$$\underline{g}(t) = \sum_{i=1}^{n} g_i \, e^{j\psi_i} \, \delta_0(t - \tau_i) \tag{9-2}$$

where:

g_i: amplitude of the i-th signal

ψ_i: phase of the i-th signal

τ_i: time delay of the i-th signal.

Since the bandwidth of a receiver is limited, the signals arriving within a certain time period cannot be resolved. This is accounted for by the convolution of $g(t)$ with the receiver impulse response function $w(t)$, which is matched to the transmit signal:

$$\underline{h}(t) = \underline{g}_a(t) * \underline{w}(t) \tag{9-3}$$

$\underline{g}_a(t)$ is the FDS, where each multipath signal is weighted with the antenna diagrams of the transmitter and receiver. The expected received power, $P_m(t)$, can then be derived:

$$P_m(t) = cE\left[\underline{h}(t)\underline{h}^*(t)\right] \tag{9-4}$$

c is a constant converting field strength into received power. Based on $P_m(t)$ the delay spread S [9-1] can be derived for the characterization of the propagation channel in the time-domain:

$$S = \sqrt{\frac{\int_{-\infty}^{+\infty} t^2 P_m(t)\mathrm{d}t}{\int_{-\infty}^{+\infty} t\ P_m(t)\mathrm{d}t - t_m^2}} \tag{9-5}$$

where:

$$t_m = \sqrt{\frac{\int_{-\infty}^{+\infty} t\ P_m(t)\mathrm{d}t}{\int_{-\infty}^{+\infty} P_m(t)\mathrm{d}t}} \tag{9-6}$$

S is a rough criterion to assess the performance of a digital system. As long as S is small compared to the duration T of the digital symbol the channel can be assumed to be resistant to inter-symbol interference.

9.2 Characterization in frequency domain

For many applications like frequency hopping or spread spectrum techniques, it is necessary to characterize the propagation channel in the frequency domain. The relation between the complex impulse response $g_a(t)$ and the complex transfer function is given by the Fourier transform:

$$\underline{G}_a(f) = \sum_{i=1}^{n} g_{a,i}\, \mathrm{e}^{-j(2\pi f \tau_i - \psi_{a,i})} \tag{9-7}$$

where:

$g_{a,i}$: amplitude of the i-th signal weighted with the antenna diagrams

$\psi_{a,i}$: phase of the i-th signal weighted with the antenna diagrams.

As the amplitudes and phases of the scattered multipath components vary statistically $G_a(f)$ is also a variable of a stochastic process. Such a weak stationary process is described by its autocorrelation function [9-2]. The autocorrelation function describing the random process in the frequency domain is the frequency correlation function (FCF):

$$l_{\underline{HH}}(\Delta f) = \int_{-\infty}^{+\infty} \underline{H}(f)\underline{H}^{*}(f+\Delta f)\mathrm{d}f \tag{9-8}$$

where:

$$\underline{H}(f) = \underline{G}_a(f)\underline{W}(f) \tag{9-9}$$

and $W(f)$ is the Fourier transform of $w(t)$. A more comprehensive description of correlation functions of the mobile radio channel can be found in [9-2]. l_{HH} is a measure to quantify frequency selective fading effects. Parameters such as correlation or coherence bandwidth [9-1] of the radio channel are derived from l_{HH}.

9.3 Characterization in angular domain and Doppler spectra

The Doppler frequency $f_{d,i}$ of each multipath signal depends on the velocity of the vehicle, the wavelength and the angle-of-arrival:

$$f_{d,i}(\alpha_i) = \frac{v}{c_0} f_0 \cos\alpha_i = f_{d,max} \cos\alpha_i \tag{9-10}$$

where:

v : vehicle velocity

c_0: speed of light

α_i: incidence angle in azimuth

$f_{d,max}$: maximum Doppler shift.

The maximum Doppler shifts occur at alpha $i = 0°$ and 180°. As each multipath signal has a different angle-of-arrival and amplitude a wide Doppler spectrum exists. This phenomenon is well known in the literature [9-2, 9-3]. For planning purposes, usually the simplified case of the so-called Jakes Spectrum [9-3] is applied, where it is assumed that all incoming signals have the same magnitude and equally distributed angles-of-arrival. This assumption characterizes the worst case.

The application of multiple directive antennas, i.e. directional diversity, may lead to significant capacity improvements in cellular mobile radio. However, in such antenna concepts the angles-of-arrival are important. Therefore directional channel models have been developed [9-4, 9-5].

9.4 WSSUS channels

One of the most popular assumptions for a physically reasonable simplification of signal description in mobile radio channels is the wide-sense stationary uncorrelated scatterer (WSSUS) assumption. The wide-sense stationary (WSS) case means:

– the mean value of the signal in the time domain is constant;

– the time correlation function of the signal in the time domain depends only on the time difference Δt and not on the absolute time itself.

In practical situations WSS conditions occur during short time spans corresponding to small regions when the MS (mobile station) is moving. The stationary regions extend typically over several wavelengths λ to several tens of wavelengths λ.

The uncorrelated scatterer (US) assumption is dual to the WSS assumption, in that it assumes that contributions with different delays τ are statistically uncorrelated. This condition means that interference processes, which cause statistical fluctuations of amplitude, are independent for the different scatterer clusters, i.e. groups of scatterers that cannot be resolved in direction. The WSSUS assumption is typically fulfilled in macro-cellular environments. However, investigations in [9-6] have shown that the assumption US is sometimes violated in small cells, especially in indoor environments.

9.5 Modelling the wideband channel

In order to forecast the characteristics of the wideband radio channel both site-specific and site-general models have been developed. The site-specific methods are used to predict channel characteristics for a specific area whereas the site-general models are used for system simulations.

9.5.1 Site-specific channel models

Site-specific models are available for both rural and urban areas. In rural areas emphasis is placed on automatic detection of long excessive time dispersions. The task of predicting multipath signals can be subdivided into two steps. The first step consists of an algorithm to extract the relevant scattering areas. All known approaches, e.g. [9-7, 9-8, 9-9] take into account single scattering processes only. Hence every potential scatter area has to fulfil the LoS-condition to both transmitter and receiver. In a second step the path loss for each multipath signal has to be calculated. This calculation consists of three parts:

– propagation from transmitter to the scattering surface,

– process of scattering at the surface,

– propagation from the scattering surface to the receiver.

Digital terrain databases consisting of raster data with a resolution of 50 m to 200 m containing terrain height and land use information are sufficient for rural areas.

In urban areas ray-tracing or ray-launching techniques are applied to predict multipath signals based on high-resolution building databases, e.g. [9-9, 9-10, 9-11, 9-12]. Both raster and vector data formats are used. Due to the complexity of the environment, multiple-scattering and diffraction processes in transversal propagation planes must be considered.

A detailed overview of models for both environments can be found in [9-6]. Methods for channel characteristics from 3D propagation models are described in [9-9, 9-13].

9.5.2 Site general channel models for system simulation

Models for the mobile radio channel are vital for the study of radio systems. These models have to reproduce the typical characteristics observed in measurement data from a number of different

representative environments. Two such models have been developed with the European research programs COST207 [9-14] and COST259 [9-4].

9.5.2.1 COST207 time delay profiles

COST207 [9-14] provided a collection of suggested channels for testing rural and urban (hilly and not hilly) environments, with implementations of 6 or 12 taps. The basic elements (settings) for the channel simulation are:

– tap delay values following different profiles;

– tap mean power and Rayleigh distribution (eventually, for the first ray, a Rice distribution is used);

– Doppler Spectrum types: Classical [9-3], Gaussian (two different types) and Rice (Classical + direct ray).

COST207 models have been used as a reference for many measurements and utilized in a number of theoretical and performance studies, mainly for, but not restricted to, GSM.

9.5.2.2 COST259 directional channel models

In order to take into account the directivity of the radio channel the COST259 project has developed directional channel models (COST259-DCM) [9-4]. These models can be seen as an extension and further development of the COST207 delay profiles.

To account for the variety of extremely different topographical and electrical features of the different propagation environments COST259 has defined a 3-level structure, providing a framework from which channel models can be deduced.

At the top level, a first distinction has been made by cell type. For each cell type, a number of radio environments (REs) have been identified. RE stands for a whole class of propagation conditions that exhibit similar or typical features that can be related to the surroundings in which a communication system operates. The topographical features of an RE are given by a number of external parameters, such as the frequency band, the average height of BS (base station) and MS (mobile station), their average distance, average building heights and separations, etc. Furthermore, it has been defined whether the propagation path has line-of-sight (LoS) or non-line-of-sight (NLoS).

The propagation conditions encountered in each RE are characterized statistically by a set of probability density functions (PDFs) and/or statistical moments. Since the members of this set characterize propagation conditions of the entire RE, they are referred to as global parameters (GPs). They serve as key channel parameters that provide the necessary information for the basic system design decisions on modulation technique, burst length, coding scheme, etc.

The third level of COST259-DCM consists of propagation scenarios, which are defined as random realizations of incidence conditions. The latter are specified by random local parameters (LPs). A possible set of LPs may be given by the parameters of the waves incident at the location of the Rx antenna, i.e. their number, complex amplitude, delay, and incidence direction, or equivalently, by

describing the location of the BS, MS, and the scattering objects interacting with the electromagnetic field. The statistical properties of the LPs are given by the set of global parameters defined in the 2nd level of COST259-DCM.

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APPENDIX A

PRACTICAL EXAMPLES

A.1 Example of testing and tuning generalized empirical point-to-area models (see also § 4.1.2)

The following section addresses the testing and tuning of generalized propagation prediction models and describes the process in its simplest form. Therefore, this example should be used as a guide only, for use in restricted circumstances, by users with little or no previous experience and by those who have no access to sophisticated measurement and propagation planning tools.

However, even in this simplest form, the described example may help to significantly improve the precision of a generalized empirical propagation prediction model (or choose the most appropriate model from several available, before applying them in an area of unknown propagation character.

A.1.1 Model testing (see also § 4.1.2.2)

The first step is the selection of test (reference) transmitter(-s) and receiver. If there is no possibility of using a dedicated test transmitter, then it is advisable to make use of existing transmitters, such us operational base stations of land mobile systems in the area of interest. On the receiving side, it is possible to use calibrated hand-held RF field monitors or even the subscriber units of those operational systems under test with field monitoring functions. It is important to place the antenna of the receive unit at an appropriate height; i.e. 1.5-3 m for the land mobile services.

Once the equipment is selected, it is advisable to sketch a field plan for measurements. This may be conveniently done using a map of an appropriate scale. On this map the measurement routes should be outlined as well as measurement points for static measurements. In the following example, it is assumed that static measurements are carried out, because mobile measurements would require access to the mobile monitoring station, and if the latter is available it is usually equipped with all necessary automated measurement functions.

One real example of such a plan for rural area measurements is given below in Fig. A.1.

Note, that it may be very convenient to use a base station that is installed at the crossing of several roads going in various directions. Then the measurements may be done along those roads, as shown in the example in Fig. A.1. But care should be taken that the measurement paths do not leave the main lobe(s) of the base station's antenna pattern if the base station is equipped with directional antennas.

All measurement results should be recorded in a table against the distance from the test transmitter. This also allows an immediate comparison of averaged measured field strength with the results obtained using one or more propagation models. It may be useful to use conventional spreadsheet software for a basic automation of this exercise. One real reduced example of such records is shown in Table A.1.

FIGURE A.1

A real example of planning measurement routes around the test transmitters



Ter-0A1

TABLE A.1

A real example of measurement record, comparing modelling and measurement results

Location:	**Xxxx**	Station:	**GSM**		Hbs (m):	**68**										
Direction:	Yyyy	Azimuth:	100.0		Hbs_eff (m):	**73**										
		Frequency:	**951.000**		erp (dBW):	**25**										
Area type:	**Rural, slightly hilly terrain with little vegetation**															
	Modelling results:			**Experimental results:**				**Measured set:**								
Points:	*P.370*	*Lee*	*Ok-Hata*	*Average*	*Deviation*	*Set*	*Confid.*	*R1*	*R2*	*R3*	*R4*	*R5*	*R6*	*R7*	*R8*	*R9*	*R10*
km	*dB(μV/m)*				*dB*	*pcs.*	*+/- dB*	*dB(μV/m)*									
5	**65.6**	**79.5**	**45.1**	**65.0**	1.9	10	**1.2**	64.8	63.8	67.8	65.3	60.8	65.8	64.3	65.3	66.8	65.3
10	**50.5**	**66.4**	**35.3**	**42.7**	3.2	10	**2.0**	42.8	44.8	44.3	46.3	45.3	42.3	36.3	39.3	45.8	40.3
15	**41.7**	**58.7**	**29.5**	**49.1**	0.8	10	**0.5**	49.8	48.3	48.8	49.8	48.8	49.3	50.3	49.8	47.8	48.3
20	**35.4**	**53.3**	**25.4**	**36.7**	1.1	10	**0.7**	37.3	36.8	35.8	36.3	38.3	37.8	36.3	34.8	35.8	37.8
25	**30.6**	**49.1**	**19.5**	**27.3**	3.0	8	**2.1**	31.8	30.8	26.8	21.8	26.8	26.8	26.8	27.3		

The example in Table A.1 was reduced to display data for five distance points only. Normally the measurements should be taken in at least 15-20 distance points, evenly spread along the intended coverage range.

Along with tabular representation shown in Table A.1, a graphical representation may be very illustrative, as shown previously in Fig. 4.2.

A.1.2 Choosing the best model (see also § 4.1.2.2)

Once the measurements are completed in several representative coverage areas, then the model best fitting measurement results may be impartially selected using the least squares criterion (LSC), as shown in expression (4-2). An example is given below of the application of equation (4-2) to compare three models with measurement set from Table A.1.

a) LSC as applied to measurement results in Table A.1 against the Recommendation ITU-R P.370 model:

$$LSC_{P370}^{areaX} = (65.0-65.6)^2+(42.7-50.5)^2+(49.1-41.7)^2+(36.7-35.4)^2+(27.3-30.6)^2 = 126.85$$

b) LSC as applied to measurement results in Table A.1 against the Lee model:

$$LSC_{Lee}^{areaX} = (65.0-79.5)^2+(42.7-66.4)^2+(49.1-58.7)^2+(36.7-53.3)^2+(27.3-49.1)^2 = 1614.9$$

c) LSC as applied to measurement results in Table A.1 against the Okumura-Hata model:

$$LSC_{OH}^{areaX} = (65.0-45.1)^2+(42.7-35.3)^2+(49.1-29.5)^2+(36.7-25.4)^2+(27.3-19.5)^2 = 1023.46$$

The above results demonstrate that for this particular example of set of measurements the Recommendation ITU-R P.370 model provided the best approximation, because it scored the lowest in the least squares analysis. Then by summarizing the performance of the selected models in all propagation areas tested, it is possible to conclude which of the models provides the best fit of experimental results more often than the others.

However, it should be stressed that in order to obtain statistically reliable results, much more extensive sets of data should be used for analysis than shown in this particular illustrative example.

A.1.3 Model tuning (see also § 4.1.2.3)

Precision of the selected generalized empirical model may be further enhanced for particular propagation conditions by means of model tuning, as described in § 4.1.2.3 of this Handbook. An illustrative example is provided below on the practical application of such tuning to the Okumura-Hata model (4-3), using the same reduced set of measurement results as shown in Table A.1.

Okumura-Hata model, for example, can be tuned by the method presented in Section 4.1.2.3 of this Handbook by making use of expressions (4-6) and (4-7). It should be also noted that the parameter x_i in equation (4-6) equals $\log(R_i)$, where R is distance in the same values as used in the model. So, for the set of distances in Table A.1 {5, 10, 15, 20, 25}, it would produce a set of R = {0.7, 1, 1.2, 1.3, 1.4}. Applying equation (4-6) to the measurement and modelling results from Table A.1 one would obtain the following:

$$\widetilde{K} = \frac{(0.7^2+1+1.2^2+1.3^2+1.4^2)\cdot(65+42.7+49.1+36.7+27.3)-(0.7+1+1.2+1.3+1.4)\cdot(0.7\cdot 65+1\cdot 42.7+1.2\cdot 49.1+1.3\cdot 36.7+1.4\cdot 27.3)}{5\cdot(0.7^2+1+1.2^2+1.3^2+1.4^2)-(0.7+1+1.2+1.3+1.4)^2} \approx 95.96$$

$$\widetilde{\gamma}_{SYS} = \frac{5\cdot(0.7\cdot 65+1\cdot 42.7+1.2\cdot 49.1+1.3\cdot 36.7+1.4\cdot 27.3)-(0.7+1+1.2+1.3+1.4)\cdot(65+42.7+49.1+36.7+27.3)}{5\cdot(0.7^2+1+1.2^2+1.3^2+1.4^2)-(0.7+1+1.2+1.3+1.4)^2} \approx -46.25$$

The above results should be then substituted into equation (4-7). The remaining variables in equation (4-7) describe the parameters of the system under test, in accordance with their definition in the original description of the Okumura-Hata model (equation (4-3)). For this particular example the values from Table A.1 are used accordingly, thus obtaining from equation (4-7) the resulting values of tuned parameters of the empirical propagation prediction model:

$$\widetilde{E}_0 = 95.96 - 25 + 6.16 \cdot \log(900) - 13.82 \cdot \log(73) - ((1.1 \cdot \log(900) - 0.7) \cdot 1.5 - (1.56 \cdot \log(900) - 0.8)) \approx 63.4$$

$$\widetilde{\gamma} = -\frac{-46.25}{44.9 - 6.55 \cdot \log(73)} \approx 1.4$$

The latter results allow one to conclude that, in a given area, the propagation of radiowaves can be modelled empirically, using the selected Okumura-Hata model (equation (4-3)) with the values of empirical parameters $E_0 = 63.4$ and $\gamma = 1.4$. However, as described in § 4.1.2.3 of this Handbook, it would be advisable to perform such calculation of empirically-tuned parameters in several areas with similar propagation conditions so as to obtain averaged values of E_0 and γ for more general use in a particular country or region (see example in Table 4.1).

Again, it should be stressed that, in order to obtain statistically reliable results, much more extensive sets of data should be used for analysis than that used in this particular example from Table A.1.

APPENDIX B

UNIT CONVERSIONS

B.1 Propagation losses versus field strength

Although, when presenting various models in the text of the Handbook, there are interchangeable references either to the propagation loss modelling or to the field strength prediction, it should be clearly understood that these models provide modelling of the same phenomenon. The propagation losses (usually denoted as L) are linked directly to the received power or field strength by accounting for the actual power radiated into the space by transmitter.

For example, the transmission loss calculated in decibel units may be easily converted into the received power (PR) at the input of the receiver through a logarithmic expression:

$$P_R = P_T + G_T + G_R - L_{ST} - L_{SR} - L$$

where:

P_T: power at the output of transmitter, on logarithmic scale

G_T: gain of transmitting antenna

G_R: gain of receiving antenna

L_S: system losses at the transmitter, e.g. feeder losses

L_{SR}: system losses at the receiver

L: modelled propagation losses.

When it is sufficient to calculate the power or field strength at the reception point before passing into the receiving system, then it is not necessary to account for receiver parameters G_R and L_{SR} in the above expression.

For more detailed description of the relations between propagation losses, signals and system parameters, please see Recommendation ITU-R P.341 – The concept of transmission loss for radio links [B-1].

B.2 Decibel units and logarithmic scale

Very often in radiocommunications, power and other electrical parameters are expressed in decibel units. This allows one to use simple summation instead of more complex multiplication operations. Additionally, its logarithmic scale allows for more simple and uniform representation of an extremely wide dynamic range of radio signal parameters.

It should be noted that the decibel (denoted as dB) itself does not represent the absolute value of the parameter but rather its relation to some reference value. So, for example, the ratio between the output and input powers, p_{out} and p_{in} respectively (gain, G_p), may be described in dB units as follows:

$$G_P = 10 \log_{10}\left(\frac{p_{out}}{p_{in}}\right) \qquad \text{dB}$$

For voltages or currents the expression for dB changes due to the fundamental fact that power is proportional to a square of voltage or current. This square transfers into a double multiplier in front of logarithm:

$$G_U = 20 \log_{10}\left(\frac{u_1}{u_0}\right) \quad \text{or} \quad G_I = 20 \log_{10}\left(\frac{i_1}{i_0}\right) \qquad \text{dB}$$

Described in this way, the same value of dB means the same relation between two signals, irrespective of whether it was measured using power or voltage/current properties of those signals.

Although decibels themselves represent a ratio between the two parameters, decibels are often transformed to mean the absolute values, when a certain value is used as a reference. For example, for expressing an absolute power the so called "dBW" parameter is often used, which means power of the signal as referred to 1 W:

$$P = 10 \log_{10}\left(\frac{p}{1\,\text{W}}\right) \qquad \text{dBW}$$

It may be noted here that very often the original quantities are denoted with lower case letters (such as p in the above expression), while their logarithmic equivalents are denoted with the corresponding capital letters (such as P above).

For example, the power of the transmitter equal to 25 W may be expressed in decibel units as being equal to:

$$10 \log_{10}\left(\frac{25\,\text{W}}{1\,\text{W}}\right) \approx 14\,\text{dBW}$$

Other similar logarithmic expressions for absolute values, that are most commonly used in radiocommunication practice, are shown below as derived from different reference bases:

– for powers where dBW is too large:

$$P = 10 \log_{10}\left(\frac{p}{1\,\text{mW}}\right) \qquad \text{dBm}$$

– for amplitude of a received signal:

$$U = 20 \log_{10}\left(\frac{u}{1\,\mu\text{V}}\right) \qquad \text{dB}\mu\text{V}$$

– for the electric field strength of radio signal:

$$E = 20 \log_{10}\left(\frac{e}{1\,\mu\text{V/m}}\right) \qquad \text{dB}(\mu\text{V/m})$$

Other decibel-derived units also exist. The reference value used for their establishment may be distinguished by the suffix attached to the dB sign. Sometimes such use of a reference base is extended to the description of absolute gain. For example in radiocommunications "dBi" and "dBd" are often used, which describe the gain of antenna as related respectively to an isotropic radiator or to a half-wave dipole, noting that 0 dBd = 2.15 dBi.

When applied in calculations, the gains expressed in dB (including dBi value of antenna gain) all have the same logarithmic base and may be aggregated arithmetically. For example, when calculating radiated power one may obtain: 14 dBW of transmitter power plus 10 dBi of transmitting antenna gain minus 3 dB of feeder losses produce 21 dBW of e.i.r.p. (equivalent isotropically radiated power).

B.3 Unit conversions

The conversion of logarithmic decibel units of the same kind (e.g. power or field strength), that describe absolute values may be carried out by simple conversion to a different reference base. For example, to convert dBW to dBm, it should be noted first that 0 dBW = 1 W = 1 000 mW, then the conversion may be easily calculated:

$$0\ \text{dBW} = 10 \cdot \log_{10}\left(\frac{1\,000\ \text{mW}}{1\ \text{mW}}\right) = 30\ \text{dBm}$$

Using the above expression, one can convert from dBW to dBm by simply adding 30 dB, or from dBm to dBW by subtracting 30 dB. For example 14 dBW = 44 dBm and –55 dBm = –85 dBW.

For other cases, when it is necessary to change between the units of a different nature, special conversion formulae should be used; e.g. as described in Recommendation ITU-R P.525 – Calculation of free-space attenuation [B-2]. The most frequent case met in propagation modelling is the need to convert the value of a given field strength into the isotropically received power at a given location or vice versa. This may be obtained using the following conversion formula:

$$P_R = E - 20 \cdot \log f - 167.2$$

where:

P_R: isotropically received power (dBW)

E: electric field strength (dB(μV/m))

f: frequency (GHz).

With f in MHz, add 60 dB to the constant (i.e. –107.2). To calculate , P_R, in dBm, add 30 dB to the constant (i.e. –137.2).

B.4 References

[B-1] Recommendation ITU-R P.341 – The concept of transmission loss for radio links. International Telecommunication Union, Geneva.

[B-2] Recommendation ITU-R P.525 – Calculation of free-space attenuation. International Telecommunication Union, Geneva.

ITUPublications
Recommendations

International Telecommunication Union
Radiocommunication Sector

Recommendation ITU-R P.2109-2

(08/2023)

P Series: Radiowave propagation

Prediction of building entry loss

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from http://www.itu.int/ITU-R/go/patents/en where the Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC and the ITU-R patent information database can also be found.

Series of ITU-R Recommendations

(Also available online at https://www.itu.int/publ/R-REC/en)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	**Radiowave propagation**
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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RECOMMENDATION ITU-R P.2109-2

Prediction of building entry loss

(2017-2019-2023)

Scope

This Recommendation provides a method for estimating building entry loss at frequencies between about 80 MHz and 100 GHz for probabilities of $0.0 < P < 1.0$. The method is not site-specific, and is primarily intended for use in sharing and compatibility studies.

Keywords

Building, indoor, propagation, interference, entry

Abbreviations

BEL Building entry loss

CW Continuous wave

LoS Line of sight

Related ITU Recommendations, Reports

Recommendation ITU-R P.2040

Report ITU-R P.2346

The ITU Radiocommunication Assembly,

considering

a) that, for system planning and interference assessment it may be necessary to account for the attenuation suffered by radio waves in passing into, or out of, buildings;

b) that there is a need to give guidance to engineers to estimate coverage or predict interference from outdoor to indoor and indoor to outdoor systems,

recognizing

a) that Recommendation ITU-R P.2040 provides guidance on the effect of building materials and structures on radio waves;

b) that Report ITU-R P.2346 contains collated empirical data on building entry loss,

recommends

1 that the model in Annex 1 should be used to estimate building entry loss;

2 that Annex 2 gives definitions for various types of propagation loss associated with buildings, and provides guidance on measuring building entry losses.

NOTE – Sharing studies carried out by ITU-R on different agenda items of WRC-19 were based on the text of this Recommendation which was in force at the time of these activities or at the time which the activity was carried out.

Annex 1

1 Introduction

This Annex provides a model for building entry loss (BEL) as defined in Recommendation ITU-R P.2040. The output of the model is in the form of a cumulative distribution function of the probability that a given loss will not be exceeded.

The model makes no attempt to separate the loss suffered by a signal penetrating the exterior wall and the attenuation suffered in the path through the building. This approach has been adopted as it is felt unlikely that, in the context of ITU-R studies, sufficiently detailed building-specific information would be available.

Building entry loss exhibits great variability, both within any given building and between different buildings. Although techniques such as ray-tracing can provide useful site-specific predictions when coupled with detailed architectural data, such models will usually be inappropriate for generic applications such as spectrum sharing studies.

A statistical model that attempted to describe the entry loss characteristics of the global set of buildings would give a statistical distribution so broad as to be unhelpful. On the other hand, a model that attempted to characterise many different types of building would require more data than currently exists and would be inappropriate for generic sharing studies.

NOTE – Building types referred to in this Recommendation should be considered carefully.

The model is based on the measurement data collated in Report ITU-R P.2346 in the range 80 MHz to 73 GHz. The model can be used within a Monte Carlo method, but it should be noted that the model has only been validated against empirical data over the probability range 0.01 to 0.99.

2 Parameters

The model takes the following input parameters:

– frequency (~0.08-100 GHz);
– the probability with which the loss is not exceeded;
– building class (‘traditional’ or ‘thermally-efficient’);
– elevation angle of the path at the building façade (degrees above the horizontal).

The azimuth of the path to the outdoor terminal with respect to the building surface is not accounted for explicitly. Although theory and measurement show that signals normally incident on a building surface will suffer lower loss than those arriving at oblique angles, the statistical output of the model represents the generality of building orientations with respect to the outdoor terminal.

The basic model assumes that the indoor antenna is omnidirectional and that the building entry loss will therefore take account of all energy arriving at the terminal location. In some cases, the internal terminal may use a directional antenna which will act as a spatial filter, increasing the apparent building entry loss as energy arriving from some directions is rejected. Measurements made in two large buildings in the Republic of Korea at 32 GHz showed that the building entry loss measured with antennas of 10 degree beamwidth was 5.3 dB greater than for the omnidirectional case. Further details may be found in Report ITU-R P.2346.

Following the definition given in Recommendation ITU-R P.2040, building entry loss is here defined in isolation from any surrounding clutter. Should the building be surrounded by local clutter, additional losses may need to be determined for the relevant terminal height and position above ground using Recommendation ITU-R P.2108.

The model makes the implicit assumption that terminals have an equal probability of location at any point within a building.

2.1 Classification of building type

Experimental results, such as those collated in Report ITU-R P.2346, shows that, when characterised in terms of entry loss, buildings fall into two distinct populations: where modern, thermally-efficient building methods are used (metallised glass, foil-backed panels) building entry loss is generally significantly higher than for 'traditional' buildings without such materials. The model therefore gives predictions for these two cases.

This classification, of 'thermally-efficient' and 'traditional', refers purely to the thermal efficiency of construction materials. No assumption should be made on the year of construction, type (single or multi-floors), heritage or building method.

For building entry loss, it is important to consider the thermal efficiency of the complete building (or the overall thermal efficiency). A highly thermally-efficient main structure with poorly insulated windows (e.g. single glazed with thin glass) can make the building thermally-inefficient and vice versa.

Thermal transmittance, commonly referred as U-value, provides a quantifiable description of thermal efficiency. Low U-values represent high thermal efficiency. Typically, the presence of metallised glass windows, insulated cavity walls, thick reinforced concrete and metal foil back cladding is a good indication[1] of a thermally-efficient building.

3 Model

Building entry loss will vary depending on building type, location within the building and movement in the building. The building entry loss distribution is given by a combination of two lognormal distributions. The building entry loss not exceeded for the probability, P, is given by:

$$L_{BEL}^{omni}(P) = 10\log(10^{0.1A(P)} + 10^{0.1B(P)} + 10^{0.1C}) \text{ dB} \quad (1)$$

where:

$$A(P) = F^{-1}(P)\sigma_1 + \mu_1 \quad (2)$$

$$B(P) = F^{-1}(P)\sigma_2 + \mu_2 \quad (3)$$

$$C = -3.0 \quad (4)$$

$$\mu_1 = L_h + L_e \quad (5)$$

$$\mu_2 = w + x\log(f) \quad (6)$$

$$\sigma_1 = u + v\log(f) \quad (7)$$

$$\sigma_2 = y + z\log(f) \quad (8)$$

where:

L_h : median loss for horizontal paths, given by:

$$L_h = r + s\log(f) + t(\log(f))^2 \quad (9)$$

L_e : correction for elevation angle of the path at the building façade:

---

[1] For example, U-values of < 0.3 and < 0.9 are representative of thermally efficient main structure and metallised glass, respectively.

$$L_e = 0.212\ |\theta| \tag{10}$$

and:

f: frequency (GHz)

θ: elevation angle of the path at the building façade (degrees)

P: probability that loss is not exceeded ($0.0 \leq P \leq 1.0$)

$F^{-1}(P)$: inverse cumulative normal distribution as a function of probability.

The coefficients are as given in Table 1.

TABLE 1

Model coefficients

Building type	***r***	***s***	***t***	***u***	***v***	***w***	***x***	***y***	***z***
Related to:	μ_1			σ_1		μ_2		σ_2	
Traditional	12.64	3.72	0.96	9.6	2.0	9.1	−3.0	4.5	−2.0
Thermally-efficient	28.19	−3.00	8.48	13.5	3.8	27.8	−2.9	9.4	−2.1

For illustration, Fig. 1 plots the median building entry loss returned by the model for the two building classes. In any sharing studies, the entire distribution should always be considered. Figure 2 plots the cumulative distribution function for building entry loss predicted at horizontal incidence.

FIGURE 1

Median building entry loss predicted at horizontal incidence

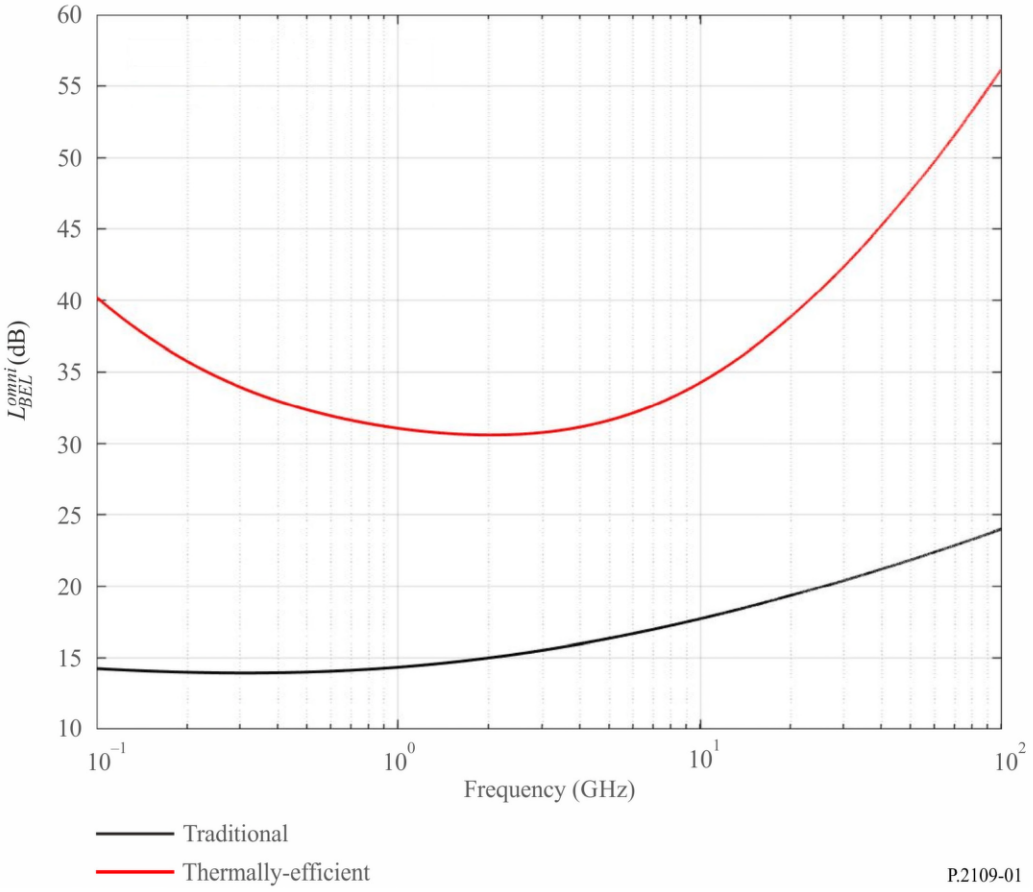
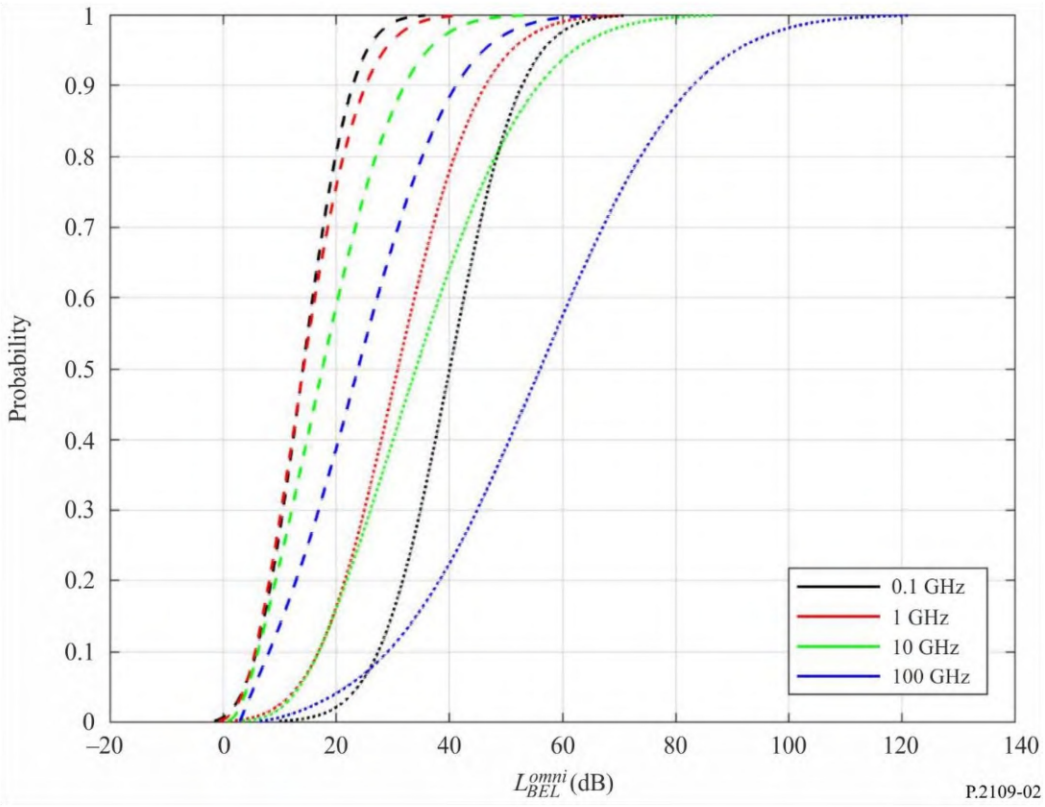


FIGURE 2

Building entry loss predicted at horizontal incidence
(Dashed line: Traditional, Dotted line: Thermally-efficient)



Annex 2

1 Introduction

This Annex provides definitions of terms relating to building loss, and gives guidance on recommended measurement practices.

Report ITU-R P.2346 contains a compilation of the results of measurements of building entry loss.

2 Description of scenarios involving the outdoor-indoor interface

2.1 Outside-inside propagation: issues concerning entry-loss reference field

A difficulty with defining the entry loss reference field is that the presence of the building will modify signal strengths outside it. Figure 3 illustrates, in somewhat simplified form, the issues involved. The three sections of the Figure show:

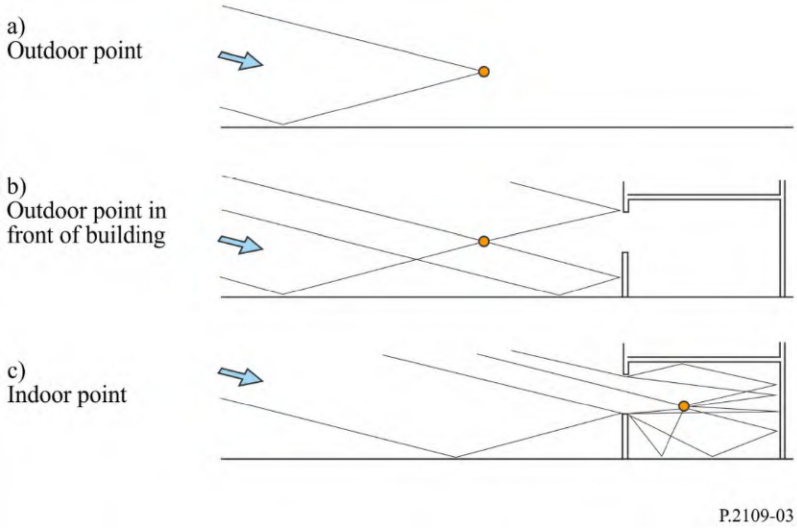
a) A relatively isolated outdoor point receives a direct and ground-reflected ray. In fact both of these rays, in an urban environment, may well arrive from a distant source via diffraction over a building to the left of the Figure. For propagation at small angles to the horizontal, there will be fairly simply and mainly vertical lobing, that is, maxima and minima when the point is moved vertically.

b) Without moving the point, a building is placed just behind it. It now receives two additional rays reflected from the building, one of which is also ground-reflected. The lobing pattern will now have fine structure in both the vertical and horizontal directions.

c) The point is now moved inside the building. For the purposes of illustration the frequency is assumed to be high enough such that only rays entering a window are significant. At a lower frequency, where penetration through the wall is significant, the ray pattern would change.

FIGURE 3

Simplified ray diagrams for outdoor and indoor points



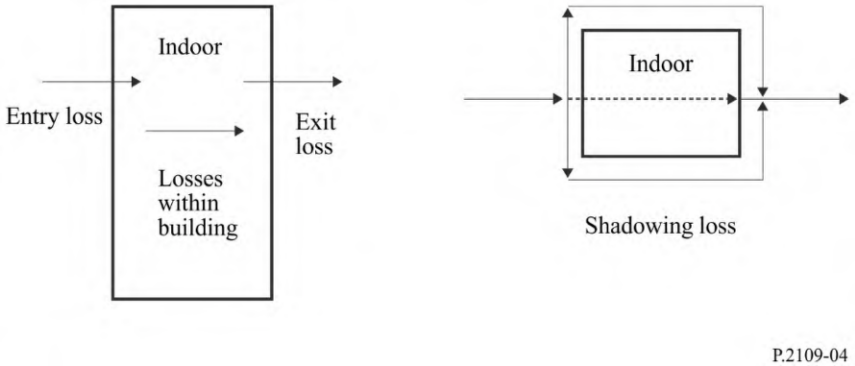
Although multipath propagation causes lobing, the power-sum of multiple rays approximates to the spatially-averaged field. In general, therefore, the presence of a building behind a receiver can be expected to increase the received signal strength. Inside the building, particularly close to the illuminated external wall, a larger number of rays is likely to be received, although many will be attenuated by transmission, reflection or diffraction. It is thus possible to have a stronger signal inside than outside.

2.2 Propagation losses in the built environment

Figure 4 shows the different kinds of building losses encountered in an outdoor-indoor and indoor-outdoor scenario. The definitions are given in the next sections.

FIGURE 4

Different kinds of propagation loss involving buildings



3 Definitions

3.1 Definition of building entry loss

Building entry loss is the additional loss due to a terminal being inside a building.

3.2 Definition of building shadowing loss

The building shadowing loss is the difference between the median of the location variability of the signal level outside the illuminated face of a building and the signal level outside the opposite face of the building at the same height above ground, with multipath fading spatially averaged for both signals. It can be considered as the transmission loss through a building.

3.3 Definition of (e.g. wall) penetration

Signals outside a building enter an enclosed building by penetration mostly through walls. Wall penetration can also refer to the penetration through partitions inside buildings. Inside buildings, wall penetration loss is the difference between the median of the location variability of the signal level on one side of a wall, and the signal level on the opposite side of the wall at the same height above ground, with multipath fading spatially averaged for both signals. It can be considered as the transmission loss through a wall.

3.4 Definition of aperture penetration

Aperture penetration is the penetration of signals from one side of a wall to the other side through openings on the walls like windows.

3.5 Definition of building exit loss

From reciprocity, the numerical value of building exit loss will be the same as the building entry loss. In the remainder of this text the terms are used interchangeably.

4 Measurement of building entry loss

4.1 Introduction

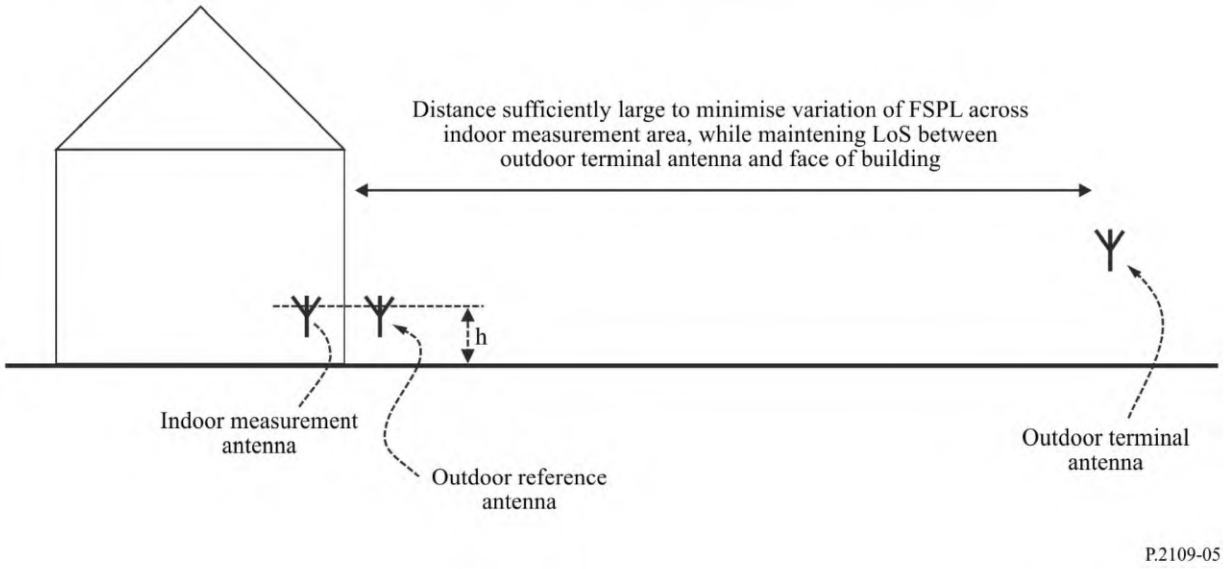
Building entry loss can be measured as the difference, expressed in dB, between the spatial median of the signal level outside the illuminated face of a building and the spatial median of the signal level inside the building at the same height above ground, shown as “h” in Fig. 5 below (i.e. loss = spatial median external field – spatial median internal field, where measurements are in decibel units). The purpose of the outside measurement is to approximate the field strength which would exist at the indoor location if the building did not exist. Where the distance between the outside and inside measurements is a significant portion of the overall path, the additional free space loss should be allowed for.

The outdoor field should be measured as close as possible to the building while ensuring that near-field effects are avoided and antenna characteristics are unaffected. Measurements made with directional and omnidirectional antennas may be expected to give different results; antenna characteristics should, in any case, be carefully described. Where it is not possible to measure the outdoor field incident on the building a predicted value should be used and this should be clearly stated.

Measurements should normally be performed with a line of sight (LoS) between the outdoor terminal and one face of the building under test.

FIGURE 5

Location of reference and measurement antennas for building entry loss measurement



The area chosen for spatial averaging inside the building will depend on the particular application, and should be clearly stated; room-averages have been found to represent a practical and useful basis for discretisation.

4.2 Parameters to be recorded

The following parameters should be recorded when performing measurements of building entry loss.

It is assumed that each measurement set will consist of a number of samples, with the results being expressed as a tabulated cumulative distribution function of loss.

Researchers are asked to provide as much additional detail as possible; in particular, interior and exterior photographs should be supplied wherever possible.

TABLE 2

Measurement parameters

Parameter	Units or classification	Notes
Frequency	MHz	
Bandwidth of test signal	MHz	0 MHz if CW source used
Surrounding environment	Open/suburban/urban/dense urban	Required to estimate importance of coupling via energy scattered from other buildings
LoS to building?	Yes/No	Should normally be LoS to minimise measurement error
Averaging	Spectral / spatial / other	Free-format field to allow user to describe form of averaging (if any) used
Penetration depth	1 = indoor terminal in room/space with external wall facing outdoor terminal 2 = indoor terminal in room/space with no external wall 3 = indoor terminal in room/space with other external wall	
Floor on which measurements made		Ground floor = 0
Area within which samples taken	Square metres	
Number of samples		Sufficient number of samples should be taken to provide for statistical confidence in the results
Reference	1 = measured median signal 2 = predicted free space path loss	Measurement preferred where possible
Distance of outdoor terminal from building	metres	
Elevation angle of path	degrees	
Minimum azimuth with respect to normal to building face	degrees	
Maximum azimuth with respect to normal to building face	degrees	

TABLE 3

Building parameters

Parameter	Units or classification	Notes
Width	metres	Approximate footprint for irregular building
Length	metres	
Height	metres	
Total number of floors		
Thickness of exterior walls	metres	
Thickness of interior walls	metres	
Thickness of floors	metres	
Proportion of building elevation area composed of windows/apertures	%	
Window elements	0 = unknown 1 = single 2 = double 3 = triple 9 = other	
Window coating	0 = unknown 1 = none 2 = metallised glass 3 = internal wire mesh 4 = metal blinds/shutters 9 = other	
Metallic thermal insulation fitted?	0 = unknown 1 = no 2 = yes 9 = other	
Floor material	0 = unknown 1 = wood 2 = metal 3 = concrete 9 = other	
Primary exterior wall material	0 = unknown 1 = stone 2 = brick 3 = brick with cavity 4 = lightweight block 5 = wooden 6 = concrete 7 = glass 8 = metal 9 = other	Material forming the greatest proportion of the exterior walls

TABLE 3 (*end*)

Parameter	Units or classification	Notes
Secondary exterior wall material	0 = unknown 1 = stone 2 = brick 3 = brick with cavity 4 = lightweight block 5 = wood 6 = concrete 7 = glass 8 = metal 9 = other	
Internal walls	0 = no interior walls 1 = stone 2 = brick 3 = lightweight block 4 = wood 5 = concrete 6 = plasterboard (wooden stud) 7 = plasterboard (metal stud) 8 = metallised plasterboard 9 = other	
Roof materials	0 = unknown 1 = concrete tiles 2 = slate tiles 3 = wooden shingles 4 = sheet metal 5 = wood with roofing felt 9 = other	

ATTACHMENT 4

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Admitted only in California

Refer To File # 505368-0001

By: *Email and Hand Delivery*

May 15, 2025

Kyle Winston
Planning Department
City of Los Angeles
200 N. Spring Street, Room 721
Los Angeles, CA 90012
kyle.winston@lacity.org

Re: Comments on Proposed Residential Project at 2930-2936 South Sepulveda Boulevard, Case Numbers CPC-2024-5548-DB-PR-HCA and ENV-2024-5549-CE

Dear Hearing Officer:

Nossaman LLP is land use counsel to 2990 S. Sepulveda Blvd. LLC, which owns the Mullikin Medical Center, located at 2990 South Sepulveda Boulevard. We are writing to provide comments on the proposed construction, use, and maintenance of a 71-foot high, six-story, 77-unit residential development with one subterranean and one street-level parking areas, including 84 parking spaces, at 2930-2935 South Sepulveda Boulevard ("Project"). The Project site is located less than one half mile southeast of the Interstate Highway 405/Interstate Highway 10 interchange.

The tenants of Mullikin Medical Center include a pediatric clinic that treats children with autism. Besides being a medical facility, 2990 South Sepulveda Boulevard is a telecommunications center with multiple wireless carriers as tenants. There is extensive infrastructure present at the medical center, including backup systems and power.

As documented below and in the supporting expert testimony of Lee Afflerbach, P.E., the Project as currently proposed will block cellular and emergency service communications north of the I-10 freeway and interfere with the City of Los Angeles' ("City") emergency response plans. This demonstrated specific adverse impact on public health and safety precludes the City from granting waivers of development standards to allow for the Project proponent's requested increase in height from 45 feet to 71 feet and the elimination of transitional height requirements in the C2-1 VL Zone. Additionally, the signal interference caused by the Project raises serious questions regarding the Project's interference with federal and state laws prohibiting such interference, as well as nuisance and trespass liability for the developer. The developer and the City should consider implementing Project modifications that avoid impairing the City's emergency response capabilities to achieve the same number of affordable and market rate units.

Additionally, as discussed below, the Class 32 Categorical Exemption Report ("Exemption Report") prepared for the Project by Meridian Consultants is flawed as it documents that the Class 32 regulatory exemption ***does not*** apply to the Project and that the Project must undergo environmental review under the California Environmental Quality Act, Pub. Resources Code, §§ 21000 et seq., ("CEQA"). Specifically, the Exemption Report confirms that Project construction will result in significant noise impacts during Project construction. In addition to documenting, beyond a reasonable doubt, that the Project will result in a potentially significant noise impact, the Exemption Report is riddled with factual inaccuracies and omissions that would cause a trier of fact to question whether the City had undertaken its due diligence in evaluating the Project's potential to significantly impact the environment.

The Class 32 categorical exemption (a/k/a "Infill Exemption") does not apply to the Project in any event because the Project's height and proximity to telecommunications facilities present an unusual circumstance that results in substantial interference with emergency response and potentially significant wildfire impacts.

For all the above reasons, we request the Hearing Officer delay acting on the requested entitlements to allow the Project proponent to propose an updated and legally defensible Project concept that can ensure the attainment of the City's affordable housing objectives while protecting public safety.

I. THE PROJECT IS NOT ENTITLED TO DEVELOPMENT STANDARD WAIVERS UNDER STATE LAW AND THE CITY'S DENSITY BONUS ORDINANCE.

The Project seeks affordable housing-based waivers from applicable transitional height and the 45-foot height limitation to increase the proposed building height to 71 feet. This amounts to a 57% increase in the permitted height of the otherwise applicable development standards for the Project site. Under the City's density bonus ordinance and state housing laws, the City may not approve a waiver of development standards if "[t]he Waiver would have a Specific Adverse Impact, as defined in California Government Code Section 65589.5(d)(2), upon public health and safety and for which there is no feasible method to satisfactorily mitigate or avoid the Specific, Adverse Impact." (Los Angeles Municipal Code, § 12.22.A.37.(d)(3)(i)(b).)

A specific, adverse impact is defined by state law as "a significant, quantifiable, direct, and unavoidable impact, based on objective, identified written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete." (Gov. Code, § 65595.5, subd. (d)(2).)

The Project would cause the existing telecommunication facilities located at the Mullikin Medical Center to fail the City's standards for adequate wireless telecommunication coverage. (See, e.g., Los Angeles Municipal Code, § 12.21.A.20(b)(7) [requiring telecom facilities to document adequate coverage].) In the attached analysis prepared by CTC Media Group, Inc., Mr. Lee Afflerbach has shown, based on his review of the Project materials and the construction plans of the telecommunication facilities located at 2990 South Sepulveda Boulevard, a 10-12 dB of degradation of wireless signal north of Interstate Highway I-10. (See Letter from Lee Afflerbach to Jonathan Kramer dated May 13, 2025, p. 5 and *id*. at Figures 4 and 5, attached hereto as **Exhibit 1**.) A degradation of this magnitude would cause wireless signal in the impacted areas (shown in Figures 4 and 5 of Mr. Afflerbach's letter), including vehicles traveling on the nearby I-10 /I-405 freeway intersection corridor, to fall below industry standards for urban

areas and interfere with emergency notifications for evacuation for natural disasters or emergency response plans. (*Id*. at pp. 2, 6.)

Mr. Afflerbach's analysis documents, based on 2022 California Department of Transportation traffic counts, that the wireless signal interference from the Project would impact over one million drivers every day. (*Id*. at p. 6.)

The City's Emergency Operations Master Plan and Master Procedures, available on the City's website, provides that cellular communication provided through private vendors are used primarily for emergency situations by various City departments.[1] The City's early warning and notifications strategy relies on voicemail, text, and email as a form of rapid dissemination of time sensitive information in an emergency.[2] For example, the City uses the platform NotifyLA as a mass notification system to provide emergency information regarding necessary protective actions, such as evacuation orders, to Los Angeles residents, businesses, and visitors.[3] The alerts are sent via recorded telephone messages, text messages, and emails, in the event of emergencies or critical situations.[4]

The City may not grant the requested waivers to the Project proponent as they would interfere with the City's emergency response plan by causing a degradation of wireless service in the Project vicinity that falls below industry standards and the standards and policies set forth in the City of Los Angeles Municipal Code. (See Gov. Code, § 65589.5(d)(2); Los Angeles Municipal Code, § 12.22.A.37(d)(5)(ii).) The City may not interpret its density bonus ordinance in a manner that limits or interferes with the operation and maintenance of public utilities or public services. (See *id*. § 12.22.A.2 [Exceptions].)

II. THE CEQA EXEMPTION FOR INFILL PROJECTS DOES NOT APPLY TO THE PROJECT.

The Infill Exemption to environmental review—that would otherwise be required for the Project under CEQA—does not apply where a project would result in significant noise impacts. (See Cal. Code Regs., tit. 14 ["CEQA Guidelines"], § 15332, subd. (d).) The City bears the burden to establish that a project is eligible for the Infill Exemption. (See *Davidson Homes v. City of San Diego* (1997) 54 Cal.App.4th 106, 115; see also *Banker's Hill, Hillcrest, Park West Community Preservation Group v. City of San Diego* (2006) 139 Cal.App.4th 249, 268-269 [the Infill Exemption "calls on the agency to make a definitive finding, at the preliminary review stage, as to whether or not there will be a significant environmental effect"].) The City cannot meet its burden because the Project proponent's documentation shows that the Project will result in significant noise impacts.

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[1] City of Los Angeles Emergency Operations Plan, Communications Functional Support Annex (June 2008), at pp. 5, 21, 22, 26 *available at* https://emergency.lacity.gov/sites/g/files/wph1791/files/2021-04/communications_annex_2018_1.pdfhttps://emergency.lacity.gov/sites/g/files/wph1791/files/2021-04/communications_annex_2018_1.pdf.

[2] City of Los Angeles Emergency Operations Plan, Emergency Alert and Warning Functional Support Annex (Jan. 2022), at pp. 15-16, *available at* https://emergency.lacity.gov/sites/g/files/wph1791/files/2022-09/Emergency%20Alert%20and%20Warning%20Annex%202022%20.pdf.

[3] City of Los Angeles Emergency Management Department, *NotifyLA, the City of LA's Emergency Alert System*, *available at* https://emergency.lacity.gov/notifyla.

[4] *Ibid*.

A. The Project Does Not Qualify for the Infill Exemption Because It Will Result in Significant Noise Impacts.

A bedrock principle of CEQA is that public agencies may not qualify a project for a categorical exemption by applying mitigation measures to reduce the project's potentially significant impacts to below a level of significance. (See *Salmon Protection & Watershed Network v. County of Marin* (2004) 125 Cal.App.4th 1098, 1102.) Where a lead agency conditions the project on the implementation of specific, tailored measures to avoid potentially significant impacts, a categorical exemption is inappropriate. (*Azusa Land Reclamation Co. v. Main San Gabriel Basin Watermaster* (1997) 52 Cal.App.4th 1165, 1200.)

The Exemption Report identifies the following objective standards for assessing the significance of the Project's construction noise:

> An exceedance of existing ambient exterior noise levels ***by 5 dBA or more at a noise-sensitive use*** between the hours of 9:00 PM and 7:00 AM Monday through Friday, before 8:00 AM or after 6:00 PM on Saturday, or at any time on Sunday; or
>
> Construction activities lasting more than one day that would exceed existing ambient exterior sound levels ***by 10dBA or more at a noise-sensitive use***; or
>
> Construction activities lasting more than 10 days in a three-month period that would exceed existing ambient exterior noise levels ***by 5 dBA or more at a noise-sensitive use***

(Exemption Report, at p. 24, emphasis added.)

It is undisputed that the Project is located in the vicinity of several noise sensitive uses in the Project vicinity. (See *id.* at p. 24.)

Prior to the implementation of any mitigation measures, the Exemption Report states the Project's "***average noise levels during construction would result in a maximum increase of 16.9 dBA above the significance threshold of 5 dBA over ambient noise levels***." (*Id.* at p. 25, emphasis added.) Thus, the Exemption Report documents that the Project ***will*** result in significant noise impacts during Project construction. The Exemption Report reaches a less than significant construction noise impact conclusion only after imposing a suite of noise reduction measures specifically tailored to result in a quantitative reduction of Project construction noise to avoid a significance finding. (Exemption Report, Appendix B [Noise Technical Study], at pp. 19-20.) The City, however, may not mitigate the Project into a categorical exemption. (See *Salmon Protection & Watershed Network*, *supra*, 125 Cal.App.4th at p. 1102.)

The Exemption Report incorrectly states that the suite of mitigation measures recommended in the Noise Technical Report are "required to comply with the [measures] through State and local regulations." (*Id.* at p. 1.) The Project's suite of noise mitigation measures is distinguishable from generally applicable regulatory standards because here the Project proponent specifically stacked mitigation measures to achieve an overall reduction in noise that is below the City's adopted CEQA significance thresholds. (See *Walters v. City of Redondo Beach* (2016) 1 Cal.App.5th 809, 824 [involving a generally applicable condition of

approval requiring compliance with city's objective noise limit of 60 dBA].) The Los Angeles Municipal Code sections cited in the Exemption Report do not require implementation of any noise reduction measures, nor do they reference the quantitative CEQA significance thresholds relied on by the City in the Exemption Report. (See Exemption Report, at p. 16, citing Los Angeles Municipal Code sections 41.40 and 112.05.) The Association of Environmental Professionals, which broadly includes legal and technical professionals practicing under CEQA considers the construction noise measures relied on in the Exemption Report to be "mitigation measures."[5]

Unlike in *Walters*, where a project was designed to stay ***within*** the City's established noise ordinance during operation, here Project construction ***will exceed the applicable CEQA significance thresholds*** relative to ambient noise levels. CEQA does not permit the City to rely on noise mitigation to shoehorn this Project into a categorical exemption.

B. The Project Does Not Qualify for the Infill Exemption If It Will Result in Significant Water Quality Effects.

A project does not qualify for the Infill Exemption if it will result in significant water quality effects. (CEQA Guidelines, § 15332, subd. (d).) The Exemption Report and the corresponding Phase 1 Report does not identify the potential for groundwater and soil contamination as a result of a former gas station on the parcel adjacent to the Project site. A 1992 Phase II technical memo prepared for 2990 Sepulveda Boulevard identified that Standard Oil Company constructed a gasoline station on the subject site in 1951 with possible underground storage tanks." (1992 Phase II, at p. 1, attached hereto as **Exhibit 3**.) The Phase II technical memo reports that a "[r]eview of nearby wells indicates poor water quality under the subject site from several organic compounds and metals from ***off site*** sources. (*Ibid*., emphasis added.)

The Exemption Report does not acknowledge the prior gasoline station on the adjacent parcel or the related soils and groundwater contamination or that the Project could disturb contaminated soils during the substantial excavation activities proposed as part of the Project.

III. UNUSUAL CIRCUMSTANCES TAKE THE PROJECT OUT OF CATEGORIES OF PROJECTS NORMALLY SUBJECT TO THE INFILL EXEMPTION.

The Infill Exemption does not apply if "there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances." (CEQA Guidelines, § 15300.2, subd. (c); see also *Berkeley Hillside Preservation v. City of Berkeley* (2016) 60 Cal.4th 1086, 1104; *Banker's Hill*, *supra*, 139 Cal.App.4th at p. 268 [same].) Where a project ***will*** result in a significant impact to the environment, however, that finding ***necessarily*** establishes that the project is unusual and not subject to any categorical exemption. (*Berkeley Hillside Preservation*, *supra*, 60 Cal.4th at p. 1105.)

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[5] See Association of Environmental Professionals, *2025 CEQA California Environmental Quality Act Statute and Guidelines* (2025), *available at* https://www.califaep.org/docs/CEQA_Handbook_2025combined.pdf.

A. There Is at Least a Reasonable Possibility That the Project Will Have a Significant Effect on the Environment Due to the Project's Height.

(i) The Project's height presents an unusual circumstance.

The Exemption Report improperly concludes that there are "no unusual circumstances associated with the Project site or the Proposed project" that would exclude the Project from using the Infill Exemption. (Exemption Report, at p. 37.) The Project's height of 71 feet is a 57% increase over what is permitted by the applicable zoning and its proximity to telecommunications facilities is unusual for residential projects in the vicinity and will result in potentially significant wildfire and utilities impacts. Accordingly, even if the Infill Exemption did apply to the Project (it does ***not***), the City's reliance on the Infill Exemption is barred by the presence of unusual circumstances that will result in significant impacts to the environment.

(ii) The Project's height will result in potentially significant wildfire impacts.

A project that "[s]ubstantially impair[s] an emergency response plan or emergency evacuation plan may result in a potentially significant impact under CEQA. (CEQA Guidelines, Appendix G, XX [Wildfire], threshold (a).) As discussed in Section I above, the Project would interfere with the City's emergency response plan by causing a degradation of wireless service in the Project vicinity that falls below industry and regulatory standards. Further, as documented by Mr. Lee Afflerbach, the signal interference would impact millions of drivers in the Project vicinity and substantially impair the City's emergency response plans. The Project's wildfire impacts are potentially significant.

(iii) The Project's height will result in potentially significant impacts on utilities and service systems.

A project that will result in the relocation or construction of new or expanded telecommunications facilities may result in a potentially significant impact. (CEQA Guidelines, Appendix G, XIX [Utilities and Service Systems], threshold (a).) If the Project is constructed, the telecommunications facilities located at Mullikin Medical Center will be relocated as they will cease to meet industry and regulatory standards for cell coverage. The Project's impacts on utilities and service systems are potentially significant.

IV. THE PROJET MAY RESULT IN A VIOLATION OF THE FEDERAL TELECOMMUNICATIONS ACT.

The Project's height may result in a violation of the Federal Telecommunications Act by impacting the coverage provided by the telecommunications facilities located on the neighboring property. Congress recognized the national public interest of having uninterrupted wireless service and rapid technological advancement of wireless communications when it passed the Telecommunications Act of 1996 ("TCA").[6] Since the TCA's passage, there has been a sea of change in the growth of wireless services. According to the Federal Communications

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[6] Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (1996), codified throughout Title 47 of the United States Code.

Commission ("FCC"), "[m]obile wireless services are an essential part of Americans' daily lives."[7] Further, "mobile wireless serves a critical role in public safety, enabling uses to summon lifesaving help, receive timely alerts, and access pertinent information. These developments have made mobile wireless one of the most important sectors in the national economy."[8]

The wireless telecommunications facilities located at 2990 South Sepulveda Boulevard enable carriers to broadcast signals over frequencies licensed by the FCC to provide wireless cellular service to customers in the vicinity of the property. As required by the FCC, and discussed above, the wireless facilities service municipal emergency personnel and allow the public to access emergency 911 services in the event of an emergency, and permit emergency service first responders to communicate in the performance of life-saving activities. Any interference with the wireless carriers' continued operation of its equipment may impact its ability to provide continuous wireless coverage in the area, including emergency 911 services, and may result in a violation of federal law.

Not only does the interference shown by Mr. Afflerbach potentially violate federal and state laws prohibiting the interference with telecommunications and utility services, but such actions may also raise issues of nuisance and trespass. (See *Goshgarian v. George* (1984) 161 Cal.App.3d 1214, 1224-1225; *Herzog v. Grosso* (1953) 41 Cal.2d 219, 224.)

Additionally, any interference with the carriers' ability to provide wireless services, and in particular emergency 911 services, may also violate the United States Code and could result in the imposition of criminal penalties:

> Whoever willfully or maliciously injures or destroys any of the works, property, or material of any radio, telegraph, telephone or cable, line, station, or system, or other means of communication, operated or controlled by the United States, or used or intended to be used for military or civil defense functions of the United States, whether constructed or in process of construction, or ***willfully or maliciously interferes in any way with the working or use of any such line, or system, or willfully or maliciously obstructs, hinders, or delays the transmission of any communication over any such line, or system***, or attempts or conspires to do such an act, ***shall be fined under this title or imprisoned not more than ten years, or both.***

(18 U.S.C. § 1362, emphasis added.)

V. OTHER OVERSIGHTS THAT MAKE CLEAR THAT THE PROJECT PROPONENT'S MATERIALS ARE INADEQUATE.

A. Failure to Identify or Analyze Noise Impacts from Nearby Airport.

In analyzing whether a Project may have a significant noise impact, for projects located within close proximity to an airport, the CEQA Guidelines inquire whether a project will "expose

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[7] Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Eighteenth Report, WT Docket No. 15-125 (Dec. 23, 2015), at p. 2, *available at https://docs.fcc.gov/public/attachments/DA-15-1487A1.pdf*.

[8] *Ibid*.

people residing or working in the project area to excessive noise levels." (CEQA Appendix G, XIII [Noise], threshold (c).) The Exemption Report states that "[t]he Project site is not located within an airport land use plan and is not located within two miles of public airport or public use airport, nor is it within the vicinity of private airstrips." (Exemption Report, at p. 23.) This is incorrect. ***The Project is less than 1.5 miles away from the Santa Monica Airport.*** Consistent with the CEQA Guidelines, the City must consider whether the people residing or working at the Project will be subject to excessive noise levels.

The City should withdraw the Exemption Report and prepare an updated analysis that addresses potential impacts from airport noise, in accordance with CEQA.

B. Failure to Consider All Sensitive Noise Receptors.

The Exemption Report also fails to identify and study the potential impacts to all of the sensitive receptors surrounding the Project site. Under CEQA, sensitive noise receptors are commonly referred to as "those land uses that are ***particularly sensitive to noise intrusion***, including residences, schools, libraries, churches, hospitals, nursing homes, and other health care facilities." In identifying the sensitive noise receptors around the Project site, the Exemption Report identified adjacent daycare and residential uses. (Exemption Report, Appendix B [Noise Technical Study], at p. 10.)

While the Exemption Report recognizes that there is a "medical office building" also adjacent to the Project site (Exemption Report, at p. 4), it fails to consider the fact that at least one of the medical uses in the building qualifies as a sensitive receptor. One of the tenants in the office building provides medical services to children with special needs, who are particularly sensitive to the types of sudden auditory increases consistent with construction projects.[9] This tenant's office looks directly onto the Project site and is located less than 30 feet away.

The City should withdraw the Exemption Report and prepare an updated analysis that addresses potential impacts to sensitive receptors at the Mullikin Medical Center immediately adjacent to the Project site.

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[9] Williams et al., *A Review of Decreased Sound Tolerance in Autism: Definitions, Phenomenology, and Potential Mechanisms* (2021), attached hereto as **Exhibit 2.**

VI. CONCLUSION.

The Project as proposed is not entitled to waivers of height restrictions because it will result in a significant, quantifiable, direct, and unavoidable impact to the City's emergency response capabilities by interfering with adequate cell signal for millions of Angelenos in contravention to local, state and federal law. The City should withdraw the Exemption Report and continue the hearing on the Project entitlements to allow the Project proponent to bring the Project into compliance with the applicable laws and for the City to develop an adequate CEQA analysis for the Project.

Sincerely,



Liz Klebaner
Nossaman LLP

LK:LK
(Attachments)

EXHIBIT 1

May 13, 2025

Dr. Jonathan L. Kramer, Esq.
Telecom Law Firm, PC
2708 Wilshire Blvd #330
Santa Monica, CA 90403

Reference: Proposed New Construction at 2930 Sepulveda Boulevard and its Effect on Existing Wireless Telecommunications Sites at the Mullikin Medical Center at 2990 Sepulveda Boulevard

Dear Dr. Kramer:

We have completed our review of the effect that a proposed new 6 story, 71-foot high residential development at 2930-2936 South Sepulveda Boulevard will have on existing telecommunications sites located adjacent at the Mullikin Medical Center, located at 2990 South Sepulveda Boulevard, and the hundreds of thousands of cellular phone service users who rely on this specific site for routine and emergency cell phone services at the I404/I10 interchange.

In order to provide a proper technical review of the proposed project's impact on public safety, we used the following information:

- the Notice of Public Hearing provided by the Los Angeles City Planning department;
- the PZA Resubmittal 3 (dated April 2, 2024) compiled by TCA Architects which contains annotated site plans, floor plans, roof plans, elevations, as well as computer renderings of the proposed development at 2930 Sepulveda Boulevard;
- T-Mobile As-Built Construction Plans (most recently dated February 25, 2025) depicting T-Mobile and Sprint wireless facilities on the roof of the Mullikin Medical Center prepared by Smartlink;
- DISH Wireless Construction Plans (most recently dated April 30, 2024) depicting proposed DISH Wireless facilities on the roof of the Mullikin Medical Center prepared by MD7;
- Data provided by CalTrans for traffic counts on the nearby I-10 and I-405 Freeways;
- FCC database information on T-Mobile wireless licenses for Los Angeles market; and
- The International Telecommunication Union (ITU) Publication "Recommendations for Prediction of building entry loss" (dated 08/2023).

The Google Earth Satellite photo below (Figure 1) shows the current building heights that are in the area northwest of Mullikin Medical Center (which is the existing building at the Northeast corner of Sepulveda Blvd. and National Blvd, and which physically support the existing wireless sites). The current height of the roof of the Mullikin Center is at 44'9". The green and red dots indicate the existing antenna locations for Verizon and T-Mobile, respectively. The planned Dish antennas are indicated with the blue dots. Currently, next door at 2930 S. Sepulveda, the former

Bank of America building is 22’ feet high. That lower height allows the RF signals from the antennas on the northwest roof face of the Mullikin Center to propagate northwest toward the I-405/I-10 interchange and freeway segments used by around a million vehicles/drivers each day.

Figure 1: Google Earth Satellite Photo of Site



Figure 2 is a plot of the expected coverage for 3 sector T-Mobile wireless facilities located on 2990 South Sepulveda Blvd. The salmon-colored areas of the plot indicate locations where there is good in-building wireless coverage (-90 dBm or better is considered a typical industry standard for urban areas) for the existing T-Mobile 700 MHz band signal.

Figure 2:

Existing 700 MHz T-Mobile Wireless Coverage



Figure 3 is a portion of the TCA Architects' rendition of the southern elevation of the proposed development which is the side facing the Mullikin Center.

Figure 3:

Southern Elevation of Proposed 2930 S. Sepulveda Blvd.



The ITU publication mentioned above provides internationally-accepted tools to predict the attenuating effect of RF signal attempting to pass through a building. Obviously, there are opportunities for variation since there are various building materials (glass, wood, brick, steel, sheetrock, etc.) as well as building layout (number of walls, doors, courtyards, etc.), but the ITU publication's "Figure 2" (our Figure 4 below) details probabilities of the signal loss at various transmission frequencies.

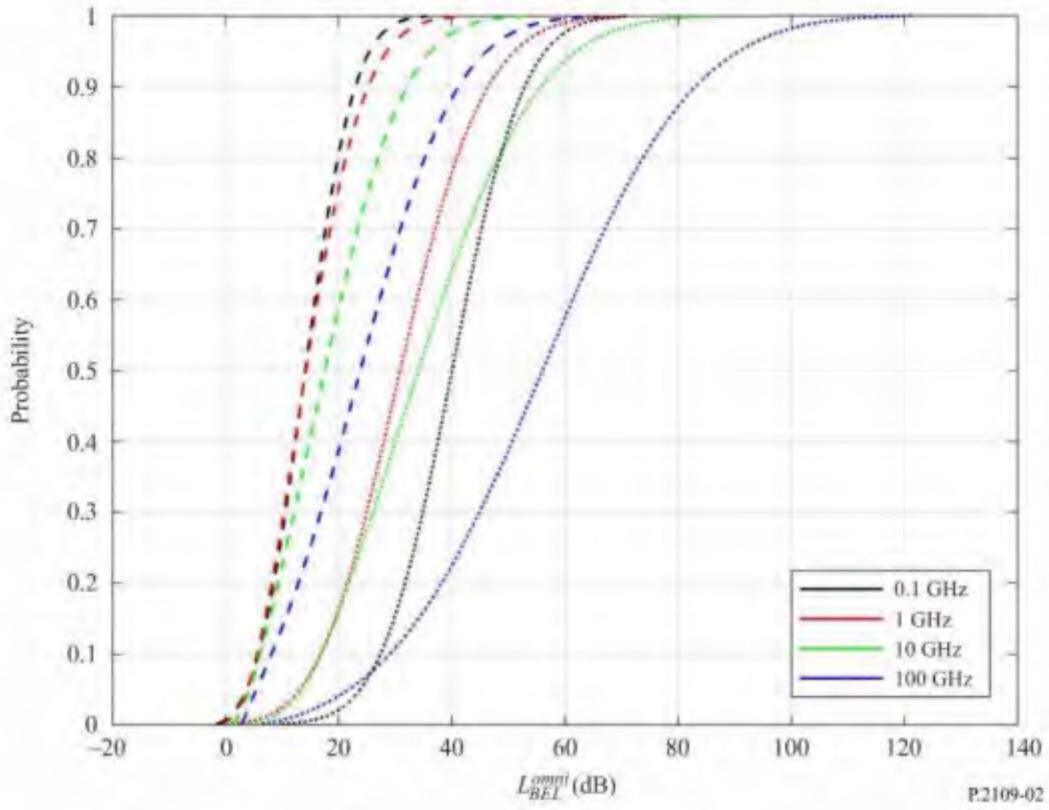
Figure 4:

"Figure 2" from ITUT-R P.2109-2

Rec. ITU-R P.2109-2

FIGURE 2

Building entry loss predicted at horizontal incidence
(Dashed line: Traditional, Dotted line: Thermally-efficient)

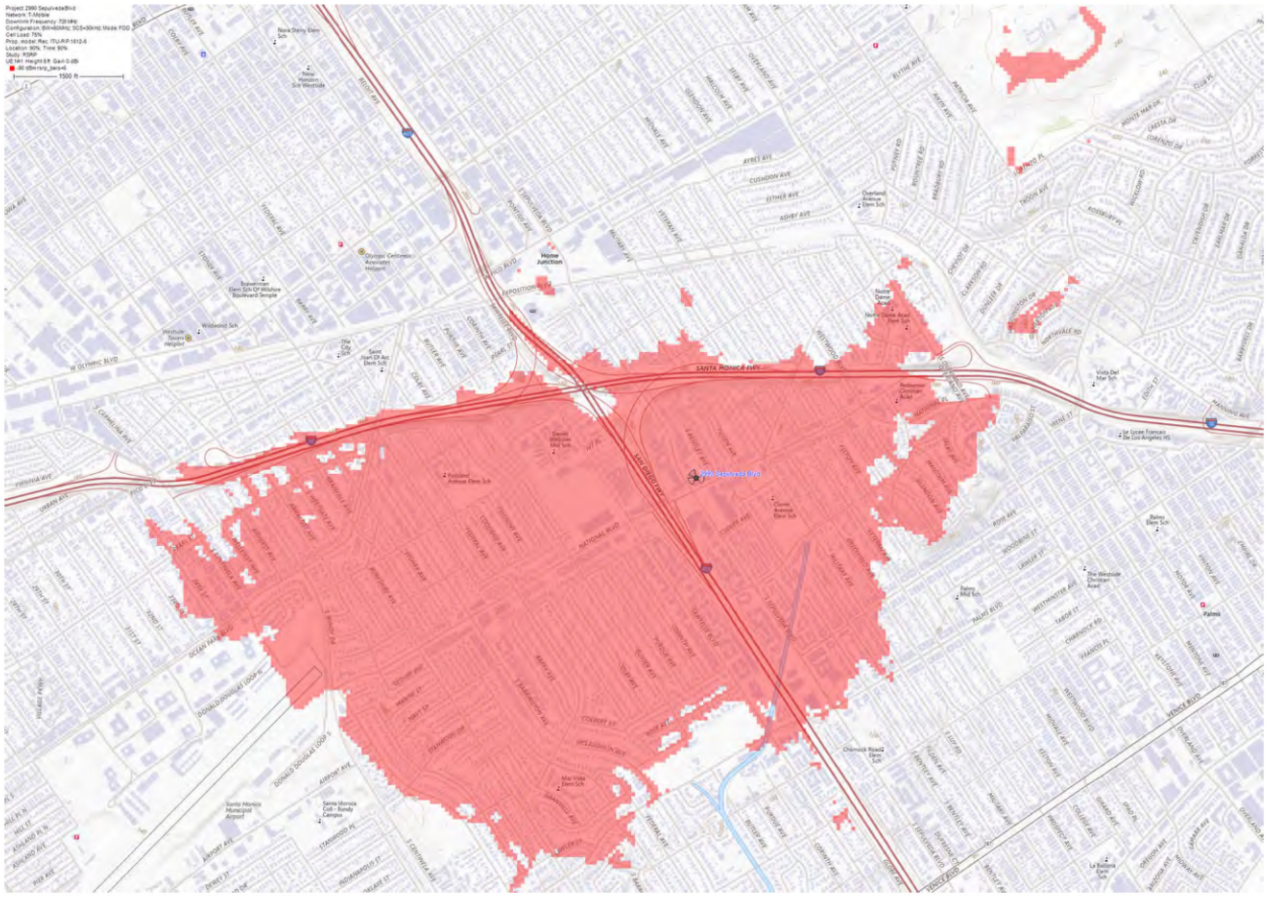


For the purposes of this review, and based on the frequencies used by T-Mobile (indicated by the dashed red line), the graph conservatively suggests that there is an even chance (50% or 0.5 probability) that the wireless spectrum (0.6-4 GHz) will have at least 10-12 dB of degradation of the signal which is sent in that direction. This means that for every 10 watts of power transmitted through a building, it is reasonable to expect that only a maximum of only 1 watt of power will remain after the transit. Thus, here is Figure 5, where we modified our existing 700 MHz T-Mobile Coverage with a 10 dB attenuation only in the northwest sector (which will be directly facing the 4th floor southern elevation of the proposed new development at 2930 Sepulveda).

Figure 5:

Projected 700 MHz T-Mobile Coverage with Proposed 2930 Sepulveda

(-10 dB Proposed Building Attenuation Loss in the Northwest Sector)



It is apparent that almost no signal meets -90 dBm requirement for good in-building coverage from the wireless site continues north past the I-10 freeway. This would also severely compromise wireless communications in-vehicle in the I-10 / I-405 freeway intersection corridor. According to CalTrans vehicle count data from 2022, the I405/I10 interchange handles over a million average vehicle trips a day, not to mention the associated arterial and local traffic, creating real possible public safety concerns in event of necessary emergency notifications for evacuation for natural disasters or emergency response plans.

If you have any questions regarding our findings or require additional analysis, please get in touch with me.

Regards,



Lee Afflerbach, P.E.
Project Manager and Principal Engineer



CTC MEDIA GROUP, INC

Wireless-LMR-Broadcast Engineering Services

Municipal Wireless Consultants

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CTC Media Group, INC

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CTC Media Group – Qualifications and Experience

CTC Media Group is an independent telecommunications consulting firm with over 20 years of experience assisting public sector clients with communications network and facilities engineering, design, and analysis. Our clients primarily are local governments, state agencies, public utilities, and nonprofits. CTC Media Group is independent of the industry and not affiliated with equipment manufacturers, cable operators, wireless providers, or tower companies.

Since 2002, CTC Media Group's wireless team has helped public agencies and utilities review and analyze applications for thousands of towers, colocations, small cells, and distributed antenna system deployments. Our expertise includes:

- Developing best practices in wireless siting to enable efficient deployment while protecting community interests.
- Reviewing and testing wireless facilities for compliance with FCC rules as well as the wireless industry's own best practices and standards in design and construction.
- Addressing technical challenges in wireless facility siting, including ADA violations, radio frequency (RF) interference, and unsightly deployment.
- Developing strategies to comply with state, federal, and local requirements and zoning considerations relating to wireless facilities.
- Reviewing wireless siting applications for zoning compliance, RF coverage, interference, and colocation opportunities.
- Developing local processes and standards that enable wireless facility deployment while protecting public interests and property.

Evaluating and vetting wireless facility siting applications

Our engineers analyze siting applications and RF studies to assess the accuracy of an applicant's-claimed technical service objectives, the extent to which proposed wireless sites are necessary to fill gaps in coverage or capacity, and the significance of such gaps. Analysis typically includes:

- Reviewing applications, including RF propagation studies or drive tests.
- Identifying colocation options in the vicinity of a proposed site.
- Considering options to minimize the visual or other community impact of a wireless facility, such as painting antennas to match a mounting location, requiring a stealth monopole design, or requiring that equipment meets local noise ordinances.

- Visiting and reviewing sites to evaluate community impact.
- Reviewing applications and requesting additional information, as necessary.
- Evaluating relevant reports, studies, public input, and other materials.
- Presenting findings to planning departments, counsel, and elected bodies.
- Preparing reports, maps, charts, documentation, or presentations to document findings and recommendations.

Developing technical and safety standards

Our engineering staff develops and helps enforce **technical standards to protect the public interest, public safety, public assets, and utility worker safety**, including through:

- Verifying compliance with FCC rules on RF emissions and related warning signage.
- Evaluating RF signal level to ensure non-interference with public safety, city, and utility wireless operations.

Developing processes to address preemption threats or comply with preemptive laws

In light of new and changing federal and state limitations on local authority over the placement of wireless facilities, including the FCC's 2018 *Small Cell Order*, CTC Media Group's analysts have developed pragmatic alternative siting strategies that address local policymakers' desire for facilitating new deployment while **protecting public assets, interests, and mission-critical public infrastructure**. We also work with local governments to identify and anticipate new deployment strategies by the major carriers as they densify and upgrade their wireless sites to newer 5G technologies as well as future upgrades in radio and antenna capabilities.

Some recent clients include the Village of Mill Neck, NY, Village of Pelham, NY, Yamhill County, OR, and Huntsville, Alabama.

We have also advised numerous California cities (including Campbell, Palo Alto, Monterey, Sonoma, Napa, Palos Verdes Estates, Dublin, Martinez, Novato, Piedmont, Arcadia, Hillsborough, and Rancho Palos Verdes) on wireless siting standards that minimize the visual impact of wireless facilities while improving mobile service coverage.

For Hillsborough, CA, we worked with the City Engineering staff to develop siting alternatives employed to negotiate a settlement of a case that reached litigation in the 9th Circuit Federal Court of Appeals.

Integrating Fiber Optics into Hybrid Wired/Wireless Broadband Networks

Our team has worked for 20 years with the Delaware Department of Transportation (DelDOT) in designing and overseeing a state-wide traffic management network. This network consists of thousands of Intelligent Transportation Services (ITS) monitoring and controlling devices for DelDOT's traffic management center in Smyrna, Delaware.

The DelDOT state-wide network employs a mix of Fiber Optic and Wireless transmission networks that provide seamless two-way data transmission to support traffic cameras, traffic sensors, and real-time data collection.

DelDOT Fiber Network Access Cabinet



Qualifications of Key Wireless Technology Staff

CTC Media Group provides expert, independent guidance and technical analysis support for our municipal clients seeking to defend their established zoning, land use, street use and construction codes and to protect the public interest while facilitating the deployment of new wireless services.

CTC Wireless Engineering Analysis Capabilities

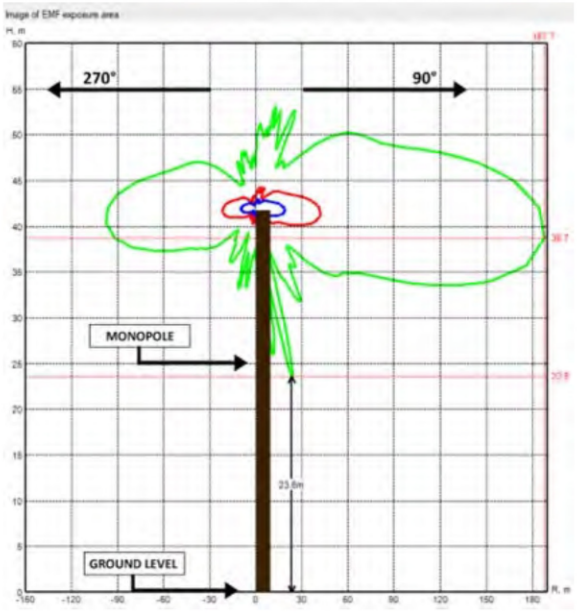
CTC Media Group stands ready to support government clients by providing the following on-call wireless telecommunications planning and commercial wireless application evaluation services:

- Review the technical application submission by the applicant within the framework of a local government's zoning and other code requirements.
- Examine applications with regard to all FCC technical standards, including RF exposure guidelines.[1]

Illustrated Examples of RF Exposure Modeling



RF Exposure at Antenna Height

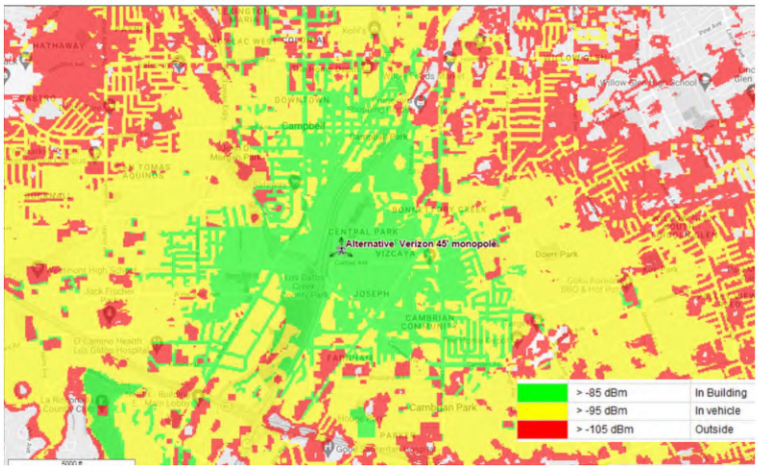


RF Exposure Above Ground

1 Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, OET Bulletin 65, Edition 97-01 August 1997 FCC, Washington, DC 20554

- Request, when necessary additional supporting information as needed to clarify/complete initial submissions.
- Independently evaluate, through computer-based radio propagation modeling, the predicted wireless coverage data submitted by an applicant in support of the wireless carrier's claimed need for the facilities to meet its stated service coverage objectives.[2]

Illustrated of Computer Coverage Modeling at 700 MHz



ITU Propagation Model 700MHz Coverage Map 43.5'

- Perform independent on-site measurements where required and as requested.

Illustrated Examples of Field Measurements Coverage



Drive Test Result Map Version One



Drive Test Result Map Version Two

2 Propagation data and prediction methods for planning of short-range outdoor radiocommunications systems and radio local area networks in the 300Mhz-100GHz, ITU-R p.14111-10 International Telecommunications Union, Geneva, 2019

- Examine whether there are viable, alternative, less-intrusive siting options to the facilities and/or locations proposed by the applicant-- including the use of existing support structures, based on the supporting engineering documentation provided by the applicant.
- Prepare project reports of our findings, conclusions, and recommendations as requested.
- Have qualified staff available to participate (onsite or remote) in briefings to municipal decision-makers at staff or public meetings.

Our project team includes:

- **Lee Afflerbach**, **P.E., Director of Engineering**, oversees our team of engineers reviewing wireless antenna siting applications. He has provided technical guidance on wireless deployment options for (among others) Montgomery County, Baltimore, County Carroll County, and Prince George County, Maryland, as well as the cities of Arcadia, Burlingame, Fremont, Hillsborough, Monterey, Napa, Palo Alto, Palos Verdes Estates, Piedmont, Rancho Palos Verdes, and Sonoma in California.

- **Michael Afflerbach**, **Senior Analyst,** has performed on-site testing and technical analysis for our Maryland clients and conducted site surveys and coverage testing for Palo Alto, Los Angeles, Monterey, Rancho Palos Verdes, and Petaluma, California.
- **Michael Breda, Senior Systems Engineer,** has reviewed and examined wireless applications to upgrade existing and new facilities in Prince George and Montgomery Counties in Maryland.
- **Carolina Olivares**, **Staff Analyst,** is responsible for assembling and preparing findings and recommendation reports for clients.

Fee Structure

The CTC Media Group team hourly billing rates:

Labor Category	Hourly Billing Rate
Director of Engineering	$200.00
Senior Communications Analyst	$185.00
Senior Systems Engineer	$125.00
Staff Analyst	$ 90.00

Local travel is billed at current standard mileage rates. Non-routine expenses and long-distance travel are recovered at direct cost with no mark-up.

CTC Wireless Team Resumes

Lee Afflerbach, P.E. | Principal Engineer

Lee is a communications systems engineer with over 50 years of experience advising federal, state, and local government clients. He is the founder of Columbia Telecommunications Corporation, a firm that has delivered independent telecommunications-related consulting services to federal, state, and local government clients since 1983.

His expertise covers a wide range of communications technologies, including commercial wireless deployment, broadcasting, and land mobile radio. His work involves radio frequency (RF) propagation modeling to determine the extent of coverage feasible from a given wireless facility siting. He also evaluates network capacity and examines alternative deployment strategies to address clients' needs.

Wireless siting expertise

For over three decades, Lee has supported local government clients in reviewing commercial wireless siting applications and examining options for siting commercial wireless communications facilities in a manner that is consistent with local zoning codes and federal regulations. This work routinely involves computer modeling to determine the extent of existing and proposed signal coverage for a wide range of commercial wireless applications prepared by commercial carriers. As part of these evaluations, when requested by the client, Lee identifies and then examines alternative, less intrusive locations for proposed wireless facility sitings. In addition to meeting the applicant's coverage requirements, these alternative sites are intended to meet local government planning and zoning code requirements.

Lee provides ongoing support to municipal clients, evaluating options for implementing advanced cellular technology in their respective communities. He serves as CTC Media Group's project leader for the team of engineers who are examining or have recently addressed deployment options for more than a dozen cities in California, including the cities of Arcadia, Burlingame, Fremont, Hillsborough, Los Altos, Monterey, Napa, Palo Alto, Palos Verdes Estates, Piedmont, Rancho Palos Verdes, and Sonoma. Over the past 30 years, he has reviewed several hundred site applications for new wireless facilities and existing facility modifications for numerous municipal clients in the Washington, DC, and Baltimore, MD, metropolitan areas.

He has supported local government clients in a variety of ways, including a comprehensive technical review of wireless facilities applications, oversight of field signal verification measurements, negotiations of technical options/issues with carriers, expert witness testimony in litigation, and presentations before local planning commissions and city councils.

Lee has served as an expert witness providing testimony in support of municipal clients in their ongoing litigation with commercial wireless carriers in State and Federal courts. His assignments have included the preparation of testimony and analysis of technical filings presented before the court by the cities of Wilmington, DE; Los Angles, Los Altos, Hillsborough, and Piedmont, CA; Pueblo County, CO; Wichita, KS; McKinney, TX; and North Buffalo Township, PA. As directed by the courts in some of these disputes, he has supported numerous communities in preparing technical alternatives to wireless carriers' initial wireless facility siting applications.

Licenses and Education

Licensed Professional Engineer, Delaware, District of Columbia, Maryland, North Carolina, and Washington.

Bachelor of Science, Electrical Engineering, Drexel University.

Michael Afflerbach | Senior Communications Analyst

Michael Afflerbach is a wireless communications consultant with over 20 years of experience serving clients in Montgomery, Prince George, and Baltimore Counties in Maryland. At CTC Media Group, he supports clients with reviews of applications to site wireless facilities and conducts extensive field measurements. Most recently, he has worked in this capacity for Los Angeles, Petaluma, Rancho Palos Verdes, Monterey, and Palos Verdes Estates in California. Mr. Afflerbach has worked with the FCC, FAA, and dozens of municipalities and counties to resolve tower and antenna construction and zoning issues with cellular/mobile providers and broadcasters.

Tower Regulatory Compliance

For more than 20 years, Michael has worked on communications towers and their federal, state, and local regulatory requirements. As a broadcaster, he owns three radio towers (including one built new in 2004) and is keenly aware of the hurdles that need to be addressed to develop or modify communications structures. Over the years, he has worked with other broadcasters and public safety entities to secure antenna placement (often through collocation) to maximize service coverage while dealing with the regulatory forces that limit possible locations.

Additionally, Michael consults regularly with local governments, such as Montgomery County, MD, Arlington County, VA, Carroll County, MD, Huntsville, AL, and Annapolis, MD, to help them determine the technical merits of communications towers and antennas for broadcast, wireless internet service providers (WISPs), cellular carriers and other wireless and microwave operators, including small cell and Distributed Antenna Systems deployment. Using sophisticated computer modeling and FCC databases, he has worked with local planning and zoning officials to verify coverage areas and identify possible alternative sites for non-conforming antenna placements.

Wireless Broadband Networking

Over the past four years, Michael has developed, and trained others to develop, wireless broadband networks (using both licensed and unlicensed spectrum) for a diverse clientele. Using different computer modeling and network management software, he has helped to deploy, or examined the feasibility for local and state government clients to deploy, wireless networks for the State of Delaware Department of Transportation (DelDOT); Garrett County, MD; Ellensburg, WA; Port Angeles, WA; Stafford County, VA; and Palo Alto, CA. Michael has served as a wireless specialist for private WISPs and marinas that need wide-area Wi-Fi service. He has worked to design and build his own wide-area wireless network in New Bern, NC.

Education

1994 B.A., St. John's College, Annapolis, Md
Member of the Society of Broadcast Engineers (SBE)

Michael Breda | Systems Engineer

Michael Breda is a systems engineer who reviews and processes wireless siting applications for Montgomery, Prince Georges, and Baltimore Counties in Maryland.

Before joining CTC Media Group, Mr. Breda was a Senior Systems / Software Engineer with over 20 years of experience serving technical innovators such as NDS Group, HIFN, TV/Com International, and General Instruments. Mr. Breda has performed various roles in the design, development, systems integration, and deployment of technical systems, focusing primarily on the satellite and cable television industries and eCommerce.

Mr. Breda's experience centers around developing and deploying systems for conditional access control and digital rights management employed in the cable and satellite broadcasting Industry worldwide. His focus has included subscriber management systems and the secure communication and key management technology used to meet the needs of customers operating in the digital media marketplace. He also has experience in secure internet communications systems employed in eCommerce.

Mr. Breda has participated in development efforts domestically and in Holland and Israel. He has also deployed technical systems at customer sites in the United States, Australia, Canada, and Germany.

Education

B.S., Computer Science, Louisiana State University.

Carolina Olivares | Staff Analyst/Publications Specialist

Carolina is responsible for the production of all documents associated with CTC Media's wireless client projects. She oversees preparation of all reports, technical graphic displays, and PowerPoint presentations.

She maintains our library of client technical documents and technical research reports used to support client litigation activities. For the past few years, Ms. Olivares' has created exhibits and schematic drawings for preferred placement of antennas and associated electronics on city poles. Her focus has included cleaning raw RF testing data and pin data markers on Google Earth. Ms. Olivares has also created keyhole markup language files for drive test maps and created other display maps using different formats to show target areas where carriers are proposing to increase coverage or improve network capacity.

Education

Bachelor of Technology: Graphic and Multimedia Design,
State University of New York at Canton, Canton, NY

EXHIBIT 2

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A Review of Decreased Sound Tolerance in Autism: Definitions, Phenomenology, and Potential Mechanisms

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Abstract

Atypical behavioral responses to environmental sounds are common in autistic children and adults, with 50–70% of this population exhibiting decreased sound tolerance (DST) at some point in their lives. This symptom is a source of significant distress and impairment across the lifespan, contributing to anxiety, challenging behaviors, reduced community participation, and school/workplace difficulties. However, relatively little is known about its phenomenology or neurocognitive underpinnings. The present article synthesizes a large body of literature on the phenomenology and pathophysiology of DST-related conditions to generate a comprehensive theoretical account of DST in autism. Notably, we argue against conceptualizing DST as a unified construct, suggesting that it be separated into three phenomenologically distinct conditions:

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Declaration of Interests

ZJW has received consulting fees from Roche. He is also a member of the Family Advisory Committee of the Autism Speaks Autism Treatment Network site at Vanderbilt University and the Autistic Researcher Review Board of the Autism Intervention Research Network on Physical Health (AIR-P). The remaining authors declare no competing interests, financial or otherwise.

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hyperacusis (the perception of everyday sounds as excessively loud or painful), misophonia (an acquired aversive reaction to specific sounds), and phonophobia (a specific phobia of sound), each responsible for a portion of observed DST behaviors. We further elaborate our framework by proposing preliminary neurocognitive models of hyperacusis, misophonia, and phonophobia that incorporate neurophysiologic findings from studies of autism.

Keywords

autism spectrum disorder; auditory; sensory; decreased sound tolerance; sensitivity; hyperacusis; misophonia; phonophobia; central gain; salience; anxiety; specific phobia; review; theory

1. Introduction

Autism spectrum disorder (hereafter referred to as "autism") is a heterogeneous, lifelong neurodevelopmental condition characterized by difficulties with social communication and the presence of restricted, repetitive patterns of behavior, interests, and activities (American Psychiatric Association, 2013). In addition to these cardinal features, autistic[1] people commonly find a number of everyday sensory stimuli to be quite aversive (Ben-Sasson et al., 2009, 2019; Cascio et al., 2016; Schauder & Bennetto, 2016), now considered a core feature of the condition (American Psychiatric Association, 2013). Although this so-called "sensory hyperreactivity" can be present in any modality (Ausderau et al., 2014; Crane et al., 2009; Hazen et al., 2014; Leekam et al., 2007; Tavassoli et al., 2014), decreased sound tolerance (DST; i.e., an inability to tolerate everyday sounds) is among the most prevalent, persistent, and disabling sensory features of autism (Gomes et al., 2008; O'Connor, 2012; Stefanelli et al., 2020; Stiegler & Davis, 2010). A recent meta-analysis estimated that the current prevalence of DST in the autistic population is 38–45%, with 50 to 70% of individuals on the autism spectrum having experienced DST at some point in their lives (Williams, Suzman, et al., 2020b). In the largest single study investigating this phenomenon, Law and colleagues (2016) reported current and lifetime DST prevalence rates of 77.6% and 86.6%, respectively, in an online sample of 814 autistic children. The majority of children exhibited DST-related challenging behaviors daily or weekly, and over one third had physically injured themselves or others as a result of these behaviors (Law et al., 2016). Even when not a safety concern, DST contributes significantly to autism-related functional impairment, as many caregivers report that their children's reactions to sounds prevent them from participating in a wide range of family, school, and community activities (Hussein et al., 2019; E. K. Jones et al., 2020; Law et al., 2016). Furthermore, aversions to sensory stimuli, such as DST, are often cited as reasons that autistic individuals find it difficult to seek medical care (Carter et al., 2017; Giarelli et al., 2014; Muskat et al., 2015; Nicholas et al., 2016). DST symptoms in autism are known to persist into adulthood (Elwin et al., 2013; Kuiper et al., 2019; Landon et al., 2016; A. E. Robertson & Simmons, 2015; Tavassoli et al., 2014), contributing to workplace difficulties (Hayward et al., 2019; Hedley et al., 2018; Lorenz et al., 2016; A. E. Robertson & Simmons, 2015), anxiety (Landon et al., 2016; Simonoff, 2020), avoidance

[1]The terms 'autistic person' and 'person on the autism spectrum' are the preferred language of the majority of people diagnosed with autism (Bury et al., 2020; Kenny et al., 2016). Out of respect for these preferences, we use these terms to refer to individuals on the spectrum rather than exclusively using person-first language.

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behavior (Landon et al., 2016), and general distress (Griffith et al., 2011; R. S. P. Jones et al., 2003; Smith & Sharp, 2013). Notably, although autism is also associated with *hyporeactivity* to everyday auditory stimuli (Ben-Sasson et al., 2009, 2019; Law et al., 2016; Watts et al., 2016), this response pattern is far less prevalent than DST in the autistic population, and its effects on activity participation and functional impairment appear to be less pronounced (Law et al., 2016). Thus, we choose to focus this review solely on DST in autistic individuals, which we believe to be the sensory feature of autism with the largest overall impact on quality of life in this population.

Despite the prevalence and impact of DST in autism, there is currently insufficient evidence to support recommendations of any behavioral or pharmacologic treatment to reduce the severity or functional impact of this symptom (Fung et al., 2012; Sandbank et al., 2020; Schoen et al., 2019; Sinha et al., 2006; Weitlauf et al., 2017). One potential reason for the lack of evidence-based intervention in this area is the fact that the underlying mechanisms of autism-associated DST are still largely unknown, hindering the development of targeted interventions. Though a number of physiological and psychological processes have been suggested as potential sources of DST in autism (Marriage & Barnes, 1995; McCullagh et al., 2020; Pillion et al., 2018; Stiegler & Davis, 2010), there is still debate in the literature over whether DST behaviors reflect a disturbance in low-level auditory processing, abnormally strong emotional reactions to specific auditory stimuli, or a combination of the two. The purpose of the present article is to review the literature on DST in autism, incorporating published experimental and clinical observations into a unified theoretical framework. Synthesizing findings from the clinical and neuroscientific literature, we propose several potential neurocognitive models to explain the phenomenon of DST in autism. By doing so, we aim to generate testable hypotheses about the relationships between physiology, perception, and behavior, setting the stage for future research on DST mechanisms and bringing the field one step closer to the development of targeted interventions.

2. Definitions

The terminology used to describe DST in the medical literature has been extremely varied, with the words hyperacusis (Fagelson & Baguley, 2018; Tyler et al., 2014), misophonia (P. J. Jastreboff & Jastreboff, 2015; Schröder et al., 2013), phonophobia (Møller, 2011; Phillips & Carr, 1998), auditory over-responsivity (Tavassoli et al., 2019; Van Hulle et al., 2012, 2018), noise sensitivity (Stansfeld, 1992), auditory defensiveness (Goldsmith et al., 2006; Kern et al., 2006), noxacusis (Auerbach, 2019), and auditory hypersensitivity (Gomes et al., 2008) all used to describe specific patterns of sound intolerance across populations. The terminology used to describe DST as a symptom of autism specifically has also been highly inconsistent (Gomes et al., 2008; Landon et al., 2016; Stefanelli et al., 2020; Stiegler & Davis, 2010; Tavassoli et al., 2019), and thus we seek to provide definitions of several key terms before reviewing the literature on these topics. Although there is no unified standard of nomenclature for disorders of sound tolerance, we align our terminology with the first major academic text on this topic (Fagelson & Baguley, 2018), separating disorders of DST into the specific conditions of *hyperacusis*, *misophonia*, and *phonophobia* (Table 1; see also Tyler et al., 2014 for a similar framework).

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2.1 Hyperacusis

Hyperacusis is defined here as a hearing disorder involving an increased sensitivity or decreased tolerance to sound at levels that would not trouble most individuals. For the person experiencing hyperacusis, everyday sounds can be unpleasant, intense, painful, and/or overwhelming, and these sounds are often perceived as much louder than they actually are (Fackrell et al., 2019). This definition is more expansive than many that have previously been proposed, which have tended to focus exclusively on the perception of moderate-intensity sounds as overly loud (Fackrell et al., 2017; Phillips & Carr, 1998; Tyler et al., 2014). In their pivotal review on the topic, Tyler and colleagues (2014) proposed that hyperacusis could be separated into four subtypes characterized by loudness, annoyance, fear, and pain, occurring either singly or in combination. A more recent consensus definition of hyperacusis (Fackrell et al., 2019) differentiates hyperacusis from both misophonia (an acquired aversive reaction to specific "trigger" sounds characterized by anger, extreme annoyance, and disgust) and phonophobia (a persistent, abnormal and unwarranted fear of certain sounds). Thus, within our framework, hyperacusis refers specifically to *loudness hyperacusis* and *pain hyperacusis*, whereas the terms *misophonia* and *phonophobia* are proposed to refer to the constructs of *annoyance hyperacusis* and *fear hyperacusis* proposed by Tyler et al., respectively. Furthermore, despite the consensus definition of hyperacusis including the words "increased sensitivity," it is well established that patients with hyperacusis do not have increased sensitivity to sounds in the psychoacoustic sense (i.e., lower auditory detection thresholds), and that many non-autistic individuals with hyperacusis exhibit some degree of hearing loss (Anari et al., 1999; Sheldrake et al., 2015; Tyler et al., 2014). Within the framework proposed by Ward (2019), a distinction is made between *subjective* sensory sensitivity (i.e., higher self-reported intolerance of sensory stimuli), *neural* sensory sensitivity (i.e., increased neural responses evoked by a given sensory stimulus), and *behavioral* sensory sensitivity (i.e., lower thresholds for stimulus detection and/or discrimination). However, as these three types of "sensory sensitivity" are generally unrelated to each other within the autistic population (Donkers et al., 2015; Dunlop et al., 2016; Gravel et al., 2006; Hudac et al., 2018; C. R. G. Jones et al., 2009; Kuiper et al., 2019; Millin et al., 2018; Tharpe et al., 2006), we believe the use of this single term to describe constructs at the behavioral, perceptual, and neural levels will lead researchers to commit the "jingle fallacy" (Dang et al., 2020), in which measures of "sensory sensitivity" at different levels are thought to tap the same construct. Thus, in accordance with Tyler et al. (2014) we refrain from using the term "hypersensitivity" to describe hyperacusis or any other form of DST, and we encourage autism researchers to use the term "sensory sensitivity" only when referring to *behavioral* stimulus detection or discrimination thresholds.

Loudness hyperacusis is a condition in which the threshold for loudness discomfort is reduced and sounds of moderate intensity are judged to be very loud (Phillips & Carr, 1998). Psychoacoustically, loudness hyperacusis can be thought of as an increased slope of the loudness growth function (i.e., steeper growth of perceived loudness as a function of sound intensity; Brandy & Lynn, 1995; Hébert et al., 2013; Noreña & Chéry-Croze, 2007). This condition is distinguishable from *loudness recruitment*, a steepening of the loudness growth function that occurs in the setting of cochlear hearing loss due to outer hair cell damage

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(Fowler, 1965; B. C. J. Moore et al., 1985; Preyer & Gummer, 1996). Notably, in loudness recruitment, the loudness of a sound "catches up" to that of a normal hearing listener, and at high levels the loudness growth functions of recruiting and normal-hearing ears will again overlap (B. C. J. Moore et al., 1985). This is in contrast to loudness hyperacusis, where the loudness growth curve diverges from that of a normal hearing listener without again merging with the normal loudness function (Brandy & Lynn, 1995; Noreña & Chéry-Croze, 2007).

Pain hyperacusis (Auerbach, 2019; Pollard, 2019; Tyler et al., 2014), also referred to as noxacusis, is a less well understood form of the condition in which an individual perceives physical pain in the ear when exposed to certain sounds at levels far below those needed to cause pain in a typical listener (i.e., approximately 120 dB sound pressure level [SPL], as loud as the front row of a rock concert; Plutchik, 1963). Although the character of the pain varies greatly across individuals (e.g., dull ache, burning, sharp, stabbing, or throbbing), 62% of hyperacusis patients responding to an online survey reportedly experienced ear pain at least daily (Pollard, 2019). It is currently unclear whether the pain experienced in this condition is the same pain experienced by typical listeners at extremely high sound levels or an entirely separate phenomenon with distinct neurophysiologic substrates. Recent discoveries have implicated the population of type II cochlear afferent neurons in mediating the perception of noxious or painful auditory stimuli (Flores et al., 2015; Liu et al., 2015; Zhang & Coate, 2017), but the role of these cells in pain hyperacusis remains to be determined.

Throughout this review, the term "hyperacusis" will be used to refer generally to both loudness and pain hyperacusis, regardless of neurological, psychiatric, otologic, or idiopathic etiology (Tyler et al., 2014). The specific terms "loudness hyperacusis" and "pain hyperacusis" will be utilized when referring to only one of the subtypes.

2.2 Misophonia

Misophonia, also called selective sound sensitivity syndrome (Neal & Cavanna, 2013) or annoyance hyperacusis (Danesh & Aazh, 2020; Tyler et al., 2014), is a newly described neuropsychiatric condition in which individuals have excessive and inappropriate emotional responses to specific "trigger" sounds (e.g., chewing, tapping, sniffling), even when presented at a low level (Brout et al., 2018; Claiborn et al., 2020; Jager et al., 2020; Palumbo et al., 2018; Potgieter et al., 2019; Schröder et al., 2013). The specific triggers and their elicited responses vary greatly across individuals and may change over time, although the predominant emotional response tends to involve some form of anger, disgust, or irritation (Jager et al., 2020) and increased autonomic arousal (Edelstein et al., 2013; Kumar et al., 2017). This emotional response is often accompanied by an idiosyncratic set of physical symptoms (e.g., muscle tension, paresthesias, abdominal discomfort, or other physical sensations; Claiborn et al., 2020; Dozier & Morrison, 2017). Moreover, misophonic reactions are in some cases evoked by specific visual stimuli as well (e.g., the sight of a person chewing can trigger anger and physical sensations, even in the absence of a sound), a phenomenon that has been termed "misokinesia" (Potgieter et al., 2019). Interestingly, the context in which these triggers are encountered modulates the response substantially, with more intense responses being reported when triggers are experienced in a familiar context

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(Potgieter et al., 2019) and fewer or less intense responses occurring when the triggering sound is made by a toddler or an adult with cognitive impairment (Jager et al., 2020). Triggering sounds also do not seem to typically evoke a response when produced by the individuals with misophonia themselves (Potgieter et al., 2019).

Compared with hyperacusis, misophonia is a relatively new concept, first described in the academic literature in 2002 (M. M. Jastreboff & Jastreboff, 2002). However, it was not until 2013, when diagnostic criteria for this disorder were proposed (Schröder et al., 2013), that misophonia began to attract the attention of researchers in psychology, psychiatry, and audiology. Although misophonia research remains in its infancy, there is sufficient evidence to indicate that misophonia is a distinct behavioral syndrome that can result in substantial distress and functional impairment (Brout et al., 2018; Jager et al., 2020; Potgieter et al., 2019; Schröder et al., 2013).

2.3 Phonophobia

The term phonophobia, literally meaning "fear of sound," is commonly used in neurology to describe the sound intolerance that often accompanies migraine headaches (Ashkenazi et al., 2009; Irimia et al., 2008; Vingen et al., 1998; Woodhouse & Drummond, 1993). However, in the current framework, we define phonophobia as a specific phobia of particular sounds or classes of sounds, resulting in anticipatory responses and avoidance of potential sound sources (Baguley & McFerran, 2011; Landgrebe & Langguth, 2011; Møller, 2011; Stiegler & Davis, 2010). Our definition of phonophobia is nearly synonymous with that of Tyler's (2014) "fear hyperacusis," whereas the "phonophobia" described in migraine could be better classified within this framework as episodic loudness hyperacusis (Suhnan et al., 2017). Although a fear of loud noises is common in childhood (Meltzer et al., 2009; Ollendick et al., 2002), a diagnosis of phonophobia would require an amount of fear and impairment out of proportion to what one would expect for that individual's developmental level (American Psychiatric Association, 2013). Furthermore, while both misophonia and phonophobia can involve inappropriate emotional reactions to specific sounds, the misophonic reaction primarily involves anger and/or disgust, whereas phonophobia is characterized by fear and/or anxious preoccupation. Notably, phonophobia as defined here often develops secondary to other forms of DST, as some patients with hyperacusis or misophonia may develop excessive anxiety with respect to situations in which they may encounter painful or otherwise distressing sounds (Blaesing & Kroener-Herwig, 2012; Goebel & Floezinger, 2008; Jager et al., 2020; Jüris et al., 2014; Landgrebe & Langguth, 2011).

2.4 Noise Sensitivity

Unlike the previous terms, noise sensitivity is not a diagnosable medical condition but is instead a stable personality trait that moderates one's reactions to noise. It is not, however, a true "sensory sensitivity," as this trait is unrelated to auditory detection thresholds (Stansfeld et al., 1985). Defined by Job (1999, p. 58), noise sensitivity refers to "the internal states (be they physiological, psychological [including attitudinal], or related to life style or activities conducted) of any individual which increase their degree of reactivity to noise in general." Noise sensitivity is thought to moderate the degree to which a person finds any given noise annoying, irrespective of overall noise exposure (Kliuchko et al., 2016; van Kamp et al.,

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2004). Compared to the general population, noise-sensitive individuals attend more to noises, find noises more threatening and out of their control, and adapt to noises more slowly (Stansfeld, 1992; Stansfeld & Clark, 2019). Unlike hyperacusis, noise sensitivity is not associated with changes in loudness functions (Ellermeier et al., 2001; Stansfeld et al., 1985), although self-reports of hyperacusis symptoms and noise sensitivity may correlate highly in some populations (Viziano et al., 2017). Notably, although most noise-sensitive individuals do not have hyperacusis, patients with hyperacusis report high levels of noise sensitivity (Paulin et al., 2016), likely as a result of the discomfort they experience in response to many everyday sounds.

2.5 Decreased Sound Tolerance

We define decreased sound tolerance (DST) as an umbrella term encompassing hyperacusis, misophonia, and phonophobia (P. J. Jastreboff & Jastreboff, 2014, 2015). This term is preferred over equally general terms such as "auditory defensiveness" and "auditory over-responsivity," as it refers to the subjective percept of the sound as intolerable without describing any particular behavioral reaction. The personality trait of noise sensitivity is *not* included within this definition, though high levels of noise sensitivity may be seen in those with DST (Paulin et al., 2016). Similarly, individuals with chronic subjective tinnitus are not necessarily classified as having DST, although comorbid hyperacusis (Tyler et al., 2014) and phonophobia (Blaesing & Kroener-Herwig, 2012; Landgrebe & Langguth, 2011) are commonly observed in this population and can be diagnosed separately. While the labels of hyperacusis, misophonia, and phonophobia are better able to describe the phenomenology of an individual's sound intolerance, the label of DST is useful when there is a lack of certainty about the underlying reasons for an individual's sound-induced distress or discomfort (e.g., in nonverbal individuals who cannot describe why certain sounds are aversive). Thus, we use DST to refer to the behavioral hyperreactivity to auditory stimuli seen in individuals on the autism spectrum, as it is currently unclear whether these behaviors are due to hyperacusis, misophonia, phonophobia, or some combination thereof (Stiegler & Davis, 2010). As we argue in the following section, all three conditions likely contribute to the high rates of DST behavior seen in autistic individuals, and further research is needed to determine their relative contributions to the autistic DST phenotype.

3. Phenomenology of Decreased Sound Tolerance in Autism

Although a sizable body of literature has been published on DST in autism (Gomes et al., 2008; Moossavi & Moallemi, 2019; O'Connor, 2012; Stefanelli et al., 2020; Stiegler & Davis, 2010), there has been relatively little research to date systematically examining the specific sounds that autistic individuals find distressing or which aspects of the stimuli these individuals find difficult to tolerate. Although some first-person accounts of autistic people contain descriptions of subjective DST (Bemporad, 1979; Cesaroni & Garber, 1991; DePape & Lindsay, 2016; Elwin et al., 2012, 2013; Howe & Stagg, 2016; R. S. P. Jones et al., 2003; Kirby et al., 2015; Landon et al., 2016; Preece & Jordan, 2010; A. E. Robertson & Simmons, 2015; Smith & Sharp, 2013; Stiegler & Davis, 2010; Volkmar & Cohen, 1985), these accounts often do not provide enough detail of the individual's perception of sound to confidently classify the reported DST as hyperacusis, misophonia, or phonophobia. An

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exception is the qualitative study by Landon and colleagues, which focused exclusively on the phenomenology of DST in autistic adults (Landon et al., 2016). In this study, researchers interviewed 10 adults with diagnosed autism and self-reported DST, asking questions about the participants' experiences of sounds, the qualities of sounds that they felt caused their distress, specific events that produced aversive reactions, and strategies employed to cope with sounds in everyday life. Participants consistently regarded loud, sharp, or otherwise high-pitched sounds to be the most distressing, although several also indicated that specific sounds elicited strong emotional reactions regardless of level. The authors concluded that the participants reported experiences were consistent with both hyperacusis and "an intolerance to specific sounds" (i.e., misophonia). Anxiety and avoidance also played a prominent role in the participants' responses to noise, indicating that a number of participants likely would be considered to have phonophobia as well.

Another frequently reported symptom in the Landon study was a tendency to be easily distracted by noises, even in relatively innocuous or quiet situations (Landon et al., 2016). Although auditory distractibility is pertinent to the overall sensory phenotype of autism, this process is distinct from DST as it is typically defined (Fagelson & Baguley, 2018; P. J. Jastreboff & Jastreboff, 2015). Moreover, auditory distractibility is likely mediated by higher-order cognitive factors such as working memory capacity and selective attention (Sörqvist, 2010; Sörqvist & Marsh, 2015; Sörqvist & Rönnberg, 2014), which are known to differ in the autistic population (Habib et al., 2019). Individuals with attention-deficit/hyperactivity disorder (ADHD) are also particularly susceptible to the effects of auditory distractions (Micoulaud-Franchi et al., 2015; Pelletier et al., 2016; Zentall & Shaw, 1980), and thus the high prevalence of co-occurring ADHD in autistic children and adults (Lai et al., 2019; Lugo-Marín et al., 2019) may contribute to the high rates of auditory distractibility seen in this population. A failure to habituate to low-level sounds may also play a role, as preliminary work has demonstrated reductions in simple loudness adaptation in autistic adults relative to neurotypical controls (Lawson et al., 2015). Alternatively, this symptom may be related to the ability of individuals on the autism spectrum to simultaneously process a larger amount of auditory information than neurotypical controls, a difference supported by data from laboratory-based auditory detection tasks (Brinkert & Remington, 2020; Remington & Fairnie, 2017). Auditory distractibility is also a known correlate of noise sensitivity (Belojević et al., 1992; Kjellberg et al., 1996; Sandrock et al., 2008), and the enhanced distractibility seen in autism could potentially contribute to more autistic individuals developing noise sensitivity. However, as the correlates of auditory distractibility in autism have yet to be empirically tested, these relationships remain purely speculative at this time.

In sum, the most detailed phenomenological account of DST in autism indicates that the auditory challenges in this population encompass hyperacusis, misophonia, phonophobia, and potentially noise sensitivity as well (Landon et al., 2016). Accordingly, questions of whether the DST seen in autism is physiological or psychological in origin (Stiegler & Davis, 2010) present a false dichotomy, as abnormalities in lower-level perceptual processes (i.e., hyperacusis) and higher-level cognitive processes (i.e., misophonia and phonophobia) each likely contribute to DST in a portion of autistic individuals (Danesh et al., 2015; Demopoulos & Lewine, 2016; Khalfa et al., 2004; Landon et al., 2016; B. Y. Lau et al.,

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2020; A. E. Robertson & Simmons, 2015). Still, it remains possible that a "dominant" pattern of sound intolerance (e.g., loudness hyperacusis) exists in this population. Thus, in sections 3.1–3.3, we review the published literature suggesting that DST in autism is characterized by (a) hyperacusis, (b) misophonia, and (c) phonophobia.

3.1 Hyperacusis in Autism

An aversion to loud stimuli is one of the most prominent forms of DST reported in both personal accounts and clinical descriptions of autism (O'Connor, 2012; Phillips & Carr, 1998; Stiegler & Davis, 2010; Tyler et al., 2014). Furthermore, when autistic people complete standardized self-report questionnaires assessing hyperacusis symptoms, they routinely endorse higher symptom levels than neurotypical controls (Danesh et al., 2015; Dunlop et al., 2016; Keith et al., 2019). Though such reactions are highly consistent with hyperacusis, it remains unclear whether individuals on the autism spectrum are more likely to manifest the loudness or pain subtype. Personal accounts of autism often describe certain sounds as physically painful (Elwin et al., 2012; Howe & Stagg, 2016; R. S. P. Jones et al., 2003; Kirby et al., 2015; Landon et al., 2016; A. E. Robertson & Simmons, 2015; Smith & Sharp, 2013); however, there are no empirical studies quantifying the number of autistic individuals who experience physical pain in response to everyday sounds. Alternatively, several studies indicate that loudness growth functions assessed via categorical loudness scaling are steeper in persons on the autism spectrum (Dunlop et al., 2016; Khalfa et al., 2004; Ohmura et al., 2019), confirming the presence of loudness hyperacusis in those participants. Notably, an unpublished study by our group of 243 patients with self-reported hyperacusis contained four individuals on the autism spectrum (Williams, Suzman, et al., 2020a), two of whom reported pain hyperacusis (one with comorbid misophonia and the other with comorbid phonophobia) and two of whom reported loudness hyperacusis (one with comorbid phonophobia and the other reporting no other DST conditions). Three of these individuals (two loudness, one pain) had also received diagnoses of hyperacusis from physicians or audiologists. These data, although preliminary, support the contention that both loudness and pain hyperacusis are present in some individuals on the autism spectrum, although the portion of individuals experiencing each subtype has yet to be precisely determined.

As further evidence of hyperacusis in autism, individuals on the autism spectrum also tend to exhibit lower loudness discomfort levels (LDLs) than neurotypical controls (Demopoulos & Lewine, 2016; Khalfa et al., 2004; Rosenhall et al., 1999; Steigner & Ruhlin, 2014). During LDL testing, a discrete sound stimulus (typically about one second in duration) is repeatedly presented with increasing intensity until the participant verbally or behaviorally indicates that the sound has become uncomfortably loud (Punch et al., 2004). In one of the first studies objectively assessing sound tolerance in autism, Rosenhall et al. (1999) reported that 18% of autistic children were unable to tolerate an 80 dB nHL broadband click stimulus as part of an auditory brainstem testing protocol (although all could tolerate be tested at 70 dB nHL). Notably, only one autistic child with sound tolerance problems had a sensorineural hearing loss, indicating that loudness recruitment could not account for this phenomenon in the majority of the sample. A smaller but more comprehensive study by Khalfa et al. (2004) confirmed the presence of enhanced loudness perception in autism, reporting that 63% of

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their autism group had LDLs for pure tones below 80 dB HL. In a higher-IQ group of autistic children, Demopoulos and Lewine (2016) tested LDLs for speech stimuli, finding that 37% of their autism group reported LDLs three or more standard deviations below the neurotypical group's mean in at least one ear. Steigner and Ruhlin (2014) also reported the case of an autistic man with profoundly reduced tolerance of low-frequency sounds, confirmed by abnormally low LDLs to tones in the low frequencies and normal LDLs in the high frequencies (≥2000 Hz). Two additional studies have used behavioral observations to test sound tolerance in autistic children, finding that only a small minority of individuals exhibited behavioral signs of distress when exposed to high-level sounds (Gomes et al., 2004; Lucker, 2013). However, both of these studies were limited by their reliance solely on observable behavioral reactions; they were unable to rule out the possibility that additional participants experienced the sounds as uncomfortable but failed to communicate that discomfort in a "typical" way (Keating & Cook, 2020; D. J. Moore, 2015). Despite mixed results concerning behavioral loudness tolerance, multiple studies demonstrating reduced LDLs in autism suggest that loudness hyperacusis is prevalent in this population, although other forms of DST (i.e., pain hyperacusis or phonophobia) may also contribute to these abnormalities.

To further assess the role of loudness in autism-associated DST, we also consider the literature on intensity discrimination in this population. In persons with cochlear hearing loss and loudness recruitment (increased loudness growth due to outer hair cell damage), it has been hypothesized that steepened loudness functions translate into superior intensity discrimination ability (Buus et al., 1982; although see Huettel & Collins, 2004; Schroder et al., 1994 for an alternative explanation based on spread of excitation). Thus, based on the steeper loudness functions observed in autism, it would stand to reason that autistic people may also possess superior intensity discrimination ability compared to neurotypical listeners. However, the literature on psychophysical intensity discrimination in autism has not confirmed this hypothesis, with the majority of studies finding intensity discrimination abilities in persons on the autism spectrum to be normal (Alcántara et al., 2012; Bonnel et al., 2010; C. R. G. Jones et al., 2009) or even impaired (Kargas et al., 2015) relative to neurotypical controls. While these data are inconsistent with the theory that abnormal loudness growth in autism leads to enhanced intensity discrimination, it is notable that none of these studies concomitantly measured loudness functions and intensity discrimination thresholds. It is therefore still possible that the subset of individuals on the autism spectrum with steep loudness growth curves *would* exhibit superior intensity discrimination when compared to typical controls. Further work on loudness and intensity processing in autism is necessary to extend these findings, specifically addressing whether subjective reports of hyperacusis can be linked to psychoacoustic disturbances of loudness perception.

3.2 Misophonia in Autism

As misophonia has only recently been recognized as a distinct DST condition, far fewer studies have considered it as a potential explanation for observed behavioral reactions to auditory stimuli in autism (Stiegler & Davis, 2010). Furthermore, no study has specifically been conducted to assess the prevalence of misophonia in autistic individuals. Nevertheless, in the clinical sample of misophonia patients described by Jager et al. (2020), 14 of 575

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(3%) were diagnosed with comorbid autism spectrum disorder. Notably, individuals with "primary autism spectrum conditions" referred for misophonia evaluation were excluded from the sample (i.e., misophonia in the aforementioned 14 individuals was judged to be "separate" from autism), indicating that the overlap between these conditions could potentially be substantially larger. Additionally, 38 of 1061 individuals (3.6%) in a large online sample of adults with self-reported misophonia reported having been diagnosed with autism (Claiborn et al., 2020), a prevalence nearly double that of the general population (Dietz et al., 2020). In another large clinical sample, over one fourth of children referred to a specialist pediatric hyperacusis center (60% of whom were diagnosed with autism) identified classic misophonia triggers (i.e., "people chewing, breathing, and snoring") as the specific sounds causing distress (Amir et al., 2018). Lastly, in the survey of DST in autism performed by Law et al. (2016), many parents reported that environmental sounds made their children irritable (61.3%), frustrated (43.9%) or annoyed (40.9%), raising the possibility that some of these episodes may arise from misophonic reactions (Potgieter et al., 2019).

A number of personal accounts also support the contention that autistic individuals with DST may be experiencing misophonia-like symptoms (Cesaroni & Garber, 1991; Grinker, 2007; Landon et al., 2016; A. E. Robertson & Simmons, 2015; Smith & Sharp, 2013). A particularly classic account of an autistic person displaying misophonic reactions comes from anthropologist Roy Grinker, who described his autistic teenage daughter Isabel's reaction to very specific sounds such as throat-clearing and the sounds of certain words:

> …she still hates certain sounds, like a baby crying, the car alarm that tells you your seatbelt isn't fastened, or the sound of a bathtub draining. When she hears them, she gets agitated, holds her hands over her ears, and vocalizes to block out the sound. She has the same reaction when she hears me clear my throat, or when someone says words associated with bathing, such as "bath," "shower" or "shampoo." (Grinker, 2007, p. 299)

Other examples have been published of autistic adults reacting strongly to sounds considered to be common misophonic triggers, "Small noises annoy me, like breathing, crunching food or … someone whistling … it makes me ratty" (A. E. Robertson & Simmons, 2015, p. 575) or describing experiences of being emotionally "triggered" by sounds in a way they retrospectively view as excessive:

> … there is all this energy racing around inside me out of irritation and thinking about these things… its building up inside and you can't let it out, you can't go "ahhhhh be quiet" or whatever and can't be jumping up and down or doing anything… (Landon et al., 2016, p. 47).

Remarkably, many of these individuals reporting misophonia-like experiences also seemed to concurrently experience problems tolerating loud noises (Landon et al., 2016), suggesting that a number of autistic individuals with DST may meet criteria for both misophonia and hyperacusis. Overall, these results together provide substantial evidence that at least some cases of DST in autism are likely due to misophonia, although additional research is needed to estimate the prevalence of misophonia, its co-occurrence with other types of DST, and its functional consequences in this population.

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3.3 Phonophobia in Autism

Comorbid anxiety disorders are exceedingly common in autistic individuals (Hollocks et al., 2019; Lai et al., 2019), presenting as a mixture of "typical" anxiety symptoms and "atypical" fears that are unique to autism (Kerns et al., 2014, 2016; Kerns & Kendall, 2012; B. Y. Lau et al., 2020; Rodgers et al., 2016; Scahill et al., 2019; Wood & Gadow, 2010). Among these autism-specific fears, a number of studies have listed loud noises (either loud noises in general or specific noises such as toilets flushing) as the object of a child's specific phobia (Gjevik et al., 2011; Kerns et al., 2014, 2016; B. Y. Lau et al., 2020; Leyfer et al., 2006; Mayes et al., 2013; Mukaddes & Fateh, 2010; Ozsivadjian et al., 2012), and multiple autism-specific anxiety questionnaires include items directly assessing a fear of loud noise (Rodgers et al., 2016; Scahill et al., 2019). This particular fear is present in a sizable minority of autistic children, with one large study finding that 23% had a phobia of loud sounds (e.g., babies crying, hairdryer sounds), and an additional 6% had fears of other specific sounds (B. Y. Lau et al., 2020). In addition, over half of autistic children with DST in the study by Law et al. (2016) were reported to become "scared" (55%) or "nervous" (54%) in response to bothersome sounds. No study has investigated the prevalence of phonophobia in adults on the autism spectrum, but qualitative reports indicate that many autistic adults continue to experience anxiety in response to loud noises (Simonoff, 2020), resulting in patterns of avoidance consistent with a specific phobia of these sounds (Bemporad, 1979; Cesaroni & Garber, 1991; Landon et al., 2016; Smith & Sharp, 2013).

Although published studies confirm the presence of phonophobia in many individuals on the autism spectrum, one major unresolved question in this area is whether this phonophobia is secondary to hyperacusis or unrelated to abnormalities in loudness perception. As noted by Jastreboff and Jastreboff (2015), phonophobia is practically inevitable in cases of severe hyperacusis, as anxious apprehension and hypervigilance directed toward everyday sounds can easily develop from repeated exposures to extremely unpleasant/painful stimuli. Kerns and colleagues (2016) provide a relevant case example, in which an autistic child develops an anticipatory fear of fire alarms as a result of pre-existing hyperacusis. However, these authors argue that the majority of DST-related impairment experienced by this patient is due to hyperacusis, and therefore a diagnosis of specific phobia is not warranted unless a more impairing pattern of avoidance behavior develops. Interestingly, there is some limited evidence that behavioral tolerance of the aversive sound stimulus can be achieved by treating the phobia with graded exposure (Johnston et al., 2020; Koegel et al., 2004). This may indicate a bidirectional relationship between sound-induced discomfort and anxiety, whereby interventions targeting either hyperacusis or phonophobia symptoms have the potential to reduce symptoms in the other domain. As acute stress can decrease LDLs in some individuals (Hasson et al., 2013), reducing phobic anxiety could feasibly improve both the emotional reaction to the feared sound and its perceived loudness. However, as these studies did not include judgments of subjective loudness or pain, any effects of exposure therapy on the perceptual qualities of aversive sounds remain speculative. An alternative possibility is that the participants in these studies did not suffer from hyperacusis at all, and thus treatment of phonophobia was sufficient to eliminate all DST in those individuals. Additional research is necessary to determine whether autistic people with

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psychoacoustically-confirmed hyperacusis can experience a reduction in subjective DST from interventions targeting phonophobia or anxiety in general.

4. Potential Mechanisms of Decreased Sound Tolerance in Autism

While DST in autism is frequently discussed from a clinical perspective, the neurobiological correlates of this symptom cluster remain poorly understood. A wide range of abnormalities in the structure and function of the auditory system have been demonstrated in both autistic individuals and preclinical animal models of autism (Beers et al., 2014; Chin et al., 2013; McCullagh et al., 2020; O'Connor, 2012; Pillion et al., 2018; Williams, Abdelmessih, et al., 2020), but few theoretical models have been constructed to link these findings to behavioral sound intolerance. Instead, current theoretical frameworks for sensory hyperreactivity in autism tend to focus on multi-modality sensory processing (Mottron et al., 2006; Pellicano & Burr, 2012; C. E. Robertson & Baron-Cohen, 2017; Van de Cruys et al., 2014; Ward, 2019) in an attempt to explain the wide range of sensory differences seen in autistic individuals. Alternatively, a number of theoretical mechanisms of DST have been proposed based on findings in non-autistic individuals (Auerbach, 2019; Auerbach et al., 2014; Brout et al., 2018; Diehl & Schaette, 2015; P. J. Jastreboff & Jastreboff, 2014, 2015; Kumar et al., 2017; Palumbo et al., 2018; Pienkowski, 2019; Pienkowski et al., 2014; Sheppard et al., 2020; Suhnan et al., 2017), few of which have been specifically considered in the context of autism-associated DST. Thus, the purpose of this section is to synthesize the literature on these related topics, generating explanatory neurocognitive models to account for the presence of hyperacusis, misophonia, and phonophobia in individuals on the autism spectrum. Although evidence to support our proposed mechanisms of DST in autism is limited at this time, these theoretical models will provide a framework for future research in this area, generating hypotheses about the underlying neurobiology of DST and providing context for findings related to auditory physiology in autism and related conditions.

4.1 Model of Hyperacusis: Enhanced Central Gain

Although the underlying biology of hyperacusis is still poorly understood, a growing body of evidence suggests that the symptoms of loudness hyperacusis are generated by a pathological increase in central auditory gain (Auerbach, 2019; Auerbach et al., 2014; Diehl & Schaette, 2015; Pienkowski, 2019; Salvi et al., 2020; Sheppard et al., 2020) in which "neural activity from more central auditory structures is paradoxically increased at suprathreshold intensities" (Auerbach et al., 2014, p. 1). In particular, animal models of hyperacusis display steeper neural input-output functions in multiple cortical and subcortical areas, with the largest increases seen in the inferior colliculus (IC) and primary auditory cortex (Auerbach et al., 2019; Y.-C. Chen et al., 2015; Ma et al., 2020; Salvi et al., 2020; Stolzberg et al., 2012; Wong et al., 2020). Although there have been few studies examining sound-evoked neural activity in humans with hyperacusis (J.-H. Hwang et al., 2009), those that have examined hyperacusis in tinnitus patients have typically found increased activity comparable to that seen in these animal models (Gu et al., 2010; Lanting et al., 2008; Melcher et al., 2009). As activity in the primary and secondary auditory cortex is thought to encode loudness rather than intensity (Behler & Uppenkamp, 2016, 2020; Langers et al., 2007; Röhl & Uppenkamp, 2012; Schmidt et al., 2020; Schreiner & Malone, 2015;

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Uppenkamp & Röhl, 2014), hyperactive responses to sounds in these areas are hypothesized to be the substrate of loudness hyperacusis. While some studies have indicated that this enhanced neural activity may be insufficient to explain hyperacusis-like behavior in animal models (Möhrle et al., 2019; Radziwon et al., 2019), the central gain model remains the most empirically-supported model of hyperacusis pathophysiology proposed to date (Auerbach, 2019; Auerbach et al., 2014; Diehl & Schaette, 2015; Pienkowski, 2019; Sheppard et al., 2020).

Given the strong associations between hyperacusis, tinnitus, and noise exposure (Pienkowski et al., 2014; Tyler et al., 2014), the central gain model of hyperacusis typically posits that an increase in central gain is a homeostatic consequence of reduced neural output from the cochlea (i.e., sensorineural hearing loss or potentially "cochlear synaptopathy"; Auerbach et al., 2014; Hickox & Liberman, 2014). However, rates of peripheral hearing loss are not greatly elevated in persons on the autism spectrum (Beers et al., 2014), and the majority of autistic individuals with reduced LDLs have hearing acuity within normal limits (Demopoulos & Lewine, 2016; Dunlop et al., 2016; Khalfa et al., 2004; Rosenhall et al., 1999), indicating that the central gain mechanism that putatively drives hyperacusis in autism may arise via a different mechanism. Though we are only able to speculate about the ways in which aberrant neurodevelopment in autism could contribute to enhanced central auditory gain, multiple plausible mechanisms exist based on current understandings of autism neuropathology (Figure 1).

One likely source of enhanced central gain in autism is auditory brainstem dysfunction, which has been observed in both idiopathic autism and several neurodevelopmental syndromes that frequently cause autism, such as fragile X syndrome (McCullagh et al., 2020; Pillion et al., 2018). Postmortem human and rodent studies have documented a number of abnormalities in auditory brainstem nuclei, with multiple studies converging on pathology in the superior olivary complex (Eto et al., 2017; Kulesza et al., 2011; Kulesza & Mangunay, 2008; Li et al., 2003; Lukose et al., 2011, 2015; Mansour et al., 2019; Mansour & Kulesza, 2020; McCullagh et al., 2020; Rodier et al., 1997; Rotschafer et al., 2015; Rotschafer & Cramer, 2017; Toyoshima et al., 2009; Zimmerman et al., 2018, 2020), a group of nuclei that mediates aspects of binaural processing and the efferent auditory pathways (Guinan, 2006, 2018; Laumen et al., 2016). Though data are mixed regarding the presence and nature of functional auditory brainstem abnormalities in autism (Bennetto et al., 2017; Dabbous, 2012; Danesh & Kaf, 2012; ElMoazen et al., 2020; Gravel et al., 2006; Kaf & Danesh, 2013; B. K. Lau et al., 2018; Lukose et al., 2013; McCullagh et al., 2020; Mercati et al., 2017; Miron et al., 2018, 2020; Ohmura et al., 2019; Pillion et al., 2018; Santos et al., 2017; Talge et al., 2018; Tharpe et al., 2006; Wilson et al., 2017), preliminary studies have indicated that certain auditory brainstem assays may differentiate autistic individuals with and without concurrent hyperacusis (Mercati et al., 2017; Ohmura et al., 2019; Wilson et al., 2017). In cases where such brainstem dysmorphology does exist, data from animal models suggests that fewer inhibitory axons project from various areas of the auditory brainstem to the IC (Li et al., 2003; Zimmerman et al., 2020). As the central gain model typically posits increased spontaneous and sound-evoked activity in the IC and higher auditory regions (Auerbach et al., 2014), a plausible model of central gain in autism would likely include similar enhancements of activity in these areas, brought on by homeostatic

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adaptations to aberrant brainstem information transfer. We therefore propose a model wherein structural abnormalities in the auditory brainstem during early neurodevelopment lead to compensatory changes in the IC and auditory cortex in autism, which result in an overall increase in central auditory gain and hyperacusis symptoms (Figure 1B). As the percept of subjective loudness (rather than sound intensity) is not seemingly represented until auditory cortex (Behler & Uppenkamp, 2016; Langers et al., 2007; Röhl & Uppenkamp, 2012; Schreiner & Malone, 2015; Uppenkamp & Röhl, 2014), increased central gain occurring only in cortical structures may also reasonably explain the phenomenon of hyperacusis in autism. Further research using both animal models and human neuroimaging is thus necessary to validate this model, investigating the presence of increased central auditory gain in autism at either the cortical or subcortical level.

An alternative explanation for increased central auditory gain in autism is the presence of an imbalance in the ratio of excitatory and inhibitory neurotransmission (E/I ratio) in key subcortical and cortical auditory structures (McCullagh et al., 2020), leading to an overall increase in activity of the IC, thalamus, and/or auditory cortex (Figure 1C). Such an increase in E/I ratio is not inconsistent with the previous hypothesis of brainstem dysfunction, as an imbalanced E/I ratio could feasibly serve as the circuit-level substrate of decreased brainstem information transfer or the homeostatic activity upregulation seen in the IC and/or auditory cortex (McCullagh et al., 2020; Zimmerman et al., 2020). Furthermore, it is quite likely that an increased E/I ratio is responsible for increases in central gain seen in models of hyperacusis elicited by salicylates (G.-D. Chen et al., 2013; Gong et al., 2008; Lu et al., 2011; W. Sun et al., 2009) or acoustic trauma (Heeringa & van Dijk, 2016; Ma et al., 2020; Salvi et al., 2000; Scholl & Wehr, 2008; Wei Sun et al., 2012).

A model of increased E/I ratio has long been posited as a common final pathway to explain the core features of autism (Culotta & Penzes, 2020; Foss-Feig et al., 2017; Lee et al., 2017; Nelson & Valakh, 2015; Rubenstein & Merzenich, 2003; Sohal & Rubenstein, 2019) as well as some associated conditions such as epilepsy (Bozzi et al., 2018). Although some recent data have suggested that this imbalance is an epiphenomenon of autism rather than its underlying cause (Antoine et al., 2019), this distinction is irrelevant when determining whether E/I imbalance is responsible for hyperacusis and enhanced central gain in some autistic individuals. The E/I imbalance model was further elaborated by Ward (2019) as a potential explanation for the wide range of sensory features seen in autism. In this framework, an increased E/I ratio results in both an increased signal level but also increased noise within a neural circuit's computations. Thus, a given sensory stimulus will elicit a stronger neural response, activating larger areas of cortex and corresponding to a more intense (and in the case of hyperacusis, louder) percept. Although evidence for this model of sensory hyperreactivity is mixed (Dickinson et al., 2016; Ward, 2019), there are no studies specifically investigating the relationship of loudness hyperacusis and E/I imbalance in humans. A single study (Naples et al., 2020) has examined the relationship between self-reported "auditory sensitivity" (as measured by the Glasgow Sensory Questionnaire; A. E. Robertson & Simmons, 2013) and E/I imbalance (as measured by the Hurst exponent of the resting EEG power spectrum) in a sample of adults with and without diagnoses of autism or schizophrenia, finding a moderate correlation between the two metrics. In addition, comorbid epilepsy is associated with DST in autistic children (Law et al., 2016), implicating

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E/I imbalance as a potential cause of both co-occurring conditions. Furthermore, both rodent and human studies suggest that the phenotype of DST and increased auditory cortical activity seen in fragile X syndrome (Ethridge et al., 2016; McCullagh et al., 2020; Rotschafer & Razak, 2013) can be attributed to an E/I imbalance in auditory cortex (Ethridge et al., 2017; Lovelace et al., 2020; Wen et al., 2018). Given the plausibility of E/I imbalance as a mechanism for central auditory gain and hyperacusis in autism, future studies on this topic should incorporate human neuroimaging metrics of E/I balance (Bruining et al., 2020; Dickinson et al., 2016; Trakoshis et al., 2020), testing whether psychoacoustically-defined loudness growth is associated with an excess of excitatory neurotransmission.

4.2 Model of Misophonia: Conditioned Allocation of Excess Salience

In contrast to hyperacusis, there has been relatively little research seeking to understand the pathological basis of misophonia in non-autistic individuals. Based on neurophysiologic models of tinnitus and hyperacusis, Jastreboff and Jastreboff (2014, 2015) proposed a model of misophonia/phonophobia (considered to be the same construct in their framework) in which the processing of low-level auditory information is intact, but "the functional connections between the auditory and the limbic and autonomic nervous systems are enhanced for specific patterns of sound," (P. J. Jastreboff & Jastreboff, 2014, p. 111). This model suggests that the aversive responses to sounds seen in misophonia are developed and maintained, at least in part, by associative learning mechanisms, and thus that the brain areas most likely implicated in misophonia are those involved in emotion, memory, and learning (Brout et al., 2018). So far, a small number of studies have begun to validate parts of this model. For instance, it is now fairly well established that individuals with misophonia have normal hearing acuity (Jager et al., 2020) and that exposure to misophonic triggers induces a degree of autonomic arousal greater than that seen in healthy controls (Edelstein et al., 2013; Kumar et al., 2017; Schröder et al., 2019). Furthermore, preliminary neuroimaging studies of misophonia indicate that misophonic triggers elicit intense emotional responses that are coupled with hyperactivation of anterior insular cortex (Kumar et al., 2017; Schröder et al., 2019), a key node of the brain's salience network (Menon & Uddin, 2010; Uddin, 2015). One of these studies also investigated functional connectivity of the anterior insula during the presentation of misophonic trigger sounds (Kumar et al., 2017), finding an increase in connectivity between the insula and ventromedial prefrontal cortex, posteromedial cortex, hippocampus and amygdala, limbic regions involved in emotional processing and regulation. Thus, while misophonic reactions are likely mediated in part by the limbic system, the primary process at work may instead be the attribution of excessive salience to specific sounds.

The attribution of salience to specific auditory stimuli is an important neurocognitive process that allows individuals to efficiently focus attention on important environmental signals (e.g., a fire alarm or police siren) and to enact a timely behavioral response (Huang & Elhilali, 2017; Kaya & Elhilali, 2017). Of particular note, the human auditory system has been evolutionarily primed to detect and respond to the cries of our young (Arnal et al., 2015; Soltis, 2004), and thus, the acoustic properties of an infant's cry cause this sound to be exceptionally salient. Using acoustic analysis, psychophysical experiments, and neuroimaging, Arnal et al. (2015) demonstrated that a wide range of natural and artificial

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alarm signals (including human screams, air horns, and sports arena buzzers) all contain amplitude modulations in the 30–150 Hz range, which correlate with the psychoacoustic attribute of roughness (see also Trevor et al., 2020). The roughness of a sound is highly predictive of its salience and subjective aversiveness (Arnal et al., 2015, 2019; Zhao et al., 2019), and individuals can localize rough stimuli both more quickly and more accurately than other sounds (Arnal et al., 2015). Notably, the perception of rough sounds is associated with unique patterns of brain activity, including the synchronization of large-scale salience-related networks that include superior temporal regions, subcortical and cortical limbic areas, frontal areas (e.g., inferior frontal gyrus, orbitofrontal cortex), and insular cortex (Arnal et al., 2019). As preliminary neuroimaging studies implicate many of these areas in the pathophysiology of misophonia (Kumar et al., 2017; Schröder et al., 2019), we hypothesize that misophonia is characterized by dysfunctional hyperactivation of this specialized "auditory salience detection" network, causing individuals with misophonia to categorize a number of everyday sounds as disproportionately salient and aversive.

In addition to neuroimaging studies, several other factors suggest that an inappropriate attribution of salience to auditory stimuli could lie at the heart of misophonia. Subjectively, patients with misophonia routinely describe an intense hyper-focus on their various trigger stimuli (da Silva & Sanchez, 2019; Edelstein et al., 2013; Osuagwu et al., 2020; Schröder et al., 2017), which may serve to further amplify the already intense emotional reactions elicited by those stimuli. Moreover, in the first published study to systematically evaluate cognitive behavioral therapy in misophonia, Schröder and colleagues (2017) targeted hyper-focus on trigger sounds as a core symptom of misophonia in addition to the patients' negative emotional reactions (see also Aazh et al., 2019). The potential interactions between hyper-focus on triggers, intense emotional experiences, and autonomic arousal can be further explained by the large degree of functional overlap between neural circuits responsible for sympathetic arousal, emotion, and salience detection (Beissner et al., 2013). As the salience of an auditory stimulus is highly associated with its perceived emotional intensity (Anikin, 2020), it is quite possible that the intense negative emotional reactions seen in misophonia could be coupled with an over-activation of salience neurocircuitry, along with associated projections to limbic areas. Moreover, as auditory salience attribution is remarkably context dependent (Huang & Elhilali, 2017), a salience mechanism helps account for the variable reactions that individuals with misophonia can have to the same stimulus across different situations. Furthermore, the inability of self-produced sounds to trigger a misophonic reaction can potentially be explained by the reduced salience attributed to self-generated stimuli, a phenomenon known as self-suppression (Hughes et al., 2013; Whitford, 2019). Like other authors, we contend that the idiosyncratic nature of misophonic triggers is the result of each individual's unique learning history; however, as some sounds have been reported to trigger the vast majority of individuals with misophonia (e.g., chewing, nasal/breathing sounds; Jager et al., 2020), we also believe that some acoustic property of these sounds preferentially activates the aforementioned salience attribution neurocircuitry in persons with misophonia, increasing the likelihood that a given individual will find them aversive.

With regard to the neural underpinnings of misophonia, we have no *a priori* reason to expect that the pathophysiology of this condition would differ in autistic and non-autistic

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individuals. Moreover, the insula and salience network have been heavily implicated in the pathology of autism (Nomi et al., 2019; Uddin, 2015), and changes in insular structure/function may contribute to a higher rate of misophonia in individuals on the autism spectrum. This hypothesis is further supported by neuroimaging studies in autistic children that indicate that nonspecific (auditory-tactile) sensory hyperreactivity is related to increased resting-state connectivity between the salience network and amygdala (Green et al., 2016; Green & Wood, 2019). This finding also raises the question of whether the intolerance of stimuli in other modalities seen in autism could similarly be attributed to the mechanism of excessive salience attribution. Additional research is necessary to understand the manner in which the salience network contributes to sensory processing abnormalities in autism, particularly in the context of comorbid misophonia.

4.3 Model of Phonophobia: Pathological Fear Learning and Extinction

As a form of specific phobia, the neurobiological underpinnings of phonophobia are far more established than those of either hyperacusis or misophonia. A large body of research has been published on the neural correlates of fear conditioning and anxiety disorders (Chavanne & Robinson, 2020; Garcia, 2017; Herry & Johansen, 2014; Ipser et al., 2013; LeDoux et al., 2017; Tovote et al., 2015), as well as the ways in which auditory stimuli acquire affective valence (Frühholz et al., 2016). While a comprehensive overview of both topics is beyond the scope of this review, we seek to integrate these two lines of research into a neurocognitive model of phonophobia, which can be applied to autistic as well as non-autistic individuals.

The predominant neurocircuitry involved in fear and fear conditioning centers on connections within and between nuclei of the amygdala, hippocampus, and multiple areas of medial prefrontal cortex, including anterior cingulate cortex (ACC) and ventromedial prefrontal cortex (vmPFC; Chavanne & Robinson, 2020; Fullana et al., 2020; Tovote et al., 2015). The amygdala is essential for the acquisition, storage, and expression of learned fear associations, serving as a major hub in a number of fear- and anxiety-related neural circuits (LeDoux, 2000). Additionally, the amygdala is highly connected to auditory areas of the thalamus and cortex (Frühholz et al., 2016; Frühholz & Staib, 2017; LeDoux et al., 1991), and during sound processing, the amygdala is implicated in both the modulation of auditory cortical activity (Aizenberg et al., 2019) and encoding multiple features of the sound stimulus, including its perceived aversiveness (Kumar et al., 2012; Viinikainen et al., 2012). This hippocampus is primarily involved in the learning, storage, and retrieval of fear memories, as well as inhibiting the retrieval of these memories in specific contexts. The ACC, which plays a role in assessing the salience of a stimulus and regulating emotional responsiveness, has been associated with the expression of conditioned fear responses (Ipser et al., 2013). Via connections with the anterior insula, the ACC also makes up part of a "central autonomic–interoceptive network," which is responsible for integrating representations of one's cognitive, affective, and physical state to facilitate homeostatic autonomic and behavioral responses (Fullana et al., 2016). The vmPFC plays a role in the inhibition of threat expression by downregulating amygdala activity (Fullana et al., 2020), and this region is also implicated in the generation, storage, and retrieval of "safety" signals (i.e., extinction memories; Fullana et al., 2016; Milad & Quirk, 2012). Working in concert,

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this fear conditioning network serves to evaluate the content of a stimulus within the current context, triggering downstream signals of "danger" or "safety" and priming the individual to enact an appropriate behavioral response.

Although appropriate fear learning is key to survival, dysfunctional fear neurocircuitry can lead to phobias, in which the fear experienced by an individual is disproportionate to any potential danger. Neuroimaging studies have indicated that specific phobia is associated with hyperactivation of the amygdala and insular cortex when exposed to a phobic stimulus (Ipser et al., 2013), seemingly indicating that the salience and subjective aversiveness of the stimulus are both exaggerated in this condition. As a fear of loud noises is common during development (Meltzer et al., 2009; Ollendick et al., 2002), phonophobia is considered a nonexperiential or nonassociative phobia (i.e., a phobia not developed through direct experience with the phobic object; Garcia, 2017; Poulton & Menzies, 2002). While for the majority of children, the fear of loud noises is transient, there exists a small group of individuals in whom these fears intensify over time rather than resolving, potentially due to a genetic vulnerability (Muris et al., 2002). According to a recent model proposed by Garcia (2017), nonexperiential phobias are generated and maintained by both a sensitization of the fear response and a deficit in fear extinction learning, resulting in overly exaggerated initial fear responses and a persistence of the irrational fear despite nontraumatic exposure to the feared stimulus. This sensitized fear response is likely due to hyperactive amygdala responses to loud noises, which could result from baseline differences in the extent of sound-evoked auditory cortical activity, amygdala E/I balance, or auditory-limbic connectivity. Individuals with hyperacusis in particular may find specific sounds extremely painful or aversive, leading to a similar avoidant phenotype seen in chronic pain patients with high levels of pain anxiety (Greenberg & Burns, 2003). In addition to this sensitized fear response, individuals with specific phobias display persistent amygdala activity to repeated stimulation that does not habituate effectively (Garcia, 2017). An inability to habituate to repeated exposures likely indicates an underlying deficit in the ability to encode the "safety" signal necessary to extinguish a learned fear response. Thus, abnormalities in neurocircuitry involved in fear extinction, including the vmPFC and hippocampus (Fullana et al., 2016), likely play a role in the pathological persistence of phobic responses. Additionally, the extinction process may be hindered in patients with hyperacusis, whose adverse reactions to loud and/or painful sounds may serve to reinforce their maladaptive responses to phobic stimuli.

Although this model of phonophobia is equally applicable to autistic and non-autistic individuals, neuroimaging studies of autism provide further evidence of its utility in this population. Autistic children and adolescents display elevated amygdala activity in response to mildly aversive auditory stimuli (Green et al., 2013, 2015), with stronger amygdala activation predicting higher levels of parent-reported sensory hyperreactivity (Green et al., 2013, 2015). In addition, autistic individuals with high levels of sensory hyperreactivity demonstrate reduced amygdala habituation over repeated presentations of auditory and tactile stimuli (Green et al., 2015, 2019), which is thought to result from altered functional connectivity of the amygdala with prefrontal regions (Green et al., 2015, 2019). These findings provide preliminary evidence that the pattern of neural activity elicited by sensory stimuli in autistic individuals may be altered in such a way as to predispose these individuals

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to developing specific phobias, including phonophobia. This hypothesis is further supported by clinical studies demonstrating correlations between self/parent reports of sensory hyperreactivity and anxiety symptoms in autistic children and adults (Glod et al., 2015; Y. I. J. Hwang et al., 2020; Neil et al., 2016, 2017; Pickard et al., 2020; Syu & Lin, 2018; Wigham et al., 2015), with particularly strong relationships between sensory hyperreactivity and symptoms of specific phobia (Bitsika et al., 2016; Black et al., 2017; MacLennan et al., 2020). Longitudinal studies further indicate that increased sensory hyperreactivity early in development is predictive of later anxiety symptoms, both in autistic children and the general population (Carpenter et al., 2019; Green et al., 2012). This body of research generally supports the theory that hyperreactivity to sensory stimuli in autism may contribute to the high rates of anxiety disorders seen in this population (Green & Ben-Sasson, 2010; Kerns et al., 2016; McVey, 2019; Muskett et al., 2019; South & Rodgers, 2017). However, as sensory reactivity to date has primarily been measured using parent reports of a child's observable behaviors, it remains possible that many aversive responses to sensory stimuli are actually the manifestations of specific phobia (Koegel et al., 2004). Additional research relating observed sound intolerance behaviors, psychoacoustic loudness growth, and phonophobia symptoms is thus necessary to clarify the relative contributions of hyperacusis and phonophobia to the observable phenotype of DST in autism.

5. Conclusion and Future Directions

Based on our review of the literature on DST in autism, it is likely that autistic individuals with DST present with a wide range of subjective complaints, including hyperacusis, misophonia, and phonophobia. Evidence from personal accounts, behavioral studies, and psychophysical tests all tend to support the notion that autistic people frequently perceive everyday sounds as unbearably loud or painful, suggesting that a substantial portion of DST behaviors can be explained by the presence of hyperacusis. In addition, many autistic children and adults exhibit clinically significant anxiety directed towards specific sounds (i.e., phonophobia), which may arise on its own or secondary to hyperacusis. However, the interplay between hyperacusis and phonophobia has not been studied in autism, and it remains unclear whether these conditions are comorbid in the majority of cases. Lastly, while much less research has examined the overlap of misophonia and autism, there is moderate evidence to suggest that a minority of autistic individuals with DST complaints likely meet diagnostic criteria for misophonia, regardless of whether hyperacusis is present.

In addition to describing the phenomenology of DST in autism, we propose neurocognitive models to explain each subtype of DST and its occurrence in people on the autism spectrum. Although hyperacusis in non-autistic individuals is typically associated with cochlear damage, we instead hypothesize that an alteration in the subcortical processing of auditory information leads to enhanced central auditory gain, resulting in the same sound-evoked auditory cortex hyperactivity seen in patients with tinnitus and hyperacusis. As opposed to our autism-specific model of hyperacusis, we believe that the neurocognitive processes leading to misophonia and phonophobia are the same regardless of the presence of autism, although certain neurobiological alterations seen in autism may predispose autistic individuals to these conditions. We propose that misophonia is a disorder of excessive salience attribution, in which neural machinery to detect evolutionarily important stimuli is

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abnormally sensitive to the acoustic properties of certain repetitive sounds, causing widespread neuronal synchronization that results in a disproportionate emotional and autonomic response. This misophonic reaction becomes associated with the "trigger" stimulus through associative learning mechanisms, potentially generalizing to other stimuli over time. Similarly, we hypothesize that phonophobia results from pathological fear learning, including an abnormally strong initial fear response to aversive sound stimuli and a failure to extinguish this response in the presence of non-threatening stimuli. Our model further suggests that hyperacusis strongly predisposes an individual to phonophobia, as aversive reactions to loud or painful sounds sensitize the amygdala to these stimuli, reinforcing and maintaining the fear response in the presence of repeated sound exposures. Though we find preliminary support for these explanatory models in the autism literature, additional behavioral, psychophysical, and neuroimaging research is necessary to validate model predictions and further refine the proposed DST constructs. By developing this theoretical framework, we hope to set the stage for future research on DST in autism, encouraging the field to move beyond descriptive science and into a new era of hypothesis-driven investigations and mechanism-based therapeutic development.

Although this work represents a major step forward in conceptualizing DST in autism, substantially more research in this area is necessary to improve our theoretical understanding of this construct and its mechanistic underpinnings. The body of literature describing DST in autism is limited by variable and inconsistent terminology and a tendency to group hyperacusis, misophonia, and phonophobia symptoms together into the construct of "auditory over-responsiveness." Moreover, no study simultaneously assesses multiple types of DST in individuals on the autism spectrum, making it difficult to determine the relative contributions of hyperacusis, misophonia, and phonophobia to DST in this population. Perhaps most importantly, the most widely used measures of sensory responsiveness in autistic children and adults (DuBois et al., 2017; Jorquera-Cabrera et al., 2017; Williams et al., 2018) do not effectively differentiate between DST subtypes, substantially limiting the inferences that can be made about DST using these tools. Important future directions in this area of research include (a) the abandonment of "auditory over-responsiveness" and generalized sensory hyperreactivity as unitary constructs, (b) the establishment of a common nomenclature for DST conditions across disciplines, (c) the development and validation of novel DST questionnaires with adequate content coverage of hyperacusis, misophonia, and phonophobia, (d) the simultaneous assessment of all DST subtypes and their developmental trajectories in autistic individuals, (e) the investigation of DST in relation to other sensory features of autism, such as hyporeactivity and sensory seeking, (f) the comparison of psychoacoustic and neurophysiologic indices of auditory processing between groups of individuals with each form of DST, and (g) the evaluation of candidate interventions specifically targeting individual DST subtypes in controlled clinical trials. By partitioning DST into the distinct conditions of hyperacusis, misophonia, and phonophobia, we can reduce the heterogeneity inherent in autism and potentially derive subgroups of autistic individuals who differ in neuropathology, clinical course, or response to treatment (Feczko et al., 2019; Harris, 2019; Uljarević et al., 2017).

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Highlights

- Decreased sound tolerance (DST) is a common and disabling feature of autism
- DST in autism is a combination of hyperacusis, misophonia, and phonophobia
- Hyperacusis is thought to result from excessive gain in the central auditory system
- Misophonia may be caused by the attribution of excess salience to certain sounds
- Phonophobia is a specific phobia of sound maintained by impaired fear extinction

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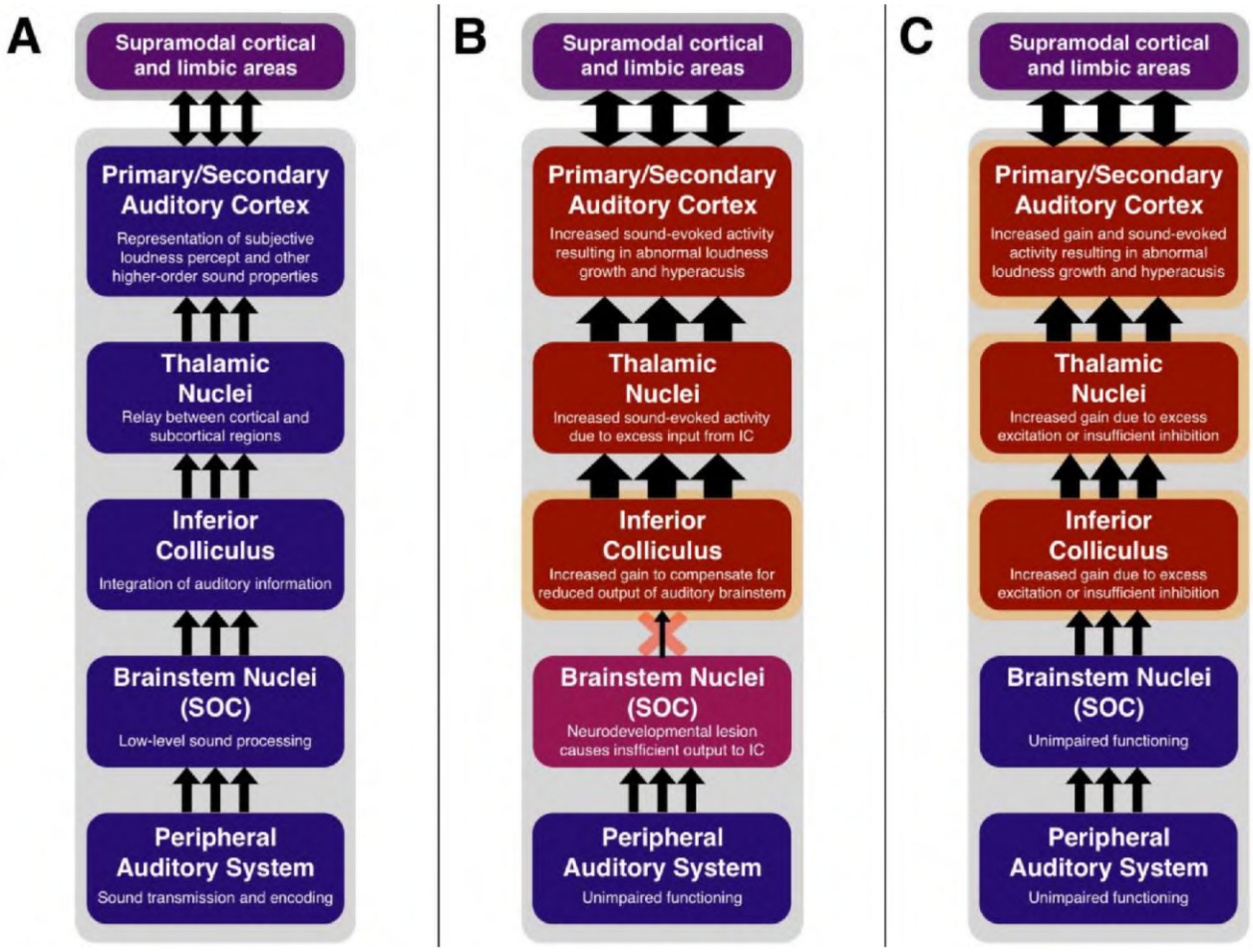

Figure 1.

(A) Schematic of ascending information pathway in the central auditory system. Descending and recurrent connections have been omitted for simplicity. **(B)** Hypothesized model of enhanced central gain and hyperacusis in autism resulting from impaired brainstem transmission. Homeostatic upregulation of gain in the inferior colliculus (IC) results in excessive sound-evoked activity in the higher structures of the auditory system, including primary/secondary auditory cortex, the putative source of enhanced loudness perception. **(C)** Alternate model of enhanced central gain and hyperacusis in autism as a result of excitation/inhibition imbalance in the IC, thalamus, and/or auditory cortex. Notably, enhanced auditory cortical activity is likely sufficient to cause hyperacusis, and while other central auditory structures may contribute, pathology could feasibly be limited to cortical areas. SOC = Superior Olivary Complex.

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Table 1.

Comparison of the Hyperacusis, Misophonia, and Phonophobia

	Hyperacusis	Misophonia	Phonophobia
Definition	A hearing disorder in which sound of moderate intensity is perceived as excessively loud, painful, and/or overwhelming.	A neuropsychiatric condition in which individuals have excessive and inappropriate emotional responses to specific "trigger" sounds (e.g., chewing, tapping, sniffling), even when presented at a low level.	A specific phobia of particular sounds or classes of sounds, resulting in anticipatory responses and avoidance of potential sound sources.
Limited to specific sounds	No	Yes	Yes
Primary response to sound	Excessive loudness sensation and/or pain in ears/head	Anger, disgust, and/or extreme irritation	Fear and/or panic, anticipatory anxiety
Psychoacoustic loudness perception	Steeper loudness growth, reduced LDL	Normal	Unknown (possibly reduced LDL)
Influence of contextual factors	Low	High	High
Results in avoidance behavior	Yes	Yes	Yes
Associated with psychopathology	Yes	Yes	Yes
Occurs secondarily to	Cochlear hearing loss, noise trauma, brain injury	Unknown	Hyperacusis, reactive tinnitus, misophonia, posttraumatic stress disorder, other anxiety disorders
Proposed cognitive mechanism	Amplification of low-level sensory information resulting in a steeper growth of subjective loudness with increasing sound level.	Attribution of excess salience to particular sounds or associated perceptual phenomena (e.g., sights), resulting in conditioned aversive emotional response and heightened sympathetic arousal.	Pathological fear learning, combining excess attribution of threat to specific sounds with poor experience-dependent extinction. Maintained by avoidance of feared stimulus.
Implicated brain regions	Primary/secondary auditory cortex, inferior colliculus, auditory brainstem (superior olivary complex)	Salience network (anterior insular cortex, dorsal anterior cingulate cortex), ventromedial prefrontal cortex, posteromedial cortex, hippocampus, amygdala	Amygdala, hippocampus, anterior cingulate cortex, ventromedial prefrontal cortex, anterior insular cortex, bed nucleus of the stria terminalis/extended amygdala
Increased prevalence in autism	Yes	Unknown	Yes
Unique pathophysiology in autism	Yes	No	No

Note. LDL = loudness discomfort level (the decibel level at which a sound starts being perceived as uncomfortably loud).

EXHIBIT 3

SEPULVEDA CHECKLIST

maxim

MAXIM ENGINEERS, INC.
Engineering and Environmental Consultants

3020 E. Camelback Road. Suite 367
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August 17, 1992

Ms. Joanne Burroughs
Resolution Trust Corporation
National Sales Center
801 17TH Street NW, Second Floor
Washington, DC 20434

RE: **HOME FEDERAL DUE DILIGENCE - PHASE II**
Documentation Review and Site Visit
Sepulveda Pacific Medical Building
2990 Sepulveda Boulevard
Los Angeles, California
Asset No. 9077489
Maxim Project No. 7492000953

91-122

Dear Ms. Burroughs:

We have completed our review of the available documentation and have conducted an on-site inspection for the above-referenced property.

The purpose of this document review and subsequent site inspection was to determine the need for further environmental and/or special resources investigations, and to visually determine the current status and condition of the site. Our scope of services also included completing applicable RTC checklists. The information contained in this summary report is not intended as legal advice and any observations, conclusions and/or recommendations as they apply to regulatory requirements or liability should be discussed with your legal counsel.

The results of our investigation are presented below:

Site Information

The subject site consists of a rectangular tract of land 10,900 square feet in size. Standard Oil Company constructed a gasoline station on the subject site in 1951 with possible USTs. This station was demolished in 1982 and the property was improved by a three (3) story 21,860 square foot office building with subterranean parking garage. Review of near by wells indicates poor water quality under the subject site from several organic compounds and metals from off site sources. No shallow groundwater is present on site. Only three (3) tenants store or handle hazardous chemicals; one carpet company and two (2) medical offices with x-ray machines and bio-infectious wastes. In review of their operations, all wastes appeared to being handled in a proper manner. Adjacent properties include strip shopping center, bank and dry cleaners. No transformers were observed on the property.

RTC Checklists:

During the course of our site visit we completed the RTC's Environmental Checklist Selection Form, in addition to the following RTC checklists which were applicable to the site:

D Hazardous Substance Management - Use, Storage and Disposal
E Radiological Hazards
G Polychlorinated Biphenyls
H Asbestos

A copy of each of these checklists is enclosed.

Phase I Report Review Checklist

We reviewed a Phase I Environmental Site Assessment Report prepared by ATEC Environmental Consultants for the subject property dated August 12, 1991. The purpose of this review was to first, determine if the contents of the report and the topics addressed are in substantial compliance with those required by the Resolution Trust Corporation's (RTC's) standard Phase I Environmental Site Assessment scope of work and second, to determine if, in our opinion, a new assessment should be conducted because of the age of the report. Our scope of our services did not include verifying the accuracy of the information presented.

In our opinion, the topics addressed within the report are not in compliance with those required by the standard RTC Phase I scope of work. Please refer to the attached Phase I Report Review Checklist for a more detailed analysis of our findings.

Conclusions

Based upon our review of available documentation and information obtained during our site visit, we have reached the following conclusions:

The presence of suspect ACM is a potential environmental concern. Storage and use of the minor amounts of bio-hazardous waste materials and other hazardous chemicals does not present an environmental concern.

The historic presence of USTs on site prior to construction represents and environmental concern for petroleum contamination of soils and groundwater.

Recommendations

Based upon our review of the information presented in this report, and our resulting conclusions, we recommend the following:

A Phase I Environmental Site Assessment performed on this site to determine its current condition and regulatory status.

A Comprehensive Asbestos Survey performed on this site to identify asbestos-containing materials.

Please do not hesitate to contact us should you have any questions regarding any of the information presented in this report.

Sincerely,

MAXIM ENGINEERS, INC.

Steve R. Connor
Environmental Engineer
Environmental Services

SRC/jr
Enclosures: as stated

cc: Rosanne Sanchez (Maxim - Phoenix)

ATTACHMENT 5

From: Kyle Winston <kyle.winston@lacity.org>
Sent: Wednesday, July 16, 2025 10:03 AM
To: Noah DeWitt
Cc: Liz Klebaner
Subject: [External] Re: Status update for 2930 S. Sepulveda Blvd Project

Good Morning,

This case will be heard on August 14, 2025. Courtesy Hearing Notices will go out closer to the date.

Regards,

Kyle Winston
City Planner
Los Angeles City Planning

LOS ANGELES CITY PLANNING
200 N. Spring St., Room 721
Los Angeles, CA 90012
T: (213) 978-1348 | Planning4LA.org
E-NEWS
Note: Regular Day Off Alternating Mondays

On Tue, Jul 15, 2025 at 11:16 AM Noah DeWitt <ndewitt@nossaman.com> wrote:

Kyle,

Can you please provide an updated project status and anticipated hearing date for the Project located at 2930 – 2936 South Sepulveda Boulevard (City Case No. CPC-2024-5548-DB-PR-HC; Environmental Case No. ENV-2024-5549-CE)?

Thank you,

Noah DeWitt
NOSSAMAN LLP
T 949.477.7644 F 949.833.7878
D 714.470.6793

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nossaman.com

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ATTACHMENT 6

From: Liz Klebaner
Sent: Thursday, December 4, 2025 8:31 PM
To: 'Charles Turner' <charles.turner@lacity.org>; Jennifer Torres <jenny.torres@lacity.org>
Cc: Michael Myers <mmyersmd@icloud.com>
Subject: RE: [External] Re: Proposed Residential Project at 2930-2936 South Sepulveda Boulevard, Case Numbers CPC-2024-5548-DB-PR-HCA and ENV-2024-5549-SE

Good evening Jennifer and Charles:

Thank you for your time today.

Further to our conversation, below is the condition that we request the Commission incorporate into the City's conditions of approval of the height standard waivers. This assumes that the Project proponent has, pursuant to Government Code section 65950(b), provided its agreement in writing to extend the City's deadline to act on the waivers. Please confirm that the Project has agreed to extend the City's decision timeline.

Prior to issuance of demolition, grading or building permits for the project, the Project proponent shall fund the design, construction, and installation of a monopole, or other telecommunications facilities at 2990 South Sepulveda Boulevard, not exceeding the cost of $300,000, such that said monopole or facilities are capable of maintaining the existing wireless signal strength of the telecommunications facilities located at 2990 South Sepulveda Boulevard. Compliance with this condition shall be demonstrated through a fully executed agreement with 2990 S. Sepulveda, LLC.

If the above condition is made enforceable through the City's approvals, 2990 South Sepulveda LLC would offer its support for the project at the forthcoming City Planning Commission hearing.

For the reasons stated in the attached, relocating the telecommunications infrastructure to 2930 S South Sepulveda Project site is infeasible. Please let us know if you have any questions regarding Mr. Afflerbach's analysis.

We look forward to hearing from you on the Project proponent's response.

Thank you,

Liz Klebaner

Attorney at Law
NOSSAMAN LLP
777 South Figueroa Street, 34th Floor
Los Angeles, CA 90017
lklebaner@nossaman.com
Admitted only in California
T 213.612.7800 F 213.612.7801
D 213.612.7880

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ATTACHMENT 7

From: Jennifer Torres <jenny.torres@lacity.org>
Date: November 22, 2025 at 9:49:39 AM PST
To: Liz Klebaner <lklebaner@nossaman.com>, Kyle Winston <kyle.winston@lacity.org>
Cc: Charles Turner <charles.turner@lacity.org>, Michael Myers <mmyersmd@icloud.com>
Subject: [External] Re: 2930 S Sepulveda Project discussion

Hi Liz,

Thank you for reaching out , you beat me to it! I wanted to touch base with your team to see where the conversations with the neighbors went.

Thank you also for sharing your concerns regarding the telecommunications equipment on your roof. While I understand that uninterrupted telecom function is important for operations, impacts to private telecommunications networks are not considered environmental impacts under CEQA. Typically, telecom equipment can be relocated or adjusted by the service provider as needed, and these matters are handled through private agreements rather than through the City's environmental review process.

If you believe your equipment may need to be repositioned due to nearby development, I recommend reaching out directly to your telecommunications provider so they can evaluate relocation options. The City does not regulate private telecom signal paths, and CEQA does not require mitigation for these types of private system adjustments.

I'm also including the Planner assigned to this project, +Kyle Winston, on this email so he can provide additional input if needed.

Best,

COUNCILWOMAN
KATY YAROSLAVSKY
LOS ANGELES COUNCIL DISTRICT 5
cd5.lacity.gov

Jennifer Torres
Pronouns: She, Her, Hers
PLANNING DEPUTY
O: (213) 751-1432
Los Angeles City Hall
200 North Spring St., Room 440
Los Angeles, CA 90012

ATTACHMENT 8

This page is part of your document - DO NOT DISCARD

20230816840

Recorded/Filed in Official Records
Recorder's Office, Los Angeles County, California

11/27/23 AT 11:18AM

Pages: 0003

FEES:	32.00
TAXES:	0.00
OTHER:	0.00
SB2:	75.00
PAID:	107.00

LEADSHEET

202311273000034

00023991484

014407392

SEQ:
01

DAR - Mail (Intake)

THIS FORM IS NOT TO BE DUPLICATED

E530907

RECORDING REQUESTED BY AND
WHEN RECORDED, RETURN TO:

Maria M. Rohaidy, Esq.
TAUBMAN SIMPSON YOUNG & SULENTOR
One World Trade Center, Suite 400
Long Beach, CA 90831-0400

23991484
Batch Number: 14407392

Assessor's Parcel No. 4251-003-033

SPACE ABOVE THIS LINE FOR RECORDER'S USE

QUITCLAIM DEED

The Undersigned hereby declares:

Documentary transfer tax is $ None*

[ ] Computed on full value of property, or
[ ] Computed on full value of liens and encumbrances at time of sale or transfer.

*The grantors and the grantees in this conveyance are comprised of the same parties who continue to hold the same proportionate interest in the property, R&T 11925(d)..

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, ROBIN HOFF, as Property Trustee of the MF Trust No. 1,

do(es) hereby quitclaim to 2990 S. SEPULVEDA, LLC, a California Limited Liability Company

all right, title, and interest in the real property situated in the City of Los Angeles, County of Los Angeles, State of California, described as follows:

THAT PORTION OF THE 120.71 ACRE TRACT ALLOTTED TO PEDRO TALAMENTES BY DECREE OF PARTITION IN CASE NO. 965 OF THE DISTRICT COURT, IN THE CITY OF LOS ANGELES, IN AND FOR THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT THE MOST SOUTHERLY CORNER OF LOT 1 OF TRACT 14252, AS PER MAP RECORDED IN BOOK 298 PAGES 15 AND 16 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY; THENCE SOUTH 64 DEGREES 55 MINUTES 30 SECONDS WEST, ALONG NATIONAL BOULEVARD, 80 FEET WIDE, AS SHOWN ON SAID MAP, A DISTANCE OF 100 FEET TO AN ANGLE POINT IN THE NORTHERLY LINE OF SAID NATIONAL BOULEVARD; THENCE NORTH 74 DEGREES 02 MINUTES 55 SECONDS WEST A DISTANCE OF 15.09 FEET TO AN ANGLE POINT IN THE NORTHEASTERLY LINE OF SEPULVEDA BOULEVARD, 100 FEET WIDE, AS SHOWN ON THE MAP OF SAID TRACT 14252; THENCE NORTH 33 DEGREES 01 MINUTE 20 SECONDS WEST ALONG SAID SEPULVEDA BOULEVARD, A DISTANCE OF 100 FEET TO THE INTERSECTION OF THE NORTHEASTERLY LINE OF SAID SEPULVEDA BOULEVARD WITH THE SOUTHEASTERLY LINE OF THAT CERTAIN 20 FOOT ALLEY SHOWN ON SAID MAP AS ADJOINING LOT 39 OF SAID TRACT ON THE SOUTH; THENCE NORTH 57 DEGREES 04 MINUTES 05 SECONDS EAST, ALONG SAID ALLEY, A DISTANCE OF 109 FEET TO THE MOST WESTERLY CORNER OF SAID LOT 1; THENCE SOUTH 33 DEGREES 01 MINUTES 20 SECONDS EAST ALONG THE SOUTHWESTERLY LINE OF SAID LOT 1; A DISTANCE OF 125.03 FEET TO THE POINT OF BEGINNING.

Commonly known as: 2990 S. Sepulveda Blvd., Los Angeles, CA 90064

Dated: September 20 2023

ROBIN HOFF, Property Trustee of the MF Trust No. 1

Mail Tax Statements to: 2990 S. Sepulveda, LLC, 16835 Algonquin St., #458, Huntington Beach CA 92649

CERTIFICATE OF ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)
)
County of San Mateo)

On 09/20, 2023 before me, Zhichong Chan, a notary public, personally appeared Robin Hoff, who 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.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature Zhichong Chan

ZHICHONG CHAN
Notary Public - California
Santa Clara County
Commission # 2417748
My Comm. Expires Sep 23, 2026

(Seal)

2025

ANNUAL SECURED PROPERTY TAX BILL

2025

CITIES, COUNTY, SCHOOLS AND ALL OTHER TAXING AGENCIES IN LOS ANGELES COUNTY

SECURED PROPERTY TAX FOR FISCAL YEAR JULY 1, 2025 TO JUNE 30, 2026

ELIZABETH BUENROSTRO GINSBERG, TREASURER AND TAX COLLECTOR

FOR ASSISTANCE, CALL 1(213) 974-2111 OR 1(888) 807-2111, ON THE WEB AT propertytax.lacounty.gov

PROPERTY IDENTIFICATION
ASSESSOR'S ID.NO.: 4251 003 033 25 000

OWNER OF RECORD AS OF JANUARY 1, 2025
SAME AS BELOW

MAILING ADDRESS 000182858 02 AV 0.59
0182858-0182858 SNGL 004 1234-- 827461

2990 S SEPULVEDA LLC
16835 ALGONQUIN ST STE 458
HUNTINGTON BEACH CA 92649-3810

Save Money – Save Time – Pay Online
ttc.lacounty.gov

Electronic Payment Information
(Required for Online and Telephone Payments)
ID#:19 4251 003 033 2 YEAR:25 SEQUENCE:000 1
Personal Identification Number (PIN) [redacted]

SPECIAL INFORMATION

PROPERTY LOCATION AND/OR PROPERTY DESCRIPTION
*TR=PAR OF
PEDRO TALAMANTES 120.71 AC ALLOT IN RO
COMPLETE DESCRIPTION IN ASSESSOR RECORDS
E 125 FT TO BEG POR OF LOT 24

ASSESSOR'S REGIONAL OFFICE
REGION #23 INDEX: TRA:00067
C/I CENTRAL
500 W TEMPLE STREET RM. 180
LOS ANGELES CA 90012
(213)974-3108

ACCT. NO.: PRINT NO.:1397513 BILL ID.:

ASSESSOR'S ID. NO.	YR SEQ	CK
4251 003 033	25 000	31

DETAIL OF TAXES DUE FOR

AGENCY	AGENCY PHONE NO.	RATE		AMOUNT
GENERAL TAX LEVY				
ALL AGENCIES		1.000000	$	[redacted]
VOTED INDEBTEDNESS				
CITY-LOS ANGELES		.012232	$	
METRO WATER DIST		.007000		
COMMNTY COLLEGE		.048543		
UNIFIED SCHOOLS		.119605		
DIRECT ASSESSMENTS				
SAFE CLEAN WATER	(833) 275-7297		$	
FLOOD CONTROL	(626) 979-5498			
CITY LT MAINT	(213) 847-1821			
LA STORMWATER	(213) 485-4094			
LACITY PARK DIST	(213) 485-4795			
RPOSD MEASURE A	(833) 265-2600			
LA WEST MOSQ AB	(310) 915-7370			
TRAUMA/EMERG SRV	(866) 587-2862			

VALUATION INFORMATION

ROLL YEAR 25-26	CURRENT ASSESSED VALUE	TAXABLE VALUE
LAND	[redacted]	
IMPROVEMENTS		

TOTAL [redacted]
LESS EXEMPTION:

NET TAXABLE VALUE [redacted]

1ST	2ND	1ST + 2ND
[redacted] DUE NOVEMBER 1, 2025 (After December 10, 2025, add 10% penalty)	[redacted] DUE FEBRUARY 1, 2026 (After April 10, 2026, add 10% penalty and $10 cost)	[redacted] IF PAYING BOTH BY DECEMBER 10, 2025 (Include 1st & 2nd stubs if paying by mail)

ANY RETURNED PAYMENT MAY BE SUBJECT TO A FEE UP TO $50.00.

SEE REVERSE SIDE FOR MORE INFORMATION.

DETACH AND MAIL WITH YOUR PAYMENT
SAVE MONEY! SAVE TIME! PAY ONLINE!

ANNUAL 2025

2990 S SEPULVEDA LLC
16835 ALGONQUIN ST STE 458
HUNTINGTON BEACH CA 92649-3810

ASSESSOR'S ID. NO.	YR SEQ	CK	PK
4251 003 033	25 000	31	2

FOR MAILING ADDRESS CHANGE
PLEASE SEE REVERSE SIDE OF THIS PAYMENT COUPON.

2ND INSTALLMENT DUE [redacted] INDICATE AMOUNT PAID

2ND Installment Taxes due Feb. 1 and must be received or USPS Postmarked by April 10 ---------->
If received or postmarked after, include 10% penalty and $10 cost

MAKE PAYMENT PAYABLE TO:
Please write the ASSESSOR'S ID. NO. on the lower left corner of your payment.

41300

LOS ANGELES COUNTY TAX COLLECTOR
P.O. BOX 54018
LOS ANGELES, CA 90054-0018

26425000142510033033000183278700020170653002041O

2ND

DETACH AND MAIL WITH YOUR PAYMENT
SAVE MONEY! SAVE TIME! PAY ONLINE!

ANNUAL 2025

2990 S SEPULVEDA LLC
16835 ALGONQUIN ST STE 458
HUNTINGTON BEACH CA 92649-3810

ASSESSOR'S ID. NO.	YR SEQ	CK	PK
4251 003 033	25 000	31	1

FOR MAILING ADDRESS CHANGE
PLEASE SEE REVERSE SIDE OF THIS PAYMENT COUPON.

1ST INSTALLMENT DUE [redacted] INDICATE AMOUNT PAID

1ST Installment Taxes due Nov. 1 and must be received or USPS Postmarked by December 10 ---------->
If received or postmarked after, include 10% penalty

MAKE PAYMENT PAYABLE TO:
Please write the ASSESSOR'S ID. NO. on the lower left corner of your payment.

51313

LOS ANGELES COUNTY TAX COLLECTOR
P.O. BOX 54018
LOS ANGELES, CA 90054-0018

25525000142510033033000183278800020160663131121O

1ST

IMPORTANT INFORMATION

For information about property tax assistance and relief programs, please visit our website at **ttc.lacounty.gov**
to view options under **SECURED (REAL) PROPERTY TAX PROGRAMS AND SERVICES.**

HOW YOUR PROPERTY TAX BILL IS CREATED AND WHAT OFFICE TO CONTACT FOR ADDITIONAL INFORMATION

It takes three separate Los Angeles County offices, ASSESSOR, AUDITOR-CONTROLLER, and TREASURER AND TAX COLLECTOR to produce and account for your property tax bill and payment.

* * * * * * * * * * * * * *

The Los Angeles County **ASSESSOR** establishes the assessed value of your property by appraising the value of that property under State law. The assessed value of your property is placed on the "Assessment Roll." The Assessor also approves and applies all exemptions which are included in the Assessment Roll. The Roll is then presented to the Los Angeles County Auditor-Controller for further processing.

The items listed below are within the jurisdiction of the Assessor's Office and questions regarding these areas should be directed to that office; or, visit the website at **assessor.lacounty.gov**:

- Assessed Values
- Exemptions - General
- Reappraisable Changes in Ownership
- Parent-Child/Grandparent-Grandchild Transfers (Proposition 19)
- Age 55 and Older/Disabled Persons Tax Base Transfers (Proposition 19)
- Disaster Relief Tax Base Transfers (Proposition 19)
- Homeowners' Exemptions
- Name/Mailing Address Changes
- Decline-in-Value Reviews
- Misfortune & Calamity Tax Relief

The Los Angeles County Assessor's Public Service Section is located in Room 225, 500 W. Temple St., Los Angeles, CA 90012-2770.

You may send a request for assistance by going to:
assessor.lacounty.gov/contact/assessor

The address and phone number of the Assessor's district office that handles your assessment is shown on the front of this bill.

* * * * * * * * * * * * * *

The Los Angeles County **AUDITOR-CONTROLLER** adds direct assessments to the Tax Roll then applies the General Tax Levy (1%) and Voted Indebtedness (voter & bonded) tax rates to the value on the Tax Roll. This function is called "extending the Assessment Roll." The Extended Roll is then sent to the Los Angeles County Treasurer and Tax Collector for individual tax bill distribution and payment collection.

Direct Assessment questions should be directed to the agency authorizing the charge at the telephone number shown on the face of this bill. This information is also available online at: **auditor.lacounty.gov/direct-assessments**.

The Los Angeles County Auditor-Controller is located in Room 153, 500 W. Temple St., Los Angeles, CA 90012-3552.

Website: **propertytax.lacounty.gov**

Information related to the items listed below are within the jurisdiction of the Auditor-Controller and questions regarding these areas should be directed to that office by email at **propertytax@auditor.lacounty.gov**:

- Direct Assessments
- General Tax Levy
- Refunds - Change in Taxes Due to an Assessor Value Change
- Voted Indebtedness

* * * * * * * * * * * * * *

The Los Angeles County **TREASURER AND TAX COLLECTOR** receives the Extended Roll, prints the property tax bills and mails them to the names and addresses on the Roll. When you send your remittance to pay your tax bill, the Treasurer and Tax Collector then posts that payment to your property. The Los Angeles County Treasurer and Tax Collector is located at 225 N. Hill St., Los Angeles, CA 90012-2798.

The items listed below are within the jurisdiction of the Treasurer and Tax Collector. Questions regarding these areas should be directed to this office:

- Due Dates
- Payment Posting
- Payment Amount
- Penalties
- Refunds - Overpayments
- Defaulted Taxes

If these taxes remain unpaid after June 30th of the fiscal year indicated on the reverse side of this bill, you will be charged delinquency penalties, costs, redemption penalties, and a redemption fee.

School district parcel tax exemption information is available online at **ttc.lacounty.gov**.

HOW TO CONTACT OUR OFFICE

You may not need to speak with a representative for common requests. Please visit **ttc.lacounty.gov/public-inquiries** for self-service options or to submit an inquiry.

Visit us: 225 North Hill Street, First Floor Lobby, Los Angeles, CA 90012
Call us: 1(213) 974-2111, if outside of Los Angeles County, or 1(888) 807-2111, if in Los Angeles County. Anyone who is hearing impaired and has TDD equipment may leave a message at 1(213) 974-2196 or use California Relay Services at 1(800) 735-2929.
Website: **propertytax.lacounty.gov**

Si usted requiere información en Español acerca de los impuestos de su propiedad, por favor llame al 1(213) 974-2111 o al 1(888) 807-2111. Operadoras que hablan Español le ayudarán. También puede visitar nuestra página de Web al **propertytax.lacounty.gov**.

* * * * * * * * * * * * * *

LOS ANGELES COUNTY ASSESSMENT APPEALS BOARD

The property taxes you pay are primarily based on your property's assessed value as determined by the Los Angeles County Assessor. If you disagree with the assessed value placed on your property, you can file an appeal with the ASSESSMENT APPEALS BOARD during the filing periods stated below. **Applications may be filed online at lacaab.lacounty.gov. Please note there is a non-refundable $46 filing fee that must be submitted at the time of filing an appeal.**

Regular Assessments - Filing period is July 2 through November 30.
Supplemental/Adjusted/Escape/Roll Corrections - No later than 60 days after the mailing date on the notice or tax bill.
Misfortune & Calamity Reassessments - Within six months of the mailing date of the Assessor's proposed reassessment notice due to property damaged by misfortune or calamity.

For more information, please visit **bos.lacounty.gov/services/assessment-appeals/aab-resources**.

The Los Angeles County Assessment Appeals Board is located at
500 W. Temple St., Room B4, Los Angeles, CA 90012; Telephone numbers: 1(213) 974-1471; 1(888) 807-2111; 1(800) 735-2929 (TDD);
Website: **bos.lacounty.gov/Services/Assessment-Appeals**.

Electronic Check Processing - When you provide a check as payment, you authorize the County of Los Angeles to either use information from your check to make a one-time electronic fund transfer from your bank account or process the payment as a check transaction. If we use information from your check to make an electronic fund transfer, funds may be withdrawn from your bank account as soon as the same day we receive your payment, and you will not receive your check back from your financial institution. The transaction will appear on your bank statement as "LA Co TTC Paymnt."

TO PAY ONLINE, CHANGE YOUR MAILING ADDRESS,

OR

ACCESS ADDITIONAL SELF-SERVICE OPTIONS,

PLEASE VISIT propertytax.lacounty.gov

TO PAY ONLINE, CHANGE YOUR MAILING ADDRESS,

OR

ACCESS ADDITIONAL SELF-SERVICE OPTIONS,

PLEASE VISIT propertytax.lacounty.gov

LOS ANGELES CITY PLANNING COMMISSION

200 North Spring Street, Room 272, Los Angeles, California, 90012-4801, (213) 978-1300
www.planning.lacity.org

LETTER OF DETERMINATION

MAILING DATE: JANUARY 15, 2026

Case No.: CPC-2024-5548-DB-PR-HCA Council District: 5 – Yaroslavsky
CEQA: ENV-2024-5549-SE
Plan Area: West Los Angeles

Project Site: 2930 – 2936 South Sepulveda Boulevard

Applicant: George Garikian
Representative: Rodney Khan, Khan Consulting, Inc.

At its meeting **December 11, 2025**, the Los Angeles City Planning Commission took the actions below in conjunction with the following Project:

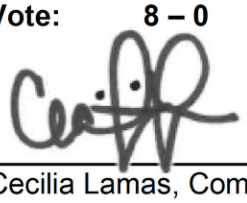
Construction of a 71-foot high, six story, 77-unit residential development including 12 units set aside for Very Low-Income Households, and two subterranean parking levels including 84 parking spaces. The Project includes a total Floor Area of 74,282 square feet with a 2.99:1 Floor Area Ratio (FAR). There are no existing trees on site, and two existing street trees to remain. The Project includes the demolition of an existing office building and a haul route for the export of 9,771 cubic yards of soil.

1. **Determined**, based on the whole of the administrative record, the Project is statutorily exempt from CEQA pursuant to Public Resources Code Section 21080.66 and the provisions in Assembly Bill (AB) 130;
2. **Approved**, pursuant to Section 12.22 A.25 of the Los Angeles Municipal Code (LAMC), a Density Bonus Compliance Review for a Housing Development Project totaling 77 dwelling units and setting aside 12 units as Very Low Income Restricted Affordable Units for a period of 55 years, with the following On- and Off-Menu Incentives and Waivers of Development Standards:
   a. An On-Menu Incentive to average floor area, density, open space and parking over the project site, and permit vehicular access from a less restrictive zone to a more restrictive zone across the C2-1VL and R4P-1 Zones;
   b. An On-Menu Incentive to allow an increase in floor area by 35 percent to 2.99:1 FAR or 74,282 square feet;
   c. An Off-Menu Incentive to allow an increase in height from 45-feet to 71 feet in the C2-1VL Zone;
   d. A Waiver of Development Standards to eliminate the Transitional Height requirement at the C2-1VL Zone; and
   e. A Waiver of Development Standards to allow a rear yard reduction to five-feet in lieu of 18-feet;
3. **Approved**, pursuant to LAMC Section 13B.2.4, a Project Review for a development that creates more than 50 new residential dwelling units;
4. **Adopted** the attached Conditions of Approval; and
5. **Adopted** the attached Findings.

The vote proceeded as follows:

Moved: Lawshe
Second: Saitman
Ayes: Chavez, Choe, Diaz, Johnson, Klein, Rosenstein
Absent: Zamora

Vote: 8 – 0



Cecilia Lamas, Commission Executive Assistant II
Los Angeles City Planning Commission

WHO CAN FILE AN APPEAL

The decision of the Los Angeles City Planning Commission as it relates to the Density Bonus Off-Menu Incentives and Waiver of Development Standards are not further appealable. The On-Menu Density Bonus/Affordable Housing Incentive Program Review is appealable to City Council by adjacent and abutting owners and tenants only. The remaining entitlements are appealable to City Council within **15 days** after the mailing date of this determination letter. Any appeal not filed within the 15-day period shall not be considered by the Council.

FINAL APPEAL DATE: JANUARY 30, 2026

HOW TO FILE AN APPEAL

An appeal application must be submitted and paid for before 4:30 PM (PST) on the final day to appeal the determination. Should the final day fall on a weekend or legal City holiday, the time for filing an appeal shall be extended to 4:30 PM (PST) on the next succeeding working day. Appeals should be filed early to ensure the Development Services Center (DSC) staff has adequate time to review and accept the documents, and to allow appellants time to submit payment. Appeals may be filed either online or in person as referenced below:

Forms are available online at http://planning.lacity.gov/development-services/forms.

ONLINE APPEAL FILINGS THROUGH ONLINE APPLICATION SYSTEM (OAS)

QR Code to
Online Appeal Filing

Online Application System (OAS): The OAS (https://planning.lacity.gov/oas) allows entitlement appeals to be submitted entirely online. Appeal fees may be paid for by credit card or e-check.

IN PERSON APPEAL FILINGS

QR Code to Forms for In-Person Appeal Filing

Drop off at DSC. Appeals of this determination can be submitted in-person at the Metro or Van Nuys DSC locations, as well as the South Los Angeles DSC on Tuesdays and Thursdays only, and payment can be made by credit card or check.

a. City Planning has established drop-off areas at the DSCs with physical boxes where appellants can drop off appeal applications;
b. Alternatively, appeal applications can be filed with staff at DSC public counters.

CITY PLANNING DEVELOPMENT SERVICES CENTERS – PUBLIC COUNTERS

Office	Address	Phone Number	Email
Metro DSC	201 N. Figueroa St 4th Floor Los Angeles, CA 90012	(213) 482-7077	planning.figcounter@lacity.org
Van Nuys DSC	6262 Van Nuys Blvd Suite 251 Van Nuys, CA 91401	(818) 374-5050	planning.mbc2@lacity.org
South LA DSC *Tuesday and Thursday Only*	8475 S. Vermont Ave, 1st Floor Los Angeles, CA 90044	(213) 978-1465	planning.southla@lacity.org

City Planning staff may follow up with the appellant via email and/or phone if there are any questions or missing materials in the appeal submission, to ensure that the appeal package is complete and meets the applicable LAMC provisions.

If you seek judicial review of any decision of the City pursuant to California Code of Civil procedure Section 1094.5, the petition for writ of mandate pursuant to that section must be filed no later than the 90th day following the date on which the City's decision became final pursuant to California Code of Civil Procedure Section 1094.6. There may be other time limits which also affect your ability to seek judicial review.

DETERMINATION EFFECTIVE DATE

This determination will become effective after the end of the appeal period date on the first page of this document unless an appeal is filed with the Department of City Planning.

This grant is not a permit or license and any permits and/or licenses required by law must be obtained from the proper public agency. If any Condition of this grant is violated or not complied with, then the applicant or their successor in interest may be prosecuted for violating these Conditions the same as for any violation of the requirements contained in the Los Angeles Municipal Code (LAMC).

SCHEDULING CASE CONDITION CLEARANCE AND BUILDING PERMIT SIGN-OFFS

QR Code to BuildLA Appointment Portal for Condition Clearance

In order to clear conditions and/or obtain building permit sign-offs, you must make an appointment with the Department of City Planning's Development Services Center (DSC). You may schedule a Case Condition Clearance Appointment with the DSC at appointments.lacity.org after the effective date of the determination..

See instructions on how to prepare for your appointment at planning.lacity.gov/project-review/case-filings

Attachments: Conditions of Approval, Findings

cc: Theodore Irving, Principal City Planner
Connie Chauv, Senior City Planner
Kyle Winston, City Planner

CONDITIONS OF APPROVAL

1. **Site Development.** The project shall be in substantial conformance with the plans and materials submitted by the Applicant, including the proposed building design elements and materials, stamped "Exhibit A," dated December 3, 2024, attached to the subject case file. No change to the plans will be made without prior review by the Department of City Planning, Project Planning Bureau, and written approval by the Director of Planning. Each change shall be identified and justified in writing. Minor deviations may be allowed in order to comply with the provisions of the Los Angeles Municipal Code or the project conditions.

2. **Residential Density**. The project shall be limited to a maximum density of 77 multi-family residential dwelling units, including On-Site Restricted Affordable Units.

3. **On-Site Restricted Affordable Units.** 12 units shall be reserved for Very Low Income households, as defined by the California Government Code 65915 and by the Los Angeles Housing Department (LAHD). In the event the SB 8 Replacement Unit condition requires additional affordable units or more restrictive affordability levels, the most restrictive requirements shall prevail.

4. **Changes in On-Site Restricted Units**. Deviations that increase the number of restricted affordable units or that change the composition of units or change parking numbers shall be consistent with LAMC Section 12.22 A.25.

5. **Housing Requirements.** Prior to issuance of a building permit, the owner shall execute a covenant to the satisfaction of the Los Angeles Housing Department (LAHD) to make 12 units available to Very Low Income Households or equal to 16 percent of the project's total base residential density allowed, for sale or rental, as determined to be affordable to such households by LAHD for a period of 55 years. In the event the applicant reduces the proposed density of the project, the number of required reserved on-site Restricted Units may be adjusted, consistent with LAMC Section 12.22 A.25, to the satisfaction of LAHD, and in consideration of the project's Replacement Unit Determination. Enforcement of the terms of said covenant shall be the responsibility of LAHD. The Applicant shall submit a copy of the recorded covenant to the Department of City Planning for inclusion in this file. The project shall comply with the Guidelines for the Affordable Housing Incentives Program adopted by the City Planning Commission and with any monitoring requirements established by the LAHD.

6. **Averaging (Incentive).** Development rights related to FAR, density, parking, open space, and vehicular access shall be averaged across the site instead of segregated into the underlying C2-1VL and R4P-1 Zones.

7. **Floor Area Ratio (FAR) (Incentive)**. The project total Floor Area shall be limited to 74,282 square feet or 2.99:1 FAR per Exhibit "A".

8. **Height (Waiver)**. The project shall be limited to a maximum height of 71 feet and six (6) stories as shown on sheets A-3.5 and A-3.6 of Exhibit "A".

9. **Transitional Height (Waiver)**. The project shall not be subject to the Transitional Height requirement at the C2-1VL..

10. **Setback (Incentive)**. The project shall have a minimum 5-foot rear yard setback.

11. **Parking Per AB 2345**. The project shall be allowed to provide a minimum of one (1) parking space per unit for studio and one- bedroom units and 1.5 spaces per unit for two- bedroom units pursuant to California Government Code Section 65915 (AB 2345). The project is providing 84 parking spaces, as shown in Exhibit "A".

12. **Bicycle Parking.** Bicycle parking shall be provided consistent with LAMC 12.21 A.16 and Exhibit "A".

13. **Landscape Plan.** The landscape plan shall indicate landscape points for the project equivalent to **10% more than otherwise required** by LAMC 12.40 and Landscape Ordinance Guidelines "O". All open areas not used for buildings, driveways, parking areas, recreational facilities or walks shall be attractively landscaped, including an automatic irrigation system, and maintained in accordance with a landscape plan prepared by a licensed landscape architect or licensed architect, and submitted for approval to the Department of City Planning.

14. **Soil Depths.** Shrubs, perennials, and groundcover shall require a minimum soil depth as follows:

    a. A minimum depth with a height ranging from 15 to 40 feet shall be 42 inches.
    b. A minimum depth with a height ranging from 1 to 15 feet shall be 24 to 36 inches.
    c. A minimum depth with a height of less than 1 foot shall be 18 inches.
    d. A minimum depth of an extensive green roof shall be 3 inches.

    Trees shall require a 42-inch minimum soil depth. Further, the minimum amount of soil volume for tree wells on the rooftop or any above grade open spaces shall be based on the size of the tree at maturity:

    e. 220 cubic feet for trees with a canopy diameter ranging from 15 to 19 feet.
    f. 400 cubic feet for trees with a canopy diameter ranging from 20 to 24 feet.
    g. 620 cubic feet for trees with a canopy diameter ranging from 25 to 29 feet.
    h. 900 cubic feet for trees with a canopy diameter ranging from 30 to 34 feet.

15. Street Dedications and Improvements.

    Dedications

    a. Sepulveda Boulevard (Boulevard II) – A variable width to a 5-foot wide strip of land along the property frontage to complete a 55-foot wide half right-ofway in accordance with Boulevard II standard.

    Improvements

    b. Sepulveda Boulevard – Construct a new full-width concrete sidewalk along abutting the new property line. Repair and or replace any broken, off-grade concrete curb, gutter and adjacent roadway pavement. Close all unused driveways with full height concrete curb, 2-foot gutter and sidewalk.

    c. Alley (East of Sepulveda Boulevard) – Repair any broken, damaged, cracked or off-grade alley pavement and longitudinal concrete gutter. Upgrade the alley intersection at Sepulveda (as necessary) per BOE standard.
    d. Alley (North of National Boulevard) – Repair any broken, damaged, cracked or off-grade alley pavement and longitudinal concrete gutter.

    Notes: Broken curb and/or gutter includes segments within existing score lines that are depressed or upraised by more than ¼ inch from the surrounding concrete work or are

separated from the main body of the concrete piece by a crack through the entire vertical segment and greater than 1/8 inch at the surface of the section.

Non-ADA compliant sidewalk shall include any sidewalk that has a cross slope that exceeds 2% and/or is depressed or upraised by more than ¼ inch from the surrounding concrete work or has full concrete depth cracks that have separations greater than 1/8 inch at the surface. The sidewalk also includes that portion of the pedestrian path of travel across a driveway.

All new sidewalk curb and gutter shall conform to the Bureau of Engineering Standard Plans S410-2, S440-4, S442-6 and S444-0.

Upgrade all existing curb ramps to comply with ADA requirements. Install tree wells with root barriers and plant street trees satisfactory to the City Engineer and the Urban Forestry Division of the Bureau of Street Services. The applicant should contact the Urban Forestry Division for further information at https://engpermits.lacity.org/public or via https://appointments.lacity.org/apptsys/Public/Account.

Board of Public Works approval be obtained for the removal of any tree in the existing or proposed right-of-way area associated with the improvement requirements outlined herein. The Bureau of Street Services, Urban Forestry Division is the lead agency for obtaining Board of Public Works approval for removal of such trees.

Notes: Street lighting may be required satisfactory to the Bureau of Street Lighting at https://lalights.lacity.org or via https://appointments.lacity.org/apptsys/Public/Account.

Department of Transportation may have additional requirements for dedication and improvements.

Refer to the Department of Transportation regarding traffic signals, signs and equipment at (213) 485-1062 or via https://appointments.lacity.org/apptsys/Public/Account.

Regarding any conflicts with power pole matters, contact the Department of Water and Power at (213) 367-0562 or via https://appointments.lacity.org/apptsys/Public/Account.

Refer to the Fire Department Hydrants and Access Unit regarding fire hydrants at (213) 482-6543 or via https://appointments.lacity.org/apptsys/Public/Account.

c. Provide proper drainage for street being improved and for the site being developed. Any discharge of roof or site storm water drainage must be through a curb outlet. Discharge must be by gravity flow or approved outlet structure from the property line to the curb face.

d. Sewer lines exist in Sepulveda Boulevard and in the alley east of Sepulveda Boulevard. All Sewerage Facilities Charges and Bonded Sewer Fees are to be paid prior to obtaining a building permit.

e. Submit a request to the West Los Angeles (WLA) District Office sewer counter to determine the capacity of the existing public sewer to accommodate the proposed development at https://engpermits.lacity.org/public or via https://appointments.lacity.org/apptsys/Public/Account.

d. Submit a parking area and driveway plan to the WLA District Office of the Bureau of Engineering and the Department of Transportation for review and approval.

16. **Street Trees.**

    a. Street Trees. Street trees shall be provided to the satisfaction of the Urban Forestry Division.

    b. Street trees may be used to satisfy on-site tree requirements pursuant to LAMC Section 12.21 G.3 (Chapter 1, Open Space Requirement for Six or More Residential Units). Per Exhibit "A" and 12.21 G.3, two (2) Street trees shall be provided.

    c. Required Trees per 12.21 G.2. As conditioned herein, a final submitted landscape plan shall be reviewed to be in substantial conformance with Exhibit "A." There shall be a minimum of eight (8) 24-inch box, or larger, trees on site pursuant to LAMC Section 12.21 G.2. Any required trees pursuant to LAMC Section 12.21 G.2 shown in the public right-of-way in Exhibit "A" shall be preliminarily reviewed and approved by the Urban Forestry Division prior to building permit issuance. In-lieu fees pursuant to LAMC Section 62.177 shall be paid if placement of required trees in the public right-of-way is proven to be infeasible due to City determined physical constraints.

17. **Stormwater/irrigation.** The project shall implement on-site stormwater infiltration as feasible based on the site soils conditions, the geotechnical recommendations, and the City of Los Angeles Department of Building and Safety Guidelines for Storm Water Infiltration. If on-site infiltration is deemed infeasible, the project shall analyze the potential for stormwater capture and reuse for irrigation purposes based on the City Low Impact Development (LID) guidelines.

18. **Lighting Design**. Areas where nighttime uses are located shall be maintained to provide sufficient illumination of the immediate environment so as to render objects or persons clearly visible for the safety of the public and emergency response personnel. All pedestrian walkways, storefront entrances, and vehicular access ways shall be illuminated with lighting fixtures. Lighting fixtures shall be harmonious with the building design. Wall mounted lighting fixtures to accent and complement architectural details at night shall be installed on the building to provide illumination to pedestrians and motorists.

19. **Heat Island Effect**. To reduce the heat island effect, a minimum of 50% of the area of pathways, patios, driveways or other paved areas shall use materials with a minimum initial Solar Reflectance value of 0.35 in accordance with ASTM (American Society of Testing Materials) standards.

20. **Solar and Electric Generator.** Generators used during the construction process shall be electric or solar powered. Solar generator and electric generator equipment shall be located as far away from sensitive uses as feasible.

    Or: Where power poles are available, electricity from power poles and/or solar-powered generators rather than temporary diesel or gasoline generators shall be used during construction. (WL)

21. **Solar-ready Buildings.** The Project shall comply with the Los Angeles Municipal Green Building Code, Section 99.05.211, to the satisfaction of the Department of Building and Safety.

22. **Signage.** There shall be no off-site commercial signage on construction fencing during construction.

Assembly Bill (AB) 130 Conditions

23. (If requested by a California Native American tribe) The project shall include tribal monitoring during all ground-disturbing activities, as follows:
    a. The California Native American tribe shall designate the monitor.
    b. The tribal monitor shall comply with applicant's site access and workplace safety requirements.
    c. The applicant shall compensate the tribal monitor at a reasonable rate, determined in good faith, that aligns with customary compensation for cultural resource monitoring, taking into account factors such as the scope and duration of the project.

24. Tribal cultural resources shall be avoided where feasible, in accordance with subdivision (a) of PRC Section 21084.3. In furtherance of this requirement, where feasible, the project applicant shall provide deference to tribal preferences regarding access to spiritual, ceremonial, and burial sites, and incorporate tribal traditional knowledge in the protection and sustainable use of tribal cultural resources and landscapes.

25. All treatment and documentation of tribal cultural resources shall be conducted in a culturally appropriate manner, consistent with PRC Section 21083.9.

26. A California Historical Resources Information System (CHRIS) archaeological records search and a tribal cultural records search shall be completed for the project site.

27. A Sacred Lands Inventory request shall be submitted to the Native American Heritage Commission.

28. The project shall comply with Section 7050.5 of the Health and Safety Code and PRC Section 5097.98, including immediate work stoppage upon discovery of human remains or burial grounds, and treatment in accordance with applicable law and in consultation with the affected California Native American tribe.

29. An application of tribal ecological knowledge into habitat restoration efforts undertaken by the project as applicable to the specific environmental context and conditions of the project.

30. The development proponent shall complete a Phase I environmental assessment, as defined in Section 78090 of the Health and Safety Code, prior to effectuating the associated project entitlement and/or issuance of a demolition, grading, or building permit.

31. If a recognized environmental condition is found, the development proponent shall complete a preliminary endangerment assessment, as defined in Section 78095 of the Health and Safety Code, prepared by an environmental assessor to determine the existence of any release of a hazardous substance on the site and to determine the potential for exposure of future occupants to significant health hazards from any nearby property or activity.

32. If a release of a hazardous substance is found to exist on the site, the release shall be removed, or any effects of the release shall be mitigated to levels required by current federal and state statutory and regulatory standards before the local government issues a certificate of occupancy.

33. If a potential for exposure to significant hazards from surrounding properties or activities is found to exist, the effects of the potential exposure shall be mitigated to levels required by current federal and state statutory and regulatory standards before the local government issues a certificate of occupancy.

34. **Freeway Proximity Requirements.**
    a. The building shall have a centralized heating, ventilation, and air-conditioning system.
    b. The outdoor air intakes for the heating, ventilation, and air-conditioning system shall face away from the freeway.
    c. The building shall provide air filtration media for outside and return air that provides a minimum efficiency reporting value of 16.
    d. The air filtration media shall be replaced at the manufacturer's designated interval.
    e. The building shall not have any balconies facing the freeway.

35. **Fire Department.** Submit plot plans for Fire Department approval and review prior to issuance of building permits.

36. **Department of Transportation.**
    Worksite Traffic Control Requirements: DOT recommends that a construction work site traffic control plan be submitted to DOT's Citywide Temporary Traffic Control Section or Permit Plan Review Section for review and approval prior to the start of any construction work. Refer to http://ladot.lacity.org/what-we-do/plan-review to determine which section to coordinate review of the work site traffic control plan. The plan should show the location of any roadway or sidewalk closures, traffic detours, haul routes, hours of operation, protective devices, warning signs and access to abutting properties. DOT also recommends that all construction on related truck traffic be restricted to off-peak hours to the extent feasible.

Administrative Conditions

37. **Final Plans.** Prior to the issuance of any building permits for the project by the Department of Building and Safety, the applicant shall submit all final construction plans that are awaiting issuance of a building permit by the Department of Building and Safety for final review and approval by the Department of City Planning. All plans that are awaiting issuance of a building permit by the Department of Building and Safety shall be stamped by Department of City Planning staff "Plans Approved". A copy of the Plans Approved, supplied by the applicant, shall be retained in the subject case file.

38. **Notations on Plans.** Plans submitted to the Department of Building and Safety, for the purpose of processing a building permit application shall include all of the Conditions of Approval herein attached as a cover sheet and shall include any modifications or notations required herein.

39. **Approval, Verification and Submittals.** Copies of any approvals, guarantees or verification of consultations, review of approval, plans, etc., as may be required by the subject conditions, shall be provided to the Department of City Planning prior to clearance of any building permits, for placement in the subject file.

40. **Code Compliance.** Use, area, height, and yard regulations of the zone classification of the subject property shall be complied with, except where granted conditions differ herein.

41. **Department of Building and Safety**. The granting of this determination by the Director of Planning does not in any way indicate full compliance with applicable provisions of the Los Angeles Municipal Code Chapter IX (Building Code). Any corrections and/or modifications to plans made subsequent to this determination by a Department of Building and Safety Plan Check Engineer that affect any part of the exterior design or appearance of the project as approved by the Director, and which are deemed necessary by the Department of Building and Safety for Building Code compliance, shall require a referral of the revised plans back to

the Department of City Planning for additional review and sign-off prior to the issuance of any permit in connection with those plans.

42. **Enforcement.** Compliance with these conditions and the intent of these conditions shall be to the satisfaction of the Department of City Planning.

43. **Indemnification and Reimbursement of Litigation Costs.**

Applicant shall do all of the following:

(i) Defend, indemnify and hold harmless the City from any and all actions against the City relating to or arising out of, in whole or in part, the City's processing and approval of this entitlement, including but not limited to, an action to attack, challenge, set aside, void, or otherwise modify or annul the approval of the entitlement, the environmental review of the entitlement, or the approval of subsequent permit decisions, or to claim personal property damage, including from inverse condemnation or any other constitutional claim.

(ii) Reimburse the City for any and all costs incurred in defense of an action related to or arising out of, in whole or in part, the City's processing and approval of the entitlement, including but not limited to payment of all court costs and attorney's fees, costs of any judgments or awards against the City (including an award of attorney's fees), damages, and/or settlement costs.

(iii) Submit an initial deposit for the City's litigation costs to the City within 10 days' notice of the City tendering defense to the Applicant and requesting a deposit. The initial deposit shall be in an amount set by the City Attorney's Office, in its sole discretion, based on the nature and scope of action, but in no event shall the initial deposit be less than $50,000. The City's failure to notice or collect the deposit does not relieve the Applicant from responsibility to reimburse the City pursuant to the requirement in paragraph (ii).

(iv) Submit supplemental deposits upon notice by the City. Supplemental deposits may be required in an increased amount from the initial deposit if found necessary by the City to protect the City's interests. The City's failure to notice or collect the deposit does not relieve the Applicant from responsibility to reimburse the City pursuant to the requirement in paragraph (ii).

(v) If the City determines it necessary to protect the City's interest, execute an indemnity and reimbursement agreement with the City under terms consistent with the requirements of this condition.

The City shall notify the applicant within a reasonable period of time of its receipt of any action and the City shall cooperate in the defense. If the City fails to notify the applicant of any claim, action, or proceeding in a reasonable time, or if the City fails to reasonably cooperate in the defense, the applicant shall not thereafter be responsible to defend, indemnify or hold harmless the City.

The City shall have the sole right to choose its counsel, including the City Attorney's office or outside counsel. At its sole discretion, the City may participate at its own expense in the defense of any action, but such participation shall not relieve the applicant of any obligation imposed by this condition. In the event the Applicant fails to comply with this condition, in whole or in part, the City may withdraw its defense of the action, void its approval of the entitlement, or take any other action. The City retains the right to make all decisions with respect to its representations in any legal proceeding, including its inherent right to abandon or settle litigation.

For purposes of this condition, the following definitions apply:

"City" shall be defined to include the City, its agents, officers, boards, commissions, committees, employees, and volunteers.

"Action" shall be defined to include suits, proceedings (including those held under alternative dispute resolution procedures), claims, or lawsuits. Actions includes actions, as defined herein, alleging failure to comply with any federal, state or local law.

Nothing in the definitions included in this paragraph are intended to limit the rights of the City or the obligations of the Applicant otherwise created by this condition.

FINDINGS

DENSITY BONUS / AFFORDABLE HOUSING INCENTIVES PROGRAM FINDINGS

1. **Government Code Section 65915 and LAMC Section 12.22 A.25(c) state that the Commission shall approve a density bonus and requested incentive(s) unless the Commission finds that:**

   a. The incentives do not result in identifiable and actual cost reductions to provide for affordable housing costs as defined in California Health and Safety Code Section 50052.5 or Section 50053 for rents for the affordable units.

   The record does not contain substantial evidence that would allow the City Planning Commission to make a finding that the requested incentives do not result in identifiable and actual cost reduction to provide for affordable housing costs per State Law. The California Health & Safety Code Sections 50052.5 and 50053 define formulas for calculating affordable housing costs for very-low, low, and moderate-income households. Section 50052.5 addresses owner-occupied housing and Section 50053 addresses rental households. Affordable housing costs are a calculation of residential rent or ownership pricing not to exceed 25 percent gross income based on area median income thresholds dependent on affordability levels.

   The applicant proposes to construct a total of 77 dwelling units, of which 12 dwelling units will be set aside for Very Low Income Household Occupancy for a period of 55 years. Density Bonus projects are eligible for four (4) incentives if they reserve at least 16 percent of base dwelling units for Very Low Income Households. Based on the set-aside of 16 percent of base units for Very Low Income households, the applicant is entitled to four (4) Incentives under the Government Code. Therefore, the three (3) On and Off-Menu Incentive requests qualify as the proposed development's Incentives.

   Averaging: As the site contains two (2) different zones of C2-1VL and R4P-1 with different zoning requirements, the project shall be allowed up to average development rights related to FAR, density, open space, and vehicular access over the project site. This incentive does not increase or decrease the development rights or requirements, but allows them to be averaged across the site instead of segregated into the underlying C2-1VL and R4P-1 Zones. Limiting the project to a 1.5:1 FAR in the C2-1VL Zone and a 3:1 FAR in the R4P-1 Zone would cause an uneven distribution of dwelling units and massing, restricting the building envelope and increasing construction costs. The requested incentive will allow the developer to create a uniform development and accommodate the intended level of density, including the construction of the Restricted Affordable unit, and the necessary circulation and common amenity space. The averaging incentive will permit floor area, density, and open space to be distributed across the entire Project site which would result in building design and construction efficiencies that provide for affordable housing costs. In addition, due to the zoning of the lots, the project requires the ability to have vehicular access from a less restrictive zone to a more restrictive zone.

   FAR: The portion of the property that is zoned C2-1VL allows for a maximum FAR of 1.5:1, and the portion of the property that is zoned R4P-1 allows for a maximum FAR of 3:1. The applicant has requested an incentive to allow an averaging of the FAR across the two zones, and a second incentive to increase the allowable FAR by 35 percent up to 2.99:1. The project is for the construction of 74,282 square feet of floor area with a

2.99:1 FAR across six stories and an average of 12,380 square feet of floor area for each floor. The limitation of the maximum allowed FAR would limit the ability to provide space for the construction of the residential dwelling units permitted by-right and the Restricted Affordable Units which are of a sufficient size. The ability to develop larger units will increase the revenues from the market-rate units, which will lower the marginal cost of developing the affordable units. The additional floor area will allow certain fixed costs involved in the construction of new residential units to be spread over more floor area thereby reducing the per square foot build cost of the development. As proposed, the additional FAR will allow for the construction of the affordable residential units. The requested incentives will allow the developer to expand the building envelope which ensures that all units are of habitable size and the overall space dedicated to residential units is increased.

	FAR by-right	Buildable Lot Area (sf)	Base Floor Area (sf)
C2-1VL Zone	1.5:1	13,007	13,007 x 1.5 = **19,510**
R4P-1 Zone	3:1	11,845	11,845 x 3 = **35,535**
Total	2.24:1	24,852	55,045

	FAR Requested	Requested Floor Area (sf)	Additional Floor Area (sf)
Averaged	2.99:1	74,282	74,282 – 55,045 = **19,237**

Height: The subject site is zoned C2-1VL which allows a maximum height of 45 feet and three-stories, and R4P-1 which allows for unlimited height. The applicant has requested an incentive to allow an increase in building height to 71 feet and six-stories. As proposed, the increased building height will allow the developer to expand the building envelope to allow for the construction of the affordable residential units and floor area, whose rents will provide for the operational costs of the affordable units..

b. **The incentive(s) will have a specific adverse impact upon public health and safety, or on any real property that is listed in the California Register of Historical Resources and for which there are no feasible method to satisfactorily mitigate or avoid the specific adverse impact without rendering the development unaffordable to Very Low, Low and Moderate Income households. Inconsistency with the zoning ordinance or the general plan land use designation shall not constitute a specific, adverse impact upon the public health or safety (Government Code Section 65915(d)(1)(B) and 65589.5(d)).**

There is no substantial evidence in the record that the proposed incentive(s) will have a specific adverse impact. A "specific adverse impact" is defined as, "a significant, quantifiable, direct and unavoidable impact, based on objective, identified written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete" (LAMC Section 12.22 A.25(b)). As required by Section 12.22 A.25 (e)(2), the project meets the eligibility criterion that is required for density bonus projects. The project also does not involve a contributing structure in a designated Historic Preservation Overlay Zone or on the City of Los Angeles list of Historical-Cultural Monuments. The project is not located on a substandard street in a Hillside area or a Very High Fire Hazard Severity Zone. There is no evidence in the record which identifies a written objective health and safety standard that has been exceeded or violated. Therefore, there is no substantial evidence that the proposed incentive(s) will have a specific adverse impact on public health and safety, or on property listed in the California Register of Historic Resources. Based on the above, there is no basis to deny the requested incentives.

c. The incentive(s) <u>are contrary</u> to state or federal law.

There is no evidence in the record that the proposed incentives are contrary to state or federal law.

Following is a delineation of the findings related to the request for two (2) Waivers of Development Standards, pursuant to Government Code Section 65915.

2. **Government Code Section 65915 and LAMC Section 12.22 A.25 state that the Commission <u>shall approve</u> a density bonus and requested Waiver of Development Standard(s) unless the Commission finds that:**

   a. **The concession or incentive would be contrary to state or federal law.**

   There is no substantial evidence in the record indicating that the requested Incentives are contrary to any State or federal laws.

   A project that meets the requirements of Government Code Section 65915 may request other "waiver[s] or reduction[s] of development standards that will have the effect of physically precluding the construction of a development meeting the [affordable set-aside percentage] criteria of subdivision (b) at the densities or with the concessions or incentives permitted under [State Density Bonus Law]" (Government Code Section 65915(e)(1)).

   Therefore, the request for the following is recommended as Waivers of Development Standards. Without the below Waivers, the existing development standards would physically preclude development of the base units, build out of the incentives, and project amenities:

   Yards: The subject site is zoned C2-1VL and R4P-1 which requires rear yard setbacks of 18 feet. The applicant has requested waivers for a reduction of the required rear yard setback to allow for minimum setback of 5 feet. The request for an additional 26 feet and three (3) stories is needed to construct the number of units that the requested density bonus allows. Strict application of the rear yard requirements would remove thirteen (13) feet from the proposed building, resulting in a loss of square footage for 12 dwelling units across Levels two through six, in addition to the rents from those units and that floor area on those five (5) stories. An increased rear yard setback will also limit the ability to construct at a sufficient marketable size, the proposed residential units. As proposed, the reduced rear yard setbacks will allow the developer to expand the building footprint, to allow for the construction of the affordable residential units and floor area, whose rent will provide for the operational costs of the affordable units. The requested waiver will allow the project to expand the building envelope so that additional units can be constructed, provide for design efficiencies and allow the overall space dedicated to residential uses to be increased.

   Transitional Height: The subject site is zoned C2-1VL and R4P-1. Los Angeles Municipal Code (LAMC) Section 12.21.1 requires any project within the C or M zone to transition within a varied proximity of the RW or more restrictive zone. Since the subject site has a split zone, if subject to the transitional height requirements, the proposed project would have to transition from itself. The limitation on the height would remove

the half of the uppermost three (3) stories from the proposed building, resulting in a loss of 24 total dwelling units across Levels four through six, in addition to the rents from those units and that floor area on those three (3) stories. A limitation on the height will also limit the ability to construct at a sufficient marketable size, the proposed residential units. The strict restriction of zoned height and imposition of transitional height would physically preclude the development of the project and the requested density of 77 dwelling units by reducing the habitable square footage of 24 dwelling units. The Waiver further supports the applicant's decision to reserve 12 units for Very Low Income households and facilitates the creation of affordable housing units.

b. **The waiver will have specific adverse impact upon public health and safety or the physical environment, or on any real property that is listed in the California Register of Historical Resources and for which there is no feasible method to satisfactorily mitigate or avoid the specific adverse Impact without rendering the development unaffordable to Very Low-, Low- and Moderate-Income households. Inconsistency with the zoning ordinance or the general plan land use designation shall not constitute a specific, adverse impact upon the public health or safety.**

There is no evidence that the proposed density bonus incentives will have a specific adverse impact upon public health and safety, or any real property that is listed in the California Register of Historical Resources. A "specific adverse impact" is defined as "a significant, quantifiable, direct and unavoidable impact, based on objective, identified written public health or safety standards, policies, or conditions as they existed on the date the application was deemed complete."

The project does not involve a historic structure, is not located on a substandard street in a hillside area, a Very High Fire Hazard Severity Zone, or Alquist-Priolo Zone. There is no evidence in the record which identifies a written objective health and safety standard that has been exceeded or violated. There is no substantial evidence in the record that the proposed incentives will have a specific adverse impact on the physical environment, on public health and safety, and on property listed in the California Register of Historic Resources. Therefore, there is no substantial evidence that the proposed incentives will have a specific adverse impact on public health and safety or on any real property listed in the California Register of Historical Resources.

PROJECT REVIEW

5. The project is in substantial conformance with the purposes, intent and provisions of the General Plan, applicable community plan, and any applicable specific plan.

The subject site is located at 2930 – 2936 South Sepulveda Boulevard. The project site is located in the West Los Angeles Community Plan Area. The project site consists of three contiguous lots totaling approximately 25,756 square feet with approximately 130 feet of frontage along the east side of Sepulveda Boulevard and a varied depth of approximately 194 feet. The project site is located in the C2-1VL and R4P-1 zones which limits building height to a maximum of 45 feet on the C2-1VL half of the site and has an unlimited height on the R4P-1 half of the site. The project is the construction, use, and maintenance of a 71-foot high, six story, 77-unit residential development including 12 units set aside for Very Low-Income Households, and two subterranean parking levels including 84 parking spaces. The project includes a total Floor Area of 74,282 square feet with a 2.99:1 FAR. There are 60 long term residential bicycle parking spaces and 6 short term residential bicycle parking spaces for a total of 66 bicycle parking spaces.

The Citywide General Plan Framework is a guide for communities to implement growth and development policies by providing a comprehensive long-range view of the City as a whole. The General Plan Framework establishes categories of land use including Multi-Family Residential that are broadly described by ranges of intensity/density, heights, and lists of typical uses. The definitions reflect a range of land use possibilities found in the City's already diverse urban, suburban, and rural land use patterns. The project is consistent with and advances the following objectives and policies of the General Plan Framework:

> Objective 3.4. Encourage new multi-family residential, retail commercial, and office development in the City's neighborhood districts, community, regional, and downtown centers as well as along primary transit corridors/boulevards, while at the same time conserving existing neighborhoods and related districts.
>
> Objective 3.7: Provide for the stability and enhancement of 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 or improved.

General Plan Framework Element Chapter 4 - Housing:

> Goal 4A. An equitable distribution of housing opportunities by type and cost accessible to all residents of the City.
>
> Objective 4.1. Plan the capacity for and develop incentives to encourage production of an adequate supply of housing units of various types within each City sub region to meet the projected housing needs by income level of the future population to the year 2010.
>
> Objective 4.2. Encourage the location of new multi-family housing development to occur in proximity to transit stations, along some transit corridors, and within some high activity areas with adequate transitions and buffers between higher-density developments and surrounding lower-density residential neighborhoods.
>
> Objective 4.3. Conserve scale and character of residential neighborhoods.

The project will provide 77 apartment units, including 12 units set aside for Very Low Income households. Thus, supplementing the existing housing stock in the West Los Angeles Community Plan area with diversity and contributing to the affordable housing supply. The project is in close proximity and has access to bus options that provide robust public transportation options around the site and greater Los Angeles metropolitan area. This provides regional connectivity from the Beach cities, through West Los Angeles, and to Downtown Los Angeles and the larger Los Angeles Region, including the Los Angeles International Airport.

The Proposed Project has a height of 71 feet, which is appropriate with existing and future developments. Additionally, the Site is located just under 150 feet away from the relatively busy intersections of Sepulveda Boulevard and National Boulevard and is next door to a school that is four stories, similar to the proposed project. Therefore, the Project is consistent with the General Plan as it supports the addition of residential units near commercial districts with transit options.

Consistent with the Goal and Policies noted above, the project proposes to develop a residential development with 77 residential apartment units including 16% of the base

density units set aside for Very Low Income households, having a variety of unit sizes and types, to meet the diverse economic and physical needs and overall demand for the projected increased population in the community plan area. The project contains a range of units from studio- to two-bedroom units, which are intended to accommodate families of all types, as well as 12 units of which will be set aside for Very Low Income households, in order to generate a mixed-income project where families can support each other's stability and growth. As discussed above, the Project will help to alleviate the ongoing housing crisis in Los Angeles and will address the critical demand for affordable housing in the City without displacing existing residential tenants.

Housing Element 2021 - 2029

The proposed project also conforms with the applicable policies of the Housing Element, including:

> Goal 1: A City where housing production results in an ample supply of housing to create more equitable and affordable options that meet existing and projected needs.
>
> Objective 1.2: Facilitate the production of housing, especially projects that include Affordable Housing and/or meet Citywide Housing Priorities.
>
> Policy 1.2.1: Expand rental and for-sale housing for people of all income levels. Prioritize housing developments that result in a net gain of Affordable Housing and serve those with the greatest needs.
>
> Policy 1.3.1: Prioritize housing capacity, resources, policies and incentives to include Affordable Housing in residential development, particularly near transit, jobs, and in Higher Opportunity Areas.
>
> Goal 3: A City in which housing creates healthy, livable, sustainable, and resilient communities that improve the lives of all Angelenos.
>
> Objective 3.2: Promote environmentally sustainable buildings and land use patterns that support a mix of uses, housing for various income levels and provide access to jobs, amenities, services and transportation options.
>
> Policy 3.1.5: Develop and implement environmentally sustainable urban design standards and pedestrian centered improvements in development of a project and within the public and private realm such as shade trees, parkways and comfortable sidewalks.
>
> Policy 3.2.2: Promote new multi-family housing, particularly Affordable and mixed-income housing, in areas near transit, jobs and Higher Opportunity Areas, in order to facilitate a better jobs-housing balance, help shorten commutes and reduce greenhouse gas emissions.

The proposed project will result in a net increase of 77 new residential units to the City's housing stock and conforms with the applicable provisions of the Housing Element. The applicant has requested deviations from code requirements under the Density Bonus program for increased height, and reduced setbacks, thereby allowing the creation of affordable units. Pursuant to Density Bonus requirements, 16 percent (12 units) of the base 74 density units, will be set aside for Very Low Income units. Additionally, this mixed-income development is in close proximity to public transit options, and a variety of retail, commercial,

recreational, and employment opportunities. Locating new housing in this portion of the City will allow residents to have better access to employment centers and places of interest in area. Maintaining the existing street trees will help achieve the City's goals for environmentally sustainable urban design standards and pedestrian-oriented improvements.

Mobility Plan 2035

The proposed project also conforms with the following additional policies of the Mobility Plan, including:

> 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.
>
> Policy 3.1: Access for All: Recognize all modes of travel, including pedestrian, bicycle, transit, and vehicular modes - including goods movement – as integral components of the City's transportation system.
>
> Policy 3.3: Land Use Access and Mix: Promote equitable land use decisions that result in fewer vehicle trips by providing greater proximity and access to jobs, destinations, and other neighborhood services.

The project utilizes Density Bonus incentives for the construction of a residential mixed-income development that provides housing opportunities in proximity to public transit along the Santa Monica Boulevard and utilizes AB 2345 to reduce parking consistent with state law, encouraging multi-modal transportation and decreasing vehicle miles traveled in the neighborhood. The site is located along a portion of Sepulveda Boulevard that is designated by the Mobility Plan as a Boulevard II. The project will also provide 60 long-term and 6 short-term bicycle parking spaces, which is consistent with LAMC Section 12.21 A.16 bicycle parking requirements. Maintaining the two existing street trees will help achieve the City's goals for environmentally sustainable urban design standards and pedestrian-oriented improvements.

Land Use Element – West Los Angeles Community Plan

The project site is in the West Los Angeles Community Plan, and is designated for Community Commercial land uses, with corresponding zones of CR, C2, C4, RAS3, RAS4, P, and PB. The site is split zoned with the C2-1VL zone along the westerly half of the site and the R4P-1 zone along the easterly half of the site and is consistent with the land use designation.

Consistent with the Community Plan, the proposed 77-unit residential development, which includes 12 Very Low-Income units, adds new multi-family housing and much needed affordable housing to Los Angeles's housing supply, in a neighborhood that is conveniently located to a variety of destinations, community services and amenities, and multi-modal transportation options.

The proposed project aligns with the intent of the West Los Angeles Community Plan including the following:

Policy 1-1.3: Provide for adequate multi-family residential development.
Objective 1-2: To reduce vehicular trips and congestion by developing new housing in proximity to adequate services and facilities.

Policy 1-2.1: Locate higher residential densities near commercial centers and major bus routes where public service facilities and infrastructure will support this development.
Policy 1-4.1: Promote greater individual choice in type, quality, price and location of housing
Policy 1.4-3: Encourage multiple residential development in specified commercial zones.
Objective 2-1: To conserve and strengthen viable commercial development and to provide additional opportunities for new commercial development and services within existing commercial areas.
Policy 2-1.1: New commercial uses shall be located in existing established commercial areas or shopping centers.
Policy 2-2.1: Encourage Pedestrian-oriented design in designated areas and in new development.

The proposed project meets the above goal, policies, and objective by providing multi-family dwelling units in a new, safe, and secure building. The proposed project is located within a neighborhood designated for Community Commercial Land Uses, which includes multiple-family residential uses, and is well served by facilities and necessary infrastructure. The site is near several bus stops, which encourages alternative modes of transportation. Planting new street trees will help achieve the City's goals for high-quality pedestrian access for a safe and comfortable walking environment. The 12 affordable units will ensure that the proposed project is accessible to lower-income segments of the population.

Therefore, the proposed project is consistent with the purposes, intent and provisions of the General Plan, West Los Angeles Community Plan, Housing Element, and Mobility Plan by meeting several of its goals, objectives, and policies. Specifically, the project would provide housing and commercial uses on underutilized land to 1) accommodate necessary residential growth and provide a mix of apartment sizes and affordability levels, including rent restricted units for Very Low Income households, and 2) reinforce an existing mixed-use corridor by providing an array of housing options, improved streetscape, and landscaping, that would be inviting to nearby residents and pedestrians along Sepulveda Boulevard.

6. The project consists of an arrangement of buildings and structures (including height, bulk and setbacks), off-street parking facilities, loading areas, lighting, landscaping, trash collection, and other pertinent improvements, that is or will be compatible with existing and future development on adjacent properties and neighboring properties.

As shown in Exhibit A, the proposed project will be compatible with existing and future development on the neighboring properties The project site is an infill site surrounded by commercial and residential land uses. The property is fully developed with streets, sidewalk, gutter, sewer and street trees. The surrounding neighborhood is characterized by commercial, institutional, and mixed-use development with single-family residential across the alley to the rear. The property adjacent to the north is in the C2-1VL and R4P-1 Zone and developed with a 4-story school with a 5-story residential development just north of that in the (T)(Q)C2-1 zone. The properties to the east across the alley are zoned R1-1 and developed with single-story single-family homes. The property to the south across the alley is zoned C2-1VL and is developed with a three-story medical facility. Properties to the west across Sepulveda Boulevard are zoned C2-1VL and are developed with single-story commercial uses. The proposed building form and bulk is consistent with height limits allowed through Density Bonus incentives and waivers.

.

<u>Height</u>

The subject site is zoned C2-1VL which permits a height of 45 feet and R4P-1 which permits an unlimited building height. The property adjacent to the north is in the C2-1VL and R4P-1 Zone and developed with a 4-story school with a 5-story residential development just north of that in the (T)(Q)C2-1 zone. The property to the south across the alley is zoned C2-1VL and is developed with a three-story medical facility. Therefore, the addition of a new 6-story residential development is comparable to other existing developments in proximity to the project. The applicant has requested an increase for 26 additional feet in height to allow for 71 feet and 6 stories through a Waiver of Development Standards. The proposed height is consistent with height limits allowed through Density Bonus incentives and waivers.

Bulk and Setbacks

In the C2-1VL and R4P-1 zones, the setbacks and open space areas for projects involving new construction shall be developed in accordance with the underlying zone. Developments in the C2-1VL Zone are subject to R4 rear yard setbacks and developments in the R4P-1 zone are required to provide a minimum 18-foot rear yard setback. As designed the project is proposed with a minimum five-foot rear yard setback at the lowest residential floor which is the first story of the building. The u-shaped building will allow relief from the school to the north, and roof deck will allow relief from residential to the east.

Entrances

The primary pedestrian entrance is located along Sepulveda Boulevard that will provide direct access to the lobby, parcel/mail room, leasing office, and elevators. The pedestrian entrance is recessed and enhanced with a metal planter wall to be differentiated from the remainder of the street frontage.

Materials

The project is proposed with a variety of building materials including both metal and fiber cement panels, aluminum storefront glazing, and a mix of both glass and plaster balconies. The provided variations of materials and building depths create visual interest and promote best practices for 360 degree design.

Off-Street Parking Facilities

The above grade parking is completely screened along Sepulveda Boulevard by habitable floor area and building systems. Vehicular access to the parking structure is accessible from the alley to the south of the property. Additionally, the project will provide a total of 84 residential vehicular parking spaces. The project will also provide 60 long term residential bicycle parking spaces and 6 short term residential bicycle parking spaces, for a total of 66 bicycle parking spaces.

Lighting

All pedestrian walkways and vehicle access points will be well-lit. Outdoor lighting shall be designed and installed with shielding, such that the light source cannot be seen from adjacent residential properties, the public right-of-way, nor from above. As required by Condition Number 18, all outdoor lighting will be shielded to prevent excessive illumination and mitigate light impacts on adjacent residential properties and the public right-of-way.

Landscaping

The project includes approximately 8,608 square feet of open space areas, including 2,381 square feet of courtyard space, and 964 square feet for a roof deck, both of which are proposed as usable open space for residents and are designed with landscaping and seating. Approximately 1,198 square feet of the total open space will be landscaped. There are 19 trees required for the development. The project is proposed with 22 trees including one new street tree in addition to the two existing street trees proposed to remain. The proposed project's landscaping creates a pedestrian friendly environment along the

sidewalk providing an attractive and inviting entrance to the development and there will be several trees located along the northern side of the building courtyard to create a buffer between the adjacent school and the project.

Trash Collection
A trash and recycling room will be located on the ground level directly accessible from the parking garage. The parking garage is accessible from the alley. Each floor, except the roof level will have a trash room convenient to residents.

7. The residential project provides recreational and service amenities to improve habitability for its residents an minimize impacts on neighboring properties.

The project includes recreational facilities and amenities that will improve the habitability for the residents and will minimize impacts on neighboring properties. The building is proposed with a second story 2,381 courtyard that is adjacent to an indoor 1,285 square foot fitness room, 964 square foot roof deck, all of which is proposed as usable open space for residents and is designed with landscaping and seating. The project will provide a total of 8,608 square feet of open space and 3,250 square feet of private balconies. The proposed project's landscaping creates a pedestrian friendly environment along the sidewalk providing an attractive and inviting entrance to the development and there will be several planters located along the sidewalk and on the building façade to create visual interest to the project.

CEQA FINDINGS

The Planning Department determined that the City of Los Angeles Guidelines for the implementation of the California Environmental Quality Act of 1970 and the State CEQA Guidelines designate the subject project as Statutorily Exempt under California Public Resource Code Section 21080.66.

A project qualifies for a Statutory Exemption if it is developed as a Housing Development Project as defined as 65905.5(b) of the California Government Resource Code and meets the following eligibility criteria and procedural requirements:

Eligibility Criteria
a. Site is 20 acres or less.
b. Site is previously developed or 75 percent of the perimeter of the site adjoins parcels developed with urban uses.
c. Project is consistent with General Plan and Zoning; if the plan or zone is inconsistent, then consistent with the plan or the zoning.
d. Density is 15 dwelling units per acre (for City of Los Angeles) or more.
e. Site is not located within a coastal zone, farmland, wetlands (as defined by the U.S. Fish and Wildlife Service), very high fire hazard severity zone unless mitigation exists, hazardous waste site listed pursuant to PRC 65962.5, earthquake fault zone, special flood plain, floodway, habitat conservation plan, habitat for protected special status species, conservation easement.
f. Not demolishing designated historic resource.
g. No portion of the project is for hotel, motel, other transient lodging (not including residential hotel or resident use as short-term lodging).

Procedural Requirements
a. Tribal Notification/Consultation
b. Condition for Phase I Environmental Site Assessment (ESA) and if necessary, mitigation is necessary.

c. Conditions added to housing within 500 feet of freeway.

Project Description
The project is the construction, use, and maintenance of a 71-foot high, six story, 77-unit residential development including 12 units set aside for Very Low-Income Households, and two subterranean parking levels including 84 parking spaces. The project includes a total Floor Area of 74,282 square feet with a 2.99:1 FAR. There are no existing trees on site, however there are two (2) existing trees within the public right-of-way adjacent to the subject property proposed to remain. There is an existing one-story commercial office building and surface parking lot proposed to be demolished, and a haul route for the export of approximately 9,771 cubic yards of soil proposed as a part of the project.

As a qualifying Housing Development Project as defined in Section 65905.5(b) of the California Government Resource Code, the project qualifies for the Statutory CEQA Exemption pursuant to California Public Resource Code Section 21080.66 as described below:

SITE AND ENVIRONMENTAL CRITERIA

a. *Site is 20 acres or less.*

The project site is approximately 0.593 acres pre-dedications per the Zone Information & Map Access System (ZIMAS).

b. *Site is previously developed with or 75 percent of the perimeter of the site adjoins parcels developed with urban uses.*

The site was previously developed with a commercial bank since 1961.

The surrounding neighborhood is characterized by commercial, institutional, and multi-family residential, with single-family to the rear of the subject site. The property adjacent to the north is in the C2-1VL and R4P-1 Zone and developed with a 4-story school, with a 5-story residential development just north of the school in the (T)(Q)RAS4-1 Zone. The properties to the east across the alley are zoned R1-1 and developed with sing-story single-family homes. The property to the south across the alley is zoned C2-1VL and is developed with a three-story medical facility. Properties to the west across Sepulveda Boulevard are zoned C2-1VL and are developed with single-story commercial uses.

c. *Project is consistent with General Plan and Zoning; if the plan or zone is inconsistent, then consistent with the plan or the zoning.*

The project site is located in the West Los Angeles Community Plan Area and has a General Plan Land Use Designation of Community Commercial. As shown in the case file, the project is consistent with the applicable West Los Angeles Community Plan designation and policies and all applicable zoning designations and regulations.

The project seeks a density bonus request with two on-menu incentives, one off-menu incentive and two waivers of development standards that are established in the Los Angeles Municipal Code (LAMC). Additionally, the project requires a Project Review as a development that creates more than 50 new residential dwelling units. The project meets the requirements of the State and City density bonus law. Excluding the incentive and waiver requests to deviate from the LAMC standards,

d. *Density is 15 dwelling units/acre (for City of Los Angeles) or more.*

The Project proposes 77 dwelling units and the site is approximately 0.591 acres, making the proposed density approximately 130 dwelling units per acre.

e. *Not located within a Coastal Zone, farmland, wetlands (defined by USFW), VHFHSZ unless mitigation exists, hazardous waste site listed pursuant to PRC 65962.5 or DTSC pursuant to H&S Code 25356 – unless site has been cleared for residential use, earthquake fault zone, special flood hazard area, regulatory floodway, habitat conservation plan, habitat for protected special status species, conservation easement.*

The project site is not located within a coastal zone, farmland, wetlands (as defined by USFW), very high fire hazard severity zone unless mitigation exists, hazardous waste site listed pursuant to PRC 65962.5, earthquake fault zone, special flood plain, floodway, habitat conservation plan, habitat for protected special status species, or conservation easement.

f. *Not demolishing designated historic resource (designated before preliminary application).*

The project site was not identified on SurveyLA, the citywide Historic Resources Database of Los Angeles, as a potential individual resource. Therefore, the project will not result in a substantial adverse change to the significance of a historic resource and this exception does not apply.

g. *No portion of the project is for hotel, motel, other transient lodging (not including residential hotel or resident use as short-term lodging).*

No portion of the Project shall be used for hotel, motel, or other transient lodging.

PROCEDURAL CRITERIA

a. *Tribal Notification/Consultation*

The City has met the tribal notification and consultation requirement as evidenced in the case file. This includes the City providing formal notification via certified mail to each California Native American Tribe that is traditionally and culturally affiliated with the project as an invitation to consult on the proposed project, its location, and the project's potential effects on tribal cultural resources. Additionally, this includes adhering to the requisite number of days for a tribe to request consultation and to accept the invitation to consult, and the City to initiate and close consultation.

b. *As a condition of approval, the applicant will be required to submit a Phase 1 Environmental Site Assessment (ESA) to identify any potential exposures to hazardous conditions. If necessary, mitigated to current federal and state standards.*

A Phase 1 Environmental Site Assessment (ESA), prepared by Partner Engineering and Science Inc., dated April 30, 2012 was submitted into the public administrative record. The ESA did not reveal evidence of recognized environmental conditions in connection with the subject property. The subject property historically appeared to be utilized for agricultural purposes prior to the construction of the existing structure. There is a potential that agriculturally related chemicals: pesticides, herbicides, and fertilizers may have been used and stored on site. The subject property is currently developed with a commercial building with paved parking areas and landscaped areas. During development activities

at the subject property, near surface soils (where residual pesticide concentrations would have most likely been present, if at all) would have been mixed with fill material or disturbed during grading. Also, it is common that engineered fill material was placed over underlying soils as part of the development activities. Furthermore, it is likely that residual pesticides (if any) would have degraded since the subject property was last utilized for agricultural purposes. Therefore, the former agricultural use of the subject property is not expected to represent a significant environmental concern.

Based on the construction date of the subject building, it is possible that asbestos-containing materials (ACMs) are present on the subject property. Overall, suspect ACMs were observed in good condition and do not pose a health and safety concern to the occupants of the subject property at this time. Suspect ACMs should be sampled prior to repair, renovation, or demolition activities.

Based on the conclusions of this assessment, Partner recommends the following:

An Operations and Maintenance (O&M) Program should be implemented in order to safely manage the suspect ACMs located at the subject property.

As required by Conditions 31, 32, and 33 of this determination, the project is condition to satisfy this recommendation.

c. *Freeway – Additional Conditions of Approval for Projects within 500 feet of a Freeway.*

The subject site is within 500 feet of a freeway and therefore conditions of approval for the freeway proximity requirements will ensure that applicants provide HVAC, filtration, and other related design specifications to Los Angeles Department of Building and Safety (LADBS) to ensure compliance.

Applicant Copy
Office: Downtown
Application Invoice No: 106963

68001106963

City of Los Angeles
Department of City Planning

City Planning Request

NOTICE: The staff of the Planning Department will analyze your request and accord the same full and impartial consideration to your application, regardless of whether or not you obtain the services of anyone to represent you.

This filing fee is required by Chapter 1, Article 9, L.A.M.C.

If you have questions about this invoice, please contact the planner assigned to this case. To identify the assigned planner, please the assigned planner, please visit https://planning.lacity.gov/pdiscaseinfo/ and enter the Case Number.

Payment Info: $218.94 was paid on 01/28/2026 with receipt number 200421555755

Applicant: Pam Rieder (2990 S. Sepulveda, LLC)
Representative:
Project Address: 2930 S SEPULVEDA BLVD, 90064

NOTES:

CPC-2024-5548-DB-PR-HCA-1A			
Item	Fee	%	Charged Fee
Appeal by Person Other Than The Applicant	$178.00	100 %	$178.00
		Case Total	**$178.00**
		* Fees Subject to Surcharges	$178.00
		Fees Not Subject to Surcharges	$0.00
		Plan & Land Use Fees Total	$0.00
		Expediting Fee	$0.00
		Development Services Center Surcharge (3%)	$5.34
		City Planning Systems Development Surcharge (6%)	$10.68
		Operating Surcharge (7%)	$12.46
		General Plan Maintenance Surcharge (7%)	$12.46

* Fees Subject to Surcharges	$178.00
Fees Not Subject to Surcharges	$0.00
Plan & Land Use Fees Total	$0.00
Expediting Fee	$0.00
Development Services Center Surcharge (3%)	$5.34
City Planning Systems Dev. Surcharge (6%)	$10.68
Operating Surcharge (7%)	$12.46
General Plan Maintenance Surcharge (7%)	$12.46
Grand Total	$218.94
Total Overpayment Amount	$0.00
Total Paid (amount must equal sum of all checks)	$218.94

Council District:
Plan Area:
Processed by MAIRA SANCHEZ on 1/28/2026

Signature: _____

Quality Mapping Service

MAILING SERVICES CONTRACT

PAID $2/03/26 PT

CONTACT: George Garikian
SITE ADDRESS: 2930 S Sepulveda Blvd
CASE NUMBER: CPC-2024-5548-DB-PR-HCA

QMS: 25-035MA
DATE: 02/02/2026

DESCRIPTION OF SERVICES AND FEES:
NOTE: NOTICE MUST BE RECEIVED 7-10 DAYS BEFORE MAILING

Mailing of Public Hearing Notice/Appeal (1 to 4 Pages 8 ½ x 11, or (1) 11x17 Page)	409	x $4.30ea	$1,758.70
Mailing of Determination Letter (up to 4 pages) (over 4 pages @ .70¢/page)		x $4.30ea	
Posting of Site – Weather Resistant	1	x $130.00 (1st)	$130.00
		x $110.00 (addtl.)	
Removal of Signs (optional)		x $100 (1st)	
		x $25.00 (addtl.)	
Credit Card Fee		x 3.5%	
		TOTAL DUE:	**$1,888.70**

A COPY OF THIS FORM MUST BE PRESENTED TO THE PLANNING DEPARTMENT AT THE TIME OF FILING TO HAVE YOUR APPLICATION DEEMED "COMPLETE"	**INITIAL**
The City of LA usually generates a determination letter compromising of (1) to (4) pages which requires 1st Class postage and will be billed at $4.30 each. If your project requires an LOD/NOP that exceeds four pages, you will be billed for excess postage and materials cost that are due on receipt of bill.	gg Int-
REFUNDS Cancelations and changes are subject to a 20% or $50.00 handling fee, whichever is greater. Returned checks/payment are subject to a $200.00 fee. In which case the City will be notified that the invoice is null and void. A fee of 50% will be charged to re-activate all null and void invoices.	gg Int-
If instructed by the City that your case has gone to Appeal, CPC, or PLUM, we will immediately mail out per City instructions. The cost of mail and processing of $4.25/label, (price may change without notice if postage increases) is immediately due to us from you.	gg Int-

george garikian
Signature

(818)634-2161
Telephone

George Garikian
Print Name

14549 Archwood Street, #301 • Van Nuys, CA 91405 • (818) 997-7949 • Fax (818) 997-0351 • qmapping@qesqms.com