# Communication from Public

**Name:** Janet Schaaf-Gunter
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**Council File No:** 11-1813-S8
**Comments for Public Posting:** The issue of the large body of water currently almost filling the 12.5 million gallon impound basin of the Rancho LPG facility only adds to the chronically dangerous existence of this site within the Southern region of Los Angeles. This facility has long been a literal "ticking timebomb" for the City that endangers thousands of people within a scant distance and also the Port of Los Angeles that falls within 1/2 mile. Introduced in 1973 under the political influence of the Nixon administration and "exempted" from regulatory controls at that time, this facility sits within one of the "most" seismically vulnerable areas in our state. With "each" of its two 12.5 MILLION gallon tanks of highly explosive butane gas representing an over 3 mile blast radius, it abuts the Phillips 66 refinery on the north, and lies above a hornet's nest of chemical and fuel pipelines. This site has the potential for disaster that is unimaginable in its scale. The notion of this impound basin originally was that the "liquefied" butane of an entire tank (12.5 million gallons) were it to be ruptured would be captured in the basin preventing it from flowing down the grade to the highway and storm drain preventing its explosion and fire. However, at its best....this explanation suffers from hallucination. Butane gas is kept in the tank in liquid form ONLY due to its refrigeration below 32 degrees. Once the gas escapes the refrigerated tank and is introduced into warmer ambient air....it rapidly voluminizes over 230 times its volume as a liquid! The gas cloud is heavier than air and would rapidly overflow that basin flowing down into the storm drain and onto Gaffey Street. That rapid voluminization is what causes the explosion and the ignition of the gas is instigated by as little as an electric spark! There are several back up gas generators on the Rancho premises alone, and a plethora of cars daily running on Gaffey Street. The explosion and fire would impact the area for literal miles with the first 1/2 mile representing a literal "vaporization zone" for those within it. This facility, under all three owners of it, have erroneously claimed that the impound basin reduces its blast radius from a single tank of butane gas to 1/2 mile rather than the EPA formula for flammables worst case blast radius which projects 3 miles! There are also 5 60,000 gallon horizontal pressurized propane tanks that empty into that basin. This gas upon release reacts in much the same way as butane. The basin would have some effectiveness in

the capture of that gas due to the much smaller volume. The water currently within the basin means that even that gas will now be floating on "top" of that water significantly reducing the volume of capture. The water that sits within that basin was observed more than a year ago and has increased significantly. The water is no doubt contaminated now and cannot be emptied into the storm drain. It absolutely further affects the high risk of this operation which is now used primarily as a remote butane gas storage location for the distant refinery of Valero in Wilmington. The city of Los Angeles currently allows the use of both rail and pipeline to transfer these explosive commodities over Port of LA controlled properties that fall within the "public trust". If there is a genuine desire on behalf of our Councilmember McOsker or any other City officials to really be effective on this (criminally convicted) Plains All American Pipeline-owned, Rancho LPG issue there need to be additional parallel motions for the long ignored comprehensive risk analysis of the City's rail transport and the risks associated with the massive storage in their antiquated 50 year old tanks that were never held to regulations. The issue of the facility's lack of insurance and liability to the city of Los Angeles is also a grave concern. An audit of the Port's enforcement of the rail permit (Permit No. 89) servicing the rail should also be pursued. A simple revocation of both the rail and pipeline permits could easily resolve this high-risk situation "if" there is a backbone exhibited on behalf of the people by this City Council. The LA City Council's attention and action on this outrageous situation is long, long overdue.

# Backyard Mega-Bombs

A Case Study on the Rancho LPG LLC Holdings Facility in San Pedro, California:
History, Danger, Sources of Disruption, Current Obstacles, and Possible Solutions

Tim Saunders
University of Southern California – EH MATTERS
March 2022

## Executive Summary

The Rancho LPG LLC Holdings Facility is a butane storage facility located in the densely populated residential area of San Pedro, CA. The facility holds an enormous 25 million gallons of butane, a flammable and volatile substance. Were the dangerous substance to be ignited, the energy released would be on par with a nuclear bomb.

The blast radius for an explosion of this magnitude would extend past 8 miles, affecting over 1.3 million individuals. Over 100,000 people would likely be killed instantly. Infrastructure would be crippled by degrees depending on the proximity to the facility. Key infrastructural pieces—the Port of Los Angeles and the Port of Long Beach—would be decimated by the resulting explosion. Forty percent of the United States' ability to import goods would be lost, the thousands of jobs supported nationwide would be affected, and overall, the economy of the country would fall into recession. This makes the danger of the facility a national concern. Lastly, as the nation's largest urban oil field, Los Angeles is checkered with multiple additional potential ignition sites following the initial explosion. Such a cascade of disruptions and explosions would ravage the southern peninsula of California.

There are several factors that make Rancho LPG uniquely dangerous compared to other facilities of its type and service. Facility age is a huge concern, as it sports outdated infrastructure and ineffective regulatory systems. The facility was constructed about 50 years ago and only meant to last 25 years. Additionally, when it was constructed, it was exempted from adhering to standard building codes. To this day, this storage facility has failed to complete a proper risk analysis, further avoiding this issue.

Its location also makes the facility far more hazardous compared to others in its class. First, it is located in a dense urban residential area. Second, the facility is on unstable ground, since it sits on the Palos Verdes Fault Line, within a liquefaction zone, and in a landslide area. Any geological event would lead to devastation.

Lastly, there was a terrorist plot to detonate a similar facility in Elk Grove, CA. The "Twin Sisters" plot in the 1990s had the intention of disrupting the Elk Grove facility to kill thousands of individuals and destabilize the government. Fortunately, it was foiled by the FBI. That said, Rancho LPG has highest possible risk ranking while not requiring any protection. It is potentially vulnerable to a high-powered rifle or Rocket-Propelled Grenade attack, either of which could easily disrupt the tanks and set off an explosion.

While there have been attempts in the past to relocate or close this facility, previous attempts have failed. Despite this, there are options by which the facility could be forced to cease operations or otherwise reduce the risks associated with continued operations. The operating company (Rancho LPG) have revokable permits that rolls over monthly, allowing them use of the public land for exporting their product. These permits can be reviewed and revoked at any time by the City Council of Los Angeles. Revoking the permits would lead to the condemnation of the hazardous facility due to the inability to export product in conformance with modern codes. Recent legislation has also been proposed, allowing grants to be given to companies for relocating facilities, incentivizing the relocation of hazardous facilities away from dense, residential, and urban areas. In the case of the Rancho LPG facility, however, neither of these actions have been readily pursued, and some have been dismissed entirely. In lieu of facility closure, proper and effective safety precautions—such as an effective sprinkler system or more appropriate leak detection systems—should be put in place to mitigate possible disruptions.

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## Abstract

The densely populated, residential neighborhood of San Pedro, CA houses two 12.5-million-gallon butane tanks at Rancho LPG LLC Holdings. The danger of the tanks has been greatly underestimated, downplayed, and misreported. While seemly inconspicuous, these tanks have the same energy output of a nuclear bomb. A catastrophic failure event would result in an explosion with a blast radius extending past 8 miles, affecting over 1.3 million people, and likely killing over 100,000. There are several factors that could contribute to a failure event. The facility is on unstable ground—a fault line and a liquefaction zone. The facility is old, twice past its initially planned closing date. Lastly, terrorists previously targeted an identical facility with California; Rancho LPG has no defense. As of late, there have been no documented motions to condemn or otherwise improve the safety of the facility despite there being multiple options to do so such as revoking usage permits, relocating using grant money, or improving safety functions. There has been a failure to uphold safety at the facility, posing far more danger to the public than is justified but this outdated storage facility. The benefits do not outweigh the cost, and the public suffers for it.

## Introduction

Imagine having a nuclear bomb right in your backyard, but what if none knew about it—not your neighbors, the larger surrounding community, not even you. To everyone, the bomb is just another industrial landmark, nothing out of the ordinary. Still, this bomb must be carefully protected, right? Certainly something with so much destructive power would be kept under heavy surveillance, would it not? Well, not particularly. Not only is this bomb on an unstable piece of ground, but there have also been some potential plans to attack and detonate it. Some people are aware of the danger, but either refuse to do anything or do not know how to help—and this has been the case for around 50 years! It's a waiting game, day in and day out: will everything go on as it has for decades, or will today be the day hundreds of thousands of people lose their lives?

This is the status and story of the Rancho LPG LLC Holdings Facility, a butane storage facility located in the residential neighborhood of San Pedro, California adjacent to a major freeway, large refineries, and the ports of Los Angeles and Long Beach. The facility itself holds over 25 million gallons of liquid butane, a highly flammable substance. Butane has many uses as a fuel source and, for reference, is commercially sold to consumers in eight-ounce canisters. If one exploded while cooking with a portable stove for instance, some major burns could be expected along with a trip to the hospital. Were the tanks at Rancho LPG to explode, the energy released would be on par with a nuclear bomb. The blast radius would literally cover miles; even those living in homes three miles away would not be considered safe. For those within this blast radius, it would more likely be a trip to the cemetery rather than the hospital.

As alluded to before, by a number of criteria, this facility should not be considered “safe”. Possible sources of disruption are addressed ineffectively or not at all. A multitude of factors raise serious questions about the dangers posed by this facility, from its geography to its history and even its daily operations. Any facility storing massive amounts of flammable substance is an omnipresent threat. However, there are particulars to Rancho LPG that make it extremely dangerous.

The goal of this report is to illuminate the public safety issues associated with the Rancho LPG facility, identify the inadequacies of current Rancho LPG facility plans and protocols, and offer solutions to reduce the cumulative current public health and safety hazards. This report includes an overview of the operational history of the facility to the present day, a breakdown of the potential for disaster using proven mathematical and scientific calculations, the numerous contributing factors to the hazardous nature of the facility, the scope of consequences following a catastrophe on both a local and national scale if one were to occur, and the obstacles impeding the condemnation of the facility and ways to overcome them. In the interests of public health and safety, the status quo simply cannot continue; the decades of a *de facto* waiting game must end. Failure to act only invites disaster. Given the nature of this

facility and the current safety practices in place in its current location, it is not a question of "if" something will go wrong, but unfortunately a question of "when".

## Background

Built in 1973, the Rancho LPG LLC storage facility serves the function of storing massive amounts of liquid butane using two 12.6 million-gallon refrigerated tanks.[1(14)] At the time of construction fifty years ago, butane was viewed as a viable replacement for fossil fuels. In the past, butane would be transported via underground piping system to the Port of LA which sits roughly 3.5 miles away from the facility. The butane was then loaded onto a ship or truck where it could be transported and sold.[2(19)] As a potential alternative energy source, using the port of LA as a base would allow butane to be easily distributed.

As the US was facing down a potential oil crisis in the 1970s, the tanks were constructed without proper permits to insure they were readily available. Permits normally exist to ensure that buildings are reliably safe to operate—for those within the area and surrounding region. Over time, building codes have become more detailed and more restrictive, especially for facilities containing potential hazards such as flammable gas.[3(18)] Given that this facility lacks those permits, the structural integrity and ethical viability of the current facility is highly questionable. Since the facility was not built to the standards of its own time, it would be hard to claim that they can meet the more rigid, current criteria nearly 50 years later.

Currently, the facility is still in operation. In 2008, the Rancho LPG Holdings LLC purchased the facility and is currently solely responsible for operations. Though not as widely used—or considered for use—butane is still transported from the facility via pipeline and tanker truck, providing income for the facility. Propane (a similarly volatile substance) is also exported via rail car. The facility functions to store the volatile gasses as a byproduct of gasoline refining. During winter months, the facility also blends the stored butane with gasoline for high octane gas.[4(14)] This export is then transported via the same pathways. Little has been done to update the facility, and it largely retains its 50-year-old infrastructure. Additionally, as the tanks were seen

as a temporary solution and constructed quickly, they were not meant to last very long. They were built to last 25-years, seeing as other fuel options would be more accessible by that point. Obviously, it's well past that date now.

## The Explosion

Rancho LPG stores a massive amount of volatile butane. Were a catastrophic event to occur, the energy released would be on par with a nuclear bomb. The radius of the explosion from the facility could be anywhere from 3 to 10.5 miles with individuals affected ranging from hundreds of thousands to millions. The following section provides an in-depth explanation of the potential explosion, using proven scientific and mathematic calculations based on the publicly available information. The results are also cross-referenced with other formulas of similar type to provide confirmation, accuracy, and a better breakdown of explosion ranges. Finally due to the massive scale, both minimum and maximum ranges of the potential explosion are calculated. While the "truth" is likely somewhere in-between, the purpose is to demonstrate the ongoing large-scale dangers associated with the continued operation of this facility. Regardless, these calculations support the claim that the facility represents a significant threat to safety that must be addressed.

### How Much Is There?

The total weight of the butane stored in the two 12.6 million-gallon tanks is about 60,480,000 lbs per tank for just under **121,000,000 lbs** total. The refrigerated tanks keep butane in a liquid state, below its boiling point of 31°F.[5(17)] Butane leaking from the tank would cause the liquid to absorb heat from the surrounding air and immediately undergo a phase change from liquid to gas. When butane changes from its liquid to gaseous state, it expands to over **230 times** its starting volume, creating a non-flammable explosion called a vapor cloud. The newly formed vapor cloud would not readily disperse, since it would be twice as heavy as air; it would instead form near the bottom on the tanks and begin crawling outward. Upon finding any ignition source the cloud would explode, this time creating a **fireball**.[6(3,17)] Sources of ignition on-site

include three compressors, a heater, and a flare. Car engines on the adjacent roads of Gaffey Street and Westmoreland—even something as small as a static charge—could also ignite the gas. It is important to note that BOTH types of explosions (the vapor cloud and the ignition-source) are dangerous and could result in serious injury or death as well as extensive property damage.

The facility also houses five pressurized 60,000 gallon tanks filled with propane coming to a total weight of **1,260,000 lbs**.[7(4,14)] These are maintained at -44°F, and the propane would expand to **270 times** its original volume when changing from liquid to gaseous state. It follows the same path as butane outlined previously.[8(4)] Since both set of tanks are close to one another, both would be collateral hazards if the other were to fail. Because of this, the tanks can and should be evaluated together to determine the total explosive power of the facility.

## Risk Management Analysis According to Rancho LPG

The EPA has clear and standardized guidelines on how risk should be calculated. For butane and other flammable sources, companies are required to report the effective damage in equivalents amount of Tri-nitro-toluene (TNT). The EPA guidelines also state that certain parameters which reduce the overall risk can be abused. By having a "passive mitigation system", company are allowed a 90% reduction credit.[9(4)] This means only 10% of a compound is required in analysis. Typical passive mitigation systems might include building enclosures, dikes, containment walls, or any other technologies that function without a human or mechanical energy input.[10(17)] Rancho LPG has a passive mitigation system in the form of an impound basin designed to hold the **liquid** contents of one tank.[11(4,14,16,18)] However, this system is *completely useless*, since any leaking butane would immediately turn into a **gas** upon tank release. This basin accomplishes nothing except allowing Rancho LPG to downplay the risk of the facility. Furthermore, Rancho LPG also has "administrative procedures" that prevent tanks from filling to capacity.[12(16)] Administrative procedures can include any form of upkeep like monitoring or other human or mechanical-based systems.[13(17)] This allows them to reduce the total weight by an undefined amount according to the EPA guidelines. According to publicly available information, for

assessment of one tank, this allowed Rancho LPG personnel to reduce the calculated weight of potentially leaking butane from 60,480,000 lbs to 57,000,000 lbs.[14(4,16)] Finally, Rancho LPG Holdings LLC incorrectly represented the severity of an explosion by incorrectly representing butane as a "Toxic Substance" rather than a "Flammable Gas". This is relevant regarding which guidelines and reports the facility must apply, which depend on the substance classification. Based on their designation of butane as a "hazardous substance" rather than a "flammable gas", Rancho LPG concluded that the disruption of a single tank would have a blast radius of 0.5 miles and affect 722 individuals living in the area.[15(4,16)] This is simply incorrect; running the same process as Rancho LPG yields 3 miles. How they arrived at these results in entirely unclear. Regardless, these numbers severely downplay and misrepresents the extreme danger these tanks represent.

## Worst-Case Analysis

The EPA has a specific formula for flammable substances to evaluate the explosion size in miles based on pounds of material. The formula below can be found in the Risk Management Program Guidance for Offsite Consequence Analysis - Appendices (April 1999) under Appendix C:

$$D_{mi} = 0.0081\ x\ \left(.1^{*}\ x\ W_{lb}\ x\ \frac{HC_f}{HC_{TNT}}\right)^{\frac{1}{3}}$$

| | | | |
|---|---|---|---|
| Where: | D | = | Distance to overpressure of 1 psi (mi) |
| | $W_{lb}$ | = | Weight of flammable substance (lbs) |
| | $HC_f$ | = | Heat of combustion of flammable substance (Kj per Kg) |
| | $HC_{TNT}$ | = | Heat of explosion of trinitrotoluene (TNT) (4,680 Kj per Kg) |

This is the proper formula that should be used to evaluate a flammable substance like butane.[16(17)] Of note, in a "Worst-Case Analysis", the protocol allows for "only" the worst case has to be presented. What this means for the Rancho LPG facility is that despite there being two massive butane tanks and smaller propane tanks in the immediate facility area, Rancho

LPG need only evaluate **a single butane tank**, since its disruption would account for the "Worst Case" on the site.[17(4,16,17)] From a public health and safety standpoint, this allows collateral factors to be ignored and the overall danger of a facility—on paper—to be minimized. In the following calculations, to properly evaluate the potential public health risk, both a "minimum estimate" (using Rancho LPG numbers) and a "maximum estimate" (inclusion of all the tanks present) are evaluated to get a more accurate sense of the community risk represented by the Rancho facility.

## The Minimum Estimate

When using Rancho LPG Holdings LLC's numbers, the following blast radius of **one butane tank** would be as follows:

$$Mi = .0081\ x\ \left(.1\ x\ 57{,}000{,}000\ x\ \frac{45{,}719}{4{,}680}\right)^{\frac{1}{3}}$$

The blast radius with this amount of butane would be **3 miles**; that is six times what Rancho LPG reported.[18(4,11,16)] The explosion would cover **28 sq. mi**, about 13,550 football fields. The 3-miles blast radius would reach the Terminal Island Freeway on the east, encompass most of the Port of LA to the south, and include parts of the Port of Long Beach. In terms of affected population, since Rancho estimated reported 722 individuals in a .8 sq mi range ($.5^2$ x π), converting to the new range results in an estimated residential population of 27,000 individuals. Of note, this is the **best outcome**—and frankly unrealistic—considering how dangerous the disruption of this facility would be.

## The Maximum Estimate

As mentioned previously, there are two 12.6 million-gallon butane tanks and five 60,000 gal propane tanks that sit on the facility site. If any one of the tanks are disrupted, every other tank will also likely be disrupted. Thus, *every* tank should be accounted for when calculating the total

blast radius associated with an explosion; this would account for the most likely outcome, if there were a tank rupture and gas explosion on-site:

For Butane: $$Mi = .0081\ x\ \left(121{,}000{,}000\ x\ \frac{45{,}719}{4{,}680}\right)^{\frac{1}{3}}$$

For Propane: $$Mi = .0081\ x\ \left(1{,}260{,}000\ x\ \frac{46{,}333}{4{,}680}\right)^{\frac{1}{3}}$$

The total explosion radius for both butane and propane are 8.6 mi and 1.9 mi respectively. Together, a gas explosion disruption at the facility would result in an explosion with a blast radius of **10.5 mi** covering **364 sq mi**. This number is more than likely an overestimate, as it relies on the tanks being at 100% capacity—hence "0.1" being removed in the calculations—that all volatile substances participate in the explosion, and all substances being additive. Still, reducing the tanks to 75% capacity would still result in a blast radius of 7.8 mi! An explosion on this scale would have over ½ megaton of energy released: 2.3 x 10^15 J. This is **36x** the energy released of the Little Man atomic bomb dropped on Hiroshima during WWII (which was about 15 kilotons).

This resulting blast radius would extend all the way into the Pacific Ocean to the west and south, engulfing both the Ports of LA and Long Beach as well as the city of Palos Verdes. To the east, the blast would reach the Long Beach Airport, and north past California State Route 91. For scale, the overall area affected would be larger than the cities of New York, San Diego, and Indianapolis. Buildings all the way out to the perimeter would have broken glass with those closer to the facility being completely leveled. Anyone caught within the massive blast zone would be either injured, severely injured, or killed depending on proximity to the epicenter.[19(8,22)] Finally, this higher-end estimate only takes into account the Rancho LPG facility itself, not including the most adjacent oil refinery—which have its own 5 million-gallon butane tanks—or any other ignition sources in the area. Therefore, it is very possible that this "higher-end" estimate could also be underrepresenting the range and resulting damage.

**Figure 1 Differing Reported Explosion Radii for Rancho LPG, Minimum, and Maximum**

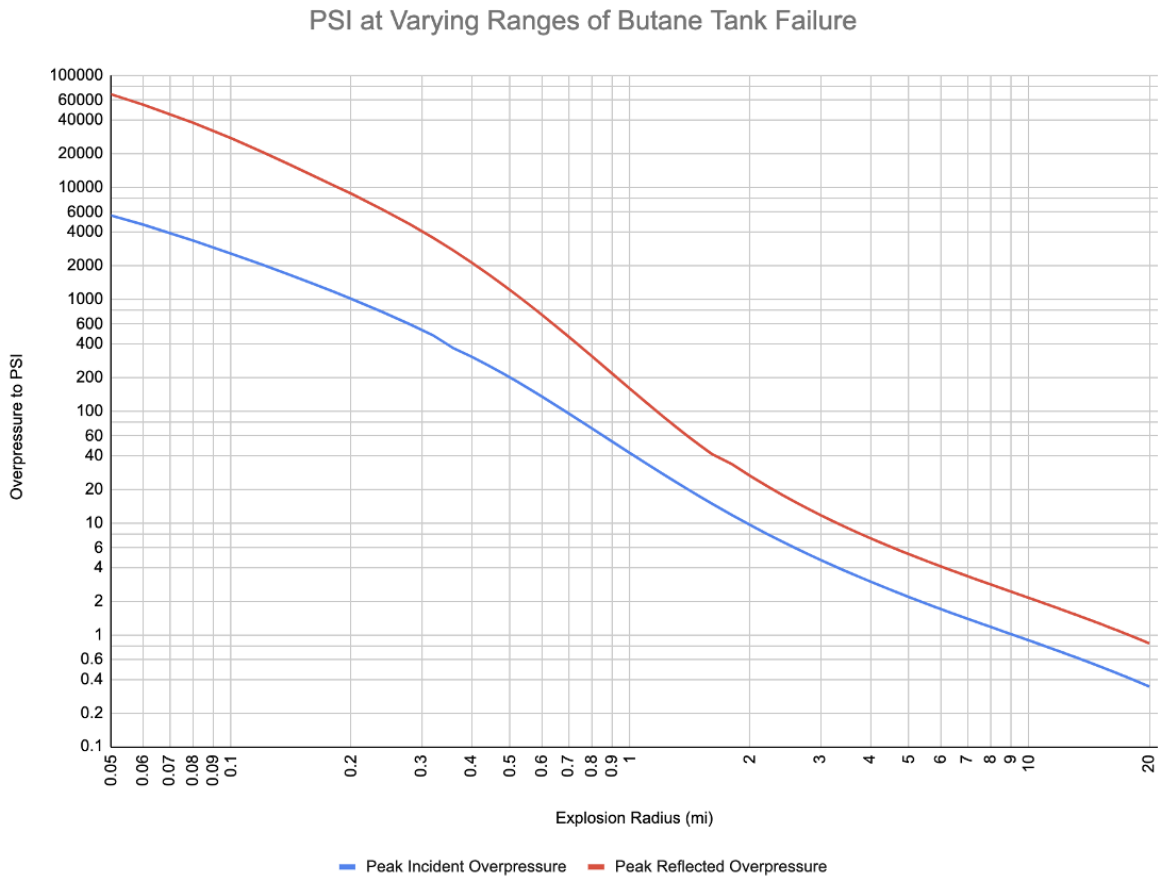

## Explosion Breakdown

To assess the impact of extreme events, calculations can be made to estimate explosion impacts. On most every applicable scale, the maximum explosion radius is measured by the peak incident overpressure to 1 psi.[20(8,17,22)] This range indicates the distance at which glass will shatter and/or to what distance light injuries to a human body may occur. This is generally considered the minimum "safe range" someone could be from an explosion. Above this range, there are certain benchmarks that can account for varying levels of damage. At 3.5 psi, serious injuries are common, with some resulting fatalities; residential and other smaller buildings would also likely collapse. At 5 psi, most buildings would collapse, and there would be widespread fatalities, while at 10 psi, reinforced concrete buildings would be demolished and most people killed.[21(22)]

The overpressure to psi can also be affected by where and how an explosion occurs. For instance, when a shockwave hits a building, the wave is reflected. This results in a higher pressure placed on the structure. The measurement taken is known as peak reflected overpressure, and it will always be higher than the peak incident overpressure.[22(8)] Thus, while a "minimum safe distance" may be calculated at a range based on the peak incident overpressure, it is very possible that damage can extend beyond that.

Figure 2 shows both peak incident and reflected overpressures for different explosion radii of butane. Here, the maximum 121,000,000 lbs of butane was used alongside the Kingery-Bulmash equation for surface-burst explosions, which is the appropriate equation used to calculate peak overpressures at varying ranges in equivalent pounds of TNT for an explosive substance. A modified version of the Kingery-Bulmash is used in EPA guidelines as well; however, that only gives peak incident overpressure.[23(8)] The inclusion of peak reflected overpressure allows for further exploration of potential damages an explosion of this magnitude could cause.

**Figure 2 Kingery-Bulmash Airblast Equation for Surface Burst Explosions**




As calculated previously, the estimated radius of impact for a peak incident overpressure to 1 psi for 121,000,000lbs of butane is about 8.6 miles; this is far beyond what Rancho LPG has reported. In fact, within a 0.5 mi radius—what Rancho LPG did report—the overpressure to psi would exceed 200psi. Since *any* type of building would be completely destroyed at around 20 psi, 10x that would leave the area unrecognizable.

## Possibility of Disruption

There are numerous factors that could disrupt the stability of the Rancho LPG facility. From seismic activity, unstable geology, or possible terrorist activity, there are no shortage of ways a catastrophic event might occur. The following section considers several possible sources of disruption, outlining their likelihood and threat level. Ultimately, while a facility of this type

would be a threat anywhere, its current location has far too many risk factors in relationship to its threat level.

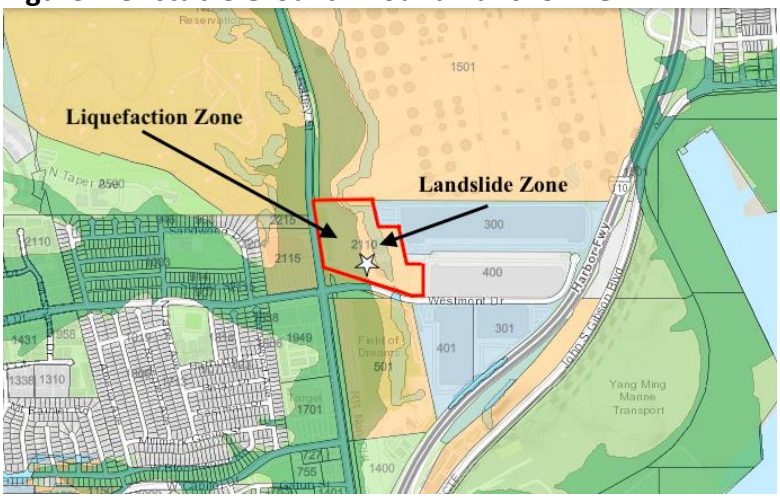
## Seismic Activity and Unstable Geology

Directly or indirectly, earthquakes pose a serious threat to the stability of the Rancho LPG tanks. Failure of the physical tanks, disruption of their regulation, and any other resulting general irregularity would be enough to initiate a catastrophic event. As Figure 3 below illustrates, the facility sits on the established Palos Verdes Fault Line.[24(2,4,18)] Technically, the area could be considered free of seismic activity since the that specific area of the fault line is not confirmed as active (currently inactive portions of the fault are noted in green in Figure 3). Rancho LPG makes a point of this, specifically claiming that the facility is not directly on a fault line.[25(14,16)] However, the facility (star) sits incredibly close to the active (orange) part of the Palos Verdes Fault.[26(2)] Additionally, the facility sits within an earthquake rupture zone, so its proximity to the fault is inconsequential. Any and all seismic activity in the surrounding area poses a threat to facility stability. Seismic activity in the immediate region could sufficiently disrupt the stability of the tanks without them physically being directly over a fault. While the area may be designated as free of direct seismic activity, propagating seismic waves pose a threat to the facility's stability. The tanks are simply not capable of handling substantial seismic activity.

**Figure 3 Palos Verdes Fault and Facility Location**

Looking at the geographic nature of the immediate area around the facility, the ground under the tanks is highly unstable as well (see Figure 4). The facility (outlined in red) sits within both a landslide zone (blue) and a liquefaction zone (green). While they have slightly different meanings, they both imply an unstable movement or shifting of the ground.[27(31)] If a landslide or liquefaction event were to occur, the tanks could be physically damaged, but more likely would be physically displaced. This would likely cause the butane to leak, expand, and ultimately cause an explosion. Furthermore, failure of the tanks could lead to a liquefaction or landslide event to occur in the surrounding area. This would cause additional damage to infrastructure and potentially make rebuilding more challenging.

**Figure 4 Unstable Ground Around Rancho LPG**




As currently configured, the tanks are not properly equipped to deal with either earthquake activity or the unstable ground upon which they currently sit; their operating permits did not require them to follow standard building codes.[28(4)] Rancho LPG has also never performed a qualitative risk assessment of the facility which would bring this issue to light. As previously noted, the tanks were built to last around 25 years, and it has been almost double that time. The facility-provided infrastructure was sub-standard at time of construction (due to the accelerated permit processing to bring this facility on-line at the time of a potential national gas shortage crisis), and the tanks are now aged considerably past their expected operational lifetime. The current infrastructure is insufficient and ill-equipped to handle the potential

geological event described above. There has been no acknowledgement of these issues by the facility operator; in fact, the opposite is true, since the geological threat has been dismissed entirely. A geological event is the most likely to occur and lead to disruption, yet there is no mention or intention to address the issue. This is a huge failure on the part of Rancho LPG to address the safety of their facility.

## Terrorism Threat

Determining the mathematical likelihood of a terrorist attack would be incredibly difficult. There is insufficient data on targets and frequency. However, there is some—unfortunate—anecdotal evidence that points to this facility being a prime target for terrorism. In 1999, the "Twin Sisters" plot in Elk Grove, California saw the FBI foil a domestic terrorist plot. The targets were two large, 12 million-gallon propane tanks[29(4,19)], which sounds eerily familiar to the Rancho LPG configuration. An objective of the Twin Sisters plot was to find targets susceptible to sabotage, so that their destruction would lead a destabilized government. Fortunately, the individuals involved were apprehended and convicted on intended use of weapons of mass destruction - yes, these butane tanks are lawfully classified under the same category as nuclear bombs.[30(23)]

**Figure 5 Elk Grove (Left) and Rancho LPG (Right)**

Since the facility in Elk Grove is nearly identical to the Rancho LPG facility, it would not be farfetched to view the Rancho facility as another potential prime terrorist target. It is unfortunately not difficult to envision various means of terrorism. The tanks are not durable

enough to withstand a bullet from a high-powered rifle. A Rocket Propelled Grenade (RPG) would also easily breach the tanks. As mentioned previously, once butane escapes its container, it rapidly expands and seeks ignition sources. An RPG could also ignite the butane immediately, leading to a massive fireball explosion.

The facility itself is marked by the Department of Homeland Security as a "Tier 1-Soft Target of Terrorism".[31(5)] The "soft" designation indicates the facility is unguarded and does not require protection. Tiers are assigned based on a one-to-four designation, with "1" representing the highest risk a facility can present based on vulnerability, potential consequences, and threat of a terrorist attack. This means the Rancho LPG facility has the highest-level threat without the need for protection. Additionally, as previously identified, the butane tanks are classified as weapons of mass destruction. Imagine a nuclear facility lacking any sort of protection; it would be absurd. That is the state at Rancho LPG. It has a parallel past of terrorist activity with a similar facility and is currently recognized as a target, yet lacks proper security, protection, and regulation.

## Past and Recent Examples of Failure

The oil industry has a very checkered track record regarding spills. In 2016, the Plains All American Pipeline—the father company of Rancho LPG—was sued for a massive oil spill in Refugio, Santa Barbara. Criminal charges included failing to immediately report the spill, purposely reporting an incorrect amount of oil spilled, failing to uphold proper safety precautions, and misleading affected individuals from seeking full compensation, were only several of the topics of litigation; there were more than 40 other criminal indictments.[32(10)] Outside of the U.S., the Port of Beirut explosion on August 4, 2020 was one of the most catastrophic disasters in recent memory. A small incidental fire resulted in an explosion that killed 218 and injured over 7,000.[33(20)] It represents how a small lapse in safety—or just sheer randomness—can lead to deadly consequences when volatile compounds are involved. A similar incident could easily occur on the Rancho LPG facility. The age of the facility, its location on unstable ground, and its similarity to a parallel historical terrorist even right here in

California are all factors that increase the risk of an accident occurring. One small lapse in regulation could set off one of the most catastrophic events in the US.

These issues, and this conversation, has not been made very transparent, and for good reasons. It would be "bad for business" to constantly expose  safety shortcomings. Nevertheless, the issues are still present. The L.A City Fire Department cited the Rancho LPG facility in 2017 for 2 violations which highlighted the failure to report outdated equipment as standardly operational.[34(11,25)] It is the duty of Rancho LPG to address and minimize the likelihood of an accident occurring. To date, little or nothing has been done.

## The Consequences

The problem of Rancho LPG is very much apparent. There is a large amount of volatile substance sitting, unprotected, on unstable ground in outdated infrastructure which, if disrupted, would lead to an explosion on par with a nuclear bomb. On paper, this is horrifying, even compared to other high-risk facilities. The contributing factors for a catastrophic event to occur are numerous. So what? Who and what are really at risk were something to happen at Rancho LPG? The following section identifies the populations who are at risk, the infrastructure that would be damaged, and the general consequences that would follow a failure at Rancho LPG. The purpose of this section is to truly capture the devastation that would occur with a catastrophic event.

### Affected Population

Rancho LPG predicted that their "worst-case" analysis would "only" impact 722 individuals; for the reasons documented above, this is a clear underestimate. Instead of relying on Rancho operators for objective assessment, it would be arguably more accurate to consider census data. CAMEO—an EPA software suite designed to plan for chemical emergencies—contains a program called MARPLOT which calculates both the population and housing units for any given selected area.[35(3)] Applying this EPA software to the Rancho site, MARPLOT determines a population of 968 individuals in a 0.5 mile radius of the facility. This number from LPG is fairly

accurate; however, it does not apply when scaling up. Thus, when scaling, the estimate would effectively be evaluating a population ¼ of the potential size. MARPLOT accounts for this issue. Additionally, MARPLOT allows for a more accurate account of individuals at risk at more relevant distances calculated in the minimum and maximum estimates.

**Figure 6 MARPLOT Population Circle 0.5 Miles from Rancho LPG Facility**


As estimated before, the number of individuals affected at the 3 mi distance was 27,000. While this is a significantly large number, it is—surprisingly—an underestimate. For the lower end of 3 mi, MARPLOT determines a population of almost **170,000** individuals. That is over 6x what was predicted using Rancho LPG's reported figure and scaling to distance. The higher end of 10.5 mi is even more extreme, totaling some **1.315 million** individuals.[36(3)] That value is larger than the population of Dallas TX, which ranks 9th in most populous cities in the United States. Furthermore, MARPLOT currently uses 2010 Census data, meaning these numbers could be even larger as the 202 Census population data is incorporated.

These numbers are quite large and difficult to realistically interpret. A catastrophic event at Rancho LPG would be unparalleled in terms of devastation in United States history. To give context to these numbers, the 9/11 tragedy resulted in 9,000 directly affected individuals, 2,974 of whom lost their lives. in the current Rancho LPG gas explosion calculations, at the 3-mile mark, the peak distance to PSI overpressure would be about 5,resulting in most people being killed within this range. As mentioned previously, that in-range population is estimated at 170,000 individuals. So, although "9/11" is considered to be the most tragic loss of life in recent US memory, an incident at Rancho LPG would eclipse it 50 times over. The disruption of these tanks at the Rancho LPG facility could easily be one of the deadliest disasters in US history.

## Economic Impact

Aside from the loss of human life, infrastructure would be leveled by a catastrophic accident at Rancho LPG. Any building within a blast radius of 8.6 miles would most likely be destroyed or otherwise crippled. At the maximum range, though the peak incident overpressure is 1psi, the peak reflected overpressure would still be about 2.6psi. While 1psi will break glass, the resulting pressures would collapse most residential buildings out to a distance of almost six miles. Thousands of buildings would therefore be rendered inoperable by this catastrophic event.

Main infrastructural concerns would also include operations at the Ports of Los Angeles and Long Beach, as an explosion would severely cripple each of them. Some parts of the ports would be unrecognizable, other parts would simply be gone. As the two largest ports in the United States, they are responsible for 40% of all imports into the country. This is because the San Pedro Bay port complex acts as the central gateway to trade with Asia, both for importing and exporting products. Furthermore, the port complex supports over 3 million jobs and contributes to over $100 billion of revenue annually nationwide. [37(12)] The destruction of these ports would cripple the import and export ability of the United States. An economic recession would most certainly occur. International trade would be extremely hindered, and billions of dollars in revenue would be lost. Rancho's safety does not just therefore involve the local

community but the country at large. A failure would send shockwaves—literally and figuratively—across the entire United States. Therefore, this is not just a local issue, but rather, a national one.

## Cascading Consequences

A catastrophic event at Rancho LPG would cascade into myriad failure events. The initial explosion would no doubt be devastating; however, consequences would extend beyond the initial incident. Following the initial explosion completely leveling the area, fires would burn for days, extending into the surrounding area, and causing further damage. Hundreds of thousands of people would either be injured, dead, or otherwise displaced either immediately or in the following days.

The demolished infrastructure would lead to difficult recovery. The Port of LA and the Port of Long Beach would be completely decimated, and that reality would severely cripple the economic productivity of the country at large. An economic recession would follow as the southern economic peninsula of the United States collapsed. Every surrounding oil refinery, storage facility, or other such container with a volatile compound within the area would be disrupted, causing further fallout. Recall that Los Angeles is the largest urban oil field in the country, so there is no shortage of fuel for fallout.

The release of so much energy at Rancho LPG during an accident—and its immediate proximity to multiple geologic fault lines—would most likely result in seismic activity, possibly leveling barely standing buildings and shifting the ground. These effects could easily extend beyond the immediate explosion radius. The area would be largely uninhabitable, with raging fires and sinkholes next to unstable ground. Reconstruction and rebuilding in the area would require a massive undertaking.

An accident at Rancho LPG would be by far the greatest tragedy in United States history with casualties comparable to war time. The entire United States economy would be greatly

affected. Recovering from the fallout would be an intense endeavor. Rancho LPG does not just pose a threat to the local community, but to the entire country. Accordingly, it is an issue that should be dealt with as a national welfare threat. Ignoring this problem any further could have lasting impacts on every single US citizen.

## Historical and Political Obstacles

The potential for disaster at the Rancho LPG facility surpasses many of the all-time tragedies nationwide. The issue extends beyond the local community and to the country as a whole. Something must be done to make this facility safer to the public. If it's such a threat, why not shut it down now? Unfortunately, nothing is ever that simple. There are problematic obstacles impeding the condemnation of the volatile facility. This section seeks to outline those problems. It explores the political power granted to the facility, the current logistical issues due to the facility's age and construction, and the failed attempts by the local community to condemn the facility. By outlining the current problems and obstacles, effective solutions or avenues to explore can be extrapolated.

### Power of Big Oil

One of the largest obstacles to overcome in an assessment of public safety is the power of Big Oil. While Rancho LPG itself is not an oil facility, it does enjoy the perks of Big Oil power as its parent company is Plains All American Pipeline. While an ambiguous concept, Big Oil can be distilled more into political power and motivation. Big Oil carries a lot of influence within the political sphere, imposing perceived limits on the abilities of policy makers. The companies can either give or take away support for a political figure, often starting and ending careers in the political realm. Policy makers are thus hesitant to take a stance against Big Oil companies for fear of losing political support.

Big Oil also commands a plethora of resources due to their wealth. The first that comes to mind is their excellent legal representation. Despite all the historical catastrophes that plague the oil

industry, no company has ever been crippled—or realistically hindered. Litigation as a process is one that requires large amounts of money. Any private entity attempting to take on a Big Oil company will more than likely be at a disadvantage on the sole basis of funds available. Additionally, their public displays of information are often carefully worded to paint the best possible picture. Companies will never lie explicitly, but instead offer non-answers to questions, requiring extensive research to obtain an accurate answer. The vast political power mounted behind Rancho LPG makes even addressing it as a threat problematic.

## Zoning and Grandfathering

As mentioned before, Rancho LPG was built under special circumstances rather than being constrained by building and zoning regulations in place at the time of initial construction; temporary or provisional permits largely paved the way for construction. Were the facility to be reconstructed today, it would be entirely different, subject to vastly different codes and regulatory practices. This concept is known as grandfathering which encourages older, less practical, and less safe facilities to stay open under looser restrictions rather than constructing a new one. Grandfathering is based on a concept of "economic fairness" since it is usually more expensive to fix an older structure to accommodate modern standards compared to building an entirely new structure. Rancho LPG's grandfathering has allowed it to exist under dangerously unrestrictive regulations for an indefinite period of time. Furthermore, the facility lacks any form of sunset clause, allowing the problem to continue indefinitely.[38(19)] As it stands, there have been no motions to update the facility or improve its safety. Operations will continue to use hazardous, outdated equipment until, ultimately, something fails.

Aside from the infrastructure itself, the location of the facility was also only possible due to the regulation exemptions given to the facility. In general, above-ground LPG facilities should be built away from urban areas. There are two major problems with its location that were completely ignored. First, Rancho LPG sits in a densely populated neighborhood. Upon its construction, and to this day, the facility was less than 2000 feet from both residential homes and a school. Second, the facility is extremely close to major economic assets—namely the

Ports of LA and Long Beach. Any sort of disruption would result in tragedies both on small and large scales. The community could be devastated while the entire country could face economic fallout.

## Past Failure to Prosecute

In 1980, Rancho LPG—formally owned by Petrolane—was sued by local community members in the case *Brown v. Petrolane, Inc. (1980)*. The litigation was based on the grounds that the facility represented both a public and private nuisance, interfering with the comfortable enjoyment of life and property of the residents. This legal approach was unsuccessful and failed to condemn the facility or even bring about any regulatory changes. Since there was no demonstrated consequence caused by the facility (such as personal injury), the court was unable to rule in favor of the community members who had argued that the facility be declared "a private nuisance". For similar reasons, the court rejected the account of the facility as a "public nuisance"; there was no demonstrated injury. This ruling held despite the impact of past failures of Petrolane being brought forth as well as a discussion of the seismic activity danger to the facility by its location. Disposal of hazardous material and pollution of the air were both presented by community members as evidence of nuisance. However, without demonstration of personal injury, the court was unable to classify the facility as a nuisance. The case would have had more traction were the members able to provide anecdotal evidence such as a high percentage of respiratory problems due to air pollution, or someone who had been directly affected by the disposal of toxic material.[39(1)] Without these points of evidence, the litigation attempts against Rancho LPG had little chance of success.

This failure of this case demonstrates both the power of Big Oil and the lack of information about the danger of the facility. By taking this approach in litigation, Rancho LPG was allowed to avoid the possible repercussions associated with operation of their facility in its current unsafe manner. The lack of specific relatable evidence linking facility operations to personal injury or specific public harm led to a determination that the facility was neither a private or public

nuisance. The political power of Big Oil Effectively meant that short of body counts, arguments regarding public safety were unlikely to gain much traction.

## Avenues to Explore

Despite historical shortfalls in restricting facility operations, there do remain routes to explore that could lead to outright condemnation or at least improved safety in operations at Rancho LPG. These possible routes vary in both directness and effectiveness. The following section describes possible approaches to addressing the Rancho LPG safety problem. A motion to condemn from the LA City Council, relocating the property using specific grants, or otherwise updating the facility's safety measures would each improve facility operations by varying degrees. Something must be done in the name of public safety; the Rancho LPG facility is potentially too dangerous to continue existing in its current state. Waiting longer only invites disaster.

### City of LA to Condemn

The City Council of LA has a few direct options to condemn Rancho LPG by revoking the facility usage permits. Some facility permits have already expired or were unable to be renewed—one example would be the permit for loading wharfs at the Port of LA. Without this permit, Rancho LPG was unable to load butane at the Port of LA. This greatly reduced the facility's use and operation since it lost a major exporter of their product. By contrast, other permits get continuously renewed; the key ones being the rail and pipeline use permits. These permits grant a private company—Rancho LPG—permission to use "public trust land" to export product via a rail spur and pipeline. These "temporary" permits have been in place for 42 years! Among other advantages, this constant rolling over allows Rancho LPG to avoid current standard procedures for land use assessment, such as the requirement for preparation and filing of an environmental impact report or comprehensive risk analysis.[40(4,11,18)]

These permits are the gravest injustices of Rancho LPG's operations. They fall under the umbrella of Public Safety since both the rail and pipeline use public land. These are public

assess being abused by a private company. Thus, while Rancho LPG rakes in profit, the burden of risk is placed on the public. Were a catastrophic event to occur at Rancho LPG, the public would be held liable for all the damages. Imagine being responsible for the deaths of thousands, the destruction of miles of land, yet being severely compromised yourself; Rancho LPG gets away scott-free. It is a blatant misuse of power that compromises public safety.

Were these “temporary" permits to be revoked, Rancho LPG would undoubtedly close. They would lose their means of export and thus lose their ability to generate revenue. They could look for other means of export, but it would also require the facility perform a comprehensive risk analysis and register with related government departments. This would lead to officially identifying the current health and safety dangers at the facility, which in principle would lead to likely condemnation or at least mandatory safety improvements. Rancho LPG could apply for a standard lease, however that would lead to the same result: identifying problems through risk analysis. Lastly, Rancho LPG could do nothing, whereby they would continuously lose revenue by virtue of their inability to export product. They do have the ability to export via trucks; however, that would not be enough to fund its current operations. Ultimately, this would also lead to facility closure.[41(4,11,18)] As it turns out, these permits can be discussed anytime and could even be overturned based on a majority vote of the LA City Council. This therefore represents the most effective and direct route towards condemning the facility.

## Selling Property and Relocation

Since the facility sits on private land, the facility cannot be forcibly sold or removed. However, were the property to be auctioned, it would become purchasable. Rancho LPG and its parent company, Plains All American Pipeline, could also just decide to sell the land. While initially this prospect seems unlikely, Plains All American Pipeline has been recently trying to move their assets out of California. The Rancho LPG facility is one of their last remaining assets in the state.[42(13)] California has rather stringent environmental policies compared to other states. Previous legal troubles of Plains All American Pipeline in California (oil spills, safety violations) provide further incentive for them to move their assets. If Plains All American Pipeline is

actively trying to remove their facility, it provides an opportunity to purchase the facility. Additionally, there is little incentive for the facility to continue in its current area. In the past, its proximity to the port would be relevant for its maritime exportation. However, since that permit has expired, it is operating as a storage facility for refinery products. This operation is somewhat outdated, the active use of butane—such as butane electric generators—has far more use than simple storing the gas. These are further incentives for Plains All American Pipeline to sell the facility.

Another possibility would be relocating the facility. This would be less extreme than simply selling the property as it would allow Plains All American Pipeline to maintain their assets at a different location. The Rancho LPG facility would be a serious concern in any location; however, most anywhere would be better than the current location. It currently sits in an urban center, on unstable ground, just a few miles away from a major US economic asset. Any one of those criteria alone would be concerning; together these conditions represent serious hazard. The possibility of full relocation is highly unlikely but pushing for this could lead to some positive outcomes. If a relocation is issued for the facility, Rancho LPG would probably not be able to reestablish a similar facility elsewhere. The cost of construction would not be worth the income generated from the facility, and it would be seen as a negative asset. Even if the facility was to be moved, it would need to be heavily modernized. Failure to do so would lead to the shutdown of the facility as well.

On the political side, there have been recent attempts to push for relocation. In 2018, there was a bill proposed to the LA City Council to authorize a $500 million grant payable to cover half the cost of relocating a hazardous facility away from homes and schools.[43(15)] While there have not been any updates regarding this bill, it highlights a desire to move these facilities such as Rancho LPG from their current, unsafe locations. Compared to the relocation cost, overall, it would be minuscule compared to the cost of damages the facility could incite following a catastrophic event. Selling or relocating the facility seems unlikely but pursuing these options

could open other avenues for mitigating the danger or even removing the hazardous facility all together.

## Better Precautions

To say the safety precautions in place at Rancho LPG are insufficient would be an understatement: they are virtually non-existent. The singular "mitigation factor" they have in place—the storage basin—would not hold any escaping butane. While Rancho LPG claim to have modern leak detection systems and fire detection systems linked to a sprinkler system, its viability is unclear. The sprinkler system is designed to cool the tanks in the event of a leak, not actively stop fires. Additionally, hydrocarbon fires—such as a fire resulting from ignited butane—cannot be extinguished or controlled with water; thus, a basic sprinkler system would be ineffective at containing a fire. Rancho LPG also claims to have a myriad of other safety precautions in place, but their effectiveness cannot be determined. Until a comprehensive risk analysis is preformed, their effectiveness or specificity can be assessed. Regardless, the regulation mechanisms currently in place are insufficient for protecting the facility.

Real-time leak detection should be mandatory for the facility. A single leak could lead to disastrous damage considering the gas is highly flammable and expands rapidly once a leak occurs. The sprinkler system should be replaced by aqueous fill-forming foam concentrate systems (AFFF) as well to protect the tank and surrounding area. AFFF can extinguish hydrocarbon fires and can prevent reignition of a source as well. Lastly, basic compliance with fire protection codes should be followed by the facility.[44(19)] This approach is realistic and relatively effective for its scale. It would help mitigate some small or regularly occurring incidents like a small leak or fire. However, this approach would be entirely ineffective against every other a threat to the facilities safety like unstable ground, earthquakes, and terrorism. Any improvement to safety is infinitely better than continuing to ignore it. Small improvements to safety could be the first step in making significant changes to Rancho LPG.

## Conclusion

The Rancho LPG facility poses a threat to vastly more individuals than initially anticipated or reported. The danger of the facility has been downplayed, overlooked, and misrepresented throughout its 50 years of existence. Unstable ground, insufficient safeguard systems, outdated construction, among others all contribute to the volatility of the facility. One small incident is all it takes to lead to a drastic outcome.

Hundreds of thousands of individuals would be impacted across the nation. Locally, the casualties would rank among the deadliest disasters in American history. The surrounding area would be demolished. The ports, key economic assists to the United States, would be crippled and possible inoperable. This would come to affect every citizen nationally as the economy takes a hit. And it could be even worse than that.

The limited attempts that have been made to either spread information about the facility or challenge it directly have failed. From lawsuits to news stories, each has been lacking in some key relevant information. This case study of Rancho LPG serves to outline the danger the facility possesses in its totality: causes to consequences. Additionally, this paper provided potential solutions to combat that danger and addressed the obstacles impeding those solutions. Its goal has been to streamline all the information into one central document.

Though Rancho LPG has been uncompromised for 50 years, the risk increases every day. The infrastructure continues to outlive its expected end date. The geology is also not improving; seismic activity is inevitable. The ever-present risk of an accidental fire ineffectively being mitigated or a terrorist attack occurring are still present. In this particular circumstance, nothing is improved by waiting and watching. To this date, nothing has been formally filed that indicates progress of any motions to condemn or repurposing of the facility. The neighborhood population surrounding the facility continues to grow. The nearby ports continue to expand in their operational capacity. Everyone and everything at risk only continues to be more and more at risk every day. “Father Time is undefeated”; it’s doubtful this will be the exception.

There is a responsibility that exists between industry, city, owner, and community whereby the risk associated with a provided service should be minimized; the public deserves to be protected. There will never be ”zero” risk associated with facility operations, but there has been a failure by the operator and the regulators to protect public health and safety in a responsible and timely manner here. The public faces a disproportionate danger in the face of current facility operations. Steps need to be taken to substantively reduce the operational threat or dispose of it entirely. The public deserves better; to continue trudging forward amidst all the possible danger is simply unjust.

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# Communication from Public

| | |
|---|---|
| **Name:** | Darlene M Zavalney |
| **Date Submitted:** | 05/24/2023 01:16 PM |
| **Council File No:** | 11-1813-S8 |
| **Comments for Public Posting:** | Rancho LPG is unsafe and unstable on many levels. Built under the Nixon administration without permits It sits on top of an earthquake rupture zone that has the potential of over a 7 point earthquake and has been classified by Homeland Security as a tier one target for terrorism. It houses 25 million gallons of refrigerated butane and would expand by ten when coming in contact with ambient temperatures. It is heavier than air therefore potentially a quarter of a million gallons of odorless butane would find its way to the lowest point and certainly into our water table that is unless it comes in contact with a spark and ignites. In that case it will do a whole lot more damage than just to the water table. |