SAN PEDRO TERRACE SUBDIVISION PROJECT NOISE AND VIBRATION ASSESSMENT PACIFICA, CALIFORNIA

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INTRODUCTION

The San Pedro Terrace Subdivision project consists of the development of a six-unit single-family dwelling tentative subdivision map on a 2.42-acre vacant triangular lot in the Linda Mar neighborhood of the City of Pacifica. Proposed residential lots range in size from 5,035 to 36,104 square feet. The project would also introduce a new 16,783 square foot private street off the end of San Pedro Terrace Road to facilitate site access, and introduce the extension of utilities into the site (e.g. sanitary sewer, water, storm drain, joint trench).

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; 2) the General Plan Consistency Section discusses the noise and land use compatibility of the proposed project utilizing policies in the City's General Plan; and 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts upon sensitive receivers, provides a discussion of each project impact, and presents measures, where necessary, to mitigate the identified impacts to a less-than-significant level.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA

are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the sound level meter. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (*DNL* or L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA CNEL. Typically, the highest steady traffic noise level during the daytime is about equal to the CNEL and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA CNEL with open windows and 65-70 dBA CNEL if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed; those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The CNEL as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA CNEL. At a CNEL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the CNEL increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a CNEL of 60-70 dBA. Between a CNEL of 70-80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the CNEL is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

Regulatory Background

The State of California and the City of Pacifica have established regulatory criteria that are applicable in this assessment. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

(b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

(e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the

project would expose people residing or working in the project area to excessive noise levels;

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

Pursuant to recent court decisions, the impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not included in the Impacts and Mitigation Section of this report. Checklist item (a), regarding the compatibility of the project with noise levels at the site, is discussed in the General Plan Consistency section of the report. Checklist items (a) through (d) are applicable in the assessment of potential impacts resulting from the proposed project at off-site receptors. Checklist items (e) and (f) are not applicable to this project because the project is not located within an airport land use plan, is not within two miles of an airport, and is not in the vicinity of a private air strip.

CEQA does not define what noise level increase would be considered substantial. Typically, an increase in the CNEL noise level resulting from the project at noise sensitive land uses of 3 dBA or greater would be considered a significant impact when projected noise levels would exceed those considered acceptable for the affected land use. An increase of 5 dBA CNEL or greater would be considered a significant impact when projected noise levels would remain within those considered acceptable for the affected land use.

City of Pacifica Draft General Plan 2014. The City of Pacifica's General Plan has not been comprehensively updated since its adoption in 1980, and the Noise Element does not contain quantitative noise thresholds. The City has proposed a General Plan Update, and the noise thresholds established in the 2014 Draft General Plan will be used as the noise thresholds in this analysis as no other standards are available to ensure reasonable exposure classification for noise levels. The Draft Noise Section sets forth policies and programs to mitigate potential impacts through both preventative and responsive measures in the City of Pacifica. The Draft Noise Section establishes thresholds for community noise exposure by land use type in Table 9-1. For proposed land uses in areas where noise exposure may be expected to be greater than the "normally acceptable" threshold, maximum allowable noise exposure with noise mitigation measures is defined in Table 9-2. Table 9-3 provides noise emission standards for new stationary (non-transportation) noise sources, such as industrial facilities, automotive servicing, or equipment yards.

Noise exposure levels are classified as being "normally acceptable," "conditionally acceptable," "normally unacceptable," or "clearly unacceptable" for different land use types.

Normally Acceptable

- Indoor Uses: Either the activities associated with the land use are inherently noisy or standard construction methods will sufficiently attenuate exterior noise to an acceptable level; for land use types that are compatible because of inherent noise levels, sound attenuation must be provided for associated office, retail, and other noise-sensitive indoor spaces sufficient to reduce exterior noise to an interior maximum of 50 dBA CNEL.

- Outdoor Uses: Outdoor activities associated with the land use may be carried out with minimal interference.

Conditionally Acceptable

- Indoor Uses: Noise reduction measures must be incorporated into the design of the project to attenuate exterior noise to the indoor noise levels listed in Table 9-2.
- Outdoor Uses: Noise reduction measures must be incorporated into the design of the project to attenuate exterior noise to the outdoor noise levels listed in Table 9-2. Acceptability is dependent upon characteristics of the specific use.

Normally Unacceptable

- Indoor Uses: Extensive mitigation techniques are required to make the indoor environment acceptable for indoor activities. Noise level reductions necessary to attenuate exterior noise to the indoor noise levels listed in Table 9-2 are difficult to achieve and may not be feasible.
- Outdoor Uses: Severe noise interference makes the outdoor environment unacceptable for outdoor activities. Noise level reductions necessary to attenuate exterior noise to the outdoor noise levels listed in Table 9-2 are difficult to achieve and may not be feasible.

Clearly Unacceptable

- New construction or development should generally not be undertaken.

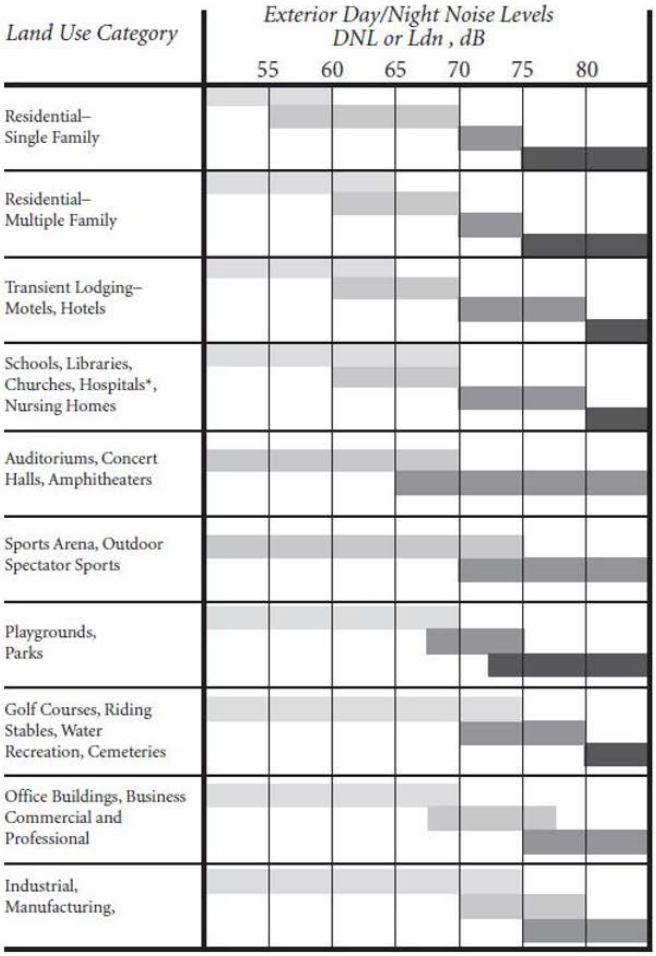
<u>Allowable Noise Exposure</u>

- Table 9-2 indicates acceptable limits of noise for various land uses for both exterior and interior environments. For new development in areas where the community noise environment is not considered "normally acceptable," noise impacts may be mitigated through use of sound-reducing strategies so that noise levels meet the allowable limits.

<u>Noise Emission Standards for Stationary Noise Sources</u>

- The Draft General Plan also provides standards for exposure to stationary (non-transportation) noise sources such as industrial facilities, automotive servicing, or equipment yards, in Table 9-3.

TABLE 9-1: LAND USE COMPATIBILITY FOR COMMUNITY NOISE ENVIRONMENTS



INTERPRETATION

Normally Acceptable:
Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements

Conditionally Acceptable:
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.

Normally Unacceptable:
New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

Clearly Unacceptable:
New construction or development clearly should not be undertaken.

Source: Office of Planning and Research, State of California General Plan Guidelines, Appendix A: Guidelines for the Preparation and Content of the Noise Element of the General Plan, 1998.

*Because hospitals are often designed and constructed with high noise insulation properties, it is possible for them to be satisfactorily located in noisier areas.

Source: City of Pacifica General Plan Draft, City of Pacifica, March 2014.

TABLE 9-2: ALLOWABLE NOISE EXPOSURE

	Outdoor Activity Areas[1]	Interior Spaces	
Noise-Sensitive Land Use	DNL/CNEL[2], dB	DNL/CNEL2, dB	Leq dB[3]
Residential	65	45	–
Transient Lodging (Hotels, Motels)	65	45	–
Hospitals, Nursing Homes	65	45	–
Theaters, Auditoriums, Music Halls	–	–	35
Churches, Meeting Halls	65	–	45
Office Buildings	–	–	45
Schools, Libraries, Museums	–	–	45

1 Outdoor activity areas generally include backyards of single-family residences and outdoor patios, decks or common recreation areas of multi-family developments.
2 The CNEL is used for quantification of aircraft noise exposure as required by CAC Title 21.
3 As determined for a typical worst-case hour during periods of use.

Source: City of Pacifica General Plan Draft, City of Pacifica, March 2014.

TABLE 9-3: NOISE LEVEL PERFORMANCE STANDARDS FOR STATIONARY NOISE SOURCES[1]

	Daytime (7:00 a.m. – 10:00 p.m.)	Nighttime (10:00 p.m. – 7:00 a.m.)
Hourly Equivalent Sound Level (Leq), dBA	50	45
Maximum Sound Level (Lmax), dBA	70	65

1 As determined at the property line of the receiving noise-sensitive use.

Source: City of Pacifica General Plan Draft, City of Pacifica, March 2014.

Additionally, the Draft General Plan Noise section provides implementing policies for noise. The following are applicable to the proposed project:

NO-I-1: *Community Noise Level Standards*. Use the Community Noise Level Exposure Standards, shown in Table 9-1, as review criteria for new land uses. Require all new development that would be exposed to noise greater than the "normally acceptable" noise level range to reduce interior noise through design, sound insulation, or other measures.

NO-I-2: *Design Features for Noise Reduction*. Require noise-reducing mitigation to meet allowable outdoor and indoor noise exposure standards in Table 9-2. Noise mitigation measures that may be approved to achieve these noise level targets include but are not limited to the following:

- Construct façades with substantial weight and insulation;
- Use sound-rated windows for primary sleeping and activity areas;
- Use sound-rated doors for all exterior entries at primary sleeping and activity areas;
- Use minimum setbacks and activity areas;
- Use minimum setbacks and exterior barriers;
- Use acoustic baffling of vents for chimneys, attic, and gable ends;
- Install a mechanical ventilation system that provides fresh air under closed window conditions.

Alternative acoustical designs that achieve the prescribed noise level standards may be approved, provided that a qualified Acoustical Consultant submits information demonstrating that the alternative designs will achieve and maintain the specific targets for outdoor activity areas and interior spaces.

NO-I-3: *Best Available Control Technology*. Require new, fixed noise sources (e.g. mechanical equipment) to use best available control technology (BACT) to minimize noise and vibration. Noise from mechanical equipment can often be reduced by applying soundproofing materials, mufflers, or other controls provided by the manufacturer.

NO-I-4 *Mechanical Equipment for New Residential Development.* Ensure that building regulations require that noise-generating appliances serving new multi-family or mixed-use residential development are located or adequately insulated to protect residents from the noise.

NO-I-5: *Noise Criteria for City Equipment*. Develop noise criteria for new equipment purchased by the City.

NO-I-6: *Construction Noise.* Continue to limit hours for certain construction and demolition work to reduce construction-related noises.

NO-I-7 *Noise from Highways and Buses.* Work with Caltrans and Sam Trans to mitigate transportation-related noise impacts on residential areas and sensitive uses. This may include encouraging installation of sound barriers or bus stop relocation in selected locations.

City of Pacifica Municipal Code. Title 5, Chapter 10 of the City of Pacifica Municipal Code makes in unlawful to cause any "loud, disturbing, unnecessary, or unnatural noise" that disturbs persons in Pacifica. Title 8, Chapter 1 provides the allowable construction hours for projects within the City of Pacifica. The applicable sections of these chapters are as follows:

Section 5-10.03: *Enumerated.* The following noises, among others, are hereby declared to be loud, disturbing, unnecessary, and unusual noises in violation of the provisions of this chapter; provided, however, such enumeration shall not be deemed or construed as in any degree exclusive, but merely illustrative, it being the intent and purpose of the provisions of this chapter to include and prohibit all noises of the kind and character described in Section 5-10.02 of this chapter.

(a) Exhausts. The discharge into the open air of the exhaust of any steam engine, stationary internal combustion engine, motorboat, or motor vehicle, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom;
(b) Defective or loaded vehicles. The use of any automobile, motorcycle, or vehicle so out of repair, so loaded, or in such manner as to create loud and unnecessary grating, grinding, rattling, or other noise;

(c) Loading and unloading vehicles and opening boxes. The creation of loud and excessive noise in connection with loading or unloading any vehicle or the opening and destruction of bales, boxes, crates, and containers;
(d) Construction or repairing buildings and excavating.
(m) Pile drivers, hammers, and similar equipment. The operation, between the hours of 8:00 p.m. and 7:00 a.m., of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist, or other appliance, the use of which is attended by loud or unusual noise;
(n) Blowers, fans, and combustion engines. The operation of any noise-creating blower, power fan, or internal combustion engine, the operation of which causes noise due to the explosion of operating gases or fluids, unless the noise from such blower or fan is muffled and such engine is equipped with a muffler device to deaden such noise;

Section 8-1.08: Amendments: Section 105.8 ("validity of permit: hours of construction"). Section 105.8 shall be added to read as follows:

> *105.8 Hours of Construction.* The hours of construction for any project for which a building permit is required within the City of Pacifica shall be limited to the hours of 7:00 a.m. to 7:00 p.m. on Monday, Tuesday, Wednesday, Thursday, and Friday. The hours of construction shall be limited to 9:00 a.m. to 5:00 p.m. on Saturday and Sunday.

Existing Noise Environment

The project site is located at north end of San Pedro Terrace Road in the City of Pacifica. Figure 1 shows the project site plan overlaid on an aerial image of the site vicinity. As shown on Figure 1, the project site is primarily surrounded by open space. The Linda Mar Rehabilitation building is located approximately 10 feet to the southeast and residential land uses are located approximately 100 feet to the northeast.

A noise monitoring survey was made between Monday, February 13, 2017 and Wednesday, February 15, 2017. The noise monitoring survey included one long-term noise measurement (LT-1) and two short-term noise measurements (ST-1 and ST-2). All measurement locations are shown in Figure 1 and the daily trend in noise levels for the long-term measurement is shown in Figure 2. The noise environment at the site and at the nearby residential land uses in the site vicinity results primarily from vehicular traffic along Peralta Road and California State Highway 1 (Highway 1).

Long-term noise measurement LT-1 was made in a tree on the project site at the end of the cul-de-sac at the north end of San Pedro Terrace Road. Hourly average noise levels at this location typically ranged from 45 to 66 dBA L_{eq} during the day and from 39 to 51 dBA L_{eq} at night. Between the 9:00 a.m. and 1:00 p.m. hours on Tuesday, February 14th, there were instances where the average hourly noise levels were 5 to 10 dB higher than the typical noise levels at similar times on the other days, which could have been due to tree trimming noise in the area observed during the study. Adjustments were made to exclude the non-typical data to reflect

typical noise levels. The adjusted day-night average noise level on Tuesday, February 14, 2017 was 52 dBA CNEL.

Short-term noise measurement ST-1 was made in front of 1391 Peralta Road, approximately 25 feet east of the Peralta Road centerline. The 10-minute average noise level measured at this location between 1:20 p.m. and 1:30 p.m. on Monday, February 13, 2017 was 61 dBA L_{eq} and the estimated community noise equivalent level was 64 dBA CNEL. Short-term noise measurement ST-2 was made in front of 1416 Flores Drive, approximately 15 feet west of the Flores Drive centerline. The 10-minute average noise level measured at this location between 1:40 p.m. and 1:50 p.m. on Monday, February 13, 2017 was 16 dBA L_{eq} and the estimated community noise equivalent level was 55 dBA CNEL. Table 4 summarizes the results of the short-term noise measurements.

FIGURE 1 San Pedro Terrace Subdivision Noise Measurement Locations

FIGURE 2 Long Term Noise Level Daily Trend for LT-1

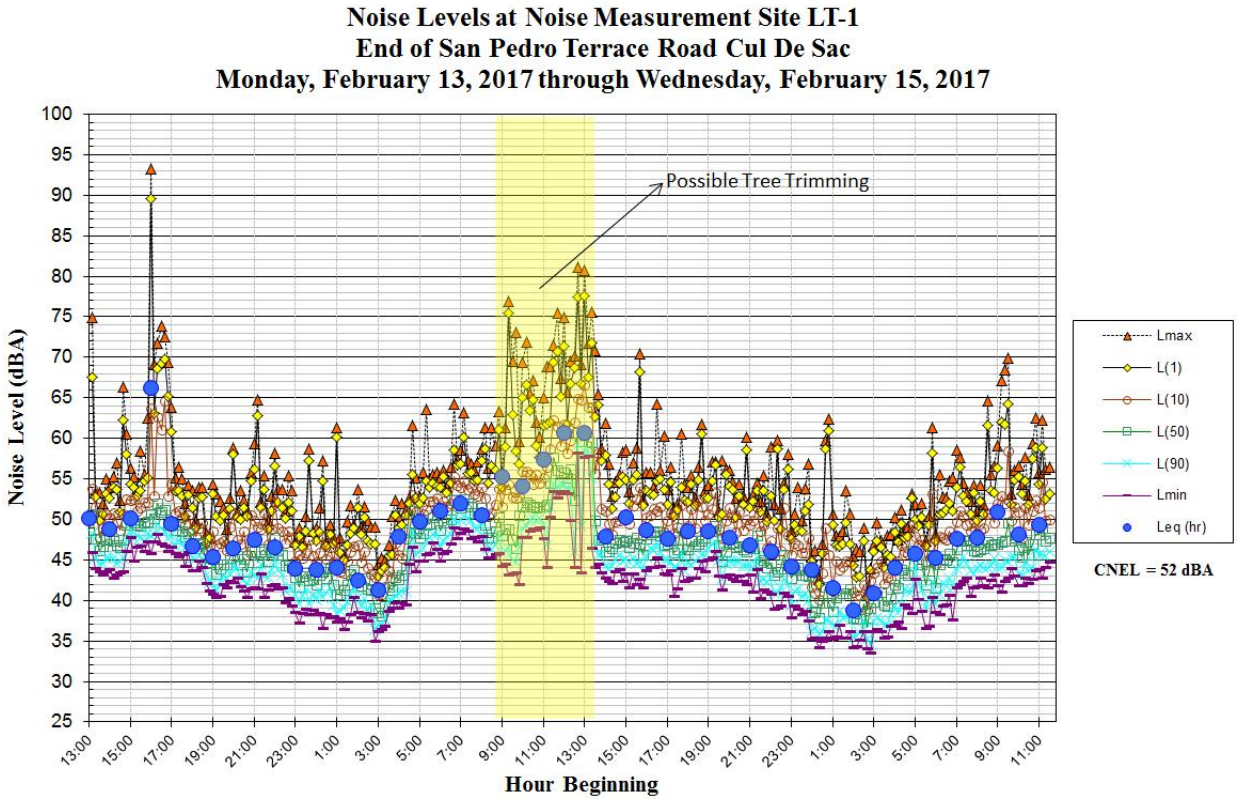


TABLE 4 Summary of Short-Term Noise Measurement Data (dBA)

Noise Measurement Location	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}	CNEL
ST-1: In front of 1391 Peralta Road. (2/13/2017, 1:20 p.m. - 1:30 p.m.)	75	72	66	52	43	61	64
ST-2: In front of 1416 Flores Drive. (2/13/2017, 1:40 p.m. - 1:50 p.m.)	65	58	46	42	40	46	55

Note: The CNEL is determined by correlating the short-term measurement with the representative long-term measurement.

GENERAL PLAN CONSISTENCY ANALYSIS – COMPATIBILITY OF PROJECT WITH NOISE ENVIRONMENT AFFECTING THE SITE

The City of Pacifica's 2014 Draft General Plan Noise Section sets forth policies and programs to mitigate potential impacts through both preventative and responsive measures. The applicable Draft General Plan policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

- The City's normally acceptable exterior noise level standard is 60 dBA CNEL or less for the proposed residential land use.

- The City's normally acceptable standard for interior noise at the proposed residential land use is 45 dBA CNEL.

The future noise environment at the project site would continue to result primarily from vehicular traffic along Highway 1 and Peralta Road. The City of Pacifica's 2014 Draft General Plan Noise Section [1] provided existing and future noise contours in the project vicinity. According to these figures, existing noise levels at the project site and surrounding areas are between 55 and 60 dBA CNEL, and would continue to be 55 and 60 dBA CNEL in the future. In addition, the proposed six single-family residences would generate approximately 5 to 6 trips during the peak hours and approximately 57 daily trips. The relatively low volume of additional traffic along roadways serving the site would not measurably increase the ambient noise environment on an hourly average or daily average basis. Therefore, as a credible worst-case estimate, the future noise level increase would be 1 dBA CNEL and the future noise environment would be 53 dBA CNEL at the project site.

Future Exterior Noise Environment

As noted above, the City's acceptable exterior noise level standard is 60 dBA CNEL or less. The future exterior noise exposure at the site would be considered compatible with the proposed residential land uses as noise levels are calculated to reach 53 dBA CNEL, and would not exceed the 60 dBA CNEL threshold.

Future Interior Noise Environment

The City of Pacifica requires that residential interior noise levels be maintained at 45 dBA CNEL or less. Assuming a 1 dBA increase in noise levels in the project vicinity, and due to the distance between the major road noise sources and intervening existing buildings, the future exterior traffic noise exposure at the single-family residences would be up to 53 dBA CNEL.

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior to interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA CNEL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise.

For this project, the set-backs from Peralta Road and Highway 1, as well as the acoustical shielding provided by the intervening building between the site and Peralta Road, is sufficient to ensure that the interior noise level standard would be met assuming standard construction methods with the windows open for ventilation. No additional noise insulation features (e.g., sound-rated construction methods) would be required.

[1] City of Pacifica, "City of Pacifica General Plan Draft: Noise", 2014.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive groundborne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- **Noise Levels in Excess of Standards:** A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the Draft General Plan or Municipal Code.

- **Groundborne Vibration from Construction:** A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- **Project-Generated Traffic Noise Increases:** A significant impact would be identified if traffic generated by the project would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA CNEL or greater, with a future noise level of less than 60 dBA CNEL, or b) the noise level increase is 3 dBA CNEL or greater, with a future noise level of 60 dBA CNEL or greater.

- **Construction Noise:** A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} at the property lines shared with residential land uses, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses.

Impact 1: **Noise Levels in Excess of Standards.** The proposed project would comply with the allowable hours of construction as established in the City's Municipal Code. **This is a less-than-significant impact.**

Section 8-1.08: Amendments: Section 105.8 of the City's Municipal Code establishes allowable hours of construction for any project for which a building permit is required shall be limited to the hours of 7:00 a.m. to 7:00 p.m. on Monday, Tuesday, Wednesday, Thursday, and Friday. The hours of construction shall be limited to 9:00 a.m. to 5:00 p.m. on Saturday and Sunday. This analysis assumes that construction activities will occur between 7:00 a.m. and 7:00 p.m. Monday through Friday and not on weekends. Project construction will be consistent with the code limits and the impact is less-than-significant.

Mitigation Measure 1: **None required.**

Impact 2: **Exposure to Excessive Groundborne Vibration due to Construction.** Construction-related vibration levels resulting from activities at the project site would exceed 0.3 in/sec PPV at the nearest noise-sensitive receptor. **This is a potentially significant impact.**

The construction of the project may generate vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include grading, foundation work, paving, and new building framing and finishing. This analysis assumes the proposed project would not require pile driving, which can cause excessive vibration.

For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 in/sec PPV for ancient buildings or buildings that are documented to be structurally weakened. No known ancient buildings or buildings that are documented to be structurally weakened adjoin the project area. Therefore, conservatively, ground-borne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in a significant vibration impact.

Table 5 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), may generate substantial vibration in the immediate vicinity. Jackhammers typically generate vibration levels of 0.035 in/sec PPV, and drilling typically generates vibration levels of 0.09 in/sec PPV at a distance of 25 feet. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

The nearest receptor is the adjacent Linda Mar Rehabilitation building approximately 10 feet southeast of the project property line. At this distance, unmitigated vibration levels at the rehabilitation building would be up to 0.575 in/sec PPV, which exceeds the 0.3 in/sec PPV threshold. The remaining receptors are the single-family residences 100 feet northeast of the project property line. At this distance, vibration levels would be at or below 0.046 in/sec PPV, which would be below the 0.3 in/sec PPV threshold. While the single-family residences to the northeast would not be exposed to vibration levels exceeding the 0.3 in/sec PPV threshold, the adjacent rehabilitation building to the southeast would at times be exposed to vibration levels that would potentially exceed the threshold where vibration levels could cause cosmetic damage to the building. This is a potentially significant impact.

TABLE 5 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approximate L_v at 25 ft. (VdB)
Pile Driver (Impact)	upper range	1.158	112
	typical	0.644	104
Pile Driver (Sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

Mitigation Measure 2:

The following measures are recommended to reduce vibration impacts from construction activities:

- Prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or excavation using clam shell or chisel drops, and avoid dropping heavy objects or equipment within 25 feet of any adjacent sensitive receptors.

The implementation of these mitigation measures would reduce the impact to a less-than-significant level.

Impact 3: **Substantial Permanent Noise Increase due to Project-Generated Traffic.** Project-generated traffic would not cause a permanent noise level increase at existing noise-sensitive land uses in the project vicinity. **This is a less-than-significant impact.**

A significant noise impact would occur if traffic generated by the project would substantially increase noise levels at sensitive receptors in the project vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA CNEL or greater, with a future noise level of less than 60 dBA CNEL, or b) the noise level increase is 3 dBA CNEL or greater, with a future noise level of 60 dBA CNEL or greater. The nearest noise-sensitive receptor is approximately 10 feet to the southeast of the project site where the ambient noise levels are below 60 dBA DNL; therefore, a significant impact would occur if project-generated traffic would permanently increase noise levels by 5 dBA CNEL. For reference, traffic volumes would have to double for noise levels to increase by 3 dBA CNEL.

Traffic noise levels from Peralta Road and Highway 1 dominate the noise environment in the area. The project's traffic analysis provided trip generation estimates for project traffic along San Pedro Terrace Road. These trip generation estimates were reviewed to calculate the permanent noise increase attributable to project-generated traffic. The modeled traffic noise level attributable to projects trips is calculated to be 50 dBA CNEL at receptors along San Pedro Terrace Road and Peralta Road. As shown from LT-1, the community noise equivalent level at receptor at the end of San Pedro Terrace Road is 52 dBA CNEL. Although the individual car pass-bys will be audible, the relatively low volume of additional traffic along roadways serving the site would not measurably increase the ambient noise environment on a daily average basis. Therefore, future noise level generated by traffic will continue to be less than 60 dBA CNEL and the noise level increase attributable to the project will be less than 5 dBA CNEL. This is a **less-than-significant** impact.

Mitigation Measure 3: **None required.**

Impact 4: **Substantial Temporary Noise Increase due to Construction.** Existing noise-sensitive land uses would not be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a less-than-significant impact**.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

Where noise from construction activities exceeds 60 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} at noise-sensitive residential uses in the project vicinity for a period exceeding one year, the impact would be considered significant. Additionally, the City's Municipal Code sets limits in which construction activities must occur between 7:00 a.m. and 7:00 p.m. on weekdays, and between 9:00 a.m. and 5:00 p.m. on weekends.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. Table 6 presents the typical range of hourly average noise levels generated by different phases of construction measured at a distance of 50 feet. Hourly average noise levels generated by excavation equipment associated with the project are calculated to range from 71 to 89 dBA L_{eq} measured at a distance of 50 feet. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors.

TABLE 6 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	II	I	II	I	II	I	II
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I - All pertinent equipment present at site.
II - Minimum required equipment present at site.

Source: U.S.E.P.A., Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

Construction for the proposed project is expected to last approximately one year. Typically, small construction projects do not generate significant noise impacts when the duration of the noise generating construction period is limited to one year or less. Construction noises associated with projects of this type are disturbances that are necessary for the construction or repair of buildings and structures in urban areas. Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction materials, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. Limiting the hours when construction can occur to daytime hours is often a simple method to reduce the potential for noise impacts. In areas immediately adjacent to construction, controls such as constructing temporary noise barriers and utilizing "quiet" construction equipment can also reduce the potential for noise impacts. Project construction is expected to last approximately one year; therefore, the temporary noise impact resulting from project construction activities would be considered less-than-significant.

Mitigation Measure 4: None required.