3.9

NOISE

3.9

NOISE

3.9.1 Introduction

This section describes the fundamentals of noise, the existing environmental setting for noise, the regulatory setting associated with noise, the potential increase of noise that would result from the proposed Project that could cause significant impacts, and any necessary mitigation measures that would reduce these impacts. However, even with all feasible mitigation incorporated, there would still be significant and unavoidable impacts related to noise.

The following list summarizes the significant and unavoidable noise impacts that would result from construction and operation of the proposed Project:

- Proposed project construction noise impacts on the closest sensitive receivers (approximately 900 feet from the proposed project site) would exceed the applicable noise standards. Thus, construction-related noise impacts on liveaboard boats at the Cabrillo Way Marina would be significant and unavoidable.

3.9.1.1 Noise Fundamentals

Noise may be defined as unwanted sound and is usually objectionable because it is disturbing or annoying. The objectionable nature of noise can 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 the amplitude of sound waves combined with the reception characteristics of the ear. Amplitude may be compared with the height of an ocean wave. Technical acoustical terms commonly used in this section are defined in Table 3.9-1.

Table 3.9-1. Definitions of Acoustical Terms

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 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 in air). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency (Hertz [Hz])	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 and 20,000 Hz. Infrasonic sounds are below 20 Hz and ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level (dBA)	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level (L_{eq})	The average A-weighted noise level during the measurement period. The hourly L_{eq} used for this report is denoted as dBA $L_{eq[h]}$.
Community Noise Equivalent Level (CNEL)	The average A-weighted noise level during a 24-hour day, obtained after the addition of 5 dB to sound levels in the evening from 7 p.m. to 10 p.m. and after the addition of 10 dB to sound levels in the night between 10 p.m. and 7 a.m.
Day/Night Noise Level (L_{dn})	The average A-weighted noise level during a 24-hour day, obtained after the addition of 10 dB to levels measured in the night between 10 p.m. and 7 a.m.
L_1, 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.
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, time of occurrence, and tonal or informational content as well as the prevailing ambient noise level.

3.9.1.1.1 Decibels and Frequency

In addition to the concepts of pitch and loudness, there are several noise measurement scales that are used to describe noise. The *decibel* is a unit of measurement that indicates the relative amplitude of a sound. Zero on the decibel scale is based on the lowest sound pressure that a healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 dB represents a 10-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its level. Each 10-dB increase in sound level is perceived as approximately a doubling of loudness over a wide range of amplitudes. Because decibels are logarithmic units, sound pressure levels are not added arithmetically. When two sounds of equal sound pressure level are added, the result is a sound pressure level that is 3 dB higher. For example, if the sound level were 70 dB when 100 cars pass by, then it would be 73 dB when 200 cars pass the observer. Doubling the amount of energy would result in a 3 dB increase to the sound level. Noise levels will not change much when a quieter noise source is added to relatively louder ambient noise levels. For example, a 60 dB noise source is added to 70 dB ambient noise levels, resulting in noise level equal to 70.4 dB at the location of the new noise source.

Frequency relates to the number of pressure oscillations per second, or *Hertz*. The range of sound frequencies that can be heard by healthy human ears is from about 20 Hz at the low frequency end to 20,000 Hz (20 kilohertz [kHz]) at the high frequency end.

There are several methods for characterizing sound. The most common is the *A-weighted sound level* or *dBA*. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Studies have shown that the A-weighted level is closely correlated with annoyance to traffic noise. Other frequency weighting networks, such as *C weighting* or *dBC*, have been devised to describe noise levels for specific types of noise (e.g., explosives). Table 3.9-2 shows typical A-weighted noise levels that occur in human environments.

Table 3.9-2. Typical Noise Levels in the Environment

Noise Level dBA	*Extremes*	*Home Appliances*	*Speech at 3 Feet*	*Motor Vehicles at 50 Feet*	*General Type of Community Environment*
120	Jet aircraft at 500 feet				
110					
100		Chain saw			
90		Power lawnmower		Diesel truck (not muffled)	
80		Shop tools	Shout	Diesel truck (muffled)	
70		Blender	Loud voice	Automobile at 70 mph	Major metropolis
60		Dishwasher	Normal voice	Automobile at 40 mph	Urban (daytime)
50					
40		Air-conditioner	Normal voice (back to listener)	Automobile at 20 mph	Suburban (daytime)
30		Refrigerator			Rural (daytime)
20					
10					
0	Threshold of hearing				

Source: Harris Miller Miller & Hanson, Inc. 2003.

3.9.1.2 Noise Descriptors

Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations is utilized. Most commonly, environmental sounds are described in terms of 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}. A common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration. The scientific instrument used to measure noise is the sound level meter, which can accurately measure environmental noise levels to within approximately plus or minus 1 dBA. Two metrics describe the 24-hour average, L_{dn} and CNEL. Both include penalties for noise during the nighttime, and CNEL also penalizes noise during the evening. CNEL and L_{dn} are normally within 1 dBA of each other and are used interchangeably in this section. L_{dn} and CNEL are approximately equal to the L_{eq} peak hour under normal traffic conditions (Caltrans 1998).

3.9.1.3 Human Response to Noise

Noise-sensitive receptors are generally defined as locations where people reside or where the presence of unwanted sound may adversely affect the use of the land. Noise-sensitive receptors typically include residences, hospitals, schools, guest lodging, libraries, and certain types of passive recreational uses. Sensitive land uses in the proposed project area include:

- existing residences, and
- existing recreational land uses.

Studies have shown that under controlled conditions in an acoustics laboratory, a healthy human ear is able to discern changes in sound levels of 1 dBA. In the normal environment, changes in noise level of 3 dBA are considered just noticeable to most people. A change of 5 dBA is readily perceptible, and a change of 10 dBA is perceived as being twice as loud.

Biological responses to noise are discussed in greater detail in Section 3.3, “Biological Resources.”

3.9.1.3.1 Noise and Health

A number of studies have linked increases in noise with health effects, including hearing impairment, sleep disturbance, cardiovascular effects, psychophysiological effects, and potential impacts on fetal development (Babisch 2005). Potential health effects appear to be caused by both short- and long-term exposure to very loud noises and long-term exposure to lower levels of sound. Acute sounds of L_{AF}[1] > 120 dB can cause mechanical damage to hair cells of the cochlea (the auditory portion of the inner ear) and hearing impairment (Babisch 2005). L_{AF} > 120 dB is equivalent to a rock concert or a plane flying overhead at 984 feet.

The World Health Organization and the EPA consider L_{eq} = 70 dB(A) to be a safe daily average noise level for the ear. However, even this “ear-safe” level may cause disturbance to sleep and concentration, and may be linked to chronic health impacts such as hypertension and heart disease (Babisch 2006).

A number of studies have looked at the potential health effects from the sound of chronic lower noise levels, such as traffic, especially as these noise levels affect children. In a study of school children in Germany, blood pressure was found to be 10 mmHg[2] higher in a group of students exposed to road traffic noise from high traffic transit routes (Babisch 2006). A study by Kwanda (2004) showed that in pregnant women, exposure to airplane noise was found to be associated with decreased fetal body weight.

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[1] L_{AF} = Sound level with “A” Frequency weighting and Fast Time weighting
[2] mmHG = millimeter of mercury

3.9.1.4 Sound Propagation

When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise is reduced with distance depends on the following important factors.

Geometric spreading: In the absence of obstructions, sound from a single source (i.e., a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance. Highway noise is not a single stationary point source of sound. The movement of vehicles on a highway makes the source of the sound appear to emanate from a line (i.e., a "line" source) rather than from a point. This results in cylindrical spreading rather than the spherical spreading resulting from a point source. The change in sound level from a line source is 3 dBA per doubling of distance.

Ground absorption: Usually the noise path between the source and the observer is very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation because of geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only; for distances of less than 200 feet, prediction results based on this scheme are sufficiently accurate. For acoustically "hard" sites (i.e., sites with a reflective surface, such as a parking area or a smooth body of water, between the source and the receiver), no excess ground attenuation is assumed. For acoustically absorptive or "soft" sites (i.e., sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.

Atmospheric effects: Research by Caltrans and others has shown that atmospheric conditions can have a major effect on noise levels. Wind has been shown to be the single most important meteorological factor within approximately 500 feet, whereas vertical air temperature gradients are more important over longer distances. Other factors, such as air temperature, humidity, and turbulence, also have major effects. Receivers located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur because of temperature inversion conditions (i.e., increasing temperature with elevation).

Shielding by natural or human-made features: A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by this shielding depends on the size of the object, proximity to the noise source and receiver, surface weight, solidity, and the frequency content of the noise source. Natural terrain features (such as hills and dense woods) and human-made features (such as buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. A higher barrier may provide as much as 20 dB of noise reduction.

3.9.2 Existing Environment

3.9.2.1 Existing Noise Measurements

Short-term noise measurements were taken at sensitive receivers[3] around the proposed project site and in the surrounding neighborhoods to establish the existing ambient noise profile in and around the proposed project site. Noise measurement locations related to potential noise construction impacts were initially determined based on aerial photographs of the area surrounding the proposed project site and location for potential operational noise impacts locations where the traffic study measured traffic. Aerial photographs helped determine the general land uses surrounding the proposed project site. Exact measurement locations were then chosen during site visits on January 25, 2012. Noise measurements at these locations were taken to address construction related or operational related noise dependent on proximity to the proposed Project. These measured noise levels (summarized in Table 3.9-3) are used for the project baseline unless otherwise stated. A Larson Davis 820 type 1 (Precision-grade) digital sound level meter was used to measure the existing ambient noise levels. The sound meter was mounted on a tripod, and a windscreen covered the sound meter’s microphone to diminish the effect of unwanted wind-generated noise; 15-minute measurements were conducted and recorded at the measurement locations. A CA 200 calibrator was used to verify the calibration of the sound level meter both before and after each set of measurements was taken. Noise metrics recorded consisted of the measured L_{eq}, L_{min}, L_{max}, L_{10}, L_{50}, and L_{90}. Prevailing weather conditions at each site were noted along with other factors that might adversely alter the quality of the noise measurements. The results of those measurements are presented in Table 3.9-3, and the locations are shown on Figure 3.9-1.

Berth 260, the location of the existing SCMI facility, is located within an industrial area on Terminal Island. The closest sensitive receiver to the existing SCMI location is approximately 3,500 feet to the west. The relatively minimal demolition work that would conducted at Berth 260, would not impact the receptor at such a great distance and therefore no baseline noise measurements were conducted for that location.

[3] Sensitive receivers are locations of frequent human use where the occurrence of high levels of noise could negatively affect the use of the area in question.

Table 3.9-3. Noise Measurement Results (dBA)

Site ID	Measurement Location	*Measurement Period*			Noise Sources	*Measurement Results (dBA)*					
		Date	Start Time	Duration (mm:ss)		L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}
ST-1	On proposed project site	1/25/12	9:30 a.m.	15:00	Truck traffic along Signal Street, idling trucks, birds	58.6	73.9	52.4	53.7	55.1	60.7
ST-2	22nd Street Park	1/25/12	10:00 a.m.	15:00	Traffic along 22nd Street and in parking lot, people talking, birds, distant construction	52.7	65.0	46.5	48.7	51.1	55.1
ST-3	Berth 35 Gangway A (Marina)	1/25/12	10:45 a.m.	15:00	Traffic along 22nd Street and in parking lot, people talking, birds, distant construction	55.9	75.1	44.9	47.1	51.8	57.3
ST-4	2024 Gaffey Street, corner of Gaffey Street and 21st Street (Residence)	1/25/12	11:45 a.m.	15:00	Traffic along Gaffey Street	68.9	79.6	47.8	56.9	66.8	72.6
ST-5	Bank Lofts Condos along 7th Street	1/25/12	1:35 p.m.	15:00	Traffic along 7th Street	64.2	77.8	48.2	52.8	61.2	67.7
ST-6	Baseball field along Harbor Boulevard	1/25/12	2:25 p.m.	15:00	Traffic along Harbor Boulevard	61.3	79.8	43.6	49.7	57.2	63.4

3.9.2.1.1 ST-1: Proposed Project Site

Site ST-1 is located on the proposed project site south of 22nd Street between the existing warehouse to the west and a group of storage tanks associated with the former Westway facility to the east. The measured noise level at ST-1 was 59 dBA L_{eq}; noise sources included truck traffic along 22nd Street and Signal Street, as well as ambient noise such as birds.

3.9.2.1.2 ST-2: 22nd Street Park

Site ST-2 is located at the 22nd Street Park to the west of the proposed project site, north of 22nd Street, approximately 3,000 feet to the west/northwest of the acoustic center of the proposed project site. Residences are located to the north of the park, a mix of residential and commercial uses are located to the west, and commercial land uses and the marina are located to the south. The measured noise level at the site was 53 dBA L_{eq}, with the main noise source being traffic along 22nd Street and ambient noises associated with the park such as birds and people talking.

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Figure 3.9-1
Noise Measurement and Modeling Locations
City Dock No. 1 Marine Research Center Project

3.9.2.1.3 ST-3: Berth 35 Gangway A (Marina)

Site ST-3 is located at the entrance to Berth 35 Gangway A, approximately 3,100 feet from the acoustic center of the proposed project site. The measurement location is representative of sensitive receptors in the marina such as pleasure craft where few people reside. ST-3 also represents commercial land use receptors along this stretch of the waterfront. The marina and landside commercial uses are to the east and west, and 22nd Street and the 22nd Street Park are to the north. The measured noise level at the site was 56 dBA L_{eq}, with the main noise source being traffic along 22nd Street and ambient noises such as people talking and birds. The closest portion of the marina is approximately 900 feet away from the acoustical center of the proposed project site. Being that the marina contains liveaboards, this location is assumed to contain sensitive receivers. Therefore modeled receiver MR-1 was utilized as assess potential impacts to sensitive receivers located in closer proximity to the proposed project site.

3.9.2.1.4 ST-4: Residence at the Corner of Gaffey Street and 21st Street

ST-4 is representative of the single-family residential land uses located along Gaffey Street. ST-4 is located approximately 5,600 feet to the west of the acoustic center of the proposed project site. Gaffey Street runs north and south and consists of residential and interspersed commercial land uses. The measured noise level was 69 dBA L_{eq} with the main noise source being traffic along Gaffey Street.

3.9.2.1.5 ST-5: Bank Lofts Condos along 7th Street

ST-5 is representative of the multi-family residential land uses along 7th Street. Land uses along 7th Street include interspersed multi-family residential mixed with commercial uses. ST-5 is located approximately 6,500 feet from the acoustic center of the proposed project site. The measured location is representative of exterior living spaces and balconies at the multi-family residences. The measured noise level at ST-5 was 64 dBA L_{eq}, with the main source of noise being traffic along 22nd Street.

3.9.2.1.6 ST-6: Bloch Field along Harbor Boulevard

ST-6 is representative of Bloch Field, a baseball field and park located along Harbor Boulevard. ST-6 is located approximately 3,100 feet to the northwest of the acoustic center of the proposed project site. The surrounding land uses include residential to the west, the project site to the south, and the harbor to the east. The measured noise level at ST-6 was 61 dBA L_{eq}, with the main source of noise being traffic along Harbor Boulevard.

3.9.3 Applicable Regulations

The following regulations are excerpts from the City of Los Angeles Municipal Code and General Plan Noise Element, and are applicable to the proposed Project.

3.9.3.1 City of Los Angeles Municipal Code

Section 41.40 of the City of Los Angeles Municipal Code prohibits construction work during nighttime and early morning hours. The Municipal Code section states the following:

> (a) No person shall between the hours of 9:00 pm and 7:00 am of the following day perform any construction or repair work of any kind upon or any excavating for, any building or structure, where any of the foregoing entails the use of any power-driven drill, driven machine, excavator, or any other machine, tool, device, or equipment which makes loud noises to the disturbance of persons occupying sleeping quarters in any dwelling, hotel, or apartment or other place of residence. In addition, the operation, repair or servicing of construction equipment and the jobsite delivering of construction materials in such areas shall be prohibited during the hours herein specified. Any person who knowingly and willfully violates the foregoing provision shall be deemed guilty of a misdemeanor punishable as elsewhere provided in this code.
>
> (b) The provisions of Subsection (a) shall not apply to any person who performs the construction, repair or excavation work involved pursuant to the express written permission of the Board of Police Commissioners through its Executive Director. The Executive Director, on behalf of the Board, may grant this permission, upon application in writing, where the work proposed to be done is in the public interest, or where hardship or injustice, or unreasonable delay would result from its interruption during the hours mentioned above, or where the building or structure involved is devoted or intended to be devoted to a use immediately related to public defense. The provisions of this section shall not in any event apply to construction, repair or excavation work done within any district zoned for manufacturing or industrial uses under the provisions of Chapter I of this Code, nor to emergency work necessitated by any flood, fire or other catastrophe.

Chapter 11 of the Municipal Code sets forth noise regulations, including regulations applicable to construction noise impacts, within 500 feet of a residence. Although the proposed Project is 900 feet from the nearest residence, the Municipal Code section is the pertinent of the significance criteria established in Section 3.9.4.2 below. Section 112.05 establishes maximum noise levels for powered equipment or powered hand tools. This section states:

> Between the hours of 7:00 am and 10:00 pm in any residential zone of the City or within 500 feet thereof, no person shall operate or cause to be operated any powered equipment or powered hand tool that produces a maximum noise level exceeding the following noise limits at a distance of 50 feet there from (a) 75 dBA for construction, industrial and agricultural machinery including crawler tractors, dozers, rotary drills and augers, loaders, power shovels, cranes, derricks, motor graders, paving machines, off-highway trucks, ditchers, trenchers, compactors, scrapers, wagons, pavement breakers, depressors, and pneumatic or other powered equipment; (b) 75 dBA for powered equipment of 20 horsepower or less intended for infrequent use in residential areas including chain saws, log chippers, and powered hand tools; and (c) 65 dBA for powered equipment intended for repetitive use in residential areas including lawn mowers, backpack mowers, small lawn and garden tools, and riding tractors.

The noise limits for particular equipment listed above in (a), (b) and (c) shall be deemed to be superseded and replaced by noise limits for such equipment from and after their establishment by final regulations adopted by the Federal Environmental Protection Agency and published in the Federal Register.

Said noise limitations shall not apply where compliance therewith is technically infeasible. The burden of proving that compliance is technically infeasible shall be upon the person or persons charged with a violation of this section. Technical infeasibility shall mean that said noise limitations cannot be complied with despite the use of mufflers, shields, sound barriers, and/or other noise reduction device and techniques during the operation of the equipment.

3.9.3.2 City of Los Angeles General Plan Noise Element

The City of Los Angeles General Plan Noise Element establishes standards for exterior sound levels based on land use categories. The Noise Element states that the maximum acceptable outdoor noise exposure-level for residential, hospital, and school zones is 65 dBA CNEL and that silencers and mufflers on intake and exhaust openings for all construction equipment are required. Table 3.9-4 summarizes the City's noise compatibility guidelines.

Table 3.9-4. City of Los Angeles Guidelines for Noise Compatible Land Use

	Day-Night Average Exterior Sound Level (CNEL dB)						
Land Use Category	*50*	*55*	*60*	*65*	*70*	*75*	*80*
Residential Single-Family, Duplex, Mobile Home	A	C	C	C	N	U	U
Residential Multi-family	A	A	C	C	N	U	U
Transient Lodging, Motel, Hotel	A	A	C	C	N	U	U
School, Library, Church, Hospital, Nursing Home	A	A	C	C	N	N	U
Auditorium, Concert Hall, Amphitheater	C	C	C	C/N	U	U	U
Sports Arena, Outdoor Spectator Sports	C	C	C	C	C/U	U	U
Playground, Neighborhood Park	A	A	A	A/N	N	N/U	U
Golf Course, Riding Stable, Water Recreation, Cemetery	A	A	A	A	N	A/N	U
Office Building, Business, Commercial, Professional	A	A	A	A/C	C	C/N	N
Agriculture, Industrial, Manufacturing, Utilities	A	A	A	A	A/C	C/N	N

Notes:
A = Normally acceptable. Specified land use is satisfactory, based upon assumption buildings involved are conventional construction, without any special noise insulation.
C = Conditionally acceptable. New construction or development only after a detailed analysis of noise mitigation is made and needed noise insulation features are included in proposed project design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning normally will suffice.
N = Normally unacceptable. New construction or development generally should be discouraged. A detailed analysis of noise

Land Use Category	Day-Night Average Exterior Sound Level (CNEL dB)						
	50	55	60	65	70	75	80
reduction requirements must be made and noise insulation features included in the design of a project. U = Clearly unacceptable. New construction or development generally should not be undertaken.							

3.9.4 Impact Analysis

3.9.4.1 Methodology

The potential noise impacts due to construction and operation of the proposed Project were estimated using the methodologies described below.

Hourly average construction noise levels are estimated based on the types of equipment proposed to be on site to complete the various construction activities. These sources included equipment such as loaders, dozers, pile drivers, and trucks. The FTA Transit Noise and Vibration Impact Assessment was used for noise levels for pieces of construction equipment which would be present onsite during construction. Noise levels presented in Table 3.9-5 (Phase 1) and Table 3.9-7 (Phase 2) are representative of specific construction equipment onsite during construction.

During any construction of the proposed Project, the overall average noise levels vary with the level of construction activity and the types of equipment that are on site and operating at a particular time. Noise levels associated with construction were modeled using the loudest piece of construction equipment to analyze representative noise levels at nearby sensitive receivers. SoundPLAN 7.0 models noise based on typical distances between source and receiver, source sound pressure level, presences of shielding between source and receiver, relative height of source and receiver, and other site conditions (ground reflectivity or absorptivity).

Operational noise impacts were assessed using the Federal Highway Administration's (FHWA's) Traffic Noise Model (TNM®), which is their computer program for highway traffic noise prediction and analysis. The most current TNM version (2.5) was used for this report. The parameters for estimating vehicular traffic noise were the typical distance between roadway centerline and receiver; typical AM/PM peak-hour traffic volumes and posted speed limits; percentages of automobiles, medium trucks, buses, motorcycles, and heavy trucks; roadway grade; and site conditions (terrain or structural shielding and ground propagation characteristics). (Federal Highway Administration 2004)

Potential vibration impacts associated with construction were assessed using the U.S. Department of Transportation (USDOT) Transit Noise and Vibration Impact Assessment. Construction vibration thresholds were based on USDOT criteria levels for potential damage to structures surrounding the proposed project site.

3.9.4.2 Thresholds of Significance

3.9.4.2.1 CEQA Criteria

The *L.A. CEQA Thresholds Guide* (City of Los Angeles 2006) contains the following significance thresholds related to construction noise. Quantification of ambient noise levels (existing and projected at the time of construction) is measured in CNEL.

A project would normally have a significant impact on noise levels from construction during the *daytime* if:

NOI-1: Construction activities lasting more than 1 day would exceed existing ambient exterior noise levels by 10 dBA or more at a noise-sensitive use; or if construction activities lasting more than 10 days in a 3-month period would exceed existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use.

A project would normally have a significant impact on noise levels from construction during the *nighttime* if:

NOI-2: Construction activities would exceed the ambient noise level by 5 dBA at a noise-sensitive use between the hours of 9:00 p.m. and 7:00 a.m. Monday through Friday, before 8:00 a.m. or after 6:00 p.m. on Saturday, or at any time on Sunday.

NOI-3: Expose persons to or generate excessive groundborne vibration or groundborne noise levels.

The *L.A. CEQA Thresholds Guide* (City of Los Angeles 2006) contains the following significance thresholds for operational noise impacts due to stationary sources, vehicular traffic, or increased railroad operations.

A project would normally have a significant impact on noise levels from project operations if:

NOI-4: Ambient noise level measured at the property line of affected uses increasing by 3 dBA in CNEL to or within the "normally unacceptable" or "clearly unacceptable category," or increasing in any way by 5 dBA or more.

Sensitive receptors in the Port area that could be potentially affected by operational noise from the proposed Project include residential land uses (single- and multi-family housing, liveaboards on boats used as residences) and neighborhood parks. At these land uses, a significant impact would occur if the proposed Project causes CNEL noise levels to increase by (1) 5 dBA or greater where the existing CNEL is less than 70 dBA, or (2) 3 dBA or greater where the existing CNEL exceeds 70 dBA.

3.9.4.3 Impacts and Mitigation

The potential for noise from construction and operation to affect sensitive receptor locations in the area surrounding the proposed project site is assessed in this section.

3.9.4.3.1 Construction Impacts

Proposed Project construction is anticipated to increase noise levels temporarily at noise-sensitive locations near the proposed project site. The magnitude of the increases would depend on the type of construction activity, the noise level generated by various pieces of construction equipment, site geometry (i.e., shielding from intervening terrain or other structures), and the distance between the noise source and receiver.

Construction Phase 1

Noise from construction activity is generated by the broad array of powered, noise-producing mechanical equipment used in the construction process. This equipment ranges from hand-held pneumatic tools to bulldozers, dump trucks, front loaders, and pile driving. Pile driving activities during wharf and ground improvement activities, and installation of the floating docks, would be the loudest individual construction activities.

A list of the construction equipment expected to be used during Phase 1 of construction is provided in Table 3.9-5, broken down by sub-phase with respective equipment noise levels. Noisy construction activities could occur on more than one part of the proposed project site at a given time. However, the noise levels from construction activity and the representative pieces of construction equipment during various phases of a typical construction project have been evaluated, and their use provides an acceptable prediction of a project's potential noise impacts.

Table 3.9-5. Noise Levels from Construction Equipment during Phase 1

Sub-Phase	*Construction Equipment*	*Typical Noise Level at 50 feet (dBA)* [a,b,c]
Wharf Improvements Ground Improvements	Dozer	85
	Front/back loader	85
	Water Truck	88
	Crane	83
	Dump Truck	88
	Material Trucking	88
	Pile Driving	101
	Forklift	85
	Grader	85
	Excavator	85
	Jet Pump	76
	Asphalt Truck	88
	Paver	89

Sub-Phase	*Construction Equipment*	*Typical Noise Level at 50 feet (dBA)* [a,b,c]
	Water Truck	88
	Striper	89
	Roller	74
	Front/back loader	85
	Material Trucking	88
Transit Shed/ Interior Building Construction	Crane	83
	Forklifts	85
	Front/back loader	85
	Welding Equipment	74
	Material Trucking	88
Floating Dock	Crane	83
	Forklifts	85
	Front/back loader	85
	Material Trucking	88
	Derrick Barge	85
	Pile Driver	101
Public Plaza	Crane	83
	Forklifts	85
	Water Truck	88
	Front/back loader	85
	Welding Equipment	74
Signal Street	Asphalt Truck	88
	Paver	89
	Water Truck	88
	Striper	89
	Roller	74
	Front/back loader	85
New Building Construction	Crane	83
	Forklifts	85
	Generator	81
	Water Truck	88
	Front/back loader	85
	Welding Equipment	74

Sub-Phase	*Construction Equipment*	*Typical Noise Level at 50 feet (dBA)* [a,b,c]
	Material Trucking	88

[1] Some pieces of equipment were not presented in the FTA Transit Noise and Vibration Impact Assessment. Therefore, similar pieces of equipment were substituted.

[2] Noise levels for pile driving assume that impact pile driving would be used during construction. Should vibratory pile driving be used, noise levels would be expected to drop.

[3] Noise levels for welding equipment were taken from the FHWA's Roadway Construction Noise Model (RCNM).

Source: FTA 2006, FHWA 2008.

In order to assess the potential noise effects of construction, this noise analysis modeled the loudest piece of construction equipment (pile driving during Wharf and Ground Improvements) to assess resultant noise impacts on surrounding noise sensitive receivers. The closest sensitive receivers were liveaboard boats located in the harbor located approximately 900 feet to the west of the proposed project site. Table 3.9-6 below shows a list of sensitive receivers located in close proximity to the proposed project site. Figure 3.9-2 shows the location of the liveaboard boats located in the harbor as well as other sensitive receivers (ST-2 & ST-5) located in close proximity to the proposed project site. Construction noise levels at the closest sensitive receiver would be approximately 76 dBA L_{max}. Noise levels like this would be readily audible and would likely dominate the noise environment. This noise level represents a worst-case scenario, and because of the cyclical nature of construction and construction equipment demands, noise levels would not likely approach the worst-case scenario. Receivers located further from the construction would experience lower levels of noise than nearby receivers due to the increased distance and intervening structures. Therefore, no other receivers are expected to experience increased levels of noise associated with construction.

Table 3.9-6. Modeled Noise Levels at Sensitive Receivers

Sensitive Receiver	*Sound Level[a] at Sensitive Receivers surrounding the proposed project- related pile driving (dBA L_{max})*
Liveaboard 1	76
Liveaboard 2	64
Liveaboard 3	69
Liveaboard 4	70
Liveaboard 5	73
Liveaboard 6	72
Liveaboard 7	72
Liveaboard 8	70
Liveaboard 9	71
Liveaboard 10	70

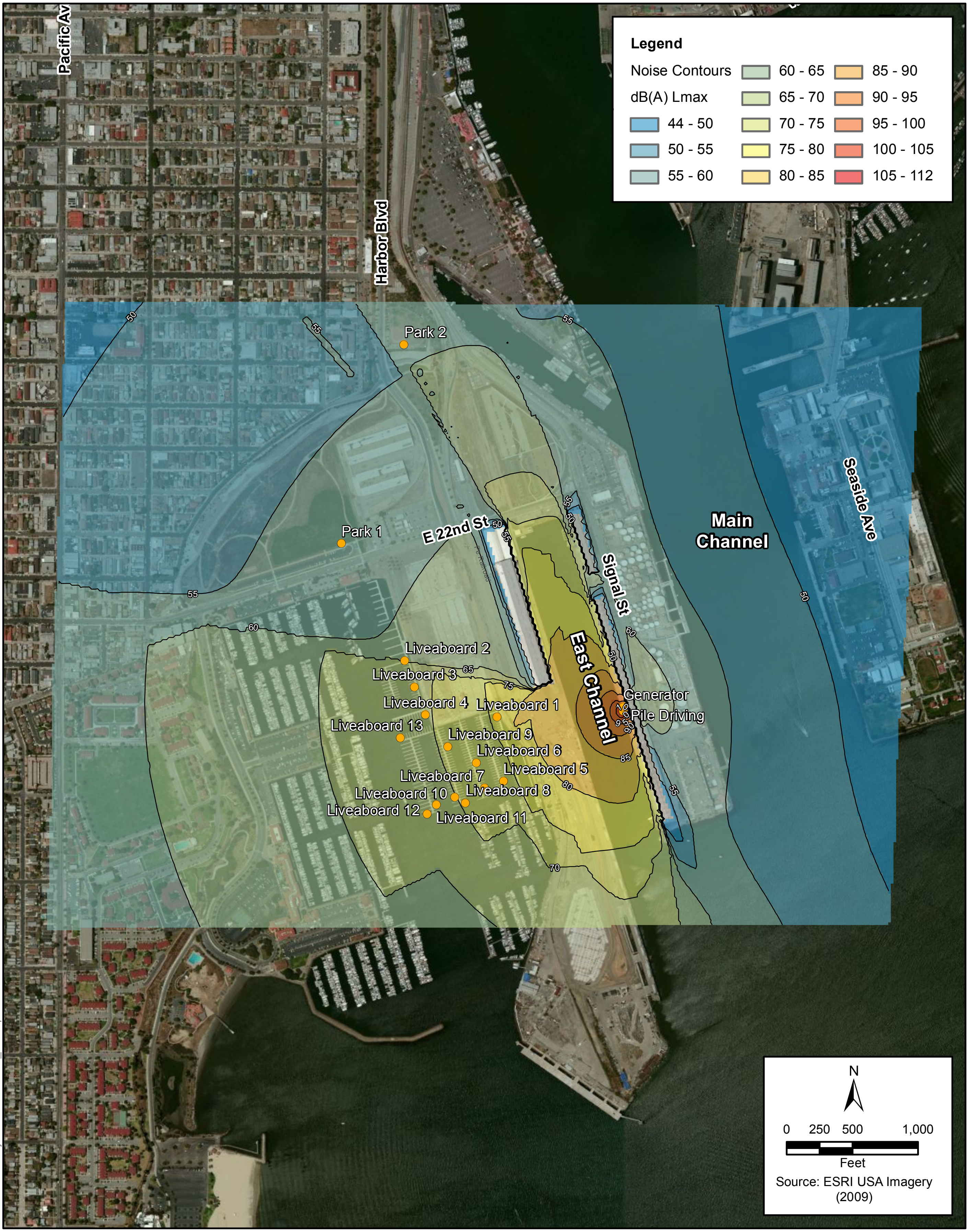

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Figure 3.9-2
Construction Noise Contours
City Dock No. 1 Marine Research Center Project

Sensitive Receiver	*Sound Level[a] at Sensitive Receivers surrounding the proposed project- related pile driving (dBA L_{max})*
Liveaboard 11	69
Liveaboard 12	68
Liveaboard 13	68
Park 1	57
Park 2	59

[a] Sound level rounded to the nearest whole number.
Source: FTA 2006, FHWA 2008.

Construction Phase 2

A list of the construction equipment expected to be used during Phase 2 of construction is presented by sub-phase in Table 3.9-7, with their respective noise levels. Pile driving activities during wharf and ground improvement activities, and wave tank construction, would be the loudest individual construction activities.

Table 3.9-7. Noise Levels from Construction Equipment during Phase 2

Sub-Phase	*Construction Equipment*	*Typical Noise Level at 50 feet (dBA) [a, b ,c]*
SCMI Building Demolition[4]	Dozer	85
	Front/back loader	85
	Water Truck	88
	Crane	83
	Dump Truck	88
	Material Trucking	88
	Derrick barge	85
	Forklift	85
Wharf Improvements/Ground Improvements	Dozer	85
	Front/back loader	85
	Pile Driving	101
	Water Truck	88
	Crane	83
	Dump Truck	88

[4] SCMI Building Demolition is located on a separate site (Berth 260). This site is located across the harbor from the main City Dock project site and therefore would be located even further from sensitive receivers. No sensitive receivers were identified there.

Sub-Phase	*Construction Equipment*	*Typical Noise Level at 50 feet (dBA)* [a, b ,c]
	Material Trucking	88
	Forklift	85
	Grader	85
	Excavator	85
	jet pump	76
	Asphalt Truck	88
	Paver	89
	Water Truck	88
	Striper	85
	Roller	74
	Front/back loader	85
	Material Trucking	88
Transit Shed	Crane	83
	Forklifts	85
	Front/back loader	85
	Welding Equipment	74
	Material Trucking	77
Promenade	Front/back loader	85
	Dump Truck	88
	Material Trucking	88
	Forklift	85
Wave Tank	Grader	85
	Excavator	85
	Asphalt Truck	88
	Paver	89
	Water Truck	88
	Striper	85
	Roller	74
	Front/back loader	85
	Material Trucking	88
	Crane	83

[a] Some pieces of equipment were not presented in the FTA Transit Noise and Vibration Impact Assessment. Therefore, similar pieces of equipment were substituted.

[b] Noise levels for pile driving assume that impact pile driving would be used during construction.

Sub-Phase	*Construction Equipment*	*Typical Noise Level at 50 feet (dBA)* [a, b, c]
Should vibratory pile driving be used, noise levels would be expected to drop.		
[c] Noise levels for welding equipment was taken from the FHWA's RCNM.		
Source: FTA 2006, FHWA 2008.		

Phase 2's construction noise profile would be similar to Phase 1's. Therefore noise levels (from Table 3.9-7) associated with pile driving during Phase 2 would be virtually the same as Phase 1 and noise levels presented in Table 3.9-6 would be representative of noise levels expected during construction.

Impact NOI-1: Construction of the proposed Project would last more than 1 day but would not exceed existing ambient exterior noise levels by 10 dBA or more at a noise-sensitive use; construction activities lasting more than 10 days in a 3-month period would not exceed existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use.

Construction activities would typically last more than 10 days in any 3-month period. Based on the thresholds of significance, an impact would be considered significant if noise from these construction activities would exceed existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use. The closest sensitive receiver is liveaboard boats located approximately 900 feet to the west of the proposed project site, which is represented by the measured receiver ST-1. The noise level of approximately 59 dBA L_{eq} (when rounded to the nearest whole number) at ST-1 would likely be similar to the noise level at the liveaboards boats shown in Figure 3.9-2. Using SoundPLAN 7.0, construction noise levels would be approximately 77 dBA L_{max} during the loudest sub-phase of both Phase 1 and 2 (these subphases include pile driving). These noise levels would result in an approximately 16 dBA increase above the existing noise environment at the closest liveaboard (Liveaboard 1 as shown in Figure 3.9-2).

Construction would exceed the construction noise standards of a more than 5 dB increase in ambient noise levels at the closest sensitive receiver. The City's noise ordinance exempts construction activities from the noise standard (providing that such activities take place between the hours of 7 a.m. and 9 p.m. Monday through Friday, 8 a.m. and 6 p.m. on Saturdays, and no time on Sundays). However, impacts from construction would be considered significant if construction noise would exceed the 5 dBA threshold. Noise control measures are required as mitigation to reduce the noise levels to the extent practicable.

Impact Determination

Construction due to the proposed Project would constitute a significant impact. Noise control measures are required to ensure that noise from construction would not exceed the referenced noise levels listed above. Thus, impacts on sensitive receptors resulting from construction would be significant and require mitigation to reduce noise impacts to the greatest extent practicable.

Mitigation Measures

MM NOI-1: Maintain Construction Equipment. All construction equipment powered by internal combustion engines will be properly muffled and maintained.

MM NOI-2: Locate Equipment away from Noise-Sensitive Land Uses. All stationary noise-generating construction equipment, such as air compressors and portable power generators, will be located as far as practical from existing noise-sensitive land uses.

MM NOI-3: Utilize Quiet Equipment. Quiet construction equipment (such as pneumatic tools) will be utilized where practicable. Noise limits established in the City of Los Angeles Noise Ordinance will be fully complied with.

MM NOI-4: Notify Sensitive Receptors. Cabrillo Way Marina liveaboards will be notified of the construction schedule in writing prior to the beginning of construction.

Residual Impacts

Impacts would remain significant and unavoidable.

Impact NOI-2: Construction activities would not exceed the ambient noise level by 5 dBA at a noise-sensitive use between the hours of 9 p.m. and 7 a.m. Monday through Friday, before 8 a.m. or after 6 p.m. on Saturday, or at any time on Sunday.

No construction activities would occur between the hours of 9 p.m. and 7 a.m. Monday through Friday, before 8 a.m. or after 6 p.m. on Saturday, or at any time on Sunday, per the City's Noise Ordinance.

Impact Determination

Impacts would be less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact NOI-3: The proposed Project would not expose persons to, or generate, excessive groundborne vibration or groundborne noise levels.

Construction of the proposed Project would generate groundborne vibration. In general, demolition of structures or pile driving during construction generates the highest levels of vibration. Vibratory compactors or rollers, pile drivers, pavement breakers, and heavy trucks can also generate perceptible vibration. The FTA has published standard vibration levels and peak particle velocities for construction equipment operations. The root mean square (RMS) velocity level and peak particle velocities for construction equipment are listed in Table 3.9-8 below.

Table 3.9-8. Vibration Velocities for Construction Equipment

Equipment	*Approximate Vibration Velocity Level at 25 Feet*	*Approximate Peak Particle Velocity at 25 Feet (inches/second)*
Large Bulldozers	87	0.089
Loaded Trucks	86	0.076
Jackhammer	79	0.035
Pile Driver	104	0.644

Data reflects typical vibration level.
Source: FTA 2006.

Vibration levels from construction equipment attenuate as they radiate from the source. The equation to determine vibration levels at a specific distance states that

$$PPV_{equip} = PPV_{ref} \text{ x } (25/D)^{\wedge 1.5}$$

where PPV_{ref} is the Peak Particle Velocity at a reference distance of 25 feet, and D is the distance from the equipment to the sensitive receptor (FTA 2006).

The closest sensitive receptors are approximately 900 feet away from the most vibration-intensive phase of construction (Wharf and Ground Improvements). Wharf and Ground Improvements, floating dock installation, and Wave Tank construction would include construction activities such as pile driving, which experiences the greatest Peak Particle Velocity values from construction equipment. Table 3.9-8 states that pile driving produces Peak Particle Velocities of approximately 0.644 inches per second at a reference distance of 25 feet. This vibration level would attenuate to approximately 0.03 inches per second, which would be virtually undetectable and would be under the threshold of 0.2 inches per second—the threshold that would cause damage from vibration for masonry and wood timber buildings (USDOT 2006).

Therefore, vibration levels due to construction activities would not expose sensitive receivers to, or generate, excessive groundborne vibration or groundborne noise levels; thus, construction vibration impacts would be less than significant.

Impact Determination

Impacts would be less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

3.9.4.3.2 Operational Impacts

Impact NOI-4: Operations would not result in ambient noise level measured at the property line of affected uses increasing by 3 dBA in CNEL to or within the "normally unacceptable" or "clearly unacceptable category," or increasing in any way by 5 dBA or more.

Operational Traffic Noise

Predicted traffic noise levels in the proposed project area under existing and existing with proposed project (Phase 1 and Phase 2) conditions were analyzed using the FHWA's TNM. The parameters used to estimate vehicular traffic noise were: the typical distance between roadway centerline and receiver; peak-hour traffic volumes and posted speed limits; proportion of automobiles, medium trucks, and heavy trucks; and site conditions (terrain or structural shielding and ground propagation characteristics) (FWHA 2004). To determine baseline CNEL in the proposed project area and the proposed Project-related increase over baseline CNEL, a spreadsheet was used that models diurnal traffic patterns based on peak noise levels.

Noise from motor vehicle traffic associated with the proposed Project was analyzed using the data from the proposed Project's traffic study. Existing and existing with proposed project (Phase 1 and Phase 2) PM peak hour volumes were used to predict the changes in traffic noise at representative noise-sensitive locations. The results of the noise modeling are shown in Table 3.9-9.

As shown in Table 3.9-9, existing modeled traffic noise levels ranged from 45 dBA CNEL (at modeled receptor ST-1) to 65 dBA CNEL (at modeled receptor ST-4) (when rounded to the nearest whole number). Existing Plus Proposed Project Phase 1 Base Peak Hour noise levels would vary from 45 dBA CNEL at ST-1 to 65 dBA CNEL at ST-4. Existing Plus Proposed Project Phase 2 traffic noise levels would also vary from 45 dBA CNEL at ST-1 to 65 dBA CNEL at ST-4. The proposed

Project's traffic noise contribution would increase traffic noise on area roadways at sensitive receptor locations 0.1 dBA or less from the baseline conditions. Therefore, traffic-related noise impacts would be less than significant.

Table 3.9-9. Traffic Noise Modeling Results

Receptor	*Relevant Noise Standard (dBA CNEL) (not to exceed)*	*Existing Modeled Peak Hour (dBA CNEL)*	*Existing Plus Proposed Project Peak Hour(Phase 1) Cumulative Base (dBA CNEL)*	*Proposed Project-related Difference between Existing and Existing Plus Project Phase 1 (dBA)*	*Existing Plus Proposed Project Peak Hour(Phase 2) Cumulative Base (dBA CNEL)*	*Proposed Project-related Difference between Existing and Existing Plus Proposed Project Phase 2 (dBA)*	*Relevant Noise Standard Exceeded by the Proposed Project?*	*Increase (Compared to Existing) over 3 dBA and Relevant Standard Exceeded?*
ST-1	65	44.8	44.9	0.1	44.9	0.1	No	No
ST-2	65	50.9	51.0	0.1	51.0	0.1	No	No
ST-3	65	52.2	52.3	0.1	52.3	0.1	No	No
ST-4	65	64.7	64.8	0.1	64.8	0.1	No	No
ST-5	65	63.6	63.6	0	63.6	0	No	No
ST-6	65	58.8	58.8	0	58.8	0	No	No

Impact Determination

Impacts would be less than significant.

Mitigation Measures

No mitigation is necessary.

Residual Impacts

Impacts would be less than significant.

3.9.4.3.3 Summary of Impact Determinations

Table 3.9-10 summarizes the impact determinations of the proposed Project related to Noise, as described in the detailed discussion in Sections 3.9.4.3.1 and 3.9.4.3.2. Identified impacts may be based on federal, state, and City of Los Angeles significance criteria, LAHD criteria, and the scientific judgment of the report preparers.

For each type of potential impact, the table describes the impact, notes the impact determinations, describes any applicable mitigation measures, and notes the residual impacts (i.e., the impact remaining after mitigation). All impacts, whether significant or not, are included in this table.

Table 3.9-10. Summary Matrix of Potential Impacts and Mitigation Measures for Noise Associated with the Proposed Project

Environmental Impacts	*Impact Determination*	*Mitigation Measures*	*Impacts after Mitigation*
3.9 NOISE			
NOI-1: Construction of the proposed Project would last more than 1 day but would not exceed existing ambient exterior noise levels by 10 dBA or more at a noise-sensitive use; construction activities lasting more than 10 days in a 3-month period would not exceed existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use**.**	Significant	**MM NOI-1: Maintain Construction Equipment.** All construction equipment powered by internal combustion engines will be properly muffled and maintained. **MM NOI-2: Locate Equipment away from Noise-Sensitive Land Uses.** All stationary noise-generating construction equipment, such as air compressors and portable power generators, will be located as far as practical from existing noise-sensitive land uses. **MM NOI-3**: **Utilize Quiet Equipment.** Quiet construction equipment (such as pneumatic tools) will be utilized where practicable. Noise limits established in the City of Los Angeles Noise Ordinance will be fully complied with. **MM NOI-4: Notify Sensitive Receptors.** Cabrillo Way Marina liveaboards will be notified of the construction schedule in writing prior to the beginning of construction.	Significant and unavoidable
NOI-2: Construction activities would not exceed the ambient noise level by 5 dBA at a noise-sensitive use between the hours of 9 p.m. and 7 a.m. Monday through Friday, before 8 a.m. or after 6 p.m. on Saturday, or at any time on Sunday.	Less than significant	No mitigation is required.	Less than significant
NOI-3: The proposed Project would not expose persons to, or generate, excessive groundborne vibration or groundborne noise levels.	Less than significant	No mitigation is required.	Less than significant
NOI-4: Operations would not result in ambient noise level measured at the property line of affected uses increasing by 3 dBA in CNEL to or within the "normally unacceptable" or "clearly unacceptable category," or increasing in any way by 5 dBA or more.	Less than significant	No mitigation is required.	Less than significant

3.9.4.4 Mitigation Monitoring

Table 3.9-11. Mitigation Monitoring for Noise

Impact NOI-1: Construction of the proposed Project would last more than 1 day but would not exceed existing ambient exterior noise levels by 10 dBA or more at a noise-sensitive use; construction activities lasting more than 10 days in a 3-month period would not exceed existing ambient exterior noise levels by 5 dBA or more at a noise-sensitive use**.** Control measures are required as mitigation to reduce the noise levels to the greatest extent practicable.	
Mitigation Measure	**MM NOI-1: Maintain Construction Equipment**. **MM NOI-2: Locate Equipment away from Noise-Sensitive Land Uses**. **MM NOI-3**: **Utilize Quiet Equipment.** **MM NOI-4: Notify Sensitive Receptors**.
Timing	During Construction
Methodology	Confirm mitigation measures are in place during construction. Construction manager to send evidence to LAHD and LAHD will verify.
Responsible Parties	Construction Manager and LAHD
Residual Impacts	Significant and unavoidable

3.9.4.5 Significant Unavoidable Impacts

Construction noise related to the proposed Project would constitute a significant impact. Mitigation is proposed that would reduce construction related noise; however, even with mitigation, noise impacts on the closest sensitive receivers (approximately 900 feet from the proposed project site) would exceed the applicable noise standards. Thus, impacts on sensitive receptors resulting from construction would be significant and unavoidable. All other noise-related impacts would be less than significant.