CITY OF CARLSBAD
BEACH ACCESS REPAIR PROJECT

NOISE STUDY

Prepared for:

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Addendum

This document contains information and data from a study that was prepared for a prior version of the proposed Project. The data contained within remains relevant and applicable to the proposed Project; however, may contain information that is no longer representative of the proposed Project. Please reference the Initial Study Mitigated Negative Declaration document for any information pertinent to the proposed Project description.

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CARLSBAD BEACH ACCESS REPAIR PROJECT CARLSBAD, CALIFORNIA NOISE STUDY

This report is an analysis of the potential noise impacts associated with the proposed Beach Access Repair Project. This report has been prepared by Birdseye Planning Group (BPG) under contract to VCS Environmental, Inc., to support preparation of the environmental documentation pursuant to the California Environmental Quality Act (CEQA). This study analyzes the potential for temporary impacts associated with construction activity and long-term impacts associated with operation of the proposed project.

PROJECT DESCRIPTION

The Beach Access Repair Project will include structural repairs and beach access improvements to the existing reinforced concrete sidewalks, access stairways and seawall, most of which were constructed in the late 1980's. The project limits of work include approximately 3,200 feet of the sidewalk, stairways, coastal bluff, seawall and beach along Carlsbad Boulevard from Pine Avenue at the north end of the beach to Tamarack Avenue near the south end of the beach. Access to the beach along the bluff is via the upper sidewalk (at the top of bluff) and lower sidewalk (at the base of bluff), with a ramp down the bluff at each end of the beach and five (5) stairways connecting the two sidewalks. The project location is shown in Figure 1 and the limits of construction are shown in Figure 2.

Upper Sidewalk. The upper sidewalk is elevated on 18-inch diameter concrete piles for a distance of approximately 1,087 feet from roughly Pine Avenue to just south of Chestnut Avenue. The inside walking width of the upper sidewalk is typically 9'-3" between the existing metal beam guardrail and aluminum railing. The upper elevated sidewalk (including two overlooks) has deteriorated and will be completely replaced as well as extended 1.5 feet over the top of bluff to provide a wider walkway for pedestrians. Additionally, the width of the median along Carlsbad Boulevard between Pine Avenue and Walnut Avenue will be reduced by approximately 3 feet, and the bike lane striping realigned between Pine Avenue and Maple Avenue to allow for the upper sidewalk to be widened by up to 5 feet to further enhance pedestrian access. From Pine Avenue to Maple Avenue the aluminum railing will be replaced and the metal beam guardrail will also be replaced with heavy-duty traffic rated bollards to provide greater pedestrian safety along Carlsbad Boulevard. The upper sidewalk support foundation, consisting of 18" diameter x 25' deep concrete piles, will remain in place to be reused to support the new sidewalk.

Beach Access Stairways. The beach access stairways between the upper and lower sidewalks consist of one set of stairs on grade at the south end of the project near Tamarack Avenue, and

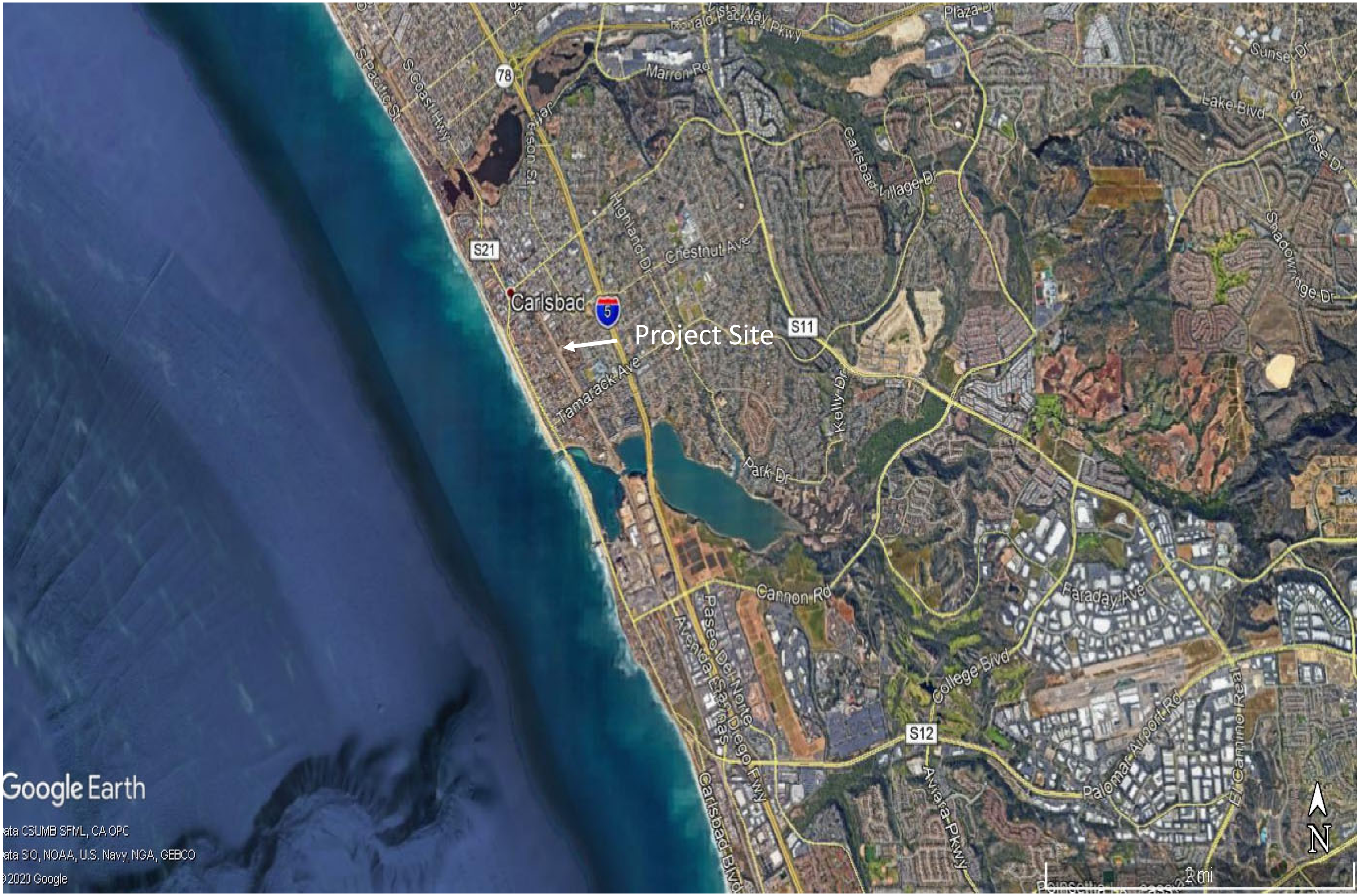

Figure 1—Regional Map

Figure 2—Project Site

four sets of elevated stairs supported on reinforced concrete platforms near the intersections of Sycamore Avenue, Maple Avenue, Cherry Avenue, and Hemlock Avenue. All of the stairways will be completely replaced, including railing, platforms and stair treads. The large 48-inch diameter reinforced concrete platform support piles will remain in place to be reused for supporting the new platforms of similar dimensions.

Lower Sidewalk and Seawall. The lower sidewalk is an approximately 4" thick concrete slab-on-grade along the base of the bluff between the seawall on the west side and the shorter retaining wall/curb on the east side of the sidewalk. Portions of the lower sidewalk, retaining wall/curb, and seawall require minor concrete repairs and sections of the short retaining wall against the slope will be extended to assist with preventing excessive buildup of dirt at the bottom of the access stairways.

Construction Overview

The Beach Access Repair Project will be constructed in two main phases to avoid the busy summer months between Memorial Day and Labor Day. Phased construction will also allow one southbound lane of traffic to remain open during the upper sidewalk widening improvements. During construction the southbound bike lane along Carlsbad Boulevard, from Pine Avenue to Maple Avenue, will need to be temporarily closed and bike traffic rerouted.

Phase 1 – Repair/Replace Upper Sidewalk, 2 Elevated Stairways and 1 Stairway on Grade. The first phase will occur in the fall/winter months (September thru January of 2021/2022) and involve repairing/replacing the upper sidewalk, replacing the Sycamore Avenue and Cherry Avenue stairway landings, and replacing the stairway at Tamarack Avenue. The upper sidewalk will also be widened and metal beam guardrail replaced with traffic bollards along Carlsbad Boulevard from Pine Avenue to Maple Avenue. During the Phase 1 construction, the westerly southbound lane of Carlsbad Boulevard (next to the bluff), from Pine Avenue to Maple Avenue will need to be temporarily shut down to accommodate construction of the upper sidewalk improvements.

Phase 2 – Repair Lower Sidewalk, Replace 2 Elevated Stairways and Modify Carlsbad Boulevard. The second phase of construction will occur in the winter/spring months (January thru May 2022) and involve repairing the lower sidewalk and seawall, replacing the Maple Avenue and Hemlock Avenue stairway landings and modifying the median and bike/travel lane striping along Carlsbad Boulevard from Pine Avenue to Maple Avenue. During Phase 2, the easterly southbound lane of Carlsbad Boulevard (next to the median), from Pine Avenue to Maple Avenue, will be temporarily shut down to accommodate construction of the median modifications.

Demolition, removal and construction of the upper sidewalk and two elevated stairways will require the use of a large crane, material handlers, and long reach excavators as well as other specialized equipment.

SETTING

Overview of Sound Measurement

Noise level (or volume) is generally measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound pressure levels to be consistent with that of human hearing response, which is most sensitive to frequencies around 4,000 Hertz (about the highest note on a piano) and less sensitive to low frequencies (below 100 Hertz).

Sound pressure level is measured on a logarithmic scale with the 0 dB level based on the lowest detectable sound pressure level that people can perceive (an audible sound that is not zero sound pressure level). Based on the logarithmic scale, a doubling of sound energy is equivalent to an increase of 3 dBA, and a sound that is 10 dBA less than the ambient sound level has no effect on ambient noise. Because of the nature of the human ear, a sound must be about 10 dBA greater than the reference sound to be judged as twice as loud. In general, a 3 dBA change in community noise levels is noticeable, while 1-2 dB changes generally are not perceived. Quiet suburban areas typically have noise levels in the range of 40-50 dBA, while arterial streets are in the 50-60+ dBA range. Normal conversational levels are in the 60-65 dBA range, and ambient noise levels greater than 65 dBA can interrupt conversations. Noise levels typically attenuate (or drop off) at a rate of 6 dBA per doubling of distance from point sources (i.e., industrial machinery). Noise from lightly traveled roads typically attenuates at a rate of about 4.5 dBA per doubling of distance. Noise from heavily traveled roads typically attenuates at about 3 dBA per doubling of distance. Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receptor and the noise source reduces the noise level by about 5 dBA, while a solid wall or berm reduces noise levels by 5 to 10 dBA. The manner in which older homes in California were constructed (approximately 30 years old or older) generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dBA with closed windows. The exterior-to-interior reduction of newer residential units and office buildings is generally 30 dBA or more (HMMH, 2006).

In addition to the actual instantaneous measurement of sound levels, the duration of sound is important since sounds that occur over a long period of time are more likely to be an annoyance or cause direct physical damage or environmental stress. One of the most frequently used noise metrics that considers both duration and sound power level is the equivalent noise level (Leq). The Leq is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). Typically, Leq is summed over a one-hour period. Lmax is the highest RMS (root mean squared) sound pressure level within the measuring period, and Lmin is the lowest RMS sound pressure level within the measuring period.

The time period in which noise occurs is also important since noise that occurs at night tends to be more disturbing than that which occurs during the day. Community noise is usually measured using Day-Night Average Level (Ldn), which is the 24-hour average noise level with a 10-dBA penalty for noise occurring during nighttime (10 p.m. to 7 a.m.) hours, or Community Noise Equivalent Level (CNEL), which is the 24-hour average noise level with a 5 dBA penalty for noise occurring from 7 p.m. to 10 p.m. and a 10 dBA penalty for noise occurring from 10 p.m. to 7 a.m. Noise levels described by Ldn and CNEL usually do not differ by more than 1 dB. Table 1 shows sounds levels of typical noise sources in Leq.

Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with each of these uses. The City of Carlsbad General Plan Noise Element Update (approved September 2015) includes a variety of land use and development types that are noise sensitive including residences, schools, churches, hospitals and convalescent care facilities. Sensitive receptors are located adjacent to the project site along the east side of Carlsbad Boulevard. Single- and multifamily residences as well as hotels are the dominant land use in proximity to the construction area.

Project Site Setting

The most common and primary sources of noise in the project site vicinity are motor vehicles (e.g., automobiles, buses, trucks, and motorcycles) along Carlsbad Boulevard. Motor vehicle can be a concern when it is characterized by a high number of individual events that can create a sustained noise level in proximity to noise sensitive uses. Interstate 5 is located approximately 3,400 feet to the east. It is inaudible over existing traffic and the ocean waves breaking on the beach.

The Atichson, Topeka and Santa Fe Railroad (AT&SF) rail corridor is located approximately 1,300 feet east of the site. This segment of the Los Angeles – San Diego – San Luis Obispo (LOSSAN) corridor is the second busiest passenger and freight rail corridor in the United States. According to the rail timetables, up to 50 trains (40 passenger and 10 freight trains) use the corridor segment daily between Oceanside and the Santa Fe Depot in downtown San Diego. The existing rail operations are not audible at the project site; however, the warning horns/bells at the Carlsbad Village Drive crossing are audible at the northern end of the project area. Train noise contributes negligibly to the ambient noise environment in the study area. McClellan-Palomar Airport is located approximately 4.0 miles southeast of the site. The site is outside the airport influence area; however, aircraft operations (airplanes and helicopters) are audible and

Table 1. Sound Levels of Typical Noise Sources and Noise Environments

Noise Source (at Given Distance)	**Noise Environment**	**A-Weighted Sound Level (Decibels)**	**Human Judgment of Noise Loudness (Relative to Reference Loudness of 70 Decibels*)**
Military Jet Takeoff with Afterburner (50 ft)	Carrier Flight Deck	140	128 times as loud
Civil Defense Siren (100 ft)		130	64 times as loud
Commercial Jet Take-off (200 ft)		120	32 times as loud **Threshold of Pain**
Pile Driver (50 ft)	Rock Music Concert Inside Subway Station (New York)	110	16 times as loud
Ambulance Siren (100 ft) Newspaper Press (5 ft) Gas Lawn Mower (3 ft)		100	8 times as loud **Very Loud**
Food Blender (3 ft) Propeller Plane Flyover (1,000 ft) Diesel Truck (150 ft)	Boiler Room Printing Press Plant	90	4 times as loud
Garbage Disposal (3 ft)	Noisy Urban Daytime	80	2 times as loud
Passenger Car, 65 mph (25 ft) Living Room Stereo (15 ft) Vacuum Cleaner (10 ft)	Commercial Areas	70	Reference Loudness **Moderately Loud**
Normal Speech (5 ft) Air Conditioning Unit (100 ft)	Data Processing Center Department Store	60	1/2 as loud
Light Traffic (100 ft)	Large Business Office Quiet Urban Daytime	50	1/4 as loud
Bird Calls (distant)	Quiet Urban Nighttime	40	1/8 as loud **Quiet**
Soft Whisper (5 ft)	Library and Bedroom at Night Quiet Rural Nighttime	30	1/16 as loud
	Broadcast and Recording Studio	20	1/32 as loud **Just Audible**
		0	1/64 as loud **Threshold of Hearing**

Source: Compiled by dBF Associates, Inc., 2016 contribute to existing noise levels in the project area. No other noise sources are near the project site.

The City of Carlsbad General Plan Update Noise Element (2015) provides noise contours associated with transportation corridors (i.e., roadways, railroad and airport). This provides a graphic illustration of sound levels near road corridors, but typically does not include effects of landforms and adjacent structures. Generally, barriers between a source and receiver absorb or reflect noise resulting in a quieter environment. Where barriers or landforms do not interrupt the noise transmission path from source to receiver, the contours prove to be reasonable estimates of typical noise levels from roadway traffic. In areas where barriers or landforms interrupt the sound transmission, the noise contours overestimate the extent to which a source intrudes into neighboring areas. The noise contour distances describe worst-case conditions because they do not account for any obstructions to the noise path, such as walls, berms, or buildings. As noted, railroad bell/horn noise is audible at the northern end of the project area when train pass-by events occur. The contours provided in the General Plan Update Noise Element provide a reasonable prediction of rail noise levels at the site. Noise contours show the residences located along the east side of Carlsbad Boulevard are within the 60-65 dBA CNEL contour interval.

To gather data on the general noise environment at the project site, two weekday 15-minute noise measurement were acquired at two locations along Carlsbad Boulevard in proximity to the project site on June 10, 2020 using an ANSI Type II integrating sound level meter. Site 1 is located in the park area at the intersection of Carlsbad Boulevard and Pine Avenue. Site 2 is located on the west side of the Carlsbad Boulevard and Juniper Avenue intersection. The predominant noise source in the area during monitoring was traffic; however, breaking ocean waves on the beach are audible and contribute to background levels along the corridor. Aircraft overflights and train pass by events did not contribute to ambient conditions during the monitoring period.

During monitoring, a total of 167 cars/light trucks, 6 medium trucks (two-axle, 6-wheels) and zero heavy trucks (6-axle, 18 wheels) passed monitoring Site 1. A total of 194 cars/light trucks, 4 medium trucks and zero heavy trucks passed monitoring Site 2 during the monitoring episode. Table 2 identifies the noise measurement location and measured noise levels. The monitoring location is shown in Figure 3. As shown, the measured Leq's were within 0.6 dBA which is consistent with the traffic conditions encountered during the monitoring episodes and the General Plan Noise Element contour referenced above. Monitoring data is provided in Appendix A.

Table 2
Noise Monitoring Results

Measurement Location	Primary Noise Source	Sample Time	Leq (dBA)
M1. Adjacent to the project site located at Carlsbad Boulevard and Pine Avenue (6/10/20)	Traffic	Weekday morning	63,5
M2. Adjacent to project site located at Carlsbad Boulevard and Juniper Avenue (6/10/20)	Traffic	Weekday morning	64.1

Source: Field visit using ANSI Type II Integrating sound level meter.

Regulatory Setting

In 1976, the California Department of Health, State Office of Noise Control published a recommended noise/land use compatibility matrix which many jurisdictions have adopted as a standard in their general plan noise elements. This matrix indicates that residential land uses and other noise sensitive receptors preferentially should be located in areas where outdoor ambient noise levels do not exceed 65 to 70 dBA (CNEL or Ldn).

Municipal Code and Noise Guideline Manual

The City of Carlsbad has established noise guidelines in the Noise Element of the City's General Plan (City of Carlsbad, 2015) that are applicable for transportation noise sources. The noise guidelines identify compatible exterior noise levels for various land use types. Residential land uses are considered normally acceptable up to 60 dB CNEL. Commercial land uses are considered normally acceptable up to 65 dB CNEL and conditionally acceptable up to 75 dB.

The City of Carlsbad Municipal Code regulates construction noise by limiting the hours of operation (City of Carlsbad 2003). Construction activities are allowed to occur Monday through Friday between the hours of 7 a.m. to sunset; and on Saturdays from 8 a.m. to sunset, excluding legal holidays. The City does not have quantitative noise level limits (i.e., based on sound levels) for general nuisance noise such as that associated with stationary equipment located on private property.

For the purpose of this study, construction noise is quantified to evaluate potential noise impacts for CEQA review purposes. The project will not generate traffic nor will the ambient environment change with construction of the improvements. The residential standard of 60 dB CNEL is used to evaluate current compliance with existing noise standards. An interior noise standard of 45 dBA CNEL is used herein as referenced in the City of Carlsbad Noise Guidelines Manual (1995).

Figure 3—Monitoring Locations

Vibration Standards

Vibration is a unique form of noise as the energy is transmitted through buildings, structures and the ground whereas audible noise energy is transmitted through the air. Thus, vibration is generally felt rather than heard. The ground motion caused by vibration is measured as particle velocity in inches per second (PPV inches/second) and referenced as vibration decibels (VdB). The vibration velocity level threshold of perception for humans is approximately 65 VdB (PPV 0.04 inches/second). A vibration velocity of 75 VdB (PPV 0.25 inches/second) is the approximate dividing line between barely perceptible and distinctly perceptible levels.

City policies do not address construction-related vibration. The Federal Transit Administration's (FTA) *Transit Noise and Vibration Impact Assessment Manual* (September 2018) and California Department of Transportation (Caltrans), *Transportation and Construction Vibration Guidance Manual* (September 2013) uses the same thresholds but different descriptors for the purpose of determining vibration impacts. FTA uses VdB while Caltrans uses PPV. A threshold of 65 VdB (PPV 0.04) is used for buildings where low ambient vibration is essential for interior operations. These buildings include hospitals and recording studios. A threshold of 72 VdB (PPV 0.25) is used for residences and buildings where people normally sleep (i.e., hotels and rest homes); and thus, is the threshold used for the purpose of determining vibration impacts associated with construction of the proposed project.

Construction activities such as blasting, pile driving, demolition, excavation or drilling have the potential to generate ground vibrations near structures. With respect to ground-borne vibration impacts on structures, the FTA states that ground-borne vibration levels in excess of 100 VdB would damage fragile buildings and levels in excess of 95 VdB would damage extremely fragile historic buildings. No historic buildings are known to occur near the site; thus, 100 VdB is used to quantify potential vibration impacts to neighboring structures. Construction activities referenced above that would generate significant vibration levels are not proposed. However, to provide information for use in completing the CEQA evaluation, construction-related vibration impacts are evaluated using the above referenced criteria.

IMPACT ANALYSIS

Methodology and Significance Thresholds

Construction noise estimates are based upon noise levels reported by the Federal Transit Administration, Office of Planning and Environment, and the distance to nearby sensitive receptors. Reference noise levels from that document were used to estimate noise levels at nearby sensitive receptors based on a standard noise attenuation rate of 6 dB per doubling of distance (line-of-sight method of sound attenuation).

The site is currently a sidewalk with various public access features adjacent to and along the west side of Carlsbad Boulevard. As referenced, the project is not expected to generate additional traffic or other noise sources; thus, the impact discussion will focus on construction noise. The operational noise discussion will address existing compliance with exterior and interior noise standards for residential/hotel uses. As discussed, existing noise levels at the monitoring site exceed 60 dBA.

Temporary Construction Noise

The primary source of noise during construction activities would be heavy machinery used during demolition, removal of existing components such as the stair components and installation of the improvements including concrete and prefabricated stair assemblies. The equipment expected to be used on the site is listed below. For modeling purposes, use of the following equipment was assumed:

- Excavator, 158 horsepower at 0.38 load factor;
- Crane, 231 horsepower at 0.29 load factor;
- Off-Highway Truck, 402 horsepower at 0.38 load factor;
- Fork-Lift, 89 horsepower, 0.2 load factor;
- Generator Set, 84 horsepower, 0.74 load factor;
- Tractor/Loader/Backhoe, 97 horsepower, 0.37 horsepower; and
- Welder, 46 horsepower, 0.45 load factor.

Table 3 shows typical noise levels associated with heavy construction equipment. As shown, average noise levels associated with the use of heavy equipment at construction sites can range from 71 to 95 dBA at 25 feet from the source, depending upon the types of equipment in operation at any given time and phase of construction (Hanson, Towers, and Meister, May 2006).

As noted, adjacent properties are residential/hotel uses and construction noise will be audible at properties in proximity to the site. Table 4 shows typical maximum construction noise levels at various distances from construction activity, based on a standard noise attenuation rate of 6 dBA per doubling of distance. These levels assume use of the noisiest equipment referenced in Table 3 (i.e., crane, excavator, loader) that would be used for an extended period of time. If all three pieces of equipment were used at the same time in the same location, noise levels at 25 feet could reach 96 dBA and 90 dBA at 50 feet. Based on empirical data obtained from noise studies addressing construction sites, the worst-case hourly construction noise level was found to be 80.8 dBA Leq at an average distance of 25 feet (Ldn Consulting 2016). The daily 12-hour average was measured to be 76 dBA at a distance of 25 feet. This results from periodic rather than constant use of equipment. Assuming a reference level of 76 dBA at 25 feet and a 6 dBA

Table 3
Typical Construction Equipment Noise Levels

Equipment Onsite	Typical Level (dBA) 25 Feet from the Source	Typical Level (dBA) 50 Feet from the Source	Typical Level (dBA) 100 Feet from the Source
Air Compressor	84	78	64
Crane	91	85	79
Backhoe	84	78	64
Bobcat Tractor	84	78	64
Concrete Mixer	85	79	73
Bulldozer	88	82	76
Jack Hammer	95	89	83
Pavement Roller	86	80	74
Excavator	91	85	79
Street Sweeper	88	82	76
Man Lift	81	75	69
Dump Truck	82	76	70
Generator Set	88	82	76
Grader	91	85	79
Paver	95	89	83
Loader	91	85	79
Welder	79	73	67

Source: Hanson, Towers and Meister, May 2006
Noise levels based on FHWA Roadway Construction Noise Handbook Table 9.1, August 2017.
Noise levels based on FHWA Roadway Construction Noise Model (2006) Users Guide Table 1.
Noise levels based on actual maximum measured noise levels at 50 feet (Lmax).
Noise levels assume a noise attenuation rate of 6 dBA per doubling of distance.

decrease per doubling of distance, the average noise level associated with the project, over a 12-hour period would be approximately 70 dBA at 50 feet.

Construction noise levels at residences and hotels along the east side of Carlsbad Boulevard could be as high as 90 dBA for short intervals and a sustained level of 70 dBA over the course of a typical day. Temporary construction noise is not restricted if it occurs between the hours specified in the noise ordinance referenced herein.

Table 4
Typical Maximum Construction Noise Levels at Various Distances from Project Construction

Distance from Construction	Maximum Noise Level at Receptor (dBA)
25 feet	91
50 feet	85
100 feet	79
250 feet	73
500 feet	66
1,000 feet	60

Construction Noise Reduction Measures

While, no significant construction noise impacts would occur, construction activities would include the following best management practices to minimize nuisance noise to the extent possible.

Construction Equipment. Electrical power shall be used to run air compressors and similar power tools where feasible. Internal combustion engines should be equipped with a muffler of a type recommended by the manufacturer and in good repair. All diesel equipment should be operated with closed engine doors and should be equipped with factory-recommended mufflers. Construction equipment that continues to generate substantial noise at the project boundaries should be shielded with temporary noise barriers, such as barriers that meet a sound transmission class (STC) rating of 25, sound absorptive panels, or sound blankets on individual pieces of construction equipment. Stationary noise-generating equipment, such as generators and compressors, should be located as far as practically possible from the nearest residential property lines.

Neighbor Notification. Provide notification to residential occupants adjacent to the project site at least 24 hours prior to initiation of construction activities that could result in substantial noise levels at outdoor or indoor living areas. This notification should include the anticipated hours and duration of construction and a description of noise reduction measures being implemented at the project site. The notification should include a telephone number for local residents to call to submit complaints associated with construction noise.

Noise Control Plan. Construction contractors shall develop and implement a noise control plan that includes a noise control monitoring program to ensure sustained construction noise levels do not exceed 75 decibels over a 12-hour period at the nearest sensitive receivers. The plan may include the following requirements:

- Contractor shall turn off idling equipment while not being used for operations after idling for five minutes.
- Contractor shall perform noisier operation during the times least sensitive to receptors.
- All diesel equipment shall be operated with closed engine doors and shall be equipped with factory- recommended mufflers.
- Electrical power shall be used to run air compressors and similar power tools and to power any temporary structures, such as construction trailers or security staff facilities, where practical.

Temporary Construction-Related Vibration

Use of the proposed improvements will not generate vibration. Thus, this discussion will focus on temporary vibration caused by construction. The highest vibration levels are typically associated with large-scale grading, excavation and impact construction methods such as pile driving. Construction of the proposed improvements would not require this level of ground disturbance or otherwise require impact construction methods. Based on the information presented in Table 5, the highest vibration levels could reach 86 VdB while loaded trucks used to remove demolition debris or deliver heavy components are operating in the area. The nearest sensitive properties are located approximately 70 feet east of the construction area across Carlsbad Boulevard, a four-lane roadway. Vibration levels would attenuate to 76 dBA at 75 feet, the approximate distance to the nearest sensitive properties.

As discussed, 100 VdB is the threshold where minor damage can occur in fragile buildings. Vibration levels are projected to be under this threshold; thus, structural damage is not expected to occur as a result of construction activities associated with the proposed project. While vibration levels at residential buildings adjacent to the project site may exceed the groundborne velocity threshold level of 72 VdB for residences and/or buildings where people sleep as discussed above, it is unlikely that vibration associated with truck operation would be perceptible over existing traffic volumes on Carlsbad Boulevard. Further, provided construction occurs within the prescribed hours, any temporary impact would be considered adverse, but **less than significant.**

Table 5
Vibration Source Levels for Construction Equipment

Equipment	Approximate VdB				
	25 Feet	**50 Feet**	**60 Feet**	**75 Feet**	**100 Feet**
Large Bulldozer	87	81	79	77	75
Loaded Trucks	86	80	78	76	74
Jackhammer	79	73	71	69	67
Small Bulldozer	58	52	50	48	46

Source: Federal Railroad Administration, 1998

Long-Term Operational Noise Exposure

Exterior Traffic Noise. Traffic is the primary noise source in the project area. As referenced, traffic noise currently exceeds the 60-dBA standard for residential properties and other sensitive uses. The project would not generate traffic; thus, no impact with respect to exterior traffic noise would occur.

Interior Traffic Noise. As referenced, the project would not generate traffic or otherwise increase noise levels post-construction. Existing residences appear to have been constructed using modern techniques and materials. Assuming the buildings were designed and constructed to meet or exceed California Energy Code Title 24 standards, the construction methods and materials likely result in a 25 to 30 dBA reduction in exterior noise levels (assuming windows are closed). When windows are open the insertion loss drops to about 10 dBA. Assuming windows are closed, interior noise levels associated with traffic operations would be reduced from 64.1 (baseline) to 34.1 dBA. Thus, while existing exterior noise levels exceed the 60-dBA standard, the 45-dBA interior standard would be met.

References

City of Carlsbad. General Plan Update Noise Element. 2015.

City of Carlsbad. Noise Guidelines Manual. September 1995.

dBF & Associates, Inc., Reference Noise Level Compilation Table, 2016.

Federal Highway Administration. *Roadway Construction Noise Model. 2006.* Users Guide Table 1.

Federal Highway Administration. Construction Noise Handbook, Table 9.1, August 2017.

Federal Transit Administration. *Transit Noise and Vibration Impact Assessment*. September 2018.

Federal Rail Administration (FRA) Guidelines (Report Number 293630-1), December 1998.

Hanson, Carl E., Towers, David A., and Meister, Lance D. (2006, May). *Transit Noise and Vibration Impact Assessment.* Federal Transit Administration, Office of Planning and Environment. http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf

Harris Miller Miller & Hanson Inc. T*ransit Noise and Vibration Impact Assessment, Final Report*. May 2006.

United States Environmental Protection Agency. *Federal Noise Control Act of 1972, 42 U.S.C. §4901 et seq.*, 1972

United States Department of Housing and Urban Development. *Noise Control Guidebook*, 2009.

Appendix A

Monitoring Data Sheet

FIELD NOISE MEASUREMENT DATA

Project Name: Carlsbad Sea Wall   Page 1 of
Project #:   Day / Date   My Name.

Sound Level Meter	Calibrator	Weather Meter
Model #: Piccolo II	Model #	Model # Serial #
Serial #	Serial #	
Weighting: (A) / C / Flat	Pre-Test: ____ dBA SPL	Terrain: (Hard) / Soft / Mixed
Response: (Slow) / Fast / Impl	Post-Test: ____ dBA SPL	Topo: (Flat) / Hilly (describe)
Windscreen: (Yes) / No		Wind: (Steady) / Gusty

ID	Time Start	Time Stop	Leq	Lmin	Lmax	L10	L50	L90	Wind Spd/ Dir (mph)	Temp (°F)	RH (%)	Bar Psr (in Hg)	Cloud Cover (%)
1	7:40	7:55	63.5	57.3	75.7	65.6	61.2	59.2	0	75			0%
2	8:15	8:30	64.1	59.8	67.8	65.6	64.0	61.5	0	75			

Location(s) / GPS Reading(s):

Roadway Name	Carlsbad Boulevard	Juniper
Speed (post/obs)	30	30
Number of Lanes	4	4
Width (pave/row)	48	2
1- or 2- way	2	2
Grade	0%	1-2%
Bus Stops	no	
Stoplights	yes	no
Street Parking	yes	yes
Automobiles	967	194
Medium Trucks	6	4
Heavy Trucks	0	0

Other Noise Sources: distant (aircraft) / (roadway traffic) / trains / landscaping / rustling leaves / children playing / dogs barking / birds vocalizing

Notes and Sketches on Reverse

Site 1 - Carlsbad Blvd/Pine Avenue

Start Date	6/10/2020
Start Time	7:35:28 AM
End Time	7:50:27 AM
Duration	00:14:59
Meas Mode	Single
Input Range	Low
Input Type	Mic
SPL Time Weight	Slow
LN% Freq Weight	dBA
Overload	No
UnderRange	No
Sensitivity	18.44mV/Pa

LZeq	73.8
LCeq	72.7
LAeq	63.5
LZSmax	88.8
LCSmax	88.4
LASmax	75.7
LZSmin	67.6
LCSmin	65.7
LASmin	57.3
LZE	103.3
LCE	102.2
LAE	93.0
LZpeak	100.3
LCpeak	100.5
LApeak	92.5
1%	72.8
2%	70.8
5%	67.4
8%	66.5
10%	65.9
25%	63.5
50%	61.2
90%	59.2
95%	58.7
99%	58.0

Site 2 - Carlsbad Blvd/Juniper Avenue

Start Date	6/10/2020
Start Time	8:11:28 AM
End Time	8:26:27 AM
Duration	00:14:59
Meas Mode	Single
Input Range	Low
Input Type	Mic
SPL Time Weight	Slow
LN% Freq Weight	dBA
Overload	No
UnderRange	No
Sensitivity	18.44mV/Pa

LZeq	72.4
LCeq	70.8
LAeq	64.1
LZSmax	79.6
LCSmax	78.3
LASmax	67.8
LZSmin	67.8
LCSmin	65.9
LASmin	59.8
LZE	101.9
LCE	100.3
LAE	93.6
LZpeak	94.8
LCpeak	92.1
LApeak	87.9
1%	66.9
2%	66.7
5%	66.1
8%	65.7
10%	65.6
25%	64.8
50%	64.0
90%	61.9
95%	61.3
99%	60.6