3.4 Noise

3.4.1 Overview

This section describes the existing noise and vibration conditions and applicable laws and regulations associated with noise and vibration, as well as an analysis of the potential effects resulting from implementation of the proposed project. Information contained in this section is summarized from the *Noise and Vibration Technical Memorandum* (Appendix D).

3.4.2 Environmental Setting

Acoustic Terminology

Noise is generally defined as unwanted sound. To account for the large pressure response range of the human ear, noise levels are presented on a logarithmic scale expressed in units of decibels (dB). The human ear does not perceive every frequency with equal loudness; therefore, sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system, known as an A-weighted decibel (dBA). An inherent property of the logarithmic dB scale is that the sound pressure levels of two separate sources are not directly additive. For example, if a sound of 50 dBA is added to another sound of 50 dBA in the proximity, the result is a 3-dB increase (or 53 dBA), not an arithmetic doubling to 100 dBA. Additional noise metrics are defined below.

- **L_{eq}**: The energy averaged, A-weighted sound level over a specified time period, also conventionally expressed as dBA.
- **L_{max}**: The maximum A-weighted sound level as determined during a specified measurement period.
- **L_{dn}**: The L_{dn} is the average hourly A-weighted L_{eq} for a 24-hour period with a 10-dB penalty added to sound levels occurring during the evening hours (7:00 p.m. to 10:00 p.m.) to account for individuals' increased sensitivity to noise levels during nighttime hours.
- **Community noise equivalent level (CNEL)**: CNEL is another average A-weighted L_{eq} sound level measured over a 24-hour period, adjusted to account for some individuals' increased sensitivity to noise levels during the evening and nighttime hours; adding 5 dB to sound levels occurring during evening hours (7:00 p.m. to 10:00 p.m.) and 10 dB to noise levels occurring during nighttime hours (10:00 p.m. to 7:00 a.m.).

The human ear perceives changes in sound pressure levels relative to changes in "loudness." Scientific research demonstrates the following general relationships between sound level and human perception for two sound levels with the same, or very similar, frequency characteristics:

- 1 dBA is the practical limit of accuracy for sound measurement systems and corresponds to an approximate 10-percent variation in the sound pressure level. A 1-dBA increase or decrease is a non-perceptible change in sound.
- A 3-dBA increase or decrease is a doubling (or halving) of acoustic pressure level, and it corresponds to the threshold of change in loudness perceptible in a laboratory environment. In practice, the average person is not able to distinguish a 3-dBA difference in environmental sound outdoors.

- A 5-dBA increase or decrease is described as a perceptible change in sound level and is a discernible change in an outdoor environment.
- A 10-dBA increase or decrease is a tenfold increase or decrease in acoustic pressure level but is perceived as a doubling or halving in loudness (i.e., the average person would judge a 10-dBA change in sound level to be twice or half as loud).

A dBA increase or decrease is a doubling (or halving) of a sound pressure level, and it corresponds to the threshold of change in loudness perceptible in a laboratory environment. In practice, the average person is not able to distinguish a 3-dBA difference in environmental sound outdoors.

Vibration Terminology

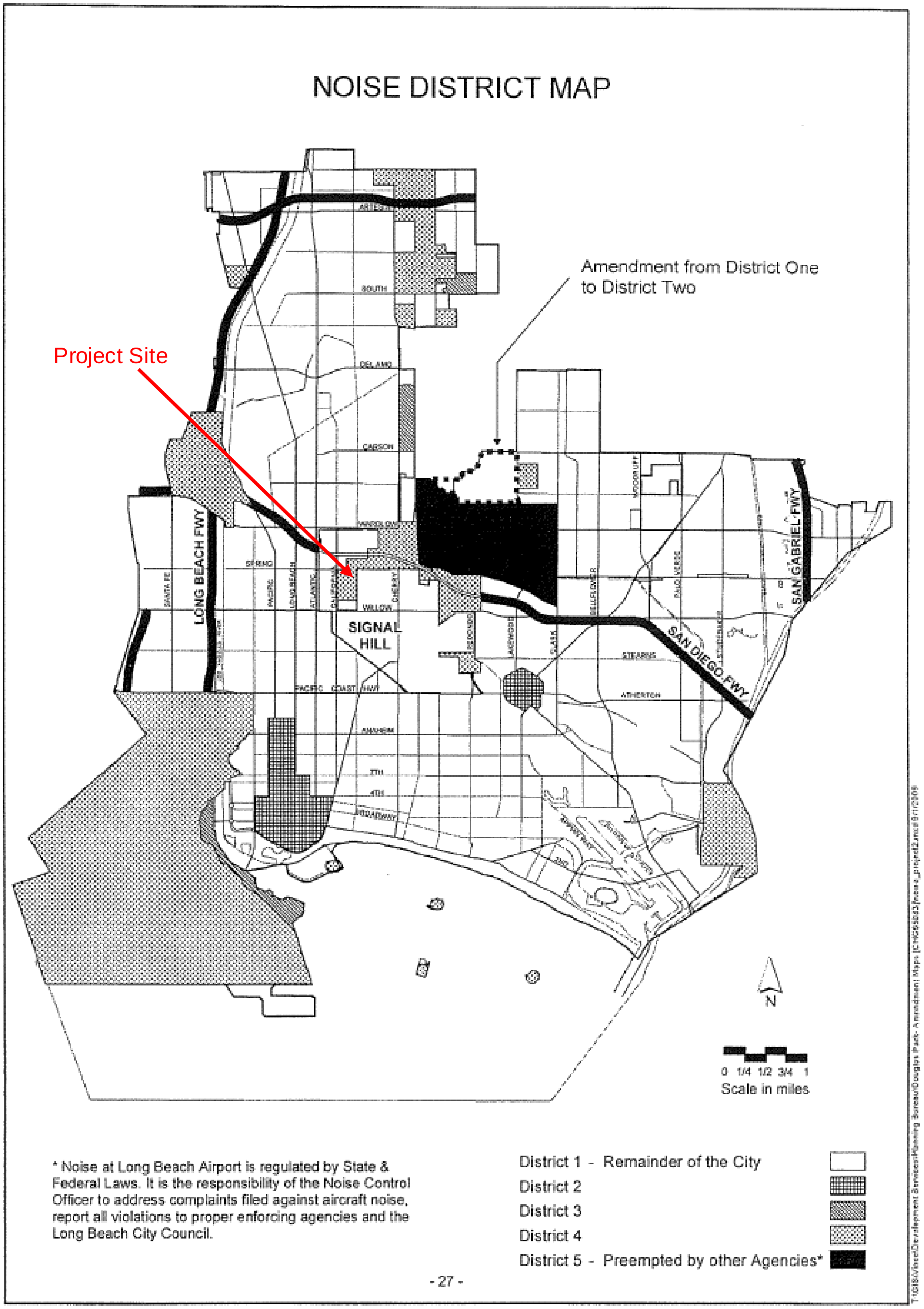
According to the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018), construction activities can be a source of ground-borne vibration. Activities such as pile driving and operation of heavy equipment may cause ground-borne vibration during project construction. Vibration is an oscillatory motion that can be described in terms of the displacement, velocity, or acceleration (FTA 2018). Velocity or acceleration is typically used to describe vibration. Two descriptors are frequently used when discussing quantification of vibration, the peak particle velocity (PPV) and the root mean square (RMS):

- ***PPV:*** PPV is the maximum instantaneous positive or negative peak of the vibration signal (FTA 2018). The potential for damage to buildings due to construction-related vibration is evaluated using PPV.
- ***RMS:*** RMS is the square root of the average of the squared amplitude of the vibration signal, typically calculated over a 1-second period (FTA 2018). The potential to annoy humans due to construction-related vibration is evaluated using RMS.

Existing Noise Environment

The project is located within the City of Long Beach's Noise District 4 (Figure 3.4-1); however, the city's noise standards are based on the noise district of the receiving source and not the project site. Immediately north, south, and west of the project site are also District 4. Across Orange Avenue to the east is the City of Signal Hill. The nearest sensitive receptor is Calvary Chapel – Signal Hill church, located approximately 150 feet east of the project site across Orange Avenue in the City of Signal Hill, is the only sensitive receptor within 0.25 mile. The closest residences to the project site are the homes located 1,200 feet north across I-405. For purposes of this analysis, Calvary Chapel – Signal Hill is considered District 1, even though the church is not in a noise district specified by the City of Long Beach. This is because the project site is within the City of Long Beach and subject to the City of Long Beach regulations and the City of Signal Hill regulations are not applicable.

Figure 3.4-1. City of Long Beach Noise District Map



Source: City of Long Beach 2019b

Sensitive Land Uses

Certain land uses are considered more sensitive to noise than others. Examples of these types of land uses include residential areas, educational facilities, hospitals, childcare facilities, and senior housing. The project site is located in an urban area. The majority of the land uses in the project area are commercial and industrial in nature. The Calvary Chapel – Signal Hill church is located approximately 150 feet east of the project site across Orange Avenue and is the nearest noise sensitive land use. The closest residences to the project site are the homes located 1,200 feet north, across I-405.

Existing Traffic Noise Levels

The primary existing noise sources in the project area is traffic on the local roadways. Traffic on Spring Street and Orange Avenue is the dominant source contributing to area ambient noise levels. Noise from motor vehicles is generated by engine vibrations, the interaction between the tires and the road, and the exhaust system. The Federal Highway Administration (FHWA) highway traffic noise prediction model (FHWA RD-77-108) was used to evaluate highway traffic-related noise conditions along the roadway segments in the project vicinity. Existing traffic volumes included in the traffic study prepared for the project (Appendix E) were used to assess the existing traffic noise levels. A typical vehicle mix for Southern California was used. These noise levels represent the worst case scenario, which assumes that no shielding is provided between traffic and the location where the noise contours are drawn. Table 3.4-1 summarizes the existing traffic volumes within the project area.

Table 3.4-1. Existing Traffic Volumes

Roadway Segment	Average Daily Traffic	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane
Spring Street between California Avenue and Orange Avenue	20,695	<50	146.2	462.4	67.9
Spring Street between Orange Avenue and Walnut Avenue	20,940	<50	147.9	467.8	68.0
Orange Avenue between I-405 and Spring Street	17,175	<50	87.5	276.7	65.7
Orange Avenue between Spring Street and 29th Street	13,655	<50	96.5	305.1	66.1
Orange Avenue between 29th Street and Willow Street	13,485	<50	95.3	301.3	66.1
29th Street east of Orange Avenue	680	<50	<50	<50	52.9

Notes:
CNEL=community noise equivalent level; dBA=A-weighted decibels; I-405=Interstate 405

3.4.3 Regulatory Framework

This section provides an overview of state and local regulations related to noise issues applicable to the project.

State

California Department of Health Services

In 1976, the California Department of Health Services published guidelines for the noise element of local general plans (Governor's Office of Planning and Research 2017). These guidelines include a noise level/land use compatibility chart that categorizes various outdoor L_{dn} ranges for up to four compatibility categories (normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable), depending on land use.

These normally and conditionally acceptable L_{dn} ranges are intended to indicate that local conditions (existing noise levels and community attitudes toward dominant noise sources) should be considered in evaluating land use compatibility at specific locations. These guidelines are used by many agencies, environmental planners, and acoustical specialists as a starting point to evaluate the potential for noise impact on, and by, a project. The guidelines are also employed to evaluate methods for achieving noise compatibility with respect to nearby existing uses. Table 3.4-2 summarizes these guidelines for the normally and conditionally acceptable L_{dn} exposures.

Table 3.4-2. California Department of Health Services Noise Guidelines

Land Use Category	Community Noise Exposure (L_{dn} or CNEL, dBA)	
	Normally Acceptable	Conditionally Acceptable
Residential – Low Density	50 - 60	60 - 70
Residential – High Density	50 - 65	65 - 70
Transient Lodging – Motels, Hotels	50 - 65	65 – 70
Schools, Libraries, Churches, Hospitals, Nursing Homes	50 – 60	60 - 65
Auditoriums, Concert Halls, Amphitheaters	—	50 - 70
Sports Arenas, Outdoor Spectator Sports	—	50 - 75
Playgrounds, Neighborhood Parks	50 – 67.5	—
Golf Courses, Riding Stables, Water Recreation, Cemeteries	50 - 70	—
Office Buildings, Business Commercial and Professional	50 – 67.5	67.5 – 77.5
Industrial, Manufacturing, Utilities, Agriculture	50 - 70	70 - 80

Notes:
CNEL=community noise equivalent level; dBA=A-weighted decibel; L_{dn}=average hourly noise level

Local

City of Long Beach General Plan

The City of Long Beach adopted its own noise standards goals and policies in their *General Plan Noise Element* (City of Long Beach 1975a). Table 3.4-3 provides a summary of the recommended criteria for maximum acceptable noise levels for each major land use type.

Table 3.4-3. Recommended Criteria for Maximum Acceptable Noise Levels (A-weighted Decibels)

Major Land Use Type	Outdoor			Indoor
	Maximum Single Hourly Peak	L_{10}	L_{50}	L_{dn}
Residential (7:00 a.m. to 10:00 p.m.)	70	55	45	45
Residential (10:00 p.m. to 7:00 a.m.)	60	45	35	35
Commercial (anytime)	75	65	55	—
Industrial (anytime)	85	70	60	—

Notes:
L_{10}=noise level exceeded 10 percent of the time during a stated period; L_{50}=median noise level; L_{dn}=average hourly noise level

The City of Long Beach has published a public review draft for the new Noise Element for the General Plan (City of Long Beach 2019c). While this plan has not yet been adopted, the new Noise Element provides similar goals and policies, which require compliance with the LBMC and applicable regulations and ordinances.

City of Long Beach Municipal Code

The LBMC establishes exterior (Section 8.80.150) and interior noise (Section 8.80.170) limits by receiving land use. Table 3.4-4 and Table 3.4-5 summarize those noise limits. The LBMC Section 8.80.202 also restricts construction activities to weekdays between 7:00 a.m. and 7:00 p.m. and Saturdays between 9:00 a.m. and 6:00 p.m., except for emergency work. Construction work on Sundays is prohibited unless the City of Long Beach's Noise Control Officer issues a permit. The permit may allow work on Sundays between 9:00 a.m. and 6:00 p.m. LBMC Section 8.80.200(E) states that loading, unloading, opening, closing, or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects between 10:00 p.m. and 7:00 a.m. is restricted to the noise level provisions of exterior noise limits, shown in Table 3.4-4 and Table 3.4-5.

Table 3.4-4. Exterior Noise Limits

Receiving Land Use District	Time Period	Noise Level (dBA)	L_{max} (dBA)
District One	Night (10:00 p.m. to 7:00 a.m.)	45	65
	Day (7:00 a.m. to 10:00 p.m.)	50	70
District Two	Night (10:00 p.m. to 7:00 a.m.)	55	75
	Day (7:00 a.m. to 10:00 p.m.)	60	80
District Three	Any time	65	85
District Four	Any time	70	90
District Five	Regulated by other agencies and laws		

Notes:

District One – Predominantly residential with other land use types also present

District Two – Predominantly commercial with other land use types also present

District Three and Four – Predominantly industrial with other land use types also present. Limits are intended primarily for use at their boundaries rather for noise control within those districts

District Five – Airports, freeways, and waterways regulated by other agencies

dBA=A-weighted decibel; L_{max}=maximum A-weighted sound level

Table 3.4-5. Interior Noise Limits

Receiving Land Use District	Type of Land Use	Time Interval	Allowable Interior Noise Level (dBA)
All	Residential	10:00 p.m. to 7:00 a.m. 7:00 a.m. to 10:00 p.m.	35 45
All	School	7:00 a.m. to 10:00 p.m. (while school is in session)	45
Hospital, designated quiet zones, and noise sensitive zones	—	Any time	40

Notes:

dBA=A-weighted decibel

3.4.4 Analysis of Impacts

Methodology

The region of interest for noise and vibration issues is typically localized. Vibration from the project would only result during construction. Construction activities would take place only during daytime hours. An evaluation was performed of anticipated noise and vibration levels compared to regulatory requirements. Noise and vibration levels were estimated using existing conditions information, project construction details, and project operations information, as well as the Roadway Construction Noise Model (Version 1.1) and FHWA highway traffic noise prediction model (FHWA RD-77-108). The project is divided into five phases of construction (consistent with the CalEEMod for the air quality emission estimates provided in Section 3.1, Air Quality, of this EIR).

1. Site preparation
2. Grading
3. Building construction
4. Paving
5. Architectural coating

Noise

Noise generated by the project would consist of (1) short duration noise resulting from construction activities and (2) long-term noise from on-site stationary sources and off-site traffic noise from vehicles operated by employees using the proposed industrial buildings. As discussed above, the nearest sensitive receptor to the project site is considered District 1; therefore, according to Table 3.4-4, exterior noise impacts would be considered significant at 70 dBA. An increase of 3 dBA is considered to be a significant off-site traffic noise impact requiring mitigation. The city has not established an exterior CNEL noise standard for office uses. Therefore, for the purposes of this analysis, a significant on-site noise impact (assumed to be generated from project-related traffic) would occur if the interior noise exceeds 45 dBA CNEL.

Vibration

Ground-borne noise is the vibration of floors and walls that may cause rattling of items such as windows or dishes on shelves, or a rumbling noise. The rumbling is created by the motion of the room surfaces, which act like a giant loudspeaker. FTA provides criteria for acceptable levels of ground-borne vibration based on the relative perception of a vibration event for vibration sensitive land uses.

FTA provides criteria for acceptable levels of ground-borne vibration based on the relative perception of a vibration event for vibration-sensitive land uses (Table 3.4-6).

Table 3.4-6. Ground-borne Vibration and Noise Impact Criteria - Human Annoyance

Land Use Category	Max Lv (VdB)[1]	Description
Workshop	90	Distinctly felt vibration. Appropriate to workshops and non-sensitive areas.
Office	84	Felt vibration. Appropriate to offices and non-sensitive areas.
Residential – daytime	78	Barely felt vibration. Adequate for computer equipment.
Residential – nighttime	72	Vibration not felt, but ground-borne noise may be audible inside quiet rooms.

Notes:
[1] As measured in 1/3-octave bands of frequency over the frequency ranges of 8 to 80 Hertz
Lv=vibration level; VdB=velocity in decibels

The level at which ground-borne vibration is strong enough to cause structural damage has not been determined conclusively. The most conservative estimates are reflected in the FTA standards, shown in Table 3.4-7. According to Caltrans' *Transportation Related Earthborne Vibration* (Caltrans 2002a), extreme care must be taken when sustained pile driving occurs within 25 feet of any building; the threshold at which there is a risk of architectural damage to normal houses with plastered walls and ceilings is 0.2 inch per second.

Table 3.4-7. Ground-borne Vibration and Noise Impact Criteria - Structural Damage

Building Category	PPV (in/sec)[1]	VdB
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
II. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Notes:
[1] Root Mean Square velocity calculated from vibration level (VdB) using the reference of one microinch/second
PPV=peak particle velocity; VdB=velocity in decibels

Ground-borne vibrations generally attenuate rapidly with increasing distance from the vibration source. The distances involved depend primarily on the intensity of the vibrations generated by the source, as well as soil and geologic conditions. Detectable vibrations will travel the greatest distance through solid rock and the least distance through loose, unconsolidated soils or saturated soils. For vibration sources such as construction activity and vehicle traffic, the region of influence is typically less than 1,000 feet from the vibration source.

Thresholds of Significance

Based on CEQA Guidelines Appendix G, project impacts related to noise and vibration are considered significant if any of the following occur:

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies

b) Generation of excessive ground-borne vibration or ground-borne noise levels

c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels

As discussed in the IS (Appendix A), criterion (c) would result in a less than significant impact and therefore is not included in the analysis below.

Impact Analysis

Threshold (a) ***Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.***

Noise generated by the project would consist of (1) short duration noise resulting from construction activities and (2) long-term noise from on-site stationary sources and off-site traffic noise from vehicles operated by employees using the proposed industrial buildings. Airborne noise dissipates with increasing distance from the noise source.

Construction

Construction noise, although temporary, can potentially affect nearby sensitive receptors, such as residences closest to the project site. Project construction would require the use of heavy equipment that may be periodically audible at off-site locations. Received noise levels would fluctuate, depending on the construction activity, equipment type, and distance between noise source and receiver. Additionally, noise from construction equipment would vary dependent on the construction phase and the number and type of equipment at a location at any given time. As described above, the project is divided into five phases of construction:

1. Site preparation
2. Grading
3. Building construction
4. Paving
5. Architectural coating

The variation in power and usage of the various construction equipment types creates complexity in characterizing construction noise levels. Expected equipment types for each phase of construction are presented in Table 3.4-8 and were used to screen for potential construction noise impacts. Each phase identified would require different types of construction equipment. The estimated composite site noise level is based on the assumption that all equipment would operate at a given usage load factor, for a given hour (i.e., front end loaders are assumed to be used for up to 40 percent of 1 hour, or 24 minutes), to calculate the composite average daytime hourly L_{eq}. The load factor accounts for the fraction of time that the equipment is in use over the specified time period. The composite noise level from several pieces of equipment operating during the same phase is obtained from dB addition of the L_{eq} of each individual unit. Although it is not possible for all the construction equipment to operate at one point simultaneously, the screening level analysis represented in Table 3.4-8 conservatively assumes concurrent operation of equipment in the same location.

The nearest sensitive receptor to the project site is the existing church to the east, across Orange Avenue. At its closest point, the construction activity would be located within 150 feet of this land use. Construction equipment would operate at various locations on the project site. The effective distance from the construction activities on the project site to this sensitive land use on an average workday is approximately 500 feet. Construction noise would attenuate with increased distance from the noise sources.

Maximum noise levels at 150 feet and composite L_{eq} noise levels at 500 feet, represented in Table 3.4-8, were evaluated assuming spherical free field spreading. As a general construction practice, functional mufflers are anticipated to be maintained on all equipment to attenuate noise levels as low as reasonably achievable. As shown in Table 3.4-8, during the loudest construction phase, the maximum noise level is projected to be 75.5 dBA L_{max}, and the average level is projected to be 64.9 dBA L_{eq}. The maximum noise level would exceed the City of Long Beach's exterior noise thresholds listed in Table 3.4-4. Therefore, this is a potentially significant impact.

Table 3.4-8. Project Construction Noise Levels by Phase

Phase	Equipment[1]			Composite Sound Level[3]	
	Type	Quantity	L_{max} at 50 feet[2]	L_{max} at 150 feet[2]	L_{eq} at 500 feet
Site preparation	Dozer	3	81.7	72.1	64.9
	Loader	4	79.1		
Grading	Scraper	1	83.6	75.5	64.4
	Grader	1	85.0		
	Dozer	1	81.7		
Building construction	Crane	2	80.6	71.1	63.4
	Forklift	3	74.7		
	Generator	1	80.6		
	Loader	3	79.1		
	Welder	1	74.0		

Table 3.4-8. Project Construction Noise Levels by Phase

Phase	Equipment[1]			Composite Sound Level[3]	
	Type	Quantity	L_{max} at 50 feet[2]	L_{max} at 150 feet[2]	L_{eq} at 500 feet
Paving	Paver	2	77.2	70.5	61.6
	Paving equipment	2	77.2		
	Roller	2	80.0		
Architectural coating	Compressor	2	80.6	71.1	60.6

Notes:

1 Equipment mix obtained from the CalEEMod emission calculations prepared for the project.

2 Measured L_{max} at given reference distance obtained from the 2006 FHWA Roadway Construction Noise Model.

3 Distance factor determined by the inverse square law defined as 6 dBA per doubling of distance as sound travels away from an idealized point.

CalEEMod=California Emissions Estimator Model; dBA=A-Weighted decibel; FHWA=Federal Highway Administration; L_{eq}=equivalent continuous sound level; L_{max}=maximum A-weighted sound level

Construction activities that comply with the hours listed in LBMC Section 8.80.202 are exempt from the City of Long Beach's exterior noise standards. Therefore, compliance with **Mitigation Measure NOI-1** would reduce the impact to less than significant. Although construction noise would be higher than the ambient noise in the project vicinity, construction noise is short term in nature and would cease once project construction is complete, and therefore, is considered less than significant with implementation of **Mitigation Measure NOI-1**.

Traffic noise associated with project construction is not anticipated to be a significant source of noise. Traffic noise is not greatly influenced by lower levels of traffic, such as those associated with the project's construction effort. For example, traffic levels would have to double for traffic noise on adjacent roadways to increase by 3 dBA. As shown in Table 3.4-1, there are currently 700 to 20,000 daily traffic trips on the local roadways. The project's construction traffic on adjacent roadways would increase hourly traffic volumes by much less than a factor of two; therefore, the increase in construction related traffic noise would be less than 3 dBA and is not significant.

Operation

TRAFFIC NOISE

Project related long-term vehicular trip increases are anticipated to be minimal when distributed to adjacent street segments. The FHWA highway traffic noise prediction model (FHWA RD 77 108) was used to evaluate highway traffic related noise conditions along the roadway segments in the project vicinity. The typical vehicle mix for Southern California was used. Table 3.4-9 shows that the project related traffic noise level increase would be 0.2 dBA or less for all analyzed roadway segments for the existing conditions with project traffic. Therefore, no significant off-site traffic noise impacts would occur under existing year conditions.

Table 3.4-9. Existing With Project Traffic Noise Levels

Roadway Segment	Average Daily Traffic	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane	Project Related Increase CNEL (dBA)
Spring Street between California Avenue and Orange Avenue	20,845	<50	147.3	465.7	68.0	0.0
Spring Street between Orange Avenue and Walnut Avenue	21,160	<50	149.5	472.8	68.0	0.0
Orange Avenue between I-405 and Spring Street	17,840	<50	90.9	287.4	65.9	0.2
Orange Avenue between Spring Street and 29th Street	14,275	<50	100.9	318.9	66.3	0.2
Orange Avenue between 29th Street and Willow Street	13,875	<50	98.0	310.0	66.2	0.1
29th Street east of Orange Avenue	680	<50	<50	<50	52.9	0.0

Notes:
CNEL=community noise equivalent level; dBA=A-weighted decibels; I-405=Interstate 405

Table 3.4-10 provides the traffic noise levels along the roadways adjacent to the project site under the cumulative (2038) without project traffic conditions. Table 3.4-11 provides the cumulative (2038) traffic noise level with project conditions on the roadways adjacent to the project site.

As shown in Table 3.4-11, the project-related traffic noise level increase would be 0.2 dBA or less for all analyzed roadway segments. Therefore, no significant off-site traffic noise impacts would occur under the cumulative conditions. No mitigation measures would be required for off-site land uses. The on-site buildings would be located at a distance of approximately 60 feet from the roadway centerline of Spring Street and Orange Avenue. At this distance, based on the noise levels listed in Table 3.4-12 the buildings along Spring Street would be exposed to an exterior noise level of 70 dBA CNEL, and the buildings along Orange Avenue would be exposed to an exterior noise level of 68 dBA CNEL.

Standard building construction provides 25 dBA of exterior to interior noise attenuation when windows are closed and 15 dBA of exterior to interior noise attenuation when windows are open (U.S. EPA 1978). All new construction requires some form of mechanical ventilation to ensure that proper indoor air quality is maintained even with all windows and doors closed. Therefore, with windows and doors closed, interior noise levels would meet the 45 dBA CNEL standard (i.e., 70 dBA – 25 dBA = 45 dBA). In addition, modern industrial building construction would likely provide more than the standard 25 dBA of noise attenuation. Therefore, no exterior mitigation measures are required.

Table 3.4-10. 2038 Without Project Traffic Volumes

Roadway Segment	Average Daily Traffic	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane
Spring Street between California Avenue and Orange Avenue	25,245	56.4	178.4	564.0	68.8
Spring Street between Orange Avenue and Walnut Avenue	25,590	57.2	180.8	571.7	68.9
Orange Avenue between I-405 and Spring Street	21,480	<50	109.4	346.1	66.7
Orange Avenue between Spring Street and 29th Street	17,365	<50	122.7	388.0	67.2
Orange Avenue between 29th Street and Willow Street	17,165	<50	121.3	383.5	67.1
29th Street east of Orange Avenue	810	<50	<50	<50	53.7

Notes:
CNEL=community noise equivalent level; dBA=A-weighted decibels; I-405=Interstate 405

Table 3.4-11. 2038 With Project Traffic Volumes

Roadway Segment	Average Daily Traffic	Centerline to 70 CNEL (feet)	Centerline to 65 CNEL (feet)	Centerline to 60 CNEL (feet)	CNEL (dBA) 50 feet from Centerline of Outermost Lane	Project-Related Increase CNEL (dBA)
Spring Street between California Avenue and Orange Avenue	25,395	56.7	179.4	567.4	68.8	0.0
Spring Street between Orange Avenue and Walnut Avenue	25,810	57.7	182.4	576.6	68.9	0.0
Orange Avenue between I-405 and Spring Street	22,145	<50	112.8	356.8	66.8	0.1
Orange Avenue between Spring Street and 29th Street	17,985	<50	127.1	401.8	67.3	0.2
Orange Avenue between 29th Street and Willow Street	17,555	<50	124.0	392.2	67.2	0.1
29th Street east of Orange Avenue	810	<50	<50	<50	53.7	0.0

Notes:
CNEL=community noise equivalent level; dBA=A-weighted decibels; I-405=Interstate 405

STATIONARY NOISE IMPACT

On-site stationary noise would include building heating, ventilation, and air conditioning systems; parking lot usage, including door closing/slamming, horn honking, and car alarms; and on-site truck movements. Heating, ventilation, and air conditioning systems typically result in noise levels that average between 50 and 60 dBA L_{max} at 50 feet from the equipment. Parking lots typically generate noise levels of up to 70 dBA L_{max} at 50 feet. Truck movements typically generate noise levels of up to 75 dBA L_{max} at 50 feet. The closest sensitive receptor to the project site, the church to the east, is located within 150 feet of the on-site stationary sources. Distance attenuation would reduce the on-site stationary noise by 10 dB to 65 dBA L_{max}. Therefore, the proposed project's stationary source noise impacts would be lower than the City of Long Beach's District 1 daytime threshold of 70 dBA L_{max}.

Threshold (b) Generation of excessive ground-borne vibration or groundborne noise levels.

Construction activities generate ground-borne vibration when heavy equipment travels over unpaved surfaces or when it is engaged in soil movement. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Vibration-related impacts generally occur due to resonances in the structural components of a building, because structures amplify ground-borne vibration.

Table 3.4-12lists the vibration source amplitudes for construction equipment. As pile driving may be required, the highest reference PPV for the proposed project would be 0.644 inch per second.

Table 3.4-12. Vibration Source Amplitudes for Construction Equipment

Equipment	PPV at 25 feet (inch/second)	Approximate Lv[1] at 25 feet (VdB)
Pile driver (impact) – upper range	1.518	112
Pile driver (impact) – typical	0.644	104
Pile drive (sonic) – upper range	0.734	105
Pile drive (sonic) – typical	0.170	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill (slurry wall) – in soil	0.008	66
Hydromill (slurry wall) – 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: FTA 2018
[1] RMS (VdB) re 1 micro-inch/second
Lv=vibration level; PPV=peak particle velocity; RMS=root mean square; VdB=velocity in decibels

The church east of the project site would be located approximately 200 feet from the building footprint where pile driving may occur. Following FTA vibration guidance, at 200 feet, the pile driver vibration level would be 77 velocity in decibels (VdB). This level would not exceed FTA's daytime annoyance threshold of 78 VdB, as described in Table 3.4-6. Therefore, the impacts from construction vibration would be less than significant.

Cumulative Impacts

As discussed above, noise generated from the project would be (1) short duration noise resulting from construction activities and (2) long-term noise from on-site stationary sources and off-site traffic noise from vehicles operated by employees using the proposed industrial buildings.

Construction

Construction of the project would not contribute cumulatively to the noise and vibration levels together with other projects under construction. Implementation of the project would result in standing noise and traffic noise levels would remain lower than the noise level limits. Vibration levels would also remain at a level lower than the ground-borne vibration level limits. Therefore, construction of the proposed project would not contribute to significant cumulative noise and vibration impacts.

Operation

As shown in Table 3.4-11, the project-related traffic noise level increase would be 0.2 dBA or less for all analyzed roadway segments. In addition, the on-site stationary source noise levels would be localized and would not contribute to the regional noise environment. Therefore, operation of the proposed project would not contribute to significant cumulative noise impacts.

Mitigation Measures

NOI-1 **City Noise Construction Compliance.** Construction shall be limited to the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday and Saturdays, between 9:00 a.m. and 6:00 p.m., in accordance with city standards. No construction activities shall occur outside of these hours or on federal holidays. Construction work on Sundays is prohibited unless the City of Long Beach's Noise Control Officer issues a permit. The permit may allow work on Sundays between 9:00 a.m. and 6:00 p.m.

The following measures shall be implemented by the contractor to reduce potential construction noise impacts on nearby sensitive receptors.

- During all site excavation and grading, the project contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards.
- The project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- The construction contractor shall locate equipment staging in areas that would create the greatest distance between construction related noise sources and noise-sensitive receptors nearest the project site during all project construction.

Level of Significance after Mitigation

Implementation of **Mitigation Measure NOI-1** would reduce short-term construction related potential significant impacts to a level less than significant by restricting construction time and construction noise control measures.

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