CONCAR PASSAGE
MIXED-USE
NOISE AND VIBRATION ASSESSMENT

San Mateo, California

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INTRODUCTION

The Passage Concar Mixed Use Project (Project) plans to construct a residential mixed-use transportation-oriented development at the approximately 14.5-acre (631,854 square feet) site currently occupied by the Concar Shopping Center and surface parking lot. The Project site is bounded by Concar Drive to the north, South Grant Street to the east, Passage Way (currently an unnamed road) and State Route 92 to the south, and South Delaware Street to the west. The Project will comprise 5 mixed-use or residential buildings with heights of 4 to 5 stories, a Trader Joe's grocery store, and a 7-Eleven convenience store. A total of 961 residential units are proposed along with 31,080 square feet of residential interior amenities and 39,580 square feet of commercial area. Residential interior amenities include lounge areas, fitness and yoga centers, and bike depots. Proposed commercial areas within buildings 2 and 5 consist of performance and administrative spaces for Peninsula Ballet Theater, the "SEED" Food Hall, a restaurant space, a retail space, and a day care center. The Project will provide 6.83 acres of open space area of which 4.67 acres are accessible to the public. The open space area will primarily be located in the center of the site.

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

SETTING

Fundamentals of Environmental Noise

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

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

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

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

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

Effects of Noise

Sleep and Speech Interference

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

noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, those facing major roadways and freeways typically need special glass windows.

Annoyance

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

Fundamentals of Groundborne Vibration

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

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

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Human perception to vibration varies with the individual and is a function of physical

setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from “Historic and some old buildings” to “Modern industrial/commercial buildings”. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

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

TABLE 1 Definition of Acoustical Terms Used in this Report

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

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

TABLE 2 Typical Noise Levels in the Environment

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

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

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

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures

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

Regulatory Background

The project would be subject to noise-related regulations, plans and policies established by the State of California and the City of San Mateo. Applicable planning documents include Appendix G of the CEQA Guidelines, the San Mateo General Plan, and the San Mateo Municipal Code. Regulations, plans, and policies presented within these documents form the basis of the significance criteria used to assess project impacts.

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

(a) 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 groundborne vibration or groundborne 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 two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels.

Of these guidelines, items (a) and (b) are applicable to the proposed project. The project is not located in the vicinity of a public airport or private airstrip; therefore, checklist item (c) is not carried forward in this analysis.

2016 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn}/CNEL in any habitable room.

2016 California Green Building Standards Code (Cal Green Code)

The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2016 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). Section 5.507 states that either the prescriptive (Section 5.507.4.1) or the performance method (Section 5.507.4.2) shall be used to determine environmental control at indoor areas. The prescriptive method is very conservative and not practical in most cases; however, the performance method can be quantitatively verified using exterior-to-interior calculations. For the purposes of this report, the performance method is utilized to determine consistency with the Cal Green Code. The sections that pertain to this project are as follows:

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.
>
> **5.507.4.2 Performance method.** For buildings located, as defined by Section 5.507.4.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

The performance method, which establishes the acceptable interior noise level, is the method typically used when applying these standards.

City of San Mateo General Plan: The Noise Element of the City of San Mateo General Plan sets forth goals and policies to control environmental noise and protect citizens from excessive noise exposure. The goals and policies relevant to this project are summarized below:

GOAL 1: Protect "noise sensitive" land uses from excessive noise levels.

POLICIES:

N 1.1: Interior Noise Level Standard. Require submittal of an acoustical analysis and interior noise insulation for all "noise sensitive" land uses listed in Table N-1 that have an exterior noise level of 60 dB (L_{dn}) or above, as shown on Figure N-1. The maximum interior noise level shall not exceed 45 dB (L_{dn}) in any habitable rooms.

N 1.2: Exterior Noise Level Standard. Require an acoustical analysis for new parks, play areas, and multi-family common open space (intended for the use and the enjoyment of residents) that have an exterior noise level of 60 dB (L_{dn}) or above, as shown on Figure N-1. Require an acoustical analysis that uses peak hour L_{eq} for new parks and play areas. Require a feasibility analysis of noise reduction measures for public parks and play areas. Incorporate necessary mitigation measures into residential project design to minimize common open space noise levels. Maximum exterior noise should not exceed 67 dB (L_{dn}) for residential uses and should not exceed 65 dB (L_{eq}) during the noisiest hour for public park uses.

GOAL 2: Minimize unnecessary, annoying and unhealthful noise.

POLICIES:

N 2.1: Noise Ordinance. Continue implementation and enforcement of City's existing noise control ordinance: (a) which prohibits noise that is annoying or injurious to neighbors of normal sensitivity, making such activity a public nuisance, and (b) restricts the hours of construction to minimize noise impact.

N 2.2: Minimize Noise Impact. Protect all "noise-sensitive" land uses listed in Tables N-1 and N-2 from adverse impacts caused by noise generated on-site by new developments. Incorporate necessary mitigation measures into development design to minimize noise impacts. Prohibit long-term exposure increases of 3 dB (L_{dn}) or greater at the common property line, excluding existing ambient noise levels.

N 2.3: Minimize Commercial Noise. Protect land uses other than those listed as "noise sensitive" in Table N-1 from adverse impacts caused by the on-site noise generated by new developments. Incorporate necessary mitigation measures into development design to minimize noise impacts. Prohibit new uses that generate noise levels of 65 dB (L_{dn}) or above at the property line, excluding existing ambient noise levels.

N 2.4: Traffic Noise. Recognize projected increases in ambient noise levels resulting from traffic increases. Promote the installation of noise barriers along highways where "noise-sensitive" land uses listed in Table N-1 are adversely impacted by unacceptable noise levels [60 dB (L_{dn}) or above]. Require adequate noise mitigation to be incorporated into the widening of SR 92 and US 101. Accept noise increases on El Camino Real at existing development, and require new multi-family development to provide common open space having a maximum exterior noise level of 67 dB (L_{dn}).

TABLE N-1
NOISE SENSITIVE LAND-USE COMPATIBILITY GUIDELINES FOR COMMUNITY NOISE ENVIRONMENTS[1]
Day-Night Average Sound Level (L_{dn}), Decibels

Land-Use Category	Normally Acceptable[2]	Conditionally Acceptable[3]	Normally Unacceptable[4]
Single-Family Residential	50 to 59	60 to 70	Greater than 70
Multi-Family Residential	50 to 59	60 to 70	Greater than 70
Hotels, Motels, and Other Lodging Houses	50 to 59	60 to 70	Greater than 70
Long-Term Care Facilities	50 to 59	60 to 70	Greater than 70
Hospitals	50 to 59	60 to 70	Greater than 70
Schools	50 to 59	60 to 70	Greater than 70
Multi-Family Common Open Space Intended for the Use and Enjoyment of Residents	50 to 67	--	Greater than 67

TABLE N-2
NOISE GUIDELINES FOR OUTDOOR ACTIVITIES
Average Sound Level (L_{eq}), Decibels

Land Use Category	Normally Acceptable[2]	Conditionally Acceptable[3]	Normally Unacceptable[4]
Parks, Playgrounds	50 to 65*	--	Greater than 65*

[1] These guidelines are derived from the California Department of Health Services, Guidelines for the Preparation and Content of the Noise Element of the General Plan, 2003. The State Guidelines have been modified to reflect San Mateo's preference for distinct noise compatibility categories and to better reflect local land-use and noise conditions. It is intended that these guidelines be utilized to evaluate the suitability of land-use changes only and not to determine cumulative noise impacts. Land uses other than those classified as being "noise sensitive" are exempt from these compatibility guidelines.

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

[3] Conditionally Acceptable – New construction should be undertaken only after a detailed analysis of the noise reduction requirement is conducted and needed noise insulation features included in the design.

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

* Average Sound Level (Leq) for peak hour.

City of San Mateo Municipal Code: The Noise Regulations of the San Mateo Municipal Code, Chapter 7.30 are set forth to protect the inhabitants of the City against all forms of nuisances.

Section 7.30.040 Maximum Permissible Sound Levels. It is unlawful for any person to operate or cause to be operated any source of sound at any location within the city or allow the creation of

any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured on any other property to exceed:

(1) The noise level standard for that property as specified in Table 7.30.040 for a cumulative period of more than thirty minutes in any hour;
(2) The noise level standard plus five dB for a cumulative period of more than fifteen minutes in any hour;
(3) The noise level standard plus ten dB for a cumulative period of more than five minutes in any hour;
(4) The noise level standard plus fifteen dB for a cumulative period of more than one minute in any hour; or
(5) The noise level standard or the maximum measured ambient level, plus twenty dB for any period of time.

If the measured ambient level for any area is higher than the standard set in Table 7.30.040, then the ambient shall be the base noise level standard for purposes of this section. In such cases, the noise levels for purposes of subsections (2) through (5) of this section shall be increased in five dB increments above the ambient.

Table 7.30.040: Noise Level Standards

Noise Zone	Time Period	Noise Level, dBA
Noise Zone 1	10 p.m.--7 a.m.	50
	7 a.m.--10 p.m.	60
Noise Zone 2	10 p.m.--7 a.m.	55
	7 a.m.--10 p.m.	60
Noise Zone 3	10 p.m.--7 a.m.	60
	7 a.m.--10 p.m.	65
Noise Zone 4	Anytime	70

Section 7.30.060 Special Provisions. Construction, alteration, repair, or land development activities authorized by a valid city permit shall be allowed at the following times:

- Weekdays: between 7:00 a.m. and 7:00 p.m.
- Saturdays: between 9:00 a.m. and 5:00 p.m.
- Sundays and Holidays: between 12:00 p.m. and 4:00 p.m.
- Or at other such hours as authorized or restricted by the permit, so long as they meet the following conditions:

    1. No individual piece of equipment shall produce a noise level exceeding 90 dBA at a distance of 25 feet. If the device is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close to 25 feet as possible.
    2. The noise level outside of any point outside the property plane of the project shall not exceed 90 dBA.

Existing Noise Environment

The project site is located west of U.S. Route 101, bounded by Concar Drive to the north, South Grant Street to the east, State Route 92 to the south, and South Delaware Street to the west. The site plan is divided into five clusters defined primarily by the project's main buildings as seen in Figure 2. The primary source of noise at the site is traffic along the surrounding roads, with State Route 92 being the most dominant. Existing uses in the vicinity of the project include residences to the north across Concar Drive, an office building to the west across South Delaware Street, and commercial use across South Grant Street to the east. A multifamily residential use is located approximately 230 feet northeast of the project boundary at the intersection of Concar Drive and South Delaware Street.

The noise monitoring survey included six short-term (10 minute) measurements and two long-term (24+ hour) measurements. Long-term measurements were made to quantify the daily trend in noise levels at the project site and at the nearest residences in the vicinity. Attended short-term measurements were made to document noise levels at sensitive receptors in the site vicinity. Noise monitoring locations are shown on Figure 1.Table 4 summarizes the results of the measurements.

Long-term noise measurement LT-1 was made at the southeast corner of the site, approximately 65 feet west of South Grant Street. The primary noise sources at this location were traffic from South Grant Street and State Route 92 and operations from the RePlanet USA recycling center, approximately 60 feet north of the measurement site. Hourly average noise levels at this location ranged from 65 to 68 dBA L_{eq} during the day and from 55 to 68 dBA L_{eq} at night. The day-night average noise level on Thursday, May 2, 2019 was 70 dBA L_{dn}. The daily trend in noise levels at LT-1 are shown in Figures 3 through 5.

Long-term measurement LT-2 was made at the nearest residences, approximately 60 feet north of the center line of Concar Drive and adjacent to Concar Park. The primary noise source at this location was Concar Drive traffic. Hourly average noise levels at this location ranged from 59 to 71 dBA L_{eq} during the day and from 47 to 69 dBA L_{eq} at night. The day-night average noise level on Thursday, May 2, 2019 was 65 dBA L_{dn}. The daily trend in noise levels at LT-2 are shown in Figures 6 through 8.

FIGURE 1 Passage Concar Noise Measurement Locations

Source: Google Earth, April 2019.

FIGURE 2 Division of Site Plan

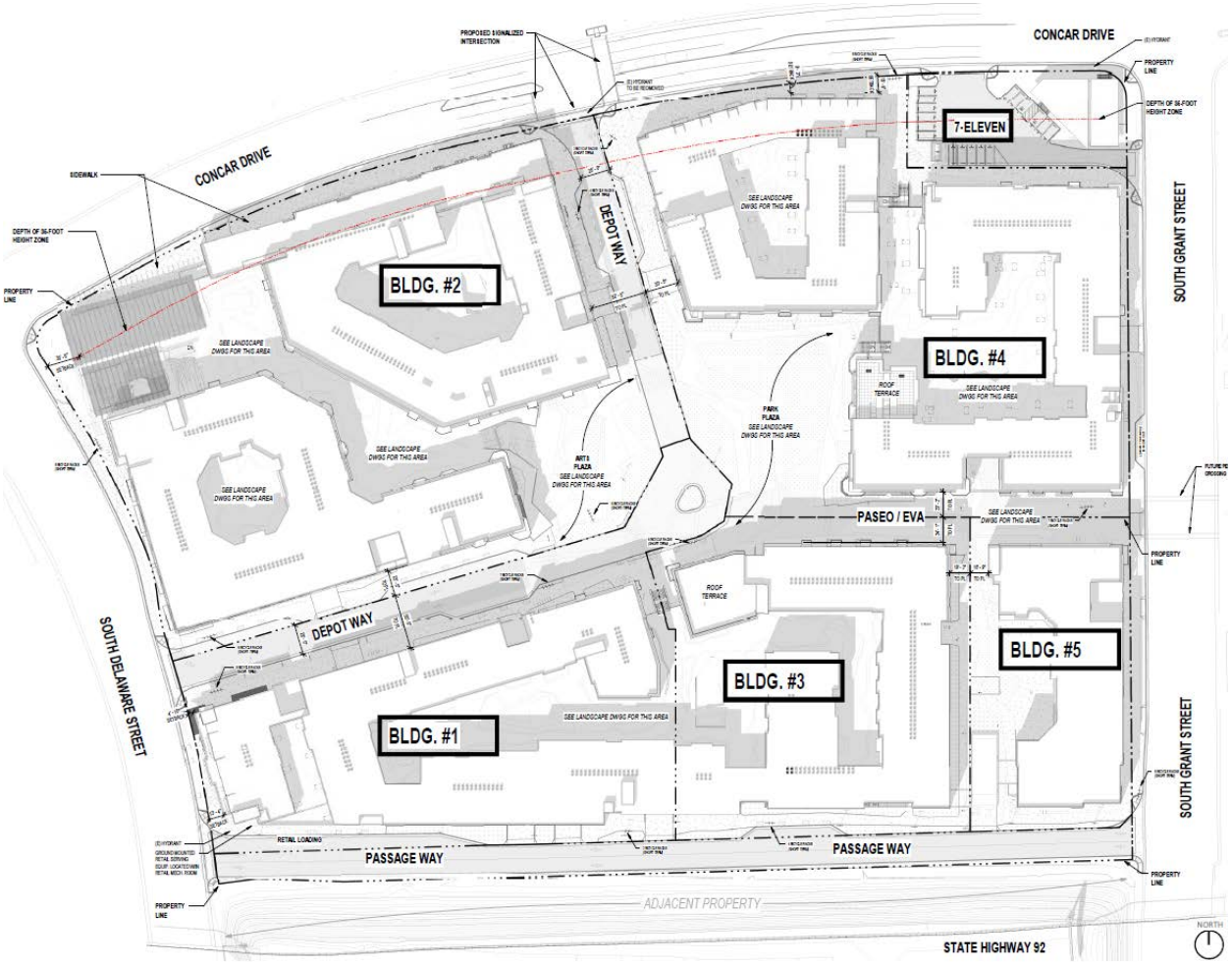


TABLE 4 Summary of Noise Measurement Data (dBA)

Noise Measurement Location	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}	L_{dn}
ST-1: Across from east side of site, 54 feet east of centerline of South Grant Street. At 5 feet above ground. (5/1/2019, 11:50 a.m. - 12:00 p.m.)	83	73	68	64	59	65	66
ST-2: Behind existing TJ Maxx, approximately 140 feet north State Route 92 centerline. At 5 feet above ground. (5/1/2019, 12:10 p.m. - 12:20 p.m.)	71	69	65	63	61	63	65
ST-3: Across from north side of site, 36 feet from centerline of Concar Drive. At 5 feet above ground. (5/1/2019, 12:30 p.m. - 12:40 p.m.)	81	78	73	65	56	69	71
ST-4: West of site, on sidewalk north of Concar Drive, in front of Station Park Green Apartments. At 5 feet above ground. (5/1/2019, 12:50 p.m. - 1:00 p.m.)	81	78	80	65	60	67	69
ST-5: 48 feet from centerline of South Delaware Street, 3 feet from eastern façade of 400|450 Concar building. At 5 feet above ground. (5/1/2019, 1:10 p.m. - 1:20 p.m.)	78	76	72	66	58	68	70
ST-6: Southeast corner of site, approximately 65 feet west of South Grant Street. At 25 feet above ground. (5/3/2019, 12:20 p.m. - 12:30 p.m.)	74	72	70	67	65	68	69
LT-1: Same location as ST-6. At 5 feet above ground. (5/1/2019 11:40 a.m. - 5/3/2019 12:30 p.m.)	-	-	-	-	-	-	70
LT-2: 100 feet north of site boundary across Concar Drive, adjacent to east side of Concar Park. (5/1/19 11:20 a.m.- 5/3/19 12:40 p.m.)	-	-	-	-	-	-	65

Note: The L_{dn} is determined by correlating the short-term measurement with the representative long-term measurement.

FIGURE 3

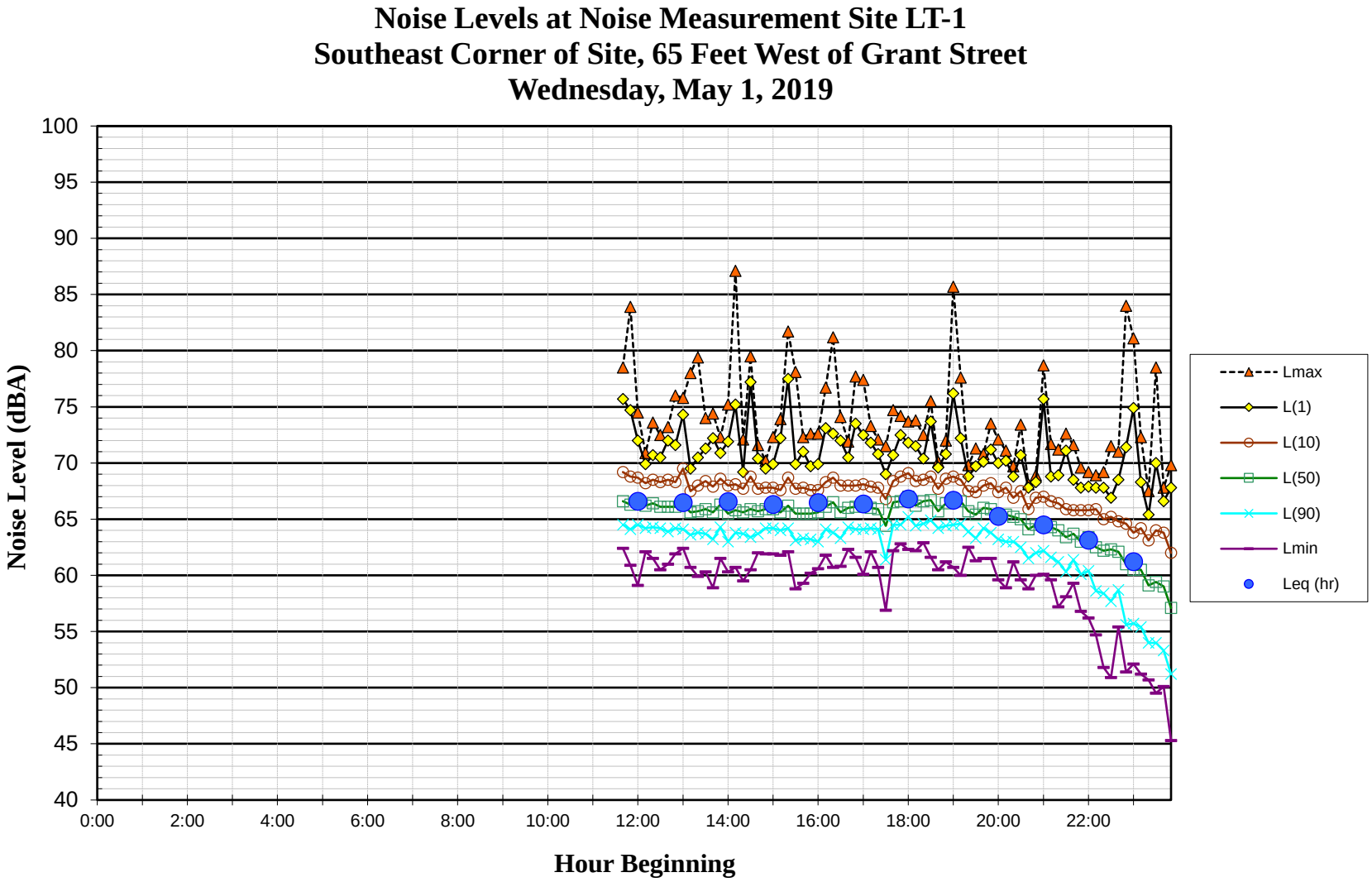

Noise Levels at Noise Measurement Site LT-1
Southeast Corner of Site, 65 Feet West of Grant Street
Wednesday, May 1, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

FIGURE 4

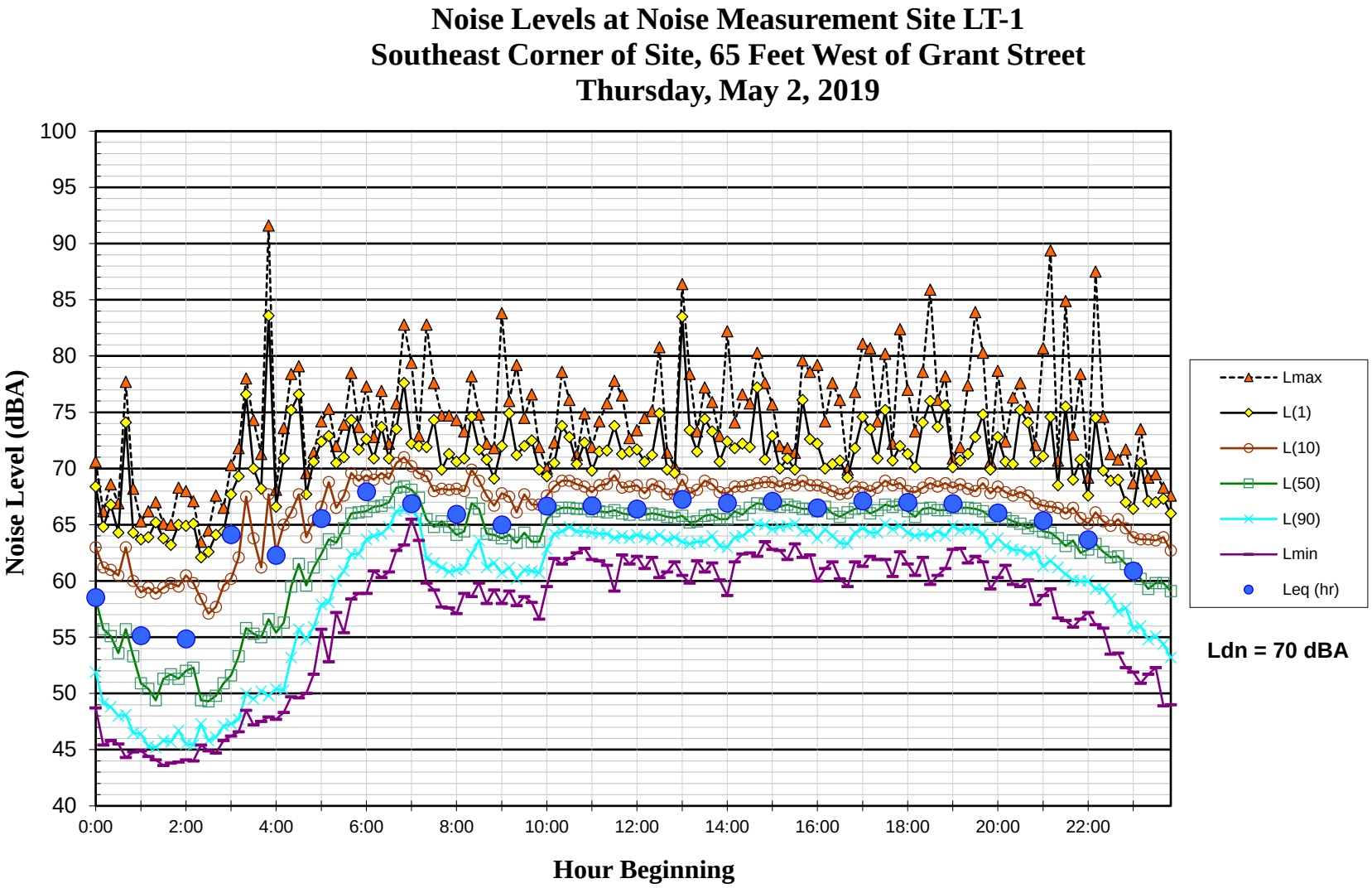

Noise Levels at Noise Measurement Site LT-1
Southeast Corner of Site, 65 Feet West of Grant Street
Thursday, May 2, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 70 dBA

FIGURE 5

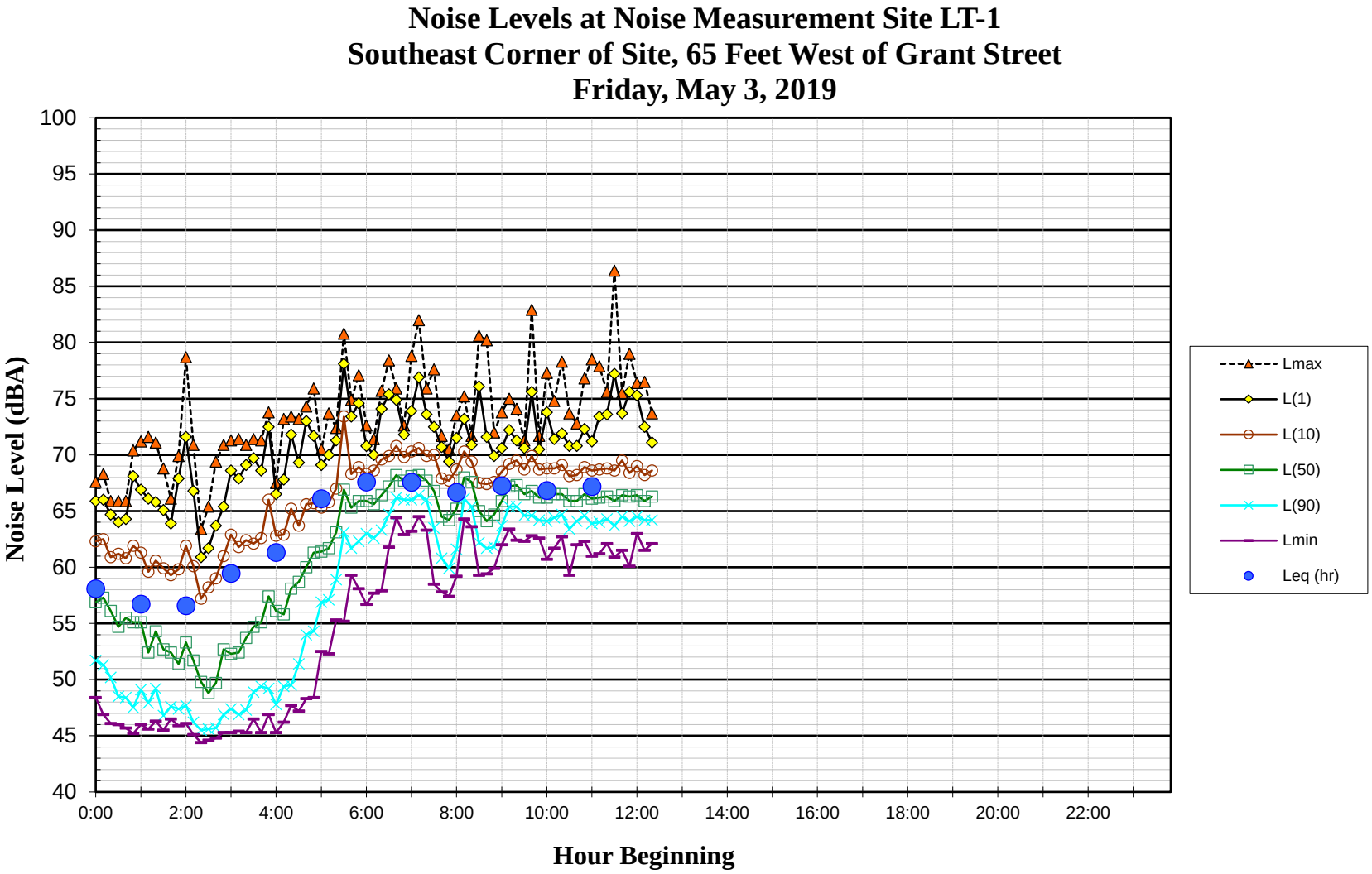

Noise Levels at Noise Measurement Site LT-1
Southeast Corner of Site, 65 Feet West of Grant Street
Friday, May 3, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

FIGURE 6

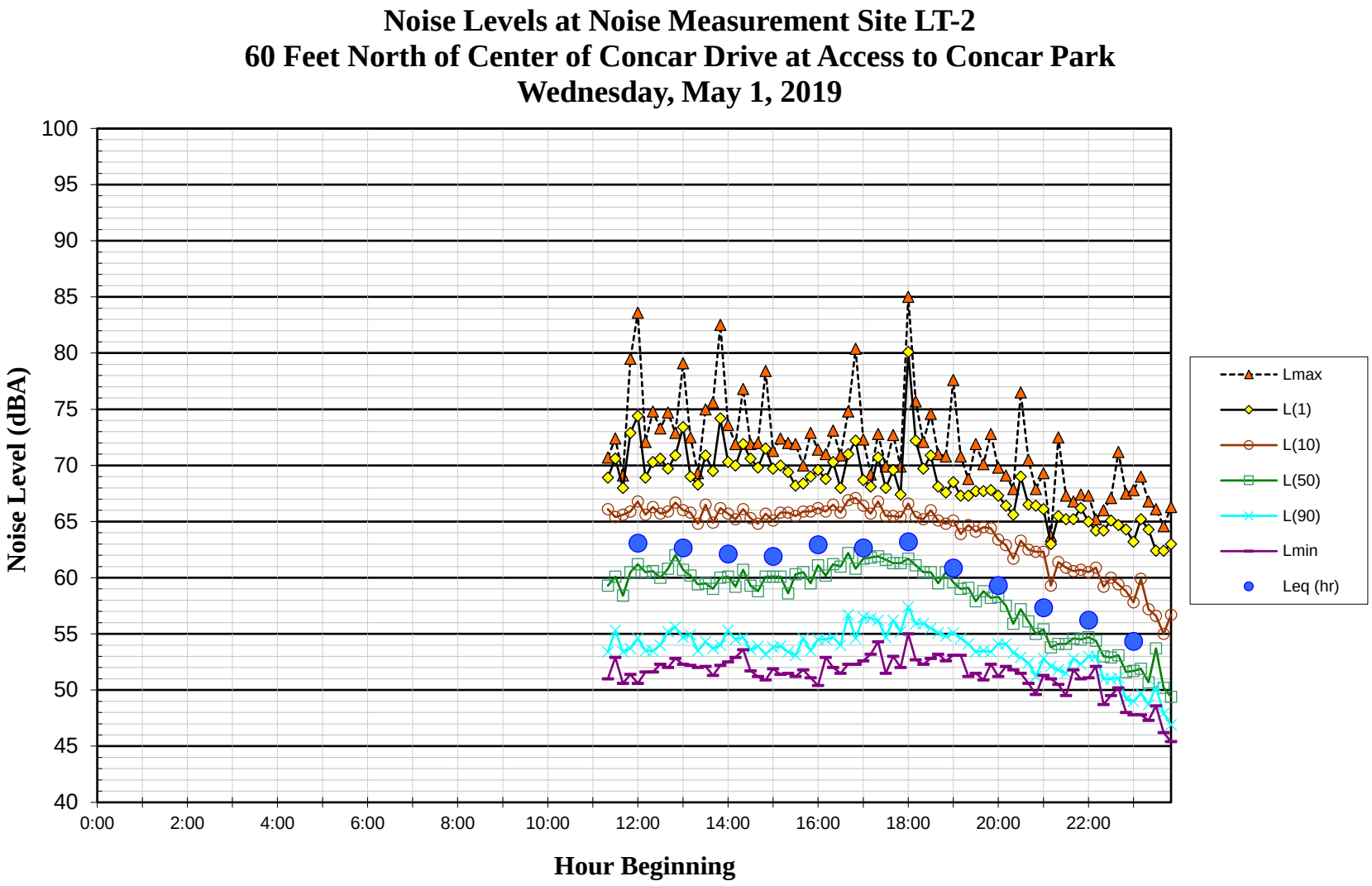

Noise Levels at Noise Measurement Site LT-2
60 Feet North of Center of Concar Drive at Access to Concar Park
Wednesday, May 1, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

FIGURE 7

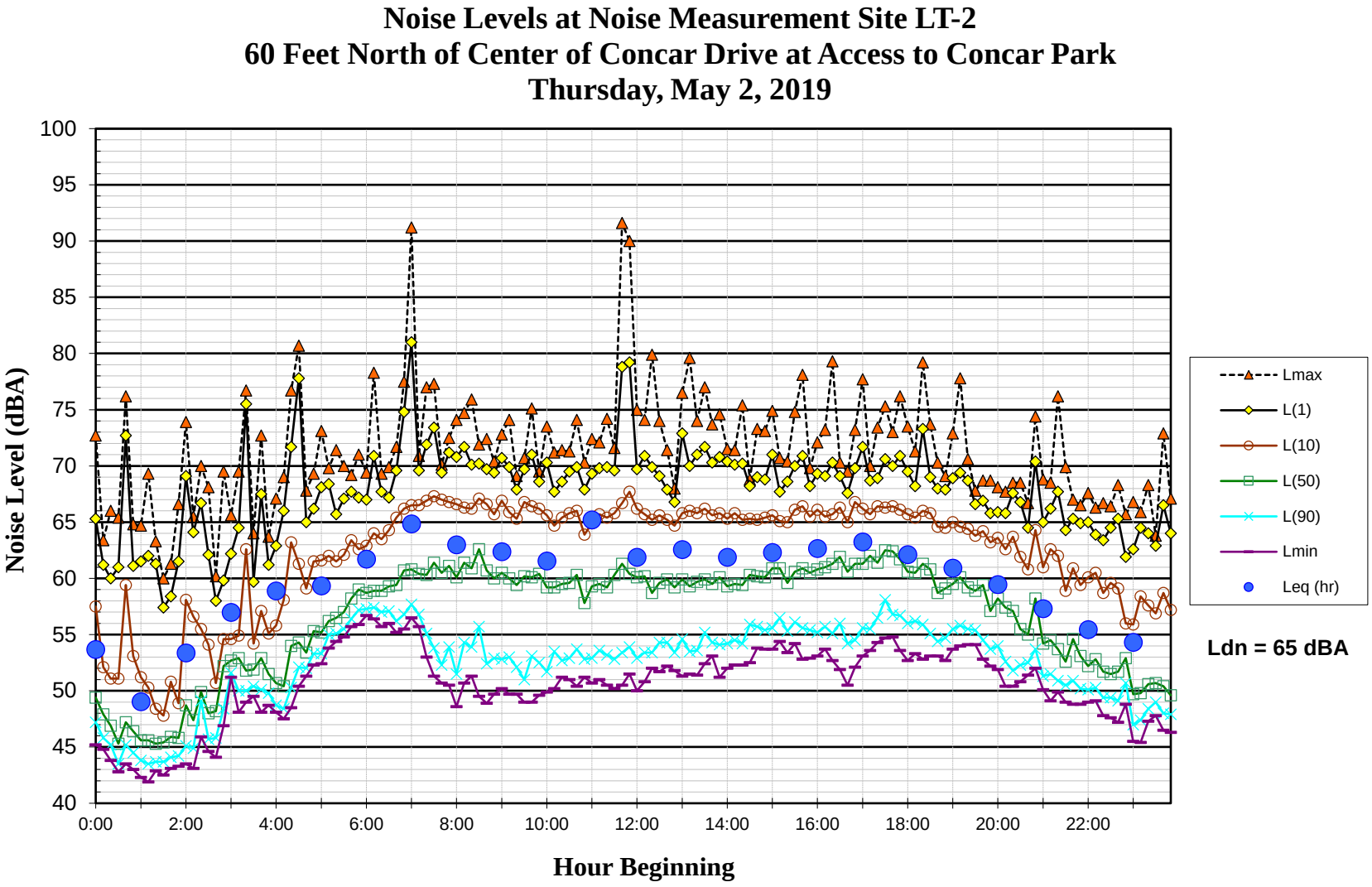
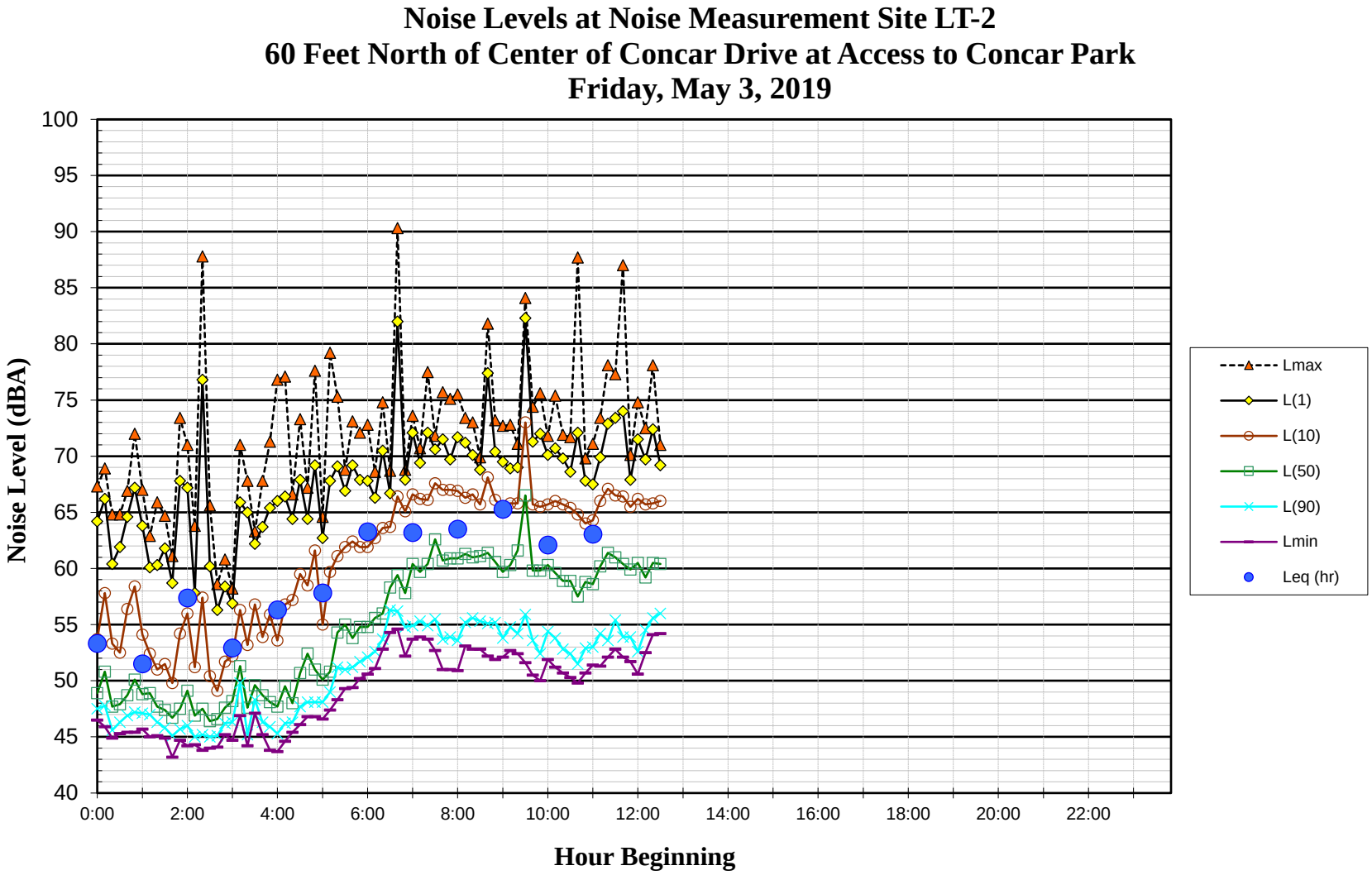

Noise Levels at Noise Measurement Site LT-2
60 Feet North of Center of Concar Drive at Access to Concar Park
Thursday, May 2, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 65 dBA

FIGURE 8


Noise Levels at Noise Measurement Site LT-2
60 Feet North of Center of Concar Drive at Access to Concar Park
Friday, May 3, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility Thresholds

The Noise Element of the City of San Mateo General Plan sets forth goals and policies to control environmental noise and protect citizens from excessive noise exposure. The applicable policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

- The City of San Mateo's normally acceptable exterior noise level objective is 59 dBA L_{dn} or less for residential land uses. Maximum exterior noise in residential outdoor activity areas should not exceed 67 dBA L_{dn}.

- The City of San Mateo's normally acceptable exterior noise level objective is 65 dBA L_{eq} or less at the loudest hour for parks and playgrounds accessible to the public.

- The City of San Mateo's interior noise level limit is 45 dBA L_{dn} or less for residential land uses consistent with the requirements of the California Building Code.

Future Exterior Noise Environment

The future exterior noise environment at the project site would continue to be characterized by traffic on South Delaware Street, Concar Drive, South Grant Street, and State Route 92. The noise environment at the site would vary depending on the proximity and shielding of the receptor to the surrounding roads. Open space outdoor areas for residents and the public are proposed throughout the project site.

Existing noise levels at the site range from 65 to 71 dBA L_{dn}. Based on traffic volumes provided for the project, future traffic noise levels are anticipated to remain the same or increase by 1 to 2 dBA L_{dn} on all roads surrounding the site with the exception of the area of the intersection of South Delaware Street and the proposed Depot Way. However, the increased noise level at this intersection is only anticipated to affect traffic heading east, into the site, and will not affect surrounding noise-sensitive areas.

Open space areas at the site would be exposed to substantial traffic noise. Anticipated noise levels at these areas were calculated based on the results of the noise monitoring survey, review of the site plan, and traffic noise modeling. Tables 5 and 6 list the anticipated maximum and average noise levels.

TABLE 5 Calculated Exterior Noise Levels at Proposed Resident-Use Open Space Areas

Open Space Location	Calculated Noise Levels (dBA L_{dn})	Calculated Noise Levels at Loudest Hour (dBA L_{eq})
Building One North-facing Deck	65	63
Building One Courtyard	**74**	**72**
Building One Southwest	48	46
Building Two Northeast	44	42
Building Two Southwest	45	43
Building Three Central	50	48
Building Three Rooftop Deck	59	57
Building Four Northern	44	42
Building Four Rooftop Deck	57	55
Building Four Southern	49	47

TABLE 6 Calculated Exterior Noise Levels at Proposed Public-Use Open Space Areas

Open Space Location	Calculated Noise Levels (dBA L_{dn})	Calculated Noise Levels at Loudest Hour (dBA L_{eq})
Building Two Northwest	64	62
Building Five Paseo and Play Area	**69**	**67**
Park Plaza	55	53
Arts Plaza	56	54

Noise levels at the courtyard space located in the Building One section above the Trader Joe's grocery store are anticipated to reach 74 dBA L_{dn}. This exceeds the City of San Mateo's "*normally acceptable*" criteria of 67 dBA L_{dn} for multi-family common open space intended for use by residents. Noise levels at the Paseo and Play Area public-use open space between Buildings Three and Five is anticipated to reach 67 dBA L_{eq} during the loudest hour which will exceed the City's "*normally acceptable*" criteria of 65 dBA L_{eq}.

It is not acoustically feasible to reduce exterior noise levels at the Building One Courtyard open space to meet the City's 67 dBA L_{dn} objective for multi-family residential uses. Alternate noise reduction strategies that would reduce average noise levels to meet these objectives include fully enclosing the Building One Courtyard or redesigning the site plan to locate the courtyard away from direct exposure to traffic noise from State Route 92. It is also infeasible to reduce exterior noise levels at the Paseo and Play Area located between Buildings Three and Five to meet the City's 65 dBA L_{eq} objective for parks and playgrounds. Revising site plans to extend the southern façade of Building Five approximately 45 feet west, overlapping the parking ramp, would reduce average noise levels well enough to meet the objective. Despite these exceedances, all residents and the public will have access to well-shielded common areas for outdoor enjoyment.

Future Interior Noise Environment

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA L_{dn}, the inclusion of adequate forced-air mechanical ventilation can reduce interior noise levels to acceptable levels by allowing occupants the option of closing the windows to control noise. Where noise levels exceed 65 dBA L_{dn}, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion. Attaining the necessary noise reduction from exterior to interior spaces is readily achievable in noise environments less than 75 dBA L_{dn} with proper wall construction techniques, the selections of proper windows and doors, and the incorporation of forced-air mechanical ventilation systems. In noise environments exceeding 75 dBA L_{dn}, the construction materials and techniques, including smaller window and door sizes as a percentage of the total building façade facing the noise source, are necessary to reduce interior noise levels to acceptable levels and are considerably more expensive.

Both the City of San Mateo and the California Building Code require that interior noise levels be maintained at 45 dBA L_{dn} or less for residences. The Cal Green Code limits noise levels inside occupied non-residential spaces to 50 dBA $L_{eq(1\text{-}hr)}$ during any hours of operation. The calculated exterior noise level exposures at building façades are summarized in Table 7.

Considering average façade noise losses, to maintain a habitable interior environment the following general observations can be made:

1. In noise environments with exterior façade noise exposures of 60 to 70 dBA L_{dn} interior noise levels in residences would be considered acceptable with the incorporation of an adequate forced-air mechanical ventilation system to allow occupants the option of keeping windows closed for noise control. (Highlighted in Blue in Table 7)

2. In noise environments of 70 to 80 dBA L_{dn} or greater, a combination of forced-air mechanical ventilation and sound-rated construction methods (typically windows with STC 30 to 40) would be required to meet the interior residential noise level limit. To meet the Cal Green Code objective, mechanical ventilation and sound-rated construction methods (typically windows with STC 28 to 34) would be required for non-residential uses. (Highlighted in Red in Table 7).

TABLE 7 Calculated Exterior Noise Levels at Building Façades

Building Cluster	Calculated Noise Levels at Façades (dBA L_{dn})			
	North	East	South	West
One	64	50 - 55	75	73 - 75
Two	69 - 70	60 - 61	67 - 70	71
Three	53 - 55	67 - 68	75	47 - 55
Four	69 - 70	67	58 - 59	59 - 60
Five	61	70	75	65 - 66

As indicated in Table 7, with few exceptions, residences along the building façades will require abatement measures due to exposure to high levels of traffic noise. All residences except for those on the east side of Building One, the north and west sides of Building Three, and the south side of Building Four will need to be equipped with forced-air mechanical ventilation to meet City of San Mateo and Cal Green Code regulations of 45 dBA L_{dn} for interior noise levels in residences and 50 dBA L_{eq} or lower for non-residential occupied spaces. Additionally, the southern façades of Buildings One, Three, and Five, and the western façades of Buildings One and Two will require sound-rated construction materials such as stucco sided, staggered-stud exterior walls, stucco sided exterior walls with resilient channels, or cement board-sided exterior walls with resilient channels, and doors and windows with STC ratings of 30 to 32.

Noise from proposed heating, ventilation, and air conditioning (HVAC) equipment will be substantial along parts of the northern façade of the fourth and fifth levels of Building Four. The fifth floor D1 and J2 units, located along the northernmost section of the building and directly above proposed HVAC equipment, are anticipated to be exposed to noise levels up to 72 dBA L_{eq}. Wall construction and windows specified above for façades exposed to traffic noise levels greater than 70 dBA L_{dn} will be required to meet City regulations. Plans indicate that fourth floor D1 and J2 units immediately adjacent to the proposed HVAC equipment will not have north-facing windows, but as they are anticipated to be exposed to higher noise levels of up to 77 dBA L_{eq}, they will require the same wall construction as fifth floor units.

For consistency with the General Plan the following Conditions of Approval are recommended for consideration by the City:

- Project-specific acoustical analyses are required by the state building code to confirm interior noise levels in residences will be reduced to 45 dBA L_{dn} or lower and interior levels in office uses will be reduced to 50 dBA L_{eq} or lower. The specific determination of what treatments are necessary will be conducted on a unit-by-unit basis. Results of the analysis, including the description of the necessary noise control treatments, will be submitted to the City along with the building plans and approved prior to issuance of a building permit.

- Building sound insulation requirements would need to include the provision of forced-air mechanical ventilation for the units detailed above so that windows could be kept closed at the occupant's discretion to control noise.

- Special building techniques (e.g. sound-rated windows and building façade treatments) may be required to maintain interior noise levels at or below acceptable levels. These treatments would include, but are not limited to, sound-rated windows and doors, sound-rated wall constructions, acoustical caulking, protected ventilation openings, etc. Preliminary calculations indicate that residential units would require sound-rated windows and doors with ratings ranging from STC 30 to 32 to assure that the 45 dBA L_{dn} and 50 dBA L_{eq} standards are met.

NOISE IMPACTS AND MITIGATION MEASURES

This section describes the significance criteria used to evaluate project impacts under CEQA, provides a discussion of each project impact, and presents mitigation measures, where necessary, to provide a compatible project in relation to adjacent land uses.

Significance Criteria

The following criteria were used to evaluate the significance of environmental noise resulting from the project:

1. **Temporary or Permanent Noise Increases in Excess of Established Standards.** A significant impact would be identified if project construction or operations would result in a substantial temporary or permanent increase in ambient noise levels at sensitive receivers in excess of the local noise standards contained in the San Mateo General Plan or Municipal Code, as follows:

    - Operational Noise in Excess of Standards. A significant noise impact would be identified if the project operations would generate noise levels that would exceed applicable noise standards presented in the San Mateo General Plan or Municipal Code.

    - Permanent Noise Increase. A significant permanent noise increase would be identified if traffic generated by the project or project improvements/operations would substantially increase noise levels at sensitive receivers in the vicinity. The City of San Mateo defines a substantial increase to occur if the noise level increase is 3 dBA L_{dn} or greater. (Policy N-2.2)

    - Temporary Noise Increase. A significant temporary noise increase would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} at residential land uses and/or 70 dBA L_{eq} at commercial and open space land uses in the vicinity of the project, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent land uses. (See Setting Section)

2. **Generation of Excessive Groundborne Vibration.** A significant impact would be identified if the construction of the project would generate excessive vibration levels.

Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings (see Table 3).

Impact 1: **Temporary or Permanent Noise increases in Excess of Established Standards.** Project operations and traffic would not exceed the applicable noise thresholds or result in a substantial permanent noise level increase at existing noise-sensitive land uses in the project vicinity. However, existing noise-sensitive land uses would be exposed to construction noise levels in excess of the temporary increase significance thresholds for a period of more than one year. **This is a potentially significant impact.**

Operational Noise

Operational noise is limited to the levels specified in Table 7.30.040, adjusted for ambient conditions. As described in the Setting Section, ambient daytime noise levels at adjacent properties are in the range of 59 to 71 dBA L_{eq}, with nighttime levels in the range of 47 to 69 dBA L_{eq}.

Mixed-use buildings typically include various mechanical equipment such as air-conditioners, exhaust fans, chillers, pumps, and air handling systems. The most substantial noise-generating mechanical equipment proposed for the project is anticipated to be building air conditioning units. Specific models of HVAC equipment were not indicated as of this writing. Noise from HVAC equipment was modeled based on plans dated July 5, 2019 showing proposed equipment locations along the various building rooftops. The nearest sensitive receptors potentially affected by mechanical equipment noise are the single-family homes and public park to the north across Concar Drive. Mechanical equipment noise levels at these locations are anticipated to range from 47 to 48 dBA L_{eq} during loudest hours. This is below the maximum noise level for Zone 1 (single-family residential including adjacent parks and open space) set in the City's municipal code.

The proposed 7-Eleven convenience store would have 17 parking spaces located near the corner of Concar Drive and South Grant Street. The center of the parking lot would be located approximately 140 feet from the nearest neighboring residential use to the north. The closest individual parking space would be approximately 100 feet from the residence. All other parking proposed for the site will be either underground or covered by site structures. The hourly average noise level generated from activities in a small parking lot would reach 35 dBA L_{eq} at a distance of 100 feet. Noise from parking activity would not be anticipated to be discernable from ambient noise levels at adjacent land uses. This is a **less-than-significant** impact.

Permanent Noise Increases from Project Traffic

A significant noise impact would occur if traffic generated by the project would increase noise levels at sensitive receptors by 3 dBA L_{dn} or more. For reference, existing traffic volumes would have to double for noise levels to increase by 3 dBA L_{dn}. The project's trip generation analysis[1] concluded that under credible worst-case conditions, the proposed project will generate insignificant increases in AM and PM peak hour trips over the existing state at all affected roadway segments but one- the entranceway to the site from South Delaware Street along the proposed Depot Way. At this segment, a 3 dBA L_{dn} increase is anticipated, however this increase will only affect the site itself, not any surrounding sensitive receptors. This is a **less-than-significant impact**.

Temporary Noise Increases from Project Construction

Section 7.30.060 of the City of San Mateo's Municipal Code limits construction to weekdays between 7:00 a.m. and 7:00 p.m., Saturdays between 9:00 a.m. and 5:00 p.m., and Sundays and holidays between 12:00 p.m. and 4:00 p.m. Additionally, the City specifies that no individual piece of equipment shall produce a noise level exceeding 90 dBA at a distance of 25 feet and that the noise level outside any point outside the property plane of the project shall not exceed 90 dBA.

Neither the City of San Mateo nor the State of California specify quantitative thresholds for the impact of temporary increases in noise due to construction. The threshold for speech interference indoors is 45 dBA (see Setting Section, Effects of Noise). Assuming a 15 dB exterior-to-interior reduction for standard residential construction with windows open and a 25 dB exterior-to-interior reduction for standard commercial construction, assuming windows closed, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Therefore, the project would be considered to generate a significant temporary construction noise impact if project construction activities exceeded 60 dBA L_{eq} at nearby residences or exceeded 70 dBA L_{eq} at nearby commercial land uses and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

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

Project construction is anticipated to occur over a period of about 5 years and would include demolition of existing structures and pavement, site preparation, grading and excavation, trenching and foundations, building erection, and paving. The hauling of excavated materials and

1 Trip Generation Analysis for proposed Passage at San Mateo, Fehr & Peers, August 30, 2019.

construction materials would generate truck trips on local roadways as well. Vibratory pile driving is anticipated along the perimeter of parking garages.

Construction activities would be carried out in stages. During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 8 and 9. Table 8 shows the average noise level ranges by construction phase and Table 9 shows the maximum noise level ranges for different construction equipment. Most demolition and construction noise falls with the range of 80 to 90 dBA at 50 feet from the source. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 10 dBA noise reduction at distant receptors.

TABLE 8 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

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

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

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

TABLE 9 Construction Equipment 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

1 Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

2 Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

3 Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

Source: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

As shown in Tables 8 and 9, construction activities generate considerable amounts of noise, especially during demolition and earth-moving activities when heavy equipment is used. Project-specific equipment lists were not made available as of this writing. Based on the typical levels in these tables, at 50 feet from the noise source maximum instantaneous noise levels generated by project construction equipment are anticipated to range from 78 to 95 dBA L_{max} and hourly average noise levels are anticipated to range from 75 to 89 dBA L_{eq}.

Project construction would occur within 100 feet of residential land uses to the north and within 100 feet of commercial and office uses to the east and west. Construction noise levels would be anticipated to reach 89 dBA L_{max} at a distance of 100 during use of the vibratory pile driver along site property lines. Noise levels may exceed 80 dBA L_{max} at nearest land uses during other heavy phases of construction when equipment such as a concrete saw is operated within 50 feet of property lines to the north, east, and west.

It is assumed that construction activities would occur within the time periods allowed by the Municipal Code as described below. Noise levels would be anticipated to exceed 90 dBA at a distance of 50 feet during some periods of heavy construction. Additionally, noise levels due to construction activities would well exceed 60 dBA L_{eq} at nearby residential uses and 70 dBA L_{eq} at nearby commercial buildings. Ambient levels would increase by more than 5 dBA L_{eq} over a period exceeding one year. This is a **potentially significant** temporary impact.

Mitigation Measure 1: Modification, placement, and operation of construction equipment are possible means for minimizing the impact of construction noise on existing sensitive receptors. Construction equipment should be well-maintained and used judiciously to be as quiet as possible. Additionally, construction activities for the proposed project should include the following best management practices to reduce noise from construction activities near sensitive land uses:

- Construction activities, including truck traffic coming to and from the construction site for any purpose, shall be limited to the hours between 7:00 a.m. and 7:00 p.m., Monday through Friday, Saturdays between 9:00 a.m. and 5:00 p.m., and Sundays and Holidays between 12:00 p.m. and 4:00 p.m., in accordance with the City's Municipal Code, unless permission is granted with a development permit or other planning approval.

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

- Use of the concrete saw within 100 feet of shared property lines shall be limited, as feasible.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors. If they must be located near

receptors, adequate muffling (with barriers or enclosures where feasible and appropriate) shall be used to reduce noise levels at the adjacent sensitive receptors.

- Utilize "quiet" air compressors and other stationary noise sources where technology exists.

- During pile driving, temporary noise barriers, such as mass loaded construction blankets on temporary fencing or a solid plywood construction barrier, will be placed around the perimeter of construction areas where pile driving is taking place. The placement of these barriers will not allow clear, line of sight openings for site access between the pile driving activities and adjacent land uses. Noise control blanket barriers can be rented and quickly erected.

- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.

- The contractor shall prepare a detailed construction plana identifying the schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.

- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g. bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule.

Implementation of the above best management practices would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. With the implementation of these measures and recognizing that noise generated by construction activities would occur over a temporary period, the impact would be **less-than-significant**.

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Vibration from project construction could be perceptible at existing structures near the project site when heavy construction is located along property lines. Vibration levels would not exceed guidelines. **This is a less-than-significant impact.**

The City of San Mateo does not specify a construction vibration limit. For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 in/sec PPV for ancient buildings or buildings that are documented to be structurally weakened (see Table 3). The 0.3 in/sec PPV vibration limit would be applicable to properties in the vicinity of the project.

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (pile driving, jackhammers, hoe rams) are used. Construction activities would include

demolition, site preparation, grading and excavation, trenching and foundation, building (exterior), interior/architectural coating, and paving. Vibratory driving of shoring piles will be used along perimeters of parking garages.

Table 10 presents vibration levels from construction equipment at the reference distance of 25 feet and levels calculated at various distances representing nearby buildings. Vibration levels are highest close to the source, and then attenuate with increasing distance at the rate $(D_{ref}/D)^{1.1}$, where D is the distance from the source in feet and D_{ref} is the reference distance of 25 feet.

TABLE 10 Vibration Levels for Construction Equipment at Various Distances

Equipment		**PPV at 25 ft. (in/sec)**	**PPV at 100 ft. (in/sec)**	**PPV at 230 ft. (in/sec)**
Pile Driver (Sonic)	upper range	0.734	0.160	0.064
	typical	0.17	0.037	0.015
Clam shovel drop		0.202	0.044	0.018
Hydromill (slurry wall)	in soil	0.008	0.002	0.001
	in rock	0.017	0.004	0.001
Vibratory Roller		0.21	0.046	0.018
Hoe Ram		0.089	0.019	0.008
Large bulldozer		0.089	0.019	0.008
Caisson drilling		0.089	0.019	0.008
Loaded trucks		0.076	0.017	0.007
Jackhammer		0.035	0.008	0.003
Small bulldozer		0.003	0.001	0.000

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, October 2018 as modified by Illingworth & Rodkin, Inc., January 2019.

The closest structures to the project site are located approximately 100 feet from the site boundaries, including residences to the north across Concar Drive, an office building to the west across South Delaware Street, and commercial use across South Grant Street to the east. A multifamily residential use is located approximately 230 feet northeast of the project boundary at the intersection of Concar Drive and South Delaware Street. At these locations vibration levels are not expected to exceed the 0.3 in/sec PPV threshold and would not be anticipated to be impacted by project construction generated vibration. This is a **less-than-significant** impact.

Mitigation Measure 2: None required.