

PDC18-016

APPENDIX D

Noise and Vibration Assessment

259 MERIDIAN AVENUE MIXED- USE NOISE AND VIBRATION ASSESSMENT

San José, California

December 5, 2018

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Project: 18-062

INTRODUCTION

A 241 micro-unit multi-family residential project is proposed at 259 Meridian Avenue in San José, California. The proposed project would include 162 parking spaces in a two-level parking garage and approximately 1,300 square feet (s.f.) of commercial land use. Currently, the site is developed with three commercial office buildings, which would be demolished under project conditions. Land uses in the project vicinity include medical offices to the south and single-family residences to the north. A self-storage facility is located to the west, and additional commercial land uses are located to the east, opposite Meridian Avenue.

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

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 (L_{dn} or DNL)* 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 DNL. Typically, the highest steady traffic noise level during the daytime is about equal to the DNL 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 DNL with open windows and 65-70 dBA DNL 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 DNL 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 DNL. At a DNL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the DNL 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 DNL of 60-70 dBA. Between a DNL of 70-80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the DNL 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 sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max} , L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01} , L_{10} , L_{50} , L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

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

TABLE 2 Typical Noise Levels in the Environment

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

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

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

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

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

Regulatory Background - Noise

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

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

- (a) Exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;
- (b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;
- (c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- (d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

- (e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels; or
- (f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

Pursuant to recent court decisions, the impacts of site constraints, such as exposure of the proposed project to excessive levels of noise and vibration, are not included in the Impacts and Mitigation Section of this report. These items are discussed in a separate section addressing the project's consistency with the policies set forth in the City's General Plan.

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

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

2016 California Building Cal Green Code. The State of California established exterior sound transmission control standards for new non-residential buildings, as set forth in the 2010 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). These standards were not altered in the 2016 revisions. 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. Both of 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 DNL 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 ($L_{eq}(1-hr)$) of 50 dBA in occupied areas during any hour of operation.

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San José. The following policies are applicable to the proposed project:

EC-1.1 Locate new development in areas where noise levels are appropriate for the proposed uses. Consider federal, state, and City noise standards and guidelines as a part of new development review. Applicable standards and guidelines for land uses in San José include:

Interior Noise Levels

- The City's standard for interior noise levels in residences, hotels, motels, residential care facilities, and hospitals is 45 dBA DNL. Include appropriate site and building design, building construction and noise attenuation techniques in new development to meet this standard. For sites with exterior noise levels of 60 dBA DNL or more, an acoustical analysis following protocols in the City-adopted California Building Code is required to demonstrate that development projects can meet this standard. The acoustical analysis shall base required noise attenuation techniques on expected Envision General Plan traffic volumes to ensure land use compatibility and General Plan consistency over the life of this plan.

Exterior Noise Levels

- The City's acceptable exterior noise level objective is 60 dBA DNL or less for residential and most institutional land uses (Table EC-1). The acceptable exterior noise level objective is established for the City, except in the environs of the San José International Airport and the Downtown, as described below:
 - For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA DNL in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA DNL exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA DNL standard for noise from sources other than aircraft and elevated roadway segments.

Table EC-1: Land Use Compatibility Guidelines for Community Noise in San José

LAND USE CATEGORY	EXTERIOR NOISE EXPOSURE (DNL IN DECIBELS (DBA))					
	55	60	65	70	75	80
1. Residential, Hotels and Motels, Hospitals and Residential Care ¹						
2. Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds						
3. Schools, Libraries, Museums, Meeting Halls, Churches						
4. Office Buildings, Business Commercial, and Professional Offices						
5. Sports Arena, Outdoor Spectator Sports						
6. Public and Quasi-Public Auditoriums, Concert Halls, Amphitheaters						

¹Noise mitigation to reduce interior noise levels pursuant to Policy EC-1.1 is required.

Normally Acceptable:

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

Conditionally Acceptable:

- Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.

Unacceptable:

- New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

EC-1.2 Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3 and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:

- Cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain “Normally Acceptable;” or
- Cause the DNL at noise sensitive receptors to increase by three dBA DNL or more where noise levels would equal or exceed the “Normally Acceptable” level.

EC-1.3 Mitigate noise generation of new nonresidential land uses to 55 dBA DNL at the property line when located adjacent to existing or planned noise-sensitive residential and public/quasi-public land uses.

EC-1.6 Regulate the effects of operational noise from existing and new industrial and commercial development on adjacent uses through noise standards in the City’s Municipal Code.

EC-1.7 Require construction operations within San José to use best available noise suppression devices and techniques and limit construction hours near residential uses per the City’s Municipal Code. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:

- Involve substantial noise generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.

EC-1.11 Require safe and compatible land uses within the Mineta San José International Airport noise zone (defined by the 65 CNEL contour as set forth in State law) and encourage aircraft operating procedures that minimize noise.

City of San José Municipal Code. The City’s Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. Chapter 20.30.700 states that sound pressure levels generated by any use or combination of uses on a property shall not exceed 55 dBA at any property line shared with land zoned for residential use, except upon issuance and in compliance with a Conditional Use Permit.

Chapter 20.100.450 of the Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 a.m. and 7:00 p.m. Monday through Friday unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.

Chapter 20.40.500 of the Municipal Code prohibits outdoor activity, including loading, sweeping, landscaping or maintenance, that occurs within 150 feet of any residentially zoned property between the hours of 12:00 a.m. midnight and 6:00 a.m.

Santa Clara County Airport Land Use Commission Comprehensive Land Use Plan. The Comprehensive Land Use Plan adopted by the Santa Clara County Airport Land Use Commission contains standards for projects within the vicinity of San José International Airport, which are relevant to this project:

4.3.2.1 Noise Compatibility Policies

Policy N-3 Noise impacts shall be evaluated according to the Aircraft Noise Contours presented on Figure 5 (2022 Aircraft Noise Contours).

Policy N-4 No residential or transient lodging construction shall be permitted within the 65 dB CNEL contour boundary unless it can be demonstrated that the resulting interior sound levels will be less than 45 dB CNEL and there are no outdoor patios or outdoor activity areas associated with the residential portion of a mixed use residential project or a multi-unit residential project. (Sound wall noise mitigation measures are not effective in reducing noise generated by aircraft flying overhead.)

Regulatory Background – Vibration

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies to achieve the goal of minimizing vibration impacts on people, residences, and business operations in the City of San José. The following policies are applicable to the proposed project:

EC-2.3 Require new development to minimize vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, a vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to a building. A vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction.

Existing Noise Environment

The project site is located at 259 Meridian Avenue in San José, California. The site is surrounded by commercial uses as well as some single-family residences. Commercial buildings consisting of local businesses and offices exist to the west, south, and east. To the north, four single-family homes border the proposed project site. The site is approximately 2 miles away from Norman Y. Mineta San Jose International Airport. San Carlos Street and Meridian Avenue are the projects two major noise sources.

A noise monitoring survey was performed in the project vicinity beginning on Monday, April 30, 2018 and concluding on Thursday, May 3, 2018. The monitoring survey included two long-term (LT-1 and LT-2) noise measurements and one short-term (ST-1) noise measurements. All measurement locations are shown in Figure 1.

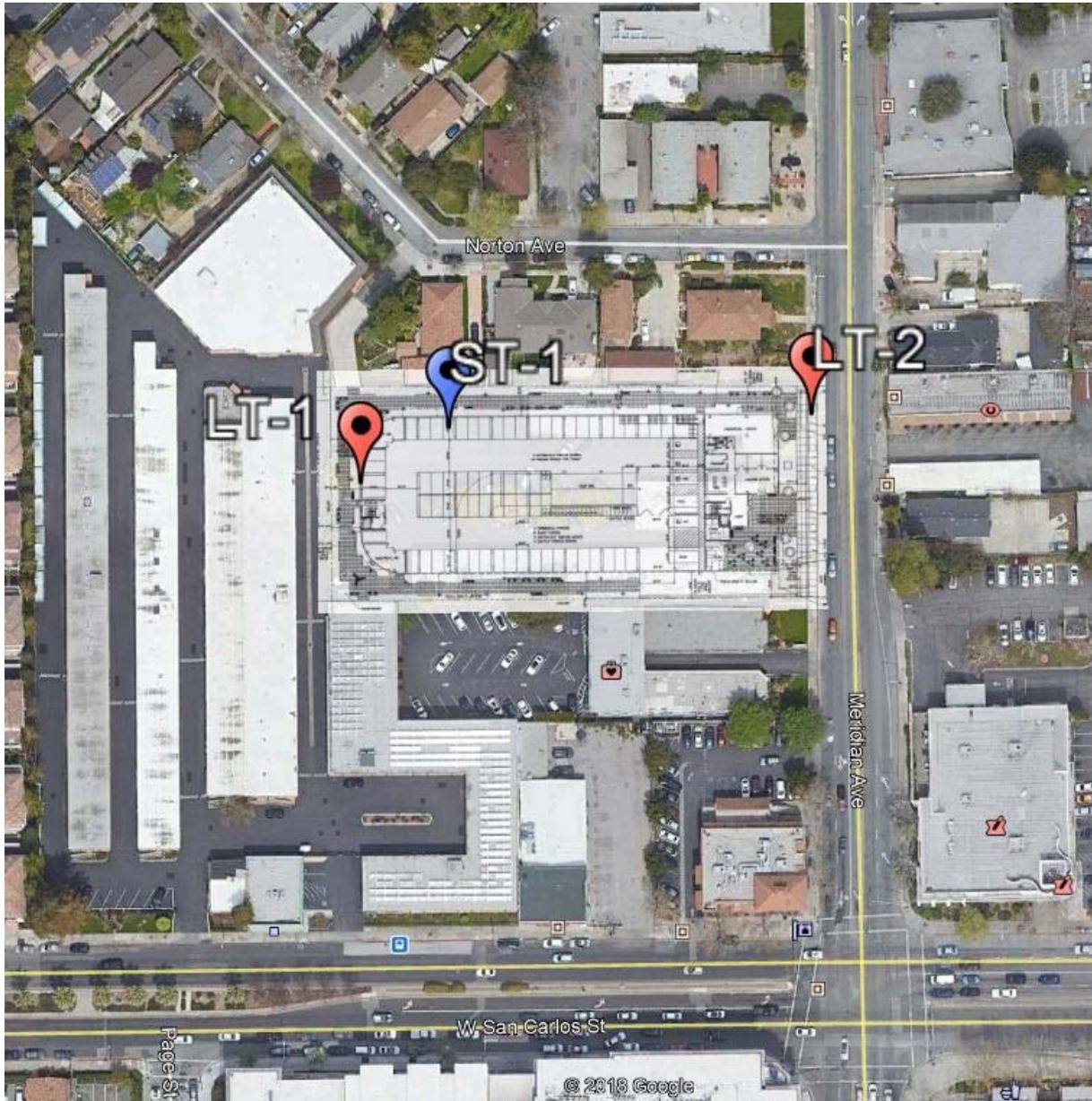
Long-term noise measurement LT-1 was made along the western boundary of the site. This location was selected to quantify noise levels near the closest residential receptors. Hourly average noise levels at this location typically ranged from 48 to 59 dBA L_{eq} during the day and from 41 to 58 dBA L_{eq} at night. The day-night average noise level at LT-1 ranged from 58 to 59 dBA DNL, and the daily trends in noise levels at LT-1 are shown in Figures 2 through 5.

Noise measurement LT-2 was made along the eastern boundary of the site, approximately 25 feet from the centerline of Meridian Avenue. This location was selected to quantify noise levels due to traffic along Meridian Avenue. Hourly average noise levels at this location typically ranged from 63 to 69 dBA L_{eq} during the day and from 50 to 65 dBA L_{eq} at night. The day-night average noise

level ranged from 68 to 69 dBA DNL at LT-2, and the daily trends in noise levels at LT-2 are shown in Figures 6 through 9.

A short-term noise measurement was made over a 10-minute period, concurrent with the long-term noise data, on Thursday, May 3, 2018, between 12:40 p.m. and 12:50 p.m. Noise measurement ST-1 was made towards the wet end of the site, approximately 300 feet west of the centerline of Meridian Avenue. The 10-minute average noise level measured at ST-1 was 48 dBA $L_{eq}(10\text{-min})$. All short-term measurement results are summarized in Table 4.

FIGURE 1 Noise Measurement Locations



Source: Google Earth 2018.

FIGURE 2 Daily Trends in Noise Levels at LT-1, Monday, April 30, 2018

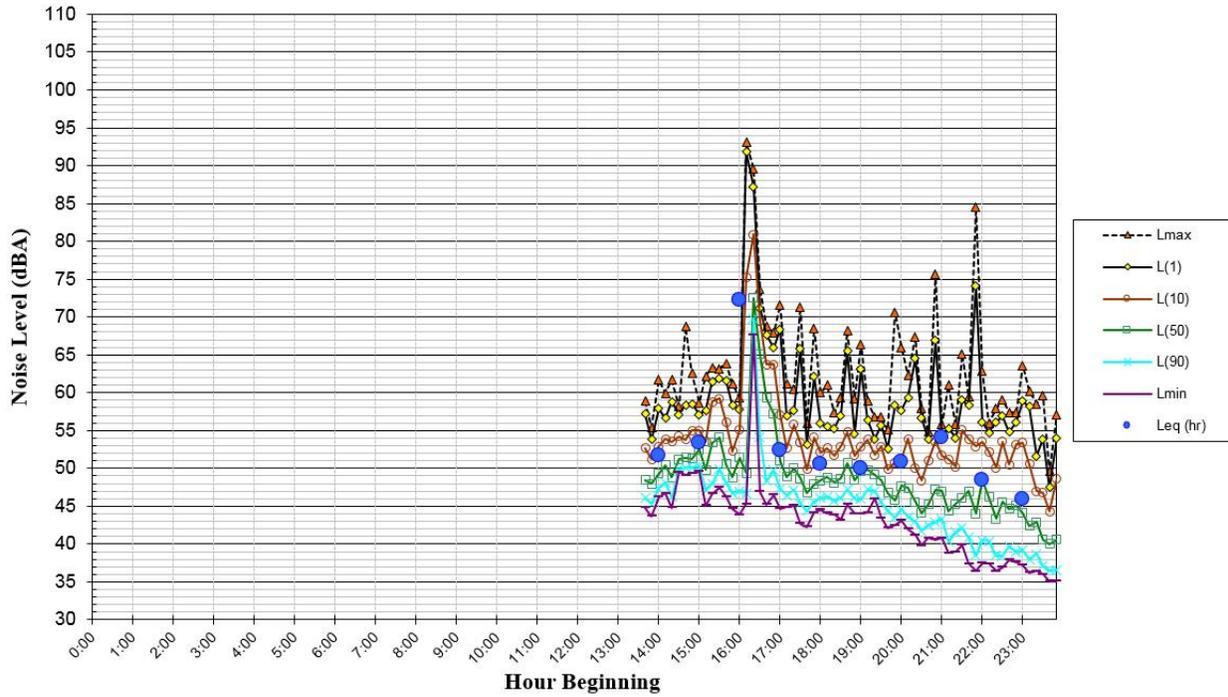


FIGURE 3 Daily Trends in Noise Levels at LT-1, Tuesday, May 1, 2018

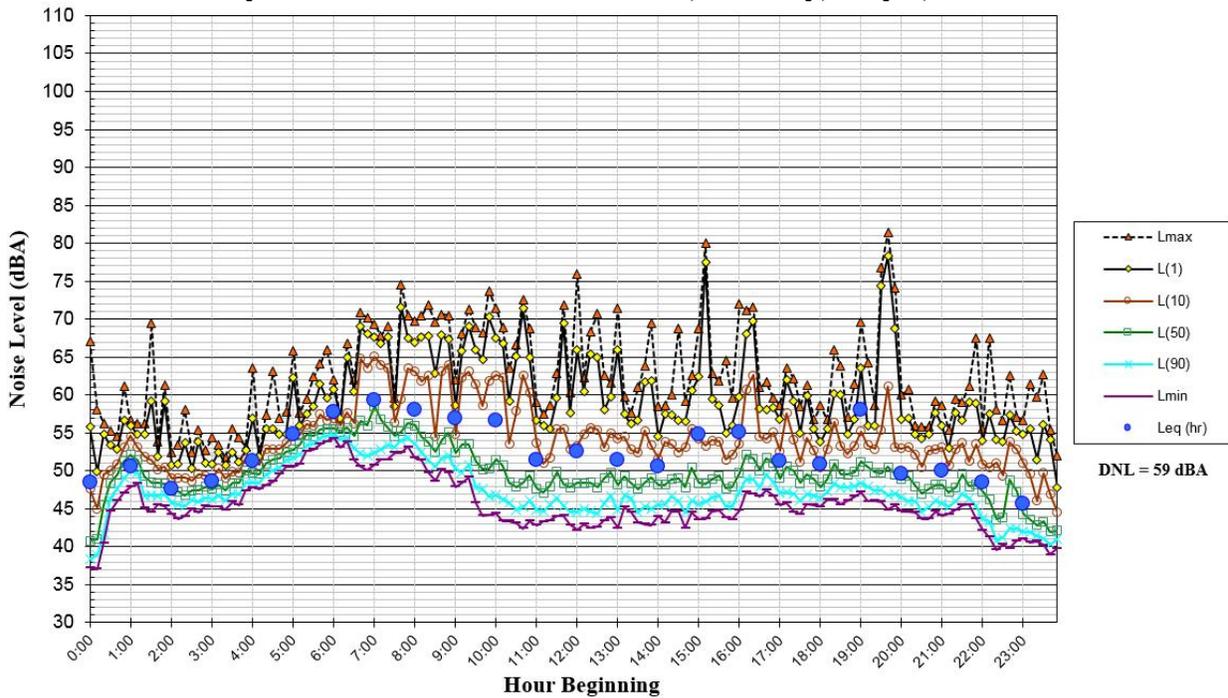


FIGURE 4 Daily Trends in Noise Levels at LT-1, Wednesday, May 2, 2018

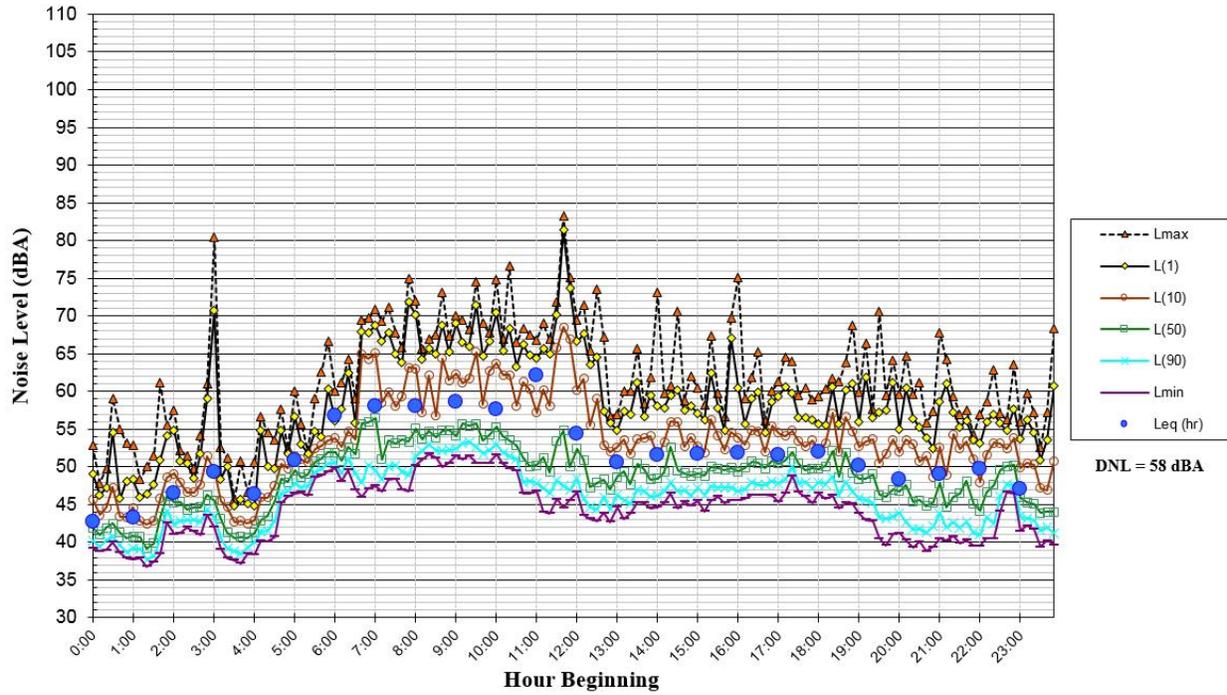


FIGURE 5 Daily Trends in Noise Levels at LT-1, Thursday, May 3, 2018

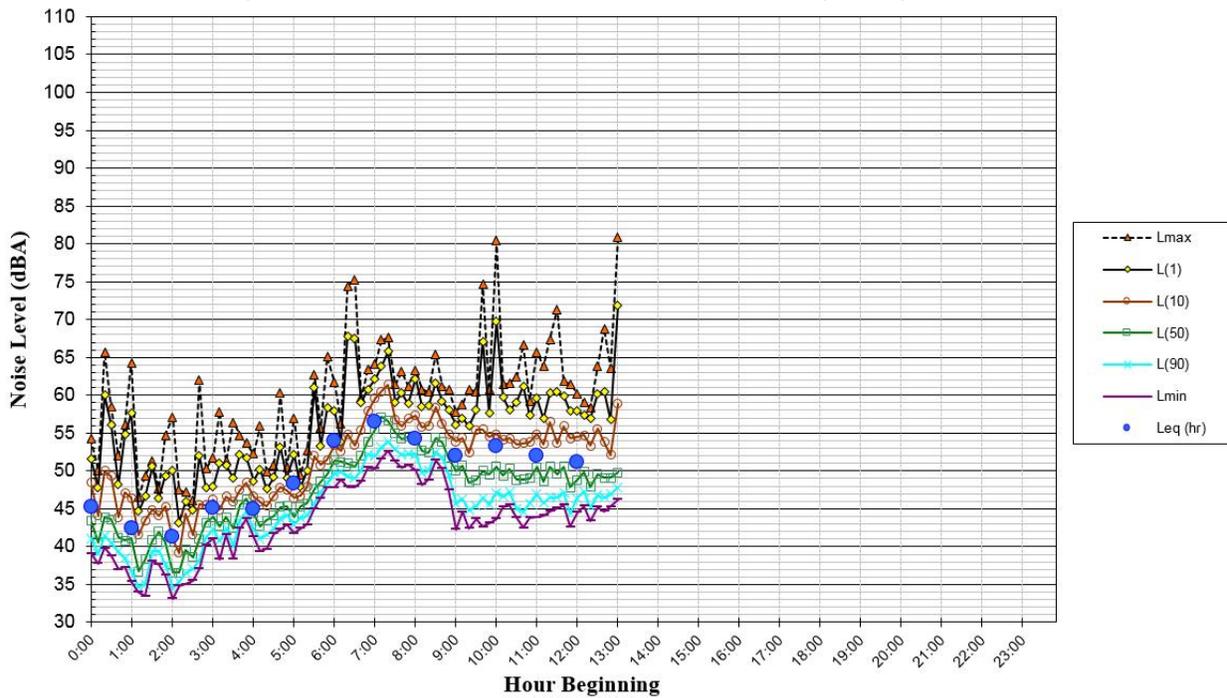


FIGURE 6 Daily Trends in Noise Levels at LT-2, Monday, April 30, 2018

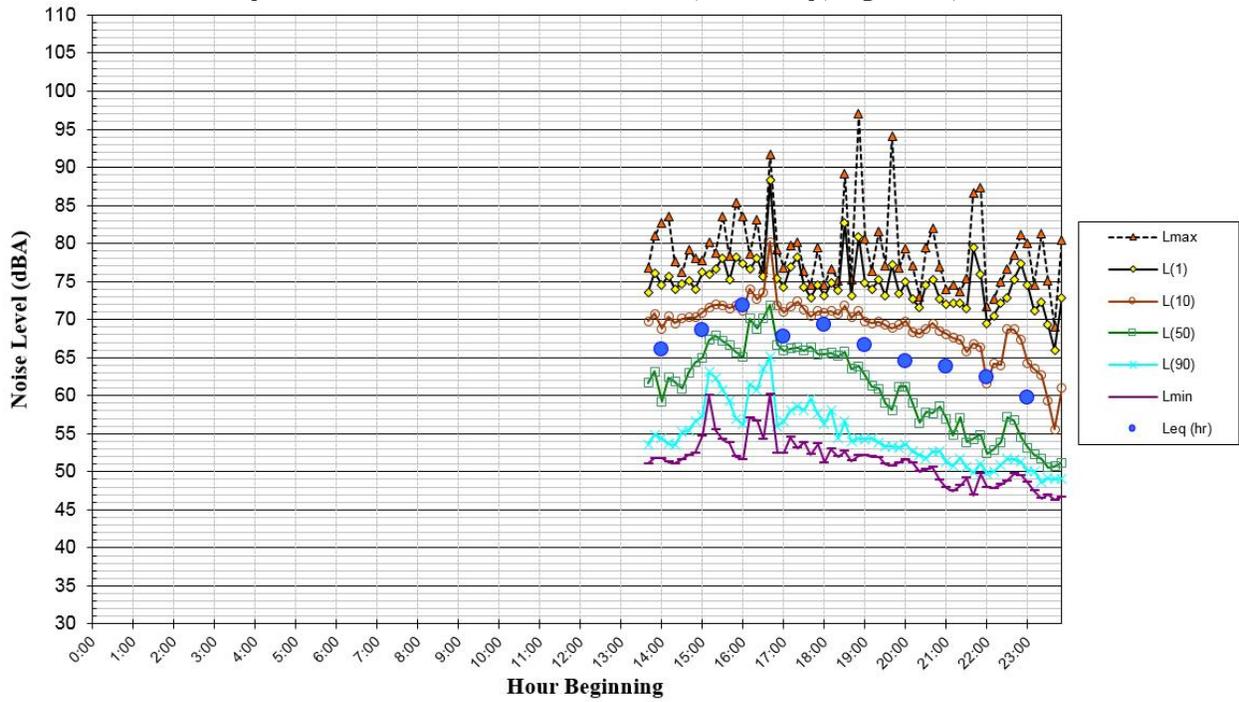


FIGURE 7 Daily Trends in Noise Levels at LT-2, Tuesday, May 1, 2018

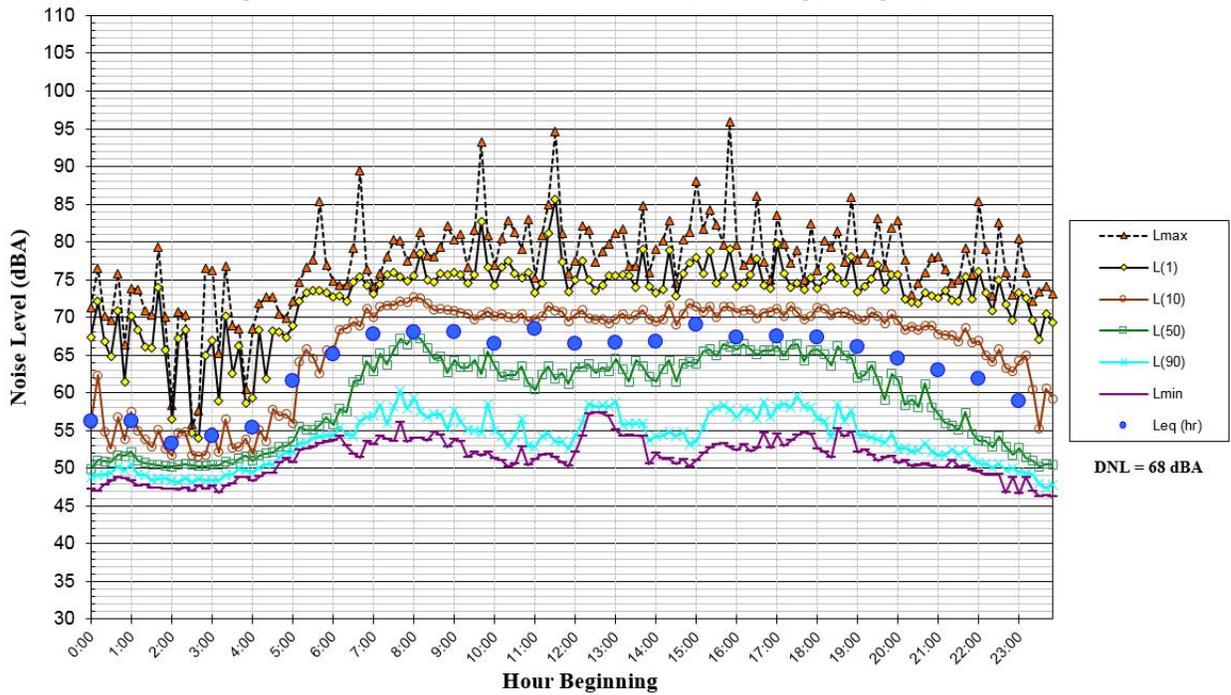


FIGURE 8 Daily Trends in Noise Levels at LT-2, Wednesday, May 2, 2018

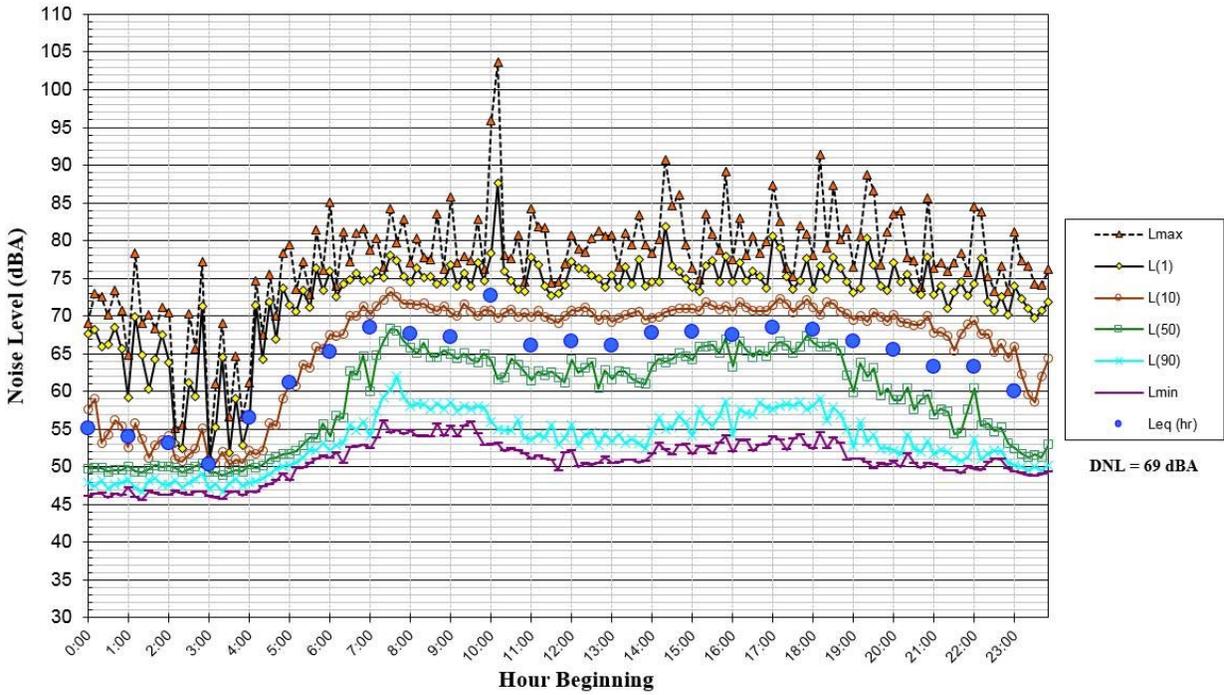


FIGURE 9 Daily Trends in Noise Levels at LT-2, Thursday, May 3, 2018

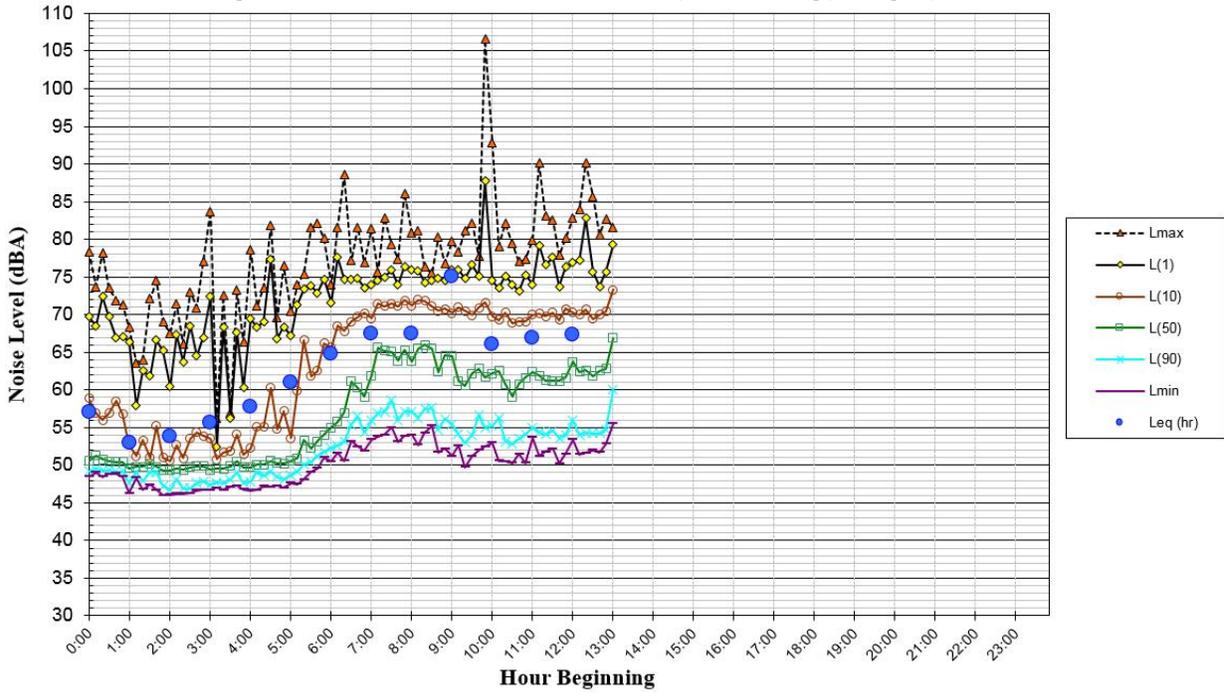


TABLE 4 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location (Date, Time)	L _{max}	L ₍₁₎	L ₍₁₀₎	L ₍₅₀₎	L ₍₉₀₎	L _{eq(10-min)}
ST-1: Back of site, 27 feet from northern border (5/3/2018, 12:40-12:50)	58	56	51	46	44	48

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The exterior noise threshold established in the City’s General Plan for new residential projects is 60 dBA DNL at usable outdoor activity areas, excluding balconies and porches. For commercial uses, the City’s “normally acceptable” threshold for exterior noise is 70 dBA DNL. The City requires that interior noise levels be maintained at 45 dBA DNL or less for residential uses. The Cal Green Code applies to the non-residential components of the proposed mixed-use project.

The future noise environment at the project site would continue to result primarily from vehicular traffic along Meridian Avenue and nearby San Carlos Street. A traffic report was completed by *Hexagon Transportation Consultants, Inc.* for the proposed project and included traffic scenarios for existing, background, and background plus project;¹ however, cumulative and cumulative plus project conditions were not included in the traffic study. To estimate future traffic noise levels in the year 2040, a review of the traffic volumes contained in the *Envision San José 2040 General Plan Comprehensive EIR*² was made. This review indicated that there would not be a measurable increase in traffic noise along Meridian Avenue, while a 1 dBA DNL increase would occur along San Carlos Street. The trips generated by the proposed project would be minimal compared to the existing traffic volumes along the surrounding roadways. Therefore, the project would not result a measurable traffic noise increase. The future noise levels at LT-2 would range from 69 to 70 dBA DNL under future cumulative conditions.

Future Exterior Noise Environment

Residential Land Uses

Two third-floor residential outdoor use courtyards were identified from a review of the site plan. Both of these courtyards would be surrounded by the building along the southern, eastern, and western sides and would be open to the north. The courtyard nearest to Meridian Avenue would be set back at least 100 feet from the centerline and would be exposed to a future exterior noise level of 65 dBA DNL assuming no intervening shielding. Additionally, both courtyards would be mostly shielded from the proposed building, with some direct exposure along the northern edge of both courtyards. Since most of the extended use would occur towards the center of the courtyards where the occupants would be mostly shielded, the future exterior noise levels at each courtyard would be below the residential outdoor use threshold of 60 dBA DNL. The residential outdoor use areas at the proposed project site would be compatible with the noise environment.

¹ Hexagon Transportation Consultants, Inc., “259 Meridian Avenue Mixed-Use Development Transportation Analysis,” September 24, 2018.

² City of San José, “Envision San José 2040 General Plan,” 2011.

Commercial Retail Uses

A ground floor public plaza was identified from a review of the site plan. The public plaza would be set back at least 50 feet from the Meridian Avenue centerline and would be exposed to a future exterior noise level of 68 dBA DNL assuming no intervening shielding. Additionally, the plaza would be partially shielded by the proposed building along the western and northern sides and would have some direct exposure along the eastern and southern edge of the plaza. Since most of the extended use would occur towards the center of the courtyards where the occupants would be mostly partially shielded, the future exterior noise levels at each courtyard would be below the commercial outdoor use threshold of 70 dBA DNL. The commercial outdoor use areas at the proposed project site would be compatible with the noise environment.

Future Interior Noise Environment

Residential Land Uses

Standard residential construction, assuming windows to be partially open, provides exterior-to-interior noise reduction of approximately 15 dBA. With the windows maintained closed, standard residential construction typically provides 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA DNL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA DNL, 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. In severe noise exposures, smaller window and door sizes as a percentage of the total building façade facing the noise source could be considered.

Units located along the eastern building façade would have direct line-of-sight to traffic noise along Meridian Avenue, and this façade would be set back approximately 50 feet from the centerline of the roadway. At this distance, the exterior-facing units along this façade would be exposed to future exterior noise levels ranging from 66 to 67 dBA DNL.

The northern and southern façades would be partially shielded from Meridian Avenue by the buildings located on the adjacent sites. With setbacks ranging from 50 to 350 feet, exterior-facing units along these façades would be exposed to future exterior noise levels ranging from 59 to 67 dBA DNL.

Units located along the western façade would be adequately shielded from traffic noise along Meridian Avenue such that the noise exposure would be below 60 dBA DNL on the exterior of the building.

Assuming a 15 dBA exterior-to-interior reduction, the future interior noise levels at the units along the eastern façade of the proposed building would be up to 52 dBA DNL. Measures would be required to reduce interior noise levels to meet the City's interior thresholds.

Commercial Retail Uses

The performance method enforced in the Cal Green Code requires that interior noise levels be maintained at 50 dBA $L_{eq}(1-hr)$ or less during hours of operation at the proposed commercial retail.

The site plan indicates a commercial land use would be located on the first floor of the proposed building, along the eastern façade. The setback of this commercial use from the centerline of Meridian Avenue would be approximately 50 feet. At this distance, the commercial use would be exposed to future exterior noise levels ranging from 61 to 67 dBA $L_{eq}(1-hr)$ during daytime hours, and a day-night average noise level of 67 dBA DNL.

Standard construction materials for commercial uses would provide at least 20 to 25 dBA of noise reduction in interior spaces. The inclusion of adequate forced-air mechanical ventilation systems is normally required so windows may be kept closed at the occupant's discretion. The standard construction materials in combination with forced-air mechanical ventilation would satisfy the daytime threshold of 50 dBA $L_{eq}(1-hr)$.

Noise Insulation Features to Reduce Future Interior Noise Levels

The following noise insulation features shall be incorporated into the proposed project to reduce interior noise levels to 45 dBA DNL or less:

- Preliminary calculations indicate that the residential units along the eastern façades of proposed building would require windows and doors with a minimum rating of 28 STC to meet the interior noise threshold of 45 dBA DNL.
- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all residential units on the project site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards.
- A qualified acoustical specialist shall prepare a detailed analysis of interior residential noise levels resulting from all exterior sources during the design phase pursuant to requirements set forth in the State Building Code. The study will also establish appropriate criteria for noise levels inside the commercial spaces affected by environmental noise. The study will review the final site plan, building elevations, and floor plans prior to construction and recommend building treatments to reduce residential interior noise levels to 45 dBA DNL or lower. Treatments would include, but are not limited to, sound-rated windows and doors, sound-rated wall and window constructions, acoustical caulking, protected ventilation openings, etc. The specific determination of what noise insulation treatments are necessary shall be conducted on a unit-by-unit basis during final design of the project. Results of the analysis, including the description of the necessary noise control treatments, shall be submitted to the City, along with the building plans and approved design, prior to issuance of a building permit.

The implementation of these noise insulation features would reduce interior noise levels to 45 dBA DNL or less.

Aircraft Noise

Norman Y. Mineta San José International Airport is a public-use airport located approximately 1.8 miles north of the project site. A review of the 2027 noise contour map established by the Santa Clara County ALUC indicates that the project site is located outside of the future Mineta San José International Airport 65 CNEL noise contour. Residential land uses proposed in exterior noise environments of 65 CNEL or less are considered compatible with aircraft noise by the Santa Clara County ALUC. While occasional aircraft flyovers would be audible at the site, the proposed project would be compatible with the City's exterior noise standards for aircraft noise.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

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

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.
- A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.2 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.
- A significant impact would be identified if traffic generated by the project would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.
- A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} , and the ambient by at least 5 dBA L_{eq} , for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses.

Impact 1: Noise Levels in Excess of Standards. The proposed project could generate noise in excess of standards established in the City's General Plan and Municipal Code at the nearby sensitive receptors. **This is a potentially significant impact.**

Residential buildings typically require various mechanical equipment, such as air conditioners, exhaust fans, and air handling equipment for ventilation of the buildings. The site plan indicates utility and electrical rooms located within the ground-floor parking structure; however, the type of equipment expected in these rooms was not available. Typically, mechanical equipment, such as air conditioning units, are located on the rooftops of buildings, but at the time of this study, the roof plans were unavailable. Without knowing specific information such as the number and types of units, size, housing specifications, source noise levels, and precise locations, the impact of mechanical equipment noise on nearby noise-sensitive uses cannot be assessed at this time.

Currently, residential land uses adjoin the site along the northern boundary of the site, as well as northeast of the site, opposite Meridian Avenue. Design planning should take into account the noise criteria associated with mechanical equipment and utilize site planning to locate equipment in less noise-sensitive areas, such as the rooftop away from the edge of the building nearest to these residential land uses. Other controls, such as fan silencers, enclosures, and taller screen walls, etc., may be required.

Under the City's Noise Element, noise levels from building equipment shall not exceed a noise level of 55 dBA DNL at receiving noise-sensitive land uses. Conservatively, mechanical equipment noise for the proposed project has the potential to exceed 55 dBA DNL at the nearby sensitive uses. This is conservatively considered a significant impact.

Mitigation Measure 1:

Mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's 55 dBA DNL noise level requirement at the nearby noise-sensitive land uses. A qualified acoustical consultant shall be retained to review mechanical noise as these systems are selected to determine specific noise reduction measures necessary to reduce noise to comply with the City's noise level requirements. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and installation of noise barriers, such as enclosures and parapet walls, to block the line-of-sight between the noise source and the nearest receptors. Other alternate measures may be optimal, such as locating equipment in less noise-sensitive areas, such as rooftop away from the northern and eastern edges, where feasible.

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Construction-related vibration levels resulting from activities near the northern, western, and southern boundaries of the project site would potentially exceed 0.2 in/sec PPV at the adjacent residential and commercial land uses. **This is a significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site preparation work, foundation work, and new building framing and finishing. While a list of construction equipment was not available for the proposed project, pile driving, which can cause excessive vibration, is not expected for the proposed project.

Policy EC-2.3 of the City of San José General Plan limits vibration levels during demolition and construction to 0.08 in/sec PPV for sensitive historic structures to minimize the potential for cosmetic damage to buildings on adjacent sites. A vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction. With no known historical buildings in the vicinity of the project site, a significant impact would occur if nearby buildings were exposed to vibration levels in excess of 0.20 in/sec PPV.

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

TABLE 5 Vibration Source Levels for Construction Equipment

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

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

While the proposed residential building would be set back approximately 20 feet from the northern, western, and southern boundaries, demolition of the existing buildings on the site would likely result in the use of heavy equipment along the northern and southern boundaries. The nearest residential and commercial structures on the adjacent sites to the north and to the south, respectively, would be within 5 to 10 feet of the shared property lines. At these distances, vibration levels would be up to 1.23 in/sec PPV, which would exceed the City’s 0.2 in/sec PPV limit.

The existing storage unit to the west of the site would be approximately 25 feet from the shared property line. Assuming construction activities could occur along the shared property line, vibration levels would be up to 0.21 in/sec PPV at the nearest storage unit building. While these vibration levels would exceed the City’s limit, storage facilities are not typically considered sensitive uses and may not be result in significant vibration impact. The residential and commercial

buildings to the east, opposite Meridian Avenue, would be approximately 60 feet or more from the eastern boundary of the site. Vibration levels at this distance would be at or below 0.08 in/sec PPV.

When the use of heavy equipment occurs near the northern and southern property lines, vibration levels at the adjacent residential and commercial buildings would exceed the 0.2 in/sec PPV threshold. Construction activity for the proposed project could potentially result in cosmetic damage to the residences and commercial buildings adjacent to the site along these boundaries. This is a significant impact.

Mitigation Measure 2:

The following measures shall be implemented where vibration levels due to construction activities would exceed 0.2 in/sec PPV at nearby sensitive uses:

- Comply with the City's Municipal Code, which limits construction hours at sites within 500 feet of residential land uses to between 7:00 a.m. and 7:00 p.m. Monday through Friday. Construction is prohibited on weekends at sites located within 500 feet of residential units.
- The project contractor shall avoid using vibratory rollers and packers near sensitive areas, such as the northern and southern property lines, whenever possible.
- Prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or clam shovel drops, within 20 feet of any adjacent sensitive land use, where feasible.
- The contractor shall alert heavy equipment operators to the close proximity of the adjacent structures so they can exercise extra care.
- The contractor shall retain a qualified firm to conduct a pre- and post-construction cosmetic crack survey of the buildings adjacent to the northern and southern boundaries and shall repair any additional cosmetic cracking.

Critical factors pertaining to the impact of construction vibration on sensitive receptors include the proximity of the existing structures to the project site, the soundness of the structures, and the methods of construction used. The implementation of these mitigation measures would reduce a potential impact to a less-than-significant level.

Impact 3: Permanent Noise Level Increase. The proposed project is not expected to cause a substantial permanent noise level increase at the existing residential land uses in the project vicinity. **This is a less-than-significant impact.**

According to Policy EC-1.2 of the City's General Plan, a significant permanent noise increase would occur if the project would increase noise levels at noise-sensitive receptors by 3 dBA DNL or more where ambient noise levels exceed the "normally acceptable" noise level standard. Where ambient noise levels are at or below the "normally acceptable" noise level standard, noise level increases of 5 dBA DNL or more would be considered significant. The City's General Plan defines

the “normally acceptable” outdoor noise level standard for the residential land uses to be 60 dBA DNL. Existing ambient levels, based on the measurements made in the project vicinity, exceed 60 dBA DNL along Meridian Avenue. Therefore, a significant impact would occur if traffic due to the proposed project would permanently increase ambient levels by 3 dBA DNL. For reference, a 3 dBA DNL noise increase would be expected if the project would double existing traffic volumes along a roadway.

Traffic volumes for the proposed project were provided for five different intersections in the project vicinity.¹ While existing plus project traffic conditions were not provided in the traffic report, existing traffic conditions and project trips were provided for each of the intersections. The project trips were added to the existing conditions to estimate the existing plus project traffic conditions. Upon comparison of existing plus project volumes to the existing traffic volumes, a traffic noise increase of less than 1 dBA was estimated for each roadway segment included in the traffic report. The project would neither result in a doubling of traffic nor result in a permanent noise increase of 3 dBA DNL or more. This is a less-than-significant impact.

Mitigation Measure 3: None required.

Impact 4: Temporary Construction Noise. Existing noise-sensitive land uses would be exposed to a temporary increase in ambient noise levels due to project construction activities. The incorporation of construction best management practices as project conditions of approval would result in a **less-than-significant** temporary noise impact.

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

Policy EC-1.7 of the City’s General Plan requires that all construction operations within the City to use best available noise suppression devices and techniques and to limit construction hours near residential uses per the Municipal Code allowable hours, which are between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday when construction occurs within 500 feet of a residential land use. Further, the City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

While noise thresholds for temporary construction are not provided in the City’s General Plan or Municipal Code, the Fundamentals section of this report provides a threshold of 45 dBA for speech interference indoors. Assuming a 15 dBA exterior-to-interior reduction for standard residential construction and a 25 dBA exterior-to-interior reduction for standard commercial construction, 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. Additionally, temporary construction would be annoying to surrounding

land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Therefore, the temporary construction noise impact would be considered significant 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.

The property line of the existing residences to the north are approximately 75 feet from the center of the project site. Ambient noise levels at these residences range from 48 to 59 dBA L_{eq} during daytime hours. Existing commercial buildings south of the site are also 75 feet from the center of project site and have daytime ambient noise levels ranging from 63 to 69 dBA L_{eq} . The distance from the center of the site to the commercial and residential uses to the east of the project site are approximately 235 feet. These land uses have ambient noise levels ranging from 63 to 69 dBA L_{eq} during daytime hours. As stated above, the storage facility to the west is not considered a noise-sensitive land use and is not treated as a receptor for this temporary construction noise assessment.

The typical range of maximum instantaneous noise levels for the proposed project would be 70 to 90 dBA L_{max} at a distance of 50 feet (see Table 6). Table 7 shows the average noise level ranges, by construction phase. Hourly average noise levels generated by construction are about 72 to 88 dBA L_{eq} for residential buildings measured at a distance of 50 feet from the center of a busy construction site. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors.

Construction of the entire project is expected to take approximately 14 months to complete. Since construction information, such as equipment phasing information, type and quantity of equipment expected to be used in each phase, and the length of time for each phase was not provided at the time of this study, default construction information for a project of the type and size was used. Based on this information, construction noise levels were estimated at the nearby existing residential and commercial land uses. Table 8 summarizes the construction information provided at the time of this study, as well as the estimated noise levels at the receiving land uses surrounding the site when each piece of equipment is used simultaneously. For the purposes of these estimations, the distances were measured from the center of the active construction site during each phase to the nearest property line of the receiving land use. For the purposes of estimating the worst-case scenario, no noise reduction due to shielding was assumed.

As shown in Table 8, construction noise levels would exceed 60 dBA L_{eq} at the existing residential land uses throughout the duration of construction and would exceed 70 dBA L_{eq} at the existing commercial uses. Further, ambient levels at the surrounding uses would potentially be exceeded by 5 dBA L_{eq} or more throughout construction.

TABLE 6 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.

TABLE 7 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 8 Estimated Construction Noise Levels at the Noise-Sensitive Receptors

Phase of Construction	Time Duration	Construction Equipment (Quantity)	Calculated Hourly Average Noise Levels, L_{eq} (dBA)		
			Residences to the North (75 feet)	Commercial Uses to the South (75 feet)	Commercial & Residential Uses to the East (235 feet)
			Ambient levels = 69-74 dBA	Ambient levels = 54-64 dBA	
Demolition	9/1/2019-9/27/2019	Concrete/Industrial Saw (1) Excavator (3) Rubber-Tired Dozer (2)	83 dBA	83 dBA	73 dBA
Site Preparation	9/28/2019-10/11/2019	Rubber-Tired Dozer (3) Tractor/Loader/Backhoe (4)	84 dBA	84 dBA	74 dBA
Grading/Excavation	10/12/2019-11/8/2019	Excavator (1) Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (3)	84 dBA	84 dBA	74 dBA
Trenching/Foundation*	10/12/2019-10/25/2019	Tractor/Loader/Backhoe (1) Excavator (1)	85 dBA	85 dBA	75 dBA
Building Exterior	11/9/2019-9/25/2020	Crane (1) Forklift (3) Generator Set (1) Tractor/Loader/Backhoe (3) Welder (1)	83 dBA	83 dBA	73 dBA
Paving	9/26/2020-10/23/2020	Paver (2) Paving Equipment (2) Roller (2)	78 dBA	78 dBA	68 dBA
Building Interior/Architectural Coating	10/24/2020-11/20/2020	Air Compressor (1)	70 dBA	70 dBA	60 dBA

* Trenching/Foundation phase overlaps with the grading/excavation phase.

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. Construction activities will be conducted in accordance with the provisions of the City's General Plan and the Municipal Code, which limits temporary construction work within 500 feet of residential land uses to between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday. Construction is prohibited on weekends at sites located within 500 feet of residential units. Further, the City shall require the construction crew to adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity.

Construction Best Management Practices

Develop and implement a construction noise control plan, including, but not limited to, the following available controls:

- In accordance with Policy EC-1.7 of the City's General Plan, utilize the best available noise suppression devices and techniques during construction activities.
- Construct temporary noise barriers, where feasible, to screen stationary noise-generating equipment. Temporary noise barrier fences would provide a 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.
- 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 as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.
- Utilize "quiet" air compressors and other stationary noise sources where technology exists.
- 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.
- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.
- 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 plan 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 in it the notice sent to neighbors regarding the construction schedule.

Implementation of the above measures 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 of less than one year, Policy EC-1.7 of the City's General Plan would consider this temporary construction impact to be less-than-significant.

Mitigation Measure 4: None required.