STOCKTON AVENUE MIXED-USE HOTEL NOISE AND VIBRATION ASSESSMENT

San José, California

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INTRODUCTION

A five-story, 120-room hotel with below-grade parking is proposed at two parcels along Stockton Avenue (615 and 623 Stockton Avenue) in San José, California. Ground-floor commercial restaurant space is also proposed. Access to the site would be from Stockton Avenue. Land uses in the project vicinity include residences to the northwest, to the southwest, and to the southeast, opposite Schiele Avenue. Light industrial uses are located to the northeast, opposite Stockton 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. Perceptible vibration levels inside residences are attributed to the operation of heating and air conditioning systems, door slams and foot traffic. Construction activities, train operations, and street traffic are some of the most common external sources of vibration that can be perceptible inside residences.

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	
		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

Category	Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
1	0.01	Barely perceptible	No effect
2	0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
3	0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
4	0.1	Strongly perceptible	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to normal buildings
5	0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
6	0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential structures
7	0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential and modern commercial/industrial 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) 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), (b), and (c) are applicable to the proposed project.

The impacts of the project on the surrounding land uses are addressed in the Noise Impacts and Mitigation Measures Section of the report. The impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not considered under CEQA and are discussed in a separate section addressing Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

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 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 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 (including hotel projects), 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						

[1]Noise 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. This code is not explicit in terms of the acoustical descriptor associated with the noise level limit. Consistent with General Plan policy E.C.-1.3, a reasonable interpretation of this standard would identify the ambient base noise level criteria as the day/night noise level (DNL).

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:

<u>4.3.2.1 Noise Compatibility Policies</u>

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 615 and 623 Stockton Avenue in San José, California. Currently, the site is developed with a 4,400 square foot commercial building and surface lot, as well as a single-family residence used as a business. Single-family residences are located adjacent to the site to the northwest and to the southwest, as well as opposite Schiele Avenue to the southeast. Light industrial use areas are located to the northeast, opposite Stockton Avenue.

A noise monitoring survey was performed in the project vicinity beginning on Wednesday, August 15, 2018 and concluding on Friday, August 17, 2018. The monitoring survey included two long-term (LT-1 and LT-2) noise measurements and two short-term (ST-1 and ST-2) noise measurements. All measurement locations are shown in Figure 1.

The existing noise environment at the project site results primarily from vehicular traffic on Stockton Avenue and nearby industrial noise and railroad noise. Occasional aircraft associated with the Mineta San José International Airport also affect the noise environment at the project site.

Long-term noise measurement LT-1 was made approximately 35 feet southwest of the centerline of Stockton Avenue, in front of the existing commercial building on the project site. The daily trends in noise levels from Wednesday, August 15, 2018 through Friday, August 17, 2018 are shown in Figures 2 through 4. Hourly average noise levels at this location typically ranged from

65 to 71 dBA L_{eq} during daytime hours and from 55 to 69 dBA L_{eq} during nighttime hours. The day-night average noise level at LT-1 was 71 dBA DNL.

Noise measurement LT-2 was made in front of adjacent residences located along Schiele Avenue. LT-2 was located approximately 20 feet northwest of the centerline of Schiele Avenue, and the daily trends in noise levels from Wednesday, August 15, 2018 through Friday, August 17, 2018 are shown in Figures 5 through 7. Hourly average noise levels at this location typically ranged from 58 to 65 dBA L_{eq} during the day and from 50 to 58 dBA L_{eq} at night. The day-night average noise level was 63 dBA DNL at LT-2.

Short-term noise measurements were made over 10-minute periods, concurrent with the long-term noise data, on Friday, August 17, 2018, between 10:50 a.m. and 11:20 a.m. in order to complete the noise survey. All short-term measurement results are summarized in Table 4.

Noise measurement ST-1 was made at the northwestern boundary of the site, near the adjacent residence along Stockton Avenue. ST-1 was made approximately 35 feet southwest of the centerline of Stockton Avenue. The 10-minute average noise level measured at ST-1 was 67 dBA $L_{eq(10\text{-}min)}$, generated primarily by traffic along Stockton Avenue. Jet flyovers generated maximum instantaneous noise levels ranging from 60 to 65 dBA L_{max}. Some operational noise from the Maaco site opposite Stockton Avenue was audible during the measurement, but did not affect the overall levels.

ST-2 was made from the front yard of 733 Schiele Avenue, approximately 25 feet from the centerline of Schiele Avenue. The primary noise source at this location was traffic along Stockton Avenue. Secondary noise sources included occasional traffic on Schiele Avenue and high jet flyovers, which generating maximum instantaneous noise levels of 51 dBA L_{max}. The 10-minute average noise level measured at ST-2 was 57 dBA $L_{eq(10\text{-}min)}$.

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

Noise Measurement Location (Date, Time)	**L_{max}**	**$L_{(1)}$**	**$L_{(10)}$**	**$L_{(50)}$**	**$L_{(90)}$**	**$L_{eq(10\text{-}min)}$**
ST-1: ~35 feet southwest of the centerline of Stockton Avenue (8/17/2018, 10:50-11:00)	80	76	71	63	54	67
ST-2: front yard of 733 Schiele Avenue (8/17/2018, 11:10-11:20)	70	66	61	52	48	57

FIGURE 1 Noise Measurement Locations

Source: Google Earth 2018.

FIGURE 2 Daily Trend in Noise Levels at LT-1, Wednesday, August 15, 2018

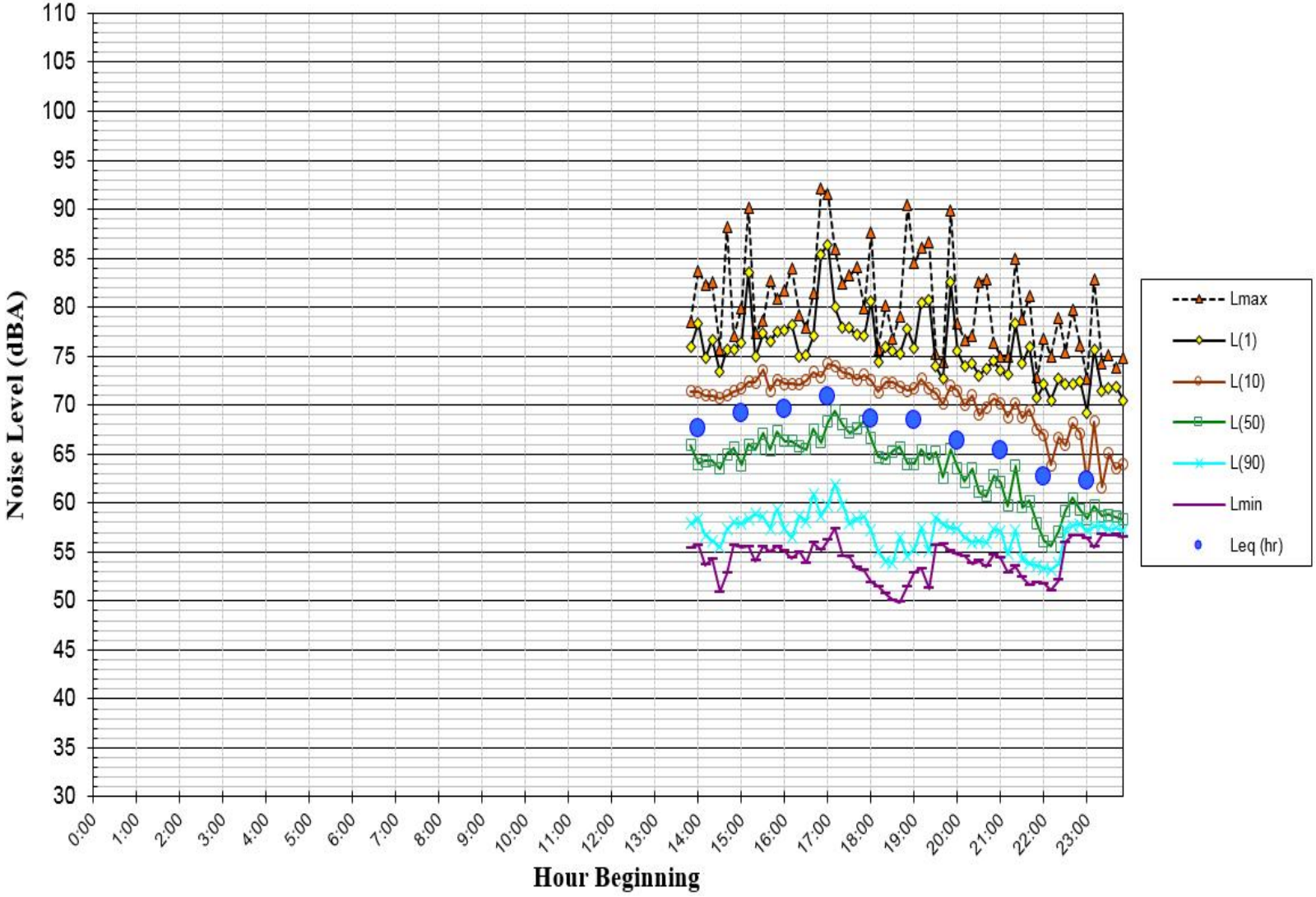


FIGURE 3 Daily Trend in Noise Levels at LT-1, Thursday, August 16, 2018

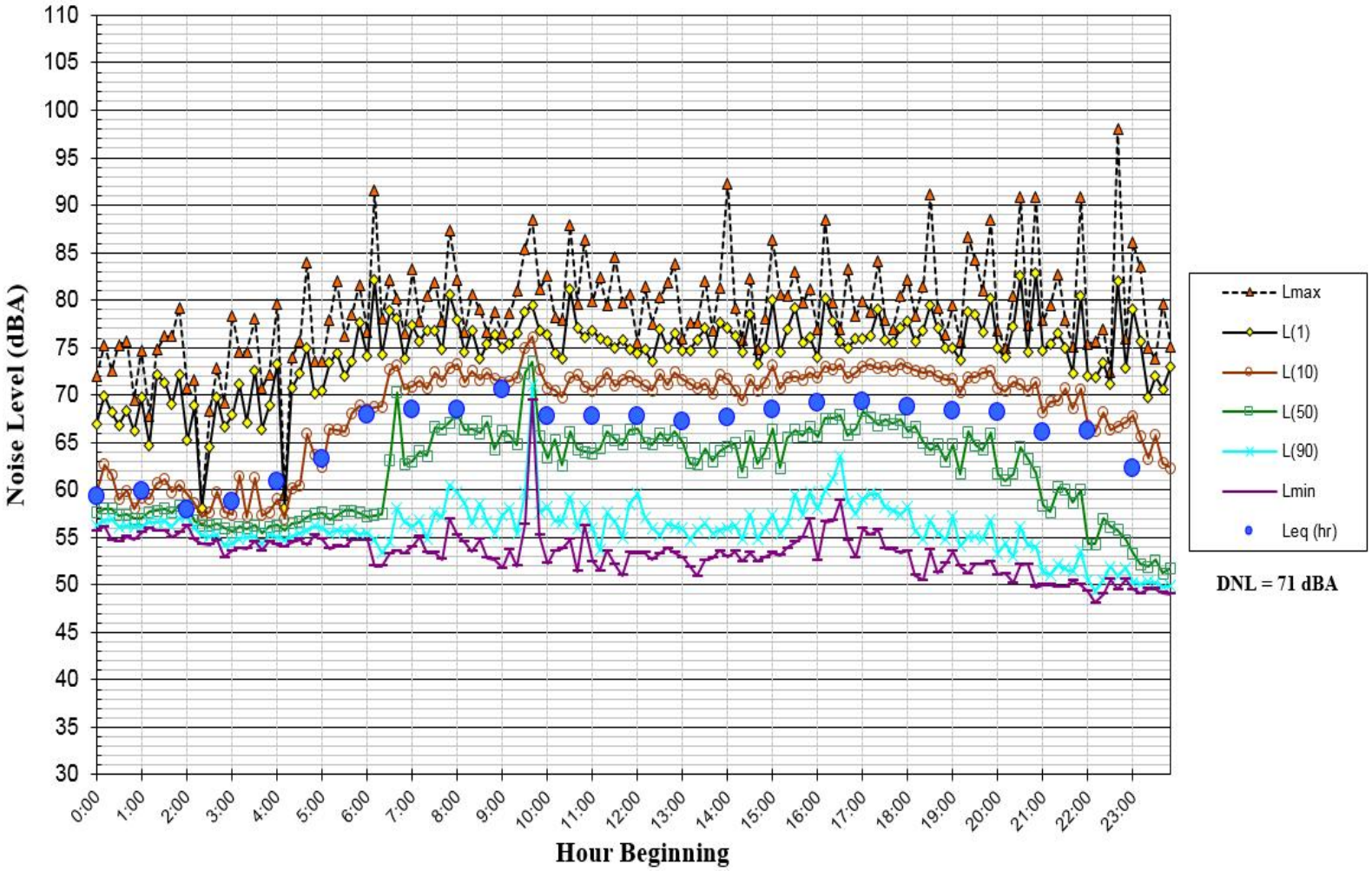


FIGURE 4 Daily Trend in Noise Levels at LT-1, Friday, August 17, 2018

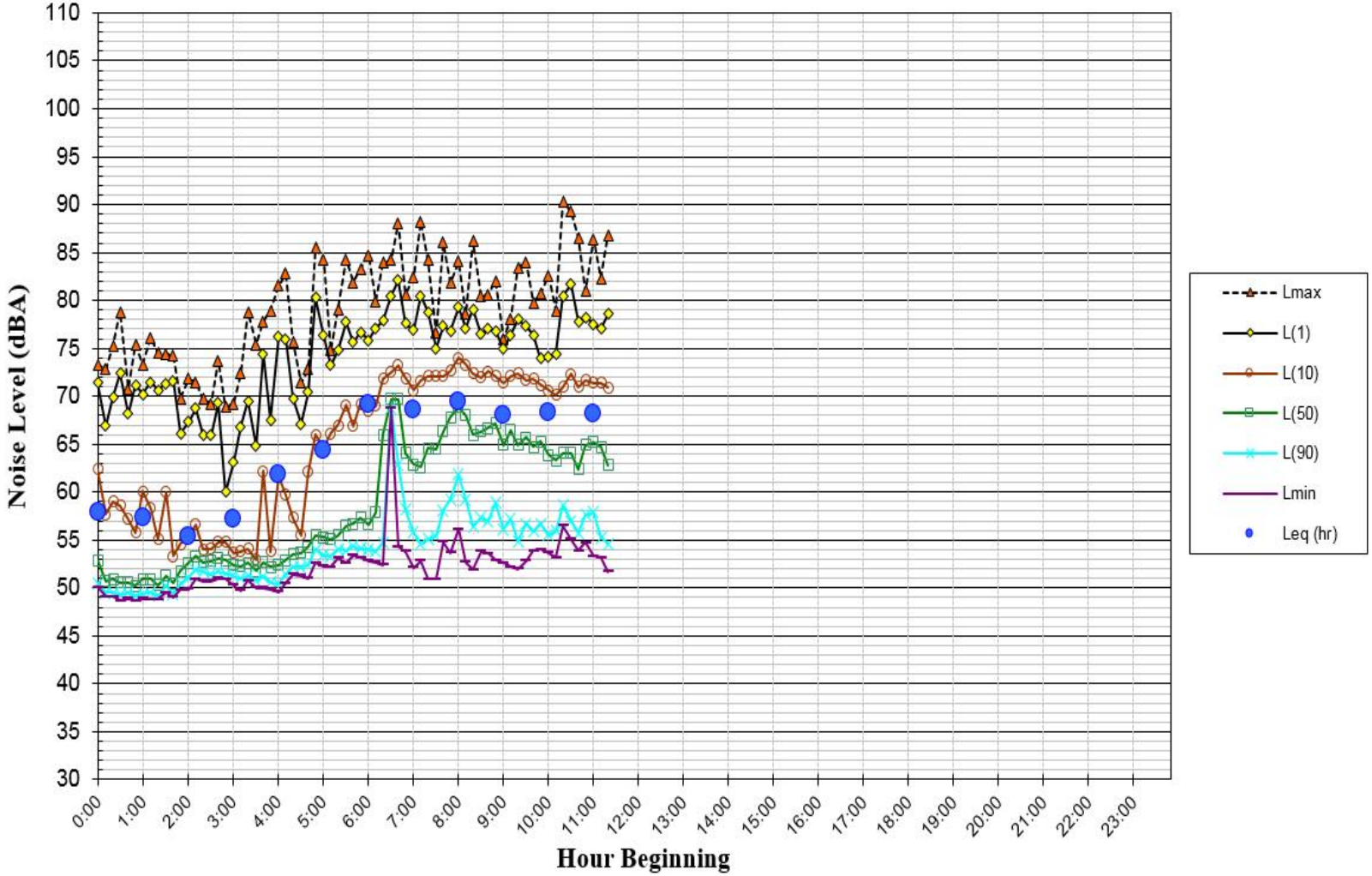


FIGURE 5 Daily Trend in Noise Levels at LT-2, Wednesday, August 15, 2018

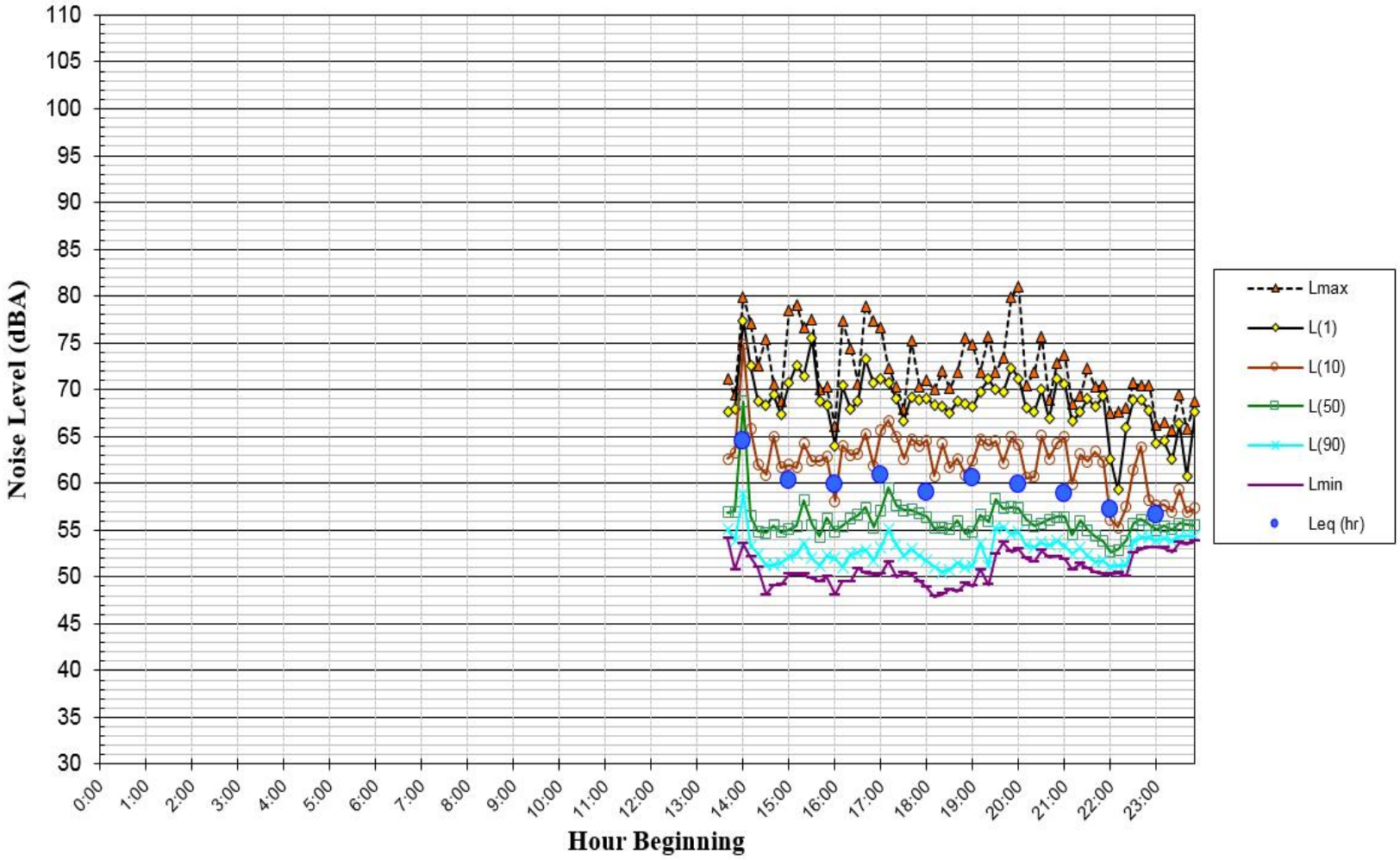


FIGURE 6 Daily Trend in Noise Levels at LT-2, Thursday, August 16, 2018

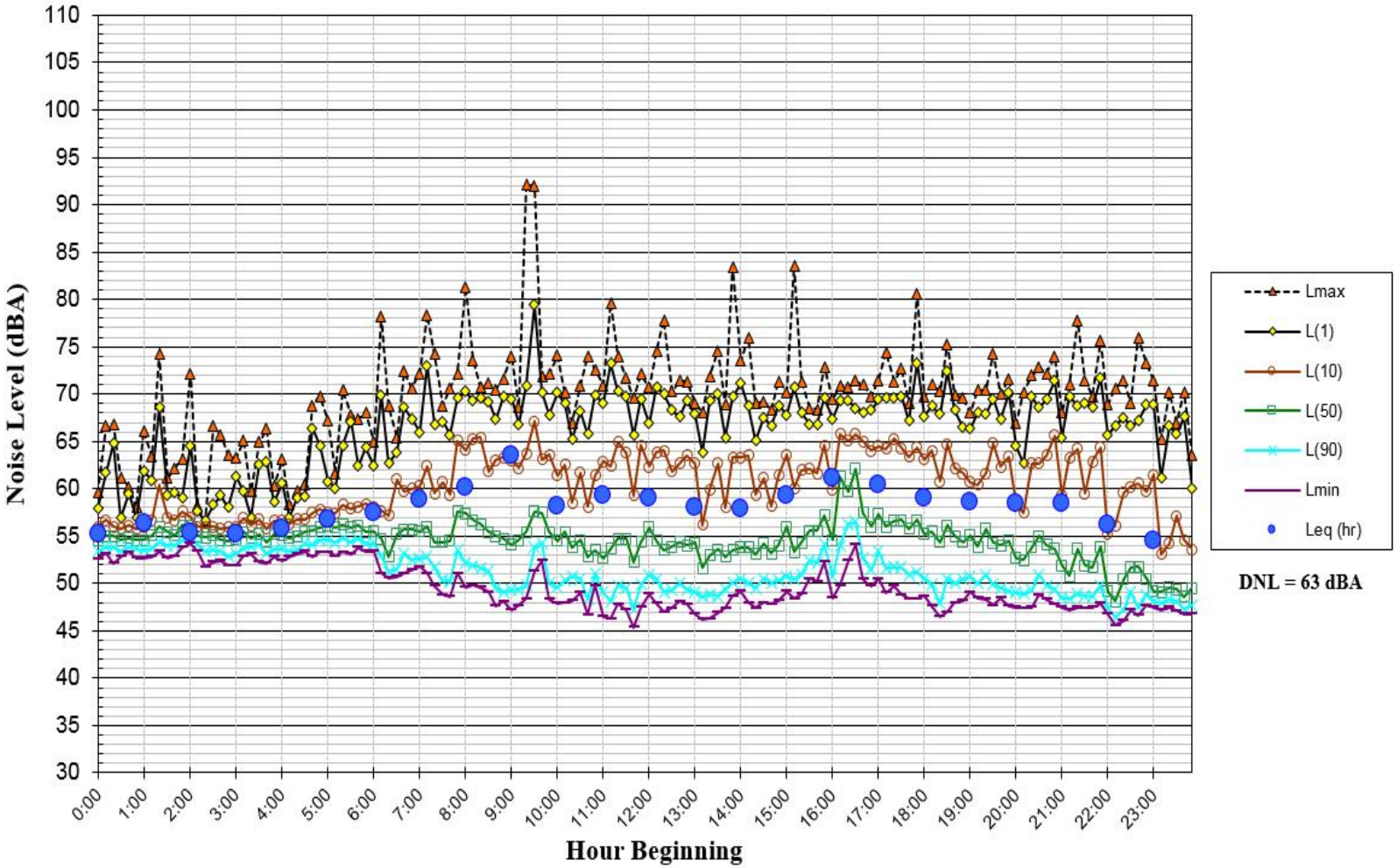
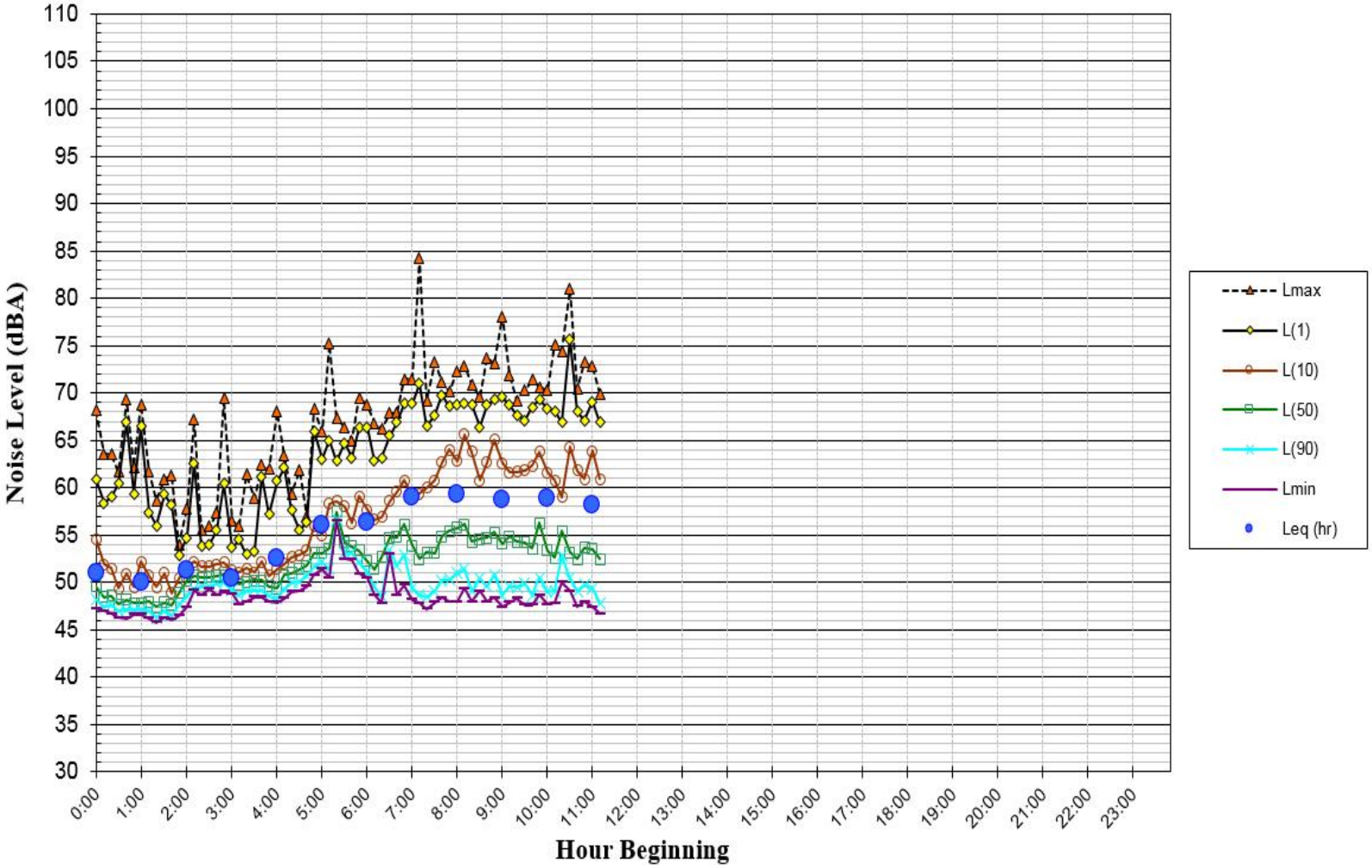


FIGURE 7 Daily Trend in Noise Levels at LT-2, Friday, August 17, 2018



GENERAL PLAN CONSISTENCY ANALYSIS

The impacts of site constraints such as exposure of the proposed project to excessive levels of noise are not considered under CEQA. This section addresses Noise and Land Use Compatibility for consistency with the policies set forth in the City's General Plan.

Noise and Land Use Compatibility

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 applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

- The exterior noise threshold established in the City's General Plan for new hotel projects is 60 dBA DNL at usable outdoor activity areas, excluding balconies and porches.

- The City requires that interior noise levels be maintained at 45 dBA DNL or less for hotel uses.

- The California Green Building Code limits interior noise levels within new non-residential land uses to an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

Future Noise Environment

The project would relocate the single-family residence at 623 Stockton Avenue to the southwest corner of the project site on Schiele Avenue and construct a five story, 120-room hotel. The building would have two levels of underground parking; a kitchen, bar, fitness center, and meeting rooms on the ground floor, hotel rooms on the second through fifth floors, and a rooftop patio .

The future noise environment at the project site would continue to result primarily from vehicular traffic on Stockton Avenue and Schiele Avenue. Based on the Environmental Noise Assessment completed for the Envision San Jose 2040 General Plan Update[1], future traffic noise levels in the Central/Downtown San Jose area are not anticipated to change substantially from existing levels (increase would be less than 1 dBA). As a result, future traffic noise levels at the site were calculated based on the results of the noise monitoring survey, assuming a 1 dBA increase attributable to future traffic conditions.

Exterior Noise and Land Use Compatibility

The only exterior use areas proposed is a rooftop patio, located on the sixth floor facing Stockton Avenue. The northeastern edge of the roof would be set back from the centerline of Stockton Avenue by approximately 50 feet. The rooftop patio would be provided with a 3-foot high, ½"

[1] Illingworth & Rodkin Inc., "Envision San Jose 2040 General Plan Comprehensive Update, Environmental Noise Assessment", December 7, 2010.

thick laminated glass railing wall system. With inclusion of this railing system, exterior noise levels would meet the City's acceptable noise criteria of 60 dBA DNL for exterior use areas in hotels.

Interior Noise and Land Use Compatibility

The City of San José and the California Building Code require that interior noise levels be maintained at 45 dBA DNL or less for hotel rooms. The Cal Green code requires interior noise attributable to exterior sources to not exceed 50 dBA $L_{eq\text{-}1hr}$ in non-residential spaces.

The calculated exterior noise level exposures of building façades are summarized in Table 5.

TABLE 5 Predicted Exterior Noise Levels at Building Façades

Building façade	Predicted Noise Levels at Façades (dBA DNL)		Recommended Sound Rated Construction[2] for 45 dBA DNL threshold
	Level 2	Level 5	
Northeast façade facing Stockton Avenue	69	67	STC 28[1]
Southeast façade facing Schiele Avenue	67	64	Forced-air[1]
Northwest façade	66	63	Forced-air[1]
Southwest façade	58	55	None Required

[1] Assumes forced-air mechanical ventilation is provided to allow occupants the option of keeping windows closed to control noise.
[2] Analysis assumes window area to be 40% of the façade area or less and wood stud wall with cavity of STC 39 rating.

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 DNL, 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 DNL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Interior noise levels in proposed hotel rooms with standard construction and windows open would be up to 54 dBA DNL inside rooms facing Stockton Avenue and up to 52 dBA DNL inside rooms facing Schiele Avenue. These levels exceed the City's threshold for interior noise (45 dBA DNL). The inclusion of forced air mechanical ventilation and windows with STC 28 rating or higher would be sufficient to reduce the interior noise exposure in these units to 45 dBA DNL or less, assuming a window to wall ratio of 40% or less.

Interior noise levels in the ground floor bar and meeting rooms would have standard commercial construction, with closed windows and forced air conditioning provided. Commercial-use construction with closed windows would be anticipated to provide approximately 25 dB of noise reduction from exterior noise sources, resulting in interior noise levels 43 dBA $L_{eq\ (1\text{-}hr)}$. These levels would comply with the acceptable interior limit of 50 dBA $L_{eq\ (1\text{-}hr)}$ specified by the Cal Green Code.

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 noise sources and 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 José General Plan or Municipal Code, as follows:

    a. Operational Noise in Excess of Standards. A significant noise impact would be identified if on-site project operations (i.e., mechanical equipment, loading dock activities, or parking) would generate noise levels that would exceed 55 dBA DNL at adjacent residential property lines or 60 dBA DNL at adjacent commercial property lines.

    b. Permanent Noise Increase. A significant permanent noise increase would occur if project traffic resulted in an increase of 3 dBA DNL or greater at noise-sensitive land uses where existing or projected noise levels would equal or exceed the noise level considered satisfactory for the affected land use (60 dBA DNL for single-family residential areas) and/or an increase of 5 dBA DNL or greater at noise-sensitive land uses where noise levels would continue to be below those considered satisfactory for the affected land use.

    c. Temporary Noise Increase. A significant temporary noise impact would be identified if construction-related noise would occur outside of the hours specified in the Municipal Code or if construction noise levels were to exceed the City's construction noise limits at adjacent noise sensitive land uses.

2. **Generation of Excessive Groundborne Vibration:** A significant impact would be identified if the construction of the project would expose persons to vibration levels exceeding the San José or Caltrans thresholds.

3. **Exposure to Excessive Aircraft Noise.** The Santa Clara County ALUC has jurisdiction over new land uses in the vicinity of airports and establishes 65 dBA CNEL as the maximum allowable exterior noise level considered compatible with residential uses and 45 dBA CNEL as the maximum allowable interior level for residences.

Impact 1: **Temporary or Permanent Noise Increases in Excess of Standards.** Project traffic would not result in substantial permanent noise level increase at existing noise-sensitive uses in the project vicinity. Noise from mechanical equipment may exceed City noise level limits at nearby noise sensitive uses. Noise levels from parking, truck deliveries, and construction activities would not exceed the noise limits. This is a **potentially significant impact**.

a. Permanent Noise from On-Site Operations

Noise generating on-site operational components of the project would include mechanical equipment, loading dock activities, and parking lot activities. Operational noise levels are limited to 55 dBA DNL at adjacent residential property lines or 60 dBA DNL at adjacent commercial property lines.

Parking and Truck Deliveries

Truck and passenger loading areas would be provided along Stockton Avenue. Loading hours would be between 10:00 am and 2:00 pm daily. Truck deliveries are anticipated to occur once or twice a week.

Noise levels generated by truck traffic are dependent on the size and speed of trucks; for this type of project, medium (box type and delivery) trucks are expected. Typically, maximum noise levels generated by medium trucks would range from 60 dBA when traveling at constant speeds to 65 dBA when stopping/starting and maneuvering at a distance of 50 feet. Typical noise levels generated by loading and unloading of truck deliveries are expected to be below noise levels generated by traffic along Stockton Avenue and lower and less frequent than activities at the light industrial sites located opposite Stockton Avenue to the northeast. This is a **less-than-significant** impact.

Mechanical Equipment Noise

Hotel buildings typically require various mechanical equipment, such as air conditioners, exhaust fans, and air handling equipment for ventilation of the buildings. Mechanical and electrical rooms would be located in the underground parking structure and on the first floor of the building's interior. VRF system heat pumps are proposed for the rooftop and would be placed and screened so as to be concealed from view at street level. Equipment located inside or in a fully enclosed room with a roof would not be anticipated to be audible at off-site locations. The exact locations and specifications of the rooftop equipment is not yet developed. Typical rooftop equipment is anticipated to generate noise levels of 50 to 60 dBA at 50 feet from the equipment, depending on the equipment selected. Shielding from equipment enclosures and surrounding structures would provide 10 to 15 dBA of reduction.

One- and two-story single-family residential land uses adjoin the site along the northwestern and southwestern boundaries of the site, and additional residences are located to the southeast, opposite Schiele Avenue. Mechanical equipment could potentially exceed the City's Municipal Code limits at adjacent residential land uses. Mechanical equipment located 150 feet or further from residential property lines or in shielded areas would be anticipated to meet the 55 dBA DNL limit. This is a **potentially significant** impact. Inclusion of **Mitigation Measure 1a** would reduce this impact to less-than-significant level.

Mitigation Measure 1a: 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. Alternate measures may be optimal to reduce mechanical equipment noise on the adjacent residential sites, such as locating equipment in less noise-sensitive areas, such as within the underground parking structure or on the rooftop away from the surrounding residences, where feasible.

b. Permanent Noise Increases from Project Traffic

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 (60 dBA DNL for residences). 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. For reference, a 3 dBA DNL noise increase would be expected if the project would double existing traffic volumes along a roadway.

To determine the effect of the project-generated traffic on the nearby residences, AM and PM peak hour traffic volumes for the Existing + Project condition were compared to Existing traffic volumes. Traffic volumes for the proposed project were provided for five intersections in the project vicinity.[2] Based on these calculations, project traffic would result in traffic noise increases of less than 1 dBA L_{eq} along the roadway network. Day-night average (DNL) noise level increases would be anticipated to be similar. This increase would not typically be noticeable and would be below the 3 dBA and 5 dBA DNL thresholds of significance. This is a **less-than-significant** impact.

Mitigation Measure 1b: None required.

c. Temporary Noise Increases from Project Construction

Chapter 20.100.450 of the City's Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless

[2] 615 Stockton Avenue Hotel Development, Transportation Analysis, Hexagon Transportation Consultants, Inc., April 8, 2019.

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. Policy EC-1.7 of the City's General Plan states that for large or complex projects within 500 feet of residential land uses or within 200 feet of commercial land uses or offices involving substantial noise-generating activities lasting more than 12 months, 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.

The significance of temporary noise increases resulting from construction depend upon the noise levels generated by various pieces of construction equipment, the timing and duration of noise-generating activities, the distance between construction noise sources and noise-sensitive areas, and the presence of intervening shielding features such as buildings or terrain. 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.

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 6 and 7. Table 6 shows the average noise level ranges, by construction phase, and Table 7 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 a distance of 50 feet from the source.

TABLE 6 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 7 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.

Project construction will occur over a period of less than 12 months and would include demolition of existing structures and pavement, site preparation, grading and excavation, trenching, building erection, and paving. Pile driving, which produces substantial noise levels, is not proposed as a method of construction.

As shown in Tables 6 and 7, construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The highest noise levels are typically generated during grading, excavation, and foundation construction. Table 8 shows the anticipated project specific construction noise levels calculated using the Federal Highway Administration (FHWA) software - Roadway Construction Noise Model (RCNM). At 50 feet from the noise source, maximum instantaneous noise levels generated by project construction equipment are calculated to range from 78 to 90 dBA L_{max} and hourly average noise levels are calculated to range from 74 to 85 dBA L_{eq} at a distance of 50 feet.

TABLE 8 Calculated Construction Noise Levels for Each Phase of Construction

Construction Phase	At Distance of 50 ft.	
	L_{eq}, dBA	**L_{max}, dBA**
Demolition (20 days)	85	90
Site Preparation (2 days)	85	84
Grading/Excavation (4 days)	82	85
Trenching (10 days)	81	84
Building-Exterior (200 days)	76	81
Building-Interior (10 days)	74	78
Paving (10 days)	77	83

Noise sensitive uses surrounding the site include residential buildings, located 10 feet to the southwest, 15 feet to the north, 70 feet to the southeast across Schiele Avenue. Light industrial use buildings located 100 feet across Stockton Avenue are not considered sensitive receptors. The residential buildings to the north and southwest would be exposed to a maximum noise level of 103 dBA L_{max} during demolition phase and maximum noise levels of 92 to 99 dBA L_{max} during other phases of construction. Typical hourly average noise levels of 99 dBA L_{eq} during demolition and site preparation and 88 to 96 dBA L_{eq} during other phases of construction are anticipated. At 70 feet from the project site, hourly average noise levels due to construction would be 71 to 82 dBA L_{eq}. Noise levels would exceed 60 dBA L_{eq} at residences by more than 5 dBA. However, the constriction is not anticipated to take more than 12 months. This is a **less-than-significant** impact.

Construction activities would occur within 500 feet of residential land use. However, construction activities will occur only during allowable hours and would be completed within a period of less than 12 months. This would be a **less-than-significant** impact, assuming the following best management practices are used:

- Construction activities shall be limited to the hours between 7:00 am and 7:00 pm, 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.

- 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. Construct temporary noise barriers to screen stationary noise-generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.

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

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

- Notify all adjacent business, residences, and other noise-sensitive land uses of the construction schedule, in writing, and provide a written schedule of "noisy" construction activities to the adjacent land uses and nearby residences.

- 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.

Mitigation Measure 1c: None required.

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Construction-related vibration levels could, at times, exceed the appropriate construction vibration thresholds at structures located within 25 feet of heavy construction. **This is a potentially significant impact.**

Policy EC-2.3 of the City of San José General Plan establishes a vibration limit of 0.08 in/sec PPV to minimize the potential for cosmetic damage to sensitive historic structures, and a vibration limit of 0.2 in/sec PPV to minimize damage at buildings of normal conventional construction. The California Department of Transportation published a Transportation and Construction Guidance Manual in 2013. The Manual developed a synthesis of various vibration criteria to assess the damage potential for representative categories of structures and effects upon people. The guideline criteria, summarized in Table 3, refine the categories and thresholds set forth in Policy EC-2.3, establishing seven separate categories. The first two categories (Categories 1 and 2) address human perceptibility of vibration only. The five remaining categories (Categories 3-7) address human perceptibility and potential for damage to buildings described as "Extremely fragile historic buildings, ruins, ancient monuments", "Fragile buildings", "Historic and some old buildings", "Older residential structures", "New residential structures", and "Modern industrial/commercial buildings". Most, if not all buildings in San José would fall into Categories 5-7. The goal in establishing vibration limits is to mitigate potential vibration impacts associated with demolition

and construction activities to a less-than-significant level by establishing safe limits to protect structures from potential damage and to minimize vibration impacts on people and businesses. The vibration limits contained in Policy EC-2.3 utilized criteria from literature available to the City in 2008 that are conservative, and given the broad categories, are now believed to be too general for buildings in the Downtown Strategy 2040 Plan area. Given that the new guideline criteria best accomplish the goal to identify and mitigate construction vibration impacts, the Downtown Strategy 2040 Integrated Final EIR recommends that these criteria be utilized to implement General Plan Policy EC-2.3 for projects facilitated by the Downtown Strategy 2040 Plan.

Construction activities associated with the project would include site demolition, preparation work, foundation work, and new building framing and finishing. Pile driving is not anticipated as a method of construction. Table 9 presents typical vibration levels that could be expected from construction equipment at a distance of 10, 25, 50, 80 and 150 feet, representative of the distances to adjacent structures. 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. Vibration levels would vary depending on soil conditions, construction methods, and equipment used.

TABLE 9 Vibration Levels for Construction Equipment at Various Distances

Equipment		PPV at 10 ft. (in/sec)	PPV at 25 ft. (in/sec)	PPV at 50 ft. (in/sec)	PPV at 80 ft. (in/sec)	PPV at 150 ft. (in/sec)
Clam shovel drop		0.553	0.202	0.094	0.056	0.028
Hydromill (slurry wall)	0.022	0.022	0.008	0.004	0.002	0.001
	0.047	0.047	0.017	0.008	0.005	0.002
Vibratory Roller		0.575	0.210	0.098	0.058	0.029
Hoe Ram		0.244	0.089	0.042	0.025	0.012
Large bulldozer		0.244	0.089	0.042	0.025	0.012
Caisson drilling		0.244	0.089	0.042	0.025	0.012
Loaded trucks		0.208	0.076	0.035	0.021	0.011
Jackhammer		0.096	0.035	0.016	0.010	0.005
Small bulldozer		0.008	0.003	0.001	0.001	0.000

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006 as modified by Illingworth & Rodkin, Inc., April 2019.

Based on the City of San José Historic Resources Inventory, there are three historic structures within 200 feet of the project site; 738 Schiele Avenue, 580 Stockton Avenue, and 630 Stockton Avenue. These historic buildings would be classified as Category 5 structures and the 0.25 in/sec PPV Caltrans threshold criteria would apply. As shown in Table 9, vibration levels at 738 Schiele Avenue, located 80 feet to the south, would be 0.056 in/sec PPV or less. Construction vibration levels at 580 Stockton Avenue, located 155 feet to the northeast, would be 0.03 in/sec PPV or less. 630 Stockton Avenue, located 90 feet to the east, would be exposed to construction vibration levels as high as 0.05 in/sec PPV.

The existing structure at 623 Stockton Avenue, which would be eligible for listing under the California Register of Historic Places and also eligible the San José City Landmark designation

under the City's Historic Preservation Ordinance, is planned to be relocated to the southwest corner of the project site on Schiele Avenue and the building will be used within the project. Vibration thresholds would not apply to this on-site building.
All other structures surrounding the project site would be classified as Category 6 or 7 structures and the 0.3 in/sec PPV (Category 6) threshold would apply. The closest buildings of conventional construction are residences located 10 feet to the southwest and 20 feet to the northwest. At distances of 10 and 20 feet, vibration levels could reach 0.58 and 0.27 in/sec PPV, respectively. The nearest residences to the southeast, opposite Schiele Avenue, would be approximately 70 feet from the project site. Vibration levels at this distance would be 0.07 in/sec PPV or less.

The US Bureau of Mines has analyzed the effects of blast-induced vibration on buildings in USBM RI 8507[3], and these findings have been applied to vibrations emanating from construction equipment on buildings[4]. Figure 8 presents the damage probability as reported in USBM RI 8507 and reproduced by Dowding assuming a maximum vibration level of 0.58 in/sec PPV. As shown on Figure 8, these studies indicate an approximate 7% probability of "threshold damage" (referred to as cosmetic damage elsewhere in this report) and no observations of "minor damage" or "major damage" at vibration levels of 0.58 in/sec PPV or less.

In summary, vibration levels could occasionally exceed the 0.2 in/sec PPV threshold for normal buildings under Policy EC-2.3 when construction is located within 25 feet of structures and the Caltrans Category 6 threshold of 0.3 in/sec PPV for older residential structures when construction is located within 18 feet. There are two Category 6 structures located within 25 feet of the project site. Cosmetic or threshold damage could be manifested at these structures in the form of hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. However, minor damage (e.g., hairline cracking in masonry or the loosening of plaster) or major structural damage (e.g., wide cracking or shifting of foundation or bearing walls) would not be anticipated to occur. Vibration levels at all historic buildings in the vicinity are calculated to be below the Caltrans and more conservative San José historic building thresholds and would not be anticipated to be impacted by construction vibration.

In surrounding areas where vibration would not be expected to cause structural damage, vibration levels may still be perceptible. However, as with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the highest potential of producing vibration (use of jackhammers and other high-power tools). By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during hours with the least potential to affect nearby businesses, perceptible vibration can be kept to a minimum.

This is a **potentially significant** impact.

Mitigation Measure 2: The implementation of the following measures would reduce the

[3] Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, Structure Response and Damage Produced by Ground Vibration form Surface Mine Blasting, RI 8507, Bureau of Mines Report of Investigations, U.S. Department of the Interior Bureau of Mines, Washington, D.C., 1980.
[4] Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

vibration impact to a **less-than-significant** level:

- Prohibit impact or vibratory pile driving. Drilled piles cause lower vibration levels where geological conditions permit their use.

- Place operating equipment on the construction site as far as possible from vibration sensitive receptors.

- Use smaller equipment to minimize vibration levels below the limits.

- Avoid using vibratory rollers and tampers near sensitive areas.

- Select demolition methods not involving impact tools.

- Modify/design or identify alternative construction methods to reduce vibration levels below the limits.

- Avoid dropping heavy objects or materials.

- A list of all heavy construction equipment to be used for this project known to produce high vibration levels (tracked vehicles, vibratory compaction, jackhammers, hoe rams, etc.) shall be submitted to the City by the contractor. This list shall be used to identify equipment and activities that would potentially generate substantial vibration and to define the level of effort required for continuous vibration monitoring.

- A construction vibration-monitoring plan shall be implemented to document structural conditions at all structures located within 50 feet of construction prior to, during, and after vibration generating construction activities. All plan tasks shall be undertaken under the direction of a licensed Professional Structural Engineer in the State of California and be in accordance with industry accepted standard methods. The construction vibration monitoring plan should be implemented to include the following tasks:

    - Identification of the sensitivity of nearby structures to groundborne vibration. Vibration limits should be applied to all vibration-sensitive structures located within 50 feet of construction activities identified as sources of high vibration levels.

    - Performance of a photo survey, elevation survey, and crack monitoring survey for each structure of normal construction within 25 feet of construction activities identified as sources of high vibration levels. Surveys shall be performed prior to any construction activity and after project completion, and shall include internal and external crack monitoring in structures, settlement, and distress, and shall document the condition of foundations, walls and other structural elements in the interior and exterior of said structures.

- Designate a person responsible for registering and investigating claims of excessive vibration. The contact information of such person shall be clearly posted on the construction site.

- Conduct a post-survey on the structure where complaints of damage are received. Make appropriate repairs in accordance with the Secretary of the Interior's Standards where damage has occurred as a result of construction activities.

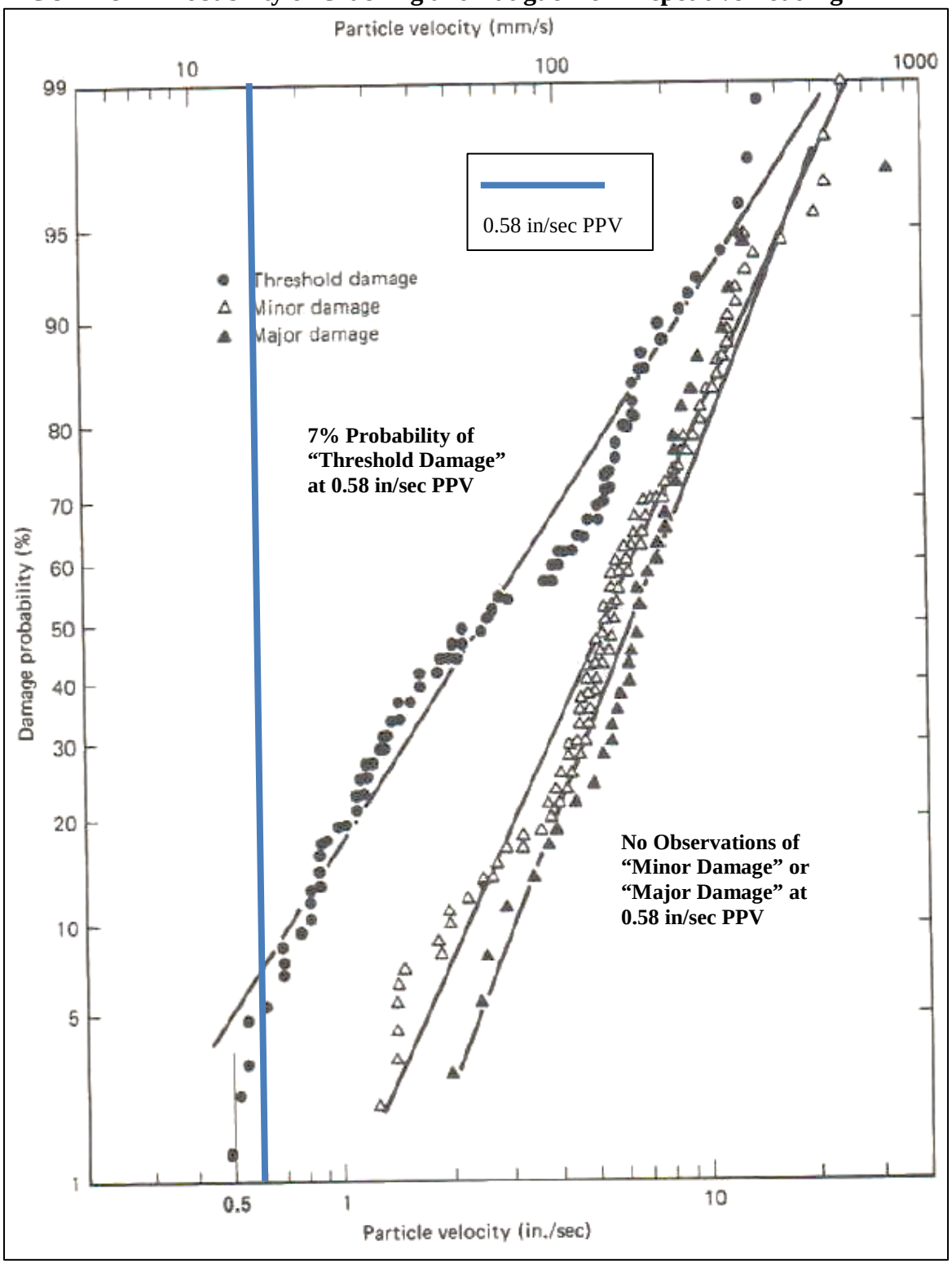
Impact 3: **Exposure to Excessive Aircraft Noise.** The project site is located outside of the 65 dBA CNEL noise contour for Norman Y. Mineta San José International Airport. **This is a less-than-significant impact.**

The project site is located about 0.85 miles south of Norman Y. Mineta San José International Airport. The Santa Clara County ALUC has jurisdiction over new land uses in the vicinity of airports and establishes 65 dBA CNEL as the maximum allowable exterior noise level considered compatible with residential uses and 45 dBA CNEL as the maximum allowable interior level for residences.

The project site lies outside of the 65 dBA CNEL noise contours shown in the Norman Y. Mineta San José International Airport Master Plan Update Project report published in February 2010 as an addendum to the Environmental Impact Report. Although aircraft-related noise would occasionally be audible at the project site, noise from aircraft would not substantially increase ambient noise levels. Exterior noise levels resulting from aircraft would be compatible with the proposed project. By ensuring compliance with the City's normally acceptable noise level standards (see General Plan Consistency Section), interior noise levels would also be considered acceptable with aircraft noise. This is a **less-than-significant** impact.

Mitigation Measure 3: None required

FIGURE 8 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996 as modified by Illingworth & Rodkin, Inc., April 2019.