RACE STREET PROJECT
NOISE AND VIBRATION ASSESSMENT

San José, California

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INTRODUCTION

A residential mixed-use project is proposed north of West San Carlos Street, between Race Street and Grand Avenue in San José, California. The proposed project would consist of two mixed-use residential buildings (one five stories tall and the other six stories tall) with a total of 206 units. Additionally, the project would include an option for 8,500 square feet of ground-floor commercial retail along the eastern building façades. Currently, the 2.3-acre site is developed with commercial buildings and single-family residences. As part of the proposed project, these existing structures would be demolished.

Six alternatives have been proposed for this project. They are as follows:

- Scenario 1: 206 units of (market rate housing) residential units
    a) Project Option: Site access along Grand Avenue with commercial retail along Race Street
    b) Alternative 1 Option: Site access along Grand Avenue with no commercial retail
    c) Alternative 2 Option: Site access along Race Street with commercial retail along Race Street

- Scenario 2: 206 residential units, one building for senior housing and one building for multi-family residences
    a) Project Option: Site access along Grand Avenue with commercial retail along Race Street
    b) Alternative 1 Option: Site access along Grand Avenue with no commercial retail
    c) Alternative 2 Option: Site access along Race Street with commercial retail along Race Street

Each of these scenarios are discussed as part of this analysis.

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) guidelines. The report is divided into several sections; 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; the Plan Consistency Section discusses the noise and land use compatibility of the proposed project utilizing policies in the City's General Plan; and the CEQA Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts upon sensitive receptors, provides a discussion of each project impact, and presents measures, where necessary, to mitigate the identified impacts to a less-than-significant level. The project's potential to result in adverse effects with respect to applicable NEPA guidelines is also assessed in this report. The NEPA Noise Assessment Section evaluates noise effects resulting from the project. Mitigation is recommended to avoid the potential for adverse effects.

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 vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much 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. 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 induce structural 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. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. 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.

Damage caused by vibration can be classified as cosmetic or structural. Cosmetic damage includes minor cracking of building elements (exterior pavement, room surfaces, etc.). Structural damage includes threatening the integrity of the building. Damage resulting from construction related vibration is typically classified as cosmetic damage. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. 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.

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

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

National Guidance. The U.S. Department of Housing and Urban Development (HUD) environmental noise regulations are set forth in 24CFR Part 51B (Code of Federal Regulations). The following exterior noise standards for new housing construction would be applicable to this project:

- 65 dBA L_{dn} or less – acceptable.

- Exceeding 65 dBA L_{dn} but not exceeding 75 dBA L_{dn} – normally unacceptable (appropriate sound attenuation measures must provide an additional 5 decibels of attenuation over that typically provided by standard construction in the 65 dBA L_{dn} to 70 dBA L_{dn} zone; 10 decibels additional attenuation in the 70 dBA L_{dn} to 75 dBA L_{dn} zone).

- Exceeding 75 dBA L_{dn} – unacceptable.

These noise standards also apply, "… at a location 2 meters from the building housing noise sensitive activities in the direction of the predominant noise source…" and "…at other locations where it is determined that quiet outdoor space is required in an area ancillary to the principal use on the site."

A goal of 45 dBA L_{dn} is set forth for interior noise levels and attenuation requirements are geared toward achieving that goal. It is assumed that with standard construction any building will provide sufficient attenuation to achieve an interior level of 45 dBA L_{dn} or less if the exterior level is 65 dBA L_{dn} or less. Where exterior noise levels range from 65 dBA L_{dn} to 70 dBA L_{dn}, the project must provide a minimum of 25 decibels of attenuation, and a minimum of 30 decibels of

attenuation is required in the 70 dBA L_{dn} to 75 dBA L_{dn} zone. Where exterior noise levels range from 75 dBA L_{dn} to 80 dBA L_{dn}, the project must provide a minimum of 35 decibels of attenuation to achieve an interior level of 45 dBA L_{dn} or less.

State Guidance. 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. 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.

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.

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 ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

Local Guidance. 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:

<u>Interior Noise Levels</u>

- 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						

[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.

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.

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

Local Guidance. 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 north of West San Carlos Street, between Race Street and Grand Avenue in San José, California. The project site is bordered to the south by a single-family residence and a commercial building and to the north by multi- and single-family residences. Opposite Race Street to the east are local commercial uses and a multi-family residential building. To the west, opposite Grand Avenue, are single-family residences, a commercial building, and a scrap yard.

A noise monitoring survey was performed in the project vicinity beginning on Tuesday, April 25, 2017 and concluding on Thursday, April 27, 2017. 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 the surrounding roadways and aircraft associated with Mineta San José International Airport operations.

Long-term noise measurement LT-1 was made approximately 25 feet west of the centerline of Grand Avenue and approximately 175 feet south of the centerline of Park Avenue. The main noise source at this location was traffic along Grand Avenue. The daily trends in noise levels at this location are shown in Figures 2 through 4. Between about 7:00 a.m. and 8:00 a.m. on Wednesday, April 26, 2017, there were elevated noise levels that do not follow the typical traffic noise trend. Since the measurement was positioned in a tree near a parking lot and along a roadway with street parking, it is assumed that these elevated noise levels were due to sources other than traffic flow along Grand Avenue. Hourly average noise levels at this location typically ranged from 51 to 65 dBA L_{eq} during the day, and from 43 to 53 dBA L_{eq} at night. The day-night average noise level based on traffic noise only was calculated by filtering out the abnormal hour of data between 7:00 a.m. and 8:00 a.m. on Wednesday, April 26, 2017. The estimated day-night average noise level on Wednesday, April 26, 2017 was 59 dBA DNL.

Measurement LT-2 was made from a telephone pole along Race Street. The setback of LT-2 from the centerline of the roadway was approximately 25 feet. Hourly average noise levels at this location typically ranged from 63 to 69 dBA L_{eq} during the day, and from 46 to 68 dBA L_{eq} at night. The day-night average noise level on Wednesday, April 26, 2017 was 70 dBA DNL. The daily trend in noise levels at LT-2 is shown in Figures 5 through 7.

Short-term noise measurements were made over periods of 10-minute intervals, concurrent with the long-term noise data, on Thursday, April 27, 2017, between 1:00 p.m. and 2:00 p.m. in order to complete the noise survey. Short-term measurement results are summarized in Table 4.

ST-1 was taken from the parking lot north of the Taqueria Eduardo restaurant along Race Street. ST-1 was set back from the centerline of the roadway by approximately 115 feet. During this 10-minute period, typical vehicular traffic along Race Street was the dominant noise source. The 10-minute average noise level measured at ST-1 was 59 dBA $L_{eq(10\text{-}min)}$. ST-2 was made on the north end of the project site, within an outdoor storage area adjacent to the existing electronic equipment commercial building. ST-2 was set back approximately 110 feet from the centerline of Grand Avenue. The 10-minute average noise level measured at ST-2 was 51 dBA $L_{eq(10\text{-}min)}$.

FIGURE 1 Noise Measurement Locations

Source: Google Earth 2017.

FIGURE 2 Daily Trend in Noise Levels at LT-1, Tuesday, April 25, 2017

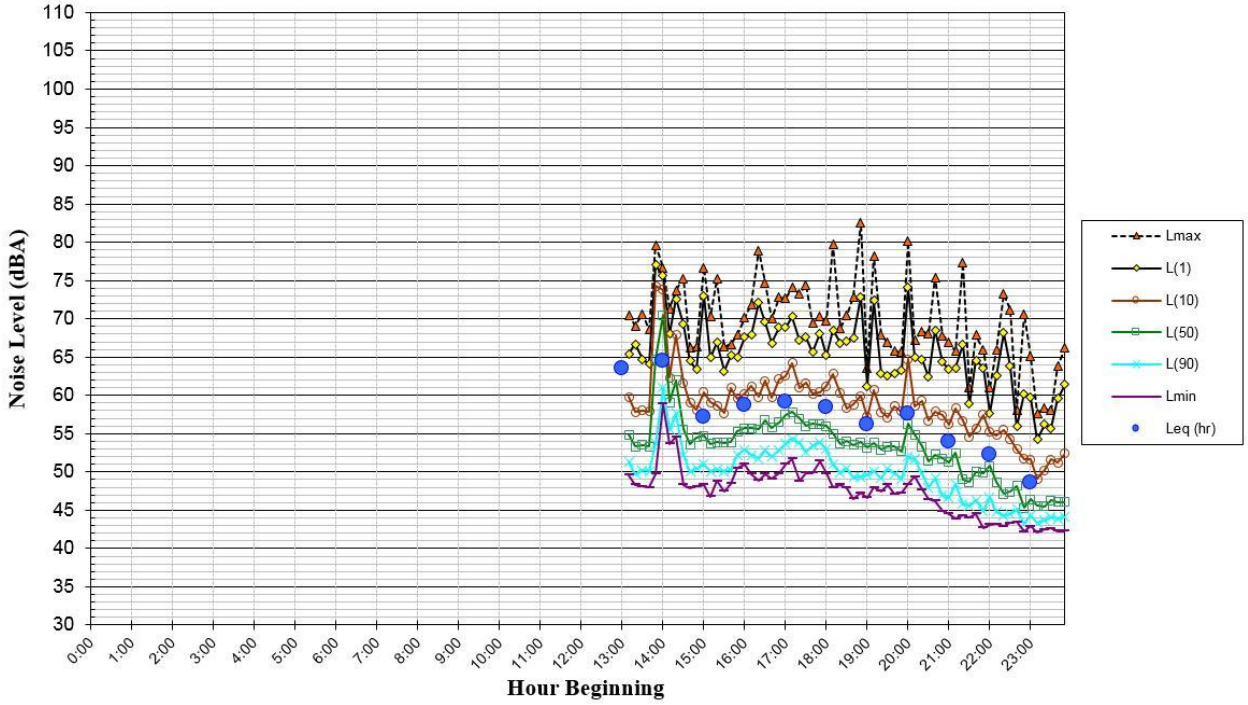

FIGURE 3 Daily Trend in Noise Levels at LT-1, Wednesday, April 26, 2017

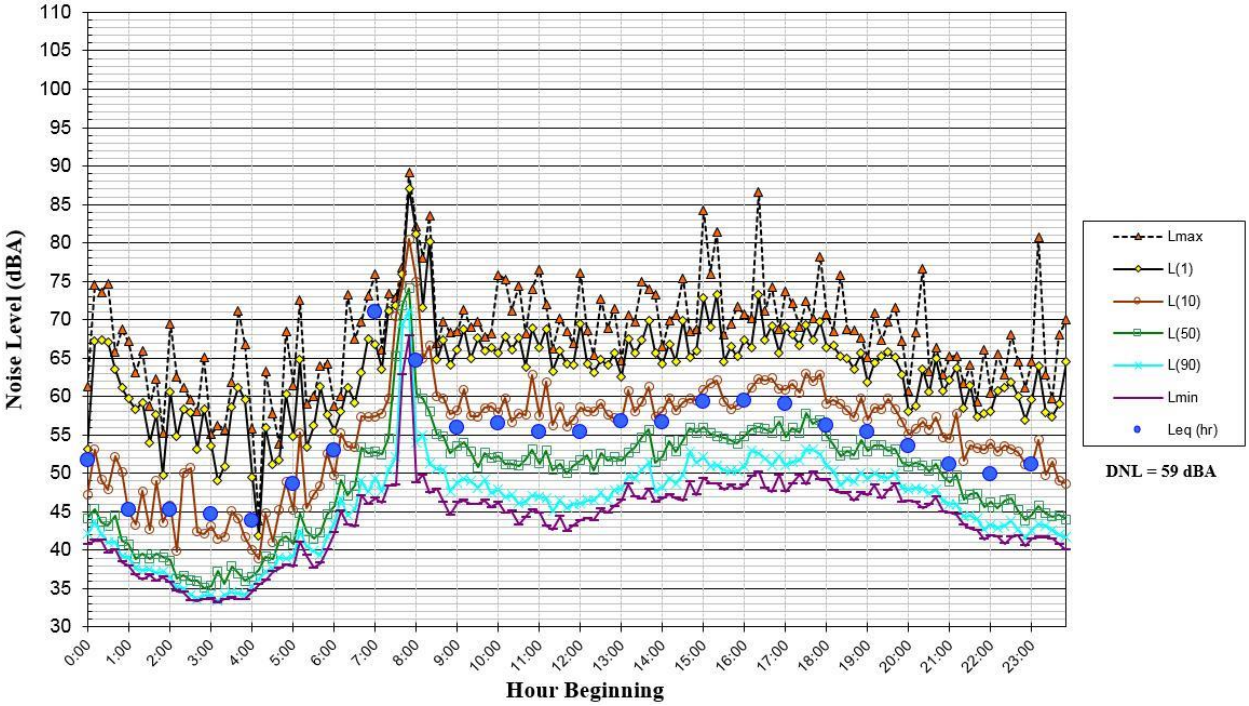

FIGURE 4 Daily Trend in Noise Levels at LT-1, Thursday, April 27, 2017

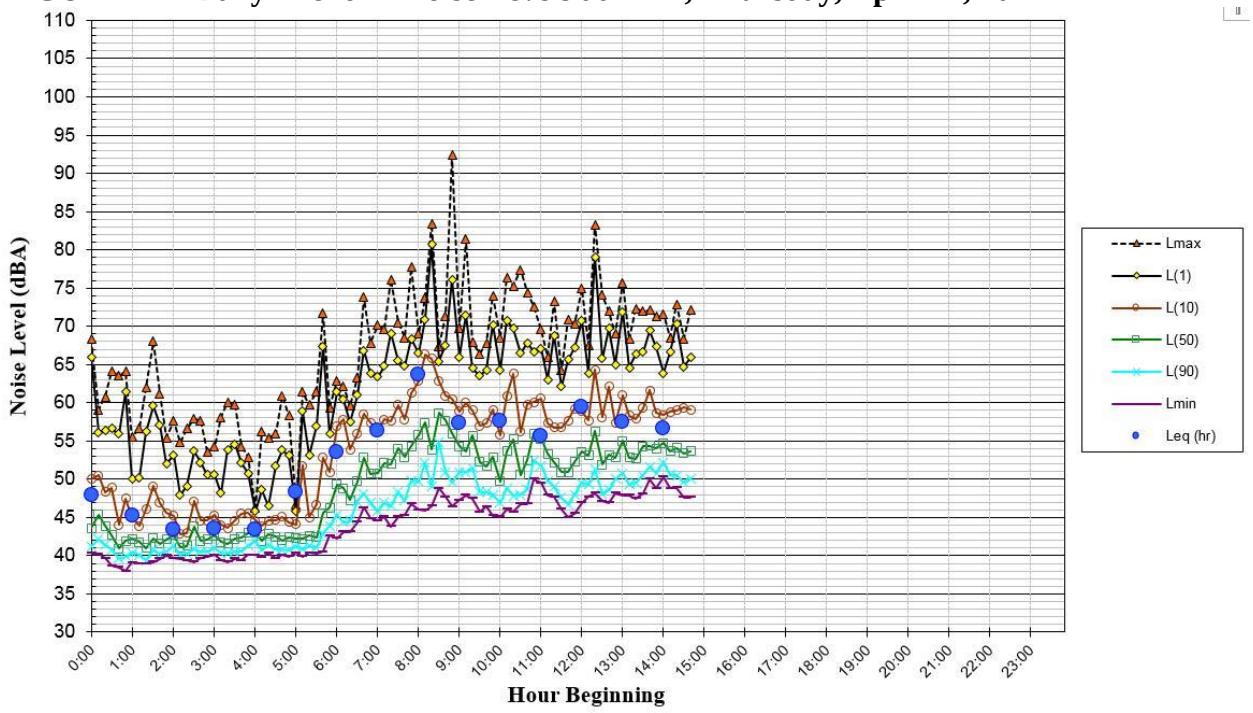

FIGURE 5 Daily Trend in Noise Levels at LT-2, Tuesday, April 25, 2017

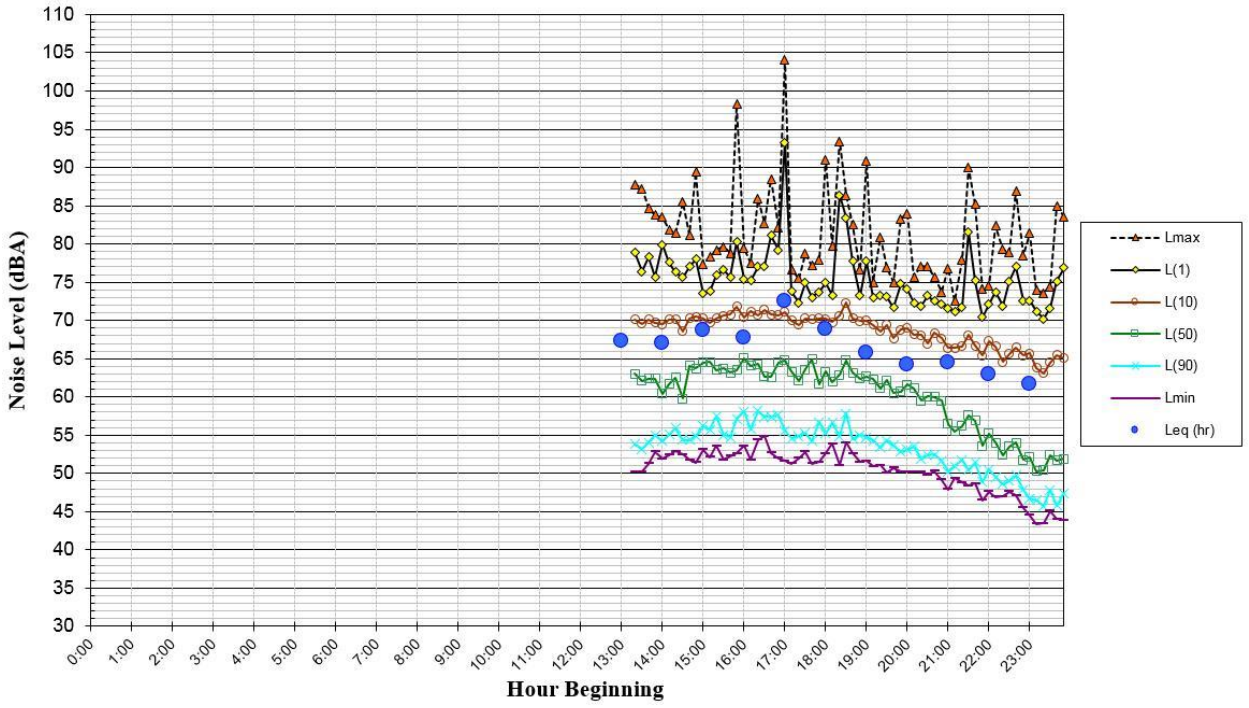

FIGURE 6 Daily Trend in Noise Levels at LT-2, Wednesday, April 26, 2017

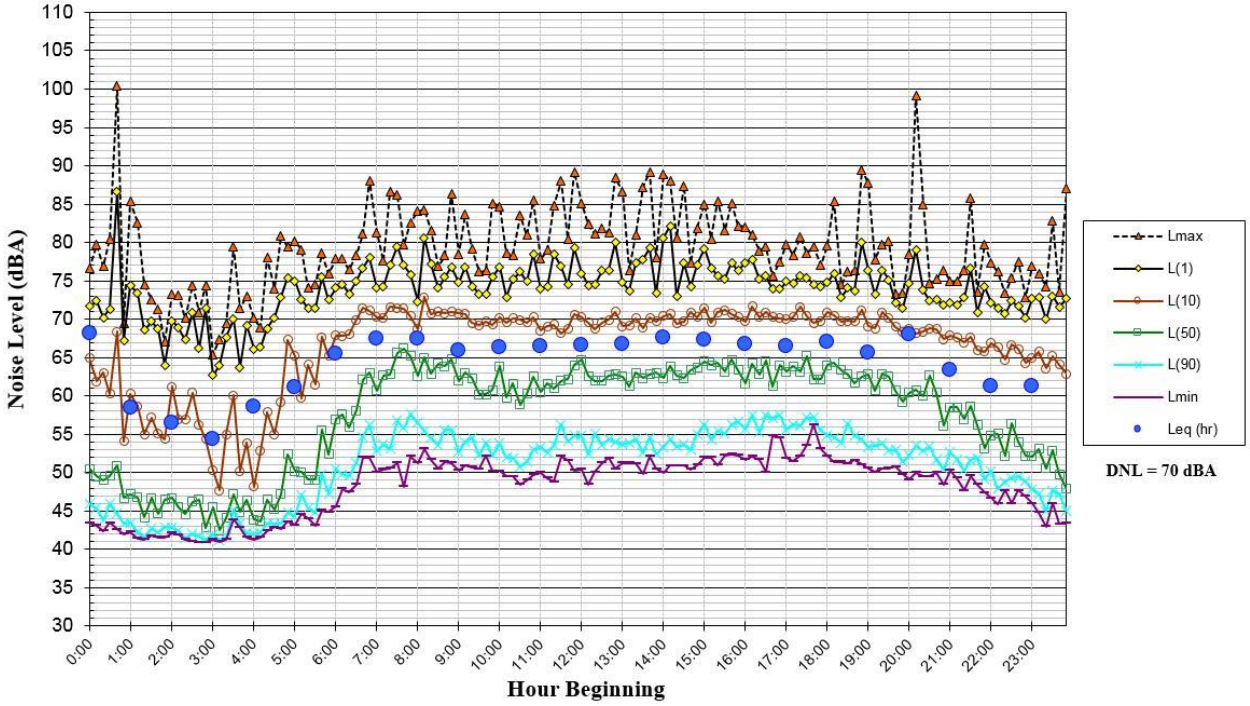

FIGURE 7 Daily Trend in Noise Levels at LT-2, Thursday, April 27, 2017

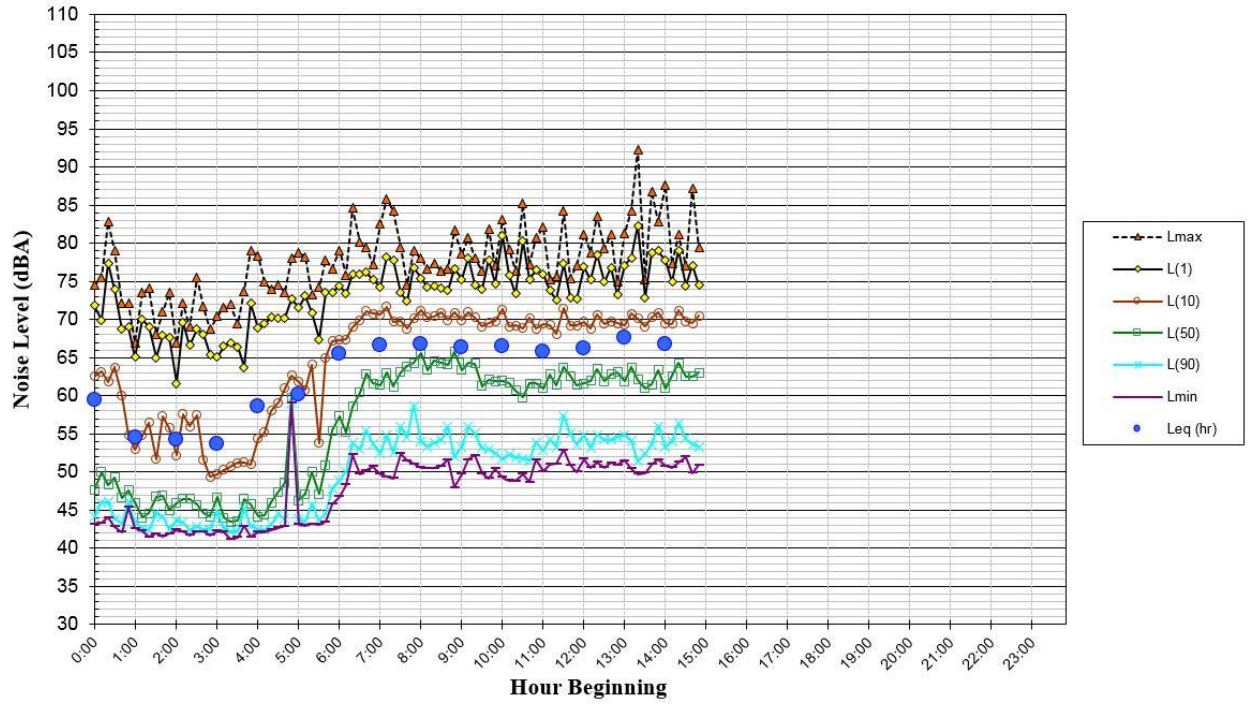

TABLE 4 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location (Date, Time)	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{eq(10\text{-}min)}$
ST-1: ~115 feet west of Race Street (4/27/2017, 1:20-1:30 p.m.)	70	69	62	56	52	59
ST-2: ~110 feet east of Grand Avenue (4/27/2017, 1:50-2:00 p.m.)	66	60	52	48	46	51

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The exterior noise threshold established in the City's General Plan for new multi-family residential projects and for the residential component of mixed-use development is 60 dBA DNL at usable outdoor activity areas, excluding balconies and porches. For commercial uses, the City's "normally acceptable" threshold for outdoor activity areas is 70 dBA DNL. The City requires that interior noise levels be maintained at 45 dBA DNL or less for residential land uses, and 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 the surrounding roadways. A transportation impact analysis was completed by *Hexagon Transportation Consultants, Inc.*[1] for the proposed project in October 2017. The three design options under Scenario 1 discussed in the Introduction section of this report were considered by the traffic study. That is, peak hour traffic volumes were provided for existing traffic conditions and background traffic conditions, which would include buildout traffic volumes for other approved projects in the area, as well as existing and background plus the following project design options: Scenario 1: Project Conditions includes access along Grand Avenue with commercial retail adjacent to Race Street; Scenario 1: Alternative 1 includes access along Grand Avenue with no commercial retail; and Scenario 1: Alternative 2 includes access along Race Street with commercial retail adjacent to Race Street.

When the peak hour traffic volumes for background plus project conditions, background plus alternative 1 conditions, and background plus alternative 2 conditions were compared to the existing peak hour volumes, a noise level increase of 1 dBA DNL was calculated along Grand Avenue for design options where site access occurs on Grand Avenue (project conditions and alternative 1) and along Race Street for the design option where site access occurs on Race Street (alternative 2). Therefore, the background plus project scenario for either of the three design options of Scenario 1 would result in a 1 dBA DNL increase at the project site. Under the design options for Scenario 2, which would be the same as Scenario 1 except the northern building on the site would consist of senior housing, the total trips generated by the project would be fewer than Scenario 1 options. Therefore, Scenario 1 options would represent the worst-case scenario and will be the focus of the noise and land use compatibility analysis.

[1] Hexagon Transportation Consultants, Inc., "Race Street Mixed-Use Project Draft Traffic Impact Analysis," October 2017.

The *Envision San José 2040 General Plan Comprehensive EIR*[2] was also reviewed to determine the traffic noise level increase under future 2040 buildout conditions. For this area of downtown San José, the future 2040 traffic volumes would not result in a measurable increase in noise levels at the project site, which is likely due to the area being mostly built out. Therefore, the total noise level increase at the project site under future 2040 plus project conditions would be approximately 1 dBA over existing conditions for the worst-case scenario conditions.

The future noise increase under project conditions would result in future noise levels of 60 dBA DNL at a distance of 25 feet from the centerline of Grand Avenue (LT-1) and 71 dBA DNL at a distance of 25 feet from the centerline of Race Street (LT-2).

For this analysis, it is assumed that the site plan from August 2017 would apply to all six design options described in the introduction of this report. A review of the site plan indicates that the first floors of each building would consist of a parking structure and commercial uses. While the second floor of the building on the southern portion of the site would also consist of indoor parking, the building located on the northern portion of the project site would have residential units on floors two through five. Residential units in the southern building are located on floors three through six.

Future Exterior Noise Environment

Residential Land Uses

The outdoor use areas identified from the site plan include a second-floor courtyard at the northern building, a third-floor courtyard at the southern building, and a ground-level common open space area between the buildings.

The second-floor courtyard at the northern residential building would be located along the northern façade, and the third-floor courtyard at the southern residential building would be located along the southern façade. Both of these courtyards would be partially shielded from the traffic noise along the surrounding roadways by the project buildings and the existing buildings located on the adjacent properties. The setbacks of both courtyards from the centerlines of both Race Street and Grand Avenue would range from 105 to 220 feet. At these distances, and assuming partial shielding from intervening buildings and the elevations of each courtyard, the future exterior noise levels at both of the proposed courtyards would be below 60 dBA DNL.

While the minimum setback of the common open space area would be approximately 45 feet west of the centerline of Race Street, most of the outdoor activities would occur towards the center of the area, approximately 100 feet from the centerline of Race Street. Since most activities would occur at this setback, this is where the City's exterior noise thresholds would be applied. Due to the partial shielding the common open space would receive from the intervening apartment buildings proposed by the project, the future exterior noise levels at a distance of 100 feet from the centerline of Race Street would be 60 dBA DNL.

Despite future exterior noise levels at the ground-level open space being up to 68 dBA DNL at the edge of the outdoor use area nearest Race Street, the future noise levels at the center of the area

[2] City of San José, "Envision San José 2040 General Plan," 2011.

would be 60 dBA DNL. Therefore, the future noise environments at the outdoor use areas associated with the proposed project would be compatible with the City's General Plan threshold.

Commercial Retail Uses

For the design options that include a commercial component, outdoor use areas are not proposed as part of the project.

Future Interior Noise Environment

The State of California and the City of San José requires that interior noise levels be maintained at 45 dBA DNL or less for residential land uses and that all non-residential land uses follow the requirements of the Cal Green Code.

Residential Land Uses

The eastern façades of each building would be set back from the centerline of Race Street by approximately 40 to 45 feet. At this distance, the exterior-facing units along these façades would be exposed to future exterior noise levels ranging from 68 to 69 dBA DNL.

The western façades of each building would be set back from the centerline of Grand Avenue by approximately 40 to 50 feet. At these distances, the units along the western façades would be exposed to future exterior noise levels ranging from 57 to 58 dBA DNL.

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 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 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.

Assuming windows to be partially open for ventilation, the interior noise levels for the proposed project would be up to 54 dBA DNL at the units along the eastern façades of proposed buildings. This would exceed the 45 dBA DNL threshold for interior noise. Future interior noise levels at the units along the western façades of the buildings would be below 45 dBA DNL.

Commercial Retail Uses

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

The proposed commercial uses would be located on the first floor of the proposed buildings along the eastern façades, adjacent to Race Street. The setbacks would be 40 to 45 feet from the centerline of Race Street. At these distances, the commercial uses would be exposed to future exterior noise

levels ranging from 61 to 67 dBA $L_{eq(1\text{-}hr)}$ during daytime hours, and a day-night average noise level ranging from 68 to 69 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 $L_{eq(1\text{-}hr)}$.

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 the proposed buildings would require windows and doors with a minimum rating of 28 STC to meet the interior noise threshold of 45 dBA DNL. Additionally, the exterior-facing units along the northern and southern building façades that are located within 100 feet of the centerline of Race Street would also require windows and doors with a minimum STC rating of 28. Exterior-facing units along the northern and southern façades that are located between 100 and 200 feet of the centerline of Race Street would meet the interior noise threshold of 45 dBA DNL with standard construction materials and the incorporation of forced-air mechanical ventilation.

- 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. The project site lies outside the 60 dBA CNEL 2027 noise contour of the airport, according to the Norman Y. Mineta San José International Airport Master Plan Update Project[3] report published in February 2010 as an addendum to the Environmental Impact Report. Although aircraft-related noise could occasionally be audible at the project site, noise from aircraft would not substantially increase ambient noise levels. Interior noise levels resulting from aircraft would be compatible with proposed project.

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.

[3] City of San José, "Norman Y. Mineta San José International Airport Master Plan Update Project: Eighth Addendum to the Environmental Impact Report," City of San José Public Project File No. PP 10-024, February 10, 2010.

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.**

Mechanical Equipment Noise

Mixed-use, multi-family 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 does not indicate any mechanical equipment rooms or include the layout for the roof, which is a common place for mechanical equipment to be located. Due to the number of variables inherent in the mechanical equipment needs of the project (number and types of units, size, housing, specs, etc.), the impacts of mechanical equipment noise on nearby noise-sensitive uses should be assessed during the final project design stage. Design planning should take into account the noise criteria associated with such 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 residential land uses, which in this case would be the southern edge of the building on the south portion of the site and the northern edge of the building on the north portion of the site. Other controls could include, but shall not be limited to, fan silencers, enclosures, and screen walls.

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. Existing residences are adjacent to the site to the south, along Grand Avenue, and to the north, along Grand Avenue and Race Street. Given the close-proximity of noise-sensitive receptors, mechanical equipment noise could exceed 55 dBA DNL at the nearby sensitive uses. This is conservatively considered a potentially significant impact.

Truck Loading and Unloading

Truck deliveries for the ground-level retail uses on the project site would also have the potential to generate noise. While the site plan does not indicate loading zones, the probable locations would be within the ground-floor parking structure or along Race Street in front of the commercial land uses. Trash areas for both buildings would be located within the parking structure, which would provide shielding for the nearby existing residences. While delivery and trash pickup times and frequency of these events were not provided at the time of this study, it is assumed that these activities, including maintenance activities would occur during daytime hours.

Typical noise levels generated by loading and unloading of truck deliveries and trash pickup would be similar to noise levels generated by truck movements at the existing commercial land uses located along Race Street. Small delivery and vendor trucks are expected to be used at the project site, and these types of trucks typically generate noise levels ranging from 65 to 70 dBA L_{max} at a distance of 50 feet. While loading/unloading activities within the parking structure would be shielded from the surrounding noise-sensitive receptors by the proposed building, the worst-case scenario would result from loading/unloading along the street. Assuming the worst-case scenario, the residences located opposite Race Street from the project site would have direct line-of-sight to the delivery activities, with distances as close as 60 feet. At this distance, noise due to truck deliveries would range from 63 to 68 dBA L_{max} at the nearest residential land uses. Assuming one

or two truck deliveries, lasting up to 20 minutes each, occurred during the daytime hours in one day, the proposed project would result in a day-night average noise level of 53 dBA DNL at the nearest residences opposite Race Street.

LT-2 was positioned along a telephone pole along Race Street and would represent the existing noise environment at these nearest residences opposite the project site. Considering that existing commercial uses are located on the project site and the surrounding properties, truck deliveries similar to those expected under future project conditions occur currently and would be included in the noise measurements at LT-2. Since the typical maximum noise levels at LT-2 range from 75 to 85 dBA L_{max} during daytime hours, additional truck deliveries are expected to occur along Race Street under future project conditions would not result in an increase in ambient noise levels.

Truck deliveries occurring at the proposed project site are not expected to generate levels exceeding 55 dBA DNL or existing ambient conditions at the nearby residences. This would be a less-than-significant impact.

Mitigation Measure 1:

Mechanical Equipment Noise

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 include locating equipment in less noise-sensitive areas, such as the rooftop of the buildings away from the building's edge nearest the noise-sensitive receptors, where feasible.

Impact 2: **Exposure to Excessive Groundborne Vibration due to Construction.** Construction-related vibration levels resulting from activities near the southern boundary of the project site would 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. According to the list of construction equipment expected to be used for the proposed project, pile driving equipment, which can cause excessive vibration, is not expected to be required for the proposed project.

For structural damage, the California Department of Transportation and City of San José recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, 0.2 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 in/sec PPV for

ancient buildings or buildings that are documented to be structurally weakened. No ancient buildings or buildings that are documented to be structurally weakened adjoin the project site. Conservatively, groundborne vibration levels exceeding 0.2 in/sec PPV would have the potential to result in a significant vibration impact.

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.

Existing residential and commercial structures are located adjacent to the site, within 10 feet of the northern and southern boundaries. At this distance, vibration levels from vibratory rollers would be up to 0.58 in/sec PPV, and clam shovel drops would generate levels up to 0.55 in/sec PPV. The City's 0.2 in/sec PPV threshold would also potentially be exceeded with the use of hoe rams, large bulldozers, caisson drills, and loaded trucks that are used near the northern and southern boundaries of the project site.

To the east of the project site, opposite Race Street, the nearest existing residential structures would be approximately 55 to 80 feet from the project's eastern boundary. At these distances, vibration levels would be up to 0.09 in/sec PPV. The nearest commercial buildings to the east would be approximately 75 to 145 feet from the project site. At these distances, vibration levels would be up to 0.06 in/sec PPV.

The existing residential structures located west of the project site, opposite Grand Avenue, would be approximately 70 to 75 feet from the project's boundary. At these distances, vibration levels would be up to 0.07 in/sec PPV. Existing commercial structures to the west of the project site would be 200 feet or more from the project's boundary. These structures would be exposed to vibration levels at or below 0.02 in/sec PPV.

Since vibration levels due to the use of specific equipment along the northern and southern boundaries of the project site may exceed 0.2 in/sec PPV, this would be a significant impact.

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.

Mitigation Measure 2:

Modification, placement, and operation of construction equipment are possible means for minimizing the vibration impact on the existing nearby structures, particularly the residences and commercial buildings adjoining the northern and southern boundaries:

- 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.

- Limit the use of heavy vibration-generating construction equipment within 30 feet of the northern and southern boundaries.

Implementation of this mitigation measure would reduce the 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 Race Street and are less than 60 dBA DNL along Grand Avenue. Therefore, a significant impact would occur if traffic due to the proposed project would permanently increase ambient levels by 3 dBA DNL along Race Street and by 5 dBA DNL or more along Grand Avenue. While measurements were not made at other locations beyond the immediate vicinity of the project site, a permanent noise increase at the residential land uses along other roadways would conservatively be considered significant with an increase of 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, and a 5 dBA DNL increase would be expected if the project would triple existing volumes.

The transportation impact analysis completed by *Hexagon Transportation Consultants, Inc.* included peak hour turning movements for seven intersections in the project vicinity. Comparing the peak hour volumes for the existing plus project conditions (i.e., access to the site along Grand Avenue with retail adjacent to Race Street), existing plus alternative 1 (i.e., access to the site along Grand Avenue with no retail), and existing plus alternative 2 (i.e., access to the site along Race Street with retail adjacent to Race Street) under Scenario 1 to the existing peak hour traffic volumes, the greatest increase in traffic volumes was determined to be less than a 5% increase along every roadway segment. That would result in a traffic noise increase of less than 1 dBA DNL along each roadway segment included in the traffic study. The seven intersections included in the traffic study do not include Grand Avenue/Park Avenue or Grand Avenue/San Carlos Street; however, when comparing the trips generated for project conditions, alternative 1 conditions, and alternative 2 conditions to existing volumes along Grand Avenue, each of the Scenario 1 design options would result in a 1 dBA DNL or less traffic noise level increase along these roadways.

Since fewer trips would be generated under the design options under Scenario 2, the proposed project would result in a 1 dBA DNL or less increase along each roadway segment for these design options. The proposed project would not result in a permanent noise increase of 3 dBA DNL or more under any design options included in Scenarios 1 or 2. This would be 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.

Existing residences along Grand Avenue range from within 10 to 75 feet of the project's boundary. Commercial buildings to the west of the project site are 200 feet or more from the project site. All uses along Grand Avenue would have existing ambient noise levels ranging from 51 to 65 dBA L_{eq} during daytime hours. Existing commercial and residential buildings located along Race Street would be within 10 feet north and south of the site and would range from 55 to 145 feet east of the site. These land uses have existing ambient daytime levels ranging from 63 to 69 dBA L_{eq} during daytime hours.

The typical range of maximum instantaneous noise levels for the proposed project, based on the equipment list provided, 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 65 to 88 dBA L_{eq} for residential developments, 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.

Demolition of existing structures on the project site is expected to commence in mid-March 2019, and construction of the proposed project is expected to be completed by the mid-February 2021. The construction schedule indicates that about 23 months would be required for project construction. Table 8 provides a detailed list of equipment expected to be used for the construction of the proposed project, by phase. For each phase, the equipment shown in Table 8 were input into the Federal Highway Administration's (FHWA) Roadway Construction Noise Model (RCNM) to predict the combined average noise level when all equipment operated simultaneously during each phase. This would represent the worst-case scenario for each phase of construction. Using the modeled worst-case noise levels, the construction noise levels were calculated from the

geometrical center of the project site to the property line of the surrounding land uses. These noise level estimates are also shown in Table 8. These levels do not assume reductions due to intervening buildings. There would be a period of time when the exterior and interior building construction phases would overlap. The range of levels summarized in Table 8 for the building interior phase reflects the building interior phase only and when operating simultaneously with the building exterior phase. Once construction moves indoors, minimal noise would be generated at off-site locations.

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

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/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 Nearby Land Uses

Phase	Time Duration	Construction Equipment (Quantity)	Calculated Hourly Average L_{eq} at Nearby Land Uses, dBA				
			Res & Comm-North & South (180ft)	Res-East (190ft)	Comm-East (205ft)	Res-West (260ft)	Comm-West (200ft)
Demolition	3/11/2019-3/17/2019	Concrete/Industrial Saw (1) Excavator (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	75	74	74	72	74
Site Preparation	3/18/2019-3/20/2019	Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	71	70	70	68	70
Grading/ Excavation	3/12/2019-3/29/2019	Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)	71	70	70	68	70
Trenching	4/1/2019-4/12/2019	Tractor/Loader/Backhoe (1) Excavator (1)	71	70	69	67	70
Building-Exterior	9/16/2019-6/28/2020	Crane (1) Forklift (1) Generator Set (1) Tractor/Loader/Backhoe (1) Welder (2)	72	72	71	69	71
Building-Interior/ Architectural Coating	5/13/2019-1/16/2021	Air Compressor (2) Aerial Lift (1)	66-73[a]	66-73[a]	65-72[a]	63-70[a]	65-72[a]
Paving	1/18/2021-2/19/2021	Cement and Mortar Mixer (1) Paver (1) Paving Equipment (1) Roller (1) Tractor/Loader/Backhoe (1)	74	74	73	71	74

[a] The range of levels for building interior reflects the overlap with the building exterior phase.

As shown in Table 8, construction noise levels would at times exceed 60 dBA L_{eq} at residential land uses and would at times exceed 70 dBA L_{eq} at commercial land uses, especially when construction would occur within 50 feet of the receiving land uses' property line. Further, ambient levels at the surrounding uses would potentially be exceeded by 5 dBA L_{eq} or more at various times throughout construction. Since project construction would last for a period of more than one year and considering that the project site is within 500 feet of existing residences and within 200 feet of existing commercial uses, Policy EC-1.7 of the City's General Plan would consider this temporary construction impact to be significant.

Mitigation Measure 4:

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 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, the temporary increase in ambient noise levels would be less-than-significant.

NEPA NOISE ASSESSMENT

Significance Criteria

Pursuant to the HUD Guidelines, the noise exposure at least 10 years in the future must be considered in addition to the existing noise exposure. An adverse effect would result if noise levels at the project site would exceed HUD Compatibility Guidelines for acceptability. Exterior noise levels exceeding 65 dBA DNL at common outdoor use areas or interior noise levels exceeding 45 dBA DNL would result in an adverse effect.

Methodology

For the purposes of this assessment, the future exterior noise environment was calculated based on adjustments made to measured noise levels, which account for increased traffic volumes along local roadways. While the transportation impact analysis completed by *Hexagon Transportation Consultants, Inc.*[1] did not include cumulative traffic volumes for scenarios 10 years or more in the future, the traffic study did indicate a 1 dBA DNL increase with the inclusion of the proposed project (under Scenario 1: project conditions, Scenario 1: alternative 1 conditions, and Scenario 1:

alternative 2 conditions) and other approved projects in the vicinity. Assuming site access from Grand Avenue (project conditions and alternative 1), the 1 dBA DNL increase was calculated along Grand Avenue; under alternative 2 conditions, which consists of site access along Race Street, the 1 dBA DNL increase was estimated along Race Street. While Scenario 2 design options were not included in the traffic study, trips generated by the project under each of these conditions would be less than the conditions under Scenario 1, which implies the noise increase would be at or below 1 dBA DNL for all three Scenario 2 options. Additionally, the *Envision San José 2040 General Plan Comprehensive EIR*[2] indicated that future 2040 traffic volumes along Race Street and Grand Avenue would not result in a measurable increase in noise levels at the project site, which is likely due to the area being mostly built out. Therefore, the total noise level increase at the project site under future 2040 plus project conditions was estimated to be 1 dBA over existing conditions under worst-case conditions. Future noise exposures at residential façades along Race Street and Grand Avenue are calculated to reach 69 and 58 dBA DNL, respectively.

Aircraft operations associated with Mineta San José International Airport, located about 1.8 miles from the project site, are audible as aircraft approach or depart the airport. A review of the 65 CNEL 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. Further, the project site is located well outside the 65 CNEL noise contours of the Reid-Hillview Airport and Moffett Federal Airfield, located approximately 4.9 and 8.9 miles, respectively, from the project site.

The HUD DNL Calculator (https://www.hudexchange.info/environmental-review/dnl-calculator/) was also used to approximate DNL noise levels at the site for the worst-case scenario, which was at the building façades facing Race Street under Scenario 1: alternative 2 traffic conditions. With building setbacks of 40 feet, the results of the calculations are summarized below and in Appendix A. The HUD DNL Calculator predicted the future exterior noise levels measured at the nearest building façade adjacent to Race Street to be 69 dBA DNL when the background plus project traffic for the alternative 2 (site access along Race Street) was used as the traffic input. This is consistent with the estimates discussed above based on the measurements and estimated traffic noise increase.

Only peak hour trips were provided along Grand Avenue for the second alternative design scenario (site access along Grand Avenue); therefore, without peak hour traffic volumes or average daily traffic volumes along Grand Avenue, the HUD DNL Calculator could not be used. The above discussion using the measurements and estimated traffic noise increase shall be used in this analysis.

The HUD DNL Calculator was not used for the outdoor use areas since the proposed building façades would result in partial shielding not accounted for in the HUD DNL Calculator.

Future Exterior Noise Environment

The outdoor use areas identified from the site plan include a second-floor courtyard at the building on the north portion of the site, a third-floor courtyard at the building on the south portion of the site, and a ground-level common open space area between the buildings.

The second-floor courtyard would be located on the northern side of the building, and the third-floor courtyard would be located on the southern side of the building. Both of these courtyards would be partially shielded from the traffic noise at the surrounding roadways by the project building façades and the existing buildings located on the adjacent properties. The setbacks of both courtyards from the centerlines of both Race Street and Grand Avenue would range from 105 to 220 feet. At these distances and assuming partial shielding from intervening building façades and the elevations of each courtyard, the future exterior noise levels at both of the proposed courtyards would be below 65 dBA DNL.

While the minimum setback of the common open space area would be approximately 45 feet west of the centerline of Race Street, most of the outdoor activities would occur towards the center of the area, approximately 100 feet from the centerline of Race Street. Since most activities would occur at this setback, this is where the City's exterior noise thresholds would be applied. Due to the partial shielding the common open space would receive from the intervening apartment buildings proposed by the project, the future exterior noise levels at a distance of 100 feet from the centerline of Race Street would be 65 dBA DNL.

Despite future exterior noise levels at the ground-level open space being up to 68 dBA DNL at the edge of the outdoor use area nearest Race Street, the future noise levels at the center of the area would be 65 dBA DNL. Therefore, the future noise environments at the outdoor use areas associated with the proposed project would be compatible with HUD's "normally acceptable" threshold for exterior noise levels at outdoor spaces.

Future Interior Noise Environment

The eastern façades of each building would be set back from the centerline of Race Street by approximately 40 to 45 feet. At this distance, the exterior-facing units along these façades would be exposed to future exterior noise levels would range from 68 to 69 dBA DNL.

The western façades of each building would be set back from the centerline of Grand Avenue by approximately 40 to 50 feet. At these distances, the units along the western façades would be exposed to future exterior noise levels ranging from 57 to 58 dBA DNL.

Future noise levels at the project site would require that residential units be designed to control interior noise levels to 45 dBA DNL or less. As noted previously, HUD assumes that buildings of standard construction will provide sufficient attenuation to achieve an interior level of 45 dBA DNL or less if the exterior level is 65 dBA DNL or less (20 dBA of attenuation). Where exterior noise levels range from 65 dBA DNL to 70 dBA DNL, the building must provide a minimum of 25 decibels of attenuation. Therefore, twenty-five (25) decibels of attenuation would be required to achieve acceptable interior noise levels at the units facing Race Street, and 20 decibels of attenuation would be required at units facing Grand Avenue.

Calculations were made to quantify the transmission loss provided by building elements in order to estimate interior noise levels resulting from exterior noise sources. Unit floor plans prepared by *LPMD* (dated February 6, 2017) were reviewed, and the relative areas of building elements (walls and windows) were input into an acoustical model to calculate interior noise levels within

individual rooms.

The exterior wall of the proposed residential units in both the family and senior buildings was assumed to be a standard 2x4 or 2x6 wood stud wall with insulation, a single layer of gypsum board attached to the inside of the studs, and a stucco exterior finish. This exterior wall construction has a rating of STC 46. Various windows and doors were then tested to determine the sound transmission class ratings for building elements necessary to achieve the improved sound insulation rating. HUD Figure 19 (Appendix B) provides a summary of the inputs used to complete the calculations of interior noise levels at residential units in each building with the future worst-case noise exposures.

The results of the calculations showed that windows and doors should have a minimum Sound Transmission Class (STC) rating of 30 STC and 28 STC, respectively. These windows and doors, in combination with the stucco exterior wall construction, would achieve an outdoor-to-indoor composite noise reduction of 30 to 32 decibels with the windows closed and would maintain interior noise levels below 45 dBA DNL with an adequate margin of safety. All units throughout the site are assumed to be mechanically ventilated so that windows can be kept closed at the occupant's discretion to control noise intrusion indoors.

APPENDIX A: DNL Calculator Results

APPENDIX B: HUD Figure 19

Figure 19
Description of Noise Attenuation Measures
(Acoustical Construction)

Part I

Project Name: Race Street Mixed-Use Project – Family Apartment Building (Worst-Case Traffic Noise Exposure)

Location: San Jose, California

Sponsor/Developer:

Noise Level (From NAG): 69 dBA DNL Attenuation Required: 25 dBA
Primary Noise Source(s): Race Street

Part II

1. For wall(s) facing and parallel to the noise source(s) (or closest to parallel:
   a. Description of wall construction*: Stucco exterior siding, insulated wood stud, and gypsum board interior
   b. STC rating for wall (rated for no windows or doors): STC 46
   c. Description of windows: Vinyl, dual-pane windows
   d. STC rating for window type: STC 30
   e. Description of doors:
   f. STC rating for doors: STC 28
   g. Percentage of wall (per wall, per dwelling unit) composed of windows: 18% and doors: 21%
   h. Combined STC rating for wall component: 32 dBA

2. For walls perpendicular to noise source(s):
   a. Description of wall construction*: Stucco exterior siding, insulated wood stud, and gypsum board interior
   b. STC rating for wall (rated for no windows or doors): STC 46
   c. Description of windows: Vinyl, dual-pane windows
   d. STC rating for window type: STC 28
   e. Description of doors: N/A
   f. STC rating for doors: N/A
   g. Percentage of wall (per wall, per dwelling unit) composed of windows: 28% and doors: 0%
   h. Combined STC rating for wall component: 33 dBA

3. Roofing component (if overhead attenuation is required to aircraft noise):
   a. Description of roof construction: N/A
   b. STC rating (rated as if no skylights or other openings): N/A
   c. Description of skylights or overhead windows: N/A
   d. STC rating for skylights or overhead windows: N/A
   e. Percentage of roof composed of skylights or windows (per dwelling unit): N/A
   f. Percentage of roof composed of large uncapped openings such as chimneys: N/A
   g. Combined STC rating for roof component: N/A

4. Description of type of mechanical ventilation provided: Satisfactory forced air mechanical ventilation system.

Prepared by:
Carrie J. Janello,
Consultant
Date: October 31, 2017
Figure 19
Description of Noise Attenuation Measures

(Acoustical Construction)

Part I

Project Name: Race Street Mixed-Use Project – Senior Apartment Building (Worst-Case Traffic Noise Exposure)

Location: San Jose, California

Sponsor/Developer:

Noise Level (From NAG): 69 dBA DNL Attenuation Required: 25 dBA
Primary Noise Source(s): Race Street

Part II

1. For wall(s) facing and parallel to the noise source(s) (or closest to parallel:
   a. Description of wall construction*: Stucco exterior siding, insulated wood stud, and gypsum board interior
   b. STC rating for wall (rated for no windows or doors): STC 46
   c. Description of windows: Vinyl, dual-pane windows
   d. STC rating for window type: STC 30
   e. Description of doors:
   f. STC rating for doors: STC 28
   g. Percentage of wall (per wall, per dwelling unit) composed of windows: 16% and doors: 21%
   h. Combined STC rating for wall component: 32 dBA

2. For walls perpendicular to noise source(s):
   a. Description of wall construction*: Stucco exterior siding, insulated wood stud, and gypsum board interior
   b. STC rating for wall (rated for no windows or doors): STC 46
   c. Description of windows: Vinyl, dual-pane windows
   d. STC rating for window type: STC 28
   e. Description of doors: N/A
   f. STC rating for doors: N/A
   g. Percentage of wall (per wall, per dwelling unit) composed of windows: 29% and doors: 0%
   h. Combined STC rating for wall component: 33 dBA

3. Roofing component (if overhead attenuation is required to aircraft noise):
   a. Description of roof construction: N/A
   b. STC rating (rated as if no skylights or other openings): N/A
   c. Description of skylights or overhead windows: N/A
   d. STC rating for skylights or overhead windows: N/A
   e. Percentage of roof composed of skylights or windows (per dwelling unit): N/A
   f. Percentage of roof composed of large uncapped openings such as chimneys: N/A
   g. Combined STC rating for roof component: N/A

4. Description of type of mechanical ventilation provided: Satisfactory forced air mechanical ventilation system.

Prepared by:
Carrie J. Janello,
Consultant
Date: October 31, 2017