ROOSEVELT PARK APARTMENTS PROJECT NOISE AND VIBRATION ASSESSMENT

San José, California

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INTRODUCTION

The Roosevelt Park Apartments site is located at 21 N. 21st Street, toward the western end of the Roosevelt Park Urban Village. The property, which is currently vacant, sits just north of E. Santa Clara Street and is surrounded by indoor batting cages, a roller rink, and Roosevelt Community Center. In keeping with the goals of the Urban Village Plan, Roosevelt Park Apartments will be an 80-unit mixed-use, eight-story light concrete building with two levels of garage parking on the basement and first level, six levels of residential units on the second through seventh levels, and one level of commercial office space on the eighth level. The building will include office spaces, a computer lab, open lounge/seating areas, a central laundry facility, and a large outdoor space on top of the garage podium that can accommodate a children's play area, community garden plots, and seating. The building would like to target foster families, low-income families, and young adults and families who are at risk of homelessness.

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.

SETTING

Fundamentals of Environmental Noise

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

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

intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

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

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

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

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA 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 additional decibel increases the percentage of the population highly annoyed by about 3 percent. People appear to respond more adversely to aircraft noise. When the 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, DNL or L_{dn}	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 DNL or less – acceptable.

- Exceeding 65 dBA DNL but not exceeding 75 dBA DNL – 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 DNL to 70 dBA DNL zone; 10 decibels additional attenuation in the 70 dBA DNL to 75 dBA DNL zone).

- Exceeding 75 dBA DNL – 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 DNL 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 DNL or less if the exterior level is 65 dBA DNL or less. Where exterior noise levels range from 65 dBA DNL to 70 dBA DNL, 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 DNL to 75 dBA DNL zone. Where exterior noise levels range from 75 dBA DNL to 80 dBA DNL, the project must provide a minimum of 35 decibels of attenuation to achieve an interior level of 45 dBA DNL 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.

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:

Interior Noise Levels

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

Exterior Noise Levels

- The City's acceptable exterior noise level objective is 60 dBA DNL or less for residential and most institutional land uses (Table EC-1). The acceptable exterior noise level objective is established for the City, except in the environs of the San José International Airport and the Downtown, as described below:

    - For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA DNL in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA DNL exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA DNL standard for noise from sources other than aircraft and elevated roadway segments.

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

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

[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 20.40.600 states the sound pressure level generated by any use or combination of uses shall not exceed 60 dBA at any property line shared with land zoned for commercial/industrial uses, except upon issuance and in compliance with a Conditional Use Permit. These codes are not explicit in terms of the acoustical descriptor associated with the noise level limit. However, a reasonable interpretation of these standards, which are based on policy EC-1.3 of the City's General Plan, would identify the ambient base noise level criteria as a day-night average noise level (DNL).

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

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

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 at 21 N. 21st Street in San José, and is surrounded by residential land uses, commercial land uses, and a park. Figure 1 show the project site plan overlaid on an aerial image of the site vicinity. Residential land uses are located east of the project site, opposite N. 21st Street. Adjacent commercial and recreational land uses include Roosevelt Park to the west, a roller rink to the north, a supermarket to the southeast, indoor batting cages to the south, and the Roosevelt Community Center to the southwest, which includes a preschool.

A noise monitoring survey was performed to quantify and characterize ambient noise levels at the site and in the project vicinity between Wednesday, January 10, 2018 and Friday, January 12, 2018. The monitoring survey included two long-term noise measurements (LT-1 and LT-2) and two short-term measurements (ST-1 and ST-2). The noise environment at the site and at the nearby land uses in the project vicinity results primarily from vehicular traffic along N. 21st Street and E. Santa Clara Street.

Long-term noise measurement LT-1 was made in front of 22 N. 21st Street, approximately 20 feet east of the roadway centerline. This location was selected to quantify noise levels due to traffic along N. 21st Street and to quantify noise levels near the closest residential receptors. Hourly average noise levels at LT-1 ranged from 55 to 65 dBA L_{eq} during the day and from 45 to 58 dBA L_{eq} at night. During the 9:00 a.m. and 11:00 a.m. hours on Thursday, January 11, 2018, there were instances where the average hourly noise levels were 5 to 10 dB higher than the typical mid-day noise levels. These noise levels were likely due to landscaping activities in the area. Adjustments were made in the calculation of the DNL to exclude the atypical data and more accurately reflect typical mid-day noise levels. The day-night average noise level on Thursday, January 11, 2018 was 62 dBA DNL. The daily trend in noise levels at LT-1 is shown in Figure 2.

Long-term noise measurement LT-2 was made at the southwest corner of the project site, approximately 215 feet west of the N. 21st Street centerline and approximately 240 feet north of the E. Santa Clara Street centerline. This location was selected to quantify noise levels due to the adjacent recreational use areas. Hourly average noise levels at this location ranged from 53 to 67 dBA L_{eq} during the day and from 45 to 56 dBA L_{eq} at night. The day-night average noise level on Thursday, January 11, 2018 was 60 dBA DNL. The daily trend in noise levels at LT-2 is shown in Figure 3.

Short-term noise measurement ST-1 was made in the parking lot of the roller rink north of the project site, approximately 100 feet west of the N. 21st Street centerline. This location was selected to quantify noise levels due vehicle traffic and the adjacent recreational use areas. The 10-minute average noise level measured at this location between 11:40 a.m. and 11:50 a.m. on Wednesday, January 10, 2018 was 55 dBA L_{eq}. During the measurement at ST-1, traffic passing to the recreational areas produced maximum noise levels ranging from 54 to 55 dBA $L_{max,}$ with a truck producing a noise level of 64 dBA L_{max}. Short-term noise measurement ST-2 was made in front of the Roosevelt Community Center, approximately 195 feet north of the E. Santa Clara Street centerline. This location was selected to quantify noise levels due to the adjacent recreational use areas. The 10-minute average noise level measured at this location between 12:00 p.m. and 12:10 p.m. on Wednesday, January 10, 2018 was 49 dBA L_{eq}. During the measurement at ST-2, an airplane passing overhead produced a maximum noise level of 63 dBA L_{max}. Table 4 summarizes the results of the short-term measurements.

TABLE 4 Summary of Short-Term Noise Measurement Data (dBA)

Noise Measurement Location	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: In parking lot of roller rink. (1/10/2018, 11:40 a.m. - 11:50 a.m.)	65	61	57	53	51	55
ST-2: In front of Roosevelt Community Center. (1/10/2018, 12:00 p.m. - 12:10 p.m.)	63	59	50	47	45	49

FIGURE 1 Noise Measurement Locations

Source: Google Earth

FIGURE 2 Daily Trend in Noise Levels at LT-1

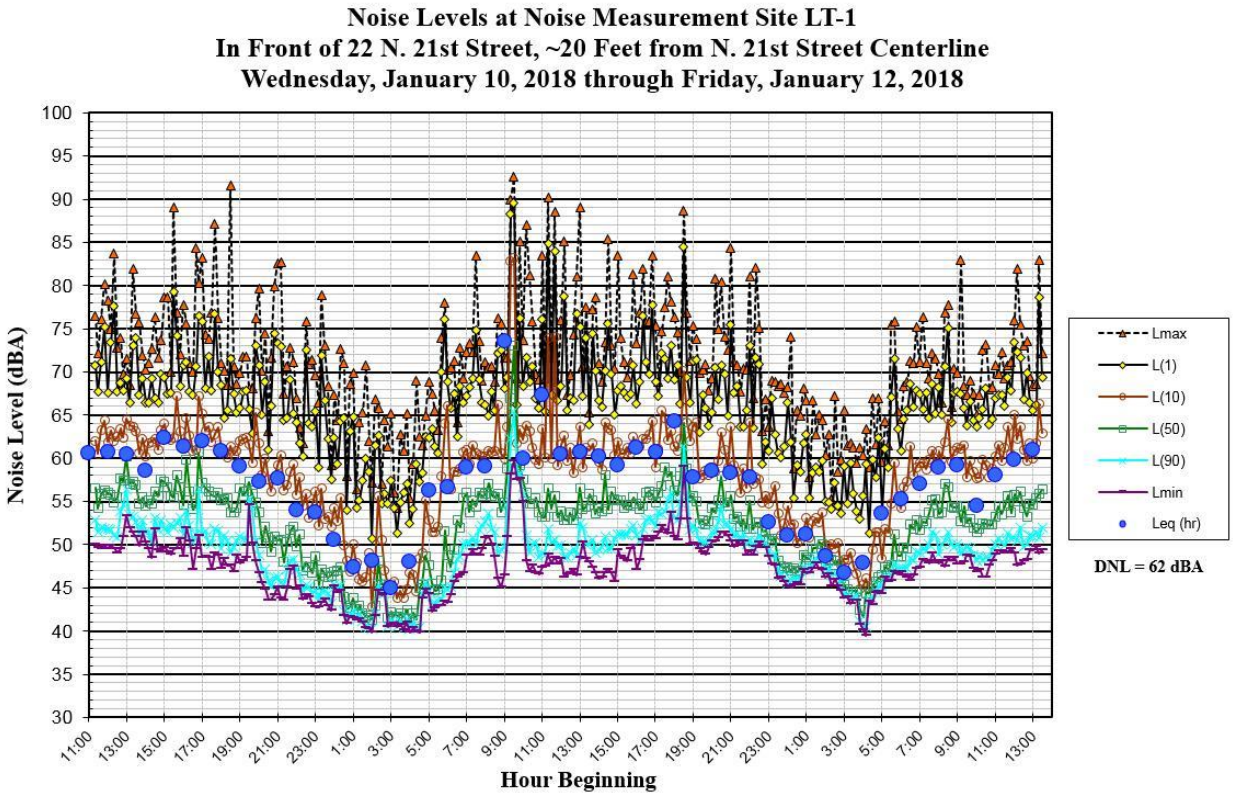
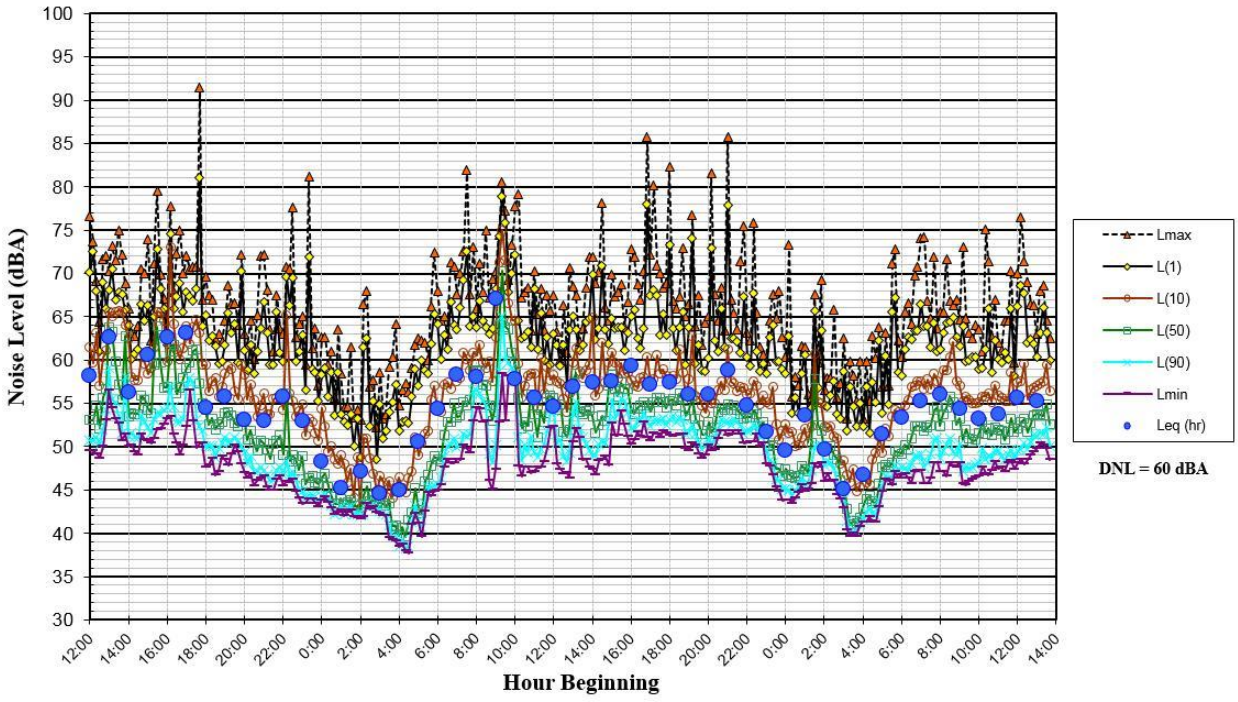


FIGURE 3 Daily Trend in Noise Levels at LT-2



PLAN CONSISTENCY ANALYSIS – NOISE AND LAND USE COMPATIBILITY

Noise and Land Use Compatibility Thresholds

The exterior noise threshold established in the City's General Plan for new multi-family residential projects and for the residential component of the development is 60 dBA DNL at usable outdoor activity areas, excluding balconies and porches. For office 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.

Future Exterior Noise Environment

The ambient noise environment at the project site ranges from 60 to 62 dBA DNL. The future noise environment at the project site would continue to result primarily from vehicular traffic along the surrounding roadways. Traffic volume data was produced for the project by *Hexagon Transportation Consultants, Inc*. According to these data, the future background plus project traffic conditions are expected to increase traffic noise levels in the area by up to 1 dBA DNL. To estimate the future noise environment at the project site, this increase in noise levels due to increased traffic volumes is applied to the results of the existing measurements described above. Therefore, at 20 feet from the centerline of N. 21st Street, the future unmitigated noise level would be up to 63 dBA DNL (LT-1) and at 215 feet from the centerline of N. 21st Street and 240 feet from the centerline of E. Santa Clara Street, the future unmitigated noise level would be up to 61 dBA DNL (LT-2).

Norman Y. Mineta San José International Airport is a public-use airport located approximately 2.3 miles northwest 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[1] 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 contribute to ambient noise levels.

Residential Land Uses

A second-floor courtyard is proposed at the southwest corner of the building. Typically, the exterior noise standards established by the City are evaluated at the center of each outdoor space. The setback of the courtyard would be approximately 140 feet west from the centerline of N. 21st Street and approximately 240 feet north from the centerline of E. Santa Clara Street. This courtyard would be partially shielded from the traffic noise along N. 21st Street by the intervening project building. At these distances, and assuming partial shielding from the intervening building and the height of the courtyard relative to the adjacent roadways, the future exterior noise levels at the proposed courtyard would be below 60 dBA DNL. The future noise environment at the residential outdoor use area would be compatible with the City's General Plan threshold.

[1] 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.

Office Land Uses

Common outdoor use areas for the proposed offices include an eighth-floor courtyard and an eighth-floor balcony. The eighth-floor courtyard would be located along the northern façade of the building. This courtyard would be partially shielded from the traffic noise along N. 21st Street by the project building. The setback of the courtyard would be approximately 120 feet west from the centerline of N. 21st Street and approximately 330 feet north from the centerline of E. Santa Clara Street. At these distances, and assuming partial shielding from the intervening building and the height of the courtyard relative to the adjacent roadways, the future exterior noise levels at the proposed courtyard would be below 70 dBA DNL.

The eighth-floor balcony would be located along the eastern façade of the building facing N. 21st Street. This balcony would be partially shielded from the traffic noise by the solid glass railing system proposed along the edge of the balcony. The setback of the balcony from the centerline of N. 21st Street would be approximately 45 feet. At this distance, and assuming partial shielding from the solid glass railing and the height of the balcony relative to the adjacent roadways, the future exterior noise levels at the proposed balcony would be below 70 dBA DNL. The future noise environment at the office-related outdoor use areas would be compatible with the City's General Plan threshold.

Future Interior Noise Environment

Residential Land Uses

The State of California and the City of San José require that interior noise levels be maintained at 45 dBA DNL or less for residences. Residential units would be located on the second through seventh floors of the building. At a distance of 40 feet from the N. 21st Street centerline and 240 feet from the E. Santa Clara Street centerline, residences along the eastern and southern façades of the proposed building would be exposed to exterior traffic noise levels of up to 61 dBA DNL.

Interior noise levels would vary depending upon the design of the building (relative window area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA DNL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows, at the discretion of the residents, to control noise. For the proposed project, the interior noise levels assuming standard construction methods and windows and doors partially open for ventilation would be up to 46 dBA DNL, which slightly exceeds the City's threshold for interior noise.

Measures to Implement to Achieve General Plan Consistency

For consistency with the General Plan, the following Conditions of Approval will be implemented by the project applicant:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all perimeter residential units, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards.

Preliminary calculations indicate that standard dual thermal-pane windows (minimum 26 Sound Transmission Class [STC][2] Rating) would be satisfactory to achieve acceptable interior noise levels of 45 dBA DNL.

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:

- **Noise Levels in Excess of Standards:** 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.

- **Groundborne Vibration from Construction:** 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.

- **Project-Generated Traffic Noise Increases:** 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.

- **Construction Noise:** 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. Hourly average noise levels exceeding 70 dBA L_{eq}, and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would also constitute a significant temporary noise at adjacent commercial land uses.

[2] **Sound Transmission Class (STC)** A single figure rating designed to give an estimate of the sound insulation properties of a partition. Numerically, STC represents the number of decibels of speech sound reduction from one side of the partition to the other. The STC is intended for use when speech and office noise constitute the principal noise problem.

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.**

Construction Noise

Chapter 20.100.450 of the City's Municipal Code establishes allowable hours of construction within 500 feet of a residential unit between 7:00 am and 7:00 pm Monday through Friday unless 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. This analysis assumes that construction activities will occur only during the allowable hours. Project construction will be consistent with the code limits and the impact is less-than-significant.

Mechanical Equipment Noise

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 indicates mechanical and utility rooms located on the interior of the below-grade parking garage, generator and electric rooms on the ground floor at the northwest corner, and rooftop mechanical equipment. The nearest noise-sensitive uses to the project site include the residences to the east opposite N. 21st Street. Under the City's Noise Element and Municipal Codes, noise levels produced by the operation of the mechanical equipment would be limited to 55 dBA at receiving noise-sensitive land uses and 60 dBA at receiving commercial land uses.

Typical air conditioning units and heat pumps for multi-story residential projects produce noise levels of up to 70 dBA at a distance of 3 feet. The rooftop mechanical equipment would be at least 65 feet from the residential property line to the east and 5 feet from the commercial property lines to the north, west, and south. The distance from the rooftop mechanical equipment to the residential and commercial property lines and the building itself would provide at least 15 to 20 dBA of acoustic shielding. The noise levels from the rooftop mechanical equipment would be less than 30 dBA at the residential property line and less than 50 dBA at the commercial property lines, and below the City's thresholds.

The project proposes a small generator room on the ground floor at the northwest corner of the building. Given the close proximity of the generator room to the northern commercial property line (approximately 5 feet) and lack of sufficient details about the proposed equipment type and enclosure at this time, there is the potential for noise from generator equipment to exceed 60 dBA at the commercial land uses property line to the north. This is a potentially significant impact.

Mitigation Measure 1:

The following mitigation measures shall be included in the project to reduce the impact to a less-than-significant level:

- Prior to the issuance of building permits, mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's requirements. A

qualified acoustical consultant shall be retained by the project applicant to review mechanical noise as the equipment systems are selected in order to determine specific noise reduction measures necessary to reduce noise to comply with the City's noise limits at the shared property lines. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels, installation of acoustical louvers and mufflers, and the construction of acoustical enclosures.

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Construction-related vibration levels would not exceed the 0.2 in/sec PPV threshold at nearby residential or commercial buildings. **This is a less-than-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 demolition, site preparation work, grading and excavation, paving, 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.

TABLE 5 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)
Pile Driver (Impact)	upper range	1.158
	typical	0.644
Pile Driver (Sonic)	upper range	0.734
	typical	0.170
Clam shovel drop		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory Roller		0.210
Hoe Ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

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

The nearest sensitive receptors would be the residences located approximately 75 feet to the east of the project site, opposite N. 21st Street. At this distance, vibration levels due to construction activities would be up to 0.06 in/sec PPV, which would be below the 0.2 in/sec PPV threshold. Other sensitive receptors near the project site include the preschool located approximately 85 feet southwest of the project site. At this distance, vibration levels due to construction activities would be up to 0.05 in/sec PPV, which would be below the 0.2 in/sec PPV threshold. The nearest commercial land uses would be the adjacent commercial building located approximately 45 feet to the south of the project site. At this distance, vibration levels due to construction activities would be up to 0.11 in/sec PPV, which would be below the 0.2 in/sec PPV threshold. Other commercial land uses near the project site include the commercial building located approximately 110 feet north of the project site. At this distance, vibration levels due to construction activities would be up to 0.04 in/sec PPV, which would be below the 0.2 in/sec PPV threshold.

Construction vibration levels would be below the 0.2 in/sec PPV threshold at nearby residential and commercial land uses. This is a less-than-significant impact.

Mitigation Measure 2: None required.

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 N. 21st Street and E. Santa Clara Street. Therefore, a significant impact would occur if traffic due to the proposed project would permanently increase ambient levels by 3 dBA DNL. For reference, a 3 dBA DNL noise increase would be expected if the project would double existing traffic volumes along a roadway, and a 5 dBA DNL increase would be expected if the project would triple existing volumes.

The traffic data provided peak hour volumes for the project-generated traffic at local and major roadways in the immediate project vicinity. Traffic volume information was reviewed to calculate the permanent noise increase attributable to project-generated traffic. Traffic volumes under the Existing Plus Project scenario were compared to the Existing scenario to calculate the relative increase in the hourly average traffic noise level (L_{eq}) attributable to the proposed project. The change in the DNL would be the same as the change in the peak hour L_{eq} given that the hourly distribution of traffic and mix of vehicles is expected to be similar to the existing traffic. The permanent noise level increase due to this project-generated traffic would be 1 dBA DNL or less at noise-sensitive receptors in project vicinity. Therefore, the proposed project would not cause a substantial permanent noise level increase at the nearby noise-sensitive receptors. 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. Project construction is anticipated to occur over an approximate period of just over one year, beginning in mid-2018.

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 and none on weekends when construction occurs within 500 feet of a residential land use. Further, the City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

While noise thresholds for temporary construction are not provided in the City's General Plan or Municipal Code, the Fundamentals section of this report provides a threshold of 45 dBA for speech interference indoors. Assuming a 15 dBA exterior-to-interior reduction for standard residential construction and a 25 dBA exterior-to-interior reduction for standard commercial construction, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Additionally, temporary construction would be annoying to surrounding land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Therefore, the temporary construction noise impact would be considered significant if project construction activities exceeded 60 dBA L_{eq} at nearby residences or exceeded 70 dBA L_{eq} at nearby commercial land uses and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

The residential property lines to the east are approximately 145 feet from the center of the project site. The commercial property lines to the south and north are approximately 65 feet or more from the center of the project site. Residences and commercial buildings along N. 21st Street are exposed to daytime ambient noise levels similar to those recorded at LT-1. Based on these data, the hourly average noise levels during construction hours range from 55 to 65 dBA L_{eq}. The preschool property line to the southwest is 90 feet from the center of the project site. The preschool is exposed to daytime ambient noise levels similar to those recorded at LT-2, which range from 53 to 67 dBA L_{eq}.

Table 6 shows the hourly average noise level range expected from project construction activities by 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. 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 7). Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors.

Construction on the project site is expected to commence in mid-2018 and is expected to be completed by mid-2019. The construction schedule indicates that a little over a year would be required to complete the project. 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. Once construction moves indoors, minimal noise would be generated at off-site locations.

TABLE 6 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

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

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

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

TABLE 7 Construction Equipment 50-Foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:
[1] Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.
[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.
[3]Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

TABLE 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		
			Commercial North & South (65ft)	Preschool Southwest (90ft)	Residential East (145ft)
Demolition	6/1/2018-6/28/2018	Concrete/Industrial Saw (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (3)	85	82	78
Site Preparation	6/29/2018-7/3/2018	Grader (1) Scraper (1) Tractor/Loader/Backhoe (1)	83	80	76
Grading/ Excavation	7/4/2018-7/11/2018	Excavator (1) Grader (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (2)	84	81	77
Building-Exterior	7/12/2018-5/15/2019	Crane (1) Forklift (2) Generator Set (1) Tractor/Loader/Backhoe (1) Welder (3)	81	78	74
Paving	5/16/2019-5/29/2019	Cement and Mortar Mixer (1) Paver (1) Paving Equipment (1) Roller (2) Tractor/Loader/Backhoe (1)	82	79	75
Building-Interior/ Architectural Coating	5/30/2019-6/12/2019	Air Compressor (1)	72	69	65

As shown in Table 8, construction noise levels would exceed 60 dBA L_{eq} at nearby residential land uses and would exceed 70 dBA L_{eq} at nearby commercial land uses. 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.

- A temporary noise control blanket barrier could be erected, if necessary, along building facades facing construction sites. This mitigation would only be necessary if conflicts occurred which were irresolvable by proper scheduling. Noise control blanket barriers can be rented and quickly erected.

- 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 traffic data provided by *Hexagon Transportation Consultants, Inc.* 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 and other approved projects in the vicinity. Therefore, the total noise level increase at the project site was estimated to be 1 dBA over existing conditions under worst-case conditions. Future noise exposures at the southern and eastern residential façades are calculated to reach 61 dBA DNL.

No active railroad exists within 3,000 feet of the project site. Aircraft operations associated with Mineta San José International Airport, located about 2.3 miles from the project site, are audible as aircraft approach or depart the airport. As noted previously, aircraft noise is at times audible at the site, but is not considered to be a significant contributor to ambient noise levels.

The HUD DNL Calculator (https://www.hudexchange.info/environmental-review/dnl-calculator/) was also used to approximate DNL noise levels at the site. With building setbacks of 40 feet from N. 21st Street and 240 feet from E. Santa Clara Street, the HUD DNL Calculator predicted the future exterior noise level at the eastern building façade adjacent to N. 21st Street to be 54 dBA DNL. The HUD DNL Calculator predicted the future exterior noise level to be 51 dBA DNL at the southern building façade facing to E. Santa Clara Street. The results of the calculations are summarized in Appendix A. Based on a comparison with the calibrated noise measurements, the HUD DNL Calculator was found to underestimate noise levels at the project site. The HUD DNL Calculator's modeled results did not credibly represent future site conditions as predicted noise levels were 7 to 10 dBA below the noise levels estimated for future conditions using adjustments to measured noise levels. The HUD DNL Calculator's results were reviewed but not used in this noise assessment to represent the site's noise exposure.

Future Exterior Noise Environment

The outdoor use areas identified from the site plan review included a second-floor courtyard in the southwest corner of the building, an eight-floor courtyard along the northern façade of the building, and an eighth-floor balcony along the eastern façade of the building facing N. 21st Street.

The second-floor courtyard and the eighth-floor courtyard would both be partially shielded from traffic noise by the project building. The setbacks of both courtyards from the centerlines of both N. 21st Street and E. Santa Clara Street would range from 120 to 330 feet. At these distances and assuming partial shielding from the intervening building, the future exterior noise levels at the courtyards would be below 65 dBA DNL.

The eighth-floor balcony would be partially shielded from the traffic noise along N. 21st Street by the solid glass railing along the edge of the balcony. The setback of the balcony from the centerline of N. 21st Street would be approximately 45 feet. At this distance, and assuming partial shielding from the solid glass railing, the future exterior noise levels at the proposed balcony would be below 65 dBA DNL. 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 façade of the building would be set back from the centerline of N. 21st Street by approximately 40 feet. The southern façade of the building would be set back from the centerline of E. Santa Clara Street by approximately 240 feet. At these distances, the exterior-facing units along these façades would be exposed to future exterior noise levels of up to 61 dBA DNL.

Where noise levels are less than 65 dBA DNL, HUD assumes that buildings of standard construction will provide sufficient attenuation to achieve an interior level of 45 dBA DNL or less (20 dBA of attenuation). 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 *The Office of Jerome King* (dated September 15, 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.

Various exterior sidings are proposed for the building. In order to represent a credible worst-case scenario, the sound insultation properties of a standard wood-sided exterior wall was used to calculate interior noise levels within units. Wood-sided walls have a sound transmission class rating of approximately 39 STC. The calculations also assumed that standard dual thermal-pane windows and doors would be installed. HUD Figure 19 (Appendix B) provides a summary of the inputs used to complete the calculations of interior noise levels at residential units with the future worst-case noise exposures.

The results of the calculations showed that windows and doors should have a minimum sound transmission class rating of 26 STC in order to achieve the 45 dBA DNL threshold 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: HUD DNL Calculator Results

DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

Note: HUD updated the Calculator December 12, 2017. If you used the Calculator prior to December 12, you may need to clear your cache to perform an accurate calculation. **View instructions to clear your cache (https://support.google.com/accounts/answer/32050).**

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID	Roosevelt Park Apartments
Record Date	01/18/2018
User's Name	Casey Zaglin

Road # 1 Name:	**N. 21st Street**

Road #1

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☐
Effective Distance	40	40	
Distance to Stop Sign	200	200	
Average Speed	25	20	
Average Daily Trips (ADT)	2100	20	
Night Fraction of ADT	15	15	
Road Gradient (%)			
Vehicle DNL	52.0814	49.9313	
Calculate Road #1 DNL	54.1364	Reset	

Road # 2 Name:	**E. Santa Clara**

Road # 2 Name:	E. Santa Clara

Road #2

Vehicle Type	Cars ☑	Medium Trucks ☑	Heavy Trucks ☐
Effective Distance	240	240	
Distance to Stop Sign	200	200	
Average Speed	25	20	
Average Daily Trips (ADT)	15850	150	
Night Fraction of ADT	15	15	
Road Gradient (%)			
Vehicle DNL	49.1872	47.0096	
Calculate Road #2 DNL	51.2339	Reset	

Add Road Source | Add Rail Source

Airport Noise Level	<65
Loud Impulse Sounds?	○ Yes ◉ No
Combined DNL for all Road and Rail sources	**55.9657**
Combined DNL including Airport	**NaN**
Site DNL with Loud Impulse Sound	

Calculate

Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative**: Cancel the project at this location
- **Other Reasonable Alternatives**: Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)**
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See ***The Noise Guidebook (/resource/313/hud-noise-guidebook/)***
  - Construct noise barrier. See the **Barrier Performance Module (/programs/environmental-review/bpm-calculator/)**

Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

Day/Night Noise Level Assessment Tool Flowcharts (/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

APPENDIX B: HUD Figure 19

Figure 19
Description of Noise Attenuation Measures
(Acoustical Construction)

Part I

Project Name: Roosevelt Park Apartments, 2nd Floor Eastern Façade Corner Unit, Line-of-Sight to N. 21st Street (Worst-Case Traffic Noise Exposure)

Location: San Jose, California

Sponsor/Developer: David J. Powers Associates, Inc.

Noise Level (From NAG): 61 dBA DNL Attenuation Required: 20 dBA
Primary Noise Source(s): N. 21st Street and E. Santa Clara Street

Part II

1. For wall(s) facing and parallel to the noise source(s) (or closest to parallel:
   a. Description of wall construction*: Wood siding, wood stud walls with cavity insultation
   b. STC rating for wall (rated for no windows or doors): STC 39
   c. Description of windows: Double glazed, dual thermal-pane windows
   d. STC rating for window type: STC 26
   e. Description of doors: Solid Core with foam/neoprene seals
   f. STC rating for doors: STC 26
   g. Percentage of wall (per wall, per dwelling unit) composed of windows: 23% and doors: 15%
   h. Combined STC rating for wall component: 30 dBA

2. For walls perpendicular to noise source(s):
   a. Description of wall construction*: N/A
   b. STC rating for wall (rated for no windows or doors): N/A
   c. Description of windows: N/A
   d. STC rating for window type: N/A
   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: N/A
   h. Combined STC rating for wall component: N/A

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:
Casey T. Zaglin,
Staff Consultant
Date: January 24, 2018