SANTANA ROW PARKING STRUCTURE PROJECT NOISE ASSESSMENT SAN JOSÉ, CALIFORNIA

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INTRODUCTION

This report presents the results of the environmental noise assessment completed for the proposed Santana Row Parking Structure Project. The project proposes to construct a five-level above-grade parking structure and one level of below-grade parking to be shared between office employees and Santana Row patrons. Access to the parking structure would be provided via Olsen Avenue and Hatton Street. An exit-only driveway would access Dudley Avenue. This parking structure would be located across all of Lot 9 and the parking garage would extend onto the northern portion of Lot 17. Lots 9 and 17 are shown on Figure 1. This assessment presents the fundamentals of environmental noise and vibration, provides a discussion of policies and standards applicable to the project, presents the results of ambient noise measurements made at the site, and provides an evaluation of the potential significance of impacts resulting from the project. Noise reduction measures are provided, as necessary, to reduce impacts to a less-than-significant level.

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* or *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)* 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.

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 is the Peak Particle Velocity (PPV) and another is the Root Mean Square (RMS) velocity. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. The RMS velocity is defined as the average of the squared amplitude of the signal. The PPV and RMS vibration velocity amplitudes are used to evaluate human response to vibration. In this section, 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. In high noise environments, which are more prevalent where groundborne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

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 ground-borne vibration levels. Because of the impulsive nature of such activities, the use of the peak particle velocity descriptor (PPV) has been routinely used to measure and assess ground-borne 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.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. 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 Definitions 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
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), Caltrans, November 2009.

TABLE 3 Reaction of People and Damage to Buildings From Continuous/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

The State of California and the City of San José have established plans and policies designed to limit noise exposure at noise sensitive land uses. These plans and policies are contained in the following documents: (1) the California Environmental Quality Act (CEQA) Guidelines, Appendix G, (2) the City of San José Noise Element of the General Plan, and (3) the City of San José Municipal Code.

<u>(1) CEQA Guidelines</u>

Under the 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 ground-borne vibration or ground-borne 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;

(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?

Of these guidelines, items (a), (b), (c), and (d) are applicable to the proposed project. Guidelines (e) and (f) are not applicable because the project is not located within two miles of a public airport and is not in the vicinity of a private airstrip.

<u>(2) City of San José General Plan</u>
The Environmental Leadership Chapter in The Envision San José 2040 General Plan sets forth policies related to noise and vibration control in the City of San José. The following policies are applicable to the proposed development.

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-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.

<u>(3) City of San José Municipal Code</u>
The City's Municipal Code contains a Zoning Ordinance that limits noise levels at any residential property to 55 dBA. The code is not explicit in terms of the acoustical descriptor associated with the noise level limit. A reasonable interpretation of this standard has been made based on similar codes of other Bay Area communities. This analysis assumes that the intent of the code is to limit noise levels at any residential property to 55 dBA L_{eq}.

Existing Noise Environment

The project site is located south of Santana Row and Olsen Drive, west of Hatton Street, and north of Interstate 280 (I-280) in San José, California. Residential units make up the land uses across Olsen Drive to the north, across Hatton Street east of the project site, and the southern portion of Lot 17 to the south. Office and commercial land uses are located adjacent to the project site, to the south and southwest.

The existing noise environment in the project vicinity results primarily from vehicular traffic along I-280. Traffic on local roadways and on-site activities such as parking lot activities contribute to noise levels adjacent to the project site. A noise monitoring survey was made between May 16th and May 19th, 2014 to quantify the existing noise environment on the project site. One long-term unattended noise measurement and four short-term attended measurements were made at representative locations to complete the noise monitoring survey. Noise measurement locations are shown on Figure 1.

Long-term noise measurement LT-1 was made along the eastern property line of Lot 9, 40 feet from the center of Hatton Street and about 625 feet from the center of I-280. This measurement location was chosen to represent the noise environment of the apartment buildings across Hatton Street. Accordingly, the primary noise sources at this location were traffic on I-280 and local streets, with intermittent noise levels generated by vehicles in the existing parking lot on-site and on adjacent driveways. The day-night average noise level over the measurement period was 60 dBA DNL. The daily trend in noise levels at LT-1 is shown in Figures 2 and 3.

Short-term noise measurement ST-1 was made about 50 feet east of the center of Hatton Street, about 560 feet from the center of I-280. The 10-minute average noise level measured at this location between 12:15 p.m. and 12:25 p.m. on May 16, 2014 was 56 dBA L_{eq}, generated primarily by traffic on I-280. Short-term noise measurement ST-2 was made about 50 feet east of the Hatton Street and Olsen Drive intersection, adjacent to northernmost residential units of the apartment complex. The 10-minute average noise level measured at this location between 12:30 p.m. and 12:40 p.m. on May 16, 2014 was 59 dBA L_{eq} generated primarily by traffic on I-280 and construction activities at the nearby vacant lot to the northeast. One particularly loud construction event reaching 71 dBA L_{max} accounted for the increase in average noise levels. Short-term noise measurement ST-3 was made about 70 feet east of the center of Hatton Street, between two apartment buildings. The 10-minute average noise level measured at this location between 12:35 p.m. and 12:45 p.m. on May 16, 2014 was 52 dBA L_{eq}, generated primarily by traffic on I-280 and traffic along Hatton Street. Short-term noise measurement ST-4 was made adjacent to the northernmost residential units of the apartment complex to the south on Lot 17, about 400 feet from the center of I-280 and 65 feet from the center of Dudley Avenue. The 10-minute average noise level measured at this location between 2:20 p.m. and 2:30 p.m. on May 19, 2014 was 55 dBA L_{eq} generated primarily by traffic on I-280 and local roadways.

Figure 1 Approximate Noise Monitoring Locations

Figure 2

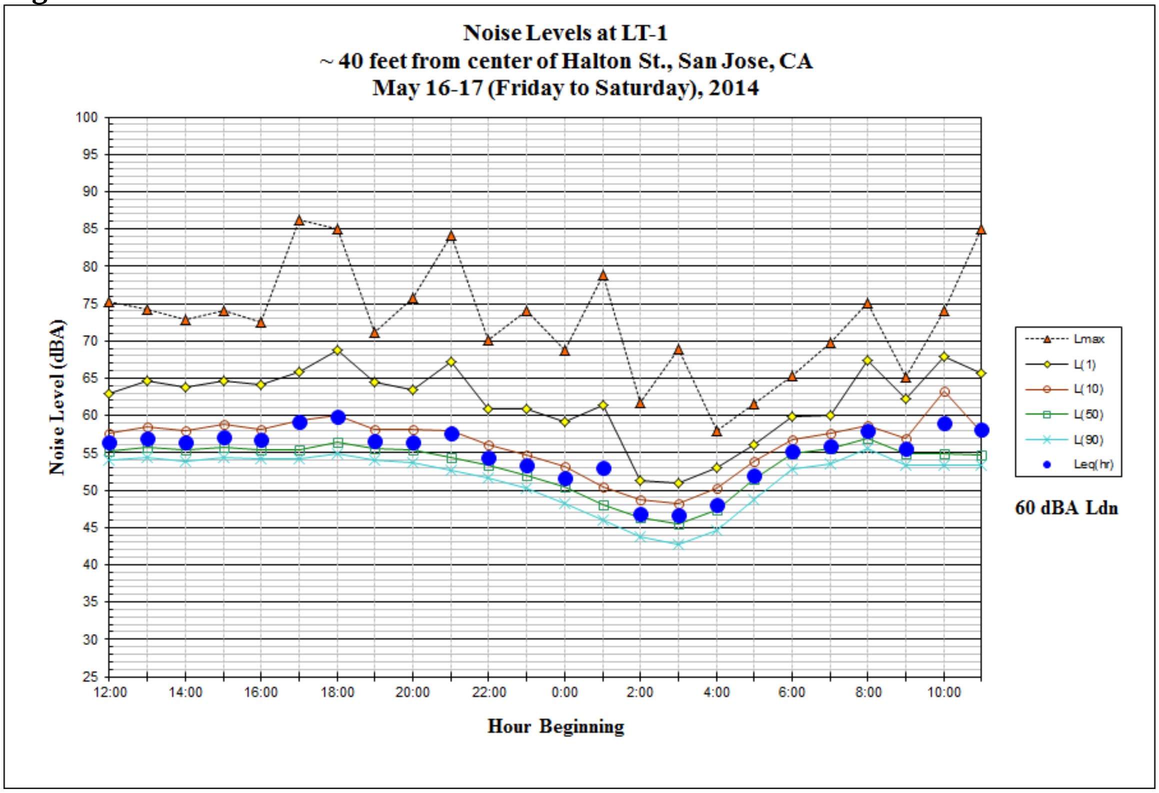
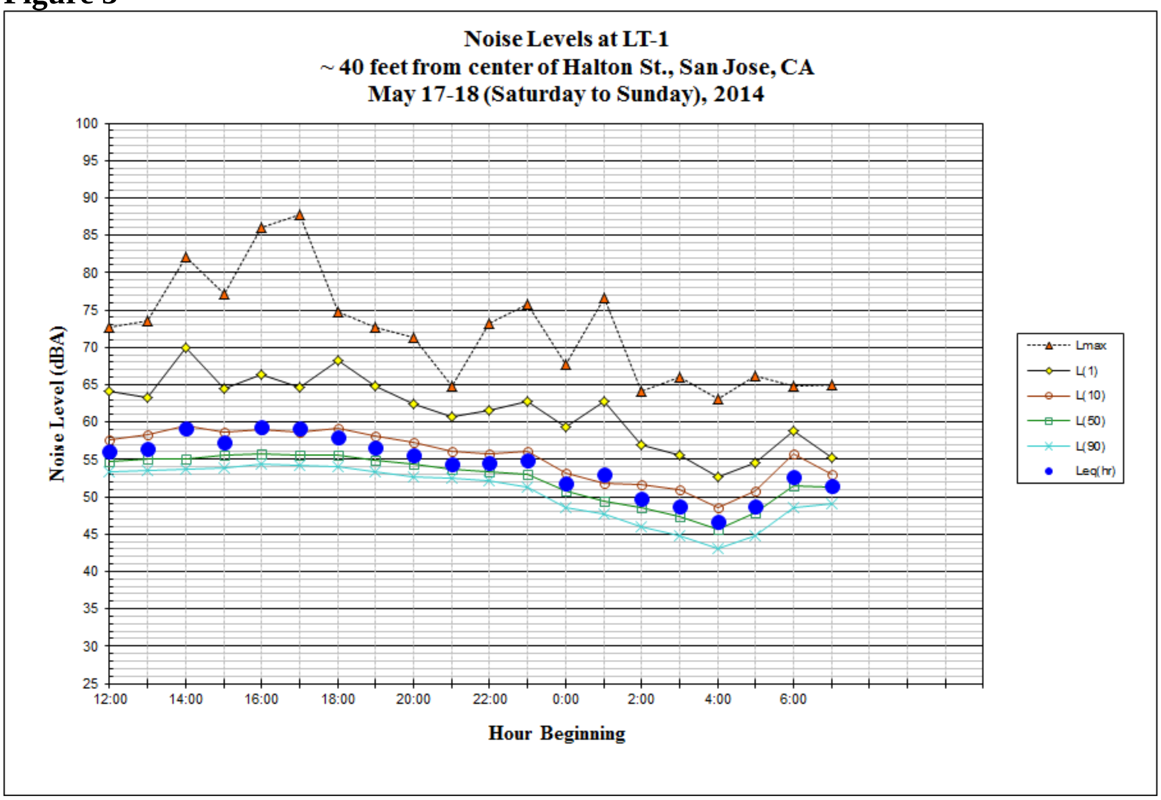


Figure 3



Future Noise Environment

The future noise environment in the vicinity of the project site would continue to result primarily from transportation noise sources in the site vicinity and on-site parking activities. Future noise levels as a result of traffic are calculated to increase by less than 1 dBA above existing noise levels. The proposed project would construct a five-level above grade parking structure and one level of below-grade parking. The nearest noise sensitive uses are apartment units located adjacent to the site, east of Hatton Street. Residences to the north and south are either on an existing Santana Row lot or part of the Santana Row Expansion Project and would not be considered sensitive receivers to project-related noise because a project cannot impact itself. Future parking activities would be located the same distance from residences to the east as the existing at-grade parking activities but because the parking structure would have a greater capacity than the existing parking lot, higher average noise levels from parking events would be expected.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

The following significance criteria are used in this report to evaluate the significance of noise impacts:

1. **Operational and Traffic Noise.** The City of San José considers significant noise impacts to occur if a commercial development 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” (60 dBA DNL for residential); 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 (60 dBA DNL for residential).
    - Cause the noise level to exceed 55 dBA DNL or 55 dBA $L_{eq\text{-}hour}$ at a property line adjacent to noise sensitive residential land uses.

2. **Construction Noise.** Construction noise impacts would be considered significant when the duration of the noise-generating activities last for more than one year and hourly average noise levels received are anticipated to exceed 60 dBA L_{eq} and are at least 5 dBA above the ambient noise environment at nearby residential land uses or are anticipated to disrupt indoor activities received at nearby commercial land uses.

3. **Construction Vibration.** Construction vibration impacts would be considered significant when construction activities are anticipated to generate a peak vertical particle velocity of 0.20 inches/sec PPV at adjacent commercial and residential structures (assumed to be structurally sound) or lower if highly vibration sensitive uses are identified adjoining the site.

Impact 1: Project Generated Traffic Noise. The proposed project would increase traffic noise levels along roadways in the project vicinity by less than 1 dBA DNL. **This is a less-than-significant impact.**

Based on the traffic volumes and trip generation estimates made for the Santana Row EIR, noise levels are calculated to increase by less than 1 dBA DNL above existing levels along roadways in the vicinity of the parking garage under the Background plus Project Condition. Therefore, project generated traffic would not substantially increase existing traffic noise levels at sensitive receivers located in the vicinity of the project.

Mitigation 1: NONE

Impact 2: Operational Noise. Use of the new parking structure with build-out of the project could generate noise in excess of the City's noise limits. **This is a potentially significant impact.**

The operation of the proposed parking structure is expected to be the predominant source of operational noise. *Illingworth & Rodkin, Inc.* conducted noise measurements near a 4-story parking structure in downtown Petaluma[1]. Noise measurements were made of typical noise generating activities occurring on the various parking levels. At each parking level, a car door was opened and closed several times, the engine was started, and the auto's horn was sounded. The noise sources were generated at the edge of each story and at a parking stall located about 50 feet from the edge. Noise measurements were also made as an auto traveled up and down the parking structure. The sounding of the auto's horn was the nosiest. Maximum instantaneous noise levels, measured about 75 feet from the façade of the structure at ground level, typically ranged from 53-58 dBA. Sounding of the car horn typically ranged from 62-70 dBA.

The proposed parking structure would be located about 65 feet to the west of the property line of the nearest noise sensitive residential land use. Maximum instantaneous noise levels from door slams, engine starts, and circulation would typically range from 54-59 dBA at the nearest residential property line located 65 feet east of the parking structure, and the sounding of the car horn would typically range from 63-71 dBA. As demonstrated in the summary of noise data collected at LT-1 (Figures 2 and 3), maximum instantaneous noise levels resulting from traffic and existing on-site activity regularly exceed 60 dBA, and are typically 70 dBA or greater during daytime hours at existing residential land uses along Hatton Street. Project-generated noises would be infrequent, would not be expected to cause an increase in daytime hourly average noise levels at nearby sensitive land uses, and would not be expected to exceed existing ambient maximum instantaneous noise levels resulting from I-280 and local traffic during the day. However, maximum instantaneous noise levels resulting from infrequent events such as auto horns, sounded as a warning or because of a vehicle's alarm system, would exceed ambient maximum instantaneous noise levels during nighttime hours, causing hourly average noise levels

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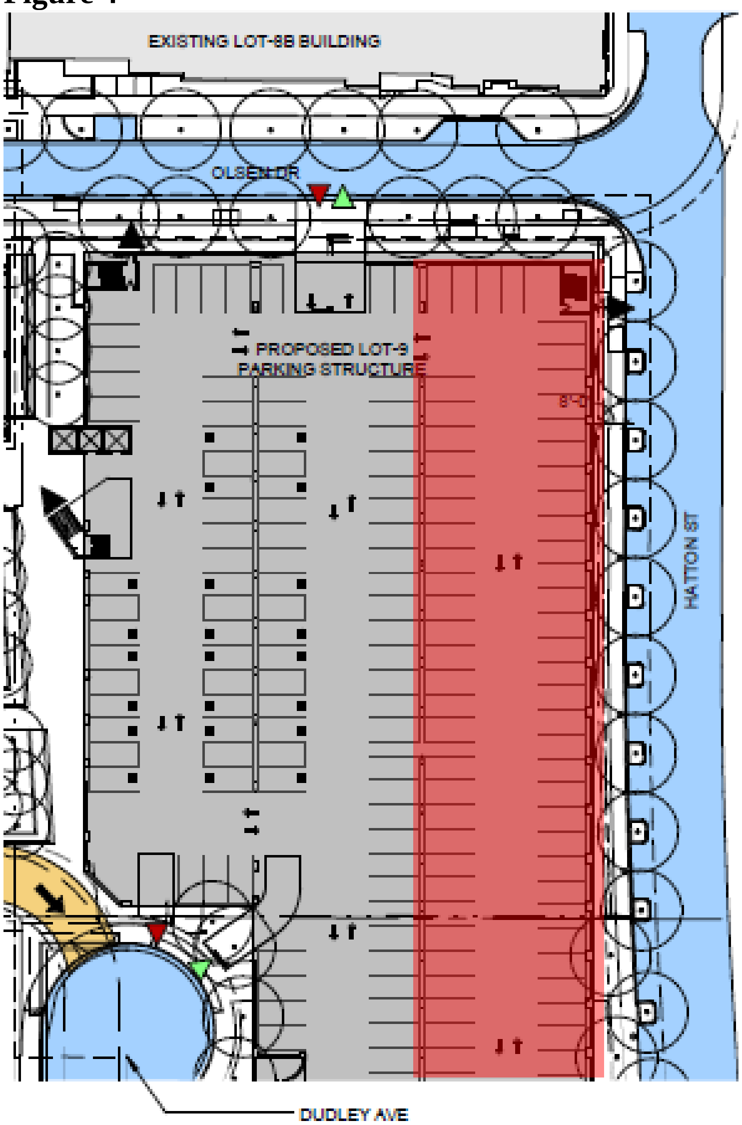
1 Environmental Noise Assessment Vallco Fashion Park – North Parking Garage prepared for City of Cupertino by Illingworth & Rodkin, Inc., October 11, 2006.

to exceed 55 dBA L_{eq} at the property line adjacent to noise sensitive residential land uses. This would be a significant impact.

Mitigation 2: Construct the eastern façade of the parking structure as a solid barrier to provide sufficient shielding of project generated noises at existing residential land uses along Hatton Street. This measure would reduce project generated maximum instantaneous noise levels at receptors to the east and, therefore, hourly average noise levels would not exceed 55 dBA L_{eq} at the property line adjacent to noise sensitive receptors. If this measure is not feasible, an alternate measure, as shown in Figure 4, would limit parking hours at spaces in the eastern portion of the parking structure (in all above-grade levels) to Santana Row's general hours of Monday through Saturday from 10AM to 9PM and Sunday from 11AM to 7PM.

Figure 4



= Limited Parking Hours

This measure would reduce project generated maximum instantaneous noise levels at receptors to the east. Consequently, hourly average noise levels would not exceed 55 dBA L_{eq} at the property line adjacent to noise sensitive receptors. The incorporation of either measure would result in a less-than-significant impact.

Impact 3: **Construction Noise.** During project construction, residences in the vicinity of the site would be intermittently exposed to high noise levels. **This is a potentially significant short-term noise impact.**

The construction of the project would generate noise levels that would exceed ambient noise levels at noise sensitive receptors in the vicinity of the project site and are anticipated to take place for a period greater than one year. Noise impacts resulting from construction depend on 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 receptors. Construction noise impacts primarily occur when construction activities occur during noise-sensitive times of the day (early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise sensitive land uses, or when construction noise lasts over extended periods of time. Where noise from construction activities exceeds 60 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} at noise-sensitive uses in the project vicinity for a duration of one year or more, the impact would be considered significant.

Construction activities generate considerable amounts of noise, especially during the demolition phase and the construction of project infrastructure when heavy equipment is used. The highest noise levels would be generated during demolition, site preparation, grading, excavation, and foundation construction when heavy equipment operates on site. Table 4 presents the typical range of hourly average noise levels generated by different phases of construction measured at a distance of 50 feet. Hourly average noise levels generated by demolition and construction are about 77 dBA L_{eq} to 89 dBA L_{eq} 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 distance between the source and receptor. Shielding provided by barriers or structures can provide an additional 5 to 10 dBA noise reduction at distant receivers.

Residential uses are east and south of the project area, with nearest buildings of the apartments to the east as close as 75 feet from the site. Noise levels generated during busy construction periods would be 73 to 85 dBA L_{eq} at nearby noise sensitive uses, exceeding the existing daytime noise environment by 13 to 29 dBA during busy construction periods. Residences would be intermittently exposed to high levels of noise (70 to 80 dBA) throughout the construction period. Such large noise level increases over extended periods of time would be significant. To reduce noise impacts from construction, a series of best practices are provided.

TABLE 4 Typical Ranges of Exterior Noise Levels at 50 feet from Construction Sites (dBA L_{eq})

	Type of Typical Construction Project							
	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.
Note: These are exterior noise levels at a distance of 50 feet from a construction site assuming different types of construction (e.g. domestic housing, etc.)
Source: United States Environmental Protection Agency, 1973, Legal Compilation on Noise, Vol. 1, p. 2-104.

Mitigation 3: Implement General Plan Policy EC-1.7 to reduce the impact to a less-than-significant level:

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.

The noise control logistics plan should include, but not be limited to the following:

1. Limit demolition and construction activities to non-holiday, daytime hours between 7:00 am and 5:00 pm;

2. Construct solid plywood fences around construction sites adjacent to operational business, residences or noise-sensitive land uses;

3. Utilize ‘quiet’ models of air compressors and other stationary noise sources where technology exists;

4. Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment;

5. Locate all stationary noise-generating equipment, such as air compressors and portable power generators, as far away as possible from businesses, residences or noise-sensitive land uses;

6. Prohibit all unnecessary idling of internal combustion engines;

7. Notify all adjacent businesses, residences, and noise-sensitive land uses of the construction schedule in writing;

8. 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;

9. Designate a disturbance coordinator, responsible for responding to complaints about construction noise. The name and telephone number of the disturbance coordinator shall be posted at the construction site and made available to businesses, residences or noise-sensitive land uses adjacent to the construction site;

10. Provide written schedule to adjacent land uses and nearby residences of “noisy” construction activities;

11. If pile driving is necessary, pre-drill foundation pile holes to minimize the number of impacts required to seat the pile; and

12. If pile driving is necessary, consider the use of “acoustical blankets” for receivers located within 100 feet of the site.

Impact 4: **Construction Vibration.** Residences in the vicinity of the project would be exposed to construction related vibration levels below the thresholds of significance. **This is a less than significant impact.**

Construction activities are expected to include demolition of existing pavement, site preparation work, excavation of below grade levels, foundation work, and new building erection. General Plan policy EC-2.3 states the following regarding vibration from demolition and construction:

"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."

Table 5 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Pile driving is not anticipated. Project construction activities such as the use of jackhammers, hoe rams, and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. Erection of the building structure is not anticipated to be a source of substantial vibration with the exception of sporadic events such as dropping of heavy objects, which should be avoided to the extent possible. The nearest vibration sensitive buildings, apartments to the east of the site, are located more than 75 feet from the nearest possible construction activities. There are no sensitive historic structures in the vicinity of the site. Vibration levels drop off with distance. Vibration levels would be substantially below 0.2 in/sec at the nearest apartment buildings. Construction vibration would cause a less than significant impact.

Mitigation 4: NONE

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: Source: United States Environmental Protection Agency, 1973, Legal Compilation on Noise, Vol. 1, p. 2-104.