APPENDIX H

NOISE AND VIBRATION ASSESSMENT

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GATEWAY VILLAGE SANTA CLARA
NOISE AND VIBRATION ASSESSMENT
SANTA CLARA, CALIFORNIA

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Prepared for:

Ranu Aggarwal
Senior Associate
Circlepoint
1814 Franklin Street, Suite 1000
Oakland, CA 94612

Prepared by:

Carrie Janello
Michael S. Thill

ILLINGWORTH & RODKIN, INC.
Acoustics · Air Quality
1 Willowbrook Court, Suite 120
Petaluma, CA 94954
(707) 794-0400

Job No.: 13-004

Introduction

This report presents the results of the environmental noise assessment conducted for the Gateway Village Santa Clara project proposed at 3610 and 3700 El Camino Real (southwest corner of El Camino Real/Lawrence Expressway intersection) in Santa Clara, California. The project would develop up to 497 multi-family residential units and approximately 85,000 square-feet of retail uses on a site currently developed with a Taco Bell fast-food restaurant, a Kohl's retail store, and parking. Noise-sensitive residential land uses border the site to the southwest and south, and retail and commercial uses bound the site to the west and north. Lawrence Expressway bounds the site to the east.

This assessment presents the fundamentals of environmental noise, provides a discussion of policies and standards applicable to the project, presents the results of noise measurements conducted at the site, and evaluates the potential significance of impacts resulting from the project. Mitigation measures are presented, as needed, to mitigate significant noise impacts to less-than-significant levels.

Fundamentals of Environmental Noise

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB) with 0 dB corresponding roughly to the threshold of hearing. Decibels and other technical terms are defined in Table 1.

Most of the sounds that we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies, with each frequency differing in sound level. The intensities of each frequency add together to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound in accordance with a weighting that reflects the facts that human hearing is less sensitive at low frequencies and extreme high frequencies than in the frequency mid-range. This is called "A" weighting, and the decibel level so measured is called the A-weighted sound level (dBA). In practice, the level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. Typical A-weighted levels measured in the environment and in industry are shown in Table 2 for different types of noise.

Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources that create a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of environmental noise, the statistical noise descriptors, L_{01}, L_{10}, L_{50}, and L_{90}, are commonly used. They are the A-weighted noise levels equaled or exceeded during 1%, 10%, 50%, and 90% of a stated time period. A single number descriptor called the L_{eq} is also widely used. The L_{eq} is the average A-weighted noise level during a stated period of time.

In determining the daily level of environmental noise, it is important to account for the difference in response of people to daytime and nighttime noises. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes very noticeable. Further, most people sleep at night and are very sensitive to noise intrusion. To account for human sensitivity to nighttime noise levels, a descriptor, L_{dn} (day/night average sound level), was developed. The L_{dn} divides the 24-hour day into the daytime of 7:00 AM to 10:00 PM and the nighttime of 10:00 PM to 7:00 AM. The nighttime noise level is weighted 10 dB higher than the daytime noise level. The Community Noise Equivalent Level (CNEL) is another 24-hour average that includes both an evening and nighttime weighting.

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 PPV descriptor 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	Definitions
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.
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, Leq	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 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-Induced Vibration Guidance Manual, California Department of Transportation, June 2004.

Regulatory Background

The State of California and the City of Santa Clara establish guidelines, regulations, and policies designed to limit noise exposure at noise sensitive land uses. Appendix G of the State CEQA Guidelines, the California Building Code, the City of Santa Clara Noise Element of the General Plan, and the City of Santa Clara Municipal Code present the following:

State CEQA Guidelines. The California Environmental Quality Act (CEQA) contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. CEQA asks the following applicable questions. Would the project:

a. Expose people to or generate noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies;

b. Expose people to or generate excessive groundborne vibration or groundborne noise levels;

c. Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

d. Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

e. For projects within an area covered by an airport land use plan or within two miles of a public airport or public use airport when such an airport land use plan has not been adopted, or within the vicinity of a private airstrip, expose people residing or working in the project area to excessive aircraft noise levels;

f. For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels?

CEQA does not define the noise level increase that is considered substantial. Typically, an increase in the day-night average noise level of 3 dBA CNEL or greater at noise-sensitive receptors would be considered significant when projected noise levels would exceed those considered satisfactory for the affected land use. An increase of 5 dBA CNEL or greater would be considered significant when projected noise levels would continue to meet those considered satisfactory for the affected land use

2010 California Building Code. The State of California establishes exterior sound transmission control standards for new hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family dwellings as set forth in the 2010 California Building Code (Chapter 12, Section 1207.11). Interior noise levels attributable to exterior environmental noise sources shall not exceed 45 dBA DNL in any habitable room. When exterior noise levels (the higher of existing or future) where residential structures are to be located exceed 60 dBA DNL, a report must be submitted with the building plans describing the noise control measures that have been incorporated into the design of the project to meet the noise limit.

City of Santa Clara General Plan. The City of Santa Clara General Plan sets forth noise and land use compatibility standards for proposed land uses (General Plan Table 5.10-2). The City establishes 55 dBA CNEL as the noise level limit compatible with residential land uses. The guidelines state that where the exterior noise level is greater than 55 dBA CNEL and less than 70 dBA CNEL, the design of the project should include measures to reduce noise levels to acceptable levels. Noise levels exceeding 70 dBA CNEL are considered incompatible with residential land uses. Residential land uses proposed in noise environments exceeding 70 dBA CNEL should generally be avoided except when the residential use is entirely indoors and interior noise levels can be maintained at 45 dBA CNEL or less.

City of Santa Clara Municipal Code. The City's Municipal Code regulates the noise levels of any fixed sources of disturbing, excessive or offensive sounds or noises on adjacent noise sensitive land uses. Section 9.10.040 pf the Municipal code limits noise levels at single and multi-family residences to 55 dBA during the daytime (7 a.m. to 10 p.m.) and 50 dBA during the nighttime (10 p.m. to 7 a.m.). The noise limits are not applicable to emergency work, licensed outdoor events, City-owned electric, water, and sewer utility system facilities, construction activities occurring within allowable hours, permitted fireworks displays, or permitted heliports. Construction activities are not permitted within 300 feet of residentially zoned property except within the hours of 7:00 am and 6:00 pm on weekdays and 9:00 am and 6:00 pm on Saturdays. No construction is permitted on Sundays or holidays.

The City Code does not define the acoustical time descriptor such as L_{eq} (the average noise level) or L_{max} (the maximum instantaneous noise level) that is associated with the above limits. A reasonable interpretation of the City Code would identify the ambient base noise level criteria as an average or median noise level (L_{eq}/L_{50}). In many Bay Area communities, the average base

noise level limit is adjusted upwards in 5 dBA increments to account for shorter duration noise events.

Existing Noise Environment

The project site is located at 3610 and 3700 El Camino Real, which is the southwest corner of the El Camino Real/Lawrence Expressway intersection, in Santa Clara, California. Existing land use on the site include a Taco Bell fast-food restaurant, a Kohl's retail store, and a parking lot. To the south and southwest of the project site, there are noise-sensitive residential land uses, and retail and commercial uses bound the site to the west and north. Lawrence Expressway bounds the site to the east. The existing noise environment at the site and in the vicinity results primarily from traffic on El Camino Real and Lawrence Expressway. Intermittent traffic noise from Halford Avenue also contributes to the ambient noise environment.

A noise monitoring survey was made between July 31, 2013 and August 4, 2013 to document existing noise conditions at the project site. The noise monitoring survey included two long-term measurements (LT-1 and LT-2) and two short-term measurements (ST-1 and ST-2). Noise measurement locations are shown in Figure 1.

Long-term noise measurement LT-1 was located along the east boundary of the project site, approximately 60 feet from the centerline of the southbound Lawrence Expressway on-ramp and about 140 feet from the centerline of the right lane of southbound Lawrence Expressway. LT-1 was positioned 15 feet above the ground. Noise levels measured at this site were primarily the result of traffic along Lawrence Expressway and the on-ramp. Hourly average noise levels typically ranged from 62 to 71 dBA L_{eq} during the day between 7:00 a.m. and 7:00 p.m., from 67 to 71 dBA L_{eq} in the evening between 7:00 p.m. and 10:00 p.m., and from 56 to 68 dBA L_{eq} at night between 10:00 p.m. and 7:00 a.m. The calculated community noise equivalent level at this location was 71 dBA CNEL. Long-term noise measurement LT-2 was located approximately 115 feet from the center of El Camino Real and about 15 feet above the ground. Noise levels measured at this site were primarily the result of traffic along El Camino Real and intermittent noise from the nearby gas station and Taco Bell. Hourly average noise levels typically ranged from 58 to 73 dBA L_{eq} during the day, from 62 to 66 dBA L_{eq} in the evening, and from 52 to 65 dBA L_{eq} at night. The calculated community noise equivalent level at this location was 68 dBA CNEL. Appendix 1 summarizes the data collected at the long-term measurement sites.

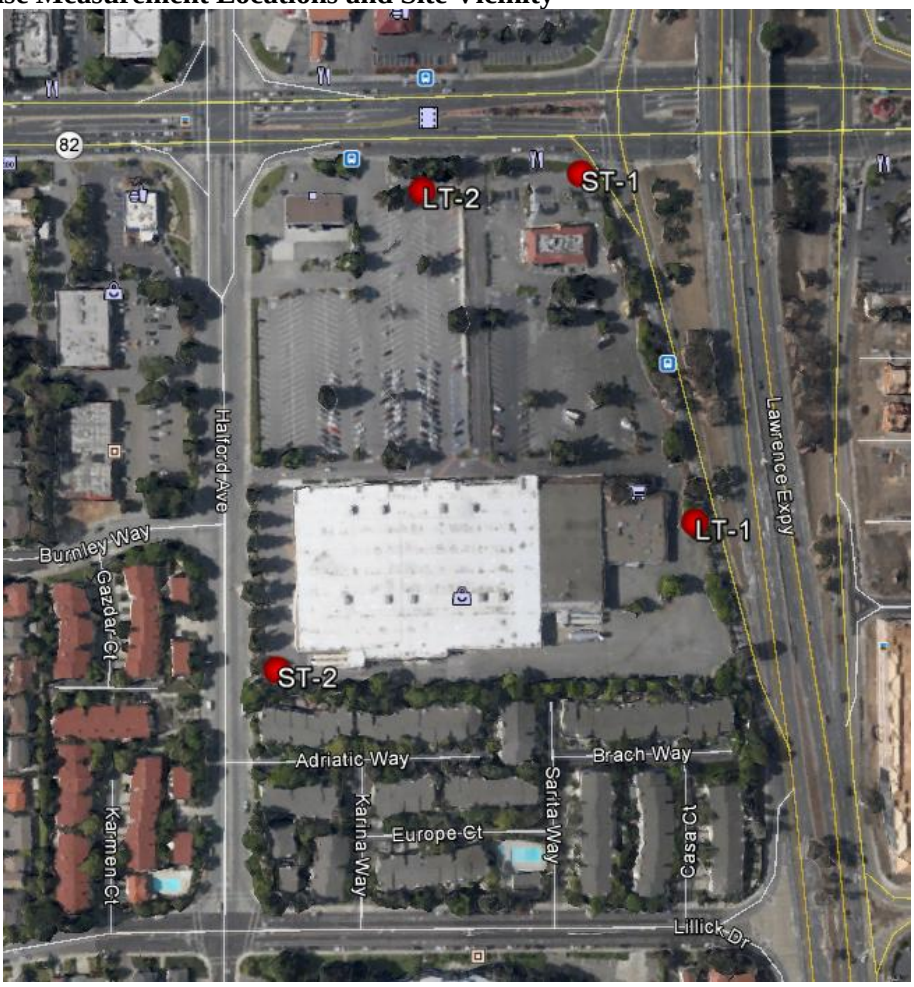
Short-term noise measurement ST-1 was made approximately 105 feet from the center of the intersection of El Camino Real and the Lawrence Expressway southbound ramps. The Taco Bell fast-food restaurant was located to the south of ST-1. The ten-minute average noise level was 65 dBA L_{eq}. Short-term noise measurement ST-2 was located approximately 96 feet from the centerline of Halford Avenue and 21 feet from the south property line of the project site. Kohl's retail store is located to the northwest of ST-2. The ten-minute average noise level at this location was 53 dBA L_{eq}. Table 4 summarizes the results of these measurements.

Table 4: Summary of Short-Term Noise Measurement Data

Noise Measurement Location	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}	CNEL
ST-1: ~105 feet from the intersection of El Camino Real and Lawrence Expressway southbound ramps. (7/31/2013, 11:00 a.m.-11:10 a.m.)	74	71	68	64	59	65	68
ST-2: ~96 feet from the centerline of Halford Avenue and ~21 feet of the south property line. (7/31/2013, 11:20 a.m.-11:30 a.m.)	63	61	57	50	47	53	<55

Note: CNEL approximated by correlating to corresponding period at long-term site.

Figure 1. Noise Measurement Locations and Site Vicinity



NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Appendix G of the CEQA Guidelines states that a project would normally be considered to have a significant impact if noise levels conflict with adopted environmental standards or plans, if noise levels generated by the project would substantially increase existing noise levels at noise-sensitive receivers on a permanent or temporary basis, or if the project would cause or expose persons to excessive vibration. A substantial permanent noise increase would occur if the noise level increase resulting from the project is 3 dBA CNEL or greater, with a future noise level greater than 60 dBA CNEL or greater. Construction noise is evaluated somewhat differently than operational noise, as its effects are temporary. When construction activities are predicted to cause prolonged interference (greater than one construction season) with normal activities at

noise-sensitive receiver locations, generate noise levels in excess of 60 dBA L_{eq}, and exceed ambient noise levels by 5 dBA L_{eq} or more, the impact would be considered significant. A significant impact would be identified if the construction of the project would expose persons to vibration levels exceeding 0.3 in/sec PPV because of the potential to result in "architectural" damage to normal buildings.

Impact 1: **Noise and Land Use Compatibility.** Residential uses proposed at the project site would be exposed to noise levels greater than those considered compatible with the City of Santa Clara Noise Element and the State Building Code. Interior noise levels would exceed 45 dBA CNEL without the incorporation of noise insulation features into the project's design. **This is a significant impact.**

The project site plan indicates that six-story residential buildings would surround a six-story parking structure, which would be concealed with a "wrap" of four-story residential units. Additionally, four-story residential buildings would be constructed around three landscaped courtyards along the southern boundary of the project site. Four-story residential buildings would also be constructed along the property boundaries facing Halford Avenue and Lawrence Expressway. On the roof of the garage would be an amenity space, which would include a large pool/spa area, cyber lounge, club house, fitness center, and bocce ball court.

Future Exterior Noise Levels

Existing noise levels measured along Lawrence Expressway were approximately 71 dBA CNEL. Based on the future traffic projections, it is anticipated that noise levels will increase at this location by approximately 1 to 2 dBA from traffic alone. As a result, future exterior noise levels at the proposed residential buildings along Lawrence Expressway would be approximately 72 to 73 dBA CNEL. According to the City of Santa Clara General Plan, noise environments that exceed 70 dBA CNEL should generally be avoided unless the residential land use is entirely indoors and interior noise levels can be maintained at 45 dBA CNEL or less. Since these are apartment structures, the main residential use would be indoors. Along El Camino Real, existing noise levels were 68 dBA CNEL. Based on the future traffic projections, it is anticipated that noise levels will also increase by 1 to 2 dBA in the future. The resulting future exterior noise levels along the northern boundary of the project site would be 69 to 70 dBA CNEL. While these levels are greater than the 55 dBA CNEL limit for compatibility established in the General Plan for residential land uses, this region of the project site will be designated for retail use only and therefore excluded from the established limit. The future apartment structures along the southwestern section of the project site will be impacted by traffic along Halford Avenue. Existing noise levels measured along Halford Avenue were less than 55 dBA CNEL. Based on the future traffic projections, noise levels are anticipated to increase by 1 dBA, resulting in future noise levels of approximately 56 dBA CNEL. Portions of the project site located further from these transportation noise sources, or in acoustically shielded areas would experience lower noise levels.

Future outdoor use areas would be located on top of the parking garage where the outdoor pool area will be located and in the three outdoor courtyard areas. The rooftop receptor would be affected mostly by traffic noise from Lawrence Expressway, as well as intermittent traffic from the future parking lot located just to the north of the parking garage. Due to the distance from El Camino Real and the retail buildings that will shield some of the noise, traffic from this roadway will not have a strong impact on the rooftop terrace. Future exterior noise levels at the rooftop terrace were calculated to be approximately 55 dBA CNEL. Due to the shielded location of common outdoor use areas and increased distance from transportation noise sources, noise levels would meet the outdoor noise threshold established by the City of Santa Clara General Plan. The main noise sources that would impact the courtyards would be Lawrence Expressway and Halford Avenue. The easternmost courtyard, nearest Lawrence Expressway would receive shielding from the four-story buildings that will be constructed along roadway. Therefore, the future exterior noise levels at the eastern courtyard were calculated to be less than 55 dBA CNEL, which is below the threshold of acceptability. The western courtyard located nearest to Halford Avenue will also be shielded by four-story buildings constructed along the roadway. The future exterior noise levels at the western courtyard were also calculated to be less than 55 dBA CNEL. The center courtyard will be located further from both roadways and have additional shielding from four-story buildings; therefore, the future exterior noise levels will also be less than 55 dBA CNEL. No additional noise mitigation measures will be required for these future outdoor use areas.

An existing gas station is located adjacent to the project site along the northwest boundary. The gas station, however, is not adjacent to any proposed residential buildings, and in the future, the gas station will be more than 443 feet from the nearest proposed apartment building with shielding in the form of retail buildings located between the structures. Therefore, intermittent noise due to the gas station should not have an impact on the future outdoor use areas.

Future Interior Noise Levels

The City of Santa Clara and California Building Code require that residential units be designed to control interior noise levels to 45 dBA CNEL or less. Standard California construction with the windows partially open for ventilation provides approximately 15 dBA of exterior-to-interior noise reduction. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction. With the windows partially open, interior noise levels in units fronting Lawrence Expressway would be 57 dBA CNEL, exceeding the City and State standard by 12 dBA. Adequate mechanical ventilation (heating and cooling) is assumed to be an integral component of this project, so that windows may be kept closed at the discretion of the occupants. With windows in the closed position, interior noise levels in these units would be 47 to 52 dBA CNEL, still exceeding the 45 dBA CNEL standard. Attaining the necessary noise reduction (approximately 27 dBA for units facing Lawrence Expressway) from exterior to interior spaces is readily achievable with the selection of proper sound rated construction materials and the incorporation of forced-air mechanical ventilation systems. Preliminary calculations indicate that proposed

units would require windows with a minimum Sound Transmission Class rating ranging from 28 to 33 STC[1] depending on the window percentage as a function of the total wall area.

Mitigation Measure 1:

- A project-specific acoustical analysis shall be prepared as required by the City of Santa Clara and the State Building Code to ensure that the design of the project is sufficient to reduce interior noise levels to 45 dBA CNEL or less. Forced air mechanical ventilation, satisfactory to the local building official, must be incorporated into all residential units facing Lawrence Expressway and to allow occupants the option of keeping windows closed to control noise intrusion.

- Special building sound insulation treatments may be required for residential facades with views of Lawrence Expressway. These treatments would include, but are not limited to, sound rated windows and doors, sound rated wall constructions, acoustical caulking, protected ventilation openings, etc. The specific determination of what treatments are necessary would be determined on a unit-by-unit basis. The results of the analysis, conducted during the design phase of the project, including the description of the necessary noise control treatments to achieve acceptable noise levels inside the living units, shall be submitted to the City along with the building plans and approved prior to issuance of a building permit. This procedure is mandated by the State Building Code.

With the implementation of the above measures, the impact would be less-than-significant.

Impact 2: **Project-Generated Noise Increases:** Project-generated traffic and on-site activities would not substantially increase noise levels at noise-sensitive receptors in the vicinity of the project site. **This is a less-than-significant impact.**

For this project, the primary noise source that would affect existing noise-sensitive receptors would be project-generated traffic. The relatively high traffic volumes on El Camino Real and Lawrence Expressway dominate the noise environment in the area. Traffic volume information was reviewed at 20 study area intersections around the project site. Traffic volumes under the "Existing" and "Existing with Project" traffic scenarios were compared to calculate the relative increase in traffic noise attributable to the proposed project. A noise impact would be identified at noise-sensitive land uses where the project would result in an increase of 3 dBA CNEL or more.

The comparison of "Existing" and "Existing with Project" traffic volumes indicates that the project would not substantially increase traffic noise at sensitive receptors in the vicinity of the

[1] **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.

project site. At each of the intersections, a noise level increase of less than 3 dBA CNEL was calculated. The impact would therefore be less-than-significant.

Secondary noise sources generated by the project may include noise from parking lots, from activities of truck loading, and from fixed sources of mechanical equipment located within the retail portion of the project site. Due to the distance from the existing noise-sensitive receptors, which are located to the south of the project site, and the shielding effects created by the apartment structures proposed by this project, the impact of these secondary noise sources would be less-than-significant. Any noise created by the proposed apartment structures would be compatible with the existing noise-sensitive receptors since both are residential land uses. Therefore, the impact would be less-than-significant.

Mitigation Measure 2: **None required.**

Impact 3: **Rooftop Mechanical Noise.** Noise from exhaust fans, heating, ventilating, and air conditioning equipment for the building may exceed the 55 dBA L_{eq} daytime and 50 dBA L_{eq} nighttime noise standards at adjacent residential properties**. This is a significant impact.**

The proposed residential structure could include various mechanical equipment, such as air conditioning systems, exhaust fans, and ventilation systems, etc. Due to the number of variables inherent in the mechanical equipment needs of the project (number and types of units, locations, size, housing, specifications, etc.), the impacts of mechanical equipment noise on nearby noise sensitive land uses should be assessed during the final project design stage. Design planning should take into account the noise criteria associated with such equipment and utilize site planning to locate equipment in less noise-sensitive areas. The most substantial noise generating equipment that may be likely are large exhaust fans and ventilation systems. Under the City's Municipal Code, noise levels from building equipment would be limited to a noise level of 55 dBA L_{eq} during the daytime (7:00 a.m. to 10:00 p.m.) and 50 dBA L_{eq} during the nighttime (10:00 p.m. to 7:00 a.m.) at receiving noise sensitive land uses such as residences. Given the close proximity of noise-sensitive uses to the southern boundary of the project site, there is a potential for noise from mechanical equipment to exceed the daytime and nighttime noise standards at noise sensitive land uses.

Mitigation Measure 3:

- Mechanical equipment shall be designed to minimize noise impacts on surrounding uses, particularly residences located south of the site. This can be accomplished by locating noise-generating equipment on the northernmost portion of the buildings to maximize the distance from the existing apartments just south of the project site or by providing acoustical shielding. If rooftop-mounted equipment is used, it should be shielded from the adjacent residential land uses by rooftop screens or perimeter parapet walls, or fitted as necessary with noise control baffles, sound attenuators, or enclosures. An acoustical specialist shall review the mechanical equipment plans prior to construction to confirm that

the design includes the controls necessary to meet the City's Municipal Code guideline at the residential property line.

The implementation of the mitigation measures specified above would reduce the impact to a less-than-significant level.

Impact 4: **Exposure to Excessive Groundborne Vibration.** Construction related vibration would not be excessive at nearby residential land uses. **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 of existing structures, grading, excavation, site preparation work, foundation work, utility trenching, and new building framing and finishing. The proposed project would not require pile driving, which can cause excessive vibration.

For structural damage, the California Department of Transportation uses a vibration limit of 0.5 inches/second, peak particle velocity (in/sec, PPV) for buildings structurally sound and designed to modern engineering standards, 0.3 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.

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. Construction activities may extend over several construction seasons, but construction vibration would not be substantial for most of this time except during vibration generating activities (as discussed above). 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. Vibration levels would be expected to be 0.2 in/sec PPV or less, below the 0.3 in/sec PPV significance threshold. Vibration generated by construction activities near the common property line would at times be perceptible, however, would not be expected to result in "architectural" damage to these buildings. This is a less-than-significant impact.

In areas where vibration would not be expected to cause structural damage, vibration levels may still be perceptible. However, as with any type of construction, this would be anticipated and it would not be considered significant given the intermittent and short duration of the phases that have the highest potential of producing vibration (demolition and use of jackhammers and other high power tools). By use of administrative controls such as notifying adjacent commercial shops of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration to hours with the least potential to affect these uses,

perceptible vibration can be kept to a minimum and as such would not result in a significant impact with respect to perception.

TABLE 5 Vibration Source Levels for Construction Equipment[2]

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

Mitigation Measure 4: None required.

Impact 5: **Temporary Construction Noise.** Noise generating construction activities are anticipated to result in noise levels that exceed 60 dBA L_{eq} and be at least 5 dBA L_{eq} above the ambient noise environment at adjacent noise-sensitive land uses over a temporary basis. The impact would be considered **less-than-significant** recognizing the duration of exterior construction activities, that the construction contractor will implement construction noise control best management practices at the site, and that construction activities will be conducted during hours allowed in the City of Santa Clara Municipal Code.

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 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.

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

Construction activities generate considerable amounts of noise, especially during earth moving activities when heavy equipment is used. The highest maximum noise levels generated by project construction would typically range from about 90 to 95 dBA at a distance of 50 feet from the noise source. Typical hourly average construction generated noise levels are about 81 dBA to 88 dBA measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). Hourly average noise levels generated by the construction of residential units would range from about 65 dBA to 88 dBA measured at a distance of 50 feet depending on the amount of activity at the site. Construction generated noise levels drop off at a rate of about 6 dBA per doubling of distance between the source and receptor. Shielding by buildings or terrain often result in lower construction noise levels at distant receptors.

The project is anticipated to commence in 2015 and would occur in one continuous phase over a two-year period. All exterior demolition and construction would occur within the timeframe permitted by the City Noise Ordinance, and once construction moves indoors, minimal noise would be generated at off-site locations. Noise generated by construction activities would temporarily elevate noise levels at adjacent noise sensitive receptors, but this would be considered a less-than-significant impact assuming that construction activities are conducted in accordance with the provisions of the City of Santa Clara Municipal Code and with the implementation of construction best management practices.

The following best management practices are assumed to be included in the project:

- Pursuant to the Municipal Code, restrict noise-generating activities at the construction site or in areas adjacent to the construction site to the hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, and between the hours of 9:00 a.m. and 6:00 p.m. on Saturdays. Construction shall be prohibited on Sundays and holidays.

- 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.

- Located stationary noise generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors. Construct temporary noise barriers to screen stationary noise generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.

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

- Route all construction traffic to and from the project site via designated truck routes where possible. Prohibit construction related heavy truck traffic in residential areas where feasible.

- 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 and submit to the City for approval a detailed construction plan identifying the schedule for major noise-generating construction activities.

- Designate a "disturbance coordinator" who would be responsible for responding to any local complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., starting too early, bad muffler, etc.) and will require that reasonable measures warranted to correct the problem be implemented. 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.

With the incorporation of these standard measures, the noise impact resulting from project construction would be considered less-than-significant.

Mitigation Measure 5: No additional measures are required.

Impact 6: Noise and Land Use Compatibility (Aircraft). The project site is not located within two miles of Mineta San Jose International Airport and outside of the 65 dBA CNEL aircraft noise contour. **This is a less-than significant impact.**

The Santa Clara County ALUC has jurisdiction over new land uses in the vicinity of airports and establishes 65 dBA CNEL as the maximum allowable noise level considered compatible with residential uses. The project site is located approximately three miles southwest of Mineta San Jose International Airport. A review of the Santa Clara County Comprehensive Land Use Plan indicates that the project site is located outside the 65 dBA CNEL contour line for aircraft activities at Mineta San Jose International Airport. This would be considered a less-than-significant impact.

Mitigation Measure 6: None Required.

Impact 7: Cumulative Traffic Noise. Traffic volumes along roadways serving the project site will increase as a result of cumulative growth planned in the City of Santa Clara. Significant cumulative traffic noise impacts are not anticipated in the project vicinity and the project would not make a "cumulatively considerable" contribution to cumulative traffic noise increases. **This is a less-than-significant impact.**

The project would result in a significant cumulative traffic noise impact if existing sensitive receptors would be exposed to cumulative traffic noise level increases greater than 3 dBA CNEL above existing traffic noise levels and if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA CNEL or more attributable solely to the proposed project.

Cumulative traffic noise level increases were calculated by comparing "Cumulative Without Project" traffic volumes and "Cumulative With Project" volumes to "Existing" traffic volumes. Cumulative traffic noise levels, with or without the proposed project, are not anticipated to increase substantially along roadways serving the project site. The maximum cumulative traffic noise increase is calculated to be approximately 2 dBA CNEL along Granada Avenue/Lillick Drive. The project's contribution to cumulative traffic noise level increases is calculated to be 0.2 dBA CNEL or less. This cumulative traffic noise increase would not be considered substantial, and the project would not make a cumulatively considerable contribution to increased noise levels.

Mitigation Measure 7: None Required.

Appendix 1. Daily Trend in Noise Levels

Figure A1. Noise Levels at LT-1

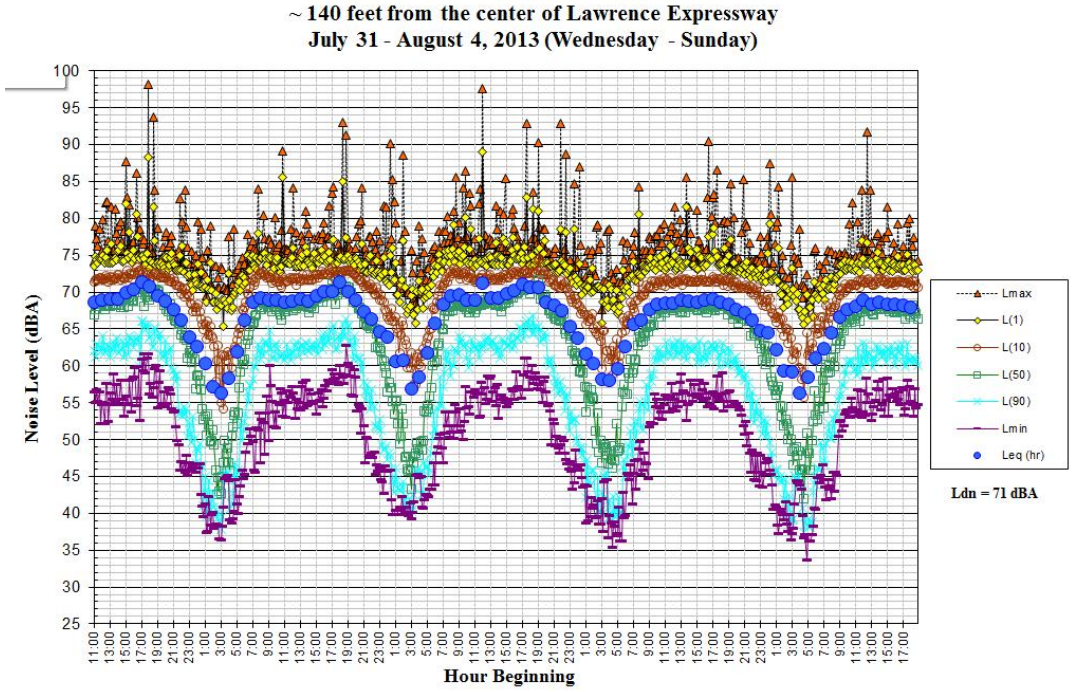
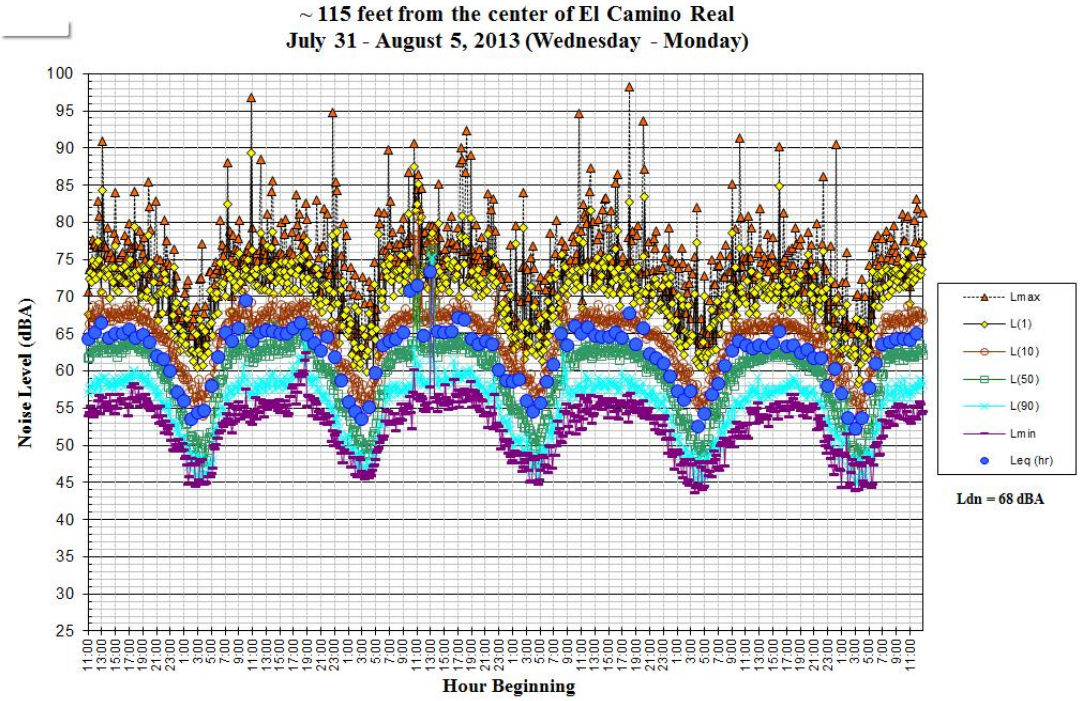


Figure A2. Noise Levels at LT-2



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