APPENDIX G

Noise and Vibration Assessment

401 - 409 ALBERTO WAY
NOISE AND VIBRATION ASSESSMENT

Los Gatos, California

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INTRODUCTION

The project would demolish three existing office buildings and construct two new, two-story buildings on an approximately 2.15-acre parcel located at 401 – 409 Alberto Way on the northwest corner of the intersection of Los Gatos – Saratoga Road (State Route (SR) 9) and Alberto Way in Los Gatos, California. The purpose of this report is to assess noise and vibration impacts associated with the proposed office development project with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into two sections. The Setting Section provides a brief description of the fundamentals of environmental noise and groundborne vibration, summarizes applicable regulatory criteria, and discusses the results of the ambient noise measurements. The Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures, where necessary, to provide a compatible project with respect to adjacent noise and vibration sources and noise-sensitive land uses.

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 p.m. - 10:00 p.m.) and a 10 dB addition to nocturnal (10:00 p.m. - 7:00 a.m.) noise levels. The *Day/Night Average Sound Level* (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. Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} 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 L_{dn} with open windows and 65-70 dBA L_{dn} 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 L_{dn} 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 L_{dn}. At an L_{dn} of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the L_{dn} 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 an L_{dn} of 60-70 dBA. Between an L_{dn} of 70-80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn} 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.

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 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
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 p.m. to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
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 Reactions 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

The proposed project would be subject to noise-related regulations, plans, and policies established within documents prepared by the State of California and the Town of Los Gatos. These planning documents are implemented during the environmental review process to limit noise exposure at existing and proposed noise sensitive land uses.

Applicable planning documents include: (1) the CEQA Guidelines, Appendix G, (2) Caltrans Construction Vibration Criteria, (3) the California Building Code, (4) the Town of Los Gatos General Plan, and (5) the Town of Los Gatos Municipal Code. Regulations, plans, and policies presented within these documents form the basis of the significance criteria used to assess project impacts.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

(a) 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.

Checklist items (a), (b), (c), and (d) are relevant to the proposed project. The project is not located within an airport land use plan, within two miles of a public airport, or in the vicinity of a private airstrip; therefore, checklist items (e) and (f) are not carried forward in this analysis.

CEQA does not define what noise level increase would be considered substantial. Typically, project-generated noise level increases of 3 dBA L_{dn} or greater would be considered significant where exterior noise levels would exceed the normally acceptable noise level standard (60 dBA L_{dn} for residential land uses). Where noise levels would remain at or below the normally acceptable noise level standard with the project, noise level increases of 5 dBA L_{dn} or greater would be considered significant.

California Department of Transportation – Construction Vibration. Caltrans recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards. A conservative vibration limit of 0.3 in/sec PPV has been used for older buildings that are found to be structurally sound but cosmetic damage to plaster ceilings or walls is a major concern. For historic buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. All of these limits have been used successfully and compliance to these limits has not been known to result in appreciable structural damage. All vibration limits referred to herein apply on the ground level and take into account the response of structural elements (i.e. walls and floors) to groundborne excitation.

2010 California Green Building Standards Code. The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2010 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). These standards were not altered in the 2013 revisions, and the sections that pertain to this project are as follows:

5.507.4.1 Exterior noise transmission, prescriptive method. Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA CNEL noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.

5.507.4.2 Performance method. For buildings located, as defined by Section 5.507.4.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

Los Gatos General Plan. The Noise Element of the Los Gatos 2020 General Plan establishes goals and policies for reducing noise levels in the Town. The Noise Element of the General Plan contains policies that pertain to noise. The following policies would be applicable to the proposed project:

- NOI-1.1: The Town, as part of the Environmental Review process, shall require applicants to submit an acoustical analysis of projects. All input related to noise levels shall use the adopted standard of measurement shown in Table NOI-2 (see Table 4, below). Noise impacts of new development shall be evaluated in terms of any increase of the existing ambient noise levels and the potential for adverse noise and groundborne vibrations impacts on nearby or adjacent properties. The evaluation shall consider short-term construction noise and on-going operational noise.

TABLE 4: Town Outdoor Limits

Land Use	Max L_{dn} Value	Max L_{eq}(24) Value	Comparable Noise Source	Response
Residential	55 dBA	--	Light auto traffic (100 feet)	Quiet
Commercial	--	70 dBA	Freeway traffic (50 feet)	Telephone use difficult
Industrial	--	70 dBA	Freeway traffic (50 feet)	Telephone use difficult
Intensive Open Space (Developed Park)	--	55 dBA	Light auto traffic (100 feet)	Quiet
Passive Open Space (Nature Park)	--	50 dBA	Light auto traffic (100 feet)	Quiet
Hospital	--	55 dBA	Light auto traffic (100 feet)	Quiet
Education	--	55 dBA	Light auto traffic (100 feet)	Quiet

SOURCE: Town of Los Gatos, 2011 (Table NOI-2 of the Noise Element).

- NOI-1.2: The Town shall maintain the noise ordinance standards.

- NOI-1.3: Employ the L_{dn} scale for the evaluation of outdoor noise for residential land uses and the L_{eq} scale for evaluation of outdoor noise for non-residential uses, as shown in Table NOI-2 (see Table 4). Pursue the outdoor noise limits shown in Table NOI-2 as representing the long range community aspirations and work toward their accomplishment, even though some may be presently unattainable.

- NOI-1.4: Apply the same indoor noise levels standards for single family residential uses and multi-family dwellings (45 dBA L_{dn} or CNEL).

- NOI-2.1: Evaluate the potential for existing ambient and/or intrusive noise to adversely affect new development.

- NOI-2.2: Require all noise-sensitive developments adjacent to or within an area where noise levels exceed community aspirations to include a noise study and recommendations for reducing noise impact to an acceptable level.

- NOI-5.1 Protect residential areas from noise by requiring appropriate site and building design, sound walls, and landscaping and by the use of noise attenuating construction techniques and materials.

- NOI-5.2 For commercial and industrial developments adjacent to residential neighborhoods, additional restrictions beyond the Noise Ordinance may be applied to reduce noise intrusions in residential districts to an acceptable level.

- NOI-6.1: The Town shall not approve land use patterns and traffic patterns that expose sensitive land uses or sensitive noise receptors to unacceptable noise levels.

- NOI-7.1: Enforce noise limits and monitor compliance with noise standards.

Town of Los Gatos Municipal Code. The Town Noise Ordinance (Chapter 16 of the Town Municipal Code) specifies noise limits to protect the peace, health, and safety of its citizens from such noise and vibration. The following policies would be applicable to the project.

Sec. 16.20.015. - Exterior noise levels for residential zones.
No person shall cause, make, suffer, or allow to be made by any machine, animal, device or any combination of same in a residential zone, a noise level more than six (6) dB above the noise level specified for that particular noise zone, as shown on the Noise Zone Map, during that particular time frame, at any point outside of the property plane.

- The project site is located in an orange zone on the Town of Los Gatos Noise Zone Map, which indicates an ambient noise level of 48 dBA between the hours of 10:00 p.m. and 6:00 a.m., 55 dBA between the hours of 6:00 a.m. and 1:00 p.m., and 59 dBA between the hours of 1:00 p.m. and 10:00 p.m.

Sec. 16.20.020. - Interior noise levels for multi-family residences.
No person shall cause, make, suffer, or allow to be made by any machine, animal, device, or any combination of same, in a multi-family residential zone, a noise level more than six (6) dB above the local ambient (interior), three (3) feet from any common wall, floor, or ceiling inside any dwelling unit on the same or adjacent property, except within the dwelling unit in which the noise source or sources may be located.

Sec. 16.20.025. - Noise levels for commercial and industrial zones.
No person shall cause, make, suffer, or allow to be made by any machine, animal, device, or any combination of same, in any commercial or industrial zone, a noise level more than eight (8) dB above the noise level specified for that particular noise zone, as shown on the Noise Zone Map, during that particular time frame, at any point outside of the property plane.

Sec. 16.20.030. - Public property noise limits.

a) No person shall cause, make, suffer, or allow to be made by any machine, animal, device, or combination of same, on public property a noise level more than fifteen (15) dB noise level specified for that particular noise zone, as shown on the Noise Zone Map, during that particular time frame, at any point outside of the property plane.
b) Public performances or special events not exceeding seventy (70) dBA at the property plane are exempt from this chapter when approval therefor has been obtained from the appropriate governmental entity.
c) Vehicle horns or other devices primarily intended to create a loud noise for warning purposes, shall not be used when the vehicle is at rest, or when a situation endangering life, health, or property is not imminent.

Sec. 16.20.035. - Construction.

Notwithstanding any other provision of this chapter, between the hours of 8:00 a.m. to 8:00 p.m., weekdays and 9:00 a.m. to 7:00 p.m. weekends and holidays, construction, alteration, or repair activities which are authorized by a valid Town permit or as otherwise allowed by Town permit, shall be allowed if they meet at least one of the following noise limitations:

1) No individual piece of equipment shall produce a noise level exceeding eighty-five (85) dBA at twenty-five (25) feet. If the device is located within a structure on the property, the measurement shall be made at distances as close to twenty-five (25) feet from the device as possible.
2) The noise level at any point outside of the property plane shall not exceed eighty-five (85) dBA.

Existing Noise Environment

A noise monitoring survey was performed at the site beginning on Tuesday, February 2, 2016 and concluding on Wednesday, February 3, 2016. The monitoring survey included two long-term noise measurements and three short-term measurements, as shown in Figure 1. The noise environment at the site and in the surrounding areas is primarily the result of local and distant traffic. The daily trend in noise levels at LT-1 and LT-2 are shown in Appendix A.

Long-term noise measurement LT-1 was located about 25 feet west of Alberto Way, just north of the site. The primary noise source at this location was vehicles on Alberto Way. Hourly average noise levels at this location ranged from 52 to 61 dBA L_{eq} during the day and were as low as 44 dBA L_{eq} at night. The day-night average noise level was 59 dBA L_{dn}.

Noise measurement LT-2 was made about 90 feet east of the Los Gatos Saratoga Road on ramp to SR 17. The primary noise source at this location was vehicles driving on the ramp. Hourly average noise levels at this location ranged from 58 to 62 dBA L_{eq} during the day and were as low as 49 dBA L_{eq} at night. The day-night average noise level was 63 dBA L_{dn}.

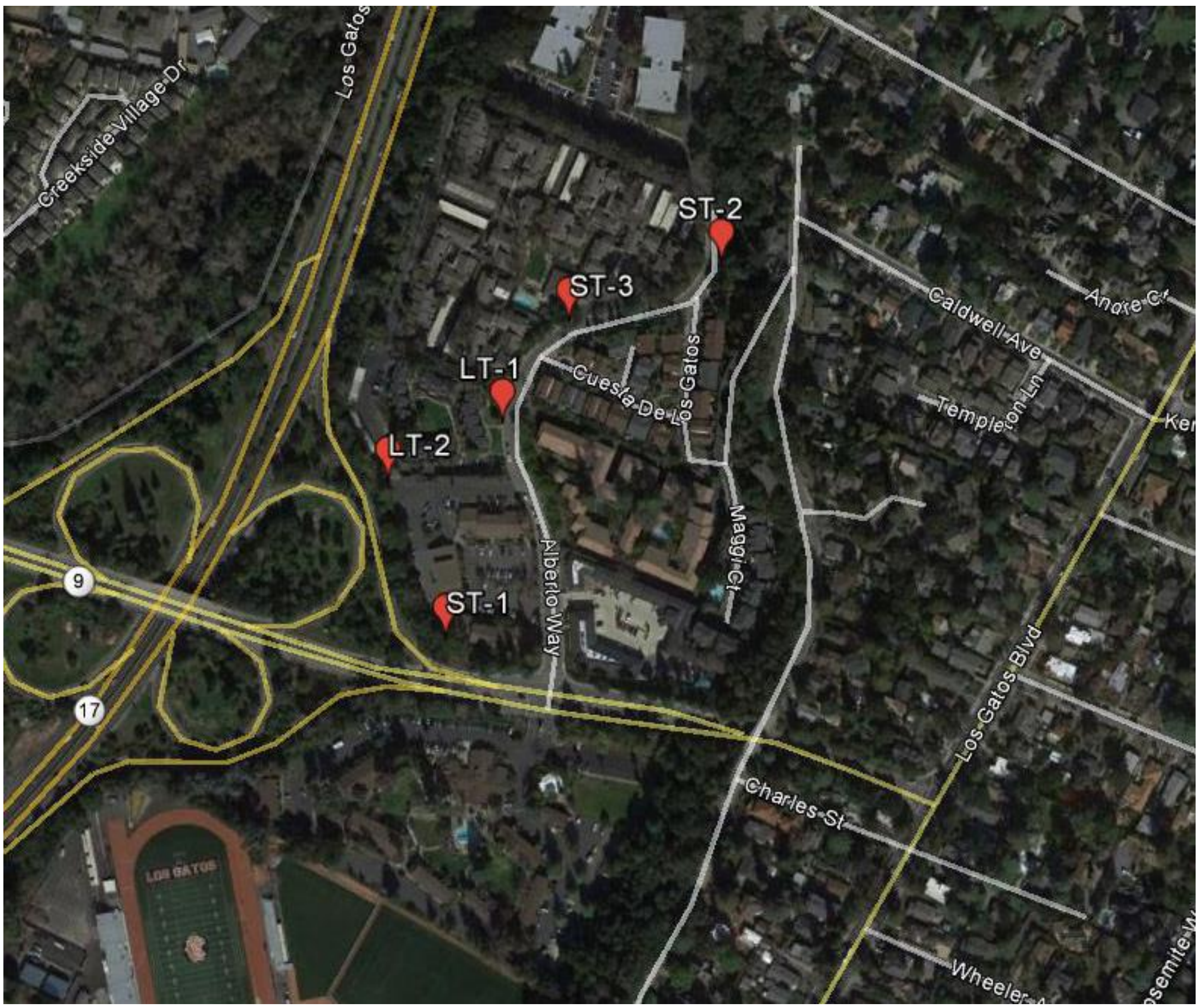
The three short-term measurements were made on Wednesday, February 3, 2016 in concurrent intervals to the long-term measurements. These measurements were attended by a noise technician who documented maximum noise levels as they occurred at each measurement location. Table 5 summarizes the short-term measurement results.

TABLE 5 Summary of Short-Term Noise Measurement Results, February 3rd, 2016

Location (Time)	Measured Daytime Noise Levels, dBA					Loudest Hour, L_{eq}, dBA*	L_{dn}, dBA*	Primary Noise Sources
	L_{eq}	L_1	L_{10}	L_{50}	L_{90}			
ST-1: ~100 feet from center of westbound Los Gatos Saratoga Road, 11:00 a.m. to 11:10 a.m.	65	72	67	63	58	67	67	Traffic on Los Gatos Saratoga Road
ST-2: 25 feet east of Alberto Road, 11:20 a.m. to 11:30 a.m.	48	60	50	43	42	50	48	Traffic on Alberto Way
ST-3: 25 feet west of Alberto Road, 11:40 a.m. to 11:50 a.m.	48	57	51	44	42	50	48	Traffic on Alberto Way

*Calculated based on comparison between short-term and long-term noise measurement results.

FIGURE 1 Noise Measurement Locations



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 expose people to or 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 and vibration resulting from the project:

1. **Noise and Land Use Compatibility:** A significant noise and land use compatibility impact would be identified if the project would expose persons working at the proposed office buildings to noise levels that would exceed applicable noise standards presented in the General Plan or Cal Green Code. The long-range community goal for office uses is 70 dBA L_{eq} or less. For non-residential land uses, the Cal Green Code requires interior noise levels to be maintained at 50 dBA $L_{eq(1\text{-}hr)}$ or less during hours of operation.

2. **Groundborne Vibration:** A significant groundborne vibration impact would be identified if the construction of the project would expose persons to excessive vibration levels. Groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in "architectural" damage to normal buildings.

3. **Operational Noise Impacts:** A significant operational noise impact would be identified if traffic or operations generated by the project would generate noise levels in excess of the noise limits specified in the General Plan and Municipal Code or substantially increase noise levels at sensitive receivers in the vicinity.
   a) The Los Gatos Municipal Code limits operational noise to 6 dBA above the noise levels specified in the Town of Los Gatos Noise Zone Map at adjacent residential land uses.
   b) A substantial increase would occur if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of 55 dBA L_{dn} or less (the long-range community goal for residential land uses), or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of greater than 55 dBA L_{dn}.

4. **Construction Noise Impacts:** A significant temporary noise impact would be identified if construction activities would exceed the construction noise thresholds specified in the Town's Municipal Code or temporarily increase ambient noise levels at sensitive receivers.
   a) The Town of Los Gatos limits construction activities to between the hours of 8:00 a.m. to 8:00 p.m., weekdays and 9:00 a.m. to 7:00 p.m. weekends and holidays. In addition, the Town specifies that construction must meet at least one of the following noise limitations:
      - No individual piece of equipment shall produce a noise level exceeding eighty-five (85) dBA at twenty-five (25) feet. If the device is located

within a structure on the property, the measurement shall be made at distances as close to twenty-five (25) feet from the device as possible.

- The noise level at any point outside of the property plane shall not exceed eighty-five (85) dBA.

b) A significant temporary increase in noise would occur if hourly average noise levels intermittently exceed 60 dBA L_{eq}, and the ambient by at least 5 dBA L_{eq}, for a period exceeding one year at adjacent residential land uses.

Impact 1: **Noise and Land Use Compatibility.** Outdoor office uses proposed by the project would not be exposed to exterior noise levels exceeding 70 dBA L_{eq}. Standard office construction methods will adequately reduce noise levels indoors. **This is a less-than-significant impact.**

The project would construct two new, two-story buildings on the site and install 395 vehicle parking spaces. Building A would have a total building area of 47,800 square feet and Building B would have a total building area of 45,000 square feet, for a total of 92,800 square feet. The majority of the parking spaces, 387, would be located in the site's proposed below-grade, 156,200 square feet parking facility. Six standard parking spaces, one accessible parking space, and one van accessible parking space would be provided at grade. The project also would include 20 short-term bicycle parking spaces and 20 long-term bicycle parking spaces.

The noise environment at the site is dominated by traffic along the surrounding roadways; SR 17, the Los Gatos Saratoga Road On-Ramp to SR 17, Los Gatos Saratoga Road, and Alberto Way. Based on the noise monitoring survey, daytime hourly average noise levels reach 67, 61, and 51 dBA L_{eq} at a distance of 100 feet from the center of Los Gatos Saratoga Road, Los Gatos Saratoga Road On-Ramp to SR 17, and Alberto Way, respectively. Noise levels along Alberto Way and Los Gatos Saratoga Road are calculated to increase by about 3 dBA under cumulative conditions based on traffic volumes supplied as part of the project's traffic study.[1] This increase would result in cumulative noise levels at the site exceeding 70 dBA L_{eq} within 100 of the center of Los Gatos Saratoga Road, 40 feet of the center of the Los Gatos Saratoga Road On-Ramp to SR 17, 10 feet of the center of Alberto Way.

Exterior Noise Levels

Noise sensitive outdoor office use areas would be considered compatible in noise environments with hourly noise levels of 70 dBA L_{eq} or less. Noise sensitive outdoor areas include patio and cushion seating, a fire pit, media for outdoor entertainment and meetings, and a communal dining table. The outdoor noise sensitive areas are proposed as close as about 100 feet from the center of Los Gatos Saratoga Road and 70 feet from the center of the Los Gatos Saratoga Road On-Ramp to SR 17. At these locations, exterior noise levels are anticipated to be 70 dBA L_{eq} or less and would be considered compatible. Noise levels would be lower at locations located on the interior of the site or in shielded areas. Depending on the height and specifications, additional noise reduction would also be provided by the wall proposed at the rear of the property, adjacent to the Los Gatos Saratoga Road On-Ramp to SR 17. This is a **less-than-significant** impact.

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[1] 401 to 409 Alberto Way, Final Transportation Impact Analysis, Prepared for LP Acquisitions, LLC, Prepared by Hexagon Transportation Consultants, Inc., January 22, 2016.

Interior Noise Levels
For office developments, the noise and land use compatibility guidelines are designed to screen projects and provide guidance in determining when special building sound insulation treatments may be necessary in order to adequately control the intrusion of environmental noise. The noise level goal for average noise levels inside offices varies depending upon the type of office space. Typically, traffic noise levels should be reduced to an hourly average noise level between 35 and 45 dBA L_{eq}. The Cal Green Code requires interior noise levels to be maintained at 50 dBA $L_{eq(1\text{-}hr)}$ or less during hours of operation.

Building A is setback about 75 feet from the center of Los Gatos Saratoga Road On-Ramp to SR 17, resulting in an exterior future noise exposure of about 66 dBA L_{eq} at the façade fronting the on-ramp. Building B is setback about 80 feet from the Center of Los Gatos Saratoga Road and about 100 feet from the Los Gatos Saratoga Road On-Ramp to SR 17, resulting in future exterior façade exposures of 71 dBA L_{eq} and 67 dBA L_{eq}, respectfully.

Standard office construction normally provides 30 dBA of noise reduction in interior spaces. Predicted interior noise levels at offices would be 41 dBA L_{eq} or less assuming standard office construction methods. These interior noise levels would be compatible with the proposed use and would meet the 50 dBA $L_{eq(1\text{-}hr)}$ noise limit established in CALGreen Code Section 5.507.4.2. Therefore, the impact would be considered **less-than-significant**.

In spaces where lower noise levels would be desired, such as private offices and conference rooms, may benefit from additional noise control in order to meet a lower, more desirable interior noise level. Additional noise control could be accomplished through building design by selecting sound-rated windows (STC 30 or greater) for sensitive interior spaces along the northernmost and westernmost façades of the proposed office building.

Mitigation Measure 1: None needed.

Impact 2: **Groundborne Vibration due to Construction.** Construction-related vibration levels resulting from activities at the project site would not exceed 0.3 in/sec PPV at adjacent structures. **This is a less-than-significant impact.**

The nearest existing structures to project construction areas include multi-family residences located as close as 35 feet from the shared property line to the north (Las Casitas), and commercial and residential structures located between 65 and 85 feet east of the site, across Alberto Way. A significant impact would be identified if the construction of the project would generate groundborne vibration levels at adjacent structures exceeding 0.3 in/sec PPV because these levels would have the potential to result in “architectural” damage to normal buildings.

Detailed construction information is not available at this time. Construction activities are anticipated to include demolition of existing structures, site grading and excavation, underground garage construction, new building construction, and paving. It is assumed that pile driving would not be needed for project construction. 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 of the work area. Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 6 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet.

TABLE 6 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approximate L_v at 25 ft. (VdB)
Pile Driver (Impact)	upper range	1.158	112
	typical	0.644	104
Pile Driver (Sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

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

Impact or vibratory pile driving is not anticipated as part of project construction activities. Based on the levels shown in Table 6, vibration could exceed 0.3 in/sec PPV when located within about 20 feet of existing structures. Vibration levels produced by heavy equipment (vibratory rollers, clam shovel drops) during construction are calculated to be 0.15 in/sec PPV or less at a distance of 35 feet. At a distance of 65 feet, vibration levels during periods of heavy construction are calculated to be 0.07 in/sec PPV or less. Vibration levels would be lower at structures located further from the construction and as construction moves away from the outer property lines of the site. Vibration levels during heavy construction may occasionally be perceptible at the closest multi-family residences to the north when construction is located near the northern property line of the site. However, vibration levels would not approach the 0.3 in/sec PPV threshold for architectural damage at any adjacent structures. This is a **less-than-significant** impact.

Mitigation Measure 2: None Needed.

Impact 3: **Project Generated Traffic and Operational Noise.** The project would not exceed the Town's noise limits or result in a permanent noise level increase at the existing residential land uses in the project vicinity. **This is a less-than-significant impact.**

Project traffic and operations would generate noise. Noise sensitive uses adjoin the site to the north and east, are located south of Los Gatos Saratoga Road, and are located west of the site across SR 17. A significant impact would be identified if traffic or operations generated by the project would generate noise levels in excess of the noise limits specified in the General Plan and Municipal Code or substantially increase noise levels at sensitive receivers in the vicinity.

Noise Increases Due to Project Traffic
A substantial increase in traffic noise would occur if the noise level increase due to project traffic is: a) 5 dBA L_{dn} or greater, with a future noise level of 55 dBA L_{dn} or less, or b) 3 dBA L_{dn} or greater, with a future noise level of greater than 55 dBA L_{dn} at residential land uses.

Traffic volumes were prepared for the project by *Hexagon Transportation Consultants, Inc.*[2] for five intersections in the vicinity of the project. Traffic volumes under the Existing plus Project Traffic Volumes scenario were compared to the Existing Traffic Volumes scenario to calculate the relative increase in traffic noise attributable to the proposed project. Based on this comparison, traffic noise levels are calculated to increase by less than 1 dBA along N. Santa Cruz Avenue, Los Gatos Saratoga Road, University Avenue, Los Gatos Boulevard, Caldwell Avenue, and Kennedy Road. Noise levels are anticipated to increase by 3 dBA along Alberto Way between Los Gatos Saratoga Road and the project driveway.

Noise sensitive multi-family residential land uses are located along this segment of Alberto Way, just east of the project site. Common outdoor use areas for the multi-family residences are located in courtyard areas and well shielded by the residential buildings from traffic noise. The residential buildings are located as close as about 60 feet from the center of Alberto Way. Based on the noise monitoring survey, vehicles on Alberto Way currently generate an average day-night noise level of about 52 dBA L_{dn} at a distance of 100 feet from the center of the portion of the road between Los Gatos Saratoga Road and the proposed project driveway. Using a projected traffic noise increase of 3 dBA, along this roadway segment, future noise levels at the setback of residences would be 55 dBA L_{dn} under existing plus project conditions. As a result, the 5 dBA increase threshold would apply.

Traffic noise levels on the surrounding roadways would not be substantially increased as a result of the project, and the impact would be **less-than-significant**.

Noise Increases Due to Project Operations
The project site is located in an orange zone on the Town of Los Gatos Noise Zone Map, which indicates an ambient noise level of 48 dBA between the hours of 10:00 p.m. and 6:00 a.m., 55 dBA between the hours of 6:00 a.m. and 1:00 p.m., and 59 dBA between the hours of 1:00 p.m. and 10:00 p.m. New operational noise sources, including mechanical equipment, parking, and on-site vehicle circulation, are limited to a noise level of 6 dBA or less above these specified ambient levels. The project is not anticipated to include nighttime uses. As a result, the more conservative daytime ambient level of 55 dBA is used for this analysis; resulting in a project operational noise limit of 61 dBA L_{eq}.

Rooftop Mechanical Equipment
The office project proposes heating, ventilation, and air conditioning (HVAC) units to be located on concrete platforms on the roofs of both Buildings A and B. Mechanical system specifications

[2] 401 to 409 Alberto Way, Final Transportation Impact Analysis, Prepared for LP Acquisitions, LLC, Prepared by Hexagon Transportation Consultants, Inc., January 22, 2016.

are not available at this time. Typically office mechanical equipment would be anticipated to generate noise levels in the range of 50 to 60 dBA at a distance of 50 feet from the equipment, depending on the equipment selected.
The Building A rooftop equipment would be located as close as about 175 feet from the nearest residences in Las Casitas to the north and about 200 feet from residences to the east. The Building B rooftop equipment would be located as close as about 300 feet from the residences to the north and 200 feet from residences to the east. Noise levels from mechanical equipment typically attenuate at a rate of 6 dBA per doubling of distance. Significant acoustical shielding would also be provided by the rooftop itself and the surrounding structures.

Not taking into account the shielding provided by the office rooftops or the surrounding structures, rooftop equipment would be anticipated to generate a noise level in the range of 38 to 48 dBA at a distance of 200 feet. Shielding from the building rooftops and the surrounding structures is anticipated to provide an additional 10 to 20 dBA of noise reduction. As a result, mechanical equipment noise levels are not anticipated to be audible above the ambient noise environment at adjacent noise sensitive locations and would be well below the 61 dBA L_{eq} threshold. This is a **less-than-significant** impact.

Parking and Vehicle Circulation
The site currently includes at-grade parking located on the northern and east-central portions of the site. The project proposes to locate the majority of on-site parking in a below grade parking facility. Six standard parking spaces, one accessible parking space, and one van accessible parking space would be provided at grade. Noise from slow moving vehicles circulating the site and at-grade parking activities would generate maximum noise levels that are similar to levels generated during existing operations in the existing parking area and below noise levels generated by faster moving vehicles on Alberto Way. Additionally, with the majority of parking moved into a below grade facility, the overall exposure of residences to parking noises would be reduced. The existing 6-foot high CMU wall, to remain, located along the northern property line of the site would continue to provide additional attenuation from these noises. This is a **less-than-significant** impact.

Mitigation Measure 3: None required.

Impact 4: Temporary Construction Noise. Existing noise-sensitive land uses would not be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a less-than-significant impact**.

Construction would be conducted in compliance with the Town of Los Gatos Municipal Code, which limits construction activities to between the hours of 8:00 a.m. to 8:00 p.m., weekdays and 9:00 a.m. to 7:00 p.m. weekends and holidays and specifies that construction must meet at least one of the following noise limitations: a) no individual piece of equipment shall produce a noise level exceeding eighty-five (85) dBA at twenty-five (25) feet, or b) the noise level at any point outside of the property plane shall not exceed eighty-five (85) dBA. 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 period exceeding one year, the impact would be considered significant.

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.

Construction noise levels would vary by phase and vary within phases based on the amount of equipment in operation and location where the equipment is operating. Typical construction noise levels at a distance of 50 feet are shown in Tables 7 and 8. Table 7 shows the average noise level range by construction phase and Table 8 shows the maximum noise level range for different construction equipment. Table 7 levels are consistent with construction noise levels calculated for the project in the Federal Highway Administration (FHWA) Roadway Construction Noise Model, including the anticipated equipment that would be used for each phase of the project. Most demolition and construction noise is in the range of 80 to 90 dBA at a distance of 50 feet from the source.

TABLE 7 Typical Ranges of Construction Noise Levels at 50 Feet, dBA L_{eq}

	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. EPA, Legal Compilation on Noise, Vol. 1, p. 2-104, 1973.

TABLE 8 Construction Equipment 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes:

1 Measured at 50 feet from the construction equipment, with a “slow” (1 sec.) time constant.

2 Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

3 Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

The project is anticipated to be constructed over a period of about 14 months from the spring of 2017 through the summer of 2018 and would include the following construction phases:

- Site Grading: 3 months
- Underground Garage Construction: 4 months
- Core & Shell Building Construction: 6 months
- Site Work: 1 month

Pile driving is not anticipated as a method of construction. Detailed information on construction equipment is not available at this time. As indicated in Table 7, office building construction activities would be anticipated to generate noise levels in the range of 75 to 89 dBA L_{eq} at a distance of 50 feet. Construction noise levels typically drop off at a rate of about 6 dBA per doubling of distance between the noise source and receptor.

The nearest noise sensitive uses to project construction include multi-family residential buildings located as close as 35 feet from the shared property line to the north (Las Casita), and residential structures located about 85 feet east of the site, across Alberto Way. At a distance of 35 feet, typical construction noise levels would be anticipated to be in the range of 78 to 92 dBA L_{eq}. At a distance of 85 feet, typical construction noise levels would be anticipated to be in the range of 70 to 84 dBA L_{eq}. Construction conducted in compliance with the Municipal Code would be limited to 85 dBA at a distance of 25 feet, resulting in a noise level of 82 dBA at 35 feet and 74 dBA at 85 feet. Construction noise levels would be lower as construction is moved into shielded areas or indoors. The existing 6-foot high CMU wall, located along the northern property line of the site, would provide a noise reduction of about 5 dBA from ground level construction noise sources to Las Casita residences. The residential pool area for the multi-family homes located across Alberto Way and the lawn area for the Las Casita residences are well shielded from project construction by surrounding structures. Noise levels in these outdoor use areas would not typically exceed 60 dBA L_{eq}.

Existing daytime traffic noise levels at adjacent residences are in the range of 52 to 62 dBA L_{eq}. Noise levels would exceed 60 dBA L_{eq} and exceed the ambient noise environment by more than 5 dBA L_{eq} at adjacent residential buildings during periods of heavy construction, such as demolition and site work/excavation. Noise levels are not anticipated to exceed the ambient noise environment by more than 5 dBA L_{eq} when construction is moved indoors or when receptors are shielded from construction activities by intervening structures. Noise levels in the outdoor use areas for the adjacent residential areas would not typically exceed 60 dBA L_{eq}.

Noise generated by construction activities would temporarily elevate noise levels at adjacent noise sensitive areas. However, although construction is anticipated to last for greater than one year, construction noise would not be anticipated to exceed 60 dBA L_{eq} at adjacent noise sensitive outdoor use areas. Construction would not occur during nighttime hours, when occupants of the residential buildings would be expected to be most sensitive to noise. As a result, this would be considered a less-than-significant impact, assuming that construction activities are conducted in accordance with the implementation of the following construction best management practices:

- Pursuant to the Municipal Code, restrict noise-generating construction activities to the hours of 8:00 a.m. to 8:00 p.m., weekdays and 9:00 a.m. to 7:00 p.m. weekends and holidays.

- Pursuant to the Municipal Code, construction activities meet at least one of the following noise limitations:

    - No individual piece of equipment shall produce a noise level exceeding eighty-five (85) dBA at twenty-five (25) feet. If the device is located within a structure on the property, the measurement shall be made at distances as close to twenty-five (25) feet from the device as possible.
    - The noise level at any point outside of the property plane shall not exceed eighty-five (85) dBA.

- All gasoline-powered construction equipment shall be equipped with an operating muffler or baffling system as originally provided by the manufacturer, and no modification to these systems is permitted.

- 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.

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

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

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

Mitigation Measure 4: **None required.**