

VALLCO SPECIAL AREA SPECIFIC PLAN EIR NOISE AND VIBRATION ASSESSMENT

Cupertino, California

May 21, 2018

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INTRODUCTION

This report presents the results of the noise and vibration assessment completed for the Vallco Special Area Specific Plan EIR. The study evaluates a Plan Area comprised of approximately 70 acres, 58 acres of which is developable. The approximately 58-acre Specific Plan area consists of multiple parcels¹ and is located at the North Wolfe Road/Vallco Parkway and North Wolfe Road/Stevens Creek Boulevard intersections in the City of Cupertino. The Specific Plan area is mostly developed with the Vallco Shopping Mall (approximately 1.2 million square feet) and associated parking facilities, and the remaining acres are developed roadways, a 148-room hotel (currently under construction), and a surface parking lot.

The proposed Specific Plan would facilitate the development of 600,000 square feet of commercial uses, 2.0 million square feet of office uses, 339 hotel rooms, and 800 residential dwelling units onsite. The Specific Plan could also include a 30-acre green roof and 65,000 square feet of civic spaces. The civic uses could include governmental uses and community meeting space. It is envisioned that 10,000 square feet of the 65,000 square feet of civic space would be for Science, Technology, Engineering, and Mathematics (STEM) lab use. The locations of the proposed land uses have not been finalized and therefore, it is assumed that the uses could be placed anywhere within the site. The City is considering three alternatives to the proposed Specific Plan, and this report addresses the noise impacts of both the proposed Specific Plan and Alternatives, described in Table 1, below.

TABLE 1 Summary of Project and Project Alternative Development

| | Land uses | | | | | |
|--|-----------------------------------|-------------------------------|------------------|------------------------|-----------------------|--|
| | Commercial (square footage) | Office (square footage) | Hotel (units) | Residential (units) | Green Roof (acres) | Civic Space (square footage) |
| Proposed Specific Plan | 600,000 | 2,000,000 | 339 | 800 | 30 | 65,000 (10,000 of which would be STEM lab use) |
| Project Alternatives | | | | | | |
| General Plan Buildout with Maximum Residential Alternative | 600,000 | 1,000,000 | 339 | 2,640 | 30 | 65,000 (10,000 of which would be STEM lab use) |
| Retail and Residential Alternative | 600,000 | 0 | 339 | 4,000 | 0 | 0 |
| Occupied/Re- Tenanted Mall Alternative | 1,207,774 | 0 | 148 | 0 | 0 | 0 |

It is anticipated that the Specific Plan could be constructed over ten years. All existing improvements onsite (except for the newly constructed hotel) would be demolished. Demolition

¹ Assessor Parcel Numbers: 316-20-080, -081, -082, -088, -092, -094, -095, -099, -100, -101, -103, -104, -105, -105, and -107.

materials including concrete, asphalt, and base rock may be recycled and reused onsite. The site elevations would generally follow the existing topography of the site in order to minimize grading, excavation, and reworking of the existing roadways. The maximum depth of excavation for the below-ground parking structures would be approximately 20 to 30 feet. It is anticipated that approximately 2 million cubic yards of soil would be excavated and hauled off-site. Construction of the proposed project and alternatives, with the exception of the Occupied/Re-Tenanted Mall alternative, is expected to take approximately 10 years and may require pile driving due to a proposed underground parking garage.

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into four sections: 1) the Setting Section, which provides a brief description of the fundamentals of environmental noise and ground-borne vibration, summarizes applicable regulatory criteria, and discusses the results of the noise and vibration monitoring surveys completed to document existing conditions; 2) the General Plan Consistency Section, which discusses land use compatibility utilizing noise- and vibration-related policies in the City's General Plan; and, 3) the Impacts and Mitigation Measures Section, which describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures to reduce impacts to less-than-significant levels where feasible.

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 2.

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 3. Because sound levels can vary markedly over a short period of time, a

method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq} . The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

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

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

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA CNEL. Typically, the highest steady traffic noise level during the daytime is about equal to the CNEL 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 CNEL with open windows and 65-70 dBA CNEL 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 CNEL 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 CNEL. At a CNEL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the CNEL increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a CNEL of 60-70 dBA. Between a CNEL 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 CNEL 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 4 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 4 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related groundborne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess groundborne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Damage caused by vibration can be classified as cosmetic or structural. Cosmetic damage includes minor cracking of building elements (exterior pavement, room surfaces, etc.). Structural damage includes threatening the integrity of the building. Damage resulting from construction related vibration is typically classified as cosmetic damage. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 2 Definition of Acoustical Terms Used in this Report

| Term | Definition |
|---|---|
| Decibel, dB | A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals. |
| Sound Pressure Level | Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter. |
| Frequency, Hz | The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz. |
| A-Weighted Sound Level, dBA | The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. |
| Equivalent Noise Level, L_{eq} | The average A-weighted noise level during the measurement period. |
| L_{max} , L_{min} | The maximum and minimum A-weighted noise level during the measurement period. |
| L_{01} , L_{10} , L_{50} , L_{90} | The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period. |
| Day/Night Noise Level, L_{dn} or DNL | The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am. |
| Community Noise Equivalent Level, CNEL | The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am. |
| Ambient Noise Level | The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location. |
| Intrusive | That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level. |

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 3 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 | |
| | 10 dBA | Broadcast/recording studio |
| | 0 dBA | |

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

TABLE 4 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 for 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, September 2013.

Regulatory Criteria

The State of California and the City of Cupertino have established plans and policies designed to limit noise exposure at noise sensitive land uses. These plans and policies are contained in the following documents: (1) the State California Environmental Quality Act (CEQA) Guidelines, Appendix G, (2) the California Building Code and Cal Green Code, (3) the City of Cupertino Noise Element of the General Plan, and (4) the City of Cupertino Municipal Code.

State CEQA Guidelines. The 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 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, exposure of people residing or working in the project area to excessive noise levels?
- (f) For a project within the vicinity of a private airstrip, exposure of people residing or working in the project area to excessive noise levels?

Pursuant to recent court decisions, the impacts of site constraints such as exposure of the proposed project to excessive levels of noise and vibration are not included in the Impacts and Mitigation Section of this report. Checklist item (a), regarding the compatibility of the project with noise levels at the site, is discussed in the General Plan Consistency section of the report. Checklist items (a) through (d) are applicable in the assessment of potential impacts resulting from the proposed project at off-site receptors. Checklist items (e) and (f) are not applicable to this project because the project is not located within an airport land use plan, is not within two miles of an airport, and is not in the vicinity of a private air strip.

CEQA does not define what noise level increase would be considered substantial. Typically, an increase in the CNEL noise level resulting from the project at noise sensitive land uses of 3 dBA or greater would be considered a significant impact when projected noise levels would exceed those considered acceptable for the affected land use. An increase of 5 dBA CNEL or greater would be considered a significant impact when projected noise levels would remain within those considered acceptable for the affected land use.

2016 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA DNL/CNEL in any habitable room.

2016 California Green Building Standards Code (Cal Green Code). The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2016 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). 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 L_{dn} 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 ($L_{eq}(1-hr)$) of 50 dBA in occupied areas during any hour of operation.

The performance method, which establishes the acceptable interior noise level, is the method typically used when applying these standards.

City of Cupertino General Plan. The Health and Safety Chapter in the City of Cupertino General Plan sets forth policies related to noise control in the City. The following policies are applicable to the proposed project:

Policy 6-50: Land Use Decision Evaluation. Use the Land Use Compatibility for Community Noise Environments chart and the City Municipal Code to evaluate land use decisions.

Strategy: Noise Review of New Development. Review the proximity of new or significantly remodeled housing to the traffic noise corridor by using the noise contour map and review the results of previous noise standards to see if the standards can be complied with through conventional construction practices. If there is not enough information, the staff may ask the developer to provide an acoustical analysis along with the application.

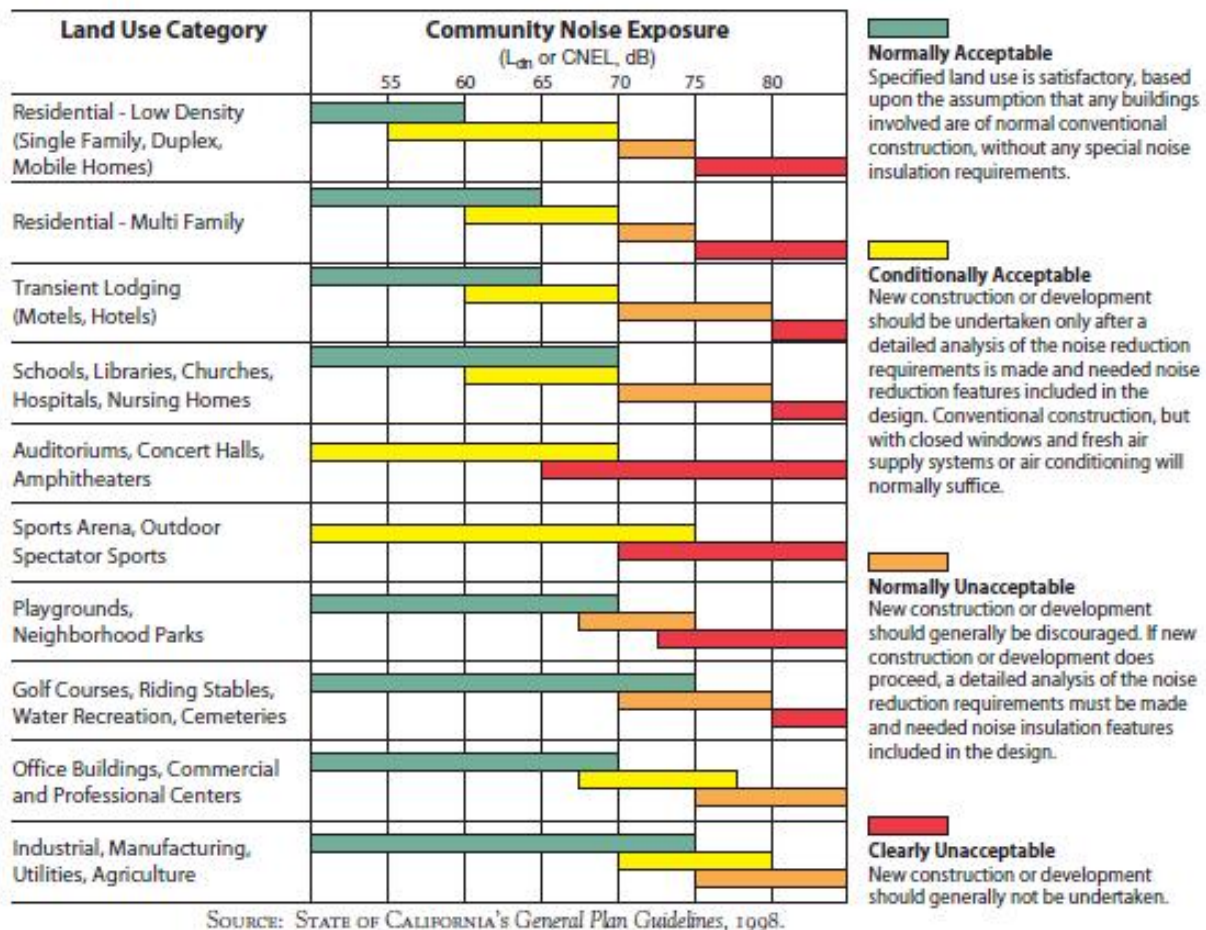


Figure 6-L: Land Use Compatibility for Community Noise Environments.

Source: City of Cupertino General Plan Community Vision 2015-2040, Health and Safety Chapter, October 2015.

Policy 6-51: Freeway Design and Neighborhood Noise. Ensure that roads and development along I-85 and I-280 are designed and improved in a way that minimizes neighborhood noise.

Policy 6-58: Commercial Delivery Areas. Be sure new commercial or industrial developments plan their delivery areas so they are away from existing or planned homes.

Policy 6-59: Delivery Hours. Actively enforce Section 10.48 of the Municipal Code limiting commercial and industrial delivery hours adjoining residential uses.

Policy 6-60: Noise Control Techniques. Require analysis and implementation of techniques to control the effects of noise from industrial equipment and processes for projects near homes.

Policy 6-61: Hours of Construction. Restrict non-emergency building construction work near homes during evening, early morning, and weekends by enforcing the noise regulations in the Municipal Code.

Policy 6-62: Construction and Maintenance Activities. Regulate construction and maintenance activities. Establish and enforce reasonable periods of the day, for weekdays, weekends and holidays for construction activities. Require construction contractors to use only construction equipment incorporating the best available noise control technology.

Policy 6-63: Sound Wall Requirements. Exercise discretion in requiring sound walls to be sure that all other measures of noise control have been explored and that the sound wall blends with the neighborhood. Sound walls should be landscaped.

City of Cupertino Municipal Code. The City's Municipal Code contains a Zoning Ordinance that limits noise levels at adjacent properties. The following sections establish applicable limits:

10.48.040 Daytime and Nighttime Maximum Noise Levels. Individual noise sources, or the combination of a group of noise sources located on the same property, shall not produce a noise level exceeding those specified on property zoned as follows, unless specifically provided in another section of this chapter:

| Land Use at Point of Origin | Maximum Noise Level at Complaint Site of Receiving Property | |
|-----------------------------|---|---------|
| | Nighttime | Daytime |
| Residential | 50 dBA | 60 dBA |
| Nonresidential | 55 dBA | 65 dBA |

10.48.050 Brief Daytime Incidents.

- A. During the daytime period only, brief noise incidents exceeding limits in other sections of this chapter are allowed; providing, that the sum of the noise duration in minutes plus the excess noise level does not exceed twenty in a two-hour period. For example, the following combinations would be allowable:

| Noise Increment Above Normal Standard | Noise Duration in 2-Hour Period |
|---------------------------------------|---------------------------------|
| 5 dBA | 15 minutes |
| 10 dBA | 10 minutes |
| 15 dBA | 5 minutes |
| 19 dBA | 1 minute |

- B. For multifamily dwelling interior noise, Section 10.48.054, the sum of excess noise level and duration in minutes of a brief daytime incident shall not exceed ten in any two-hour period, measured at the receiving location.
- C. Section 10.48.050A does not apply to Section 10.48.055 (Motor Vehicle Idling).

10.48.051 Landscape Maintenance Activities. The use of motorized equipment for landscape maintenance activities shall be limited to the hours of 8:00 a.m. to 8:00 p.m. on weekdays, and 9:00 a.m. to 6:00 p.m. on weekends and holidays, with the exception of landscape maintenance activities for public schools, public and private golf courses, and public facilities, which are allowed to begin at 7:00 a.m. The use of motorized equipment for landscape maintenance activities during these hours is exempted from the limits of Section 10.48.040; provided, that reasonable efforts are made by the user to minimize the disturbances to nearby residents by, for example, installation of appropriate mufflers or noise baffles, running equipment only the minimal period necessary, and locating equipment so as to generate minimum noise levels on adjoining properties.

10.48.052 Outdoor Public Events.

- A. Outdoor events open to the general public on nonresidential property, such as parades, rallies, fairs, concerts and special sales and promotional events, involving generation of noise levels higher than would normally occur, by use of the human voice, public address systems, musical instruments, electronic amplification systems, and similar sound producing activities, are allowed upon obtaining an appropriate permit from the city, and subject to the following general limitations:
 - 1. The event shall not produce noise levels above seventy dBA on any residential property for a period longer than three hours during daytime.
 - 2. The event shall not produce noise levels above sixty dBA on any residential property during the period from eight p.m. to eleven p.m., and above fifty-five dBA for any other nighttime period.
 - 3. Continuous or repeated peak noise levels above ninety-five dBA shall not be produced at any location where persons may be continuously exposed.
- B. The conditions imposed upon the event or activity in the permit issued by the City, regarding maximum noise level, location of noise sources, or duration of activity, for example, may be more limiting than this section, to protect certain individuals, areas or nearby activities which would otherwise be disturbed, and these permit conditions, when in conflict with this section, are overriding.

10.48.053 Grading, Construction and Demolition.

- A. Grading, construction and demolition activities shall be allowed to exceed the noise limits of Section 10.48.040 during daytime hours; provided, that the equipment utilized has high-quality noise muffler and abatement devices installed and in good condition, and the activity meets one of the following two criteria:
 - 1. No individual device produces a noise level more than eighty-seven dBA at a distance of twenty-five feet (7.5 meters); or
 - 2. The noise level on any nearby property does not exceed eighty dBA.
- B. Notwithstanding Section 10.48.053A, it is a violation of this chapter to engage in any grading, street construction, demolition or underground utility work within seven hundred fifty feet of a residential area on Saturdays, Sundays and holidays, and during the nighttime period, except as provided in Section 10.48.030.
- C. Construction, other than street construction, is prohibited on holidays, except as provided in Sections 10.48.029 and 10.48.030.
- D. Construction, other than street construction, is prohibited during nighttime periods unless it meets the nighttime standards of Section 10.48.040.
- E. The use of helicopters as a part of a construction and/or demolition activity shall be restricted to between the hours of nine a.m. and six thirty p.m. Monday through Friday only, and prohibited on the weekends and holidays. The notice shall be given at least twenty-four hours in advance of said usage. In cases of emergency, the twenty-four hour period may be waived.

10.48.054 Interior Noise in Multiple-Family Dwellings. Noise produced in any multiple-family dwelling unit shall not produce a noise level exceeding 45 dBA five feet from any wall in any adjoining unit during the period between seven a.m. and ten p.m., or exceeding 40 dBA during hours from ten p.m. to seven a.m. the following day.

10.48.055 Motor Vehicle Idling. Motor vehicles, including automobiles, trucks, motorcycles, motor scooters and trailers or other equipment towed by a motor vehicle, shall not be allowed to remain in one location with the engine or auxiliary motors running for more than three minutes in any hour, in an area other than on a public right-of-way, unless:

- A. The regular noise limits of Section 10.48.040 are met while the engine and/or auxiliary motors are running; or
- B. The vehicle is in use for provision of police, fire, medical, or other emergency services.

10.48.060 Noise Disturbances. No person shall unreasonably make, continue, or cause to be made or continued, any noise disturbance as defined in Section 10.48.010. "Noise disturbance" means any sound which:

- 1. Endangers or injures the safety or health of humans or animals; or
- 2. Annoys or disturbs a reasonable person of normal sensitivities; or
- 3. Endangers or damages personal or real property.

10.48.062 Nighttime Deliveries and Pickups. It is unlawful and a nuisance for any person to make or allow vehicular deliveries or pickups to or from commercial establishments (defined as any store, factory, manufacturing, or industrial plant used for the sale,

manufacturing, fabrication, assembly or storage of goods, wares and merchandise) by the use of private roads, alleys or other ways located on either side or the back of any building housing the commercial establishment where such private road, alley or other way lies between the building and any adjacent parcel of land zoned for residential purposes, between the hours of eight p.m. and eight a.m. weekdays (Monday through Friday) and six p.m. and nine a.m. on weekends (Saturday and Sunday) and holidays except as may be permitted under Section 10.48.029.

Existing Noise Environment

The project site is located along North Wolfe Road, between Interstate 280 (I-280) and Stevens Creek Boulevard in Cupertino, California. The Specific Plan area is mostly developed with the Vallco Shopping Mall and associated parking facilities, and the remaining acres are developed roadways, a 148-room hotel (currently under construction), and a surface parking lot. Residential and commercial land uses border the Plan Area to the west, south, and east, and I-280 forms the Plan Area's northern boundary.

A noise monitoring survey was conducted between Tuesday, February 13, 2018 and Friday February 16, 2018 to document existing noise conditions with and around the Plan Area. The noise monitoring survey included five long-term noise measurements (LT-1 through LT-5) and six short-term noise measurements (ST-1 through ST-6). Noise measurement locations are shown in Figure 1. The 2018 noise survey replicated the 2015 noise survey that took place between Thursday, November 19, 2015 and Tuesday November 23, 2015 for a previous version of the Specific Plan project. The measurement results of the 2018 survey are summarized below. A comparison of the current survey results to the 2015 survey is also provided. Appendix 1 includes the data collected at the five long-term measurement sites during both noise surveys.

Long-term noise measurement LT-1 was located at the east end of Merritt Drive in front of 19625 Merritt Drive in the residential area adjoining the west boundary of Vallco Mall near I-280. A sound wall separates the residences from the Mall. Noise levels measured at this location were primarily the result of traffic on I-280. Neighborhood noise was noted but did not make a substantial contribution to measured levels. Nearby construction directly to the east was recorded at levels of 58-60 dBA. Hourly average noise levels typically ranged from 51 to 61 dBA L_{eq} during the day and from 48 to 59 dBA L_{eq} at night. The calculated day-night average noise level at this location ranged from 62 to 63 dBA CNEL.

Long-term noise measurement LT-2 was located at the east end of Amherst Drive in front of 19627 Amherst Drive in the residential area adjoining the approximate midpoint of the west boundary of Vallco Mall. A sound wall separates the residences from the Mall. Noise levels measured at this location were primarily the result of traffic on I-280. Neighborhood noise and traffic on Vallco Mall perimeter road were noted but did not make a substantial contribution to measured levels. Hourly average noise levels typically ranged from 46 to 61 dBA L_{eq} during the day and from 42 to 56 dBA L_{eq} at night. The calculated day-night average noise level at this location ranged from 59 to 60 dBA CNEL.

Long-term measurement LT-3 was located at the east end of Wheaton Drive east of Denison

Avenue in front of 19682 Wheaton Drive. The noise sources identified included local traffic on Wheaton Drive, Denison Avenue, and Vallco Mall perimeter road, and distant traffic on I-280 and Stevens Creek Boulevard. Hourly average noise levels typically ranged from 51 to 59 dBA L_{eq} during the day and from 44 to 54 dBA L_{eq} at night. The calculated day-night average noise level at this location ranged from 58 to 60 dBA CNEL.

Long-term measurement LT-4 was located at the south boundary of Vallco Mall about 80 feet from the centerline of Stevens Creek Boulevard, and 400 feet west of N. Wolfe Road. Noise levels measured at this location were primarily the result of traffic on Stevens Creek Boulevard. Parking lot traffic was also noted but did not make a substantial contribution to the measured noise levels. Hourly average noise levels typically ranged from 65 to 70 dBA L_{eq} during the day and from 51 to 66 dBA L_{eq} at night. The calculated day-night average noise level at this location was 69 dBA CNEL.

Long-term measurement LT-5 was located at the north boundary of Vallco Mall east of N. Wolfe Road, about 185 feet from the centerline of I-280. Noise levels measured at this location were the result of traffic on I-280 and some local traffic. Construction of a nearby hotel was also audible at the time of measurement. Hourly average noise levels typically ranged from 65 to 72 dBA L_{eq} during the day and from 61 to 71 dBA L_{eq} at night. The calculated day-night average noise level at this location was 74 dBA CNEL.

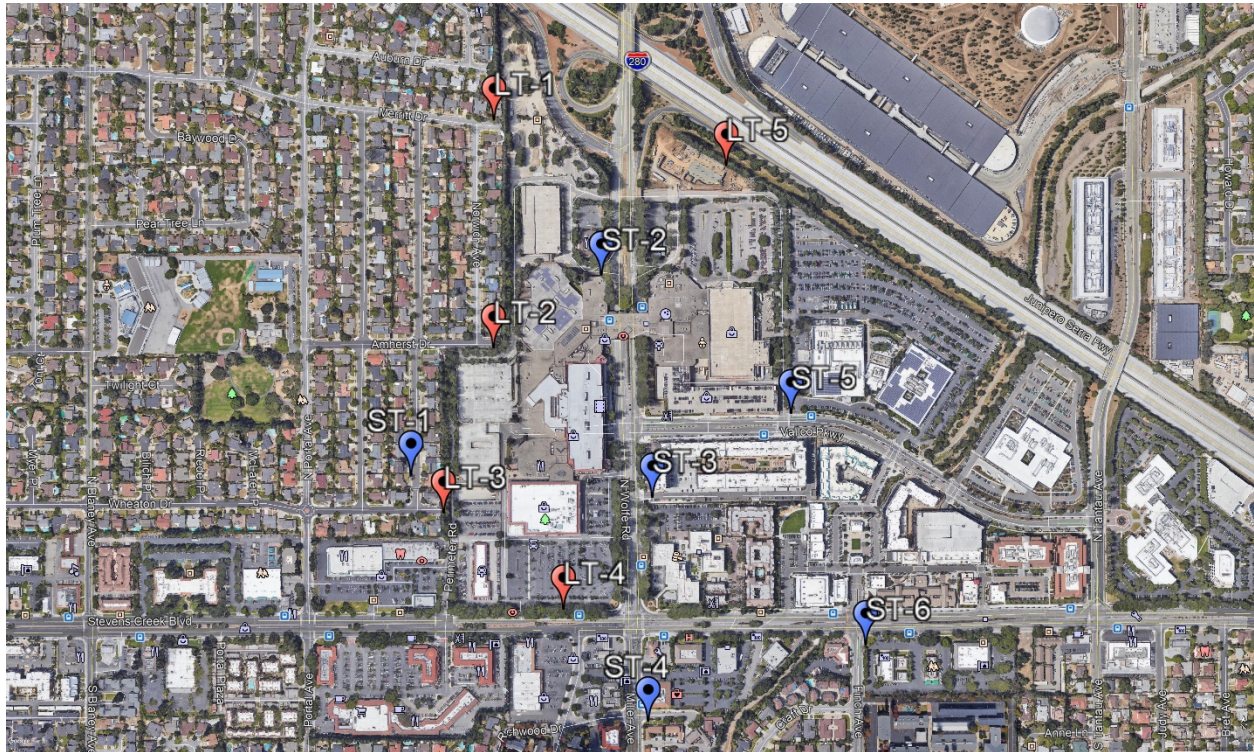
Attended short-term measurements were made at six locations during the daytime at representative locations of noise-sensitive receptors in the vicinity of the Vallco Mall. During each measurement, observations were made noting predominant noise sources and associated noise levels. Table 5 summarizes the results of the short-term measurements. Measurement ST-1 was made on the sidewalk in front of the residence located at 10127 Denison Avenue, between Amherst Drive and Wheaton Drive. Local and distant traffic on I-280 were audible throughout the measurement. Measurement ST-2 was made west of N. Wolfe Road, 350 feet south of Perimeter Road. Traffic on N. Wolfe Road was the dominant source of noise, with traffic on I-280 occasionally audible. Jets were also occasionally audible, producing noise levels that reached 72 dBA. Measurement ST-3 was made in the 10050/10080 N. Wolfe Road parking area adjacent to the apartments to the north. Traffic on N. Wolfe Road was the only significant contributor to the measured noise levels. Measurement ST-4 was made at the southeast corner of the intersection of Miller Avenue and Richmond Court, in front of the triplex located at 19480 Richmond Court. Traffic on Miller Avenue was the only significant contributor to the measured noise levels. Measurement ST-5 was on the north side of Vallco Parkway at the intersection with Perimeter Road. Construction activity nearby and construction truck traffic on Vallco Parkway, as well as general traffic in the area, contributed to the measured noise levels. Measurement ST-6 was made at the intersection of Stevens Creek Boulevard and Finch Avenue. Traffic on Stevens Creek Boulevard and nearby construction contributed to the measured noise levels. Large vehicles in the area such as garbage trucks produced maximum instantaneous noise levels up to 89 dBA.

Comparison to 2015 Noise Monitoring Survey

With regard to noise levels monitored at LT-1 and LT-2, current data shows that the noise environment at these locations has remained relatively unchanged over the three year period. Both

measurements have calculated average CNEL levels of 63 dBA for LT-1 and 59 dBA for LT-2. Measurement location LT-3 shows slightly higher levels in 2018 than those measured in 2015. Overall maximum levels for LT-3 trend higher in 2018 than 2015 and hourly L_{eq} measurements range 2 to 3 dBA higher than those in 2015. LT-4 measurements for both dates remain consistent. The calculated CNEL level for LT-4 in 2018 is 69 dBA while the calculated CNEL level for LT-4 in 2015 is 70 dBA. LT-5 measurements for both 2018 and 2015 also remain relatively unchanged, however average nightly minimum noise levels trend approximately 5 dBA higher for the 2018 survey compared to the 2015 survey. Calculated average CNEL levels at LT-5 are 74 dBA for 2018 and 75 dBA for 2015.

FIGURE 1 Noise Measurement Locations



Source: Google Earth, 2018.

TABLE 5 Summary of Short-Term Noise Measurements near Vallco Mall (dBA)

| Noise Measurement Location (Date, Time) | L_{max} | $L_{(1)}$ | $L_{(10)}$ | $L_{(50)}$ | $L_{(90)}$ | L_{eq} |
|--|-----------|-----------|------------|------------|------------|----------|
| ST-1: In front of 10127 Denison Ave. (2/15/18, 13:00-13:10) | 52 | 50 | 48 | 45 | 44 | 46 |
| ST-2: 100 feet west of N. Wolfe Road centerline near north perimeter road (2/15/18, 12:50-13:10) | 79 | 76 | 74 | 70 | 64 | 71 |
| ST-3: 10050/10080 N. Wolfe Road Parking area, about 95 feet from centerline (2/15/18, 13:30-13:40) | 73 | 70 | 65 | 60 | 56 | 62 |

| Noise Measurement Location (Date, Time) | L _{max} | L ₍₁₎ | L ₍₁₀₎ | L ₍₅₀₎ | L ₍₉₀₎ | L _{eq} |
|--|------------------|------------------|-------------------|-------------------|-------------------|-----------------|
| ST-4: 65 feet east of Miller Avenue centerline at Richmond Court (2/15/18, 13:30-13:40) | 81 | 72 | 68 | 62 | 54 | 65 |
| ST-5: 95 feet north of Vallco Parkway at Perimeter Road (2/15/18, 12:20-12:30) | 83 | 76 | 69 | 62 | 58 | 66 |
| ST-6: 95 feet from Stevens Creek Boulevard centerline at Finch Avenue (2/15/18, 12:30-12:40) | 90 | 83 | 63 | 57 | 52 | 68 |

GENERAL PLAN CONSISTENCY ANALYSIS

The City of Cupertino General Plan requires that exterior noise levels at multi-family residential and transient lodging outdoor activity areas be maintained at or below 65 dBA CNEL to be considered “normally acceptable” with the noise environment. Exterior noise levels at outdoor activity areas associated with office buildings and commercial retail land uses must be maintained at or below 70 dBA CNEL to be considered “normally acceptable” with the noise environment. The State of California requires that interior noise levels be maintained at 45 dBA CNEL or less at multi-family residences and lodging facilities where occupants sleep, and the Cal Green Code requires that interior noise levels in offices and commercial buildings be maintained at or below 50 dBA L_{eq}(1-hr) or less during hours of operation.

The future noise environment at the project site would continue to result primarily from vehicular traffic along I-280, Stevens Creek Boulevard, North Wolfe Road, and Vallco Parkway. A traffic study for the proposed project was conducted by *Fehr & Peers*² in March 2018. The study provided traffic volumes along roadway segments in the project vicinity for five future cumulative plus project alternatives. Under the proposed Specific Plan, which would result in the highest noise level increase, future traffic volume increases would occur along Perimeter Road, Stevens Creek Boulevard, North Wolfe Road, and Vallco Parkway. Future traffic noise levels along I-280 were conservatively calculated assuming capacity conditions for the highway. The maximum noise level occurs during the period where the maximum traffic volume flows freely along the highway. When traffic volumes exceed the capacity conditions, traffic slows and produces lower noise levels.

Both Mineta San José International Airport and Moffett Federal Airfield are approximately 5 miles away from the Plan Area. The Plan Area lies outside of any established noise contours for both airports; however, various aircraft are expected to continue to be audible at times. However, people residing and working in the Plan Area would not be exposed to excessive levels of noise from aircraft overflights.

Future Exterior Noise Environment

Noise levels at outdoor use areas that are affected by transportation noise are required to be maintained at or below 65 dBA CNEL to be considered normally acceptable for multi-family

² *Fehr & Peers*, “Traffic Impact Analysis (DRAFT) Vallco Special Area Specific Plan,” March 2018.

residential land uses and hotels. Noise levels at or below 70 dBA CNEL are considered normally acceptable for commercial uses as well as outdoor recreational areas (such as parks).

SoundPLAN Version V8.0, a three-dimensional ray-tracing computer program, was used to calculate future traffic noise level contours for each design alternative. Calculations took into account the traffic volumes, speeds, assumed vehicle mix information, and the topography of the area, which is relatively flat. The peak hour traffic volumes for each alternative and travel speeds were input into the model, as well as the existing sound wall along Perimeter Road, existing buildings surrounding the site, and the hotel currently under construction at the north end of the site.

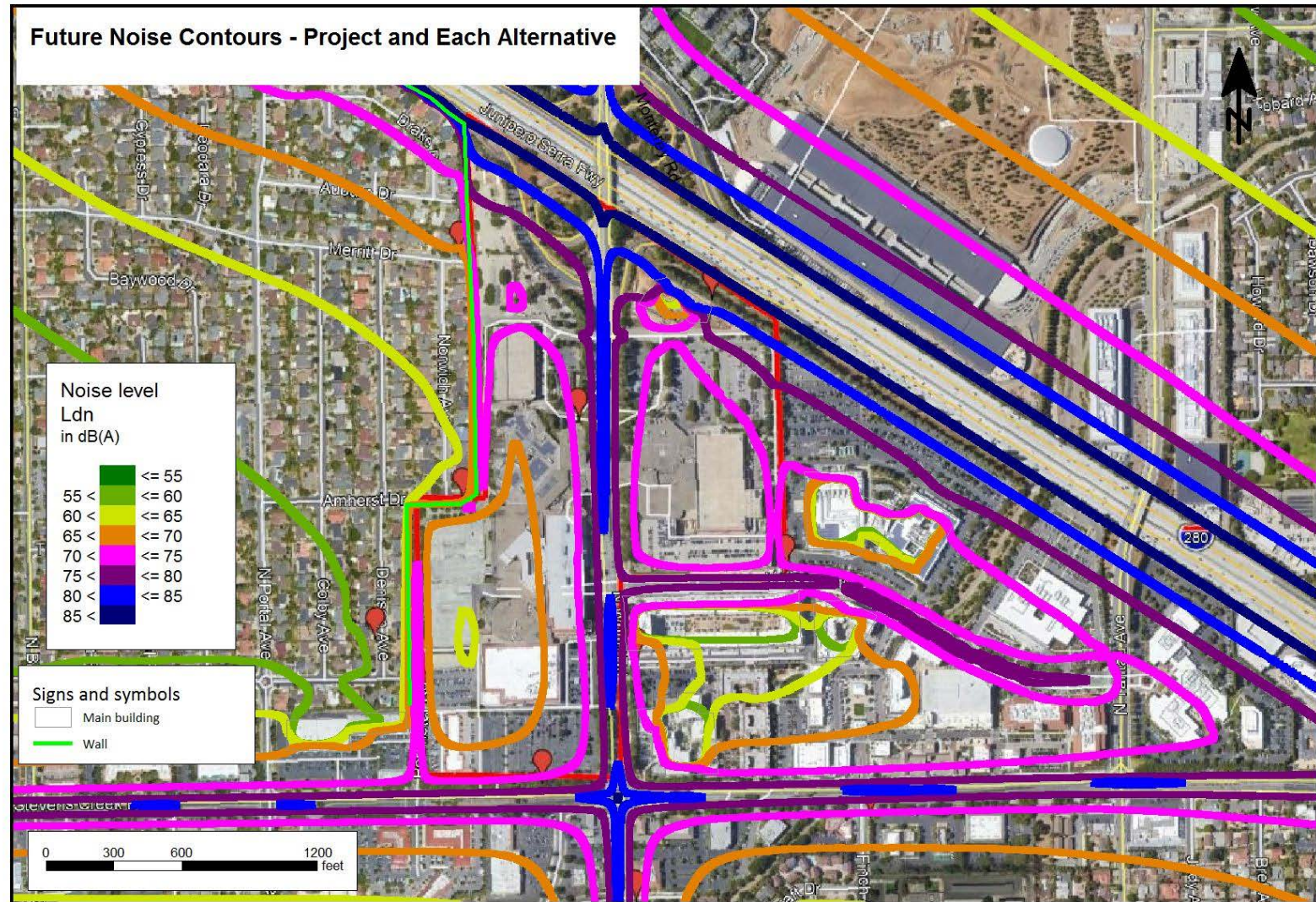
Calculations were made for the future cumulative (no project) traffic conditions and for each of the proposed future design alternatives. Table 6 presents the community noise equivalent levels for each cumulative plus project design scenario and the cumulative (no project) scenario calculated at a reference distance of 75 feet from the center of the near travel lane for the major roadways surrounding the site. As indicated in Table 6, there is very little variation in modeled noise levels for cumulative and cumulative plus project noise levels under any proposed alternative. Based on the results of the SoundPLAN model, a 1 dBA CNEL or less difference would be expected under each project design alternative. Figure 2 shows the cumulative plus project noise level contours for all proposed alternatives.

TABLE 6 Cumulative No Project and Cumulative Plus Project Modeled Noise Levels Along Surrounding Roadways

| Roadway | Future Noise Level 75 feet from the Centerline of the Roadway, dBA CNEL | | | | |
|--|---|----------------------------|------------------------|---|----------------------|
| | Cum. No Project | Occupied/ Re-Tenanted Mall | Proposed Specific Plan | General Plan Buildout with Max. Residential | Retail & Residential |
| I-280 | 85 | 85 | 85 | 85 | 85 |
| Perimeter Road, north of Stevens Creek Boulevard | 66 | 66 | 66 | 66 | 66 |
| Perimeter Road, near Amherst Drive | 62 | 62 | 63 | 62 | 62 |
| Perimeter Road, west of North Wolfe Road | 69 | 69 | 69 | 69 | 69 |
| Perimeter Road, east of North Wolfe Road | 76 | 76 | 76 | 76 | 76 |
| Perimeter Road, north of Vallco Parkway | 66 | 67 | 67 | 67 | 67 |
| Stevens Creek Boulevard | 71 | 71 | 71 | 71 | 71 |
| Vallco Parkway | 68 | 69 | 69 | 69 | 69 |
| North Wolfe Road, north of Stevens Creek Boulevard | 72 | 72 | 72 | 72 | 72 |
| North Wolfe Road, at Vallco Parkway | 72 | 72 | 72 | 72 | 72 |

| Roadway | Future Noise Level 75 feet from the Centerline of the Roadway, dBA CNEL | | | | |
|---|---|----------------------------|------------------------|---|----------------------|
| | Cum. No Project | Occupied/ Re-Tenanted Mall | Proposed Specific Plan | General Plan Buildout with Max. Residential | Retail & Residential |
| North Wolfe Road, south of Perimeter Road | 73 | 73 | 73 | 73 | 73 |
| North Wolfe Road, north of Perimeter Road | 74 | 74 | 74 | 74 | 74 |

FIGURE 2 Future Noise Contours for Cumulative Traffic Scenarios of All Project Alternatives



Proposed Multi-Family Residential Land Uses

The noise levels summarized in Table 6 were used to estimate the distances at which common outdoor use areas with direct line-of-sight to the roadways would need to be set back from area roadways to meet the 65 dBA CNEL threshold for multi-family residential land uses. Table 7 summarizes the setbacks required to meet 65 dBA CNEL without additional noise control such as barriers.

TABLE 7 Cumulative Plus Project (All Alternatives) Setback Distances to Meet the 65 dBA CNEL Threshold of Common Outdoor Use Areas at Residential Land Uses

| Roadway | Distance from Centerline to 65 dBA CNEL |
|--|--|
| I-280 | 1,035 feet |
| Perimeter Road, north of Stevens Creek Boulevard | 100 feet |
| Perimeter Road, near Amherst Drive | 35 feet |
| Perimeter Road, west of North Wolfe Road | 165 feet |
| Perimeter Road, east of North Wolfe Road | 355 feet |
| Perimeter Road, north of Vallco Parkway | 105 feet |
| Stevens Creek Boulevard | 190 feet |
| Vallco Parkway | 150 feet |
| North Wolfe Road, north of Stevens Creek Boulevard | 230 feet |
| North Wolfe Road, at Vallco Parkway | 230 feet |
| North Wolfe Road, south of Perimeter Road | 250 feet |
| North Wolfe Road, north of Perimeter Road | 290 feet |

Noise produced by vehicular traffic along roadways surrounding the project site could potentially expose the proposed residential land uses to noise levels exceeding the exterior compatibility threshold. Assuming the centers of the residential outdoor use areas have setbacks from the centerlines of the surrounding roadways that are less than those summarized in Table 7, the proposed land uses would not be compatible with the noise environment and would require the implementation of noise control to attenuate transportation noise to normally acceptable levels.

Proposed Commercial/Office Land Uses

The noise levels summarized in Table 6 were also used to estimate the distances at which common outdoor use areas with direct line-of-sight to the roadways would need to be set back from area roadways to meet the 70 dBA CNEL threshold for commercial/office land uses. The results for each proposed future design alternative are summarized in Table 8.

TABLE 8 Cumulative Plus Project (All Alternatives) Setback Distances to Meet the 70 dBA CNEL Threshold of Common Outdoor Use Areas at Commercial Land Uses

| Roadway | Distance from Centerline to 70 dBA CNEL |
|--|--|
| I-280 | 580 feet |
| Perimeter Road, north of Stevens Creek Boulevard | 30 feet |
| Perimeter Road, near Amherst Drive | <15 feet |
| Perimeter Road, west of North Wolfe Road | 55 feet |
| Perimeter Road, east of North Wolfe Road | 200 feet |
| Perimeter Road, north of Vallco Parkway | 35 feet |
| Stevens Creek Boulevard | 85 feet |
| Vallco Parkway | 60 feet |
| North Wolfe Road, north of Stevens Creek Boulevard | 115 feet |
| North Wolfe Road, at Vallco Parkway | 115 feet |
| North Wolfe Road, south of Perimeter Road | 125 feet |
| North Wolfe Road, north of Perimeter Road | 150 feet |

Noise produced by vehicular traffic along roadways surrounding the project site could potentially expose the proposed commercial land uses to noise levels exceeding the exterior compatibility threshold. Assuming the centers of the outdoor commercial use areas have setbacks from the centerlines of the surrounding roadways that are less than those summarized in Table 8, the proposed land use would not be compatible with the noise environment and would require the implementation of noise control to attenuate transportation noise to normally acceptable levels.

Future Interior Noise Environment

The State of California requires that interior noise levels for residential land uses be at or below 45 dBA CNEL. For commercial land uses, the 2016 Cal Green Code would apply. The performance method enforced in the Cal Green Code requires that interior noise levels be maintained at 50 dBA $L_{eq}(1-hr)$ or less during hours of operation, which are assumed to be daytime hours of 7:00 a.m. to 10:00 p.m. for the proposed project, at the commercial uses.

Proposed Multi-Family Residential Land Uses

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA CNEL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA CNEL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors,

sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

For residential building setbacks from the centerline of the nearby roadway equivalent to those distances shown in Table 7, the exterior-facing units would be exposed to future exterior noise levels of 65 dBA CNEL, and the future interior noise levels at these units would be 50 dBA CNEL, which would exceed 45 dBA CNEL. Proposed residential buildings with standard construction materials would not meet the City's interior noise level threshold and would require noise insulation features to be compatible with the noise environment at the site.

Proposed Commercial Land Uses

Hourly average noise levels during business hours would need to meet the 50 dBA $L_{eq(1-hr)}$ threshold established by the 2016 Cal Green Code within proposed commercial land uses. Standard construction materials for commercial uses would provide at least 20 to 25 dBA of noise reduction in interior spaces. The inclusion of adequate forced-air mechanical ventilation systems is normally required so windows may be kept closed at the occupants' discretion.

Assuming a minimum of 20 dBA of exterior-to-interior noise reduction, the future interior noise levels would be 50 dBA $L_{eq(1-hr)}$ or less at the setback distances shown in Table 8. Commercial buildings proposed nearer to area roadways than the minimum screening distances shown in Table 7 would potentially be exposed to interior noise levels above 50 dBA $L_{eq(1-hr)}$ and would require noise insulation features to be compatible with the noise environment at the site.

Recommendations to Reduce Future Exterior and Interior Noise Levels

An acoustical study shall be conducted during the application process when project-specific information, such as building elevations, layouts, floor plans, and position of buildings on the site, is known. The study shall determine compliance with the noise and land use compatibility standards, identify potential noise impacts, and propose site-specific measures to reduce exposure to exterior and interior noise levels that exceed maximum permissible levels.

The following general recommendations shall be considered to reduce exterior noise levels to meet the normally acceptable thresholds of 65 dBA CNEL at multi-family residences or 70 dBA CNEL at commercial uses:

- When developing project site plans, locate noise-sensitive outdoor use areas away from major roadways or other significant sources of noise. Shield noise-sensitive spaces with buildings or noise barriers to reduce exterior noise levels. The final detailed design of the heights and limits of proposed noise barriers shall be completed at the time that the final site and grading plans are submitted.

The following general recommendations shall be considered to reduce interior noise levels to meet the normally acceptable thresholds of 45 dBA CNEL at multi-family residences or 50 dBA $L_{eq(1-hr)}$ at commercial uses during hours of operations:

- If future exterior noise levels at residential building façades are between 60 and 65 dBA CNEL, incorporate adequate forced-air mechanical ventilation to reduce interior noise levels to acceptable levels by closing the windows to control noise.
- If future exterior noise levels at residential building façades exceed 65 dBA CNEL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.
- If the 50 dBA $L_{eq}(1-hr)$ threshold would not be met, other site-specific measures, such as increasing setbacks of the buildings from the adjacent roadways, using shielding by other buildings or noise barriers to reduce noise levels, implementing additional sound treatments to the building design, etc. shall be considered to reduce interior noise levels to meet the Cal Green Code threshold.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

Paraphrasing from Appendix G of the CEQA Guidelines, a project would normally result in significant noise impacts if noise levels generated by the project conflict with adopted environmental standards or plans, if the project would generate excessive groundborne vibration levels, or if ambient noise levels at sensitive receivers would be substantially increased over a permanent, temporary, or periodic basis. The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.
- A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Ground-borne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.
- A significant impact would be identified if traffic generated by the project or project improvements/operations would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA CNEL or greater, with a future noise level of less than the “normally acceptable” standard, or b) the noise level increase is 3 dBA CNEL or greater, with a future noise level equal to or greater than the “normally acceptable” standard.
- A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA L_{eq} , and the ambient by at least 5 dBA L_{eq} , for a period of more

than one year would constitute a significant temporary noise increase at adjacent residential land uses.

Impact 1: Noise Levels in Excess of Standards. The proposed project would potentially exceed the City's established construction noise thresholds and operational noise thresholds at nearby existing noise-sensitive receptors. **This is a potentially significant impact.**

When the source of noise originates from residential land uses, Section 10.48.040 of the City's Municipal Code limits noise levels received on any nearby land use to 60 dBA L_{eq} during daytime hours (7:00 a.m. to 10:00 p.m.) and to 50 dBA L_{eq} at night (10:00 p.m. to 7:00 a.m.). When the source of noise originates from nonresidential land uses, noise levels received on any nearby land use are limited to 65 dBA L_{eq} during daytime hours and to 55 dBA L_{eq} at night. Additionally, Section 10.48.050 provides further noise limitations during daytime hours for sources that occur for brief periods of time. For a 15-minute noise duration occurring within a 2-hour period, the daytime noise limits mentioned above would increase by 5 dBA. For a 10-minute noise duration occurring within a 2-hour period, the daytime noise limits mentioned above would increase by 10 dBA. For a 5-minute noise duration occurring within a 2-hour period, the daytime noise limits mentioned above would increase by 15 dBA. For a 1-minute noise duration occurring within a 2-hour period, the daytime noise limits mentioned above would increase by 19 dBA. Noise measured from the interior of a receiving multi-family residence shall not exceed 70 dBA L_{eq} during daytime hours when the noise source originates from a residential property or exceed 75 dBA L_{eq} when the noise source originates from a nonresidential property.

Section 10.48.051 of the City's Municipal Code limits landscape maintenance activities to between 8:00 a.m. and 8:00 p.m. on weekdays and to between 9:00 a.m. and 6:00 p.m. on weekends and holidays. During these allowable hours, maintenance activities are exempt from the above noise limits, provided reasonable efforts are made to minimize noise disturbance.

Section 10.48.053 exempts construction noise from the limits discussed above if activities occur on weekdays during daytime hours, provided that the equipment utilized has high-quality noise muffler and abatement devices installed and are in good condition. The construction activities also need to meet the following two criteria: 1) no individual device shall produce noise levels exceeding 87 dBA at a distance of 25 feet; and 2) the noise level measured at any nearby property shall not exceed 80 dBA. Construction activities are prohibited on weekends, holidays, or during nighttime hours at sites within 750 feet of a residential land use.

Section 10.48.062 prohibits deliveries or pickups to and from commercial establishments between the hours of 8:00 p.m. and 8:00 a.m. on weekdays and between the hours of 6:00 p.m. and 9:00 a.m. on weekends and holidays.

Construction Noise

It is assumed that the proposed project would limit construction activity to daytime hours, Monday through Friday, consistent with Section 10.48.053 of the Municipal Code.

Construction activities generate considerable amounts of noise, especially during demolition, earth-moving, and infrastructure construction phases when heavy equipment is used. The highest maximum noise levels generated by project construction would typically range from about 80 to 90 dBA L_{max} at a distance of 50 feet from the noise source. A list of typical maximum instantaneous noise levels measured at 50 feet are provided in Table 9. Typical hourly average construction-generated noise levels for residential mixed-use buildings are about 81 to 88 dBA L_{eq} 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.), as shown in Table 10. Hourly average construction noise levels for hotels and office buildings typically range from 78 to 89 dBA L_{eq} . Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 10 dBA noise reduction at distant receptors.

A detailed list of equipment expected to be used for the proposed project construction and phasing information were not available at the time of this study. Based on the noise levels in Table 9, 6 dBA can be added to the maximum instantaneous noise levels to determine the noise levels at 25 feet. Several individual pieces of equipment listed in Table 9 would potentially produce noise levels that would exceed the City's 87 dBA L_{max} limit at 25 feet. Considering the proposed project may include underground parking, pile driving may be required. As shown in Table 9, impact pile driving would result in maximum noise levels up to 105 dBA L_{max} at 50 feet, which would equate to 111 dBA L_{max} at 25 feet. This would be a potentially significant impact.

Without knowing the location on the project site for each proposed land use, distances to the shared property lines of the adjacent residential land uses cannot be determined, and construction noise levels cannot be estimated. However, to meet the 80 dBA L_{eq} threshold at the property lines of the nearby residences, minimum distances from the residential property lines to the center of the construction sites for each proposed land use type were calculated. Table 11 summarizes the minimum distances required to meet the City's threshold. Conservatively, it is assumed that construction activities on the project site would exceed the 80 dBA L_{eq} threshold at the property lines of the nearby existing residences. The distances shown in Table 11 to the 80 dBA threshold do not consider pile driving activities, which would increase noise levels. This would be a potentially significant impact.

TABLE 9 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 |

| Equipment Category | L_{max} Level (dBA)^{1,2} | Impact/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.

TABLE 10 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

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

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

TABLE 11 Minimum Distances from Nearby Existing Residential Property Lines to the Center of the Construction Site Required to Meet the 80 dBA L_{eq} Threshold

| | Type of Proposed Land Use | | | |
|---|------------------------------------|--------------|--|------------------------------|
| | Residential Development | Hotel | Office/ Commercial Building | Parking Structure |
| Minimum Distance Required to Meet 80 dBA L_{eq} | 126 feet | 141 feet | 141 feet | 141 feet |

Mechanical Equipment Noise

The proposed project would include mechanical equipment, such as heating, ventilation, air conditioning systems, backup generators, etc. Information regarding the number, type, and size of the mechanical equipment units to be used in the proposed project was not available at the time of this study. Typically, mechanical equipment would be located on building rooftops, on the ground-level surrounding the exterior building façades, or within mechanical or electrical equipment rooms on the interior of the buildings, but without site plans, specific locations are unknown at this time.

This type of equipment could run continuously during the daytime and nighttime hours. Therefore, the daytime and nighttime noise thresholds of 60 and 50 dBA L_{eq} , respectively, would apply for any proposed residential developments at the property lines of the adjacent existing residential land uses and of 65 and 55 dBA L_{eq} , respectively, would apply for any proposed nonresidential developments at the property lines of the adjacent existing residential land uses.

Without knowing details regarding the mechanical equipment on the project site, this is conservatively considered a potentially significant impact.

Truck Loading and Unloading

Truck deliveries are expected at proposed office buildings, other commercial buildings, hotel buildings, and mixed-use residential buildings on the project site. Site plans showing proposed loading zones were not available at the time of this study. It is assumed that the project would adhere to Section 10.48.062 of the City's Municipal Code, which prohibits deliveries between 8:00 p.m. and 8:00 a.m. on weekdays and between the hours of 6:00 p.m. and 9:00 a.m. on weekends and holidays. Typical deliveries would take approximately 15 minutes or less, which means the City would require loading and unloading activities at the office and commercial buildings to be at or below 70 dBA during daytime hours only. For the proposed hotel and mixed-use buildings, loading and unloading activities must be maintained at or below 65 dBA at the nearest residential land use.

Heavy trucks typically generate maximum noise levels ranging from 70 to 75 dBA at a distance of 50 feet, while smaller delivery trucks generate maximum noise levels ranging from 60 to 65 dBA at a distance of 50 feet. Additionally, backup alarms are typically 65 to 70 dBA at a distance of 50 feet. While noise levels during deliveries cannot be estimated at the adjacent residential land uses, loading zones within 50 feet of the shared property line would potentially result in noise levels exceeding the 70 dBA threshold for commercial deliveries and the 65 dBA threshold for hotel and mixed-use deliveries. This would be a potentially significant impact.

Outdoor Activity Areas

The proposed project is expected to include outdoor use areas such as outdoor dining, playgrounds, and walking paths and picnic areas. It is assumed that the proposed outdoor use areas would not include active play fields or courts.

The City's Municipal Code includes thresholds that would be applied based on the time duration of activities at these uses in any two-hour period. Typically, outdoor activities described above would be expected to last for a period of more than 15 minutes in any two-hour period. Since these outdoor use areas would be considered activities at a nonresidential land use, noise levels generated by proposed outdoor activity areas are required to be maintained at or below 65 dBA during daytime hours and at or below 55 dBA at night.

While a detailed site plan showing the locations of proposed outdoor use areas was not available at the time of this study, this analysis assumed that these activity areas could be located along the perimeter of the project site and on the proposed green roof. Due to the elevations expected for the green roof, which could range from 15 to 75 feet above the ground, the existing sound wall located along the property lines of the residences to the west would provide little to no shielding benefits. For the purposes of this analysis, the sound wall is assumed to provide no attenuation for project generated noise at proposed outdoor activity areas.

Outdoor Dining Areas

Illingworth & Rodkin, Inc. measured noise levels produced by active commercial outdoor use areas at Santana Row in San Jose, California. Noise measurements were made from a fourth-floor balcony overlooking active commercial outdoor use areas, which included a busy outdoor dining area, conversations, an open grassy area, a small child play area, and local traffic (e.g., autos and trucks revving engines up to 87 dBA L_{max}). Noise levels produced by these sources typically ranged from 66 to 71 dBA, and the average noise level was 69 dBA L_{eq} . Indoor music from the restaurant was audible, but noise levels due to the music were immeasurable due to the other dominating noise sources. These noise level measurements were a combination of multiple sources, and distances from each noise source varied. Therefore, the center point of all activities in the area was used to determine the distance from the source to the receptor. Taking into account the elevation of the measurement location, the distance was approximately 65 feet.

Based on the data above, the center of busy outdoor dining areas would need to be setback a minimum distance of 310 feet from the nearest existing residential property line in order to reduce the average noise level to meet the nighttime threshold of 55 dBA. Other design options for outdoor dining areas would be to locate them on the ground floor with an open roof and surrounded by the elevated green roof. Under this design option, the building supporting the green roof would provide shielding for the nearby residents.

Playgrounds

Playground noise would primarily result from activities such as raised voices and the use of playground equipment. Typical noise levels resulting from various playground activities range from 59 to 67 dBA L_{eq} at a distance of 50 feet. Maximum instantaneous noise levels typically result from children shouting and can reach levels of 75 dBA L_{max} at a distance of 50 feet. Assuming playground activities would be restricted to daytime hours only, the minimum setback of the center of the playground areas to the nearest residential property lines would need to be 60 feet for the typical noise levels to meet the daytime threshold of 65 dBA.

Walking Paths and Picnic Areas

Typically, walking paths and picnic areas are used for activities such as walking, running, conversations, and dining. These types of activities do not typically generate noise levels beyond ambient, background levels and would not be audible at distances beyond 50 feet. Since the existing residences would be separated from the project site by either Perimeter Road, Vallco Parkway, or North Wolfe Road, and it is assumed that the centers of the walking paths and picnic areas would not be located right along the roadway, these proposed outdoor use areas are not expected to result in noise levels exceeding 55 dBA at the nearest residential property lines.

Mitigation Measure 1:

Construction Noise

Construction activities will be conducted in accordance with the provisions of the City's Municipal Code, which limits temporary construction work to daytime hours, Monday through Friday. Construction is prohibited on weekends and all holidays. Further, the City requires that all equipment have a high-quality noise muffler and abatement devices installed and are in good

condition. Additionally, the construction crew shall adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity.

Construction Best Management Practices

Develop a construction noise control plan, including, but not limited to, the following available controls:

- Construct temporary noise barriers, where feasible, to screen stationary noise-generating equipment. Temporary noise barrier fences would provide a 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receptor and if the barrier is constructed in a manner that eliminates any cracks or gaps.
- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Unnecessary idling of internal combustion engines should be strictly prohibited.
- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used to reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.
- Utilize "quiet" air compressors and other stationary noise sources where technology exists.
- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.
- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.
- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.
- If impact pile driving is proposed, temporary noise control blanket barriers shall shroud pile drivers or be erected in a manner to shield the adjacent land uses. Such noise control blanket barriers can be rented and quickly erected.
- If impact pile driving is proposed, foundation pile holes shall be pre-drilled to minimize the number of impacts required to seat the pile. Pre-drilling foundation pile holes is a standard construction noise control technique. Pre-drilling reduces the number of blows required to seat the pile. Notify all adjacent land uses of the construction schedule in writing.

- The contractor shall prepare a detailed construction schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.
- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include in it the notice sent to neighbors regarding the construction schedule.

Construction noise associated with the proposed project could expose sensitive receptors to noise levels that exceed the noise standards set forth in the Municipal Code. The implementation of the reasonable and feasible controls outlined above as a project condition of approval would reduce construction noise levels emanating from the site and minimize disruption and annoyance to the extent feasible. However, even with these measures, it may not be feasible in all cases to mitigate construction noise of individual projects to a less-than-significant level, and impacts from construction noise would be significant and unavoidable.

Mechanical Equipment Noise

Mechanical equipment shall be selected and designed to reduce impacts on surrounding uses to meet the City's noise level requirements. A qualified acoustical consultant shall be retained to review mechanical noise, as these systems are selected, to determine specific noise reduction measures necessary to reduce noise to comply with the City's noise level requirements. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and/or installation of noise barriers, such as enclosures and parapet walls, to block the line-of-sight between the noise source and the nearest receptors. Alternate measures may include locating equipment in less noise-sensitive areas, where feasible.

The implementation of the above measure would reduce the impact to a less-than-significant impact at adjacent residences.

Truck Loading and Unloading

Section 10.48.062 prohibits deliveries between 8:00 p.m. and 8:00 a.m. on weekdays and between the hours of 6:00 p.m. and 9:00 a.m. on weekends and holidays, which shall be enforced as part of the proposed project. Additionally, the effect of loading zone activities would need to be evaluated for noise impacts once project-specific information, such as type and size of the commercial uses, hours of operation, frequency of deliveries, and location of loading zones, is available. Noise reduction measures could include, but are not limited to, the following:

- Move loading zones inside (e.g., within parking structures), where possible, and as far from adjacent residential uses as possible.

- Implement a no idling policy at all locations that requires engines to be turned off after five minutes.
- Recess truck docks into the ground or locate them within parking structures.
- Equip loading bay doors with rubberized gasket type seals to allow little loading noise to escape.

Prior to issuance of building permits, a noise study shall be conducted to determine noise levels due to truck deliveries at the proposed buildings, and the specific noise control recommendations necessary to reduce noise levels below the City's thresholds at adjacent residential property lines would be determined. The implementation of this measure would reduce the impact to a less-than-significant level.

Outdoor Activity Areas

The following minimum setbacks should be implemented into the project as conditions of approval in order to meet the daytime and nighttime thresholds established by the City:

- Outdoor dining areas with direct line-of-sight to the existing residences to the west of the site, opposite Perimeter Road, and to the southeast of the site, opposite Vallco Parkway and North Wolfe road, shall be setback a minimum distance of 310 feet from the nearest residential property line to meet the nighttime threshold of 55 dBA. Alternately, outdoor dining areas shall be acoustically shielded by noise barriers or buildings.
- Playgrounds proposed shall be setback a minimum distance of 60 feet from the nearest residential property line or acoustically shielded by noise barriers.

The implementation of minimum setback distances or additional acoustical shielding features would reduce the impact to a less-than-significant level at surrounding residences.

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Construction-related vibration levels resulting from activities at the project site would exceed 0.3 in/sec PPV at the nearest noise-sensitive receptor. **This is a potentially significant impact.**

The construction of the project may generate vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include grading, foundation work, paving, and new building framing and finishing.

For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 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. No known ancient buildings or buildings that are documented to be structurally weakened adjoin the Plan Area. Therefore, conservatively,

groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in a significant vibration impact.

Table 12 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as pile driving, 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. Impact pile driving typically generates vibration levels of 0.644 in/sec PPV at 25 feet, with an upper range of 1.158 in/sec PPV at this distance. Vibratory pile driving typically generates vibration levels of 0.170 in/sec PPV at 25 feet, with an upper range of 0.734 in/sec PPV at this distance. 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.

The nearest sensitive receptors are located west of the site, opposite Perimeter Road. Some of these residential structures would be as close as 10 feet from the project site. At 10 feet, impact and vibratory pile driving would generate vibration levels up to 3.173 and 2.011 in/sec PPV, respectively. All other equipment would generate vibration levels up to 0.575 in/sec PPV. An existing apartment building is located in the southeast corner of the Vallco Parkway/North Wolfe Road intersection, as well. This building would be approximately 110 feet from the boundary of the project site. At this distance, vibration levels would be up to 0.227 in/sec PPV for impact pile driving, up to 0.144 in/sec PPV for vibratory pile driving, and up to 0.041 in/sec PPV for every other type of construction equipment. Currently, a hotel building is being constructed along the northern boundary of the project site, adjacent to I-280. This hotel would be located opposite North Wolfe Road and opposite Perimeter from the expected developments proposed on the project site. The distance from the future hotel structure to the nearest probable construction activity for the proposed project would be approximately 75 feet, and at this distance, impact and vibratory pile driving would be up to 0.346 and 0.219 in/sec PPV, respectively, while all other construction activities would generate vibration levels up to 0.1 in/sec PPV.

Commercial buildings are located opposite Perimeter Road to the west, opposite Perimeter Road to the east, opposite North Wolfe Road to the east, and opposite Stevens Creek Boulevard to the south. The nearest commercial building west of the site would be 50 feet from the project's boundary, while the remaining commercial buildings would be 100 feet or more from the project site. At 50 feet, pile driving activities would generate vibration levels up to 0.540 and 0.342 in/sec PPV for impact and vibratory, respectively, while all other equipment would be at or below 0.1 in/sec PPV. At 100 feet, pile driving activities would generate vibration levels up to 0.250 and 0.160 in/sec PPV for impact and vibratory, respectively, while all other equipment would be at or below 0.05 in/sec PPV.

Pile driving activities would potentially generate vibration levels in excess of the 0.3 in/sec PPV threshold at residential and commercial structures to the east of the project site. Additionally, all other construction equipment operated near the western boundary shared with residential land uses would exceed 0.3 in/sec PPV. This is a potentially significant impact.

TABLE 12 Vibration Source Levels for Construction Equipment

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

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

Mitigation Measure 2:

The following measures shall be implemented where vibration levels due to construction activities would exceed 0.3 in/sec PPV at nearby sensitive uses:

- Comply with the construction noise ordinance to limit hours of exposure. The City's Municipal Code allows construction noise to exceed limits discussed in Section 10.48.040 during daytime hours. No construction is permitted on Sundays or holidays.
- In the event that pile driving would be required, all receptors within 300 feet of the project site shall be notified of the schedule a minimum of one week prior to its commencement. The contractor shall implement "quiet" pile driving technology (such as pre-drilling of piles, the use of more than one pile driver to shorten the total pile driving duration, or the use of portable acoustical barriers), in consideration of geotechnical and structural requirements and conditions.
- To the extent feasible, the project contractor shall phase high-vibration generating construction activities, such as pile driving/ground-impacting operations, so they do not occur at the same time with demolition and excavation activities in locations where the combined vibrations would potentially impact sensitive areas.
- The project contractor shall select demolition methods not involving impact tools, where possible (for example, milling generates lower vibration levels than excavation using clam shell or chisel drops).
- The project contractor shall avoid using vibratory rollers and packers near sensitive areas.

- Impact pile driving shall be prohibited within 90 feet of an existing structure surrounding the project site. Vibratory pile driving shall be prohibited within 60 feet of an existing structure surrounding the project site.
- Prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or clam shovel, within 20 feet of any adjacent sensitive land use.
- If pile driving is required in the vicinity of vibration-sensitive structures adjacent to the project site, survey conditions of existing structures and, when necessary, perform site-specific vibration studies to direct construction activities. Contractors shall continue to monitor effects of construction activities on surveyed sensitive structures and offer repair or compensation for damage.
- Construction management plans for substantial construction projects, particularly those involving pile driving, shall include predefined vibration reduction measures, notification requirements for properties within 200 feet of scheduled construction activities, and contact information for on-site coordination and complaints.

Critical factors pertaining to the impact of construction vibration on sensitive receptors include the proximity of the existing structures to the Plan Area, the soundness of the structures, and the methods of construction used. The implementation of these mitigation measures would reduce a potential impact to a less-than-significant level.

Impact 3: Permanent Noise Level Increase. Project generated traffic would result in a substantial permanent noise level increase at the existing noise-sensitive land uses in the project vicinity. **This is a significant impact.**

A significant impact would occur if the permanent noise level increase due to project-generated traffic was 3 dBA CNEL or greater for future ambient noise levels exceeding 60 dBA CNEL or was 5 dBA CNEL or greater for future ambient noise levels at or below 60 dBA CNEL. Based on measurements made at LT-1, LT-2, and LT-3, the existing ambient noise levels exceed 60 dBA CNEL, and considering traffic volumes increase in the future, the future ambient noise levels would exceed 60 dBA CNEL. Therefore, a significant impact would occur if the project resulted in an increase of 3 dBA CNEL or more. For reference, a 3 dBA CNEL noise increase would be expected if the project would double existing traffic volumes along a roadway, and a 5 dBA CNEL increase would result if existing traffic volumes were to triple with the project.

To determine noise level increases at existing residential land uses due to project-generated traffic, existing plus project peak hour traffic conditions from the *Fehr & Peers* traffic study were compared to the existing peak hour traffic conditions. For the Vallco Special Area Specific Plan, a total of 63 intersections were evaluated for peak hour traffic volumes. With the exception of Perimeter Road, receptors along Vallco Parkway and all other roadway segments in the project vicinity would experience noise level increases of 2 dBA CNEL or less under the project and project alternatives. Perimeter Road receptors would experience a 7 to 8 dBA increase in noise levels above existing conditions under the project and project alternative traffic scenarios.

Perimeter Road is within 50 feet of nearby sensitive residential receptors but is shielded from these receptors by an eight-foot sound wall, which provides at least 5 dBA of noise attenuation. This sound wall is expected to remain under project conditions. The noise levels measured at LT-3 documented that existing noise levels along Perimeter Road were 58 to 60 dBA CNEL. The sound level meter at LT-3 measured noise levels above the sound wall along Perimeter Road, so existing noise levels in the backyards of the residences along Perimeter Road are estimated to be 53 to 55 dBA CNEL, assuming a 5 dBA reduction from the wall. Since the project and each alternative would generate a noise level increase of more than 5 dBA CNEL at receptors along Perimeter Road, the project (or project alternatives)-generated traffic would cause a permanent noise increase at the surrounding noise-sensitive receptors. With the project (or project alternatives), the future noise levels at the shielded backyards of the residences along Perimeter Road would range from 60 to 62 dBA CNEL assuming an increase of 7 dBA and from 61 to 63 dBA CNEL with an increase of 8 dBA with the project or project alternatives. Therefore, the project-generated traffic noise increase would result in a significant impact at residences bordering Perimeter Road.

Mitigation Measure 3:

Methods available to mitigate project-generated noise level increases would need to be studied on a case-by-case basis at receptors that would be considered significantly impacted by project/project alternative-generated traffic on Perimeter Road. Noise reduction methods could include the following:

- New or larger noise barriers or other noise reduction techniques could be constructed to protect existing residential land uses where reasonable and feasible. Final design of such barriers should be completed during project level review.
- Alternative noise reduction techniques could be implemented, such as re-paving Perimeter Road with "quieter" pavement types including Open-Grade Rubberized Asphaltic Concrete. The use of "quiet" pavement can reduce noise levels by 2 to 5 dBA, depending on the existing pavement type, traffic speed, traffic volumes, and other factors.
- Installing traffic calming measures to slow traffic, such as speed bumps.
- Affected residences could be provided building sound insulation, such as sound-rated windows and doors, on a case-by-case basis as a method of reducing noise levels in interior spaces.

Significance after Mitigation: The methods above related to the existing sound walls and the sound insulation features of the existing residences are not subject to change as part of the proposed project. Additionally, due to the 15 mph speed limit along Perimeter Road, quiet pavement and the installation of speed bumps may not reduce the noise level increase to a less-than-significant level in all cases, resulting in significant and unavoidable impact.

Impact 4: Cumulative Noise Increase. The proposed project would result in a "cumulatively considerable" permanent noise level increase at the existing residential land uses in the project vicinity. **This is a significant impact.**

A significant impact would occur if two criteria are met: 1) if the cumulative traffic noise level increase was 3 dBA CNEL or greater for future levels exceeding 60 dBA CNEL or was 5 dBA CNEL or greater for future levels at or below 60 dBA CNEL; and 2) 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 the cumulative no project traffic volumes and the cumulative plus project volumes (including each alternative scenario) to existing traffic volumes. A traffic noise increase of 3 dBA CNEL was calculated along several roadway segments included in the traffic study under the cumulative no project scenario, the cumulative plus project scenario, and each alternative. However, traffic noise levels along Vallco Parkway, east of North Wolfe Road, are projected to increase by 3 dBA CNEL under cumulative plus project (and each alternative) conditions, while cumulative (no project) conditions resulted in an increase of 2 dBA CNEL. Since each scenario involving project and alternative conditions would be substantially increased, and the project’s contribution would be 1 dBA CNEL, the project would cause a significant cumulative traffic noise impact.

Additionally, along Perimeter Road north of Stevens Creek Boulevard, an increase of 7 to 8 dBA was calculated under the cumulative plus project scenario and each alternative, while the cumulative (no project) scenario resulted in no measurable noise increase. The speed limit is expected to remain 15 mph in the future, and the eight-foot sound wall is expected to remain under future cumulative plus project conditions, as well as under each alternative. However, given the increase is expected to exceed 5 dBA CNEL as compared to the existing conditions and the project’s contribution to the increase is more than 1 dBA CNEL, a cumulatively considerable contribution to the overall traffic noise increase at the adjacent existing residential land uses would occur under the proposed project and each alternative. This is a significant impact.

TABLE 13 Calculated Cumulative Noise Level Increases Above Existing Conditions

| Roadway Segment | Cumulative (No Project) Noise Increase | Cumulative Plus Project/Project Alternatives Noise Increase |
|--|---|--|
| Perimeter Road, north of Stevens Creek Boulevard | < 1 dBA | 7 to 8 dBA |
| North Wolfe Road, north of Vallco Parkway | 1 dBA | 2 dBA |
| North Wolfe Road, between Vallco Parkway and Stevens Creek Boulevard | 1 dBA | 2 dBA |
| Miller Avenue, south of Stevens Creek Boulevard | 1 dBA | 1 dBA |
| Stevens Creek Boulevard, east of North Wolfe Road | 1 dBA | 1 to 2 dBA |
| Stevens Creek Boulevard, between North Wolfe Road and Perimeter Road | 1 dBA | 1 dBA |
| Stevens Creek Boulevard, west of Perimeter Road | 1 dBA | 1 to 2 dBA |
| Vallco Parkway, east of North Wolfe Road | 2 dBA | 3 dBA |

The calculated increases shown in the table are for the roadway segments in the immediate vicinity of the project site. All other intersections included in the traffic study resulted in the same noise level increases for all cumulative conditions (no project, plus project, and each project alternative).

Mitigation Measure 4: Implement traffic noise controls identified in Mitigation Measure 3.

Impact 5: Temporary Construction Noise. Existing noise-sensitive land uses would be exposed to increased noise levels due to project construction activities for a period of 10 years. Even with the incorporation of construction best management practices as project conditions of approval, the temporary noise impact would be considered **significant and unavoidable**.

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.

As discussed in Impact 1, pile driving activities are expected to exceed the requirements established in the City of Cupertino Municipal Code for individual pieces of equipment even with the implementation of the Construction Best Management Practices. The discussion below evaluates the temporary noise impacts resulting from project construction activities when compared to ambient noise conditions and general thresholds based on indoor speech interference.

As discussed in the Fundamentals section of this report, the threshold for speech interference indoors is 45 dBA. Assuming a conservative 15 dBA exterior-to-interior reduction for standard residential construction and a 25 dBA exterior-to-interior reduction for standard commercial construction, this would correlate to an exterior threshold of 60 dBA L_{eq} at residential land uses and 70 dBA L_{eq} at commercial land uses. Additionally, temporary construction would be annoying to surrounding land uses if the ambient noise environment increased by at least 5 dBA L_{eq} for an extended period of time. Therefore, the temporary construction noise impact would be considered significant if project construction activities exceeded 60 dBA L_{eq} at nearby residences or exceeded 70 dBA L_{eq} at nearby commercial land uses and exceeded the ambient noise environment by 5 dBA L_{eq} or more for a period longer than one year.

Residential receptors exist adjacent to the western boundary of the project site and opposite Perimeter Road to the west. These receptors are represented by ambient noise measurements made at LT-1, LT-2, and LT-3, which range from 46 to 61 dBA L_{eq} during daytime hours. Existing commercial land uses along Stevens Creek Boulevard, which would be to the west, to the south, and to the east of the site, would be represented by ambient noise levels measured at LT-4, which range from 65 to 70 dBA L_{eq} during daytime hours. For the existing residential apartment building opposite North Wolfe Road and Vallco Parkway from the project site, ambient noise measurements made at ST-3 and ST-5 would represent typical daytime noise levels at these receptors, which range from 62 to 66 dBA L_{eq} . The commercial property to the east of the project site, opposite Perimeter Road, and the hotel building along the northern boundary that is currently being built would be represented by ambient noise levels measured at LT-5 since I-280 would dominate the noise environment at this location. The daytime noise levels at LT-5 range from 65 to 72 dBA L_{eq} .

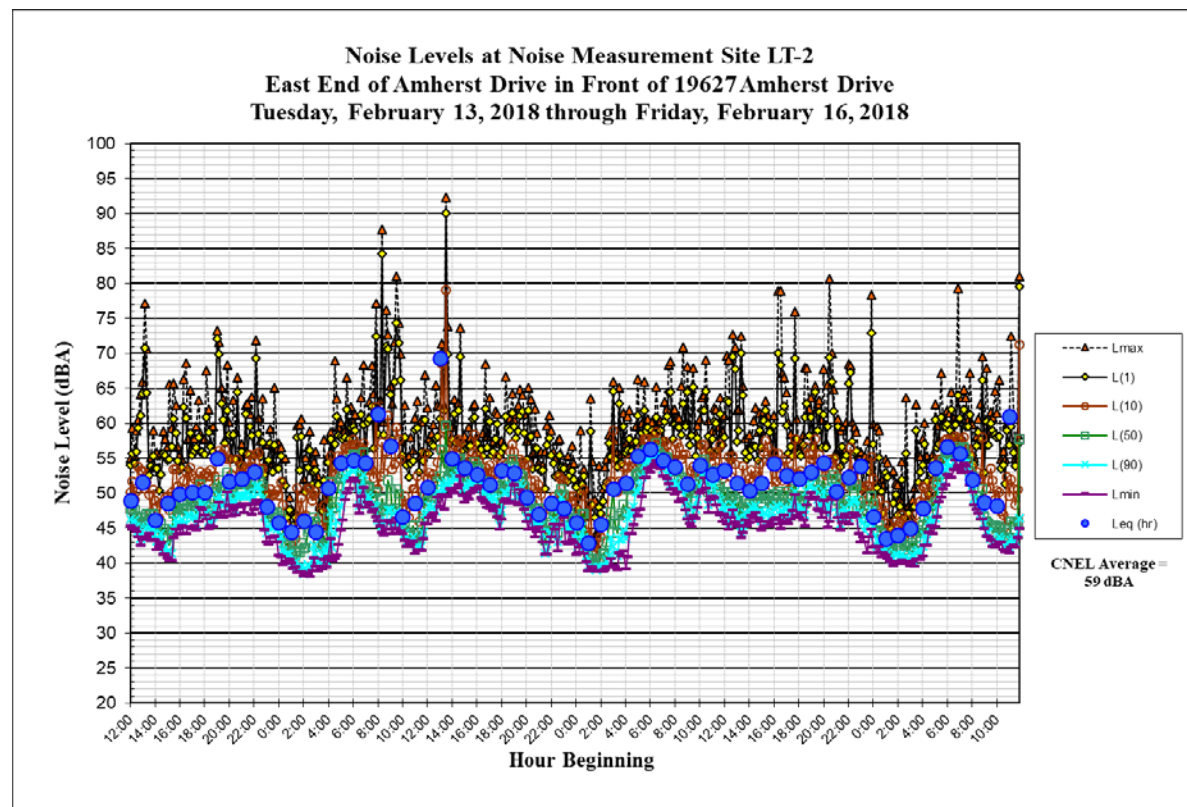
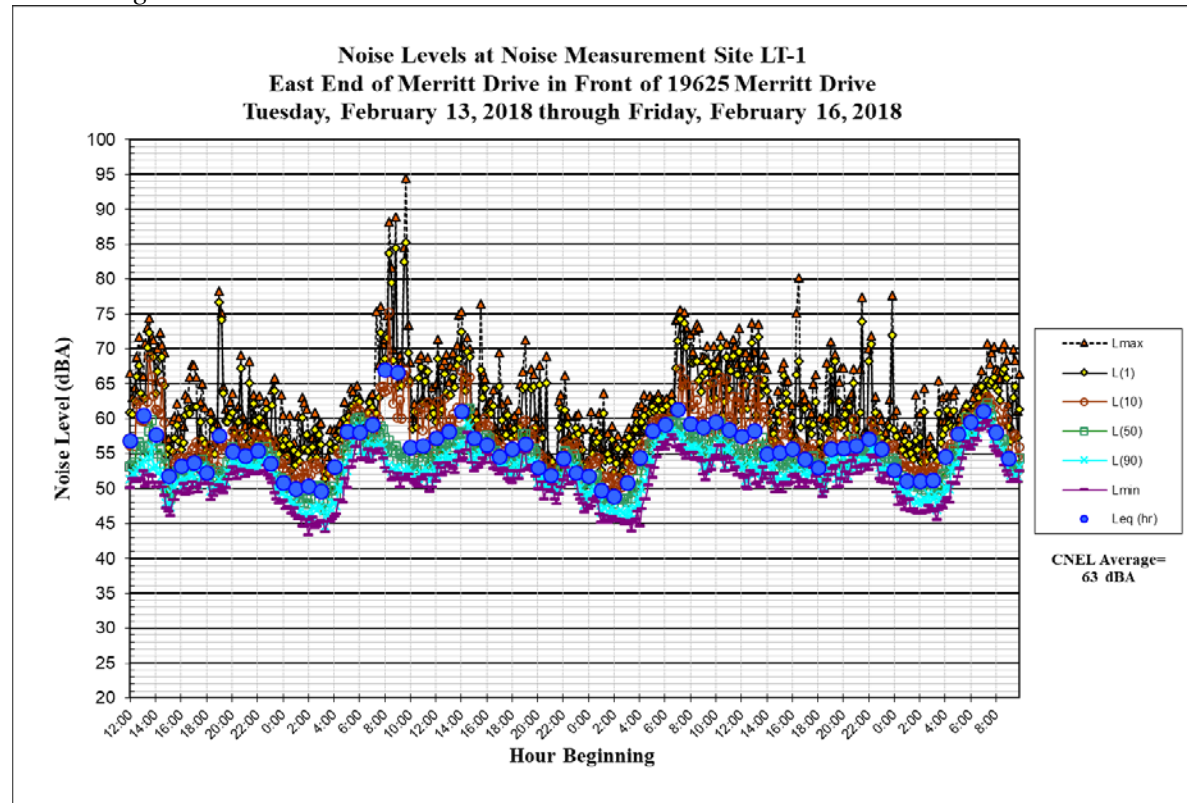
While detailed information for the construction of the proposed project was limited at the time of this study, the project is expected to take 10 years for completion. Based on the hourly average noise levels summarized above in Table 10, construction activities within 50 feet of the property lines of the nearby residential and commercial land uses would exceed 60 and 70 dBA L_{eq} , respectively, and exceed ambient noise levels by more than 5 dBA throughout construction. This would result in indoor speech interference and disruption for a period of up to 10 years.

Construction noise associated with the proposed project and project development alternatives could expose sensitive receptors to elevated noise levels over a period of up to 10 years. The implementation of the reasonable and feasible controls outlined in Mitigation Measure 1 would reduce construction noise levels emanating from the site and minimize disruption and annoyance to the extent feasible. However, the impacts from construction noise would be significant and unavoidable because of the extended period of time anticipated for project construction.

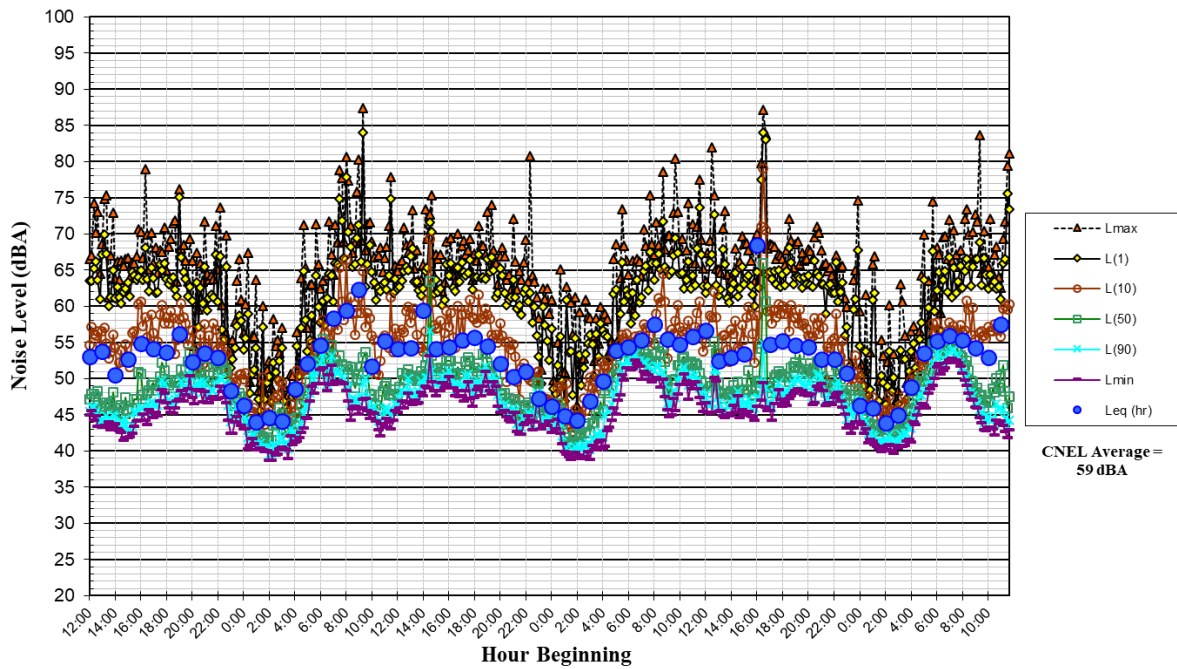
Mitigation Measure 5: Implement construction noise controls identified in Mitigation Measure 1.

Appendix 1

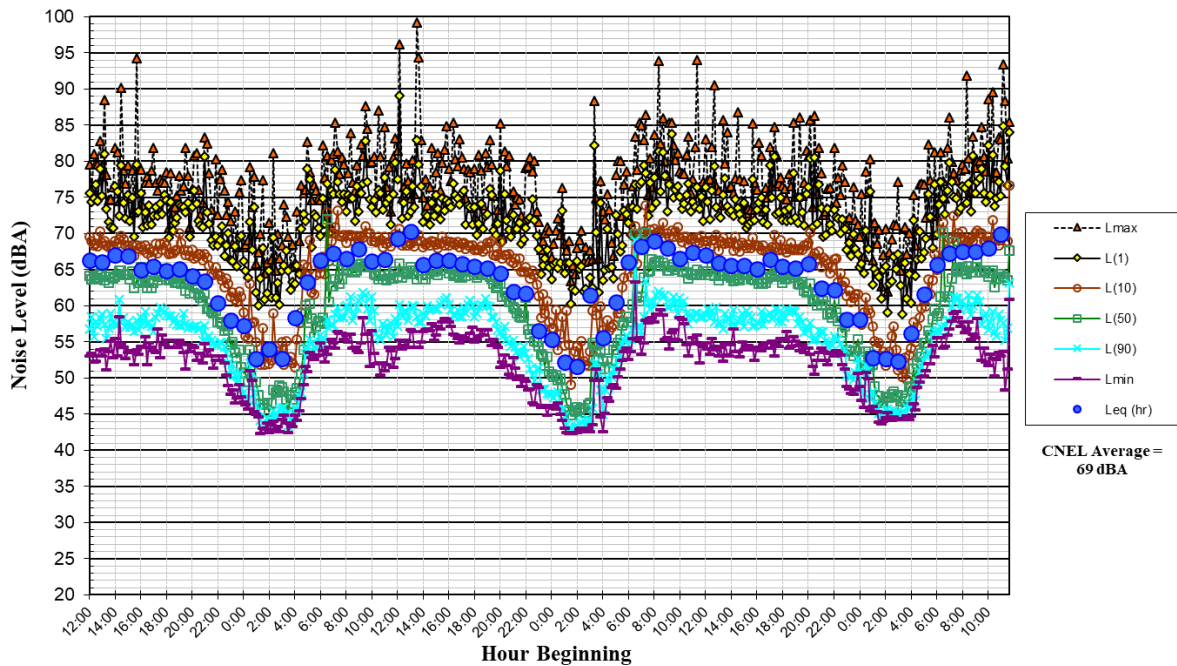
2018 Long-Term Data



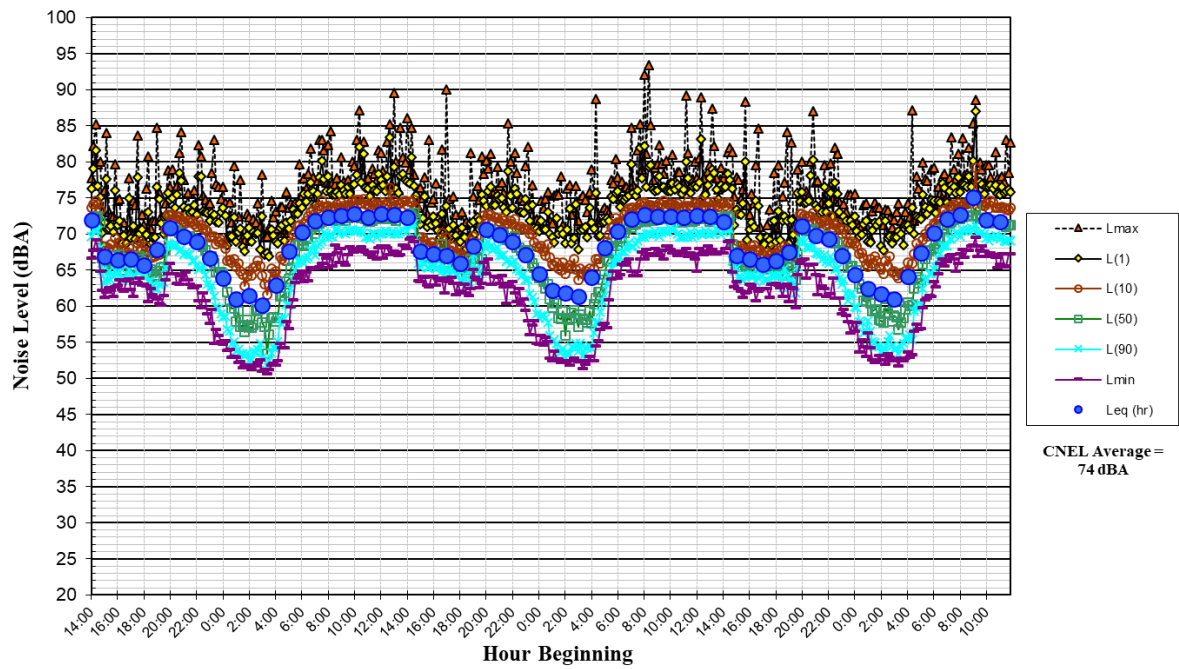
Noise Levels at Noise Measurement Site LT-3
East End of Wheaton Drive, East of Denison Avenue, in Front of 19682 Wheaton Drive
Tuesday, February 13, 2018 through Friday, February 16, 2018



Noise Levels at Noise Measurement Site LT-4
~ 80ft from Centerline of Stevens Creek Blvd, ~ 400ft West of N. Wolfe Road
Tuesday, February 13, 2018 through Friday, February 16, 2018



Noise Levels at Noise Measurement Site LT-5
East of N. Wolfe Road, ~ 185 Feet from the Centerline of I-280
Tuesday, February 13, 2018 through Friday, February 16, 2018



2015 Long-Term Data

