APPENDIX E

Noise and Vibration Assessment

OAKLAND ROAD SITE DEVELOPMENT PERMIT NOISE AND VIBRATION ASSESSMENT

San José, California

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INTRODUCTION

The project proposes to develop the vacant site (APN 237-03-044) with approximately 39,100 gross square feet of industrial office and warehouse uses configured in two three-story buildings (Buildings A and B). The proposed buildings would reach maximum heights of 50 feet. Building A would include 21,900 square feet of industrial office uses on the first through third floors, 2,200 square feet of warehouse space on the first floor, and a 1,195 square feet of amenity space in the form of a roof deck on the third floor. Building B would include 15,000 square feet of industrial office uses. The project would also provide 128 vehicle parking spaces in surface parking lots bordering the proposed buildings. Site access would be provided via a new 26-foot wide driveway at the southeastern corner of the site. The driveway would connect to a perimeter access road along the southern boundary of the site, which would provide access to the surface parking lots adjacent to the proposed buildings.

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 two sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and groundborne vibration, summarizes applicable regulatory criteria, and discusses existing noise conditions in the project vicinity; and, 2) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and recommends mitigation measures to reduce project impacts to less-than-significant levels.

SETTING

Fundamentals of Environmental Noise

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

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

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

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

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

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA DNL. Typically, the highest steady traffic noise level during the daytime is about equal to the DNL and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA DNL with open windows and 65-70 dBA DNL if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed, those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The DNL as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA DNL. At a DNL of about 60 dBA, approximately 12 percent of the population is highly annoyed. When the DNL increases to 70 dBA, the percentage of the population highly annoyed increases to about 25-30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a DNL of 60-70 dBA. Between a DNL of 70-80 dBA, each 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 DNL is 60 dBA, approximately 30-35 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about 3 percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a 4 percent increase in the percentage of the population highly annoyed.

TABLE 1 Definition of Acoustical Terms Used in this Report

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

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

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

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

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous or frequent intermittent vibration levels produce. The guidelines in Table 3 represent syntheses of vibration criteria for human response and potential damage to buildings resulting from construction vibration.

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 cause 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. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from "Historic and some old buildings" to "Modern industrial/commercial buildings". 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.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at 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.

TABLE 3 Reaction of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.25	Strongly perceptible to severe	Threshold at which there is a risk of damage to historic and some old buildings.
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

Regulatory Background – Noise

The State of California, Santa Clara County, and the City of San José have established regulatory criteria that are applicable in this assessment. The State of California Environmental Quality Act (CEQA) Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

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

(a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;

(b) Generation of excessive groundborne vibration or groundborne noise levels; or

(c) For a project located within the vicinity of a private airstrip or an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels.

Santa Clara County Airport Land Use Commission Comprehensive Land Use Plan. The Comprehensive Land Use Plan adopted by the Santa Clara County Airport Land Use Commission contains standards for projects within the vicinity of San José International Airport. Industrial land use projects are considered to be "Generally Acceptable" in noise environments of 70 dBA CNEL or less. This designation assumes that any buildings involved are of normal conventional construction, without any special noise insulation requirements and some outdoor activities might be adversely affected.

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies in the City of San José. The following policies are applicable to the proposed project:

EC-1.2 Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3 and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:

• Cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain "Normally Acceptable"; or

• Cause the DNL at noise sensitive receptors to increase by three dBA DNL or more where noise levels would equal or exceed the "Normally Acceptable" level.

EC-1.3 Mitigate noise generation of new nonresidential land uses to 55 dBA DNL at the property line when located adjacent to existing or planned noise-sensitive residential and public/quasi-public land uses.

EC-1.6 Regulate the effects of operational noise from existing and new industrial and commercial development on adjacent uses through noise standards in the City's Municipal Code.

EC-1.7 Require construction operations within San José to use best available noise suppression devices and techniques and limit construction hours near residential uses per the City's Municipal Code. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:

- Involve substantial noise generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.

Regulatory Background – Vibration

City of San José General Plan. The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies to achieve the goal of minimizing vibration impacts on people, residences, and business operations in the City of San José. The following policies are applicable to the proposed project:

EC-2.3 Require new development to minimize continuous vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, including ruins and ancient monuments or building that are documented to be structurally weakened, a continuous vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to a building. A continuous vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction. Equipment or activities typical of generating continuous vibration include but are not limited to: excavation equipment; static compaction equipment; vibratory pile drivers; pile-extraction equipment; and vibratory compaction equipment. Avoid use of impact pile drivers within 125 feet of any buildings, and within 300 feet of historical buildings, or buildings in poor condition. On a project-specific basis, this distance of 300 feet may be reduced where warranted by a technical study by a qualified professional that verifies that there will be virtually no risk of cosmetic damage to sensitive buildings from the new development during demolition and construction. Transient vibration impacts may exceed a vibration limit of 0.08 in/sec PPV only when and where warranted by a technical study by a qualified professional that verifies that there will be virtually no risk of cosmetic damage to sensitive buildings from the new development during demolition and construction.

Existing Noise Environment

The approximately 2.1-acre project site is comprised of one parcel (APN 237-03-044) located along the west side of Old Oakland Road approximately 900 feet north of the intersection with East Brokaw Road in the City of San José. The project site is within the North San José Development Policy (NSJDP) area. The site is currently vacant, consisting of ruderal vegetation, several mature trees, and cement pads. The site is enclosed by chain-link fencing, and there are no developed vehicular access points to the site. Southern Pacific railroad tracks run adjacent to the western property line. Coyote Creek is located approximately 1,200 feet west of the site, and the I-880 freeway is located approximately 1,600 feet west of the site. The site is surrounded by a mix of light industrial and residential land uses to the north, multi-family residential development to the east across Old Oakland Road, a retail center to the south, and industrial uses to the west across the railroad tracks. Figure 1 shows the project site plan overlaid on an aerial image of the site vicinity.

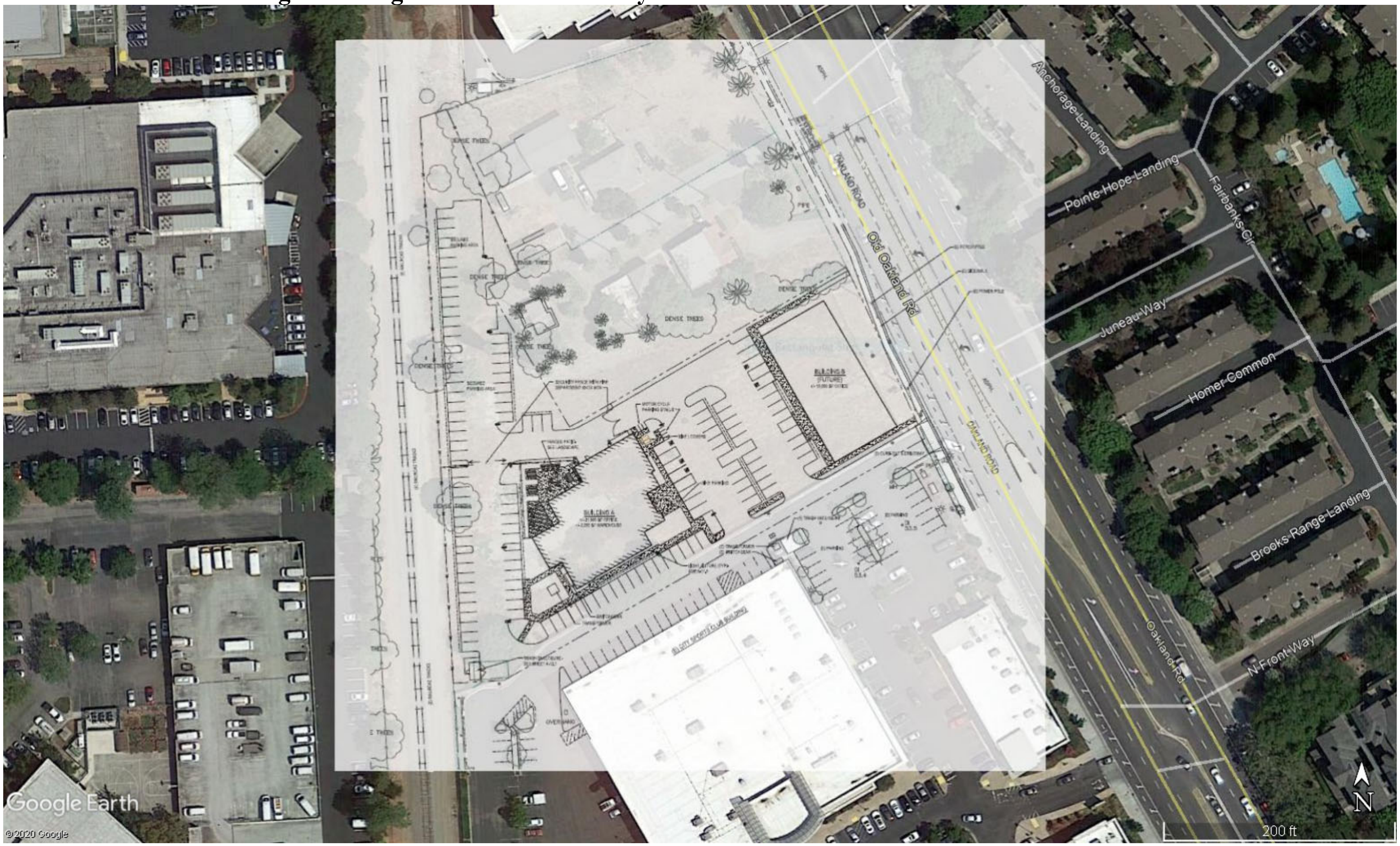
Due to Shelter-in-Place restrictions implemented by the State of California[1] at the time of this study, traffic volumes along the surrounding roadways were lower. A noise monitoring survey was not completed to document ambient noise levels during this time period because resultant noise levels would not be representative of typical conditions.

In order to establish the environmental baseline for the project, noise data contained in the City of San José General Plan were reviewed. A review of these data indicates that the noise environment in the project vicinity is primarily the result of vehicular traffic along Old Oakland Road. In 2008, Old Oakland Road produced a noise level of approximately 70 dBA DNL at 75 feet from the near direction of travel.[2] The General Plan noise contour information shows that noise levels along Old Oakland Road typically range from 65 to 75 dBA DNL, as shown in Figure 2. Noise levels along Old Oakland Road are projected to increase to 74 dBA DNL by 2035.

1 Cal. Exec. Order No. N-33-20, (Mar. 19, 2020).

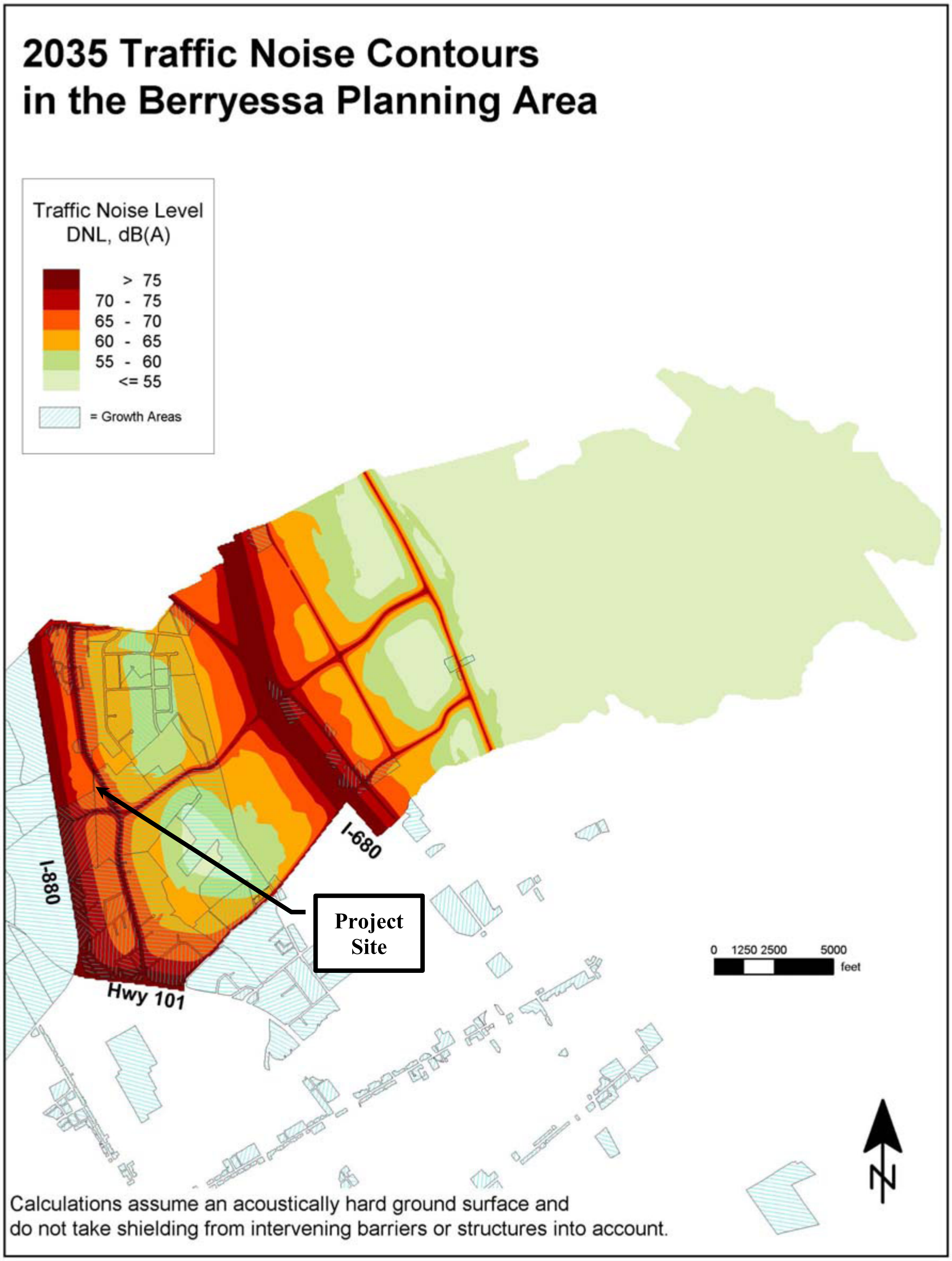
2 Illingworth & Rodkin, Inc., "Envision San Jose 2040 General Plan Comprehensive Update Environmental Noise Assessment," December 2010.

FIGURE 1 Aerial Image Showing Site Plan and Vicinity



Source: Google Earth, October 20, 2020 and McKim Design Group, June 16, 2020.

FIGURE 2 Project Site in Relation to 2035 General Plan Noise Contours



Source: Illingworth & Rodkin, Inc., "Envision San José 2040 General Plan Comprehensive Update Environmental Noise Assessment," December 2010.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

The following criteria were used to evaluate the significance of noise or vibration resulting from the project:

- A significant noise impact would be identified if the project would generate a substantial temporary or permanent noise level increase over ambient noise levels at existing noise-sensitive receptors surrounding the project site.
  - A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. The City of San José considers large or complex projects involving substantial noise-generating activities and lasting more than 12 months significant when within 500 feet of residential land uses or within 200 feet of commercial land uses or offices.
  - A significant permanent noise level increase would occur if project-generated traffic would result in: a) a noise level increase of 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) a noise level increase of 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.
  - 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.
- A significant impact would be identified if the construction of the project would generate excessive vibration levels surrounding receptors. Groundborne vibration levels exceeding 0.2 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.
- A significant noise impact would be identified if the project would expose people residing or working in the project area to excessive aircraft noise levels.

Impact 1a: **Construction Noise.** The construction of the project would increase ambient noise levels in the project vicinity over a period of approximately 36 months. **This is a significant impact**.

Policy EC-1.7 of the City's General Plan requires that all construction operations within the City to use best available noise suppression devices and techniques and to limit construction hours near residential uses per the Municipal Code allowable hours, which are between the hours of 7:00 a.m. and 7:00 p.m. Monday through Friday when construction occurs within 500 feet of a residential land use. Further, the City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. Phases of the project would include demolition, site preparation, grading/excavation, trenching/foundations, construction of the building shell, interior finishing/architectural coatings, and paving. The hauling of exported soil and imported materials would generate truck trips on local roadways as well.

Construction of the project is anticipated to last approximately 24 months, beginning in Spring of 2021. The project would be constructed in two phases, with Building A to be constructed in the first phase. The project would also reconstruct a 12-foot attached sidewalk with tree wells along the project frontage and construct a raised median island along the northbound Oakland Road approach to the Oakland Road/McKay Drive intersection.

During each stage of construction, there would be a different mix of equipment operating, and noise levels would vary by stage and vary within stages, based on the amount of equipment in operation and the location at which the equipment is operating. Typical construction noise levels at 50 feet are shown in Tables 4 and 5. Table 4 shows the average noise level ranges, by construction phase, and Table 5 shows the maximum noise level ranges for different construction equipment. Most construction noise falls with the range of 80 to 90 dBA at 50 feet from the source.

TABLE 4 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 5 Construction Equipment 50-foot Noise Emission Limits

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

Notes:

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

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

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

Source: Mitigation of Nighttime Construction Noise, Vibrations and Other Nuisances, National Cooperative Highway Research Program, 1999.

As shown in Table 4, construction noise levels produced by the project would typically range from 77 to 89 dBA L_{eq} at a distance of 50 feet from the source with all pertinent equipment present at the site. With the minimum required equipment present at the site, construction noise levels produced by the project would typically range from 71 to 83 dBA L_{eq} at a distance of 50 feet from the source. 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.

The nearest noise-sensitive residential land uses would be located approximately 200 feet north of the acoustic center of the construction site, and approximately 300 feet east of the acoustic center of the construction site, opposite Old Oakland Road. Construction noise levels at 200 feet would range from 65 to 77 dBA L_{eq} with all pertinent equipment present at the site and from 59 to 71 dBA L_{eq} with the minimum required equipment present at the site. At 300 feet, construction noise levels would range from 61 to 73 dBA L_{eq} with all pertinent equipment present at the site and from 55 to 64 dBA L_{eq} with the minimum required equipment present at the site.

Per General Plan Policy EC-1.7, temporary noise increases due to project construction would be considered significant as the construction activity would involve substantial noise-generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

Mitigation Measure 1a:

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life.

The City shall require the construction crew to adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity to the extent feasible.

The applicant shall develop a construction noise control plan, including, but not limited to, the following available controls:

- In accordance with Policy EC-1.7 of the City's General Plan, utilize the best available noise suppression devices and techniques during construction activities.

- Construct temporary noise barriers, where feasible, to screen stationary noise-generating equipment. Temporary noise barrier fences would provide a 5 dBA noise reduction if the noise barrier interrupts the line-of-sight between the noise source and receiver and if the barrier is constructed in a manner that eliminates any cracks or gaps.

- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited.

- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall be used reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.

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

- Construction staging areas shall be established at locations that will create the greatest distance between the construction-related noise sources and noise-sensitive receptors nearest the project site during all project construction.

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

- Locate material stockpiles, as well as maintenance/equipment staging and parking areas, as far as feasible from residential receptors.

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

- Notify in writing all adjacent business, residences, and other noise-sensitive land uses of the construction schedule.

- 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.

The construction noise control plan shall be implemented during all phases of construction activity to reduce the noise exposure of neighboring properties. Implementation of the above controls would reduce construction noise levels emanating from the site, minimizing disruption and annoyance. These controls, in combination with the limitations on hours set forth in the Municipal Code, would reduce the impact to a less-than-significant level.

Impact 1b: **Permanent Noise Level Increase.** The proposed project would not result in a permanent noise level increase at existing residential land uses in the project vicinity due to project-generated traffic. **This is a less-than-significant impact.**

A significant impact would result if traffic generated by the project would substantially increase noise levels at sensitive receptors in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater. The existing noise environment in the surrounding area would exceed 60 dBA DNL; therefore, a significant impact would occur if project-generated traffic would permanently increase noise levels by 3 dBA DNL. For reference, a 3 dBA DNL noise increase would be expected if the project would double existing traffic volumes along a roadway.

For the proposed project, peak hour turning movements were provided for the six study intersections. Background plus project traffic volumes were compared to existing volumes (August 2020) to conservatively estimate the project's contribution to the permanent noise level increase. Upon comparison of these traffic conditions, traffic noise increases of 0 to 1 dBA DNL were estimated for roadways serving the site. Traffic noise increases are summarized in Table 6, below. The project would neither result in a doubling of traffic volumes nor result in a permanent noise increase of 3 dBA DNL or more. This is a less-than-significant impact.

TABLE 6 Traffic Noise Increase Summary

Roadway	Segment	Existing PM Peak Hour Volume	Background Plus Project PM Peak Hour Volume	Relative Noise Level Increase, dBA DNL
Old Oakland Road	North of McKay Drive	1850	2006	0
	McKay Drive to Project Driveway	2095	2259	0
	Project Driveway to Brokaw Road	2094	2279	0
	South of Brokaw Road	2091	2246	0
Brokaw Road	West of Ridder Park Road	3798	4239	1
	Ridder Park Road to Old Oakland Road	3319	3735	1
	East of Old Oakland Road	3673	4034	0

Source: Hexagon Transportation Consultants and Illingworth & Rodkin, Inc., October 2020.

Mitigation Measure 1b: None required.

Impact 1c: Noise Levels in Excess of Standards. The proposed project would not generate noise in excess of standards established in the City's General Plan at nearby properties. This a **less-than-significant** noise impact.

Various mechanical equipment for heating, ventilation, and cooling purposes, exhaust fans, and other similar equipment would be located on the roofs of Buildings A and B. The Building A roof plan shows four main roof-top units (3 Outdoor VRF Heat Recovery Systems + 1 Dedicated Outdoor Air System) and exhaust fans. The Outdoor VRF Heat Recovery Systems and exhaust fans will be surrounded by a 6'-0" tall parapet wall. The Dedicated Outdoor Air System will be surrounded by a 5'-6" tall roof screen. Manufacturer's noise data indicate that the Outdoor VRF Heat Recovery Systems produce a sound power level of 85 dBA, and the Dedicated Outdoor Air

System produce a sound power level of 90 dBA. The exhaust fans would not measurably contribute to the noise produced by the main roof-top units. Noise levels generated by the operation of these mechanical equipment could reach 48 dBA L_{eq} at the nearest industrial property line when accounting for the acoustical shielding provided by the parapet wall and the building itself. The DNL, assuming operation of the rooftop mechanical equipment between the hours 6:00 am and 6:00 pm would reach 47 dBA at the nearest property line.

The location, type, and quantities of rooftop mechanical equipment for Building B are not know at this time. For the purposes of this assessment, the same equipment proposed for Building A are assumed to be located on the roof of Building B, at least 15 feet from the north edge of the building, and similarly shielded by parapet walls and roof screens. Under these assumptions, noise levels generated by the operation of Building B mechanical equipment could reach 47 dBA L_{eq} at the nearest industrial property line when accounting for the acoustical shielding provided by the parapet wall and the building itself. The DNL, assuming operation of the rooftop mechanical equipment between the hours 6:00 am and 6:00 pm would reach 46 dBA at the nearest property line.

Parking would be provided in the primary lot between Buildings A and B, in a secondary lot west and south of Building A, and in a secured lot northwest of Building A. Parking lot hours of operation would generally be between 6:00 am and 6:00 pm.

The center of the primary lot between Buildings A and B would be located about 70 feet from the nearest industrial land use to the north. Noise associated with the use of the parking lot would include vehicular circulation, loud engines, car alarms, door slams, and human voices. The maximum sound (L_{max}) of a passing car at 15 mph typically ranges from 48 to 58 dBA at a distance of 70 feet. The noise generated during an engine start is similar. Door slams create lower noise levels. The hourly average noise level resulting from all of these noise-generating activities in a busy parking lot typically ranges from 43 to 53 dBA L_{eq} at a distance of 70 feet from the center of the parking area. The primary parking lot would typically be used between the hours of 6:00 am and 6:00 pm, yielding a DNL noise level of approximately 47 dBA.

Parking noise occurring in the secondary lot west and south of Building A would occur further from industrial land uses in the project vicinity, or would be partially shielded by the intervening building, resulting in lower noise levels.

Parking in the secured lot northwest of Building A would generate noise levels of about 46 to 56 dBA L_{eq} at a distance of 50 feet from the center of the parking area. The DNL noise level from parking in the secured lot is conservatively estimated to reach 50 dBA at the nearest industrial and residential property lines to the east.

The combined noise levels produced by mechanical equipment and parking would be approximately 50 dBA DNL, which would not measurably increase existing noise levels in the area. This is a less-than-significant impact.

Mitigation Measure 1c: **None required.**

Impact 2: Exposure to Excessive Groundborne Vibration due to Construction. Construction-related vibration levels could exceed 0.2 in/sec PPV at the nearest buildings of conventional construction. **This is a significant impact.**

According to Policy EC-2.3 of the City of San José General Plan, a vibration limit of 0.08 in/sec PPV shall be used to minimize the potential for cosmetic damage to sensitive historical structures, and a vibration limit of 0.2 in/sec PPV shall be used to minimize damage at buildings of normal conventional construction. The vibration limits contained in this policy are conservative and designed to provide the ultimate level of protection for existing buildings in San José. A review of the City of San José Historic Resource Inventory[3] indicates that there are no properties of historical significance in the site vicinity. Therefore, this analysis assumes that the 0.2 in/sec PPV threshold would apply to all buildings in the immediate site vicinity.

Cosmetic damage (also known as threshold damage) is defined as hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage is defined as hairline cracking in masonry or the loosening of plaster. Major structural damage is defined as wide cracking or the shifting of foundation or bearing walls.

Construction activities associated with the project would include demolition, site preparation, foundation work, and new building framing and finishing. Foundation construction techniques involving impact or vibratory pile driving, which can cause excessive vibration, are not anticipated as part of the project. Heavy vibration-generating construction equipment, such as vibratory rollers or the dropping of heavy equipment (e.g., clam shovel drops), would have the potential to produce vibration levels of 0.2 in/sec PPV or more at buildings of normal conventional construction located within 30 feet of the project site.

Table 7 presents vibration levels from construction equipment expected at the nearest buildings to the site. Calculations were made to estimate vibration levels at distances ranging from 15 feet to 35 feet. Vibration levels are highest close to the source, and then attenuate with increasing distance at the rate $(D_{ref}/D)^{1.1}$, where D is the distance from the source in feet and D_{ref} is the reference distance of 25 feet. At a distance of about 15 feet, vibration levels due to vibratory rollers or the dropping of heavy equipment are conservatively calculated to reach up to approximately 0.4 in/sec PPV, which would exceed the 0.2 in/sec PPV threshold for conventional buildings.

The US Bureau of Mines has analyzed the effects of blast-induced vibration on buildings in USBM RI 8507,[4] and these findings have been applied to vibrations emanating from construction equipment on buildings.[5] As shown on Figure 3, these studies indicate a less than 5% probability of "threshold damage" (referred to as cosmetic damage elsewhere in this report) at vibration levels of 0.4 in/sec PPV or less and no observations of "minor damage" or "major damage" at vibration levels of 0.4 in/sec PPV or less. Figure 3 presents the damage probability, as reported in USBM

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3 https://www.sanjoseca.gov/your-government/departments/planning-building-code-enforcement/planning-division/historic-preservation/historic-resources-inventory

4 Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, Structure Response and Damage Produced by Ground Vibration form Surface Mine Blasting, RI 8507, Bureau of Mines Report of Investigations, U.S. Department of the Interior Bureau of Mines, Washington, D.C., 1980.

5 Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

RI 8507, and reproduced by Dowding, assuming a maximum vibration level of 0.4 in/sec PPV. Based on these data, cosmetic or threshold damage would be manifested in the form of hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. However, minor damage (e.g., hairline cracking in masonry or the loosening of plaster) or major structural damage (e.g., wide cracking or shifting of foundation or bearing walls) would not occur at the adjacent buildings, assuming a maximum vibration level of 0.4 in/sec PPV. Other buildings of normal conventional construction located beyond 30 feet from the project site would not be exposed to vibration levels exceeding the 0.2 in/sec PPV threshold for normal buildings.

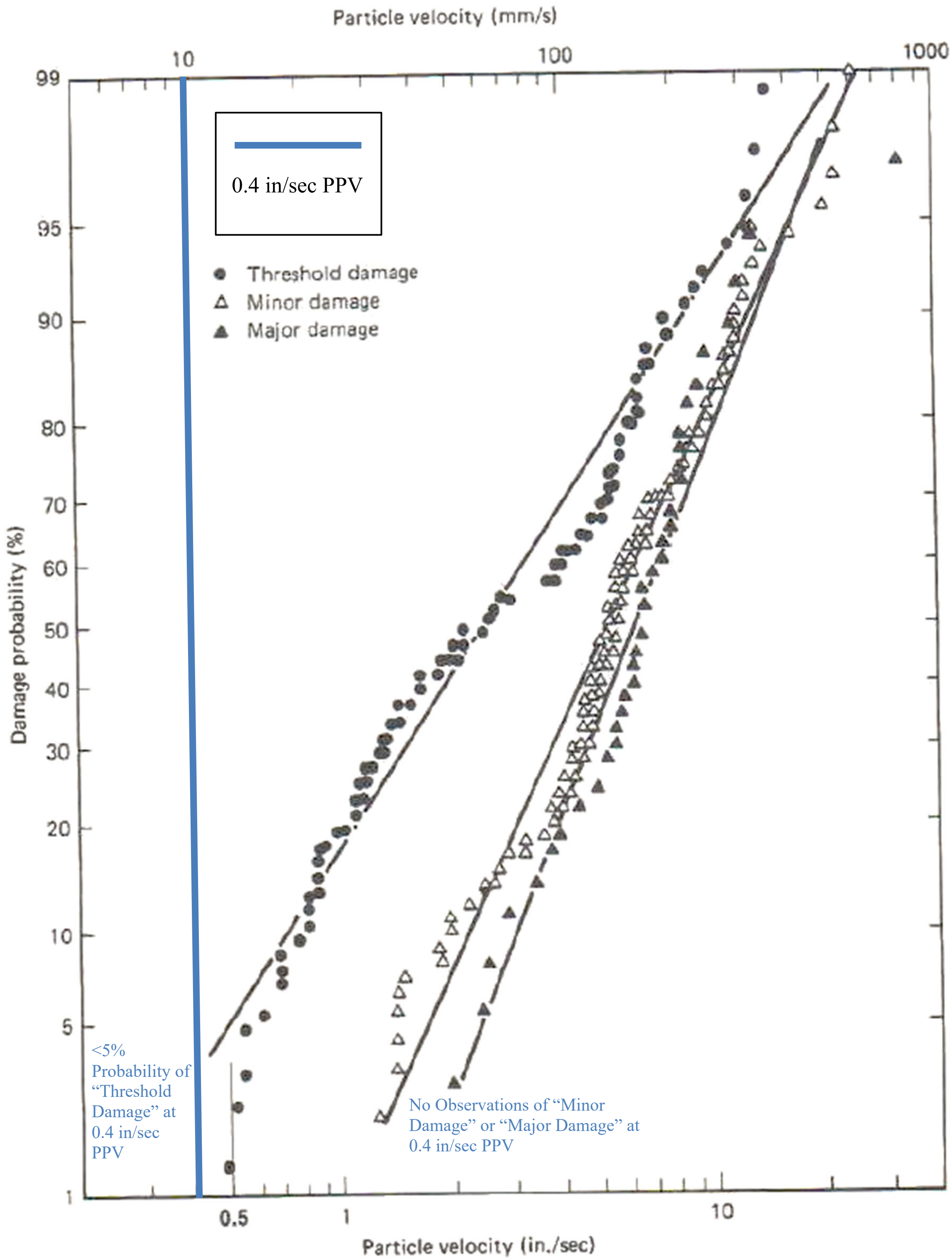
Project-generated vibration levels would be capable of cosmetically damaging the buildings located just east of the secured parking area if vibratory rollers are used, or heavy equipment is dropped, within 30 feet of the buildings. At these locations, and in other surrounding areas where vibration would not be expected to cause structural damage, vibration levels may still be perceptible. However, as with any type of construction, this would be anticipated and would not be considered significant, given the intermittent and short duration of the phases that have the highest potential of producing vibration. By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during hours with the least potential to affect nearby residences and businesses, perceptible vibration can be kept to a minimum.

TABLE 7 Construction Vibration Levels at Nearby Buildings

Equipment		PPV (in/sec)				
		Source Level at 25 ft	Vibration Level at 15 ft	Vibration Level at 20 ft	Vibration Level at 30 ft	Vibration Level at 35 ft
Clam shovel drop		0.202	**0.354**	0.258	0.165	0.140
Hydromill (slurry wall)	in soil	0.008	0.014	0.010	0.007	0.006
	in rock	0.017	0.030	0.022	0.014	0.012
Vibratory Roller		0.210	**0.368**	0.268	0.172	0.145
Hoe Ram		0.089	0.156	0.114	0.073	0.061
Large bulldozer		0.089	0.156	0.114	0.073	0.061
Caisson drilling		0.089	0.156	0.114	0.073	0.061
Loaded trucks		0.076	0.133	0.097	0.062	0.052
Jackhammer		0.035	0.061	0.045	0.029	0.024
Small bulldozer		0.003	0.005	0.004	0.002	0.002

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, FTA Report No. 0123, September 2018, as modified by Illingworth & Rodkin, Inc., October 2020.

FIGURE 3 Probability of Cracking and Fatigue from Repetitive Loading



Source: Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996 as modified by Illingworth & Rodkin, Inc., October 2020.

Mitigation Measures:

The following measures shall be implemented where vibration levels due to construction activities would exceed 0.2 in/sec PPV at nearby buildings to reduce the impact to a less-than-significant level:

- Prohibit the use of heavy vibration-generating construction equipment within 30 feet of adjacent buildings.
- Use a smaller vibratory roller, such as the Caterpillar model CP433E vibratory compactor, when compacting materials within 30 feet of adjacent buildings. Only use the static compaction mode when compacting materials within 15 feet of buildings.
- Avoid dropping heavy equipment and use alternative methods for breaking up existing pavement, such as a pavement grinder, instead of dropping heavy objects, within 30 feet of adjacent buildings.
- The contractor shall alert heavy equipment operators to the close proximity of the adjacent structures so they can exercise extra care.
- Designate a person responsible for registering and investigating claims of excessive vibration. The contact information of such person shall be clearly posted on the construction site.

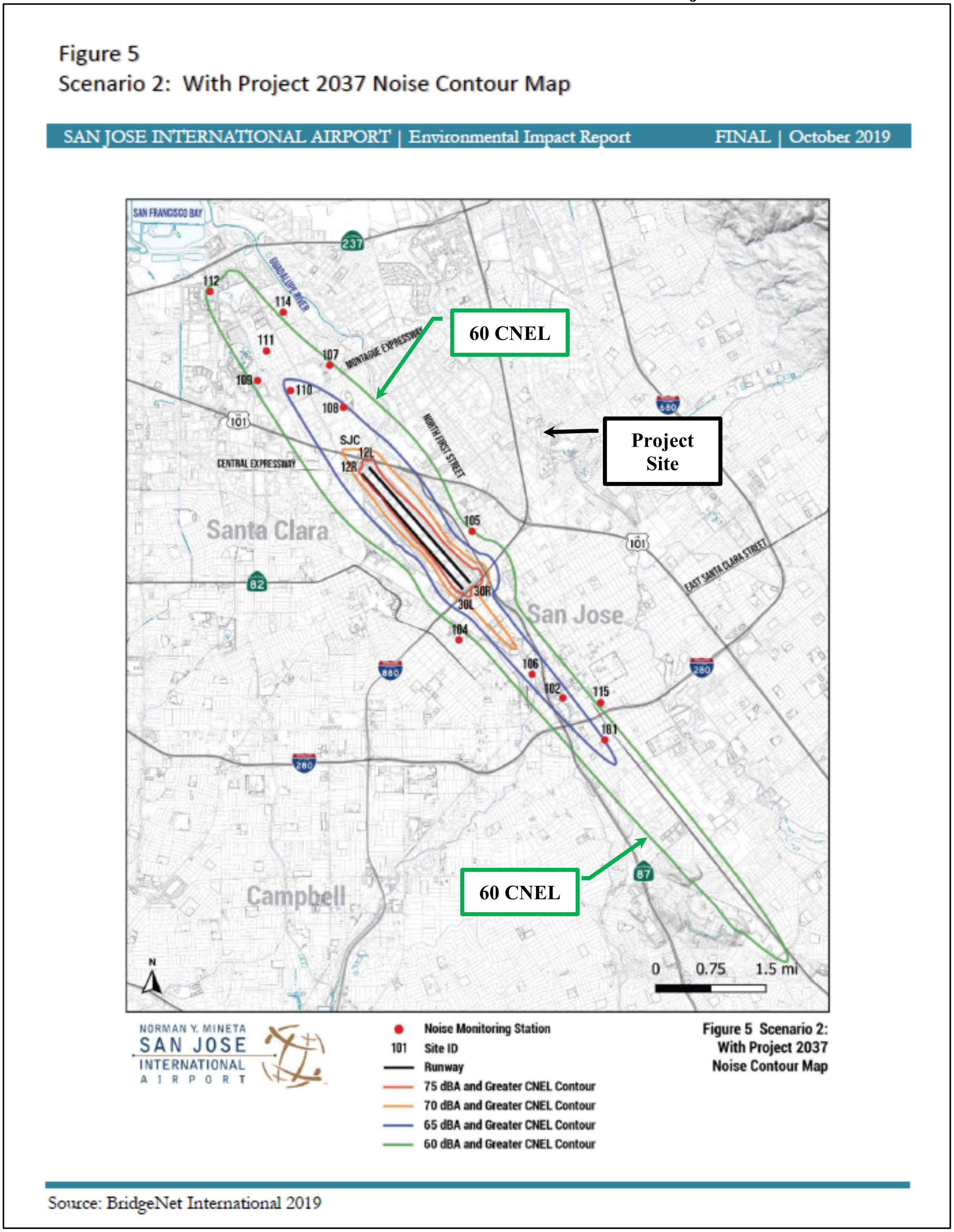
Impact 3: **Excessive Aircraft Noise.** The project site is located approximately 1.9 miles from the nearest airport, and the proposed project would not expose people working at the site to excessive aircraft noise. **This is a less-than-significant impact.**

Norman Y. Mineta San José International Airport is a public-use airport located approximately 1.9 miles southwest of the project site. Figure 4 shows that the project site lies well outside the 2037 60 dBA CNEL noise contour of the airport, according to the City's new Airport Master Plan Environmental Impact Report.[6] This means that future exterior noise levels due to aircraft would not exceed 60 dBA CNEL/DNL. Industrial land use projects are considered to be "Generally Acceptable" in noise environments of 70 dBA CNEL or less. Similarly, Reid-Hillview Airport and Moffett Federal Airfield are located approximately 5 and 7 miles from the project site, and these airports produce considerably less environmental noise as compared to Norman Y. Mineta San José International Airport. Noise levels produced by Reid-Hillview Airport and Moffett Federal Airfield aircraft are insignificant at the site and would be clearly compatible with the proposed land use. This is a less-than-significant impact.

Mitigation Measure 3: **None required.**

[6] David J. Powers & Associates, Inc., Integrated Final Environmental Impact Report, Amendment to Norman Y. Mineta San Jose International Airport Master Plan, April 2020.

FIGURE 4 2037 CNEL Noise Contours for SJIA Relative to Project Site



Appendix A
Qualifications of Technical Expert

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MICHAEL S. THILL

Mr. Thill is a principal of the firm with 22 years of professional experience in the field of acoustics. His expertise includes performing field research, analyzing data, and noise modeling. He has conducted numerous field surveys in a variety of acoustical environments to quantify airborne noise levels, groundborne vibration levels, and hydro-acoustic noise levels. He has analyzed and summarized complex sets of data for inclusion into noise models. Mr. Thill has been trained, and is a regular user of FHWA's Traffic Noise Model (TNM), and is familiar with federal and State procedures for preparing highway noise study reports.

Mr. Thill has authored technical noise reports for various land use proposals including residential, commercial, educational, and industrial developments. He has managed the General Plan Update noise studies for several communities in California and has recommended policy language in order to maintain compatible noise levels community-wide. Some of his recent major projects have included the assessment of noise and vibration from data center projects, quarry expansion projects, groundwater recharge projects, and winery projects where operations and special events have been of concern in rural settings. He has vast experience explaining acoustical concepts and the results of his analyses in public forums to the general public and project decision-makers.

Mr. Thill has also led traffic noise investigations for major transportation projects including the Route 4 Bypass project (2003 to 2013) and the I-680/Route 4 Interchange project (2014 to 2015) in Contra Costa County, California. He managed the noise study reports the US Highway 101 and State Route 85 Express Lanes projects for the Santa Clara County Valley Transit Authority (2011 to 2013), proposed along 66 miles, combined, of project study area between Mountain View and Morgan Hill, California. In 2013, Mr. Thill led the analyses of noise impacts due to the Jennings Avenue Pedestrian and Bicycle Rail Crossing Project, and in 2015, Mr. Thill led the analysis of noise impacts and noise abatement for the US Highway 101 / Hearn Avenue Interchange Project in Santa Rosa, California.

PROFESSIONAL EXPERIENCE

2009 - Present Principal	Illingworth & Rodkin, Inc. Petaluma, California
2005 - 2009 Senior Consultant	Illingworth & Rodkin, Inc. Petaluma, California
1998 - 2005 Staff Consultant	Illingworth & Rodkin, Inc. Petaluma, California

EDUCATION

1998	University of California at Santa Barbara B.S., Major: Environmental Science

PROFESSIONAL SOCIETIES

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