SAXELBY ACOUSTICS
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Environmental Noise Assessment

2801 Pinole Valley Road

City of Pinole, California

November 11, 2021

Project # 200602

Prepared for:

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prefab evolved

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- Noise Study and Vibration Study
  - p 23 Groundborne vibration needs to be assessed for construction activities.
  - p 22 Pursuant to 2010 EIR MM 4.5.6, recommendations should be provided for use of construction noise control measures.
  - p 21 Pursuant to 2010 EIR MM 4.5.3b identify appropriate noise attenuation measures to protect new residents from ambient noise (this is not a CEQA impact of the project, since this is the noise environment potentially affecting new residents, but is a land use compatibility issue that can be resolved with design features such as sound-rated windows and doors and construction techniques).
  - p 10 Mechanical parking lifts in the garage to be evaluated.
  - Upon request, M-Group is able to expand our scope of work to include preparation of a noise and vibration study.

- Water Service Will-Serve Letter from EBMUD

- Sewer Verification Letter from City

- Cultural Resources Study (CRS)/Historical investigation pursuant to Mitigation Measures 4.10.1a set forth in the 2010 EIR.
  - MM 4.10.1a The City shall include the following as an action in the Community Character Element of the General Plan Update. Cultural resources studies (i.e., archaeological, and historical investigations) shall be required for all applicable discretionary projects, in accordance with CEQA regulations, for areas not previously surveyed and/or that are sensitive for cultural resources. The studies should identify cultural resources (i.e., prehistoric sites, historic sites, and historic buildings/structures) in the project area, determine their eligibility for inclusion in the California Register of Historical Resources, and provide feasible and appropriate measures for the protection of any historical resources or unique archaeological resources to maximum extent feasible. Cultural resources studies should be completed by a professional archaeologist or architectural historian that meets the Secretary of the Interior's Professional Qualifications Standards in archaeology.
  - Upon request, M-Group is able to expand our scope of work to include preparation of CRS/Historical investigation.

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INTRODUCTION

The 2801 Pinole Valley Road project consists of the development of a commercial office addition and new 29-unit multi-family residential building. The project is located east of Pinole Valley Road and south of Interstate 80 in Pinole, California. The project will provide a new addition to the existing building as well as a new multi-family apartment building.

Figure 1 shows the project site plan. **Figure 2** shows an aerial photo of the project site.

ENVIRONMENTAL SETTING

BACKGROUND INFORMATION ON NOISE

Fundamentals of Acoustics

Acoustics is the science of sound. Sound may be thought of as mechanical energy of a vibrating object transmitted by pressure waves through a medium to human (or animal) ears. If the pressure variations occur frequently enough (at least 20 times per second), then they can be heard and are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second or Hertz (Hz).

Noise is a subjective reaction to different types of sounds. Noise is typically defined as (airborne) sound that is loud, unpleasant, unexpected or undesired, and may therefore be classified as a more specific group of sounds. Perceptions of sound and noise are highly subjective from person to person.

Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to this reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB, and changes in levels (dB) correspond closely to human perception of relative loudness.

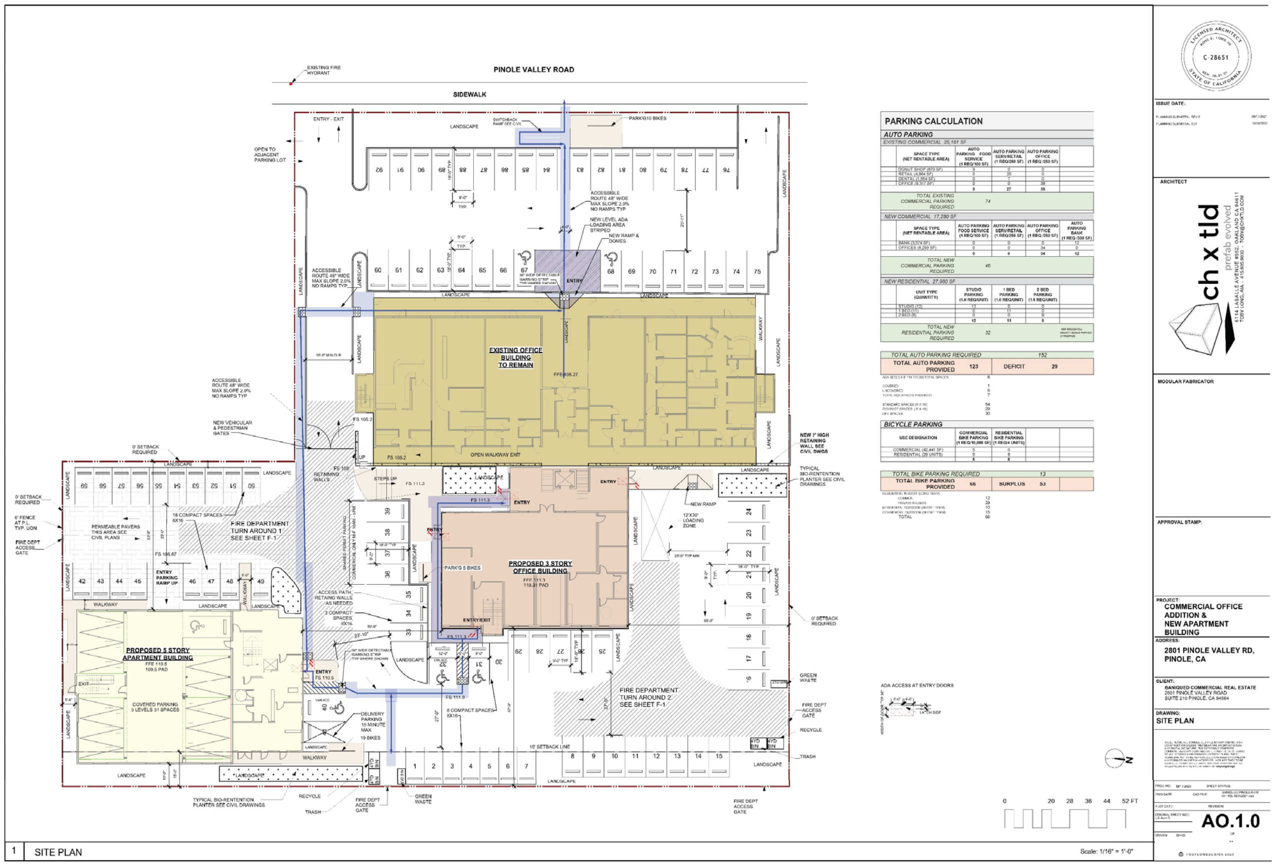
The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by A-weighted sound levels. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment.

2801 Pinole Valley Road

City of Pinole, California

Figure 1

Project Site Plan



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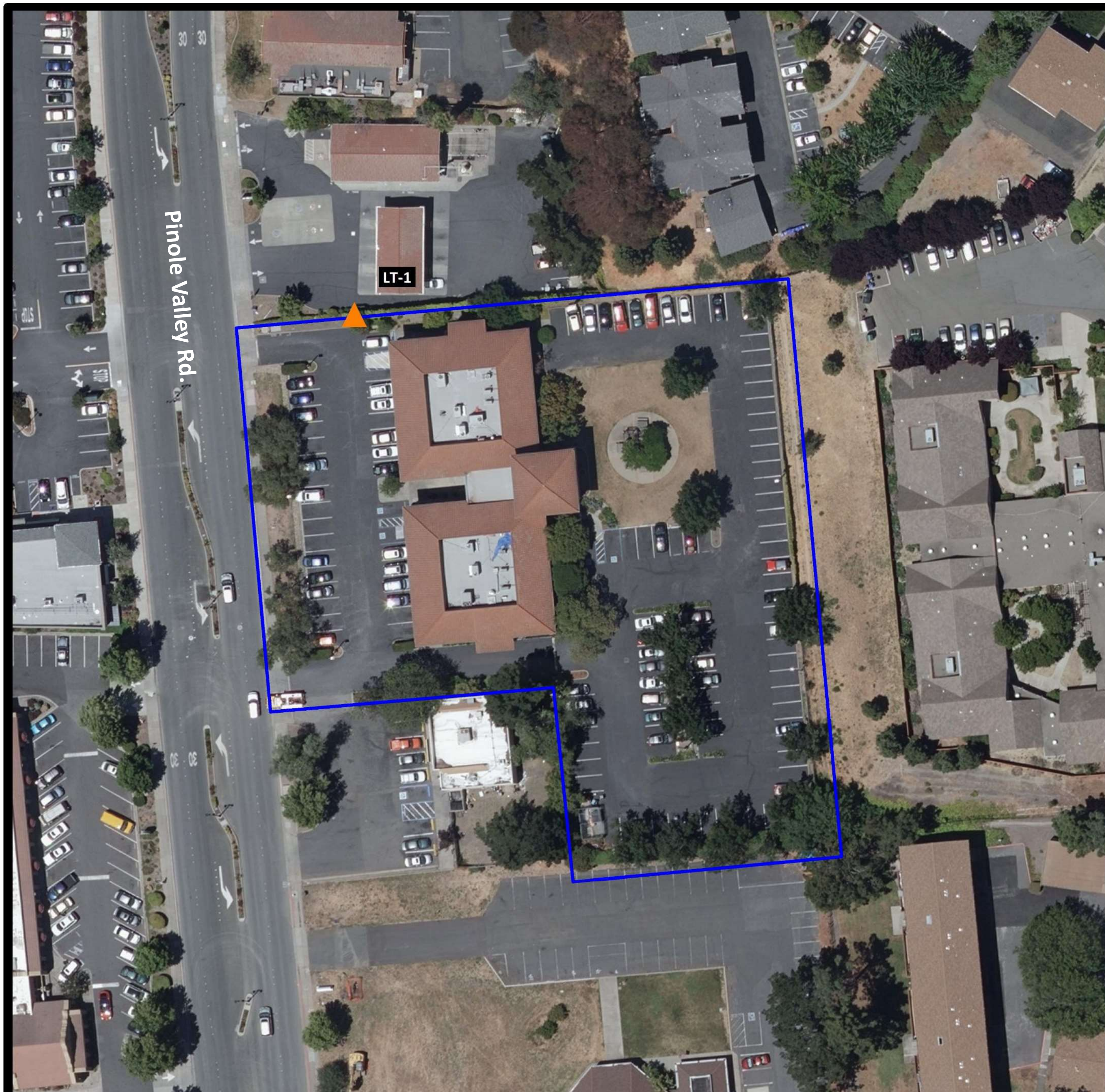

2801 Pinole Valley Road

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Figure 2

Noise Measurement Site

Legend

Project Site

Noise Measurement - Long Term

10 m 25 m 40 m

Projection: State Plane (California Zone 3) / NAD83 / meters
Rev. Date: 06/19/2020

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The decibel scale is logarithmic, not linear. In other words, two sound levels 10-dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10-dBA is generally perceived as a doubling in loudness. For example, a 70-dBA sound is half as loud as an 80-dBA sound, and twice as loud as a 60 dBA sound.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given environment. A common statistical tool is the average, or equivalent, sound level (L_{eq}), which corresponds to a steady-state A weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L_{eq} is the foundation of the composite noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The day/night average level (DNL or L_{dn}) is based upon the average noise level over a 24-hour day, with a +10-decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

Table 1 lists several examples of the noise levels associated with common situations. **Appendix A** provides a summary of acoustical terms used in this report.

TABLE 1: TYPICAL NOISE LEVELS

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	--110--	Rock Band
Jet Fly-over at 300 m (1,000 ft.)	--100--	
Gas Lawn Mower at 1 m (3 ft.)	--90--	
Diesel Truck at 15 m (50 ft.), at 80 km/hr. (50 mph)	--80--	Food Blender at 1 m (3 ft.) Garbage Disposal at 1 m (3 ft.)
Noisy Urban Area, Daytime Gas Lawn Mower, 30 m (100 ft.)	--70--	Vacuum Cleaner at 3 m (10 ft.)
Commercial Area Heavy Traffic at 90 m (300 ft.)	--60--	Normal Speech at 1 m (3 ft.)
Quiet Urban Daytime	--50--	Large Business Office Dishwasher in Next Room
Quiet Urban Nighttime	--40--	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	--30--	Library
Quiet Rural Nighttime	--20--	Bedroom at Night, Concert Hall (Background)
	--10--	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	--0--	Lowest Threshold of Human Hearing

Source: Caltrans, Technical Noise Supplement, Traffic Noise Analysis Protocol. September, 2013.

Effects of Noise on People

The effects of noise on people can be placed in three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists and different tolerances to noise tend to develop based on an individual's past experiences with noise.

Thus, an important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which one has adapted: the so-called ambient noise level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it.

With regard to increases in A-weighted noise level, the following relationships occur:

- Except in carefully controlled laboratory experiments, a change of 1-dBA cannot be perceived;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference;
- A change in level of at least 5-dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

Stationary point sources of noise – including stationary mobile sources such as idling vehicles – attenuate (lessen) at a rate of approximately 6-dB per doubling of distance from the source, depending on environmental conditions (i.e. atmospheric conditions and either vegetative or manufactured noise barriers, etc.). Widely distributed noises, such as a large industrial facility spread over many acres, or a street with moving vehicles, would typically attenuate at a lower rate.

EXISTING AND FUTURE NOISE AND VIBRATION ENVIRONMENTS

EXISTING NOISE RECEPTORS

Some land uses are considered more sensitive to noise than others. Land uses often associated with sensitive receptors generally include residences, schools, libraries, hospitals, and passive recreational areas. Sensitive noise receptors may also include threatened or endangered noise sensitive biological species, although many jurisdictions have not adopted noise standards for wildlife areas. Noise sensitive land uses are typically given special attention in order to achieve protection from excessive noise.

Sensitivity is a function of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities involved. In the vicinity of the project site, sensitive land uses include existing multifamily residential uses to the north, east, and south of the project site.

EXISTING GENERAL AMBIENT NOISE LEVELS

The existing noise environment in the project area is defined primarily by the local roadway network.

To quantify the existing ambient noise environment in the project vicinity, Saxelby Acoustics conducted a continuous (24-hr.) noise level measurement at one location on the project site.

The noise measurement location is shown on **Figure 2**. A summary of the noise level measurement survey results is provided in **Table 2**. **Appendix B** contains the complete results of the noise monitoring.

The sound level meters were programmed to record the maximum, median, and average noise levels at each site during the survey. The maximum value, denoted L_{max}, represents the highest noise level measured. The average value, denoted L_{eq}, represents the energy average of all of the noise received by the sound level meter microphone during the monitoring period. The median value, denoted L_{50}, represents the sound level exceeded 50 percent of the time during the monitoring period.

Larson Davis Laboratories (LDL) Model 812 precision integrating sound level meter was used for the ambient noise level measurement survey. The meter was calibrated before and after use with a CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

TABLE 2: SUMMARY OF EXISTING BACKGROUND NOISE MEASUREMENT DATA

Site	Date	Average Measured Hourly Noise Levels, dBA						
			Daytime (7:00 am - 10:00 pm)			Nighttime (10:00 pm – 7:00 am)		
		L_{dn}	L_{eq}	L_{50}	L_{max}	L_{eq}	L_{50}	L_{max}
LT-1	6/17/2020	63	60	58	78	56	49	73
Source : Saxelby Acoustics – 2020								

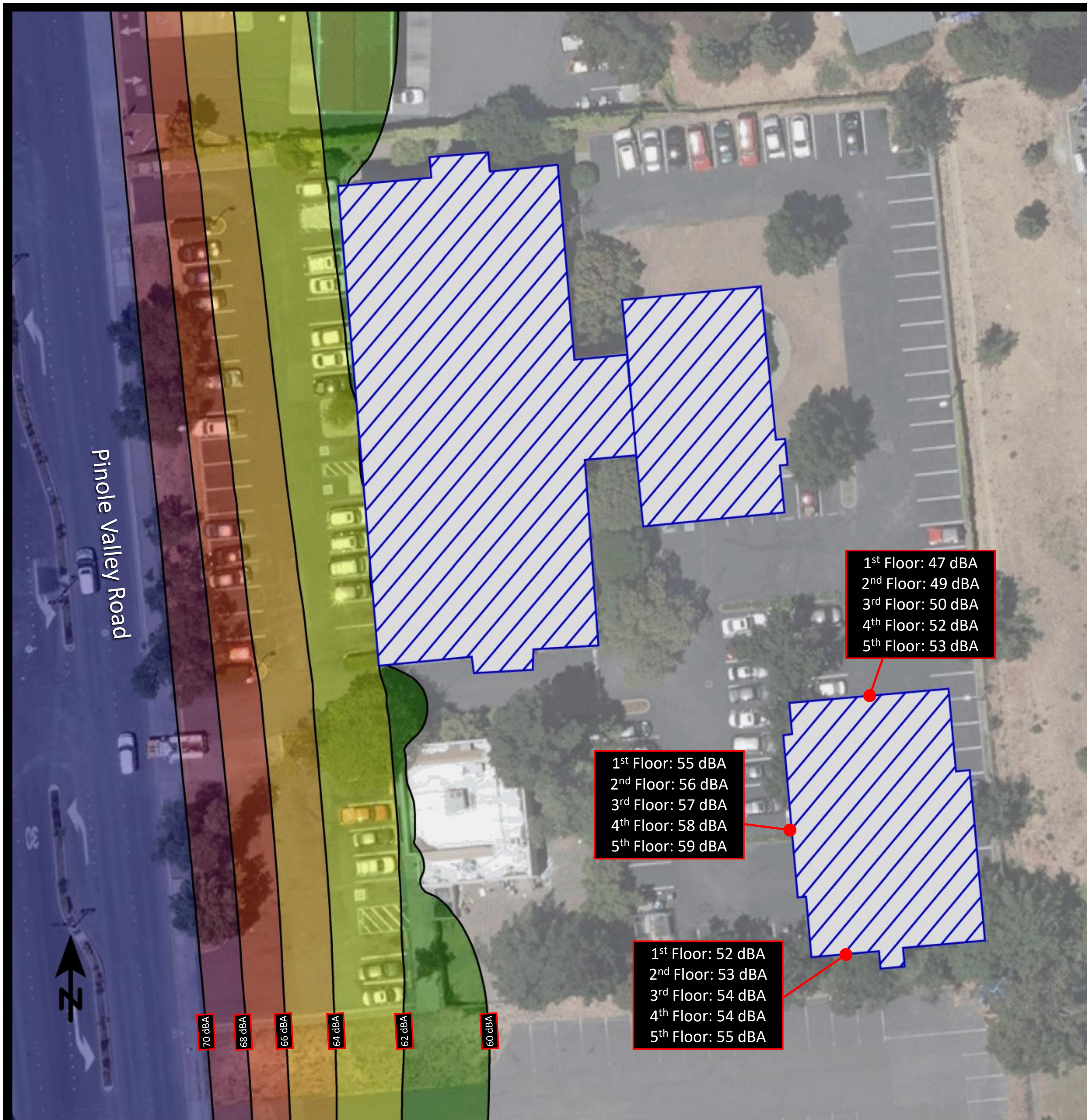
EVALUATION OF TRANSPORTATION NOISE ON PROJECT SITE

Current traffic counts along Pinole Valley Road in the project vicinity published by the City of Pinole Public Works Department totaled 4,387 vehicles during the AM peak hour as of 2006. Assuming a 1% per year growth rate, the estimated 2041 ADT volume would be 62,146 vehicles. This would equate to a +1 dBA increase in traffic noise from 2020 to 2041.

Saxelby Acoustics used the SoundPLAN noise model to calculate traffic noise levels at the proposed residential uses due to the estimated 2041 traffic on Pinole Valley Road. **Figure 3** shows future noise contours (dBA, L_{dn}) at the project site. **Table 3** summarizes the results of the analysis.

TABLE 3: TRAFFIC NOISE LEVELS ON PROJECT SITE

Location	Predicted Traffic Noise Level, L_{dn}
Floor 1 Exterior	54.8 dBA
Floor 2 Exterior	56.0 dBA
Floor 3 Exterior	57.3 dBA
Floor 4 Exterior	58.1 dBA
Floor 5 Exterior	58.7 dBA



2801 Pinole Valley Road

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Figure 3

Future (2041) Transportation Noise Contours (dBA L_{dn})

Signs and symbols

Proposed Building

Levels in dB(A)

<= 60
60 - 62
62 - 64
64 - 66
66 - 68
68 - 70
> 70

1 : 625

0 3 6 12 18 24 m

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EVALUATION OF PROJECT-GENERATED NON-TRANSPORTATION NOISE SOURCES

The HVAC units servicing the proposed commercial space and vehicle traffic in the proposed parking lot are considered to be the primary noise sources for this project. This analysis considers each of these primary noise sources on the project site.

The following is a list of assumptions used for the noise modeling. The data used is based upon a combination of manufacturer's provided data and Saxelby Acoustics data from similar operations.

Rooftop HVAC: Two twelve-ton packaged units atop the new commercial space operating continuously during the daytime. Manufacture's data.

Parking Lot: Upon completion of the project, 134 parking spaces will be available for use on the project site. For assessing parking lot generated noise, the total gross number of vehicles on the project site is used. For this project, the maximum on-site vehicle circulation was estimated to be 268 in the PM peak hour (134 vehicles entering and 134 vehicles exiting). Therefore, this number is used for assessing parking lot noise during daytime (7:00 a.m. to 10:00 p.m.) hours. Parking lot movement for cars is predicted to generate a sound exposure level (SEL) of 71 dBA SEL at 50 feet. Additionally, it is expected that a truck delivery could also occur during the peak hour@ 85 dBA SEL at 50 feet. Saxelby Acoustics data.

Saxelby Acoustics used the SoundPLAN noise prediction model. Inputs to the model included sound power levels for the proposed HVAC units and parking lot circulation, existing and proposed buildings, terrain type, and locations of sensitive receptors. These predictions are made in accordance with International Organization for Standardization (ISO) standard 9613-2:1996 (Acoustics – Attenuation of sound during propagation outdoors). ISO 9613 is the most commonly used method for calculating exterior noise propagation.

Figure 4 shows the average (dBA, L_{eq}) predicted noise contours for the project. **Figure 5** shows the maximum (dBA, L_{max}) predicted noise contours for the project.

It should be noted that the car stackers located within the first floor of the residential apartment building are not considered to be a substantial exterior noise source. Saxelby Acoustics used previously collected noise measurements of a car stacker system in Berkeley, California. During operation of the stackers noise levels measured 58 dBA Leq and 72 dBA Lmax, at a distance of 30 feet from the stacker equipment. The proposed car stackers would be located within the concrete podium structure. Assuming a conservative noise reduction of 20 dBA from this podium construction, exterior noise levels would be 38 dBA Leq and 52 dBA Lmax. This meets the City of Pinole exterior nighttime noise standards of 45 dBA Leq and 65 dBA Lmax. Therefore, no noise reduction measures would be required for the car stackers.

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Figure 4

Parking Lot and HVAC Noise Contours (dBA L_{eq})

Signs and symbols

Proposed Building

Levels in dB(A)

<= 55
55 - 56
56 - 57
57 - 58
58 - 59
59 - 60
> 60

1 : 748

0 3.75 7.5 15 22.5 30 m

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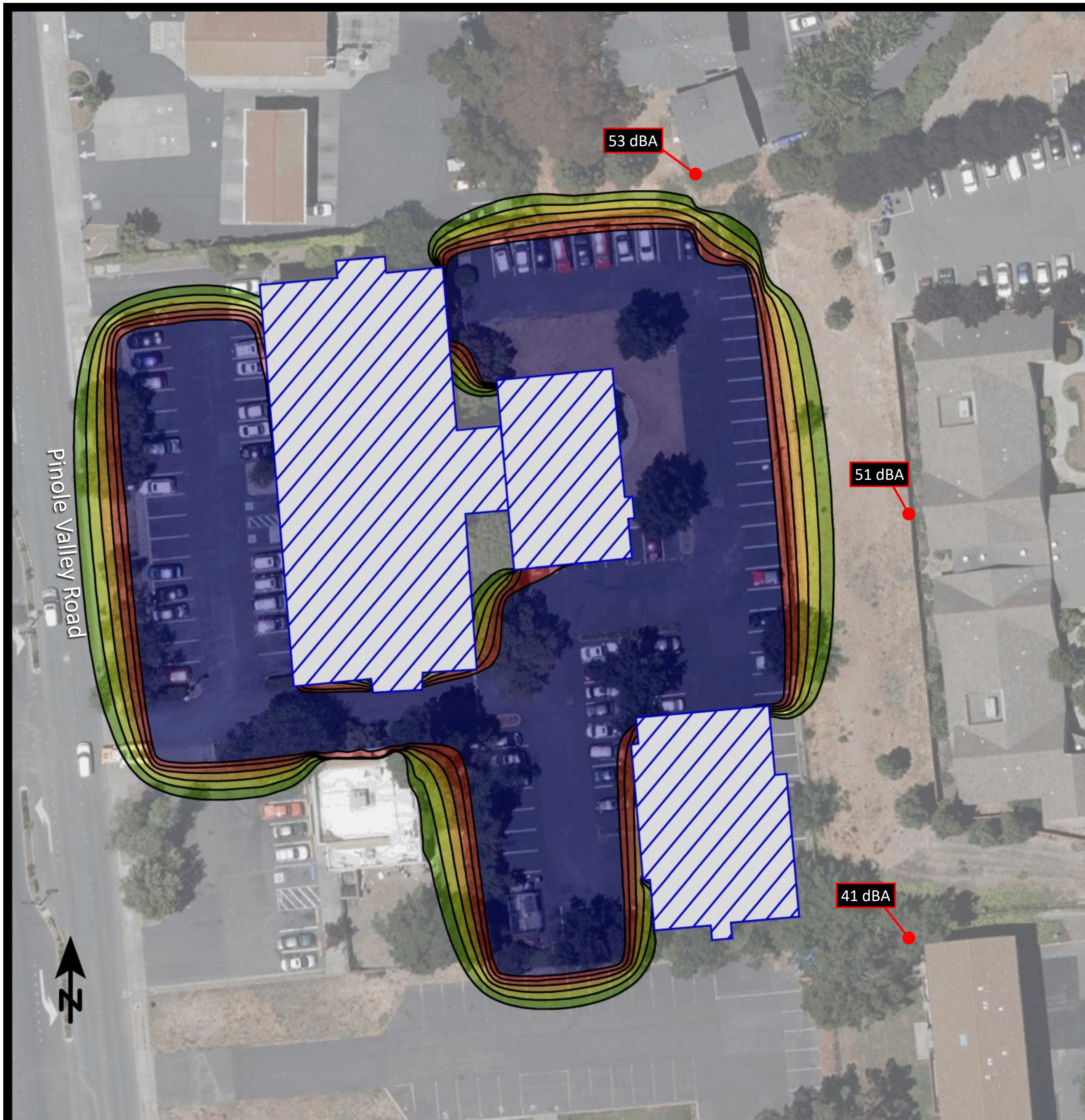

2801 Pinole Valley Road

City of Pinole, California

Figure 5

Parking Lot and HVAC Noise Contours (dBA L_{max})

Signs and symbols

Proposed Building

Levels in dB(A)

<= 55
55 - 56
56 - 57
57 - 58
58 - 59
59 - 60
> 60

1 : 748

0 3.75 7.5 15 22.5 30 m

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Construction Noise Environment

During the construction of the proposed project, noise from construction activities would temporarily add to the noise environment in the project vicinity. As shown in **Table 4**, typical activities involved in construction would generate maximum noise levels ranging from 76 to 90 dBA at a distance of 50 feet.

TABLE 4: CONSTRUCTION EQUIPMENT NOISE

Type of Equipment	Predicted Noise Levels, Lmax dB				Distances to Noise Contours (feet)	
	Noise Level At 25'	Noise Level at 50'	Noise Level at 100'	Noise Level at 200'	70 dB Lmax contour	65 dB Lmax contour
Backhoe	84	78	72	66	126	223
Compactor	89	83	77	71	223	397
Compressor (air)	84	78	72	66	126	223
Concrete Saw	96	90	84	78	500	889
Dozer	88	82	76	70	199	354
Dump Truck	82	76	70	64	100	177
Excavator	87	81	75	69	177	315
Generator	87	81	75	69	177	315
Jackhammer	94	89	83	77	446	792
Pneumatic Tools	91	85	79	73	281	500

Source: *Roadway Construction Noise Model User's Guide*. Federal Highway Administration. FHWA-HEP-05-054. January 2006.

Construction Vibration Environment

The primary vibration-generating activities associated with the proposed project would occur during construction when activities such as grading, utilities placement, and parking lot construction occur. **Table 5** shows the typical vibration levels produced by construction equipment.

TABLE 5: VIBRATION LEVELS FOR VARIOUS CONSTRUCTION EQUIPMENT

Type of Equipment	Peak Particle Velocity at 25 feet (inches/second)	Peak Particle Velocity at 50 feet (inches/second)	Peak Particle Velocity at 100 feet (inches/second)
Large Bulldozer	0.089	0.031	0.011
Loaded Trucks	0.076	0.027	0.010
Small Bulldozer	0.003	0.001	0.000
Auger/drill Rigs	0.089	0.031	0.011
Jackhammer	0.035	0.012	0.004
Vibratory Hammer	0.070	0.025	0.009
Vibratory Compactor/roller	0.210 (0.20 at 26 feet)	0.074	0.026

Source: *Transit Noise and Vibration Impact Assessment Guidelines.* Federal Transit Administration. May 2006.

REGULATORY CONTEXT

There are no federal regulations related to noise that apply to the Proposed Project.

STATE

The State Building Code, Title 24, Part 2 of the State of California Code of Regulations, establishes uniform minimum noise insulation performance standards to protect persons within new buildings which house people, including hotels, motels, dormitories, apartment houses, and dwellings other than single-family dwellings. Title 24 mandates that interior noise levels attributable to exterior sources shall not exceed 45 dB L_{dn} or CNEL in any habitable room. Title 24 also mandates that for structures containing noise-sensitive uses to be located where the L_{dn} or CNEL exceeds 60 dB, an acoustical analysis must be prepared to identify mechanisms for limiting exterior noise to the prescribed allowable interior levels. If the interior allowable noise levels are met by requiring that windows be kept closed, the design for the structure must also specify a ventilation or air conditioning system to provide a habitable interior environment.

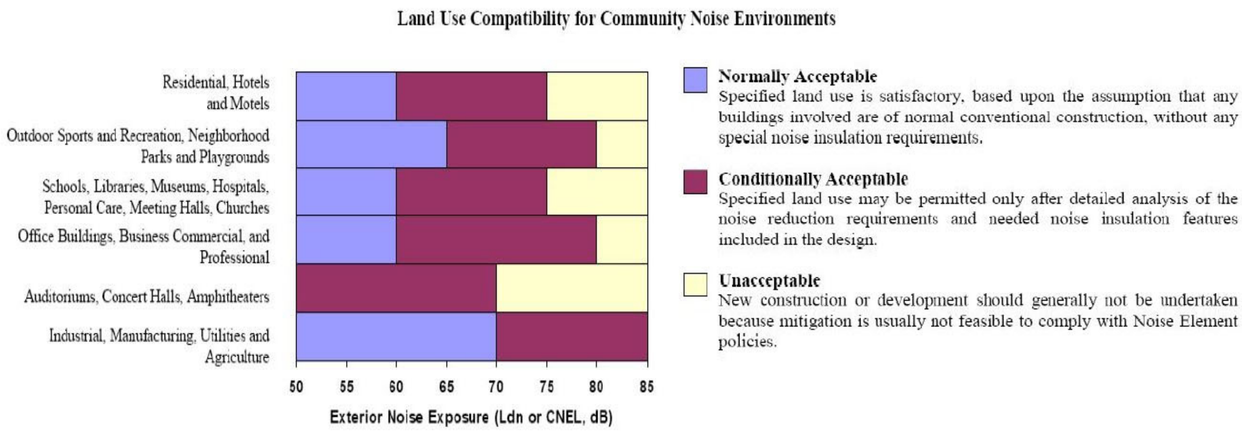
LOCAL

City of Pinole General Plan

The California Government Code requires that a noise element be included in the general plan of each county and city in the State. The noise element establishes the local government's goals, objectives, and policies relating to noise control. The following goals and policies from the Pinole General Plan direct the City's management of noise:

GOAL HS.8	Ensure all new development complies with the noise standards established in the Pinole Health and Safety Element, and prevent all new noise sources from increasing the existing noise levels above acceptable standards.
POLICY HS.8.1	New development projects should meet acceptable exterior noise level standards. The normally acceptable noise standards for new land uses are established in Land Use Compatibility for Community Exterior Noise Environments (as shown below).

Figure 6: City of Pinole Land Use Compatibility Chart



Action HS.8.1.1	Adopt a noise ordinance with noise level performance standards, including maximum allowable noise exposure, ambient versus nuisance noise, method of measuring noise, and enforcement procedures.
Action HS.8.1.2	Review development proposals to assure consistency with noise standards. Require new development of noise-creating uses to conform to the City's noise level standards.
Action HS.8.1.3	Require a combination of design features to reduce noise impacts on adjacent properties through the following and other means, as appropriate: • Screen and control noise sources such as parking, outdoor activities and mechanical equipment. • Increase setbacks for noise sources from adjacent dwellings. • Modify building designs and site planning to reduce noise exposure through a combination of sound attenuation (e.g., sound-rated windows and ventilation systems, insulation, physical and landscape buffers) and site planning (e.g., increased separation and private open area buffers) to reduce noise exposure. • Control hours of operation, including deliveries and trash pickup, to minimize noise impacts. • Require additional landscaping to assist with buffering where feasible.
Action HS.8.1.4	New development of noise-sensitive land uses will not be permitted in areas exposed to existing or planned transportation noise sources that exceed the levels specified in Policy HS.8.1, unless the project design includes measures to

reduce exterior and interior noise levels to those specified in Policy HS.8.1 of the proposed General Plan Update.

Action HS.8.1.5	Require the use of temporary construction noise control measures including the use of temporary noise barriers, temporary relocation of noise-sensitive land uses, or other appropriate measures as mitigation for noise generated during construction of public and/or private projects.
POLICY HS.8.2	Ensure that proposed nonresidential land uses likely to exceed the City's standards do not create noise disturbances in existing noise-sensitive areas.
Action HS.8.2.1	Require an acoustical analysis as part of the environmental review process when noise-sensitive land uses are proposed in areas where current or projected exterior noise levels exceed the City's standards.
Action HS.8.2.2	Require that any potential noise impacts identified during the acoustical analysis be mitigated in the project design to the maximum extent feasible.
Action HS.8.2.3	Prepare and periodically update a map of citywide noise-sensitive areas.
POLICY HS.8.3	Work with the railroads and adjoining communities to seek quiet zone status for rail lines through Pinole.
POLICY HS.8.4	Require site-specific noise studies for noise-sensitive projects which may be affected by railroad noise, and incorporate noise attenuation measures into the project design to reduce any impacts.
GOAL HS.9	Eliminate or reduce noise from existing objectionable noise sources.
POLICY HS.9.1	Noise created by commercial or industrial sources associated with new projects or developments should be controlled so as not to exceed the noise level standards set forth in the table below (Maximum Allowable Noise Exposure for Stationary Noise Sources), as measured at any affected residential land use.
Action HS.9.1.1	Adopt the following allowable noise standards:

TABLE 6: MAXIMUM ALLOWABLE NOISE EXPOSURE FOR STATIONARY SOURCES[1]

	Daytime [5] (7 AM to 10 PM)	Nighttime [2, 5] (10 PM to 7 AM)
Hourly L_{eq}, dB [3]	55	45
Maximum Level, dB [3]	70	65
Maximum Level, dB – Impulsive Noise [4]	65	60

1. *As determined at the property line of the receiving land use. When determining effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures.*
2. *Applies only where the receiving land use operates or is occupied during nighttime hours.*
3. *Sound level measurements shall be made with "slow" meter response.*
4. *Sound level measurements shall be made with "fast" meter response.*
5. *Allowable levels shall be raised to the ambient noise levels where the ambient levels exceed the allowable levels. Allowable levels shall be reduced 5 dB if the ambient hourly Leq is at least 10 dB lower than the allowable level.*

POLICY HS.9.2 Require new noise sources to use best available control technology (BACT) to minimize noise emissions.

Action HS.9.2.1 Noise control techniques used should be what most effectively mitigates the noise impacts of the development. Such measures may include building setbacks, building orientation and noise barriers. If a noise barrier is required for mitigation of exterior noise levels, it should be constructed of tight-fitting, massive materials (1-inch-thick wood, stucco, masonry, etc.) and should be of sufficient height to interrupt line of sight between the source and receiver. Line of sight should be determined by drawing a straight line between the effective heights of the noise source and receiver.

POLICY HS.9.3 Work with the railroad companies to reduce existing rail noise in Pinole.

Action HS.9.3.1 Establish a quiet zone designation at the railroad crossings in Pinole. Work with railroad companies to determine and install required safety devices to acquire the designation.

Criteria for Acceptable Vibration

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that in that noise is generally considered to be pressure waves transmitted through air, whereas vibration usually consists of the excitation of a structure or surface. As with noise, vibration consists of an amplitude and frequency. A person's perception to the vibration will depend on their individual sensitivity to vibration, as well as the amplitude and frequency of the source and the response of the system which is vibrating.

Vibration can be measured in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration measures in terms of peak particle velocities in inches per second. Standards pertaining to perception as well as damage to structures have been developed for vibration levels defined in terms of peak particle velocities.

Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. **Table 7**, which was developed by Caltrans, shows the vibration levels which would normally be required to result in damage to structures. The vibration levels are presented in terms of peak particle velocity in inches per second.

Table 7 indicates that the threshold for architectural damage to structures is 0.20 in/sec p.p.v. The general threshold at which human annoyance could occur is noted as 0.20 in/sec p.p.v. for intermittent vibrations. For construction projects which generally include intermittent vibrations, a threshold of 0.20 in/sec p.p.v. is considered to be a reasonable threshold to protect against architectural damage and annoyance to people.

TABLE 7: EFFECTS OF VIBRATION ON PEOPLE AND BUILDINGS

Peak Particle Velocity		Human Reaction	Effect on Buildings
mm/second	in/second		
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of "architectural" damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels established for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of "architectural" damage to normal dwelling - houses with plastered walls and ceilings. Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize "architectural" damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: *Transportation Related Earthborne Vibrations.* Caltrans. TAV-02-01-R9601. February 20, 2002.

IMPACTS AND MITIGATION MEASURES

THRESHOLDS OF SIGNIFICANCE

Appendix G of the CEQA Guidelines states that a project would normally be considered to result in significant noise impacts if noise levels conflict with adopted environmental standards or plans or if noise generated by the project would substantially increase existing noise levels at sensitive receivers on a permanent or temporary basis. Significance criteria for noise impacts are drawn from CEQA Guidelines Appendix G (Items XI [a-f]).

Would the project:

a. Generate 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. Generate excessive groundborne vibration or groundborne noise levels?

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, would the project expose people residing or working in the project area to excessive noise levels?

EVALUATION OF PROJECT NOISE/VIBRATION IMPACTS

IMPACT 1: WOULD THE PROJECT GENERATE 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

Operational Noise Increases

As shown in **Figures 4 and 5**, operation of the project is predicted to generate exterior HVAC and parking lot noise levels of 51 dBA L_{eq} and 53 dBA L_{max}, or less, at the nearest sensitive receptors. These noise levels would comply with the City of Pinole 55 dBA L_{eq} and 70 dBA L_{max} daytime exterior noise level standard.

Traffic Noise at New Sensitive Receptors – Exterior Areas

As shown on **Figure 3**, exterior traffic noise at the residential areas of the project are predicted to be below 60 dBA L_{dn}. This meets the City's normally acceptable exterior noise standard of 60 dBA L_{dn}.

Traffic Noise at New Sensitive Receptors – Interior Areas

As shown in **Table 3**, traffic from Pinole Valley Road is predicted to be up to 58.7 dBA L_{dn} at the building façade of the proposed project. Based upon a typical 25 dB exterior-to-interior noise level reduction achieved by modern building construction, an interior noise level of 35.7 dBA L_{dn} would be expected. This would meet the state 45 dB L_{dn} interior noise level standard. Therefore, no additional interior noise control measures would be required to achieve compliance with the City's interior noise level standards.

Construction Noise

During the construction phases of the project, noise from construction activities would add to the noise environment in the immediate project vicinity. As indicated in **Table 4**, activities involved in construction would generate maximum noise levels ranging from 76 to 90 dBA L_{max} at a distance of 50 feet. Most of the building construction would occur at distances of 50 feet or greater from the nearest residences. Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours.

Noise would also be generated during the construction phase by increased truck traffic on area roadways. A project-generated noise source would be truck traffic associated with transport of heavy materials and equipment to and from the construction site. This noise increase would be of short duration and would likely occur primarily during daytime hours.

Assuming the worst-case construction noise level for general construction activities of 90 dBA at 50 feet from the construction site, construction noise would have the potential to exceed the threshold established in the Noise Ordinance. Construction would generally not result in the worst-case scenario noise level because all construction equipment would not be operating simultaneously all day.

<u>*Noise Control Measures for Impact 1:*</u>

Noise Control Measure 1: The following noise control measures should be included for the project to reduce the potential for construction noise impacts on nearby receptors:

- The project shall utilize temporary construction noise control measures including the use of temporary noise barriers, temporary relocation of noise-sensitive land uses, or other appropriate measures as mitigation for noise generated during construction of public and/or private projects.
- Work is allowed from seven a.m. (7:00 a.m.) to five p.m. (5:00 p.m.) on non-federal holidays. Work is allowed on holidays recognized by the City of Pinole, but not acknowledged federally which include Cesar Chavez's Birthday and the Day After Thanksgiving, but no inspections will be performed.
- Construction work on Saturday is allowed in commercial zones only, from nine a.m. (9:00 a.m.) to six p.m. (6:00 p.m.), as long as it is interior work and does not generate significant noise.
- All noise-producing project equipment and vehicles using internal combustion engines shall be equipped with manufacturer-recommended mufflers and be maintained in good working condition.
- All mobile or fixed noise-producing equipment used on the project site that are regulated for noise output by a federal, State, or local agency shall comply with such regulations while in the course of project activity.
- Electrically powered equipment shall be used instead of pneumatic or internal-combustion-powered equipment, where feasible.
- Material stockpiles and mobile equipment staging, parking, and maintenance areas shall be located as far as practicable from noise-sensitive receptors.
- Project area and site access road speed limits shall be established and enforced during the construction period.
- Nearby residences shall be notified of construction schedules so that arrangements can be made, if desired, to limit their exposure to short-term increases in ambient noise levels.

IMPACT 2: WOULD THE PROJECT GENERATE EXCESSIVE GROUNDBORNE VIBRATION OR GROUNDBORNE NOISE LEVELS?

Construction vibration impacts include human annoyance and building structural damage. Human annoyance occurs when construction vibration rises significantly above the threshold of perception. Building damage can take the form of cosmetic or structural.

The **Table 5** data indicate that construction vibration levels anticipated for the project are less than the 0.2 in/sec p.p.v. threshold of damage to buildings at distances of 26 feet. Sensitive receptors which could be impacted by construction related vibrations, especially vibratory compactors/rollers, are located approximately 30 feet, or further, from typical construction activities. At these distances construction vibrations are not predicted to exceed acceptable levels. Additionally, construction activities would be temporary in nature and would likely occur during normal daytime working hours. Therefore, no additional vibration control measures would be required.

IMPACT 3: 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, WOULD THE PROJECT EXPOSE PEOPLE RESIDING OR WORKING IN THE PROJECT AREA TO EXCESSIVE NOISE LEVELS?

There are no airports in the project vicinity. Therefore, this impact is not applicable to the proposed project.

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Appendix A: Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
ASTC	Apparent Sound Transmission Class. Similar to STC but includes sound from flanking paths and correct for room reverberation. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by +5 dBA and nighttime hours weighted by +10 dBA.
DNL	See definition of Ldn.
IIC	Impact Insulation Class. An integer-number rating of how well a building floor attenuates impact sounds, such as footsteps. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz (Hz).
Ldn	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
Lmax	The highest root-mean-square (RMS) sound level measured over a given period of time.
L(n)	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50% of the time during the one-hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
NIC	Noise Isolation Class. A rating of the noise reduction between two spaces. Similar to STC but includes sound from flanking paths and no correction for room reverberation.
NNIC	Normalized Noise Isolation Class. Similar to NIC but includes a correction for room reverberation.
Noise	Unwanted sound.
NRC	Noise Reduction Coefficient. NRC is a single-number rating of the sound-absorption of a material equal to the arithmetic mean of the sound-absorption coefficients in the 250, 500, 1000, and 2,000 Hz octave frequency bands rounded to the nearest multiple of 0.05. It is a representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.
RT60	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 Sabin.
SEL	Sound Exposure Level. SEL is a rating, in decibels, of a discrete event, such as an aircraft flyover or train pass by, that compresses the total sound energy into a one-second event.
SPC	Speech Privacy Class. SPC is a method of rating speech privacy in buildings. It is designed to measure the degree of speech privacy provided by a closed room, indicating the degree to which conversations occurring within are kept private from listeners outside the room.
STC	Sound Transmission Class. STC is an integer rating of how well a building partition attenuates airborne sound. It is widely used to rate interior partitions, ceilings/floors, doors, windows and exterior wall configurations. The STC rating is typically used to rate the sound transmission of a specific building element when tested in laboratory conditions where flanking paths around the assembly don't exist. A larger number means more attenuation. The scale, like the decibel scale for sound, is logarithmic.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

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Appendix B: Continuous and Short-Term Ambient Noise Measurement Results

Appendix B1: Continuous Noise Monitoring Results

Site: LT-1
Project: 200602 2801 Pinole Valley Drive
Meter: LDL 812-1
Location: Northern Project Boundary
Calibrator: CAL200
Coordinates: 37.9943203°, -122.2853358°

Date	Time	Measured Level, dBA			
		L_{eq}	L_{max}	L_{50}	L_{90}
Wednesday, June 17, 2020	0:00	53	77	46	43
Wednesday, June 17, 2020	1:00	48	66	44	42
Wednesday, June 17, 2020	2:00	49	66	45	42
Wednesday, June 17, 2020	3:00	49	66	45	43
Wednesday, June 17, 2020	4:00	54	75	49	45
Wednesday, June 17, 2020	5:00	59	75	54	49
Wednesday, June 17, 2020	6:00	61	84	57	52
Wednesday, June 17, 2020	7:00	63	78	61	54
Wednesday, June 17, 2020	8:00	60	73	58	53
Wednesday, June 17, 2020	9:00	59	73	57	52
Wednesday, June 17, 2020	10:00	59	73	57	52
Wednesday, June 17, 2020	11:00	61	80	58	54
Wednesday, June 17, 2020	12:00	59	75	58	53
Wednesday, June 17, 2020	13:00	60	86	58	53
Wednesday, June 17, 2020	14:00	60	78	58	53
Wednesday, June 17, 2020	15:00	60	79	58	53
Wednesday, June 17, 2020	16:00	60	76	58	53
Wednesday, June 17, 2020	17:00	61	88	58	53
Wednesday, June 17, 2020	18:00	59	73	58	52
Wednesday, June 17, 2020	19:00	61	81	57	52
Wednesday, June 17, 2020	20:00	59	76	56	49
Wednesday, June 17, 2020	21:00	57	77	54	49
Wednesday, June 17, 2020	22:00	55	77	50	46
Wednesday, June 17, 2020	23:00	53	70	49	45

Statistics	Leq	Lmax	L50	L90
Day Average	60	78	58	52
Night Average	56	73	49	45
Day Low	57	73	54	49
Day High	63	88	61	54
Night Low	48	66	44	42
Night High	61	84	57	52
Ldn	63	Day %		83
CNEL	63	Night %		17