

918, 924, & 940 SAN RAFAEL AVENUE NOISE AND VIBRATION ASSESSMENT

Mountain View, California

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Project: 25-080

INTRODUCTION

The project proposes a residential development at 918, 924, and 940 San Rafael Avenue in Mountain View, California. It involves demolishing two existing vacant commercial structures on the site and constructing a 36-unit, three-story rowhouse residential development on the 1.8-acre property.

This report evaluates the project's potential to result in significant impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and groundborne vibration, summarizes applicable regulatory criteria, and discusses ambient noise conditions in the project vicinity; 2) the Plan Consistency Analysis section discusses noise and land use compatibility utilizing policies in the Town's General Plan; and 3) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures, where necessary, to mitigate project impacts to a less-than-significant level.

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 the 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 that are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement that 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 tenfold 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

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 and 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 sounds 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	
	10 dBA	Broadcast/recording studio
	0 dBA	

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

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 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 on 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 L_{dn} . Typically, the highest steady traffic noise level during the daytime is about equal to the L_{dn} , and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection, and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12 to 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.¹ Sleep and speech interference is therefore possible when exterior noise levels are about 57 to 62 dBA L_{dn} with open windows and 65 to 70 dBA L_{dn} if the windows are closed. Levels of 55 to 60 dBA are common along collector streets and secondary arterials, while 65 to 70 dBA is a typical value for a primary/major arterial. Levels of 75 to 80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed; those facing major roadways and freeways typically need special glass windows.

Annoyance

Attitude surveys are used for measuring the annoyance felt in a community for noises intruding into homes or affecting outdoor activity areas. In these surveys, it was determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. The L_{dn} as a measure of noise has been found to provide a valid correlation of noise level and the percentage of people annoyed. People have been asked to judge the annoyance caused by aircraft noise and ground transportation noise. There continues to be disagreement about the relative annoyance of these different sources. When measuring the percentage of the population highly annoyed, the threshold for ground vehicle noise is about 50 dBA L_{dn} . At a L_{dn} of about 60 dBA, approximately 12 percent of the population is highly annoyed.

¹ Based on the U.S. Department of Transportation Federal Highway Administration document "Highway Traffic Noise: Analysis and Abatement Guidance" (2010) and data from Illingworth & Rodkin, Inc. noise monitoring projects.

When the L_{dn} increases to 70 dBA, the percentage of the population highly annoyed increases to about 25 to 30 percent of the population. There is, therefore, an increase of about 2 percent per dBA between a L_{dn} of 60 and 70 dBA. Between a L_{dn} of 70 to 80 dBA, each decibel increase increases by about 3 percent the percentage of the population highly annoyed. People appear to respond more adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 30 to 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.²

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.

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	Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most 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 structures
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, April 2020.

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

² Kryter, Karl D. The Effects of Noise on Man. Menlo Park, Academic Press, Inc., 1985.

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 of 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, which 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 vibrations, 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.

Regulatory Background

This section describes the relevant guidelines, policies, and standards established by State Agencies, Santa Clara County, and the City of Mountain View. The State CEQA Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State of California

2022 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA L_{dn}/CNEL in any habitable room.

County of Santa Clara

Santa Clara County Airport Land Use Commission Comprehensive Land Use Plan. The Comprehensive Land Use Plan (CLUP) adopted by the Santa Clara County Airport Land Use Commission contains standards for projects within the vicinity of Moffett Federal Airfield, which are relevant to this project:

4.3.2.1 Noise Compatibility Policies

- N-1 The Community Noise Equivalent Level (CNEL) method of representing noise levels shall be used to determine if a specific land use is consistent with the CLUP.
- N-2 In addition to the other policies herein, the Noise Compatibility Policies presented in Table 4-1 shall be used to determine if a specific land use is consistent with this CLUP.
- N-3 Noise impacts shall be evaluated according to the Aircraft Noise Contours presented on Figure 5 (not shown in this report).
- N-4 No residential or transient lodging construction shall be permitted within the 65 dB CNEL contour boundary unless it can be demonstrated that the resulting interior sound levels will be less than 45 dB CNEL and there are no outdoor patios or outdoor activity areas associated with the residential portion of the mixed use residential project of a multi unit residential project. (Sound wall noise mitigation measures are not effective in reducing noise generated by aircraft flying overhead.).
- N-5 All property owners within the 65 dB CNEL contour boundary who rent or lease their property for residential use shall include in their rental/lease agreement with the tenant, a statement advising that they (the tenants) are living within a high noise area and the exterior noise level is predicted to be greater than 65 dB CNEL in a manner that is consistent with current state law including AB2776 (2002).
- N-6 Residential construction will not be permitted in the area between the 60 dB CNEL contour boundary and the 65 dB CNEL contour boundary unless it can be demonstrated that the resulting interior sound level will be no greater than 45 dB CNEL.
- N-7 Noise level compatibility standards for other types of land uses shall be applied in the same manner as the above residential noise level criteria. Table 4-1 presents acceptable noise levels for other land uses in the vicinity of the Airport.

Table 4 - 1

NOISE COMPATIBILITY POLICIES

Moffett Federal Airfield

LAND USE CATEGORY	CNEL					
	55-60	60-65	65-70	70-75	75-80	80-85
Residential – low density Single-family, duplex, mobile homes	*	**	****	****	****	****
Residential – multi-family, condominiums, townhouses	*	**	****	****	****	****
Transient lodging - motels, hotels	*	*	**	****	****	****
Schools, libraries, indoor religious assemblies, hospitals, nursing homes	*	***	****	****	****	****
Auditoriums, concert halls, amphitheaters	*	***	***	****	****	****
Sports arena, outdoor spectator sports, parking	*	*	*	**	***	****
Playgrounds, neighborhood parks	*	*	***	****	****	****
Golf courses, riding stables, water recreation, cemeteries	*	*	*	**	***	****
Office buildings, business commercial and professional, retail	*	*	**	***	****	****
Industrial, manufacturing, utilities, agriculture	*	*	*	***	***	****
* Generally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements. Mobile homes may not be acceptable in these areas. Some outdoor activities might be adversely affected.					
** Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Outdoor activities may be adversely affected. <u>Residential:</u> Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.					
*** Generally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor activities are likely to be adversely affected.					
**** Unacceptable	New construction or development should not be undertaken.					

Source: Based on General Plan Guidelines, Appendix C (2003), Figure 2 and Santa Clara County ALUC 1992 Land Use Plan, Table 1

Source: Comprehensive Land Use Plan Santa Clara County, Moffett Federal Airfield, December 19, 2018.

City of Mountain View

City of Mountain View 2030 General Plan. Chapter 7 of the City of Mountain View's General Plan³ includes the Noise Element with the intent to protect the community from excessive or harmful noise and the goal of sustaining a high quality of life. The following general plan policies are applicable to the project:

Goal NOI-1: Noise levels that support a high quality of life in Mountain View.

NOI 1.1: Land use compatibility. Use the Outdoor Noise Environment Guidelines as a guide for planning and development decisions (Table 7.1).

NOI 1.2: Noise-sensitive land uses. Require new development of noise-sensitive land uses to incorporate measures into the project design to reduce interior and exterior noise levels to the following acceptable levels:

- New single-family developments shall maintain a standard of 65 dBA L_{dn} for exterior noise in private outdoor active use areas.
- New multi-family residential developments shall maintain a standard of 65 dBA L_{dn} for private and community outdoor recreation use areas. Noise standards do not apply to private decks and balconies in multi-family residential developments.
- Indoor noise levels shall not exceed 45 dBA L_{dn} in all new single-family and multi-family residential units.
- Where new single-family and multi-family residential units would be exposed to intermittent noise from major transportation sources such as train or airport operations, new construction shall achieve an interior noise level of 65 dBA through measures such as site design or special construction materials. This standard shall apply to areas exposed to four or more major transportation noise events such as passing trains or aircraft flyovers per day.

NOI 1.3: Exceeding acceptable noise thresholds. If noise levels in the area of a proposed project would exceed normally acceptable thresholds, the City shall require a detailed analysis of proposed noise reduction measures to determine whether the proposed use is compatible. As needed, noise insulation features shall be included in the design of such projects to reduce exterior noise levels to meet acceptable thresholds, or for uses with no active outdoor use areas, to ensure acceptable interior noise levels.

NOI 1.4: Site planning. Use site planning and project design strategies to achieve the noise level standards in NOI 1.1 (Land use compatibility) and in NOI 1.2 (Noise-sensitive land uses). The use of noise barriers shall be considered after all practical design-related noise measures have been integrated into the project design.

³ City of Mountain View, *Mountain View 2030 General Plan*, Noise Element, Adopted July 10, 2012.

Table 7.1 Outdoor Noise Environment Guidelines							
Land Use Category	Community Noise Exposure in Decibels (CNEL) Day/Night Average Noise Level in Decibels (Ldn)						
	55	60	65	70	75	80	85
Residential–Single-Family, Duplex, Mobile Homes							
Residential–Multi-Family Transient Lodging–Motels, Hotels							
Schools, Libraries, Churches, Hospitals, Nursing Homes							
Auditoriums, Concert Halls, Amphitheaters, Sports Arenas, Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation, Cemeteries							
Office Buildings, Business Commercial and Professional							
Industrial, Manufacturing, Utilities, Agriculture							

 NORMALLY ACCEPTABLE Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.	 NORMALLY UNACCEPTABLE New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
 CONDITIONALLY ACCEPTABLE New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.	 CLEARLY UNACCEPTABLE New construction or development clearly should not be undertaken.

Source: State of California General Plan Guidelines, 2003.

NOI 1.5: Major roadways. Reduce the noise impacts from major arterials and freeways. Figure 7.3 shows the future noise contours.

NOI 1.6: Sensitive uses. Minimize noise impacts on noise-sensitive land uses, such as residential uses, schools, hospitals and child-care facilities.

NOI 1.7: Stationary sources. Restrict noise levels from stationary sources through enforcement of the Noise Ordinance.

NOI 1.8: Moffett Federal Airfield. Support efforts to minimize noise impacts from Moffett Federal Airfield in coordination with Santa Clara County's Comprehensive Land Use Plan. Figure 7.2 shows the airport noise contours.

City of Mountain View Municipal Code. Sections 8 and 21 of the City of Mountain View's Municipal Code describes allowable construction hours and limits noise levels due to stationary noise sources. The following sections are applicable to the project:

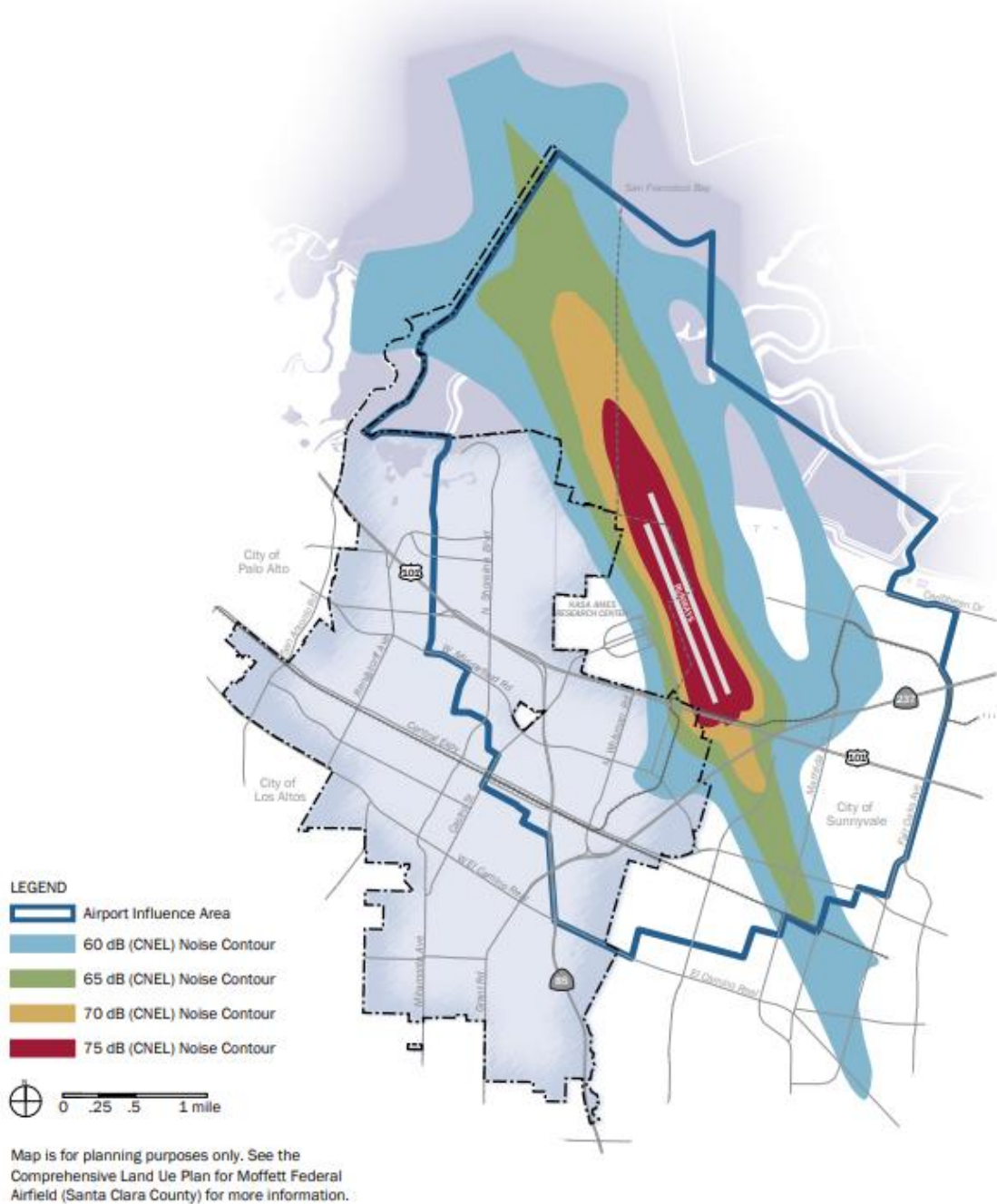
Section 8.70 – Construction noise.

- a. **Hours of construction.** No construction activity shall commence prior to 7:00 a.m. nor continue later than 6:00 p.m., Monday through Friday. No work is permitted on Saturday unless prior written approval is granted by the chief building official. The term "construction activity" shall include any physical activity on the construction site or in the staging area, including the delivery of materials. In approving modified hours, the chief building official may specifically designate and/or limit the activities permitted during the modified hours. No construction activity is allowed on Sunday or recognized holidays.
- b. **Modification.** At any time before commencement of or during construction activity, the chief building official may modify the permitted hours of construction upon twenty-four (24) hours written notice to the contractor, applicant, developer or owner. The chief building official can reduce the hours of construction activity below the 7:00 a.m. to 6:00 p.m. time frame or increase the allowable hours.
- c. **Sign required.** If the hours of construction activity are modified, then the general contractor, applicant, developer or owner shall erect a sign at a prominent location on the construction site to advise subcontractors and material suppliers of the working hours. The contractor, owner or applicant shall immediately produce upon request any written order or permit from the chief building official pursuant to this section upon the request of any member of the public, the police or city staff.
- d. **Violation.** Violation of the allowed hours of construction activity, the chief building official order, required signage or this Section shall be a violation of this code.

Section 21.26 – Stationary equipment noise.

- a. No person shall own or operate on any property any stationary equipment, such as, but not limited to, air compressors, equipment for swimming pools, spas, or air conditioners, which produces a sound level exceeding 55 dB(A) (50 dB(A) during the night, 10 p.m. to 7 a.m.) when measured at any location on any receiving residentially used property, said measurement to utilize a sound level meter equal to or better than an ANSI Standard S 1.4-1971 Type 2 noise level meter.
- b. Any plans submitted for building, plumbing, electrical or mechanical/heating permit for any stationary equipment shall be accompanied by documentation of the equipment noise level when available and by noise mitigating devices or buffers appropriate to achieve the above noise limit. Initial granting of a permit for such equipment shall not affect the

Figure 7.2: Aircraft Noise Contours, 2022, and Airport Influence Area



obligation of each person owning or operating such equipment for continued compliance with these noise level requirements.

- c. Operation of any equipment, as specified in this section, above the 55 dB(A) limit (50 dB(A) nighttime), may occur only if the owner or operator has obtained a conditional use permit. A permit to operate equipment which exceeds the limit may be granted by the zoning administrator only if it has been demonstrated that such operation will not be detrimental to the health, safety, peace, morals, comfort or general welfare of residents subjected to such noise. The manner of obtaining said permit and the rules governing its issuance and revocation shall be as specified in Mountain View City Code Sec. 36.43 and following, all relating to the issuance of conditional use permits.

Existing Noise Environment

The noise environment at the site and in the surrounding area results primarily from vehicular traffic along the US 101/State Route 85 (SR 85) interchange, which is elevated with respect to the project site and shielded by noise barriers. Secondary noise sources include local traffic along San Rafael Avenue and operational noise from the adjoining office and commercial uses. Occasional overhead aircraft associated with the Moffett Airfield would also affect the noise environment.

A noise monitoring survey was performed at the site beginning on Wednesday, June 25, 2025, and concluding on Friday, June 27, 2025. The monitoring survey included two long-term noise measurements (LT-1 and LT-2) and two short-term noise measurements (ST-1 and ST-2), which are shown in Figure 1.

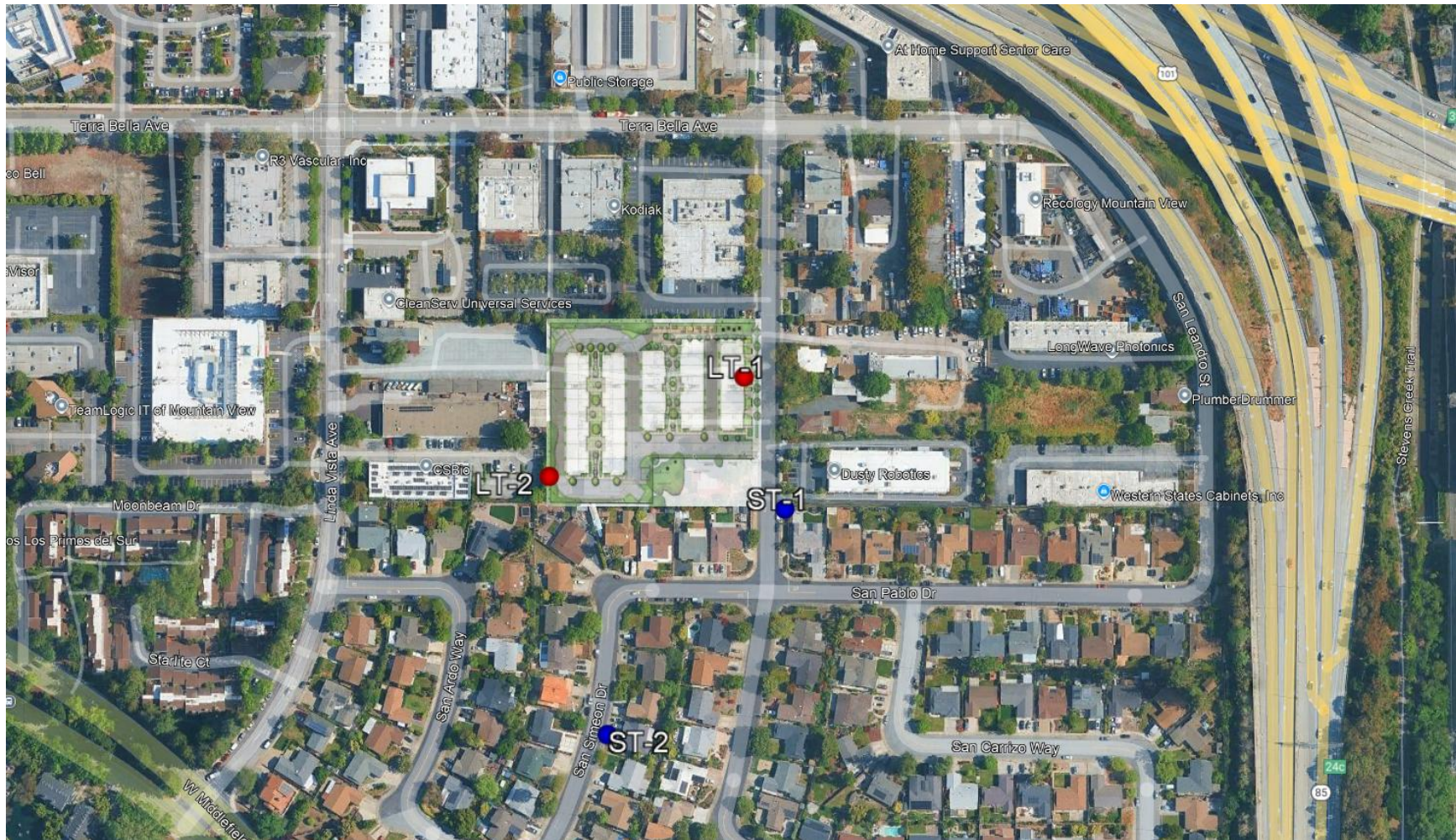
Long-term noise measurement LT-1 was installed in a tree along the eastern boundary of the project site, approximately 40 feet west of the San Rafael Avenue centerline. Hourly average noise levels at LT-1 ranged from 52 to 60 dBA L_{eq} during daytime hours (7:00 a.m. and 10:00 p.m.) and from 45 to 54 dBA L_{eq} during nighttime hours (10:00 p.m. and 7:00 a.m.). The day-night average noise level measured on Thursday, June 26, 2025, was 58 dBA L_{dn} . The daily trend in noise levels at LT-1 is shown in Figures A1 through A3 in Appendix A.

LT-2 was made in the southwestern corner of the project site, approximately 375 feet west of the San Rafael Avenue centerline. Hourly average noise levels at LT-2 ranged from 50 to 58 dBA L_{eq} during daytime hours and from 43 to 53 dBA L_{eq} during nighttime hours. The day-night average noise level measured on Thursday, June 26, 2025, was 57 dBA L_{dn} . The daily trend in noise levels at LT-2 is shown in Figures A4 through A6 in Appendix A.

Short-term noise measurements were made on Thursday, June 26, 2025, between 9:40 a.m. and 10:20 a.m. The measurements were made over 10-minute periods. The results of the short-term measurements are summarized in Table 4.

ST-1 was made at the back yard equivalent of 790 San Pablo Drive, approximately 30 feet east of the San Rafael Avenue centerline. Background noise levels due to vehicles traversing the interchange ranged from 46 to 49 dBA at ST-1. Two passenger cars passing by along San Rafael Avenue generated noise levels of 59 to 65 dBA. Additionally, four jets flew overhead, producing noise levels of 53 to 58 dBA, and a nearby construction saw generated noise levels of 54 dBA. The 10-minute average noise level measured at ST-1 was 51 dBA L_{eq} .

FIGURE 1 Aerial Image of the Project Site and Surrounding Area with Long- and Short-Term Measurement Locations Identified



Source: Google Earth, 2025.

TABLE 4 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location	Date, Time	Measured Noise Level, dBA					
		L _{max}	L ₍₁₎	L ₍₁₀₎	L ₍₅₀₎	L ₍₉₀₎	L _{eq}
ST-1: Rear yard equivalent of 790 San Pablo Drive	6/26/2025, 9:40-9:50	65	59	53	49	47	51
ST-2: Front of 879 San Simeon Drive	6/26/2025, 10:00-10:10	85	74	61	49	46	62
	6/26/2025, 10:10-10:20	69	65	56	47	44	54

ST-2 was located in front of 879 San Simeon Drive, approximately 25 feet from the centerline of San Simeon Drive. Two consecutive 10-minute measurements were made at ST-2. During the first 10-minute period, there was a trash truck that came by to collect the trash, generating noise levels up to 85 dBA. Due to the noisy trash truck, the ambient noise levels at ST-2 were elevated above typical conditions; therefore, a second measurement was completed to observe typical noise sources in the vicinity. Background noise levels due to vehicles traversing the interchange ranged from 44 to 48 dBA at ST-2. Six to eight pass-by passenger cars traveled along San Simeon Drive during the two consecutive 10-minute periods, generating noise levels of 58 to 69 dBA. Additionally, three jets flew overhead, producing noise levels of 52 to 66 dBA, and a nearby car door shut, generating noise levels of 55 dBA. The two consecutive 10-minute average noise levels measured at ST-2 ranged from 54 dBA L_{eq} without the trash truck to 62 dBA with the trash truck.

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The Noise Element provided in the Mountain View 2030 General Plan sets forth policies supporting the goal of maintaining a high quality of noise environment in the City of Mountain View. The applicable General Plan policies are summarized below for the proposed project:

- The City's acceptable exterior noise level objective is 65 dBA L_{dn} or less for the proposed multi-family residential uses, according to Policy NOI 1.2.
- Policy NOI 1.2 and the State of California require indoor noise levels at residential uses to be maintained at or below 45 dBA L_{dn}.

The future noise environment at the project site would continue to result primarily from vehicular traffic along US 101/SR 85 interchange, with the local San Rafael Avenue traffic noise remaining as a secondary source of noise. A full traffic study was not required for the proposed project. To estimate the future permanent noise level increase, a 1% to 2% traffic increase per year through 2045 was estimated. This increase is typical for a built-out area. The noise level increase by the year 2045 was calculated to be 2 dBA L_{dn}. This increase was applied throughout the project site to represent worst-case conditions.

Future Exterior Noise Environment

The site plan shows a common use courtyard area located along the northern boundary of the project site, with setbacks of approximately 45 to 200 feet from the centerline of San Rafael Avenue. At a minimum distance of 45 feet from the centerline of San Rafael Avenue and assuming no attenuation, which would represent worst-case conditions, future exterior noise levels would be 59 dBA L_{dn} at the proposed outdoor use area. Therefore, the proposed outdoor use area would be compatible with the City's normally acceptable exterior noise level threshold of 65 dBA L_{dn} .

Future Interior Noise Environment

Standard residential construction, assuming windows to be partially open, provides exterior-to-interior noise reduction of approximately 15 dBA. With the windows maintained closed, standard residential construction typically provides 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA L_{dn} , the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA L_{dn} , forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound-rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Building 5 is located nearest to San Rafael Avenue and is set back from the centerline by 40 to 80 feet. At these distances and assuming no attenuation, exterior-facing rooms with direct line-of-sight to San Rafael Avenue would be exposed to future exterior noise levels at or below 60 dBA L_{dn} . Future interior noise levels would be at or below 45 dBA L_{dn} at Building 5, assuming windows are partially open.

All other buildings on the project site would be set back further from the roadway and be partially shielded by Building 5. Exterior-facing rooms in Buildings 1 through 4 would be exposed to future exterior noise levels at or below 60 dBA L_{dn} . Future interior noise levels would be at or below 45 dBA L_{dn} at Buildings 1 through 4, assuming windows are partially open.

To meet the interior noise requirements set forth by the City of Mountain View of 45 dBA L_{dn} , standard construction materials would suffice. Additionally, the inclusion of fresh air mechanical ventilation systems is recommended for all units to allow occupants to keep windows closed to control noise.

NOISE IMPACTS AND MITIGATION MEASURES

This section describes the significance criteria used to evaluate project impacts under CEQA, provides a discussion of each project impact, and presents mitigation measures, where necessary, to reduce project impacts to less-than-significant levels.

Significance Criteria

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

- (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;
- (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.

Impact 1a: Temporary Construction Noise. Existing receptors would be exposed to temporary construction noise levels exceeding existing ambient conditions. With the incorporation of the City's Standard Conditions as a project condition of approval and compliance with the City's General Plan and Noise Ordinance, the temporary noise impact would be reduced to a **less-than-significant** level.

The project construction schedule assumed that the earliest possible start date would be early January 2026, with completion at the end of February 2027 (a total of up to 14 months). Construction phases would include demolition, site preparation, excavation, grading, building construction, architectural coating, and paving. During each phase of construction, there would be a different mix of equipment operating, and noise levels would vary by phase and vary within phases, based on the amount of equipment in operation and the location at which the equipment is operating.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time.

The City's Municipal Code limits construction activities to the hours between 7:00 a.m. and 6:00 p.m. on weekdays. No work is permitted on Saturdays unless prior written approval is granted by the chief building official. No construction activity is allowed on Sundays or recognized holidays. The City of Mountain View does not establish noise level thresholds for construction activities.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The hauling of excavated materials and construction materials would generate truck trips on local roadways, as well. For the proposed project, pile driving, which generates excessive noise levels, is not expected. The typical range of maximum

instantaneous noise levels for the proposed project would be 70 to 90 dBA $L_{\max}$ at a distance of 50 feet (see Table 5) from the equipment.

Table 6 shows the hourly average noise level ranges, by construction phase, typical for various types of projects. Hourly average noise levels generated by construction typically are about 65 to 88 dBA L_{eq} for residential structures, measured at a distance of 50 feet from the center of a busy construction site. 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 often results in lower construction noise levels at distant receptors.

Equipment expected to be used in each construction phase is summarized in Table 7, along with the quantity of each type of equipment and the reference noise level at 50 feet, assuming the operation of the two loudest pieces of construction equipment for each construction phase.

Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM) was used to calculate the hourly average noise levels for each phase of construction, assuming the two loudest pieces of equipment would operate simultaneously, as recommended by the FTA for construction noise evaluations. This construction noise model includes representative sound levels for the most common types of construction equipment along with the approximate usage factors of such equipment that were developed based on an extensive database of information gathered during the construction of the Central Artery/Tunnel Project in Boston, Massachusetts (CA/T Project or "Big Dig"). The usage factors represent the percentage of time the equipment operates at full power.

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.

TABLE 6 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 7 Construction Noise Levels at a Distance of 25 feet

Phase of Construction	Total Workdays	Construction Equipment (Quantity)	Construction Noise Level at 50 feet, dBA L _{eq}
Demolition	22	Concrete/Industrial Saw (1) ^a Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (3) ^a	85
Site Preparation	3	Grader (1) ^a Tractor/Loader/Backhoe (1) ^a Scraper (1)	84
Grading/Excavation	6	Grader (1) ^a Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (2) ^a	84
Trenching/Foundation	6	Tractor/Loader/Backhoe (1) ^a Excavator (1) ^a	82
Building – Exterior	242	Crane (1) Forklift (2) Generator (1) Tractor/Loader/Backhoe (1) ^a Welder (3)	82
Building – Interior/ Architectural Coating	11	Air Compressor (1) ^a	74
Paving	11	Cement & Mortar Mixer (1) Paver (1) Paving Equipment (1) ^a Roller (2) Tractor/Loader/Backhoe (1) ^a	84

^a Denotes two loudest pieces of construction equipment per phase.

Temporary construction noise was also assessed at the receiving property lines of all existing receptors in the area that would have direct exposure to the project site. Table 8 summarizes the hourly average noise levels calculated for all construction equipment operating simultaneously in each construction phase for the proposed project when the source levels are positioned at the center of the construction site and propagated to the receiving property lines. Noise levels in Table 8 assume no shielding from intervening buildings.

TABLE 8 Construction Noise Levels at Nearby Land Uses

Phase of Construction	Calculated Hourly Average Noise Levels, dBA			
	North Offices (115ft)	East Res. & Offices (225ft)	South Res. (110ft)	West Offices & Comm. (165ft)
Demolition	80	74	81	77
Site Preparation	78	72	78	75
Grading/ Excavation	79	73	79	76
Trenching/ Foundation	74	69	75	71
Building – Exterior	76	70	77	73
Building – Interior/ Architectural Coating	67	61	67	63
Paving	79	73	79	75

As shown in Table 7, individual pieces of construction equipment would range from 74 to 85 dBA L_{eq} when activities occur 50 feet from nearby receptors. When focused near the center of the project site, Table 8 shows that construction noise levels would typically range from 61 to 81 dBA L_{eq} at the surrounding residential receptors and from 61 to 80 dBA L_{eq} at the surrounding office and commercial receptors.

Therefore, construction noise levels would exceed 80 dBA L_{eq} at the nearby residential uses at times throughout project construction. The City of Mountain View has Standard Conditions that shall be incorporated into the proposed project as a condition of approval. The conditions that are applicable to temporary construction noise include the following:

BD-65 Work Hours/Construction Site Signage: No work shall commence on the job site prior to 7:00 a.m. nor continue later than 6:00 p.m., Monday through Friday, nor shall any work be permitted on Saturday or Sunday or any holiday unless prior approval is granted by the Chief Building Official. The general contractor, applicant, developer, or property owner shall erect a sign at all construction site entrances/exits to advise subcontractors and material suppliers of the working hours (see job card for specifics) and contact information, including an after-hours contact. Violation of this condition of approval may be subject to the penalties outlined in Section 8.70 of the MVCC and/or suspension of building permits.

PL-188 Notice of Construction: The applicant shall notify neighbors within 500 feet of the project site of the construction schedule in writing, prior to construction. For multi-phased

construction, separate notices may be required for each phase of construction. A copy of the notice and the mailing list shall be submitted for review prior to issuance of building permits.

PL-189 Disturbance Coordinator: The applicant shall designate a “disturbance coordinator” who will be responsible for responding to any local complaints regarding construction noise. The coordinator (who may be an employee of the general contractor) will determine the cause of the complaint and will require that reasonable measures warranted to correct the problem be implemented. A telephone number of the noise disturbance coordinator shall be conspicuously posted at the construction site fence and on the notification sent to neighbors adjacent to the site. The sign must also list an emergency after-hours contact number for emergency personnel.

PL-152 Construction Noise Reduction: The following noise reduction measures shall be incorporated into construction plans and contractor specifications to reduce the impact of temporary construction-related noise on nearby properties:

- Comply with manufacturer’s muffler requirements on all construction equipment engines;
- Turn off construction equipment when not in use, where applicable;
- Locate stationary equipment as far as practical from receiving properties;
- Use temporary sound barriers or sound curtains around loud stationary equipment if the other noise reduction methods are not effective or possible; and
- Shroud or shield impact tools and use electric-powered rather than diesel-powered construction equipment.

Compliance with the City’s General Plan and Noise Ordinance and implementation of the above mitigation measures would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. With the implementation of these measures and recognizing that noise generated by construction activities would occur over a temporary period, the impact would be less-than-significant.

Mitigation Measure 1a: No further mitigation required.

Impact 1b: Permanent Noise Level Increase/Exceed Applicable Standards. The proposed project would not result in a substantial permanent noise level increase at residential uses or generate operational noise levels exceeding the City’s thresholds. This is a **less-than-significant** impact.

A significant impact would result if the proposed project would result in a substantial permanent increase in noise levels at sensitive receptors in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA L_{dn} or greater, with a future noise level of less than 60 dBA L_{dn} ; or b) the noise level increase is 3 dBA L_{dn} or greater, with a future noise level of 60 dBA L_{dn} or greater. Noise-sensitive receptors surrounding the project site are exposed to existing noise

levels less than 60 dBA L_{dn} ; therefore, a significant noise increase would occur if project-generated operations would permanently increase noise levels by 5 dBA L_{dn} .

Additionally, Section 21.26 of the City's Municipal Code limits stationary noise sources to 55 dBA during daytime hours and 50 dBA during nighttime hours.

Project Traffic Increase

The Project would produce approximately 196 daily trips.⁴ Peak hour trips would be approximately 10% of the daily total or approximately 20 trips per hour. Adding these peak-hour trips to the existing ambient traffic would estimate the existing plus project volumes. When existing plus project volumes are compared to the existing volumes, the project's contribution to permanent noise level increase would not result in a measurable or detectable noise level increase (i.e., 0 dBA L_{dn} increase). This is a less-than-significant impact.

Mechanical Equipment

The site plan shows air conditioning condenser units on the ground level in front of the rowhomes, opposite the garage entrance. The site plan also shows an enclosure around the condenser units, which may help reduce noise levels. Conservatively, no attenuation from an enclosure is assumed in this study.

Residential AC condenser units typically cycle on and off continuously throughout a 24-hour period. Thus, at any given time, multiple units are operating simultaneously in a relatively small vicinity. The existing receptors surrounding the project site would potentially be exposed to noise levels from up to two units operating simultaneously.

Typical air conditioning condenser units for residential buildings of this size typically generate noise levels of 53 to 63 dBA at a distance of 3 feet. Assuming two units running simultaneously at any given time, hourly average noise levels would be up to 66 dBA L_{eq} at 3 feet, and the combined day-night average noise level would be up to 72 dBA DNL at 3 feet.

Due to the orientation of the proposed buildings, the west office and commercial uses would be shielded from the AC units and are not treated as receptors in this impact. The six-foot good neighbor fences surrounding the site along the north, west, and south boundaries would provide partial shielding for the surrounding receptors. Due to the distance of the AC units from the boundaries and the height of the fences, the minimal attenuation at the receiving properties to the north and to the south would be 9 and 8 dBA, respectively. No attenuation is assumed for the east receptors.

Table 9 summarizes the operational noise levels generated by mechanical equipment at the surrounding receptors.

⁴ Calculated from the Institute of Transportation Engineers Code 221 trip generation rate of 5.44 for "Condo/Townhouse High Rise."

TABLE 9 Operational Noise Levels for the Ground-Level AC Condensers

Receptor	Distance from Equipment, feet	Hourly L_{eq} , dBA	L_{dn} , dBA	Noise Level Increase, dBA L_{dn}
North Offices	30	34 ^a	37 ^a	0
East Residences & Offices	65	36	40	0
South Residences	50	31 ^b	34 ^b	0

^a Conservative 9 dBA attenuation due to six-foot good neighbor fence.

^b Conservative 8 dBA attenuation due to six-foot good neighbor fence.

Noise due to ground-level AC condensers would not exceed the City's existing ambient conditions or the City's Municipal Code noise limits at the surrounding receptors. For all surrounding receptors, AC condenser noise would not result in a measurable or detectable noise level increase (i.e., 0 dBA L_{dn} increase).

Total Combined Project-Generated Noise

The operational noise levels produced by the proposed project combined (i.e., traffic and mechanical equipment) would not result in a measurable or detectable permanent noise level increase (i.e., 0 dBA L_{dn} increase) at the existing noise-sensitive receptors in the project vicinity. Further, operational noise levels are not expected to exceed the City's ambient noise levels or the City's Municipal Code noise limits during daytime or nighttime hours at the surrounding land uses. This is a less-than-significant impact.

Mitigation Measure 1b: None required.

Impact 2: Exposure to Excessive Groundborne Vibration. Vibration levels generated during construction activities at the project site would potentially exceed the State's screening thresholds for cosmetic damage. With the incorporation of the City's Standard Condition for construction vibration, the impact would reduce to a **less-than-significant** level.

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g., jackhammers, hoe rams) are used. Construction activities would include demolition, site preparation work, foundation work, and new building framing and finishing. Pile driving equipment, which can cause excessive vibration, is not expected to occur during construction of the proposed project.

The California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, which typically consist of buildings constructed since the 1990s. A conservative vibration limit of 0.3 in/sec PPV is used for buildings that are found to be structurally sound but where structural damage is a major concern (see Table 3 above for further explanation). For historical buildings or some older buildings, a vibration limit of 0.25 in/sec PPV would apply. Vibration levels exceeding these thresholds would be capable of cosmetically damaging adjacent buildings. 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.

According to the City's Historical Association,⁵ there is not a historical building within 1,000 feet of the project site. Therefore, no historical buildings would be subject to construction vibration levels generated at the project site exceeding 0.25 in/sec PPV. Conservatively, all buildings surrounding the project vicinity would be subject to the 0.3 in/sec PPV threshold.

Table 10 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock drills, and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.), may generate substantial vibration in the immediate vicinity. Jackhammers typically generate vibration levels of 0.035 in/sec PPV, and drilling typically generates vibration levels of 0.09 in/sec PPV at a distance of 25 feet.

Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Table 10 also summarizes the distances to the 0.3 in/sec PPV thresholds for adjacent buildings.

TABLE 10 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft., in/sec	Minimum Distance to Meet the 0.3 in/sec PPV Threshold, feet
Clam shovel drop		0.202	18
Hydromill (slurry wall)	in soil	0.008	1
	in rock	0.017	2
Vibratory Roller		0.210	19
Hoe Ram		0.089	9
Large bulldozer		0.089	9
Caisson drilling		0.089	9
Loaded trucks		0.076	8
Jackhammer		0.035	4
Small bulldozer		0.003	<1

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., July 2025.

Vibration levels are highest close to the source and then attenuate with increasing distance at the rate $\left(D_{ref}/D\right)^{1.1}$, where D is the distance from the source in feet and D_{ref} is the reference distance of 25 feet. While construction noise levels increase based on the cumulative equipment in use simultaneously, construction vibration levels would be dependent on the location of individual pieces of equipment. That is, equipment scattered throughout the site would not generate a collective vibration level, but a vibratory roller, for instance, operating near the project site

⁵<https://www.mountainviewhistorical.org/historical-buildings-in-mountain-view-ca/>

boundary would generate the worst-case vibration levels for the receptor sharing that property line. Further, construction vibration impacts are assessed based on the potential for damage to buildings on receiving land uses, not at receptors at the nearest property lines.

Existing structures to the north, to the east, and to the west of the project site would be 65 to 85 feet from the nearest project boundaries. At these distances, vibration levels would be at or below 0.07 in/sec PPV, which would not exceed the 0.3 in/sec PPV threshold. The nearest residences south of the project site would be about 15 feet from the southern boundary. Table 11 summarizes the vibration levels expected at the nearest south residences, assuming each piece of equipment operates along the shared property lines.

TABLE 11 Construction Vibration Levels Estimated at the Nearest Southern Residential Façade Adjoining the Project Site

Phase	Equipment	PPV at 25 ft., in/sec	Vibration at Nearest Residential Façade South of the Project Site (15ft)
Demolition	Concrete/Industrial Saw	0.035	0.061
	Rubber-Tired Dozer	0.089	0.156
	Tractor/Loader/Backhoe	0.003	0.005
Site Preparation	Grader	0.089	0.156
	Tractor/Loader/Backhoe	0.003	0.005
	Scraper	0.089	0.156
Grading/ Excavation	Grader	0.089	0.156
	Rubber-Tired Dozer	0.089	0.156
	Tractor/Loader/Backhoe	0.003	0.005
Trenching/ Foundation	Excavator	0.089	0.156
	Tractor/Loader/Backhoe	0.003	0.005
Building – Exterior	Crane	0.003	0.005
	Forklift	0.003	0.005
	Generator	0.003	0.005
	Welder	0.003	0.005
	Tractor/Loader/Backhoe	0.003	0.005
Building – Interior/ Architectural Coating	Air Compressor	0.003	0.005
Paving	Cement & Mortar Mixer	0.003	0.005
	Paver	0.003	0.005
	Paving Equipment	0.003	0.005
	Roller	0.21	0.368
	Tractor/Loader/Backhoe	0.003	0.005

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., July 2025.

Project construction activities would potentially generate vibration levels up to 0.4 in/sec PPV at the nearest residential structures south of the project site. A study completed by the US Bureau of

Mines analyzed the effects of blast-induced vibration on buildings in USBM RI 8507.⁶ The findings of this study have been applied to buildings affected by construction-generated vibrations.⁷ As reported in USBM RI 8507⁶ and reproduced by Dowding,⁷ Figure 2 presents the damage probability, in terms of “threshold damage” (described above as cosmetic damage), “minor damage,” and “major damage,” at varying vibration levels. Threshold damage, or cosmetic damage, would entail hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage would include hairline cracking in masonry or the loosening of plaster, and major structural damage would include wide cracking or shifting of foundation or bearing walls. If exposed to vibration levels of 0.4 in/sec PPV, there would be less than a 4% chance of cosmetic or threshold damage at the adjacent residential buildings. No minor or major damage would occur at these buildings.

Neither cosmetic, minor, nor major damage would occur at the conventional (i.e., non-historic) buildings located 20 feet or more from the project site during use of typical construction activities. At these locations, and in other surrounding areas where vibration would not be expected to cause cosmetic 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 (use of jackhammers and other high-power tools).

Since the nearest southern residences would potentially be exposed to construction vibration levels up to 0.4 in/sec PPV, which exceeds the State’s 0.3 in/sec PPV screening threshold.

The City’s Standard Conditions for vibration shall be incorporated into the project a condition of approval. The applicable condition is as follows:

PL-201 Vibration Best Management Practices Construction Measures:

- Avoid impact pile driving and drill piles instead where possible. Drilled piles cause lower vibration levels where geological conditions permit their use. *(not applicable)*
- Avoid using vibration rollers and tampers near sensitive areas.
- In areas where project construction is anticipated to include vibration generating activities, vibration studies shall be conducted to determine the areas of impact and to present appropriate mitigation measures that may include the following *(not applicable)*:
 - Identification of sites that would be exposed to project vibration compaction activities and could result in vibration impacts to structures *(not applicable)*;
 - Develop a vibration monitoring and contingency plan *(not applicable)*;

⁶ Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting, RI 8507, Bureau of Mines Report of Investigations, U.S. Department of the Interior Bureau of Mines, Washington, D.C., 1980.

⁷ Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

- Construction contingency plan (*not applicable*); and
- Conduct post-survey on structures where either monitoring has indicated high levels or complaints of damage have been made (*not applicable*).

Use of large vibratory rollers shall be avoided within 19 feet of the adjacent buildings. Alternatively, small vibratory rollers comparable to a Caterpillar model CP433E vibratory compactor (less than 18,000 pounds) shall be used along the southern boundary of the project site. Static rollers may also be used in lieu of vibratory rollers. This would reduce vibration levels to below 0.3 in/sec PPV at the adjoining buildings south of the project site and reduce the vibration impact to a less-than-significant level.

Mitigation Measure 1b: No further mitigation required.

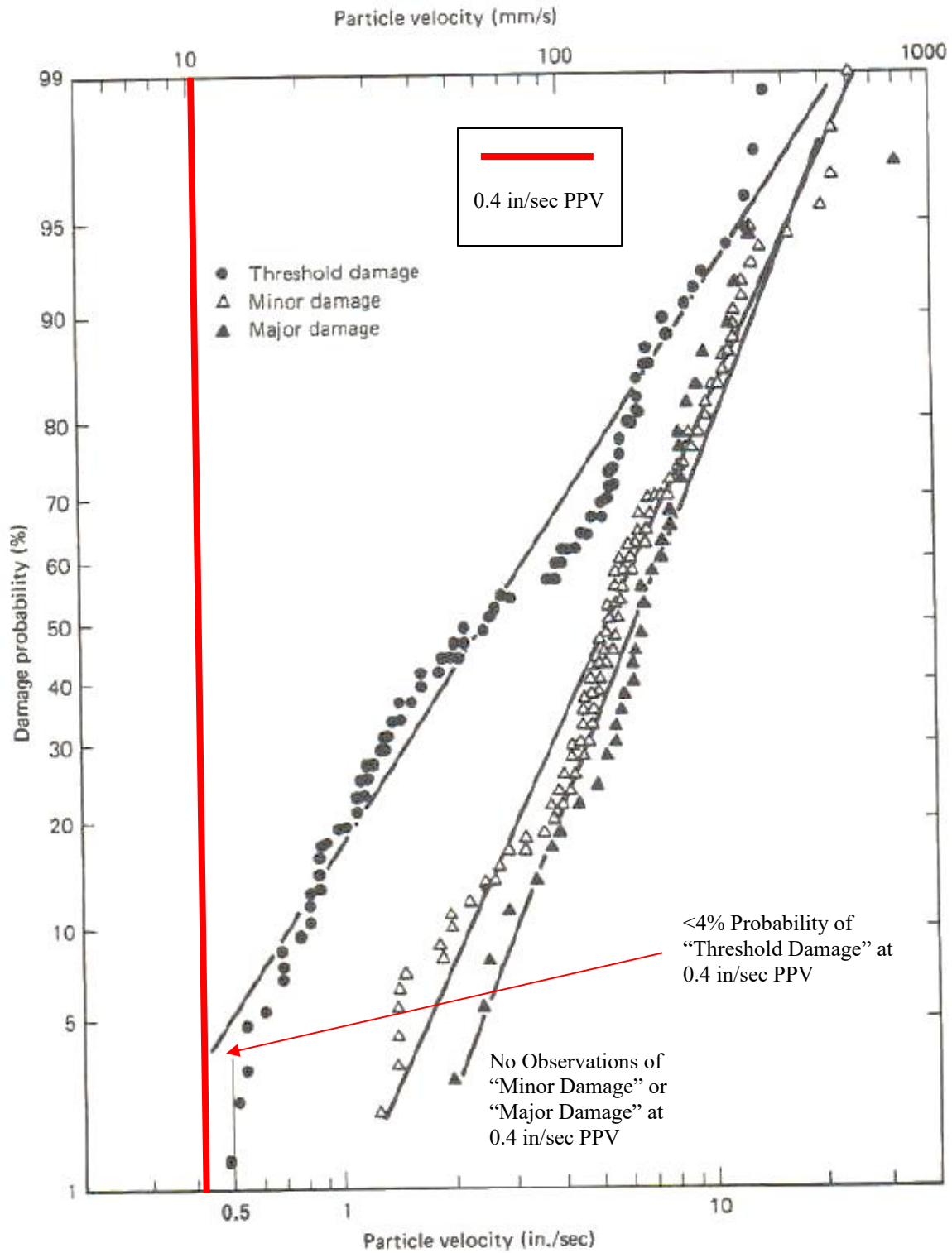
Impact 3: Excessive Aircraft Noise. The project site is located more than 1.3 miles from the Moffett Federal Airfield and more than 7 miles from the San José Mineta International Airport. Impacts associated with noise levels due to aircraft would be **less-than-significant**.

The Moffett Federal Airfield is more than 1.3 miles northeast of the project site, and the San José Mineta International Airport is more than 7 miles southeast of the project site. As shown in Figure 3, the project site is well outside the 65 dBA CNEL/L_{dn} contour line for the Moffett Federal Airfield. The required safe and compatible threshold for exterior noise levels would be at or below 65 dBA CNEL/DNL for aircraft. Therefore, the proposed project would be compatible with the City's exterior noise standards for aircraft noise.

Assuming standard construction materials with forced-air mechanical ventilation for aircraft noise, as recommended above for all residential units located on the project site, the future interior noise levels resulting from aircraft would be below 45 dBA CNEL/L_{dn}. Therefore, future interior noise at the proposed building would be compatible with aircraft noise with the inclusion of forced-air mechanical ventilation. This would be a less-than-significant impact.

Mitigation Measures: None required.

FIGURE 2 Probability of Cracking and Fatigue from Repetitive Loading



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

2022 Aircraft Noise Contours with AIA

CNEL (dBs)

- 65
- 70
- 75

0 3,000 6,000 Feet

This map was created by Santa Clara County Planning Office. The GIS data were compiled from various sources. While deemed reliable, the Planning Office assumes no liability for errors or omissions. 11/16/2022 - Y:\GIS\ALLC\projects\2022\2022_Aircraft_Noise_Contours.aprx

Source: Comprehensive Land Use Plan Santa Clara County, Moffett Federal Airfield, December 19, 2018.

Cumulative Impacts

Cumulative noise impacts could result from either cumulative traffic noise increases under future conditions or temporary construction noise from cumulative construction projects.

Project-generated vehicle trips are insignificant when compared to existing traffic volumes and would continue to be insignificant under future cumulative conditions. The project is not expected to result in a cumulatively considerable traffic noise increase. This is a less-than-significant impact.

From the City's website,⁸ there are five planned or approved projects located within 1,000 feet of the project site:

- **Arbor Square Project** – a 38-rowhouse development is proposed at 922-950 San Leandro Avenue, which is approximately 400 feet east of the proposed project site. This project is currently in the planning phase of development and could potentially be constructed simultaneously or consecutively with the proposed project site. The receptors identified in this report as the east residences and offices would be located between the two project sites; however, the residences are closer to the proposed project site (924-940 San Rafael Avenue site) than the Arbor Square Project site. Further, depending on the location of the offices within the building, exposure would be dominated by the nearest construction site, and cumulative construction would be minimal to none due to the size of the two project sites.
- **1001 North Shoreline Boulevard** – a mixed-use development is proposed at 1001 North Shoreline Boulevard, which is approximately 830 feet northwest of the project site. This project is currently under construction and is expected to be completed by 2026. Additionally, this project would not share any noise-sensitive receptors with direct line-of-sight to both project sites. This would not result in a cumulative construction impact.
- **1110 Terra Bella** – a seven-story, 70-unit affordable housing development is planned approximately 550 feet northwest of the proposed project site. The construction schedule for this project is unknown at this time. However, these two sites would not share noise-sensitive receptors with direct line-of-sight to both projects. This would not result in a cumulative construction impact.
- **1020 Terra Bella** – this approved project would include a six-story, 108-unit affordable housing development approximately 365 feet north of the proposed project site. The construction schedule for this project is unknown at this time. The office buildings north of the proposed project site would also have direct line-of-sight to the 1020 Terra Bella site. However, offices facing the proposed project site would be located on the south of the office building, and the offices facing the 1020 Terra Bella site would be located on the north side of the building. Therefore, no one receptor at the office building would have direct exposure to both construction sites. This would not result in a cumulative construction impact.
- **1040 Terra Bella** – this project site is located approximately 525 feet north of the proposed project site and would include the construction of two personal storage buildings that are six-

⁸ <https://www.mountainview.gov/our-city/departments/community-development/planning/active-projects>

and four-stories in size. This project has been approved; however, the construction schedule is currently unknown. The office buildings north of the proposed project site would also have direct line-of-sight to the 1040 Terra Bella site. However, offices facing the proposed project site would be located on the south side of the office building, and the offices facing the 1040 Terra Bella site would be located on the north side of the building. Therefore, no one receptor at the office building would have direct exposure to both construction sites. This would not result in a cumulative construction impact

With the location of the shared receptors being closer to either the Arbor Square Project site or the proposed project site, the nearest construction site would dominate the noise environment of the receptors temporarily. With the incorporation of the measures in Mitigation Measure 1a, summarized above, and measures recommended for the Arbor Square Project, the potential cumulative construction impact would be reduced to a less-than-significant level.

There are no other planned or approved development projects located within 1,000 feet of the project site that could contribute to a cumulative construction impact.

FIGURE A1 Daily Trend in Noise Levels at LT-1, Wednesday, June 25, 2025

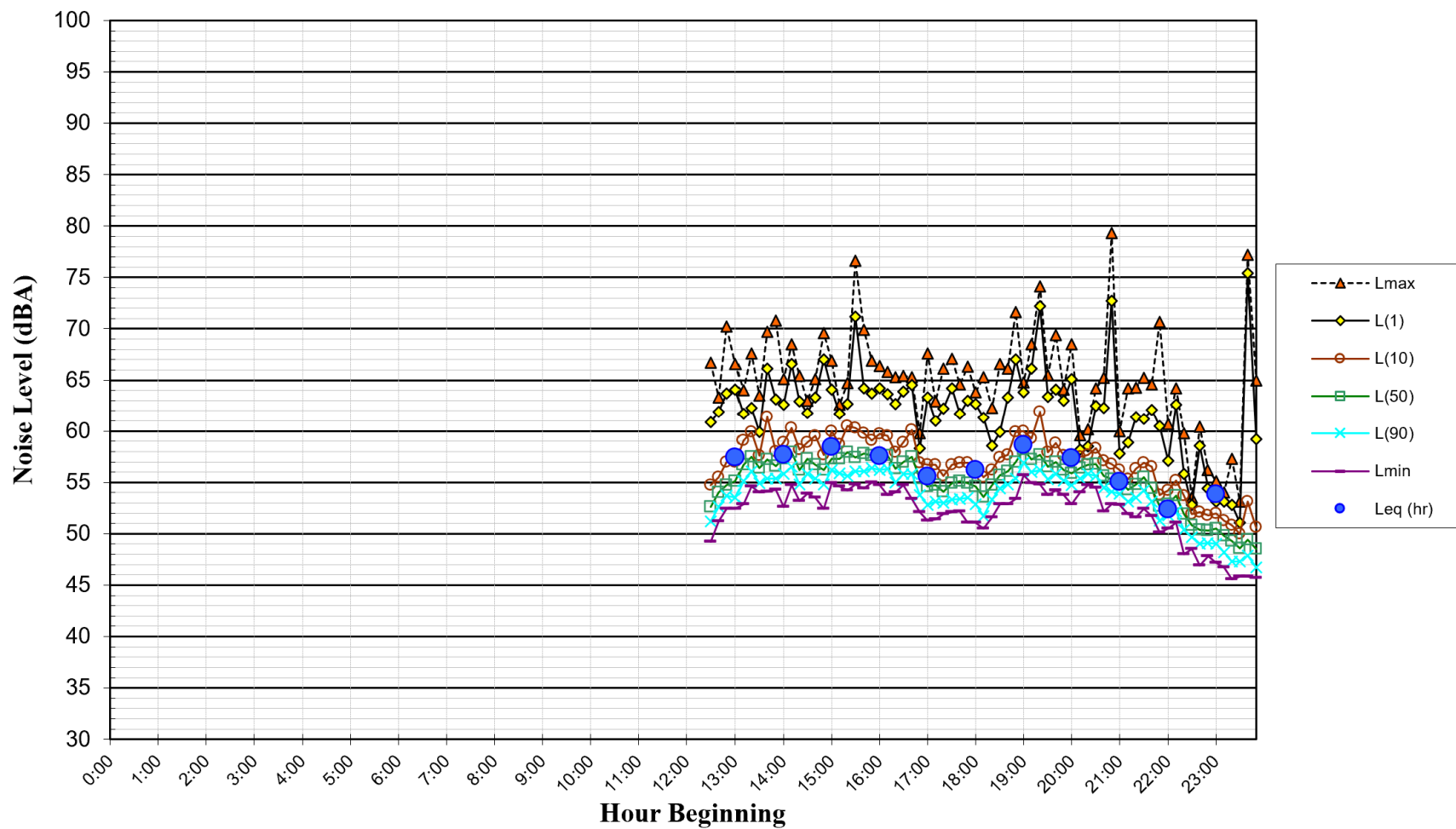


FIGURE A2 Daily Trend in Noise Levels at LT-1, Thursday, June 26, 2025

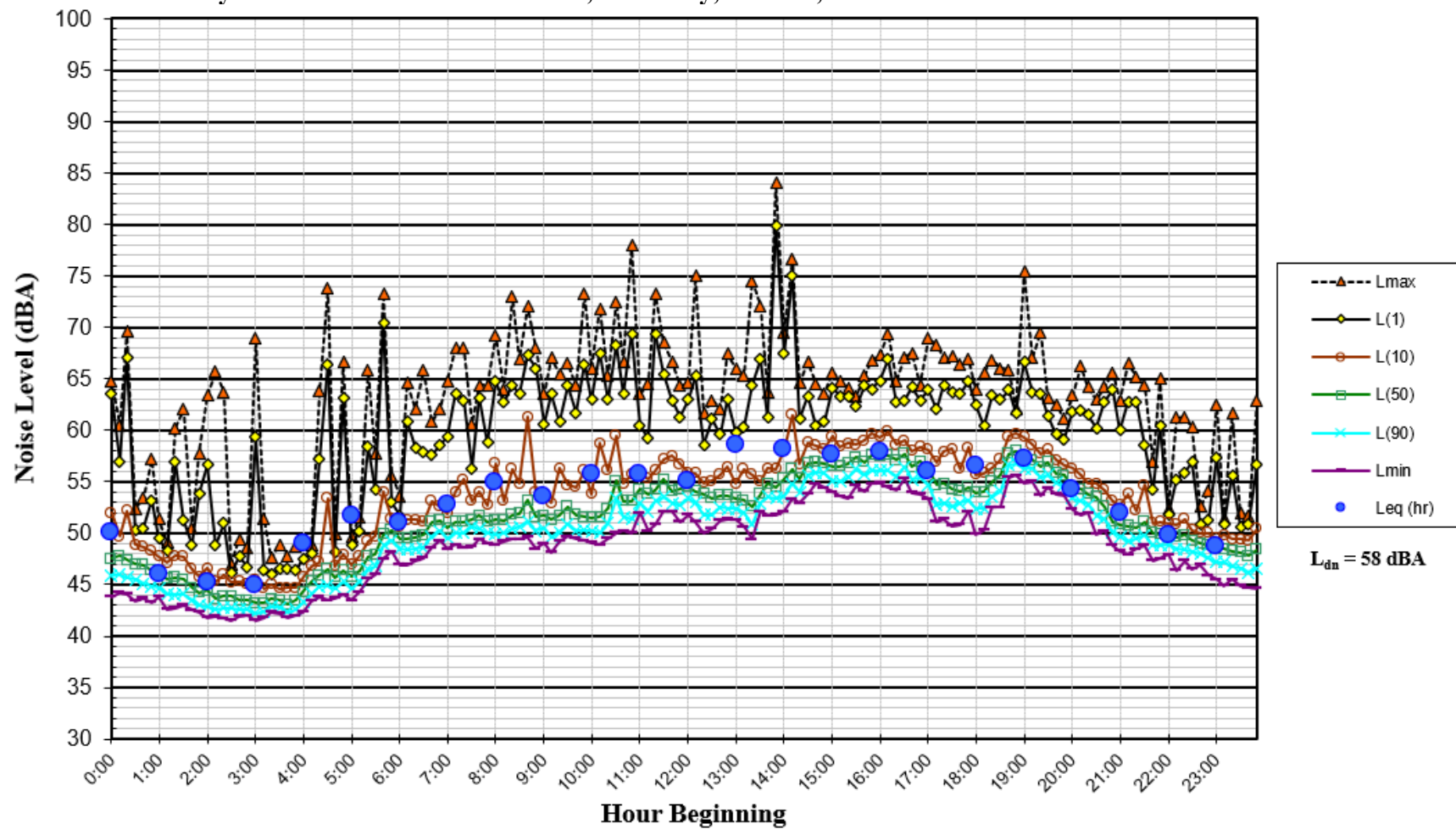


FIGURE A3 Daily Trend in Noise Levels at LT-1, Friday, June 27, 2025

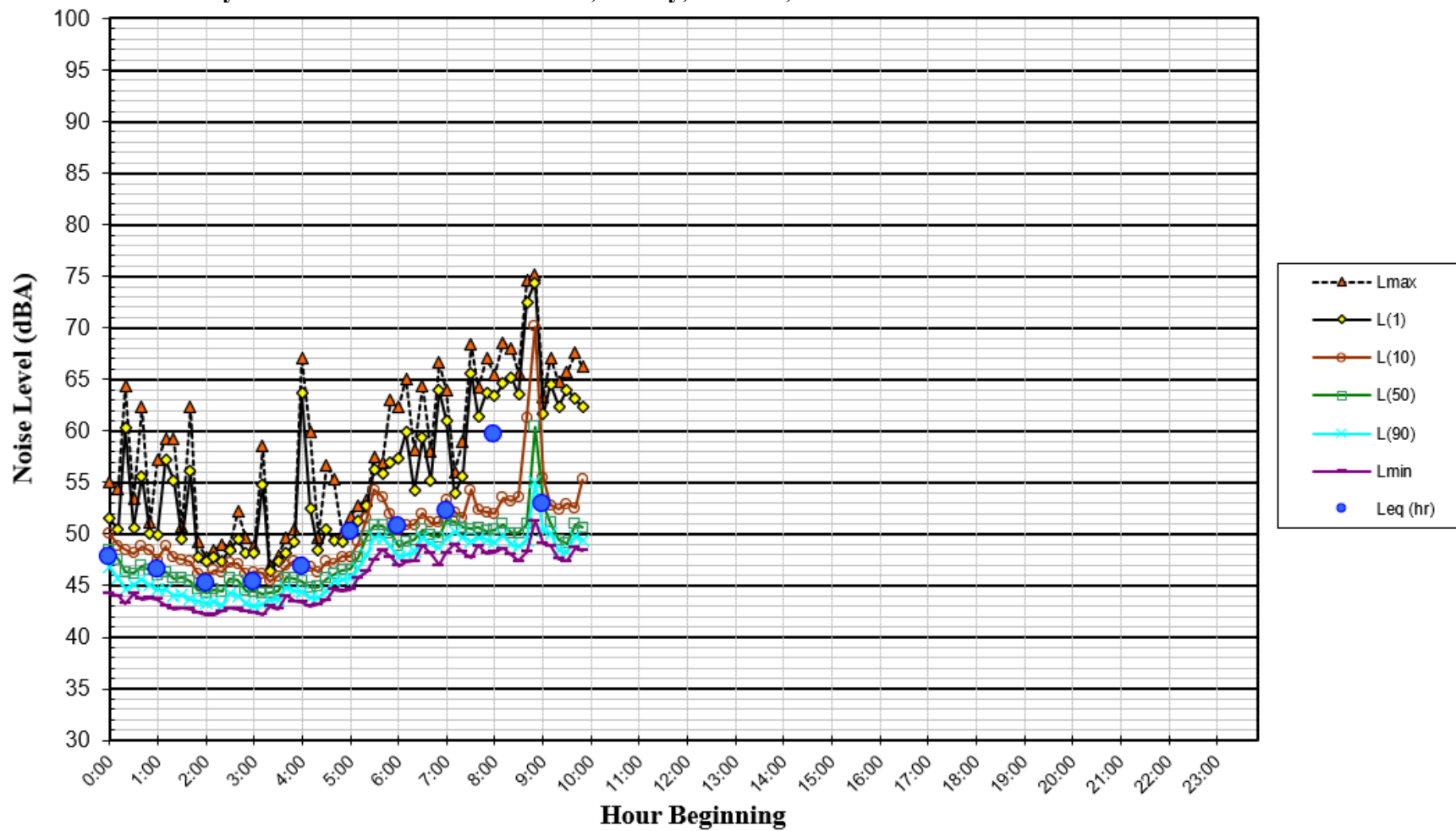


FIGURE A4 Daily Trend in Noise Levels at LT-2, Wednesday, June 25, 2025

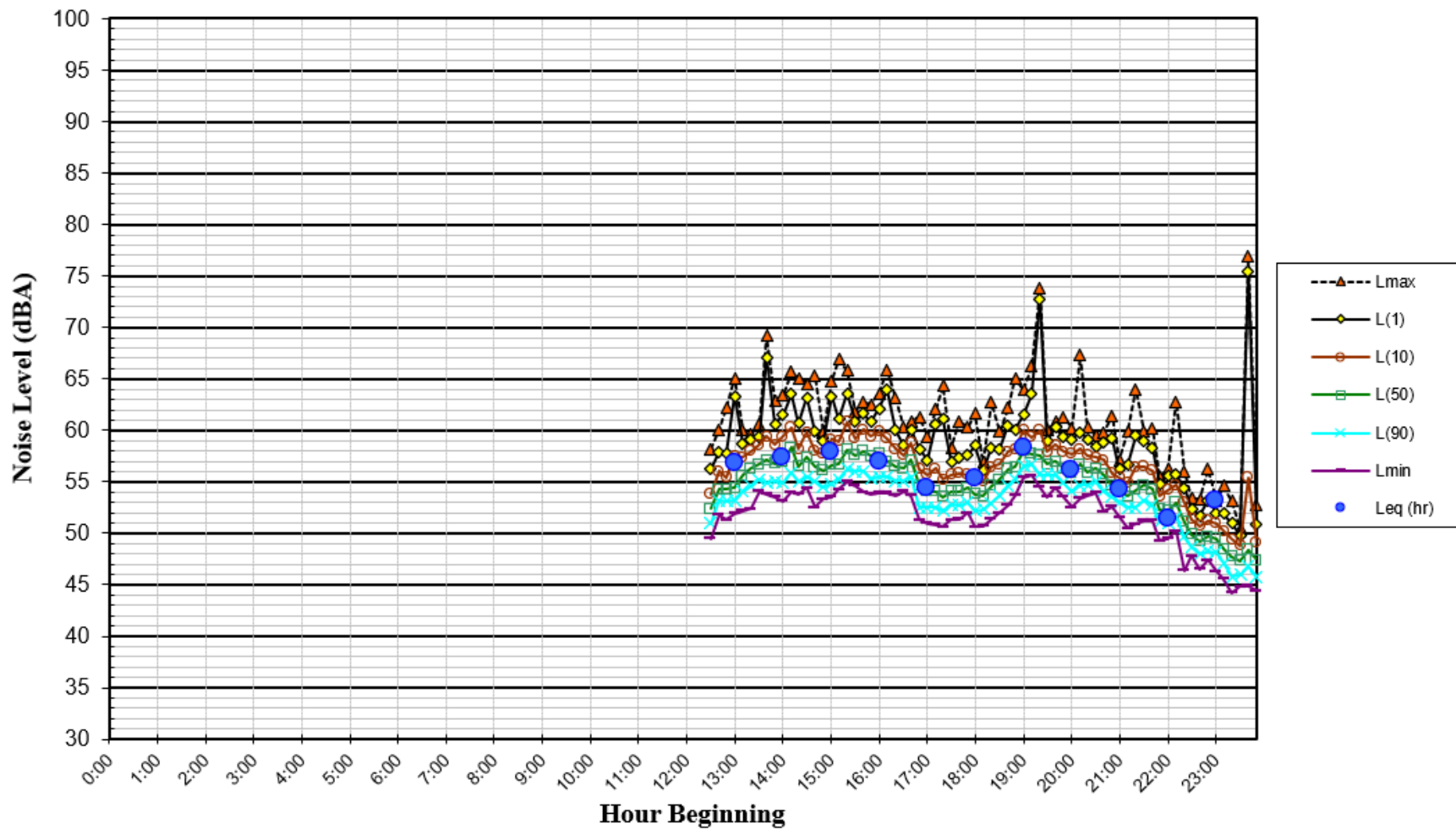


FIGURE A5 Daily Trend in Noise Levels at LT-2, Thursday, June 26, 2025

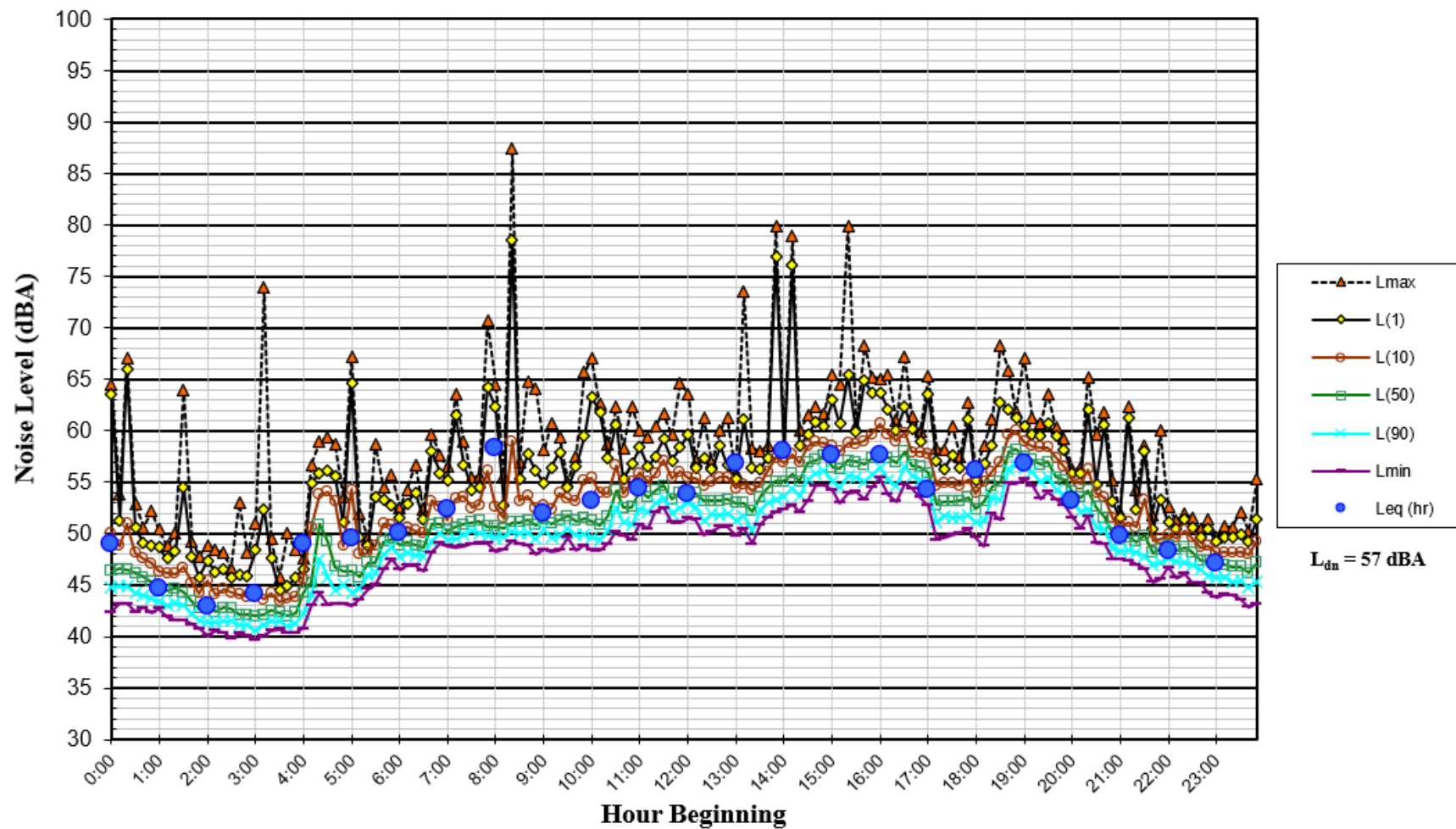


FIGURE A6 Daily Trend in Noise Levels at LT-2, Friday, June 27, 2025

