BESPOKE PROJECT
445 SOUTH B STREET
NOISE AND VIBRATION ASSESSMENT

San Mateo, California

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INTRODUCTION

A seven-story affordable housing building and a six-story commercial building are proposed at 445 South B Street in San Mateo, California. The proposed residential building would include 71 units and approximately 5,964 square feet used for a Self-Help Center for the Elderly. The commercial building would include 148,939 square feet of office space and 13,995 square feet of retail space. Currently, the project site is developed with four commercial buildings and a City-owned parking lot, which would be demolished as part of the proposed project.

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 and vibration conditions in the project vicinity; 2) the Plan Consistency Analysis section discusses noise and land use compatibility utilizing policies in the City's General Plan and vibration compatibility utilizing FTA thresholds for acceptability; 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 which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

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

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

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

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noises of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA 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. 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 between 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. 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 to 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.

TABLE 1 Definition of Acoustical Terms Used in this Report

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

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

TABLE 2 Typical Noise Levels in the Environment

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

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

Fundamentals of Groundborne Vibration

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

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

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Human perception 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, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk of 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 in a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Railroad and light rail operations are potential sources of substantial ground vibration depending on distance, the type and the speed of trains, and the type of railroad track. People’s response to ground vibration from rail vehicles has been correlated best with the average, root mean square

(RMS) velocity of the ground. The velocity of the ground is expressed on the decibel scale. The reference velocity is 1 x 10-6 in/sec RMS, which equals 0 VdB, and 1 in/sec equals 120 VdB. Although not a universally accepted notation, the abbreviation "VdB" is used in this document for vibration decibels to reduce the potential for confusion with sound decibels.

Typical background vibration levels in residential areas are usually 50 VdB or lower, well below the threshold of perception for most humans. Perceptible vibration levels inside residences are attributed to the operation of heating and air conditioning systems, door slams and foot traffic. Construction activities, train operations, and street traffic are some of the most common external sources of vibration that can be perceptible inside residences. Table 4 illustrates some common sources of vibration and the association to human perception or the potential for structural damage.

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

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	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.

TABLE 4 Typical Levels of Groundborne Vibration

Human/Structural Response	Velocity Level, VdB	Typical Events (50-foot setback)
Threshold, minor cosmetic damage	100	Blasting, pile driving, vibratory compaction equipment
		Heavy tracked vehicles (Bulldozers, cranes, drill rigs)
Difficulty with tasks such as reading a video or computer screen	90	
		Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid transit, upper range
Residential annoyance, occasional events		Commuter rail, typical Bus or truck over bump or on rough roads
Residential annoyance, frequent events	70	Rapid transit, typical
Approximate human threshold of perception to vibration		Buses, trucks and heavy street traffic
	60	
		Background vibration in residential settings in the absence of activity
Lower limit for equipment ultra-sensitive to vibration	50	

Source: Transit Noise and Vibration Impact Assessment, US Department of Transportation Federal Transit Administration, September 2018.

Regulatory Background – Noise

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

<u>State of California</u>

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

(a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

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

(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.

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

2022 California Building Cal Green Code. The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2022 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). The sections that pertain to this project are as follows:

> **5.507.4.1 Exterior noise transmission, prescriptive method.** Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA L_{dn} noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.
>
> **5.507.4.2 Performance method.** For buildings located, as defined by Section 5.507.4.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\,(1\text{-hr})}$) of 50 dBA in occupied areas during any hour of operation.

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

City of San Mateo

City of San Mateo General Plan: The Noise Element of the City of San Mateo General Plan sets forth goals and policies to control environmental noise and protect citizens from excessive noise exposure. The goals and policies relevant to this project are summarized below:

GOAL 1: Protect "noise sensitive" land uses from excessive noise levels.

POLICIES:

N 1.1: Interior Noise Level Standard. Require submittal of an acoustical analysis and interior noise insulation for all "noise sensitive" land uses listed in Table N-1 that have an exterior noise level of 60 dB (L_{dn}) or above, as shown on Figure N-1. The maximum interior noise level shall not exceed 45 dB (L_{dn}) in any habitable rooms.

N 1.2: Exterior Noise Level Standard. Require an acoustical analysis for new parks, play areas, and multi-family common open space (intended for the use and the enjoyment of residents) that have an exterior noise level of 60 dB (L_{dn}) or above, as shown on Figure N-1. Require an acoustical analysis that uses peak hour L_{eq} for new parks and play areas. Require a feasibility analysis of noise reduction measures for public parks and play areas. Incorporate necessary mitigation measures into residential project design to minimize common open space noise levels. Maximum exterior noise should not exceed 67 dB (L_{dn}) for residential uses and should not exceed 65 dB (L_{eq}) during the noisiest hour for public park uses.

GOAL 2: Minimize unnecessary, annoying and unhealthful noise.

POLICIES:

N 2.1: Noise Ordinance. Continue implementation and enforcement of City's existing noise control ordinance: (a) which prohibits noise that is annoying or injurious to neighbors of normal sensitivity, making such activity a public nuisance, and (b) restricts the hours of construction to minimize noise impact.

N 2.2: Minimize Noise Impact. Protect all "noise-sensitive" land uses listed in Tables N-1 and N-2 from adverse impacts caused by noise generated on-site by new developments. Incorporate necessary mitigation measures into development design to minimize noise impacts. Prohibit long-term exposure increases of 3 dB (L_{dn}) or greater at the common property line, excluding existing ambient noise levels.

N 2.3: Minimize Commercial Noise. Protect land uses other than those listed as "noise sensitive" in Table N-1 from adverse impacts caused by the on-site noise generated by new developments. Incorporate necessary mitigation measures into development design to minimize noise impacts. Prohibit new uses that generate noise levels of 65 dB (L_{dn}) or above at the property line, excluding existing ambient noise levels.

N 2.4: Traffic Noise. Recognize projected increases in ambient noise levels resulting from traffic increases. Promote the installation of noise barriers along highways where "noise-sensitive" land uses listed in Table N-1 are adversely impacted by unacceptable noise levels [60 dB (L_{dn}) or above]. Require adequate noise mitigation to be incorporated into the widening of SR 92 and US 101. Accept noise increases on El Camino Real at existing development and require new multi-family development to provide common open space having a maximum exterior noise level of 67 dB (L_{dn}).

N 2.5: Railroad Noise. Promote the installation of noise barriers along the railroad corridor where "noise-sensitive" land uses are adversely impacted by unacceptable noise levels [60 dB (L_{dn}) or greater]. Promote adequate noise mitigation to be incorporated into any rail service expansion or track realignment. Study the need of depressing the rail line to eliminate at-grade crossings or other mitigation measures to decrease noise levels prior to substantial expansion of the rail service.

TABLE N-1
NOISE SENSITIVE LAND-USE COMPATIBILITY GUIDELINES FOR COMMUNITY NOISE ENVIRONMENTS[1]
Day-Night Average Sound Level (L_{dn}), Decibels

Land-Use Category	Normally Acceptable[2]	Conditionally Acceptable[3]	Normally Unacceptable[4]
Single-Family Residential	50 to 59	60 to 70	Greater than 70
Multi-Family Residential	50 to 59	60 to 70	Greater than 70
Hotels, Motels, and Other Lodging Houses	50 to 59	60 to 70	Greater than 70
Long-Term Care Facilities	50 to 59	60 to 70	Greater than 70
Hospitals	50 to 59	60 to 70	Greater than 70
Schools	50 to 59	60 to 70	Greater than 70
Multi-Family Common Open Space Intended for the Use and Enjoyment of Residents	50 to 67	--	Greater than 67

TABLE N-2
NOISE GUIDELINES FOR OUTDOOR ACTIVITIES
Average Sound Level (L_{eq}), Decibels

Land Use Category	Normally Acceptable[2]	Conditionally Acceptable[3]	Normally Unacceptable[4]
Parks, Playgrounds	50 to 65*	--	Greater than 65*

[1] These guidelines are derived from the California Department of Health Services, Guidelines for the Preparation and Content of the Noise Element of the General Plan, 2003. The State Guidelines have been modified to reflect San Mateo's preference for distinct noise compatibility categories and to better reflect local land-use and noise conditions. It is intended that these guidelines be utilized to evaluate the suitability of land-use changes only and not to determine cumulative noise impacts. Land uses other than those classified as being "noise sensitive" are exempt from these compatibility guidelines.
[2] 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.
[3] Conditionally Acceptable – New construction should be undertaken only after a detailed analysis of the noise reduction requirement is conducted and needed noise insulation features included in the design.
[4] Normally Unacceptable – New construction 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.
* Average Sound Level (L_{eq}) for peak hour.

City of San Mateo Municipal Code: The Noise Regulations of the San Mateo Municipal Code, Chapter 7.30 are set forth to protect the inhabitants of the City against all forms of nuisances.

Section 7.30.040 Maximum Permissible Sound Levels. It is unlawful for any person to operate or cause to be operated any source of sound at any location within the city or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured on any other property to exceed:

(1) The noise level standard for that property as specified in Table 7.30.040 for a cumulative period of more than thirty minutes in any hour;
(2) The noise level standard plus five dB for a cumulative period of more than fifteen minutes in any hour;
(3) The noise level standard plus ten dB for a cumulative period of more than five minutes in any hour;
(4) The noise level standard plus fifteen dB for a cumulative period of more than one minute in any hour; or
(5) The noise level standard or the maximum measured ambient level, plus twenty dB for any period of time.

If the measured ambient level for any area is higher than the standard set in Table 7.30.040, then the ambient shall be the base noise level standard for purposes of this section. In such cases, the noise levels for purposes of subsections (2) through (5) of this section shall be increased in five dB increments above the ambient.

Table 7.30.040: Noise Level Standards

Noise Zone	Time Period	Noise Level, dBA
Noise Zone 1 (single-family residential zone)	10 p.m.--7 a.m.	50
	7 a.m.--10 p.m.	60
Noise Zone 2 (commercial/mixed residential, multi-family residential)	10 p.m.--7 a.m.	55
	7 a.m.--10 p.m.	60
Noise Zone 3 (commercial or central business district)	10 p.m.--7 a.m.	60
	7 a.m.--10 p.m.	65
Noise Zone 4 (any manufacturing or industrial zone)	Anytime	70

Section 7.30.060 Special Provisions. Construction, alteration, repair, or land development activities authorized by a valid city permit shall be allowed at the following times:

- Weekdays: between 7:00 a.m. and 7:00 p.m.
- Saturdays: between 9:00 a.m. and 5:00 p.m.
- Sundays and Holidays: between 12:00 p.m. and 4:00 p.m.
- Or at other such hours as authorized or restricted by the permit, so long as they meet the following conditions:

1. No individual piece of equipment shall produce a noise level exceeding 90 dBA at a distance of 25 feet. If the device is housed within a structure on the property, the measurement shall be made outside the structure at a distance as close to 25 feet as possible.
2. The noise level outside of any point outside the property plane of the project shall not exceed 90 dBA.

Regulatory Background – Vibration

Federal Government

Federal Transit Administration. The FTA has identified vibration impact criteria for sensitive buildings, residences, and institutional land uses near rail transit and railroads. These criteria are shown in Table 5. The thresholds for office buildings that operate primarily during daytime hours are 75 VdB for frequent events (more than 70 events of the same source per day), 78 VdB for occasional events (30 to 70 vibration events of the same source per day), and 83 VdB for infrequent events (less than 30 vibration events of the same source per day).

TABLE 5 Groundborne Vibration Impact Criteria

Land Use Category	Groundborne Vibration Impact Levels (VdB re 1 µinch/sec, RMS)		
	Frequent Events[1]	**Occasional Events[2]**	**Infrequent Events[3]**
Category 1 Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2 Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3 Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1. "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research should always require detailed evaluation to define the acceptable vibration levels. Ensuring low vibration levels in a building requires special design of HVAC systems and stiffened floors.

Existing Noise Environment

The project site is located at 445 South B Street in San Mateo, California. The project site is bound by South B Street, East 4th Avenue, East 5th Avenue, and South Railroad Avenue. The surrounding land uses include a future mixed-use development to the southwest, opposite South B Street; commercial uses to the west, opposite the East 4th Avenue/South B Street intersection; commercial uses to the northwest, opposite East 4th Avenue; an existing office building to the north, opposite East 4th Avenue/South Railroad Avenue; a future residential building to the northeast, opposite South Railroad Avenue and the railroad tracks; a future parking garage to the east, opposite the East 5th Avenue/South Railroad Avenue intersection; commercial uses to the southeast, opposite East 5th Avenue; and a residential building to the south, opposite the East 5th Avenue/South B Street intersection.

The existing noise environment at the site results primarily from railroad activity (UPRR and Caltrain) and local vehicular traffic along East 4th Avenue and South B Street. U.S. Highway 101 (Highway 101) traffic and aircraft associated with the San Francisco International Airport also contribute to the noise environment.

A noise monitoring survey, which included two long-term (LT-1 and LT-2) and two short-term (ST-1 and ST-2) noise measurements, was performed at the site between Wednesday, September 13, 2023, and Friday, September 15, 2023. All measurement locations are shown in Figure 1.

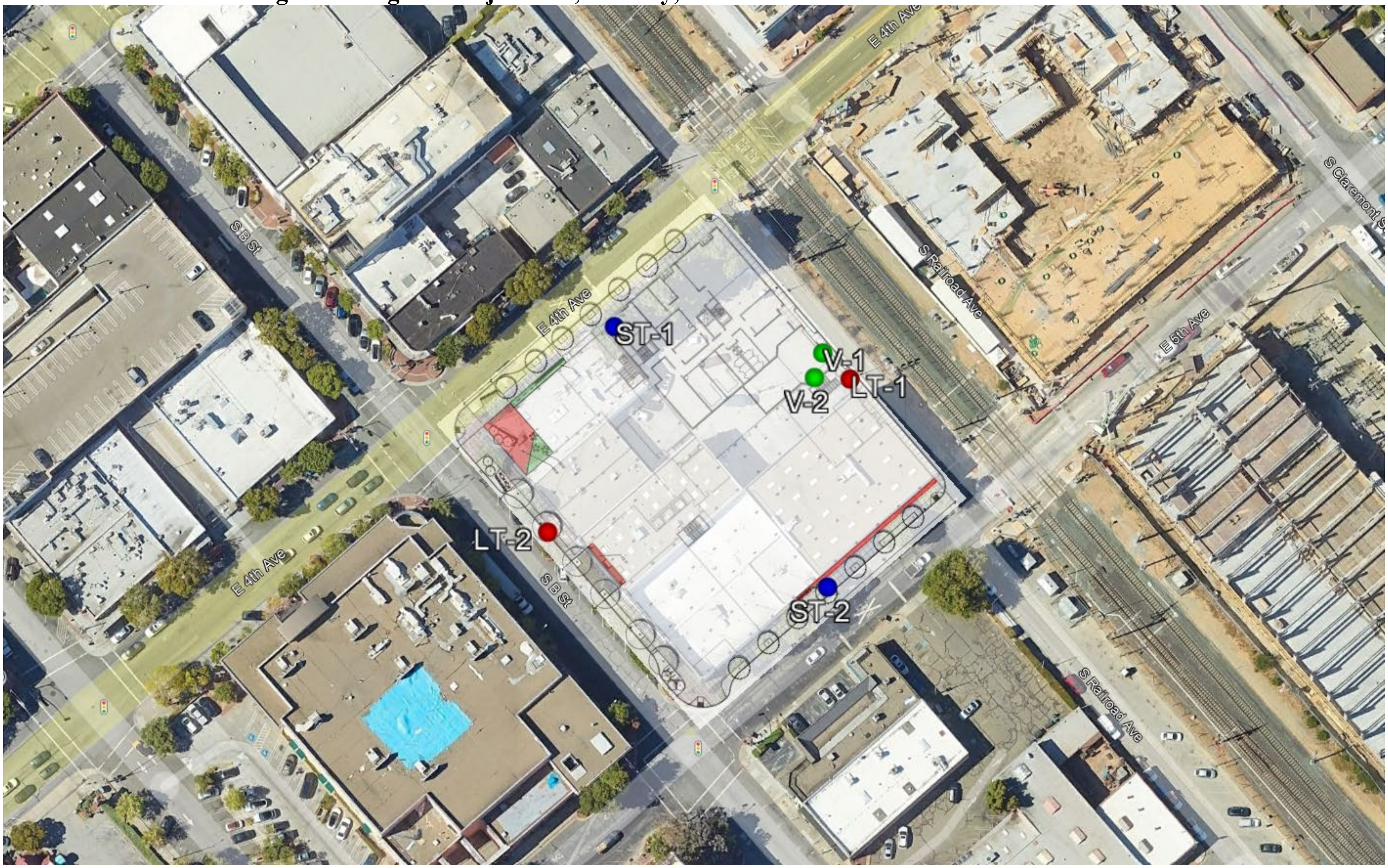
Long-term noise measurement LT-1 was made approximately 15 feet southwest of the centerline of South Railroad Avenue and approximately 40 feet southwest of the nearest set of railroad tracks. LT-1 was positioned at the approximate setback of the northeastern façade of the proposed building. Hourly average noise levels at LT-1 typically ranged from 75 to 84 dBA L_{eq} during daytime hours (between 7:00 a.m. and 10:00 p.m.) and from 54 to 81 dBA L_{eq} during nighttime hours (between 10:00 p.m. and 7:00 a.m.). The day-night average noise level (L_{dn}) for the 24-hour period occurring on Thursday, September 14, 2023, was 82 dBA L_{dn}. The daily trends in noise levels at LT-1 are shown in Figures A1 through A3 in the Appendix of this report.

Noise measurement LT-2 was made approximately 30 feet northeast of the centerline of South B Street. Hourly average noise levels at LT-2 typically ranged from 60 to 68 dBA L_{eq} during the day and from 50 to 66 dBA L_{eq} at night. The L_{dn} on Thursday, September 14, 2023, was 67 dBA. The daily trends in noise levels at LT-2 are shown in Appendix Figures A4 through A6.

Two short-term noise measurements were made on Wednesday, September 13, 2023, in 10-minute intervals between 11:50 a.m. and 12:30 p.m.

ST-1 was made along the northwestern boundary of the site, approximately 35 feet southeast of the East 4th Avenue centerline. The dominant noise source at ST-1 was traffic along East 4th Avenue, with passenger cars generating noise levels of 58 to 73 dBA and a bus generating noise levels of 75 dBA. Additionally, distant intermittent construction generated noise levels of 55 to 61 dBA. The 10-minute average noise level at ST-1 was 61 dBA L_{eq}.

FIGURE 1 Aerial Image Showing the Project Site, Vicinity, and Locations of Noise and Vibration Measurements



Source: Google Earth, 2023.

ST-2 was made along the southeastern boundary of the project site, approximately 30 feet from the centerline of East 5th Avenue. ST-2 was made during two consecutive 10-minute measurement periods. The dominant noise source at ST-2 was East 5th Avenue traffic, with passenger cars generating noise levels of 57 to 66 dBA and heavy trucks generating noise levels of 74 dBA. A Caltrain pass-by occurred during both 10-minute periods, generating noise levels up to 88 dBA. Additionally, distant intermittent construction noise levels ranged from 50 to 54 dBA, and a jet flyover generated noise levels of 64 dBA. The 10-minute average noise level at ST-2 was 66 dBA L_{eq} during both 10-minute periods.

Table 6 summarizes the results of the 10-minute noise measurements made at ST-1 and ST-2.

TABLE 6 Summary of Short-Term Noise Measurement Data (dBA)

Noise Measurement Location	Date, Time	Measured Noise Level, dBA					
		L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	L_{eq}
ST-1: ~35 feet southeast of the East 4th Avenue centerline	9/13/2023, 11:50-12:00	75	72	64	58	54	61
ST-2: ~30 feet northwest of the East 5th Avenue centerline	9/13/2023, 12:10-12:20	88	78	67	60	53	66
	9/13/2023, 12:20-12:30	88	78	64	58	51	66

Existing Vibration Environment

Vibration measurements were made along the northeastern boundary of the project site. As shown in Figure 1, V-1 and V-2 were positioned approximately 40 and 55 feet from the edge of the nearest railroad tracks, respectively, and approximately 60 and 75 feet from the edge of the farthest tracks. Both vibration sensors were measured at-grade with the tracks.

Five observed and recorded vibration measurements of individual train activity were conducted on Wednesday, September 13, 2023, between 10:41 a.m. and 11:50 a.m. The instrumentation used to conduct the measurements included a Roland model R-07 solid state recorder and seismic grade, low noise accelerometers firmly fixed to the ground. This system was capable of accurately measuring very low vibration levels.

Vibration levels at V-1 ranged from 68 to 73 VdB (average of 69 VdB), and vibration levels at V-2 ranged from 67 to 71 VdB (average of 68 VdB). Table 7 summarizes each of the five measurements made at V-1 and V-2. Vibration levels were measured in the vertical axis because ground vibration is typically most dominant on this axis. Vibration levels measured at V-1 and V-2 during each of the train pass-by events are shown in Figures A7 and A8 of Appendix A.

TABLE 7 Summary of Train Pass-by Vibration Measurements Made at V-1 and V-2

Date, Time	Train Information								Vibration Level, VdB	
	Type of Train	No. of Engines	No. of Cars	Track	Distance from V-1, feet	Distance from V-2, feet	Direction of Travel	Speed, mph	V-1	V-2
9/13/2023, 10:41 a.m.	Caltrain	1	5	Near	40	55	SB	28	71	69
9/13/2023, 10:59 a.m.	Caltrain	1	5	Far	60	75	NB	32	68	67
9/13/2023, 11:17 a.m.	Caltrain	1	5	Near	40	55	SB	30	70	69
9/13/2023, 11:38 a.m.	Caltrain	1	5	Far	60	75	NB	27	68	67
9/13/2023, 11:41 a.m.	Caltrain	1	5	Near	40	55	SB	31	73	71

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The City of San Mateo General Plan, which is presented in detail in the Regulatory Background section of this report, includes exterior and interior noise thresholds for residential uses. Note, the City's exterior noise thresholds apply only to common use areas and not private balconies, porches, or patios. Additionally, the State of California establishes acceptable interior noise limits within residential and non-residential land uses. The thresholds that apply to the proposed project are summarized below:

- Policy N 1.2 and Table N-1 of the City's General Plan identifies exterior noise thresholds of 59 dBA L_{dn} or below as "normally acceptable" for multi-family residential uses; however, the policy further states that common open spaces at multi-family residential buildings intended for the use and enjoyment of residents would be limited to a maximum allowable noise level of 67 dBA L_{dn}.

- The City and State's acceptable interior noise level standard is 45 dBA L_{dn} or less for the proposed residential land uses.

- The Cal Green Code standards specify an interior noise environment attributable to exterior sources not to exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas of nonresidential uses during any hour of operation.

The future noise environment at the site would continue to result primarily from vehicular traffic along nearby roadways and adjoining railroad tracks. The traffic study completed for the proposed project included peak hour turning movements for six intersections in the project vicinity. The estimated traffic noise increase under the cumulative plus project traffic scenario would be 2 dBA L_{dn} along East 4th Avenue and East 5th Avenue when compared to existing volumes. Additionally, train activity along the adjoining tracks is not expected to change under future conditions, and therefore, would not contribute to a noise level increase at the project site. Conservatively, a 2 dBA L_{dn} traffic noise increase is assumed at the project site under future cumulative conditions.

Future Exterior Noise Environment

The site plan shows a second-floor amenity terrace associated with the residential component of the proposed project. The second-floor amenity terrace would be located on the interior of the project, with the proposed buildings providing shielding from all surrounding roadways and train tracks. Future exterior noise levels at the center of the amenity terrace would be less than 60 dBA L_{dn}. This would meet the 67 dBA L_{dn} limit in Policy N 1.2 for multi-family residential buildings. Therefore, the proposed project would be compatible with the future exterior noise environment at the project site.

Future Interior Noise Environment

<u>Residential Land Uses</u>
Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA 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.

Residential units are located on levels two through seven. Units located along the northeastern façade would be set back approximately 40 feet from the edge of the nearest tracks and approximately 15 feet from the centerline of South Railroad Avenue. At these distances, the units along the northeastern façade would be exposed to future exterior noise levels up to 84 dBA L_{dn}. Assuming windows to be partially open, future interior noise levels in these units would be up to 69 dBA L_{dn}.

Units along the northwestern façade would be set back approximately 30 feet from the centerline of East 4th Avenue and approximately 30 to 150 feet from the edge of the nearest set of railroad tracks. At these distances, the units facing East 4th Avenue would be exposed to future exterior noise levels would range from 78 to 84 dBA L_{dn}. Assuming windows to be partially open, future interior noise levels in these units would range from 63 to 69 dBA L_{dn}.

To meet the City and State's interior noise requirement of 45 dBA L_{dn}, implementation of noise insulation features would be required.

<u>Commercial Land Uses</u>
Office and retail uses on levels one through six would have setbacks from the centerlines of the surrounding roadways of approximately 30 feet from East 4th Avenue and from East 5th Avenue and approximately 40 feet from the centerline of South B Street. Additionally, the northeastern façade would be set back approximately 40 feet from the edge of the nearest tracks. At these distances, daytime hourly average noise levels would range from 61 to 86 dBA L_{eq}, with day-night average noise levels up to 84 dBA L_{dn}.

Standard construction materials for commercial uses would provide about 25 dBA of noise reduction in interior spaces. The inclusion of adequate forced-air mechanical ventilation systems is normally required so that windows may be kept closed at the occupant's discretion and would provide an additional 5 dBA reduction. The standard construction materials in combination with forced-air mechanical ventilation would reduce hourly average noise levels to 56 dBA $L_{eq(1\text{-}hr)}$, which would exceed the threshold.

Spaces where lower noise levels would be desired, such as private offices and conference rooms, may benefit from additional noise control in order to meet a lower, more desirable interior noise level. Additional noise control could be accomplished by selecting higher sound-rated windows (STC 34 or greater along exterior façades).

Noise Insulation Features to Reduce Future Interior Noise Levels

The following noise insulation features shall be incorporated into the proposed project to reduce interior noise levels to 45 dBA L_{dn} or less at residential interiors and to 50 dBA $L_{eq(1\text{-}hr)}$ or less at commercial interiors:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all residential units on the project site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards.

- Preliminary calculations indicate that residential units facing the railroad would require windows and doors with a minimum rating of 37 STC and a wall assembly with a rating of 53 STC to meet the interior noise threshold of 45 dBA L_{dn}.

- Residential units facing East 4th Avenue would require windows and doors with a minimum rating of 35 STC to meet the interior noise threshold of 45 dBA L_{dn}.

- Commercial uses with direct line-of-sight to the railroad tracks would require windows and doors with a minimum sound-rating of 34 to 35 STC. Commercial land uses shall also be supplied with adequate forced-air mechanical ventilation to meet the interior noise threshold of 50 dBA $L_{eq(1\text{-}hr)}$.

The implementation of these noise insulation features would reduce interior noise levels to 45 dBA L_{dn} or less at residential uses and to 50 dBA $L_{eq(1\text{-}hr)}$ or less at commercial and office interiors.

Conditions of Approval

Interior Noise Standard for Residential Development. The project applicant shall prepare final design plans that incorporate building design and acoustical treatments to ensure compliance with State Building Codes and City noise standards. A project-specific acoustical analysis shall be prepared to ensure that the design incorporates controls to reduce interior noise levels to 45 dBA L_{dn} or lower within the residential unit and to 50 dBA $L_{eq(1\text{-}hr)}$ or lower within nonresidential interiors. The project applicant shall conform with any special building construction techniques requested by the City's Building Department, which may include sound-rated windows and doors, sound-rated wall constructions, and acoustical caulking.

Train Vibration and Land Use Compatibility

The FTA vibration impact assessment criteria (summarized in Table 5) were used to evaluate vibration levels produced by trains passing the project area under future conditions. The FTA vibration impact criteria are based on maximum overall levels for a single event. The impact criteria in Table 5 provide thresholds based on the number of train pass-bys in a given day: frequent events (more than 70 events of the same source per day), occasional events (30 to 70 vibration events of the same source per day), and infrequent events (less than 30 vibration events of the same source per day).

Future Vibration Environment

As shown in Table 7, five trains passed the site in just over an hour. According to the existing Caltrain schedule,[1] over 70 trains pass through San Mateo in a 24-hour period, which would fall within the frequent events FTA vibration impact category. It is assumed that the train schedule would remain the same under future conditions. Therefore, maximum vibration levels of 72 VdB for residences and buildings where people normally sleep would be the threshold for the proposed project.

Train pass-bys along the near and far tracks resulted in measured vibration levels up to 73 VdB. While the overall vibration levels did exceed 72 VdB during one of the Caltrain pass-bys, the threshold was not exceeded at any individual frequency, as shown in Figure A7.

Additionally, the FTA Manual includes adjustment factors applied to the measurements to account for coupling loss; amplification due to resonances of floors, walls, and ceilings; and floor-to-floor attenuation. At the ground-level where office space and parking would occur, no adjustment would apply; however, an adjustment of 1 VdB per floor would be made at residential levels two through seven. Therefore, vibration levels at the residential levels where sleeping would occur would be at or below 72 VdB. Vibration levels experience at the project site would be compatible with the proposed land uses.

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;

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[1] https://www.caltrain.com/station/sanmateo?active_tab=route_explorer_tab&origin=7009

(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 and future noise-sensitive land uses would potentially be exposed to a temporary increase in noise levels in excess of the City's construction noise limits. **This is a potentially significant impact.**

The project applicant proposes to demolish the existing buildings on the project site. The construction schedule assumed that the earliest possible start date would be early February 2026, with an estimated completion date of early November 2027 (total construction of about 21 months). Construction phases would include demolition, site preparation, grading, trenching, podium, 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. The applicant has indicated that construction activities are expected Monday through Friday 7:00 a.m. to 7:00 p.m.

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.

Section 7.30.060 of the City of San Mateo's Municipal Code limits construction to weekdays between 7:00 a.m. and 7:00 p.m., Saturdays between 9:00 a.m. and 5:00 p.m., and Sundays and holidays between 12:00 p.m. and 4:00 p.m. Additionally, the City specifies that no individual piece of equipment shall produce a noise level exceeding 90 dBA at a distance of 25 feet and that the noise level outside any point outside the property plane of the project shall not exceed 90 dBA.

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 8) from the equipment. Table 9 shows the hourly average noise level ranges, by construction phase, typical for various types of projects. Hourly average noise levels generated by construction are about 72 to 88 dBA L_{eq} for mixed-use buildings, 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 result in lower construction noise levels at distant receptors.

Equipment expected to be used in each construction phase are summarized in Table 10, along with the quantity of each type of equipment and the reference noise level at 25 feet, assuming the operation of the two loudest pieces of construction equipment for each construction phase. Note, building construction activities and building interior activities for both the office and residential buildings would potentially occur simultaneously. However, these phases are listed separately in Table 10.

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 and 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 that the equipment would be operating at full power.

Table 11 summarizes the worst-case construction noise levels propagated from the geometrical center of the proposed building to the property lines of the surrounding land uses, assuming all pieces of equipment per phase operating simultaneously. Noise levels in Table 11 do not assume reductions due to intervening buildings or existing barriers. While demolition, site preparation, grading, trenching, and paving would occur for the whole site, the distances in Table 11 represent the center of the entire site, from the center of the proposed office building, and from the center of the proposed residential building. As shown in Table 10, building construction activities and building interior activities for each building would be conducted separately but potentially at the same time. Therefore, Table 11 shows one building construction phase and one building interior phase with ranges representing noise levels from the center of the nearest construction activities (i.e., residential building or office building) to the combined noise levels of construction activities from both buildings during those phases. The interior and exterior phases may also overlap; however, the building exterior noise levels would dominate the noise environment, especially considering the interior construction activities would have additional shielding from the building façades.

TABLE 8 Construction Equipment 50-Foot Noise Emission Limits

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

Notes:

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

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

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

TABLE 9 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 10 Estimated Construction Noise Levels at a Distance of 25 feet

Phase of Construction	Total Workdays	Construction Equipment (Quantity)	Estimated Construction Noise Level at 25 feet, dBA L_{eq}
Demolition	40	Rubber-Tired Dozer (1)[a] Tractor/Loader/Backhoe (2)[a]	88
Site Preparation	10	Rubber-Tired Dozer (1)[a] Tractor/Loader/Backhoe (1)[a]	88
Grading/Excavation	40	Excavator (1) Rubber-Tired Dozer (2)[a] Tractor/Loader/Backhoe (1)[a] Drill Rig (1)	88
Trenching/Foundation	45	Tractor/Loader/Backhoe (2)[a]	86
Podium	40	Crane (1)[a]	79
Building – Exterior (Office)	220	Crane (1)[a] Forklift (2) Welder (3)[a]	81
Building – Exterior (Residential)	280	Crane (1)[a] Forklift (2) Welder (3)[a]	81
Building – Interior/ Architectural Coating (Office)	180	Aerial Lift (1)[a]	74
Building – Interior/ Architectural Coating (Residential)	240	Aerial Lift (1)[a]	74
Paving	60	Paver (1) Paving Equipment (1)[a] Roller (1) Tractor/Loader/Backhoe (1)[a]	91

[a] Denotes two loudest pieces of construction equipment per phase.

TABLE 11 Estimated Construction Noise Levels at Receiving Property Lines

Phase of Construction	Calculated Hourly Average Noise Levels, L_{eq} (dBA)							
	SW Future Res & Off (175ft[a] 130ft[b] 235ft[c])	West Comm (260ft[a] 265ft[b] 280ft[c])	NW Comm (170ft[a] 215ft[b] 125ft[c])	North Off (280ft[a] 345ft[b] 205ft[c])	NE Future Res (190ft[a] 230ft[b] 125ft[c])	East Future Parking Garage (260ft[a] 275ft[b] 260ft[c])	SE Comm (170ft[a] 130ft[b] 220ft[c])	South Res (275ft[a] 215ft[b] 345ft[c])
Demolition	73[a]	70[a]	74[a]	69[a]	73[a]	70[a]	74[a]	69[a]
Site Preparation	71[a]	68[a]	71[a]	67[a]	70[a]	68[a]	71[a]	67[a]
Grading/ Excavation	74[a]	70[a]	74[a]	70[a]	73[a]	70[a]	74[a]	70[a]
Trenching/ Foundation	72[a]	69[a]	72[a]	68[a]	71[a]	69[a]	72[a]	68[a]
Podium	62[a]	58[a]	62[a]	58[a]	61[a]	58[a]	62[a]	58[a]
Building –Exterior (Office & Residential)	70 to 71[b,c]	63 to 66[b,c]	70 to 71[b,c]	66 to 67[b,c]	70 to 71[b,c]	64 to 66[b,c]	70 to 71[b,c]	65 to 67[b,c]
Building – Interior/ Architectural Coating (Office & Residential)	59 to 61[b,c]	53 to 56[b,c]	60 to 61[b,c]	55 to 57[b,c]	50 to 61[b,c]	53 to 56[b,c]	59 to 61[b,c]	55 to 57[b,c]
Paving	74[a]	71[a]	75[a]	70[a]	74[a]	71[a]	75[a]	70[a]

[a] Distance measured from and noise levels propagated from center of the entire site.
[b] Distance measured from and noise levels propagated from center of the proposed office building.
[c] Distance measured from and noise levels propagated from center of the proposed residential building.

As shown in Tables 10 and 11, construction noise levels would intermittently range from 74 to 91 dBA L_{eq} when activities occur approximately 25 feet from nearby receptors and would typically range from 51 to 75 dBA L_{eq} when focused near the center of the site. Individual pieces of equipment could potentially exceed the City's 90 dBA noise limit at a distance of 25 feet. Further, when equipment is used within 25 feet of the project's boundaries, 90 dBA could be exceeded outside the property plane. This is a potentially significant impact.

Mitigation Measure 1a:

A Construction Noise Plan shall be prepared by the contractor that specifies hours of construction, noise minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses. The Construction Noise Plan shall demonstrate that noise levels during demolition or construction will not exceed 90 A-weighted sound level (dBA) at distance of 25 feet from the source of noise. The contractor shall submit the Construction Noise Plan to the City's Building Division subject to the satisfaction of the Community Development Director, or his/her designee, prior to the issuance of any demolition, building, and site development permit relating to the construction of the superstructure and prior to the pre-construction conference. At minimum, the Construction Noise Plan shall include :

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

- Quieter saws, cement mixers, cranes, dozers, excavators, graders, and pavers shall be selected. No individual device or piece of equipment shall produce a noise level exceeding 90 dBA at a distance of twenty-five (25) feet from the source.

- All internal combustion engine-driven equipment shall be equipped with intake and exhaust mufflers that are in good condition and appropriate for the equipment.

- Unnecessary idling of internal combustion engines should be strictly prohibited. If necessary, the idling of internal combustion engines shall be limited to five minutes.

- Stationary noise-generating equipment shall be located as far as possible from sensitive receptors and property lines. If they must be located within 30 feet of receptors and property lines, adequate muffling (with barriers or enclosures where feasible and appropriate) shall be used to reduce noise levels at the adjacent receptors to 90 dBA. All temporary barriers used shall be eight feet in height at minimum, continuous from grade to top, with no cracks or gaps, and have a minimum surface density of three pounds per square foot (e.g., one-inch-thick plywood).

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

- The contractor shall prepare a detailed construction plan identifying the schedule for major noise-generating construction activities. The contractor shall submit the construction plan to the City's Planning Division subject to the satisfaction of the Community Development Director, or his/her designee prior to the issuance of any demolition, building, and site development permit relating to the construction of the superstructure and prior to the pre-construction meeting.

- Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem. Conspicuously post a telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule.

Implementation of the above measures as project conditions of approval 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 reduced to a less-than-significant level.

Impact 1b: **Permanent Noise Level Increase/Exceed Applicable Standards.** The proposed project would not result in a substantial permanent noise level increase; however, the proposed project would potentially exceed applicable standards at the noise-sensitive receptors in the project vicinity. **This is a potentially significant impact.**

According to Policy N2.2 of the City's General Plan, a significant permanent noise increase would occur at existing noise-sensitive receptors if a new development results in a permanent noise increase of 3 dBA L_{dn} or greater.

Operational noise is limited to the noise levels specified in Table 7.30.040, adjusted for ambient conditions. If existing conditions exceed the limits, then existing ambient noise levels would be used as the thresholds. The thresholds would be the following:

- For noise sources operating more than 30 minutes in a given hour, thresholds would be 55 dBA at night and 60 dBA during the day at multi-family residential buildings, 60 dBA at night and 65 dBA during the day at commercial or office buildings, and 70 dBA anytime at industrial uses. The measured average L_{50} noise levels during daytime hours ranged from 51 to 69 dBA (average of 58 dBA) and from 45 to 70 dBA during nighttime hours (average of 53 dBA) along the railroad tracks. Average L_{50} noise levels during daytime hours ranged from 54 to 69 dBA (average of 59 dBA) and from 44 to 67 dBA during nighttime hours (average of 50 dBA) along South B Street. Table 12 summarizes the surrounding receptors and the thresholds used for each receptor.

- Thresholds for operations occurring more than five minutes in a given hour would be 10 dBA higher than the thresholds for the above thresholds. Table 12 summarizes the applicable thresholds for the proposed project.

TABLE 12 Summary of the Surrounding Receptors and Operational Thresholds Applied at the Property Line of Each Receptor

Receptor	For Operations Lasting More Than 30 Minutes an Hour (L_{50})		For Operations Lasting More Than 5 Minutes an Hour (L_{08})	
	Daytime	Nighttime	Daytime	Nighttime
SW Future Residences & Office	60	55	70	65
West Commercial	65	60	75	70
NW Commercial	65	60	75	70
North Office	65	60	75	70
NE Future Residences	60	55	70	65
East Future Parking Garage	70	70	80	80
SE Commercial	65	60	75	70
South Residences	60	55	70	65

Project Traffic Increase

The traffic study included peak hour turning movements for six intersections in the project vicinity for the existing and existing plus project traffic volumes. By comparing the existing plus project traffic volumes to the existing volumes, the project's contribution to the overall noise level increase was determined to be 1 dBA L_{dn} or less along each roadway segment in the project vicinity. Therefore, the project would not result in a permanent noise increase of 3 dBA L_{dn} or more at noise-sensitive receptors in the project vicinity.

Mechanical Equipment

The site plan shows the fire pump room in the below-grade garage, which would provide adequate shielding for all surrounding receptors. Noise levels generated by the fire pump would not be audible at the project boundaries.

The site plan shows two transformer rooms along the eastern façade, in the southeastern corner of the building on the ground level. Transformers up to 1,000 kVA typically generate noise levels up to 64 dB, as measured at 1 meter (3.28 feet). Assuming the transformers run continuously during daytime and nighttime hours, the hourly average noise level for both transformers would be 67 dBA L_{dn}, and the day-night average noise level would be 73 dBA L_{dn} at a distance of 1 meter. With no windows in the transformer room, the building would provide about 20 dBA attenuation for surrounding receptors.

Due to the location of the transformer rooms, the only receptors exposed to transformer noise would include the northeast future residences, the east future parking garage, and the southeast commercial uses. Table 13 summarizes the transformer noise estimated at these receiving property lines.

TABLE 13 Estimated Operational Noise Levels from Ground-Level Transformers

Receptor	Distance from Center of Transformer Rooms, feet	Combined L_{eq} from Transformers, dBA	L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
NE Future Residences	75	< 20[a]	26[a]	0
East Future Parking Garage	140	< 20[a]	21[a]	0
SE Commercial	125	< 20[a]	22[a]	0

[a] Conservative 20 dBA noise level attenuation due to the building façade.

Based on the estimated noise levels in Table 13, the ground-level equipment rooms would not exceed the City's daytime or nighttime thresholds at the surrounding land uses. For all existing receptors, the noise level increase due to ground-level equipment would not be measurable or detectable (0 dBA L_{dn} increase). This would be a less-than-significant impact.

The roof plan for the proposed buildings were not provided at the time of this study. However, a 450-kW emergency generator is expected on the roof of the proposed office building. Additional mechanical equipment, including heat pump condenser units and air handling units are expected on the rooftop of the office building.

The applicant has indicated that a diesel Cummins generator model DFEJ has been chosen for the project. According to the manufacturer's specification sheet, the emergency generator would generate sound pressure levels of 88 dBA at 23 feet with a standard weather enclosure, 85 dBA at 23 feet with a Level 1 sound enclosure, and 74 dBA at 23 feet with a Level 2 sound enclosure. This type of equipment would not typically run continuously, as it operates during emergency situations when the noise level restrictions would not typically apply. However, emergency generators are tested monthly for a period of one hour between 7:00 a.m. and 10:00 p.m. to ensure the equipment is operating efficiently in case an emergency occurs. During the monthly testing periods, the noise level thresholds would apply.

Details pertaining to such equipment, such as the specific types of units, noise level information, number of units, etc., are unavailable at this time. Typical heat pump condensing units generate noise levels up to 66 dBA at a distance of 3 feet. Air handling units typically generate noise levels up to 62 dBA at a distance of 20 feet. Assuming worst-case conditions, up to three units of each are assumed to operate at any given time in the same general area of the roof, for a combined noise level of 84 dBA at 3 feet. These types of units would cycle on and off continuously over a given 24-hour period, and assuming three units of each operating continuously at any given time throughout each hour, the day-night average noise level under worst-case conditions would be 90 dBA L_{dn} at 3 feet.

The elevation of the office rooftop equipment above the ground would provide a minimum attenuation of 15 dBA for all surrounding receptors located near the ground. The future mixed-use and residential buildings to the southwest and northeast, as well as the parking garage to the east, would be at least five stories tall. Existing receptors at the north office building and the south residential building would also have receptors at upper floors. These elevated receptors would potentially have direct line-of-sight to the rooftop equipment at the project site and, therefore, no attenuation is assumed for these receptors. Table 14 summarizes the hourly average and day-night average noise levels for the daily operational office rooftop equipment propagated from the center of the equipment to the surrounding property lines, assuming equipment to be set back from the nearest rooftop edge by 10 feet. Table 15 shows the office rooftop equipment during the monthly testing period of the emergency generator.

TABLE 14 Estimated Operational Noise Levels from Office Rooftop Equipment during Daily Operations

Receptor	Distance from Center of Rooftop Equipment, feet	Combined L_{eq} from Rooftop Equipment, dBA	Combined L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
SW Future Residences & Office	80	55	61	N/A[a]
West Commercial	115	37[b]	43[b]	0
NW Commercial	65	42[b]	48[b]	0
North Office	235	46	52	0
NE Future Residences	105	53	59	N/A[a]
East Future Parking Garage	140	50	57	N/A[a]
SE Commercial	70	41[b]	48[b]	0
South Residences	135	50	57	0

[a] Future receptors would not be exposed to a noise level increase since they are not exposed to existing ambient noise levels.
[b] Conservative 15 dBA noise level attenuation due to elevation of the rooftop above the ground and a minimum 10-foot setback is applied to receptors near the ground.

TABLE 15 Estimated Operational Noise Levels from Office Rooftop Equipment during Monthly Testing of the Emergency Generator

Receptor	Distance from Center of Rooftop Equipment, feet	Combined L_{eq} from Rooftop Equipment, dBA	Combined L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
SW Future Residences & Office	80	77[a] 74[b] 64[c]	66[a] 64[b] 62[c]	N/A[d]
West Commercial	115	59[a,e] 56[b,e] 46[c,e]	47[a,e] 46[b,e] 44[c,e]	0
NW Commercial	65	64[a,e] 61[b,e] 51[c,e]	52[a,e] 51[b,e] 48[c,e]	0
North Office	235	68[a] 65[b] 54[c]	56[a] 55[b] 52[c]	0
NE Future Residences	105	75[a] 72[b] 61[c]	63[a] 62[b] 59[c]	N/A[d]
East Future Parking Garage	140	72[a] 69[b] 59[c]	61[a] 59[b] 57[c]	N/A[d]
SE Commercial	70	63[a,e] 60[b,e] 50[c,e]	52[a,e] 50[b,e] 48[c,e]	0
South Residences	135	73[a] 70[b] 59[c]	61[a] 59[b] 57[c]	0[a] 1[b,c]

[a] Emergency generator with a standard weather enclosure.
[b] Emergency generator with a Level 1 sound enclosure.
[c] Emergency generator with a Level 2 sound enclosure.
[d] Future receptors would not be exposed to a noise level increase since they are not exposed to existing ambient noise levels.
[e] Conservative 15 dBA noise level attenuation due to elevation of the rooftop above the ground and a minimum 10-foot setback is applied to receptors near the ground.

Based on the estimated noise levels in Table 14, the rooftop equipment on the office building would potentially exceed the City's nighttime thresholds at the existing and future residential land uses to the southwest, northeast, and south during daily operations. For all existing receptors, the noise level increase due to rooftop equipment would not be measurable or detectable (0 dBA L_{dn}). This would be a potentially significant impact.

During monthly testing of the emergency generator, which would occur during daytime hours only, daytime hourly average noise levels would potentially be exceeded at future and existing receptors to the southwest, north, northeast, east, and south, depending on the enclosure of the emergency generator. For all existing receptors, the noise level increase due to rooftop equipment during monthly testing of the emergency generator would be 1 dBA L_{dn} or less. This would be a potentially significant impact.

Residential buildings would typically include heating, ventilation, and air conditioning (HVAC) units located on the rooftop. Assuming HVAC units for the proposed residential building to generate noise levels up to 62 dBA at a distance of 20 feet and up to eight units operating at any given time in the same general area of the roof, the combined hourly average noise level would be 71 dBA at 20 feet. These types of units would cycle on and off continuously over a given 24-hour period, and assuming all eight units would run continuously, the day-night average noise level under worst-case conditions would be 77 dBA L_{dn} at 20 feet.

The elevation of the residential rooftop equipment above the ground would provide a minimum attenuation of 15 dBA for all ground-level receptors with direct line-of-sight, which would include the existing commercial uses to the northwest. The future residential building to the northeast and the existing office building to the north would have elevated receptors, which would have direct line-of-sight to the residential rooftop (i.e., no attenuation). All other receptors surrounding the project site would not be exposed to rooftop equipment noise from the residential building. Table 16 summarizes the hourly average and day-night average noise levels for the daily operational residential rooftop equipment propagated from the center of the equipment to the surrounding property lines, assuming equipment to be set back from the nearest rooftop edge by 10 feet.

TABLE 16 Estimated Operational Noise Levels from Residential Rooftop Equipment during Daily Operations

Receptor	Distance from Center of Rooftop Equipment, feet	Combined L_{eq} from Rooftop Equipment, dBA	Combined L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
NW Commercial	65	29[a]	36[a]	0
North Office	140	33	40	0
NE Future Residences	90	40	47	N/A[b]

[a] Conservative 15 dBA noise level attenuation due to elevation of the rooftop above the ground and a minimum 10-foot setback is applied to receptors near the ground.
[b] Future receptors would not be exposed to a noise level increase since they are not exposed to existing ambient noise levels.

Based on the estimated noise levels in Table 16, the rooftop equipment on the residential building would not exceed the City’s daytime or nighttime thresholds at the existing and future receptors during daily operations. For all existing receptors, the noise level increase due to rooftop equipment would not be measurable or detectable (0 dBA L_{dn}). This would be a less-than-significant impact.

Truck Loading and Unloading

One loading zone would be provided for the proposed building along East 4th Avenue. Receptors with direct line-of-sight to the loading zone would be the west commercial uses, the northwest commercial uses, and the north office building. All other receptors would be well shielded by the proposed building.

Truck maneuvering, which typically lasts for a period of more than five minutes but less than 15 minutes in a given hour per delivery. Noise generated by truck maneuvering would include a combination of engine, exhaust, and tire noise, as well as the intermittent sounds of back-up alarms and releases of compressed air associated with truck/trailer air brakes. For offices and multi-family residences, medium-sized delivery trucks would be expected at the proposed building. Medium-sized delivery trucks typically generate maximum noise levels of 60 to 65 dBA at 50 feet. The noise level of backup alarms can vary depending on the type and directivity of the sound, but maximum noise levels are typically in the range of 65 to 75 dBA at a distance of 50 feet. All deliveries are assumed to occur during daytime hours between 7:00 a.m. and 10:00 p.m.

It is assumed that up to two deliveries would occur daily and only one delivery would occur in a given hour. No attenuation is assumed for this analysis. Table 17 summarizes expected noise levels generated by typical truck deliveries at the receptors with exposure to the loading areas, assuming worst-case conditions, which would include two truck deliveries in a 24-hour period.

TABLE 17 Estimated Operational Noise Levels from Truck Loading and Unloading Activities

Receptor	Distance from Center of Loading Area, feet	Noise Levels from Truck Deliveries, dBA L_{08}	L_{dn}, dBA	Noise Level Increase, dBA L_{dn}
West Commercial	200	53	36	0
NW Commercial	45	66	49	0
North Office	200	53	36	0

Based on the estimated noise levels in Table 17, truck loading and unloading activities would not exceed the City's L_{08} daytime thresholds, which are summarized in Table 12, at the receptors with direct line-of-sight to the loading areas. For all existing receptors, the noise level increase due to truck loading and unloading activities would not be measurable or detectable (0 dBA L_{dn} increase). This would be a less-than-significant impact.

Total Combined Project-Generated Noise

The operational noise levels produced by the proposed project combined (i.e., traffic, mechanical equipment, and truck loading and unloading activities) would result in an increase of 1 dBA L_{dn} or less at all existing noise-sensitive receptors surrounding the project site. Therefore, the proposed project would not result in a substantial increase over ambient noise levels in the project vicinity.

Operational noise levels from the rooftop equipment on the office building, however, would potentially exceed the City's nighttime thresholds during daily operations and the daytime thresholds during the monthly testing of the emergency generator. This is a potentially significant impact.

Mitigation Measure 1b:

A detailed acoustical study shall be prepared during final design to evaluate the potential noise generated by mechanical equipment and demonstrate the necessary noise control to meet the City's daytime and nighttime thresholds of 60 and 55 dBA L_{50}, respectively, at existing and future residential receiving property lines; and of 65 and 60 dBA L_{50}, respectively, at existing and future office and commercial receiving property lines. Noise control features, such as selection of quiet units, sound attenuators, enclosures, and barriers shall be identified and evaluated to demonstrate that mechanical equipment noise would not exceed the City's limits at the receiving property lines. The noise control features identified by the study shall be incorporated into the project prior to issuance of a building permit.

Impact 2: **Exposure to Excessive Groundborne Vibration.** Construction-related vibration levels would not exceed applicable vibration thresholds at nearby sensitive land uses. **This is a less-than-significant impact.**

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 be required for 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. Conservative vibration limits 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, and for ruins or ancient monuments, a cautious limit of 0.08 in/sec PPV is often used to provide the highest level of protection.

Buildings opposite South B Street to the southwest and to the south and buildings opposite South Railroad Avenue and the train tracks (i.e., the north offices, northeast future residences, and east future parking garage) would be new construction buildings subject to the 0.5 in/sec PPV threshold. The commercial buildings to the west, to the northwest, and to the southeast are all older buildings more sensitive to construction vibration. These buildings would be subject to the 0.25 in/sec PPV threshold. No ruins or ancient monuments would be located within 200 feet of the project site.

Table 18 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 18 also summarizes the distances to the 0.25 in/sec PPV threshold for historical and older buildings, to the 0.3 in/sec PPV threshold for structurally sound buildings, and the 0.5 in/sec PPV thresholds for buildings constructed of modern materials.

TABLE 18 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Minimum Distance to Meet Threshold, feet		
			0.25 in/sec PPV (feet)	0.3 in/sec PPV (feet)	0.5 in/sec PPV (feet)
Clam shovel drop		0.202	21	18	11
Hydromill (slurry wall)	in soil	0.008	2	1	<1
	in rock	0.017	3	2	2
Vibratory Roller		0.210	22	19	12
Hoe Ram		0.089	10	9	6
Large bulldozer		0.089	10	9	6
Caisson drilling		0.089	10	9	6
Loaded trucks		0.076	9	8	5
Jackhammer		0.035	5	4	3
Small bulldozer		0.003	1	<1	<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., April 2024.

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 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.

The Bespoke project site takes up the entire block and is bound by East 4th Avenue, East 5th Avenue, South B Street, and South Railroad Avenue. The nearest buildings susceptible to damage caused by construction activities at the project site would be located opposite each of these roadways. The classifications of these buildings range from older buildings (located to the west, to the northwest, and to the southeast) to new construction (located to the north, to the northeast, to the east, to the south, and to the southwest).

The nearest building façades in the immediate project vicinity would be 60 to 135 feet from the nearest project site boundaries. At these distances, construction vibration levels would be at or below 0.08 in/sec PPV. This would not exceed the conservative 0.25 in/sec PPV thresholds for historical and older buildings, as well as the 0.5 in/sec PPV threshold for modern buildings.

Neither cosmetic, minor, or major damage would occur at historical, old sensitive, or structurally sound buildings located 25 feet or more from the project site. 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). By use of administrative controls, such as notifying neighbors of scheduled construction activities and scheduling construction activities with the highest potential to produce perceptible vibration during hours with the least potential to affect nearby businesses, perceptible vibration can be kept to a minimum.

In summary, the construction of the project would not generate construction vibration levels exceeding 0.25 in/sec PPV at the nearest older sensitive buildings or 0.5 in/sec PPV at the nearest modern buildings surrounding the project site. This would be a less-than-significant impact.

Mitigation Measure 2: **None required.**

Impact 3: **Excessive Aircraft Noise.** The project site is located about 3.7 miles from the San Francisco International Airport. The noise environment attributable to aircraft is considered normally acceptable. This is a **less-than-significant** impact.

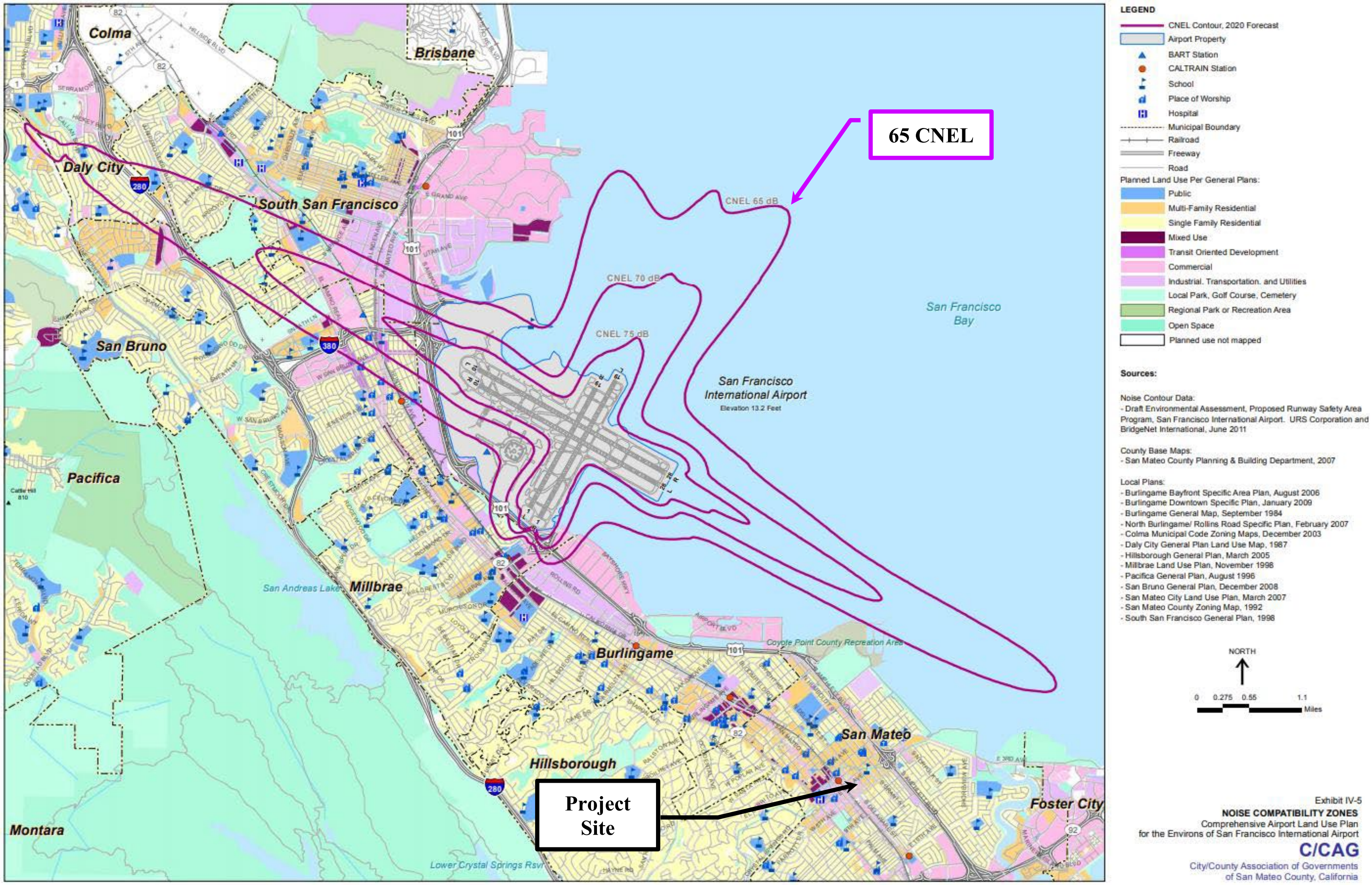
The San Francisco International Airport is a public-use airport located approximately 3.7 miles northwest of the project site. According to the *Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport*,[2] the project site lies well outside the 65 dBA CNEL/L_{dn} noise contour (see Figure 2), and the required safe and compatible threshold for exterior noise levels would be at or below 65 dBA CNEL/L_{dn} for aircrafts. Therefore, the proposed project would be compatible with the exterior noise standards for aircraft noise.

Assuming standard construction materials for aircraft noise below 60 dBA L_{dn}, the future interior noise levels resulting from aircraft would be below 45 dBA L_{dn}. Therefore, future interior noise at the proposed building would be compatible with aircraft noise. This would be a less-than-significant impact.

Mitigation Measure 3: **None required.**

[2] Ricondo & Associates, Inc. with Jacobs Consultancy and Clarion Associates, *Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport*, November 2012.

FIGURE 2 2020 CNEL Noise Contours for San Francisco International Airport Relative to Project Site



Cumulative Impacts

Cumulative noise impacts would include temporary construction noise from cumulative construction projects.

A significant cumulative traffic noise impact would occur if two criteria are met: 1) if the cumulative traffic noise level increase was 3 dBA L_{dn} or greater for future levels exceeding the normally acceptable threshold; and 2) if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA L_{dn} or more attributable solely to the proposed project.

Cumulative (no project) and cumulative plus project peak hour traffic volumes were included in the traffic study. When both the cumulative (no project) and cumulative plus project traffic volumes were compared to the existing peak hour volumes, an increase of 2 dBA L_{dn} or less was calculated along all roadway segments in the project vicinity. Since a 3 dBA L_{dn} was not calculated along any segments, the first criteria of the impact statement would not be met. Therefore, the project would not cause a significant cumulative noise increase at noise-sensitive uses in the project vicinity.

The City of San Mateo has identified one development project located within 500 feet of the proposed 445 South B Street project site:

- **Nazareth Vista Mixed-Use** – this project is located at 616 South B Street and is approximately 360 feet southeast of the proposed project site. The Nazareth Vista Mixed-Use Project, which is currently in the planning review phase, would consist of demolishing the existing buildings at the site and constructing a six-story mixed-use building. Construction dates for this project have not been confirmed. These two project sites would share noise-sensitive receptors identified in this report as the south residences and southeast commercial uses; however, no individual occupant would have direct line-of-sight to both sites. That is, the southeast commercial buildings with direct exposure to the 445 South B Street site would be the commercial building on the north portion of the block, while the commercial building on the southern portion would have direct line-of-sight to the Nazareth Vista site. Therefore, a significant cumulative construction impact would not be assumed.

- **Block 20** – this project is located approximately 375 feet northeast of the project site. This proposed six-story mixed-use building is in the planning review phase, and the construction schedule has not been confirmed. While the block between these two sites would include the northeast future residences, no one receptor would be exposed to direct exposure to both sites. Therefore, a significant cumulative construction impact would not be assumed.

- **Block 21** – this project is located approximately 390 feet northeast of the project site, opposite East 4th Avenue from the Block 20 project site. This mixed-use project has been approved but has not yet been constructed. While it is likely to be completed before the proposed 445 South B Street construction starts, these two project sites would not share noise-sensitive receptors even project construction overlaps. Therefore, a significant cumulative construction impact would not be assumed.

- **Kiku Crossing and 5th Avenue Garage** – this project is a residential building and parking garage currently under constructed northeast of the project site (future northeast residences) and east of the project site (east future parking garage). This project would be completed before the proposed 445 South B Street construction would start. Therefore, a significant cumulative construction impact would not be assumed.

- **435 East 3rd Avenue** – this five-story mixed-use building project is located approximately 485 feet northwest of the project site. This project has been approved but not yet constructed. While it is likely to be completed before the proposed 445 South B Street construction starts, this project site would not share receptors with direct line-of-sight with 445 South B Street. This would be a less-than-significant cumulative construction impact.

- **Draeger's** – this five-story mixed-use building project is located at 222 East 4th Avenue, which is located opposite South B Street from the 445 South B Street project site. This was identified as the southwest future residences and office building in this report. This project has been approved but not yet constructed. It is expected to be constructed before the 445 South B Street project starts construction. Therefore, this would be a less-than-significant cumulative construction impact.

All projects in the vicinity of 445 South B Street are either approved, under construction, or would not share noise-sensitive receptors with direct line-of-sight to both site. Therefore, the potential cumulative construction impact would be less-than-significant.

APPENDIX

FIGURE A1 Daily Trend in Noise Levels at LT-1, Wednesday, September 13, 2023

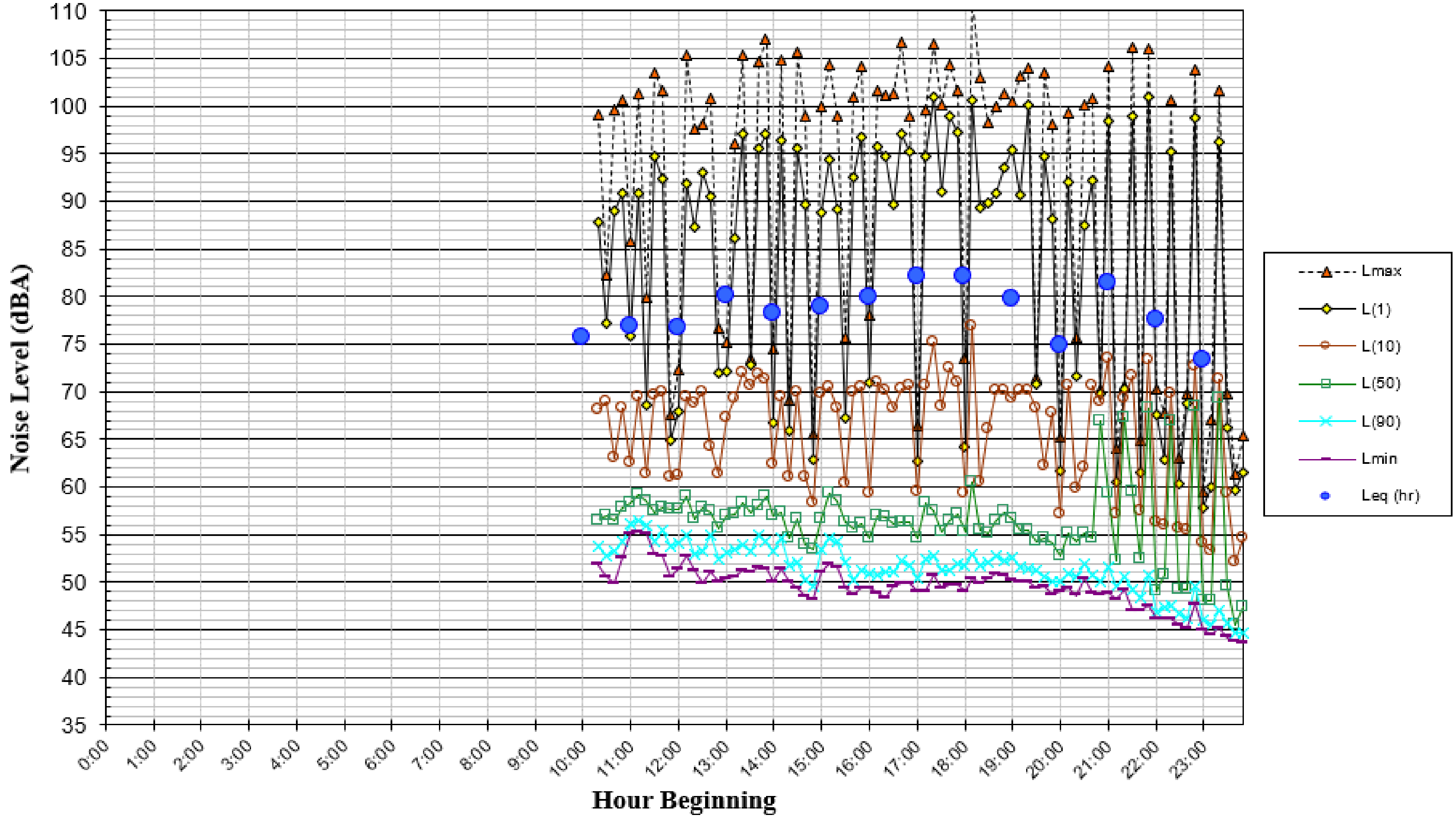


FIGURE A2 Daily Trend in Noise Levels at LT-1, Thursday, September 14, 2023

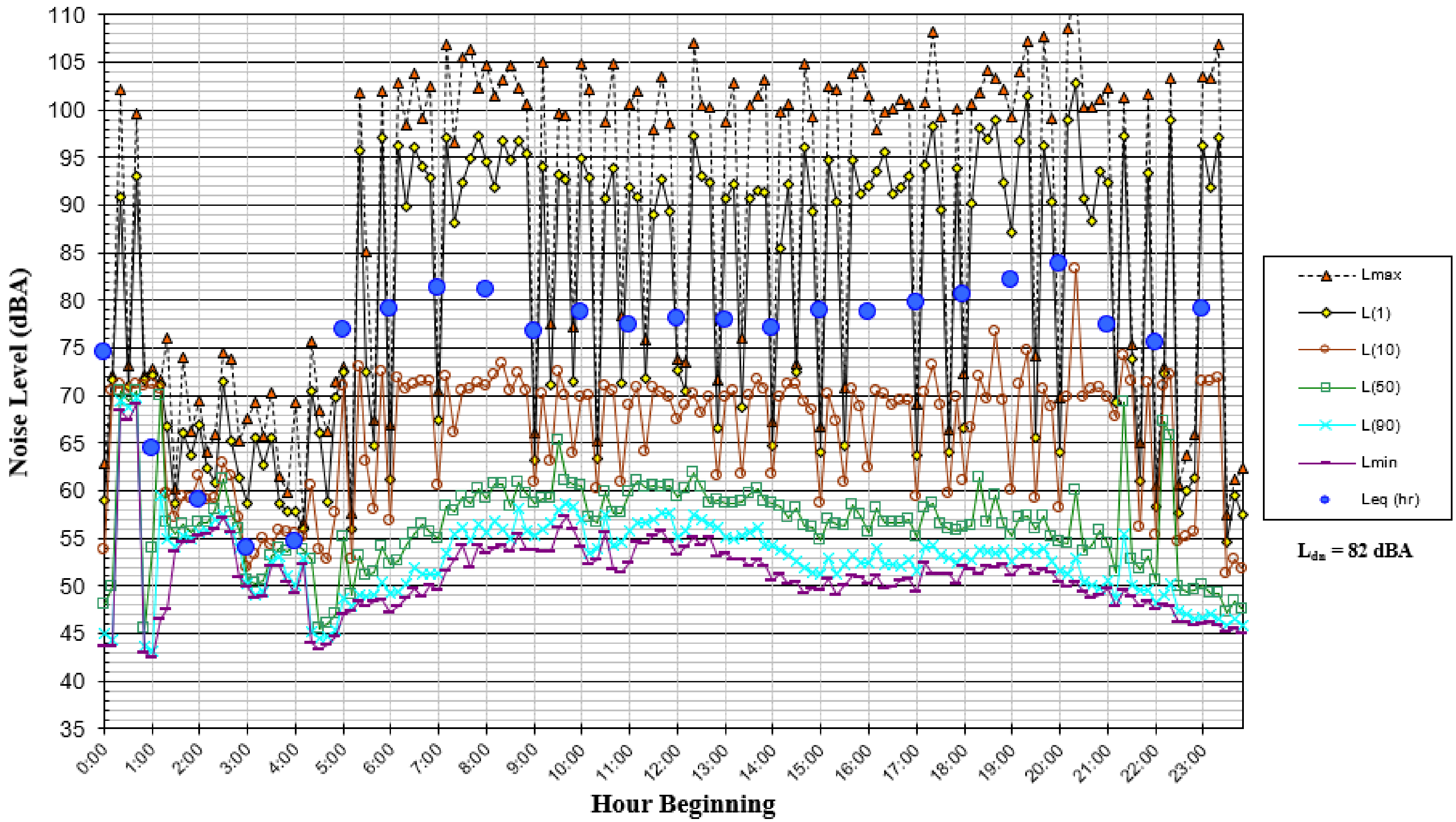


FIGURE A3 Daily Trend in Noise Levels at LT-1, Friday, September 15, 2023

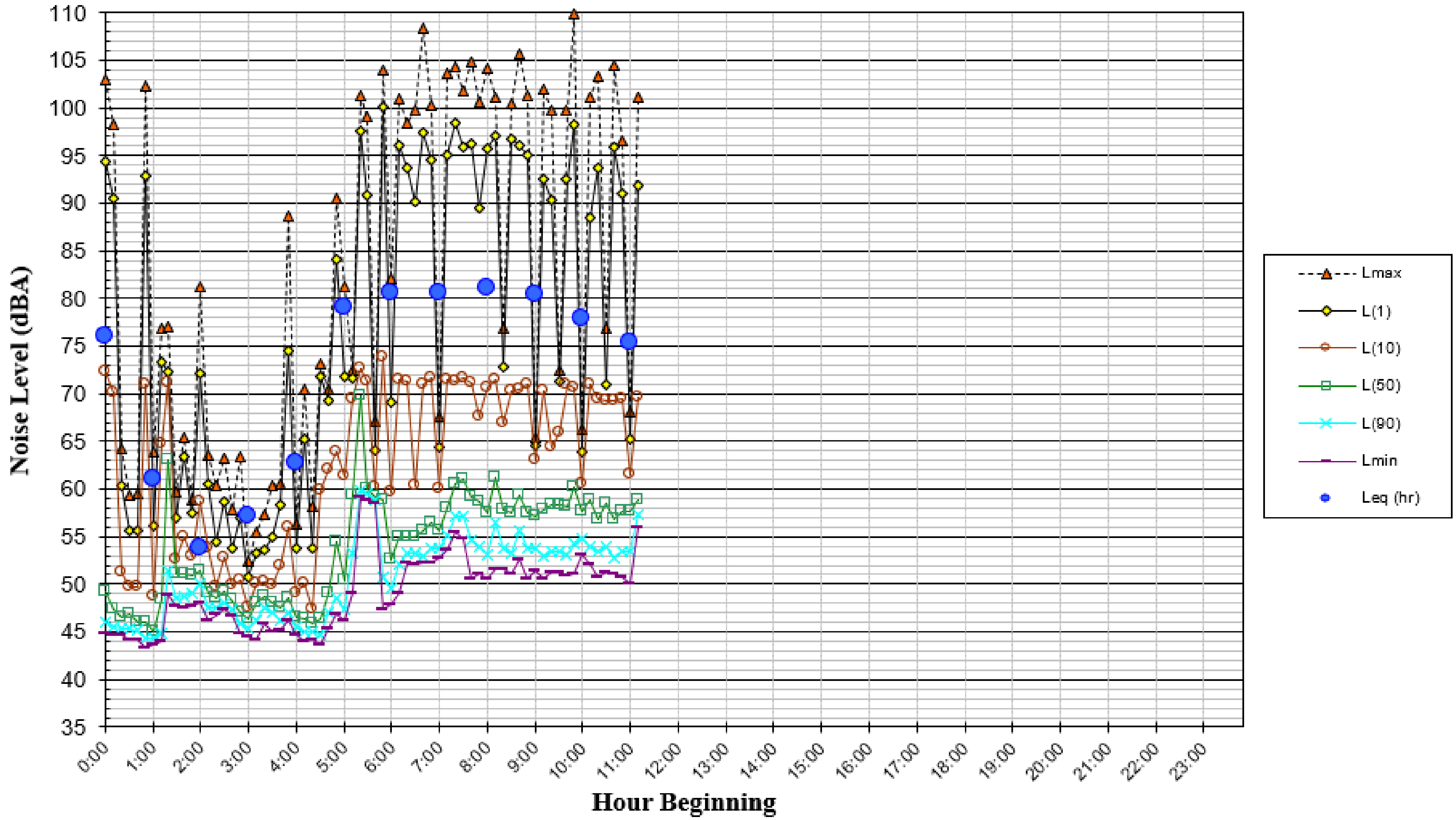


FIGURE A4 Daily Trend in Noise Levels at LT-2, Wednesday, September 13, 2023

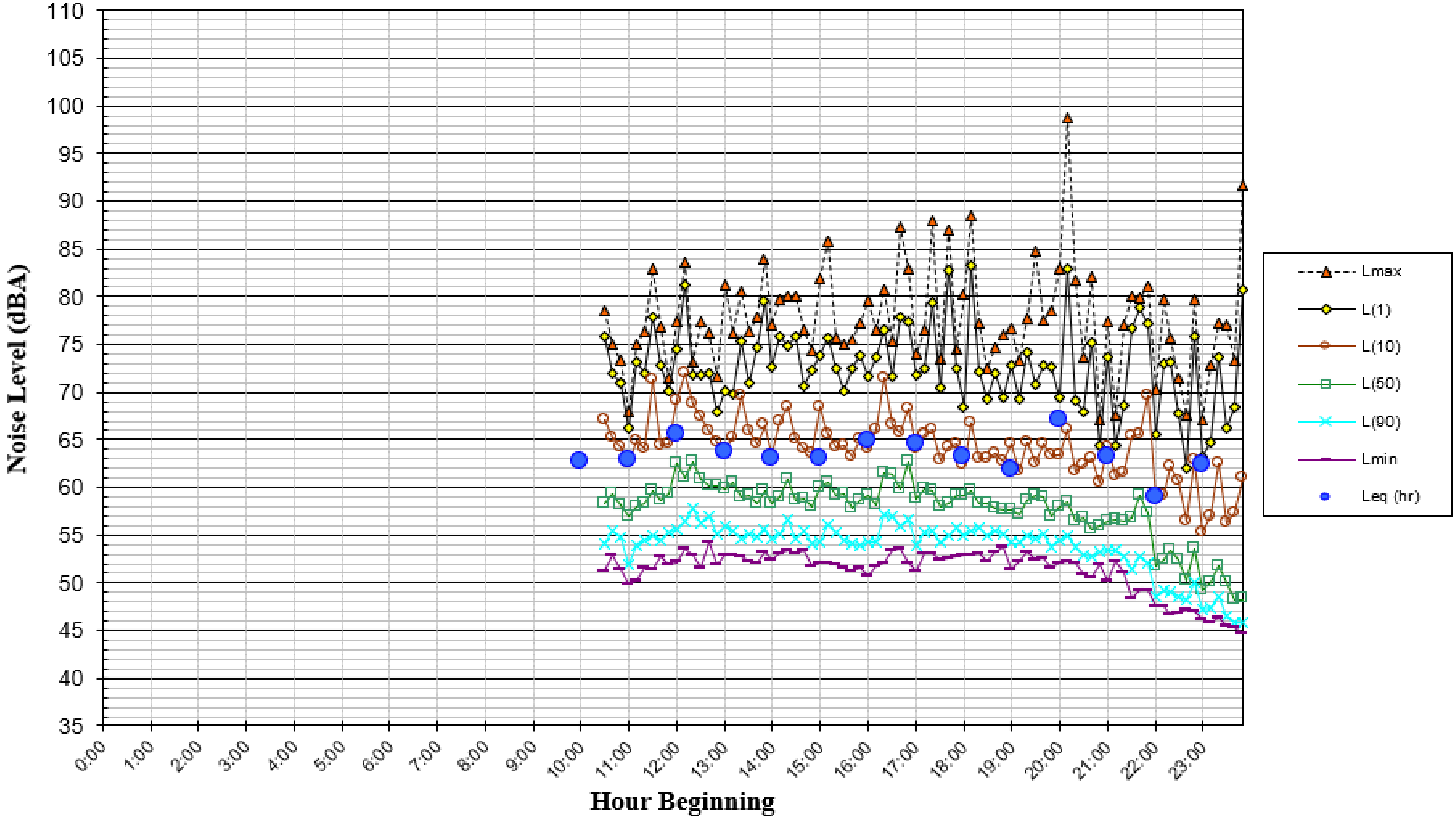


FIGURE A5 Daily Trend in Noise Levels at LT-2, Thursday, September 14, 2023

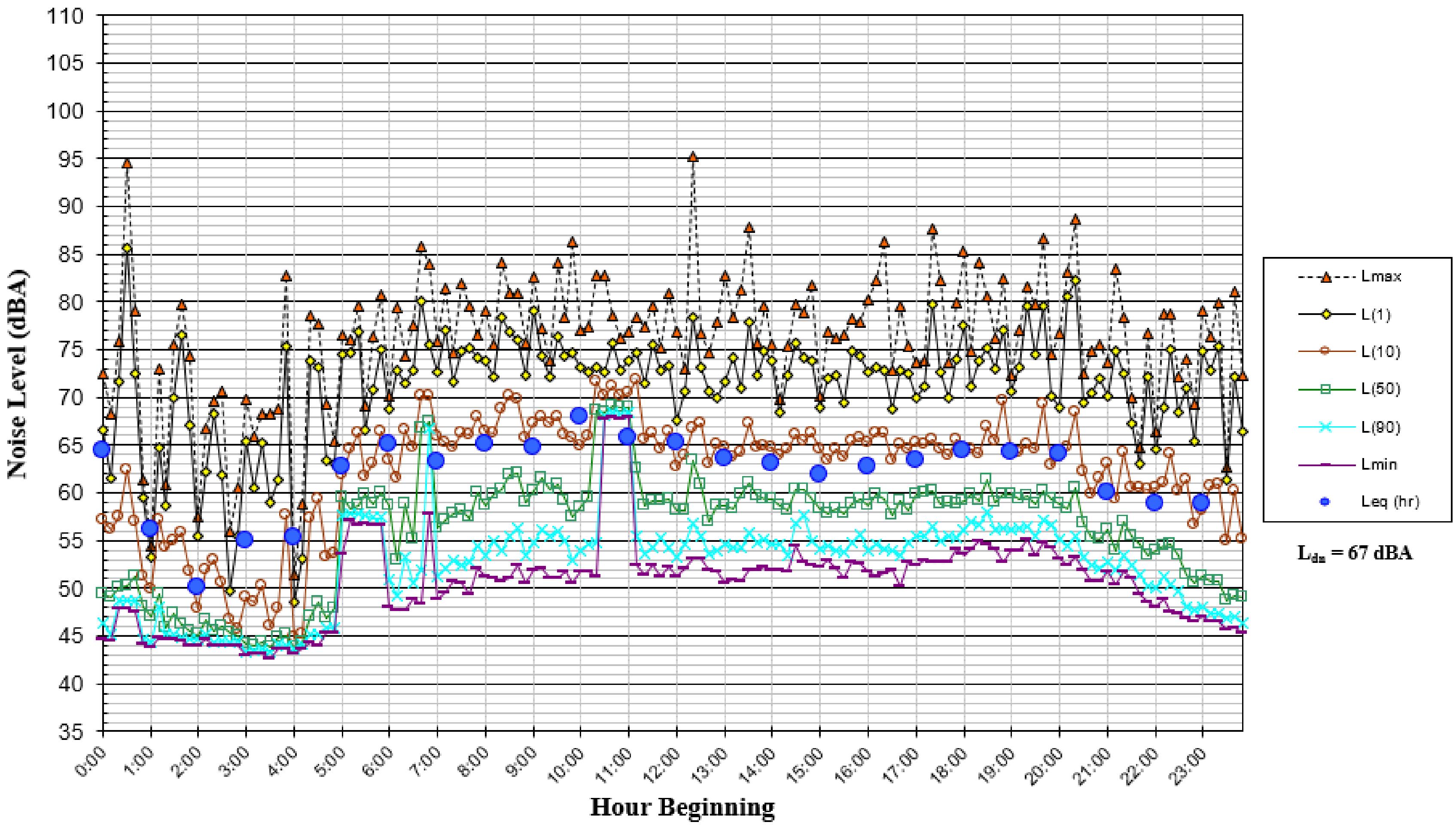


FIGURE A6 Daily Trend in Noise Levels at LT-2, Friday, September 15, 2023

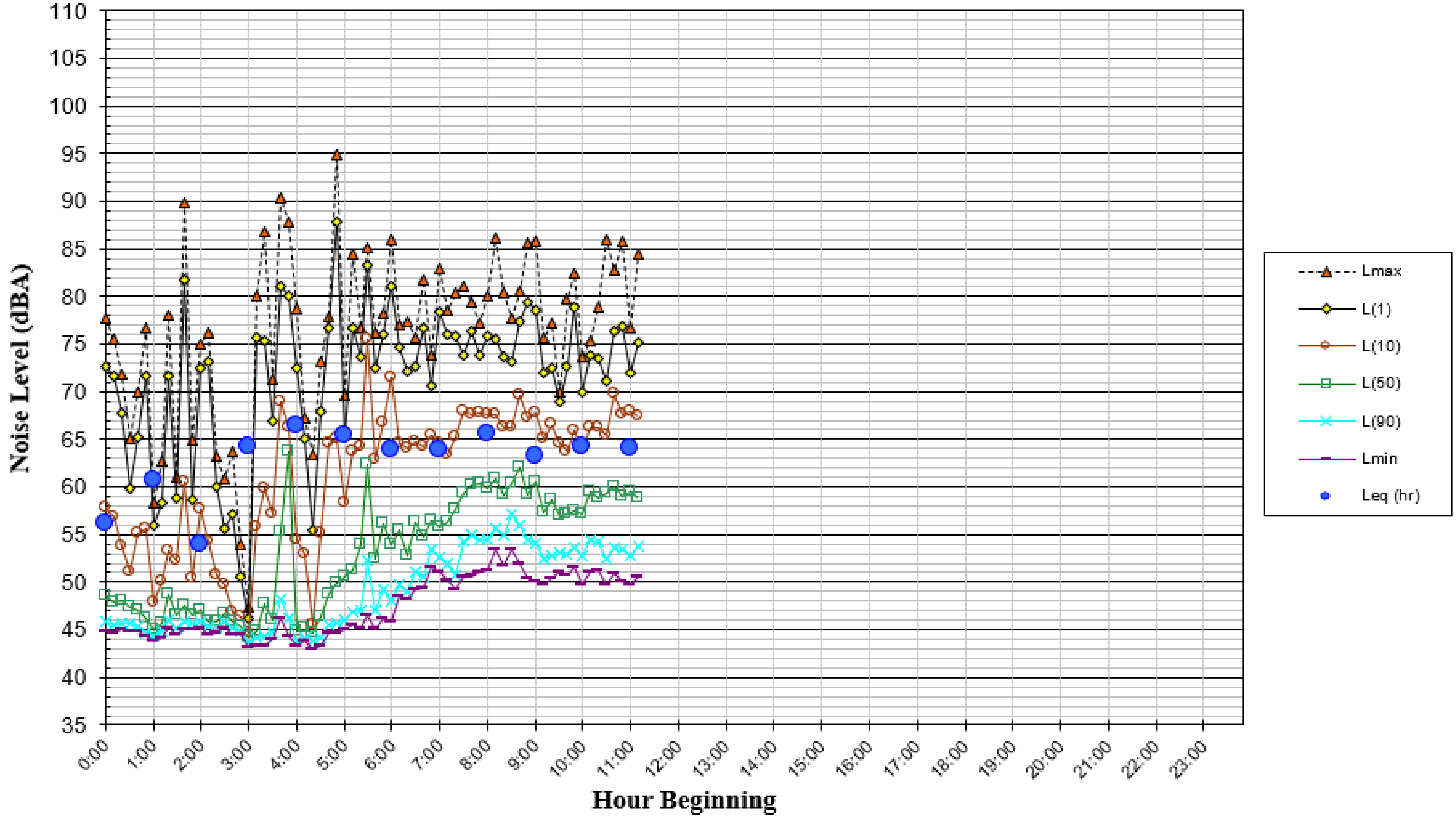


FIGURE A7 Caltrain Vibration Levels at V-1, Wednesday, September 13, 2023

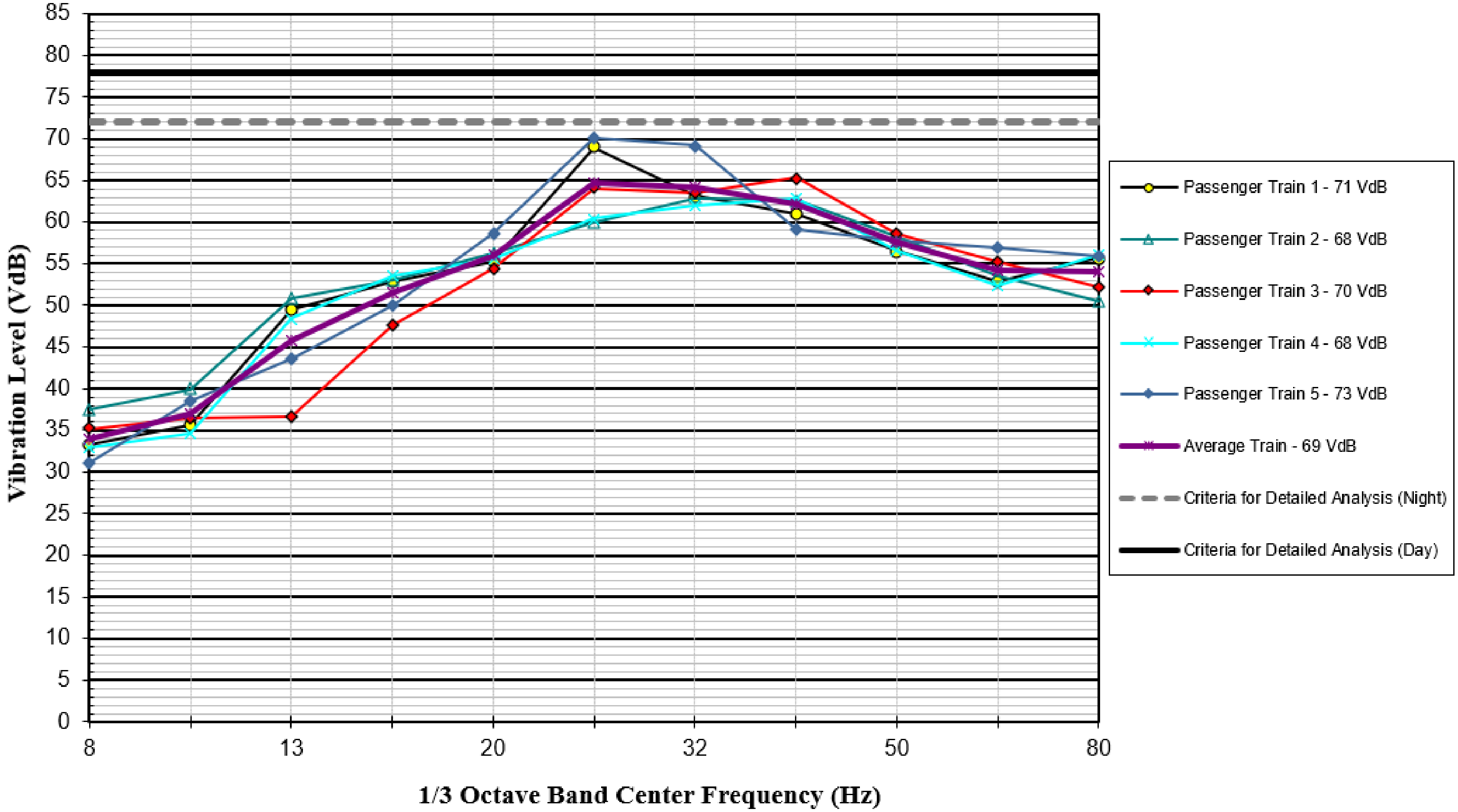


FIGURE A8 Caltrain Vibration Levels at V-2, Wednesday, September 13, 2023