455 HICKEY BOULEVARD
NOISE AND VIBRATION ASSESSMENT

Daly City, California

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Project: 22-175

INTRODUCTION

An office building is proposed at 455 Hickey Boulevard in Daly City, California. Two scenarios have been proposed and are as follows:

- A general office building consisting of eight stories and 280,000 square feet; or
- A medical office building consisting of five stories and 180,000 square feet.

This report evaluates the project's potential to result in significant noise and vibration impacts with respect to applicable California Environmental Quality Act (CEQA) guidelines. The report is divided into three sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise and groundborne vibration, summarizes applicable regulatory background, and describes the existing ambient noise environment at the project site; 2) the Plan Consistency Analysis Section discusses noise and land use compatibility utilizing applicable regulatory background; 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 measures, where necessary, to mitigate the impacts of the project on sensitive receptors in the vicinity.

SETTING

Fundamentals of Environmental Noise

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

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

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a

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

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

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (L_{dn} or *DNL*) 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 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA L_{dn} with open windows and 65-70 dBA L_{dn} if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed; those facing major roadways and freeways typically need special glass windows.

Annoyance

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

Fundamentals of Groundborne Vibration

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

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

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different vibration limits. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk to damage. Most buildings are included within the categories ranging from “Historic and some old buildings” to “Modern industrial/commercial buildings”. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

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

TABLE 1 Definition of Acoustical Terms Used in this Report

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

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.

Regulatory Background – Noise

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

Federal Government

Federal Transit Administration. The Federal Transit Administration (FTA) has identified construction noise thresholds in the *Transit Noise and Vibration Impact Assessment Manual*,[1] which limit daytime construction noise to 80 dBA L_{eq} at residential land uses and to 90 dBA L_{eq} at commercial and industrial land uses.

State of California

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

[1] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, FTA Report No. 0123, September 2018.

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

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

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

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.

<u>San Mateo County</u>

Comprehensive Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport, July 2012. Noise compatibility policies established in this document were designed to protect the public health, safety, and welfare by minimizing the exposure of residents and occupants of future noise-sensitive development to excessive noise and to protect the public interest in providing for the orderly development of SFO by ensuring that new development in the Airport environs complies with all requirements necessary to ensure compatibility with aircraft noise in the area. The intent is to avoid the introduction of new incompatible land uses into the Airport's "noise impact area" so that the Airport will continue to be in compliance with the State Noise Standards for airports (California Code of Regulations, Title 21, Sections 5012 and 5014).[2]

[2] In 2002, the San Mateo County Board of Supervisors declared that the Airport had eliminated its "noise impact area," as defined under state law -- California Code of Regulations, Title 21, Sections 5012 and 5014.

The following noise compatibility policies (NP) shall apply to the ALUCP and are applicable to this project:

NP-1: Noise Compatibility Zones. For the purposes of this ALUCP, the projected 2020 CNEL noise contour map from the Draft Environmental Assessment for the Proposed Runway Safety Area Program shall define the boundaries within which noise compatibility policies described in this Section shall apply.[3] Exhibit IV-5 depicts the noise compatibility zones. More detail is provided on Exhibit IV-6. The zones are defined by the CNEL 65, 70 and 75 dB contours.

NP-2: Airport Noise/Land Use Compatibility Criteria. The compatibility of proposed land uses located in the Airport noise compatibility zones shall be determined according to the noise/land use compatibility criteria shown in Table IV-1. The criteria indicate the maximum acceptable airport noise levels, described in terms of Community Noise Equivalent Level (CNEL), for the indicated land uses. The compatibility criteria indicate whether a proposed land use is "compatible," "conditionally compatible," or "not compatible" within each zone, designated by the identified CNEL ranges.

- "Compatible" means that the proposed land use is compatible with the CNEL level indicated in the table and may be permitted without any special requirements related to the attenuation of aircraft noise.

- "Conditionally compatible" means that the proposed land use is compatible if the conditions described in Table IV-1 are met.

- "Not compatible" means that the proposed land use is incompatible with aircraft noise at the indicated CNEL level.

NP-3: Grant of Avigation Easement. Any action that would either permit or result in the development or construction of a land use considered to be conditionally compatible with aircraft noise of CNEL 65 dB or greater shall be subject to this easement requirement. The determination of conditional compatibility shall be based on the criteria presented in Table IV-1 "Noise/Land Use Compatibility Criteria."

The San Mateo County Airport Land Use Commission (the C/CAG Board) deems it necessary to: (1) ensure the unimpeded use of airspace in the vicinity of SFO; (2) to ensure that new noise-sensitive land uses within the CNEL 65 dB contour are made compatible with aircraft noise, in accordance with California Code of Regulations, Title 21, Section 5014; and (3) to provide notice to owners of real property near the Airport of the proximity to SFO and of the potential impacts that could occur on the property from airport/aircraft operations. Thus, C/CAG shall condition its approval of proposed development upon the owner of the subject property granting an avigation easement to the City and County of San Francisco, as the proprietor of SFO. The local government with the ultimate permitting and approval authority over the proposed development shall ensure that this condition is implemented prior to final approval of the proposed development. If the approval action for the proposed development includes construction of a building(s) and/or other

[3] URS Corporation and BridgeNet International. Draft Environmental Assessment, Proposed Runway Safety Area Program, San Francisco International Airport, June 2011.

structures, the local permitting authority shall require the grant of an avigation easement to the City and County of San Francisco prior to issuance of a building permit(s) for the proposed building or structure. If the proposed development is not built, then, upon notice by the local permitting authority, SFO shall record a notice of termination of the avigation easement.

The avigation easement to be used in fulfilling this condition is presented in Appendix G.

NP-4: Residential Uses Within CNEL 70 dB Contour. As described in Table IV-1, residential uses are not compatible in areas exposed to noise above CNEL 70 dB and typically should not be allowed in these high noise areas.

> *NP-4.1: Situations Where Residential Use Is Conditionally Compatible.* Residential uses are considered conditionally compatible in areas exposed to noise above CNEL 70 dB only if the proposed use is on a lot of record zoned exclusively for residential use as of the effective date of the ALUCP. In such a case, the residential use must be sound-insulated to achieve an indoor noise level of CNEL 45 dB or less from exterior sources. The property owner also shall grant an avigation easement to the City and County of San Francisco in accordance with Policy NP-3 prior to issuance of a building permit for the proposed building or structure.

Table IV-1 Noise/Land Use Compatibility Criteria

	COMMUNITY NOISE EQUIVALENT LEVEL (CNEL)			
LAND USE	**BELOW 65 dB**	**65-70 dB**	**70-75 dB**	**75 dB AND OVER**
Residential				
Residential, single family detached	Y	C	N *(a)*	N
Residential, multi-family and single family attached	Y	C	N *(a)*	N
Transient lodgings	Y	C	C	N
Public/Institutional				
Public and Private Schools	Y	C	N	N
Hospitals and nursing homes	Y	C	N	N
Places of public assembly, including places of worship	Y	C	N	N
Auditoriums, and concert halls	Y	C	C	N
Libraries	Y	C	C	N
Outdoor music shells, amphitheaters	Y	N	N	N
Recreational				
Outdoor sports arenas and spectator sports	Y	Y	Y	N
Nature exhibits and zoos	Y	Y	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N
Golf courses, riding stables, and water recreation	Y	Y	Y	Y
Commercial				
Offices, business and professional, general retail	Y	Y	Y	Y
Wholesale; retail building materials, hardware, farm equipment	Y	Y	Y	Y
Industrial and Production				
Manufacturing	Y	Y	Y	Y
Utilities	Y	Y	Y	Y
Agriculture and forestry	Y	Y *(b)*	Y *(c)*	Y *(c)*
Mining and fishing, resource production and extraction	Y	Y	Y	Y

Notes:

CNEL = Community Noise Equivalent Level, in A-weighted decibels.

Y (Yes) = Land use and related structures compatible without restrictions.

C (conditionally compatible) = Land use and related structures are permitted, provided that sound insulation is provided to reduce interior noise levels from exterior sources to CNEL 45 dB or lower and that an avigation easement is granted to the City and County of San Francisco as operator of SFO. See Policy NP-3.

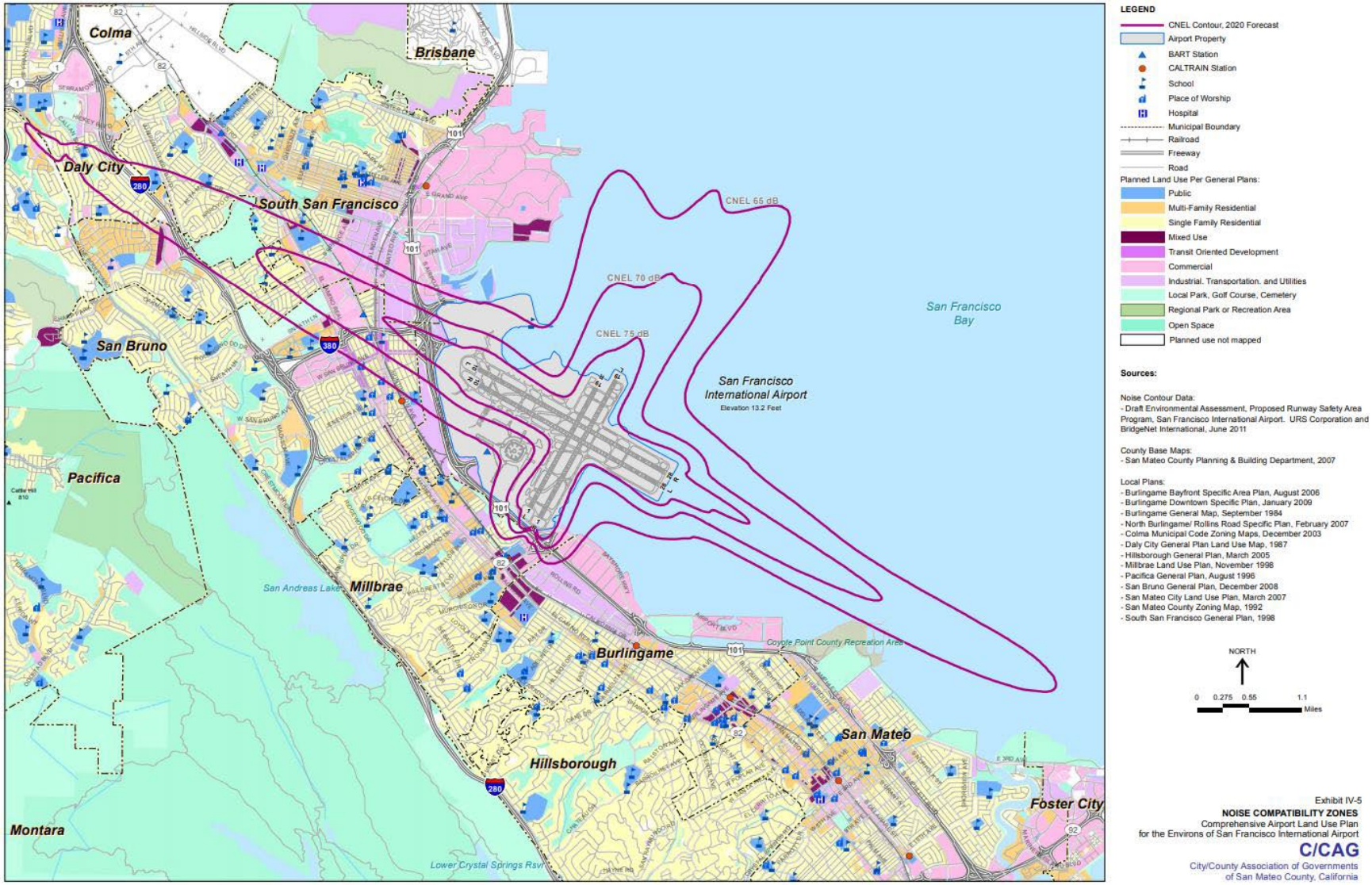
N (No) = Land use and related structures are not compatible..

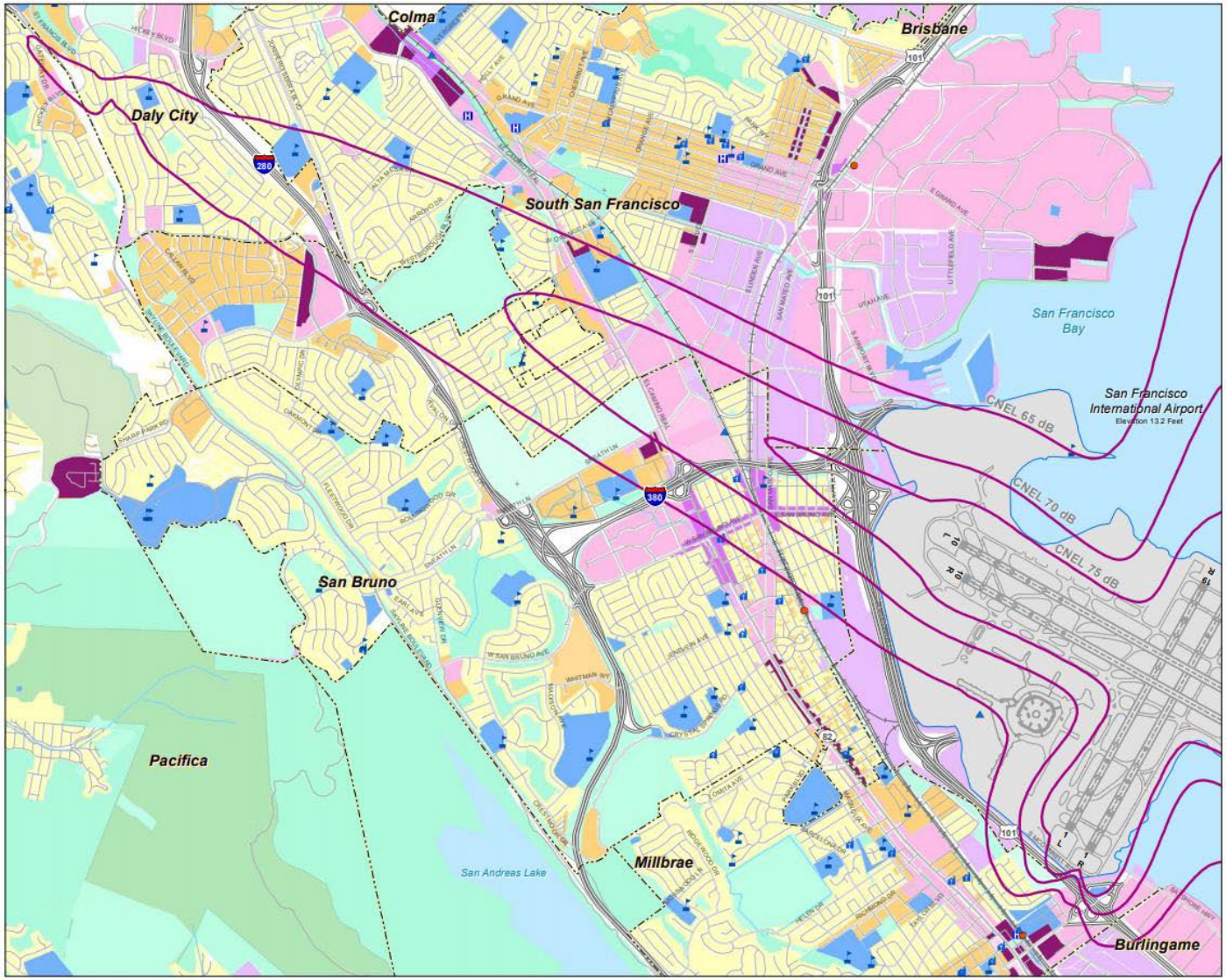
(a) Use is conditionally compatible only on an existing lot of record zoned only for residential use as of the effective date of the ALUCP. Use must be sound-insulated to achieve an indoor noise level of CNEL 45 dB or less from exterior sources. The property owners shall grant an avigation easement to the City and County of San Francisco prior to issuance of a building permit for the proposed building or structure. If the proposed development is not built, then, upon notice by the local permitting authority, SFO shall record a notice of termination of the avigation easement.

(b) Residential buildings must be sound-insulated to achieve an indoor noise level of CNEL 45 dB or less from exterior sources.

(c) Accessory dwelling units are not compatible.

SOURCES: Jacobs Consultancy Team 2010. Based on State of California General Plan Guidelines for noise elements of general plans; California Code of Regulations, Title 21, Division 2.5, Chapter 6, Section 5006; and 14 CFR Part 150, Appendix A, Table 1.
PREPARED BY; Ricondo & Associates, Inc., June 2012.


Colma
Brisbane
Daly City
South San Francisco
San Bruno
Pacifica
Millbrae
Burlingame
San Mateo
Foster City
Hillsborough
Montara
San Francisco Bay
San Francisco International Airport
Elevation 13.2 Feet
CNEL 65 dB
CNEL 70 dB
CNEL 75 dB
San Andreas Lake
Coyote Point County Recreation Area
Lower Crystal Springs Rsvr
LEGEND
CNEL Contour, 2020 Forecast
Airport Property
BART Station
CALTRAIN Station
School
Place of Worship
Hospital
Municipal Boundary
Railroad
Freeway
Road
Planned Land Use Per General Plans:
Public
Multi-Family Residential
Single Family Residential
Mixed Use
Transit Oriented Development
Commercial
Industrial. Transportation. and Utilities
Local Park, Golf Course, Cemetery
Regional Park or Recreation Area
Open Space
Planned use not mapped
Sources:
Noise Contour Data:
- Draft Environmental Assessment, Proposed Runway Safety Area Program, San Francisco International Airport. URS Corporation and BridgeNet International, June 2011
County Base Maps:
- San Mateo County Planning & Building Department, 2007
Local Plans:
- Burlingame Bayfront Specific Area Plan, August 2006
- Burlingame Downtown Specific Plan, January 2009
- Burlingame General Map, September 1984
- North Burlingame/ Rollins Road Specific Plan, February 2007
- Colma Municipal Code Zoning Maps, December 2003
- Daly City General Plan Land Use Map, 1987
- Hillsborough General Plan, March 2005
- Millbrae Land Use Plan, November 1998
- Pacifica General Plan, August 1996
- San Bruno General Plan, December 2008
- San Mateo City Land Use Plan, March 2007
- San Mateo County Zoning Map, 1992
- South San Francisco General Plan, 1998
NORTH
0 0.275 0.55 1.1
Miles
Exhibit IV-5
NOISE COMPATIBILITY ZONES
Comprehensive Airport Land Use Plan
for the Environs of San Francisco International Airport
C/CAG
City/County Association of Governments
of San Mateo County, California



LEGEND

- CNEL Contour, 2020 Forecast
- Airport Property
- BART Station
- CALTRAIN Station
- School
- Place of Worship
- Hospital
- Municipal Boundary
- Railroad
- Freeway
- Road

Planned Land Use Per General Plans:

- Public
- Multi-Family Residential
- Single Family Residential
- Mixed Use
- Transit Oriented Development
- Commercial
- Industrial, Transportation, and Utilities
- Local Park, Golf Course, Cemetery
- Regional Park or Recreation Area
- Open Space
- Planned use not mapped

Sources:

Noise Contour Data:
- Draft Environmental Assessment, Proposed Runway Safety Area Program, San Francisco International Airport. URS Corporation and BridgeNet International, June 2011

County Base Maps:
- San Mateo County Planning & Building Department, 2007

Local Plans:
- Burlingame Bayfront Specific Area Plan, August 2006
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- San Bruno General Plan, December 2008
- San Mateo City Land Use Plan, March 2007
- San Mateo County Zoning Map, 1992
- South San Francisco General Plan, 1998

NORTH

0 0.1 0.2 0.4 Miles

Exhibit IV-6

NOISE COMPATIBILITY ZONES -- DETAIL

Comprehensive Airport Land Use Plan
for the Environs of San Francisco International Airport

C/CAG

City/County Association of Governments
of San Mateo County, California

Local

Daly City 2030 General Plan. The Noise Element in the Daly City 2030 General Plan states that construction noise is regulated in Daly City through the environmental review process by the Engineering and Planning Divisions. Typically, construction activities are limited to the daytime hours between 8:00 a.m. and 5:00 p.m. and are prohibited on weekends and holidays. Additionally, the Noise Element sets forth a noise goal and policies related to noise control in the City. The City's noise goal is:

> *Promote a noise environment that reflects a balance of the various City objectives while providing an environment that maintains a healthy living environment; fosters relaxation and recreation; is conducive to the work environment; and provides pleasant living conditions.*

The following policies are applicable to the proposed project:

Policy NE-1: Use the future noise contour map to identify existing and potential noise impact areas.

> **Task NE-1.1:** Use the existing and projected noise contours in conjunction with the State Office of Noise Control Guidelines (Guidelines) to identify areas where land use incompatibilities exist and to guide future noise sensitive development to appropriate and compatible locations.
>
> **Task NE-1.2:** Use the existing and projected noise contours to identify existing noise impact areas that could benefit from noise insulation programs.

Policy NE-2: Use the State Office of Noise Control Guidelines as a guide to assess development that will need additional noise study and mitigations.

> **Task NE-2.1:** Use the Noise Control Guidelines to assess the suitability of a site for new development in combination with the noise contours to accurately identify areas that may need additional noise study and mitigation. Noise mitigations include additional insulation, double glazing of windows and increasing building setbacks from the noise source. Mitigations should also be creative and attractive whenever possible and appropriate. Creative noise mitigation measures can include incorporation of fountains using water to mask freeway noise and noise walls of an appropriate scale painted with decorative murals.

Policy NE-3: Maintain a CNEL level of not more than 70 dBA L_{eq}[4] in residential areas.

> **Task NE-3.1:** Continue to enforce the environmental noise requirements of the State Building Code (Title 24).

[4] The statistical descriptor L_{eq} is referenced in error in the City of Daly City General Plan. This analysis assumes that the noise limit is 70 dBA CNEL.

Task NE-3.2: Encourage noise insulation programs in areas that do not meet the current noise standard and ensure that future development is mitigated appropriately or avoided in areas where the noise levels exceed or is projected to exceed 70 dBA L_{eq}.[5]

Policy NE-4: Maintain a noise level not in excess of 75 dBA CNEL in open space, parks, and tot lots, including outdoor activity areas such as outdoor entertainment or green space of multi-family projects.

Task NE-4.1: When feasible, situate new parks and tot-lots away from busy streets or other known noise sources.

Policy NE-5: Maintain the City's current standard of 75 dBA CNEL for office, commercial, and professional areas.

Task NE-5.1: Additional noise studies should be conducted in "Conditionally Acceptable" noise environments to ensure adequate mitigation features are employed. Usually conventional construction with closed windows and fresh air supply systems will maintain a healthy noise environment.

Policy NE-6: Require new development to perform additional acoustical studies in noise environments that are identified as 'Conditionally Acceptable' or 'Normally Unacceptable' to the Guidelines.

Task NE-6.1: Require acoustical studies for new development through the discretionary review and California Environmental Quality Act processes, while paying particular attention to borderline noise environments. Conditions and mitigations, as appropriate, should be attached to projects.

Task NE-6.2: As part of the development of the new Commercial Mixed-Use zone, identify and codify, where possible, noise attenuation measures to assure that noise impacts by more intensive development to adjacent residential uses are reduced.

Policy NE-7: Require proposed intensification of development and proposed new development in noise environments identified as "Clearly Unacceptable" in the Guidelines to reduce ambient interior noise levels to 45 dBA CNEL.

Task NE-7.1: Either discourage new development or mitigate the noise impacts to it in areas identified as "Clearly Unacceptable" in the Noise Compatibility Guidelines.

Policy NE-8: Discourage noise sensitive land uses from locating in areas of inappropriate or high noise levels.

Task NE-8.1: Work to ensure that the outdoor ambient noise levels for uses such as day care centers, extended care facilities, and group care homes in residential neighborhoods

[5] The statistical descriptor L_{eq} is referenced in error in the City of Daly City General Plan. This analysis assumes that the noise limit is 70 dBA CNEL.

not exceed 70 dBA CNEL. For such uses allowed by right, the City should encourage a potential care provider to maintain an appropriate noise environment.

Task NE-8.2: Continue to attach conditions of project approval to residential day care centers in excess of eight children through the administrative use permit process to maintain an appropriate noise environment.

Policy NE-9: Work to ensure that the expansion of or changes to existing land uses do not create additional noise impacts for sensitive receptors in the vicinity of the project from intensification or alteration of existing land uses by requiring applicants.

Task NE-9.1: Depending upon the hours of operation, intensity of use, and the location of sensitive receptors in the area, the expansion or change of use could cause noise impacts. Acoustical studies should be performed, at the applicant's expense, during the discretionary and environmental review processes and conditions should be placed on the project accordingly.

Policy NE-11: Require that all future land use actions and/or associated development conforms to the relevant height, aircraft noise, and safety policies and compatibility criteria contained in the most recently adopted version of the Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport.

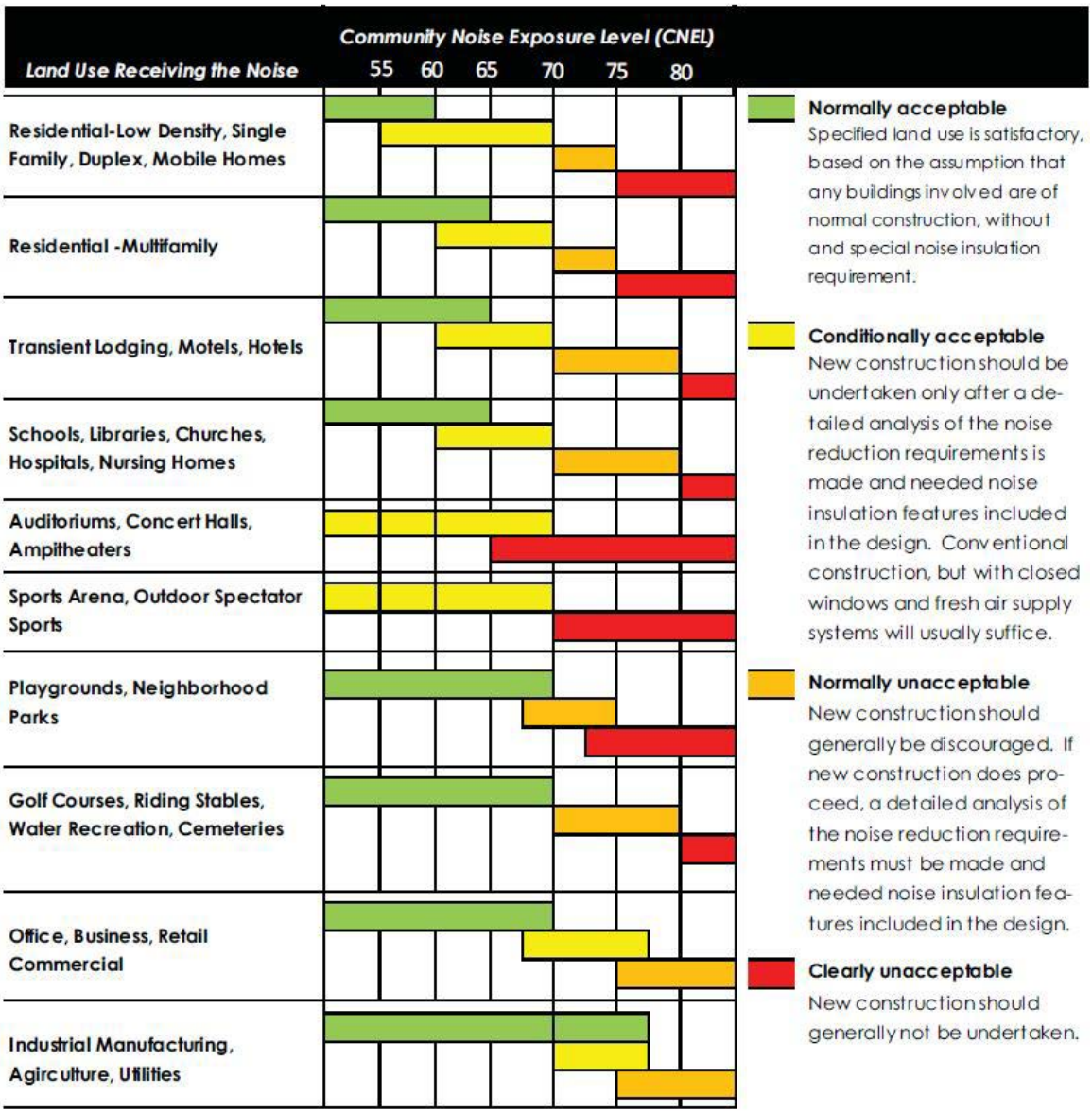
Task NE-11.1: Route any proposed land use policy actions, including new specific plans, zoning ordinances, general plan amendments, and rezoning involving land development to the Airport Land Use Commission in compliance with the Airport Land Use Plan.

Task NE-11.2: Require that development involving the construction of one or more dwelling units within the 65 dBA CNEL SFO noise contour to submit an avigation easement to the airport, when required by the Airport Land Use Commission. Specific avigation easement requirements shall be consistent with the Airport Land Use Compatibility Plan for the Environs of San Francisco International Airport. This requirement shall be implemented prior to final project approval or, if the project requires construction, prior to building permit issuance.

Task NE-11.3: Require all future development within the Airport Influence Area B boundary for San Francisco International Airport to conform to the relevant height/airspace protection, aircraft noise, and safety policies and land use compatibility criteria contained within the most recent adopted version of the comprehensive airport/land use compatibility plan (ALUCP) for the environs of San Francisco International Airport.

Task NE-11.4: Ensure that all future development in Daly City complies with all relevant FAA standards and criteria for safety, regarding flashing lights, reflective building material, land uses that may attract large concentrations of birds, HVAC exhaust vents, thermal plumes, and uses that may generate electrical/electronic interference with aircraft communications and/or instrumentation.

Figure NE-2: Noise Compatibility Guidelines



Source: State of California Office of Noise Control

Source: Daly City 2030 General Plan, Noise Element, March 2013.

Daly City Municipal Code. Chapter 9.22 of the City's Municipal Code discusses disturbing the peace. While noise level restrictions are not provided in the Municipal Code, the following sections establish qualitative noise disturbances and hours of sensitivity applicable to proposed project:

> **9.22.010 – Disturbing the peace prohibited.** No person shall make in any place, nor allow to be made upon his premises, or premises within his control, any noise, disorder or tumult to the disturbance of the public peace.

9.22.030 – Noise. Between the hours of ten p.m. (10:00 p.m.) and six a.m. (6:00 a.m.) of the following day, no person shall cause, create or permit any noise, music, sound or other disturbance upon his property which may be heard by, or which noise disturbs or harasses, any other person beyond the confines of the property, quarters or apartment from which the noise, music, sound or disturbance emanates.

Regulatory Background – Vibration

California Department of Transportation. To avoid damage to buildings, Caltrans recommends that construction vibration levels are limited to 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, to 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and to 0.08 in/sec PPV for ancient buildings or buildings that are documented to be structurally weakened (see Table 3).

Existing Noise Environment

The project site is located southwest of the I-280/Hickey Boulevard interchange in the City of Daly City. Currently, the site is occupied by an office building. The site is bound by Hickey Boulevard to the north, I-280 to the east, Gellert Boulevard to the west, and Serravista Avenue to the south. Surrounding land uses include residences to the south, opposite Serravista Avenue; commercial uses to the north, opposite Hickey Boulevard; Gellert Park, the Serramonte Main Branch – Daly City Public Library, and the North County Fire Authority to the west, opposite Gellert Boulevard; and residential uses, commercial uses, and an office building to the east, opposite I-280.

The noise environment at the site and in the surrounding areas results primarily from vehicular traffic along I-280 and Hickey Boulevard. Aircraft associated with San Francisco International Airport also contributes to the noise environment.

A noise monitoring survey, which included three long-term (LT-1 through LT-3) and three short-term (ST-1 through ST-3) noise measurements, was performed at the site beginning on Tuesday January 31, 2023 and concluding on Thursday February 2, 2023. All measurement locations are shown in Figure 1.

Long-term noise measurement LT-1 was made from the trees in Gellert Park, approximately 85 feet south of the centerline of Hickey Boulevard. Hourly average noise levels at LT-1 typically ranged from 61 to 69 dBA L_{eq} during daytime hours (between 7:00 a.m. and 10:00 p.m.) and from 53 to 63 dBA L_{eq} during nighttime hours (between 10:00 p.m. and 7:00 a.m.). The community noise equivalent level (CNEL) for the 24-hour period on Thursday February 1, 2023 was 67 dBA CNEL. The daily trends in noise levels at LT-1 are shown in Figures A1 through A3 in the Appendix of this report.

LT-2 was made from the trees in Gellert Park, approximately 95 feet west of the centerline of Gellert Boulevard. Hourly average noise levels at LT-2 typically ranged from 61 to 71 dBA L_{eq} during the day and from 51 to 61 dBA L_{eq} at night. The CNEL was 66 dBA on Wednesday, February 1, 2023. The daily trends in noise levels at LT-2 are shown in Figures A4 through A6 in the Appendix of this report.

LT-3 was made along the southern boundary of the project site, approximately 175 feet from the centerline of the nearest through lane of southbound I-280 and approximately 45 feet from the centerline of Serravista Avenue. Hourly average noise levels at LT-3 typically ranged from 71 to 75 dBA L_{eq} during the day and from 63 to 73 dBA L_{eq} at night. The CNEL was 77 dBA on Wednesday, February 1, 2023. The daily trends in noise levels at LT-3 are shown in Figures A7 through A9 in the Appendix of this report.

Each short-term noise measurement was made on Tuesday January 31, 2023, in 10-minute intervals between 10:30 a.m. and 11:20 a.m. Table 4 summarizes the measurements at each short-term location.

ST-1 was made along the sidewalk behind the backyard of 49 Berta Circle, approximately 30 feet from the centerline of Serravista Avenue. During this 10-minute measurement, 16 passenger cars drove along Serravista Avenue, generating noise levels at ST-1 ranging from 57 to 74 dBA. Nearby I-280 traffic generated noise levels of 57 to 69 dBA. Additionally, a jet flyover observed during the measurement produced noise levels of 64 dBA. The 10-minute average noise level at ST-1 was 63 dBA L_{eq}.

ST-2 was made from the front yard of 72 Marbly Avenue, approximately 20 feet from the centerline. Local traffic along Marbly Avenue (4 cars) and nearby Victoria Street (5 cars) generated noise levels of 47 to 66 dBA. Nearby I-280 traffic generated noise levels ranging from 47 to 53 dBA at ST-2, and a jet was observed to generate noise levels of 54 dBA at ST-2. The 10-minute average noise level at ST-2 was 52 dBA L_{eq}.

ST-3 was made from the front yard of 3 Dover Court, which is located at the corner of Gellert Boulevard. ST-3 was positioned approximately 85 feet from the centerline of Gellert Boulevard. Traffic noise along Gellert Boulevard included passenger cars (52 to 64 dBA), heavy trucks (63 to 72 dBA), buses (64 dBA), and a motorcycle (65 dBA). Observed jets generated noise levels at ST-3 ranging from 54 to 66 dBA. The 10-minute average noise level at ST-3 was 58 dBA L_{eq}.

TABLE 4 Summary of Short-Term Noise Measurement Data (dBA)

Noise Measurement Location (Date, Time)	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{eq(10)}$
ST-1: backyard equivalent of 49 Berta Circle (1/31/2023, 10:30-10:40 a.m.)	74	69	65	61	60	63
ST-2: front yard of 72 Marbly Avenue (1/31/2023, 10:50-11:00 a.m.)	66	60	53	50	48	52
ST-3: front yard of 3 Dover Court (1/31/2023, 11:10-11:20 a.m.)	72	68	61	55	49	58

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

Source: Google Earth, 2023.

PLAN CONSISTENCY ANALYSIS

Noise and Land Use Compatibility

The Daly City General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques and through appropriate land use policies. The applicable General Plan policies were presented in detail in the Regulatory Background section and are summarized below for the proposed project:

- The City's acceptable exterior noise level standard is 70 dBA CNEL or less for the proposed commercial 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 project site would continue to be dominated by traffic along I-280 and Hickey Boulevard. A traffic study completed for the proposed project included peak hour turning movements for two cumulative plus project traffic conditions representing both proposed project scenarios. Under both project scenarios, traffic volumes along Hickey Boulevard would not measurably increase above existing conditions. While traffic volumes along I-280 are not included in the traffic study, a conservative 1% to 2% increase per year for the next 20 years was assumed, representing a standard traffic volume increase in a developed area. Therefore, the worst-case increase by the year 2043 would be about 2 dBA CNEL at the project site.

Future Exterior Noise Environment

The project's site plan shows an outdoor seating area on level four and multiple balconies on levels six, seven, and eight.

The level four seating area is located along the southern building façade, facing Serravista Avenue. The center of the seating area would be located approximately 200 feet from the centerline of Hickey Boulevard; however, the proposed office building and parking structure would provide adequate shielding from traffic noise along Hickey Boulevard and I-280. Future exterior noise levels at the center of the level four seating area would be below 70 dBA CNEL, which would meet the City's threshold for office land uses.

Level six shows a small balcony in the northeastern corner of the proposed building, and level seven shows two small balconies in the northeastern and northwestern corners of the proposed building. Each of these balconies would face Hickey Boulevard. Additionally, three balconies on level eight are located in the northeastern and northwestern corners (facing Hickey Boulevard) and along the southern façade, facing Serravista Avenue. With the northern building set back 80 to 85 feet from the centerline of Hickey Boulevard and assuming partial shielding from the building and the elevation of the balconies above the ground, future exterior noise levels at each of the balconies located along the northern façade would be below 70 dBA CNEL, which would meet the City's threshold.

The center of the level eight balcony along the southern façade would be adequately shielded from Hickey Boulevard. With partial shielding from I-280 provided by the parking structure and the elevation of the balcony above the ground, future exterior noise levels at the level eight balcony located along the southern façade would be below 70 dBA CNEL, which would meet the City's threshold.

The proposed project would be compatible with the future exterior noise environment at the project site.

Future Interior Noise Environment

The northern building façade, which faces Hickey Boulevard, would be set back approximately 80 to 85 feet from the centerline. Additionally, the eastern façade would be set back approximately 470 to 520 feet from the centerline of the nearest through lane along I-280. At these distances, daytime hourly average noise levels would range from 63 to 71 dBA L_{eq} at the building façades, with day-night average noise level ranging from 69 to 70 dBA CNEL. Additionally, noise levels at building façades reduce at a rate of about 1 dBA for every two levels above the ground; therefore, the upper floors would be exposed to lower noise levels.

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 satisfy the daytime threshold of 50 dBA $L_{eq(1\text{-}hr)}$.

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 IMPACTS AND MITIGATION MEASURES

Significance Criteria

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

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

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

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

Impact 1a: **Temporary Construction Noise.** Existing noise-sensitive land uses would be exposed to a temporary increase in ambient noise levels due to project construction activities. The incorporation of construction best management practices as project conditions of approval would result in a **less-than-significant** temporary noise impact.

The construction schedule assumed that the earliest possible start date would be early September 2023, and the development would be built over a period of about 25 months, with construction expected to conclude by mid-October 2025. The applicant is proposing weekday construction between 7:00 a.m. and 10:00 p.m. Construction phases would include demolition, site preparation, grading, trenching, building construction, architectural coating, and paving. During each phase of construction, there would be a different mix of equipment operating, and noise levels would vary by phase and vary within phases, based on the amount of equipment in operation and the location at which the equipment is operating.

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

The City's General Plan suggests construction activities be limited to the hours of 8:00 a.m. to 5:00 p.m. on weekdays and prohibits construction on weekends and holidays. Additionally, the City's Municipal Code prohibits noise disturbances between 10:00 p.m. and 6:00 a.m. Daly City does not establish noise level thresholds for construction activities. Project construction is expected to occur outside the City's allowable hours; therefore, the applicant shall be required to get approval from the City to conduct construction outside the allowable hours.

While the City of Daly City does not establish noise level thresholds for construction activities, this analysis uses the noise limits established by the Federal Transit Administration (FTA) to identify the potential for impacts due to substantial temporary construction noise. The FTA identifies construction noise limits in the *Transit Noise and Vibration Impact Assessment Manual*. During daytime hours, an exterior threshold of 80 dBA L_{eq} shall be applied at residential land uses and 90 dBA L_{eq} shall be applied at commercial and industrial land uses.

Construction activities for individual projects are typically carried out in phases. 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 typical range of maximum instantaneous noise levels for the proposed project would be 70 to 90 dBA L_{max} at a distance of 50 feet (see Table 5) from the equipment. Table 6 shows the hourly average noise level ranges, by construction phase, typical for various types of projects. Hourly average noise levels generated by construction are about 75 to 89 dBA L_{eq} for office 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 7, along with the quantity of each type of equipment and the reference noise level at 50 feet, assuming the operation of the two loudest pieces of construction equipment for each construction phase.

Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM) was used to calculate the hourly average noise levels for each phase of construction, assuming the two loudest pieces of equipment would operate simultaneously, as recommended by the FTA for construction noise evaluations. This construction noise model includes representative sound levels for the most common types of construction equipment 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 7 also summarizes the construction noise levels for the two loudest pieces of equipment propagated to the surrounding receiving land uses.

To assess construction noise impacts at the receiving property lines of existing noise-sensitive receptors, the worst-case hourly average noise level, which would result in the combined noise level for all pieces of equipment per phase operating simultaneously, was propagated from the geometrical center of the nearest building to the property lines of the receptors. These noise level estimates are shown in Table 8. Noise levels in Table 8 do not assume reductions due to intervening buildings or existing barriers.

Additionally, the proposed project would include piles as part of the foundation of the building. These piles would be installed using an auger drill rig, which generates hourly average noise levels up to 77 dBA L_{eq} at 50 feet. Impact or vibratory pile driving is not anticipated for this project.

TABLE 5 Construction Equipment, 50-foot Noise Emission Limits

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

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

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

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

TABLE 6 Typical Ranges of Construction Noise Levels at 50 Feet, L_{eq} (dBA)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads & Highways, Sewers, and Trenches	
	I	**II**	**I**	**II**	**I**	**II**	**I**	**II**
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	88
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I – All pertinent equipment present at site.
II – Minimum required equipment present at site.

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

TABLE 7 Estimated Construction Noise Levels for the Proposed Project at a Distance of 50 feet

Phase of Construction	Total Workdays	Construction Equipment (Quantity)	Estimated Construction Noise Level at 50 feet, L_{eq} (dBA)
Demolition	20 days	Concrete/Industrial Saw (1)[a] Excavator (1) Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (1)[a]	85
Site Preparation	10 days	Grader (1)[a] Rubber-Tired Dozer (1) Tractor/Loader/Backhoe (2)[a]	84
Grading/Excavation	43 days	Excavator (2) Grader (1)[a] Rubber-Tired Dozer (1) Concrete/Industrial Saw (2)[a] Tractor/Loader/Backhoe (1)	85
Foundation/Basement Walls	21 days	Tractor/Loader/Backhoe (1)[a] Excavator (1) Crane (2) Cement & Mortar Mixer (774[b]) Auger Drill Rig[c] (1)[a]	82
Building – Superstructure/Exterior	449 days	Crane (2) Forklift (2) Generator Set (1)[a] Aerial Lift (5) Cement & Mortar Mixer (2552[b])[a]	79
Building – Cores/ Elevators	114 days	Industrial Saw (2)[a] Aerial Lift (5)[a]	83
Sitework	129 days	Cement & Mortar Mixer (200[b]) Paving Equipment (1)[a] Roller (1) Tractor/Loader/Backhoe (1)[a]	84

[a] Denotes two loudest pieces of construction equipment per phase.
[b] Not all of the equipment would operate at once; it is expected that a maximum of 5 would operate at any given time.
[c] Auger drill rig was not included in the list of equipment provided by the applicant. Pile drilling would be part of the foundation work since these are used for support.

TABLE 8 Estimated Construction Noise Levels at Nearby Land Uses

Phase of Construction	Calculated Hourly Average Noise Levels, L_{eq} (dBA)					
	Adjoining Office (80ft[a])	Adjoining Comm. (200ft[a])	South Res. (135ft[a])	North Comm. (250ft[a])	NE Res. & Comm. (570ft[a])	East Res. & Office (920ft[a])
Demolition	82	74	77	72	65	61
Site Preparation	82	74	77	72	65	61
Grading/ Excavation	85	77	80	75	68	63
Foundation/Basement Walls	82	74	77	72	65	61
Building – Superstructure/ Exterior	81	73	76	71	63	59
Building – Cores/Elevator	82	74	77	72	65	61
Sitework	82	75	78	73	65	61

[a] The distances shown in the table were measured from the center of the nearest project building to the receiving property lines.

As shown in Table 8, construction noise levels would intermittently range from 59 to 80 dBA L_{eq} at existing residential uses and from 59 to 85 dBA L_{eq} at existing office and commercial uses when activities are focused near the center of the nearest project buildings. These construction noise levels are not expected to exceed the exterior threshold of 80 dBA L_{eq} at existing residential land uses south of the site, northeast of the site, and more than 900 feet east of the site, or the 90 dBA L_{eq} threshold at office and commercial land uses in the project vicinity. When construction occurs 50 feet from the adjoining property lines, construction noise levels would range from 79 to 85 dBA L_{eq}. This would be a less-than-significant impact.

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. The construction crew shall adhere to the following construction best management practices to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity.

Construction Best Management Practices

- Limit construction activities to the City's allowable hours of 8:00 a.m. to 5:00 p.m. on weekdays and prohibit construction on weekends and holidays, where possible.

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

- At a minimum, the construction contractor shall implement the following control measures: improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures, and acoustically-attenuating shields or shrouds.

- Equipment used for project construction shall be hydraulically or electrically powered impact tools (e.g., jack hammers) wherever possible to avoid noise associated with compressed air exhaust from pneumatically-powered tools. Where use of pneumatically-powered tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used. A muffler could lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible; this could achieve a reduction of 5 dBA. Quieter procedures shall be used (such as drilling rather than impact equipment) wherever feasible.

- The construction contractor shall not allow any construction equipment, trucks, or vehicles to idle.

- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible. If they must be located near receptors, adequate muffling (with enclosures where feasible and appropriate) shall

be used to reduce noise levels at the adjacent sensitive receptors. Any enclosure openings or venting shall face away from sensitive receptors.

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

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

- Route construction-related traffic along major roadways and as far as feasible from sensitive receptors.

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

- The contractor shall prepare a detailed construction schedule for major noise-generating construction activities. The construction plan shall identify a procedure for coordination with adjacent residential land uses so that construction activities can be scheduled to minimize noise disturbance.

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

Implementation of the above best management practices would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. With the implementation of these practices and recognizing that noise generated by construction activities would occur over a temporary period, the temporary increase in ambient noise levels would be reduced to a less-than-significant level.

Mitigation Measure 1a: No further mitigation required.

Impact 1b: Permanent Noise Level Increase/Exceed Applicable Standards. The proposed project would not result in a substantial permanent noise level increase, and operational noise generated by the proposed project would not exceed the ambient noise level conditions at the surrounding receptors. **This is a less-than-significant impact.**

A significant impact would occur if the permanent noise level increase due to project-generated operations was 3 dBA CNEL or greater for future ambient noise levels exceeding 60 dBA CNEL or was 5 dBA CNEL or greater for future ambient noise levels at or below 60 dBA CNEL. With existing ambient noise levels exceeding 60 dBA CNEL, it is assumed future noise levels would

remain over 60 dBA CNEL. Therefore, a significant impact would occur if project-generated operations increased levels by 3 dBA CNEL or more.

The City of Daly City does not specify noise limits for operations, such as mechanical equipment, truck deliveries, noise-generating outdoor activities, etc. However, the City's Municipal Code prohibits noise disturbances between 10:00 p.m. and 6:00 a.m. For purposes of this study, the average daytime and nighttime ambient noise levels summarized in Table 9 for each of the receptors surrounding the site shall be used as thresholds for hourly average operational noise generated by the project. Therefore, an increase in ambient noise levels, operational noise levels exceeding average ambient conditions, or deliveries outside the City's allowable hours would constitute a significant impact.

TABLE 9 Summary of Ambient Noise Levels for Existing Receptors Surrounding the Project Site

Roadway	Range of Daytime Noise Levels (Average)	Range of Nighttime Noise Levels (Average)	CNEL
Adjoining Office	61 to 71 dBA L_{eq} (63 dBA L_{eq})	51 to 61 dBA L_{eq} (56 dBA L_{eq})	66 dBA CNEL
Adjoining Commercial	61 to 69 dBA L_{eq} (65 dBA L_{eq})	53 to 63 dBA L_{eq} (58 dBA L_{eq})	67 dBA CNEL
South Residences	61 to 71 dBA L_{eq} (63 dBA L_{eq})	51 to 61 dBA L_{eq} (56 dBA L_{eq})	66 dBA CNEL
North Commercial	61 to 69 dBA L_{eq} (65 dBA L_{eq})	53 to 63 dBA L_{eq} (58 dBA L_{eq})	67 dBA CNEL
Northeast Residences & Commercial	71 to 75 dBA L_{eq} (73 dBA L_{eq})	63 to 73 dBA L_{eq} (68 dBA L_{eq})	76 dBA CNEL
East Residences & Offices	71 to 75 dBA L_{eq} (73 dBA L_{eq})	63 to 73 dBA L_{eq} (68 dBA L_{eq})	76 dBA CNEL

Project Traffic Increase

The traffic study included peak hour turning movements for 17 intersections in the project site vicinity. For each intersection, traffic scenarios included peak hour existing volumes and peak hour existing plus project traffic volumes for both proposed project scenarios. By comparing the existing plus project volumes to the existing volumes, the project's contribution to the overall noise increase was calculated. Table 10 summarizes the estimated noise level increase for both traffic scenarios along each roadway segment included in the traffic report. As shown in Table 9, the project's traffic would result in a 1 dBA CNEL or less increase along all roadway segments in the project vicinity. This would be a less-than-significant impact.

TABLE 10 Estimated Noise Level Increases of Existing Plus Project Traffic Volumes (for Alternatives 1 and 2) Over Existing Volumes at Receptors in the Project Vicinity

Roadway	Segment	Estimated Noise Level Increase	
		Alternative 1	Alternative 2
Serravista Avenue	Gellert Boulevard to Marbly Avenue	1 dBA CNEL	1 dBA CNEL
	Marbly Avenue to Project Driveway	1 dBA CNEL	1 dBA CNEL
	Project Driveway to Victoria Street	1 dBA CNEL	0 dBA CNEL
	South of Victoria Street	0 dBA CNEL	0 dBA CNEL
Hickey Boulevard	West of Skyline Boulevard	0 dBA CNEL	0 dBA CNEL
	Skyline Boulevard to Campus Drive	0 dBA CNEL	0 dBA CNEL
	Campus Drive to Callan Boulevard	0 dBA CNEL	0 dBA CNEL
	Callan Boulevard to Gellert Boulevard	0 dBA CNEL	0 dBA CNEL
	Gellert Boulevard to Project Driveway	0 dBA CNEL	0 dBA CNEL
	Project Driveway to I-280 southbound ramps	1 dBA CNEL	0 dBA CNEL
	I-280 southbound ramps to I-280 northbound ramps	0 dBA CNEL	0 dBA CNEL
	I-280 northbound ramps to Junipero Serra Boulevard	0 dBA CNEL	0 dBA CNEL
	East of Junipero Serra Boulevard	0 dBA CNEL	0 dBA CNEL
Serramonte Boulevard	West of Gellert Boulevard	0 dBA CNEL	0 dBA CNEL
	Gellert Boulevard to I-280 southbound ramps	0 dBA CNEL	0 dBA CNEL
	I-280 southbound ramps to I-280 northbound ramps	0 dBA CNEL	0 dBA CNEL
	I-280 northbound ramps to Junipero Serra Boulevard	1 dBA CNEL	0 dBA CNEL
	East of Junipero Serra Boulevard	0 dBA CNEL	0 dBA CNEL

Roadway	Segment	Estimated Noise Level Increase	
		Alternative 1	Alternative 2
Gellert Boulevard	North of Serramonte Boulevard	0 dBA CNEL	0 dBA CNEL
	Serramonte Boulevard to Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
	Hickey Boulevard to Serravista Avenue	1 dBA CNEL	0 dBA CNEL
	Serravista Avenue to Victoria Street	0 dBA CNEL	0 dBA CNEL
	South of Victoria Street	0 dBA CNEL	0 dBA CNEL
Marbly Avenue	South of Serravista Avenue	0 dBA CNEL	0 dBA CNEL
Victoria Street	West of Gellert Boulevard	0 dBA CNEL	0 dBA CNEL
	Gellert Boulevard to Serravista Avenue	0 dBA CNEL	0 dBA CNEL
	East of Serravista Avenue	0 dBA CNEL	0 dBA CNEL
Junipero Serra Boulevard	North of Serramonte Boulevard	0 dBA CNEL	0 dBA CNEL
	Serramonte Boulevard to Hickey Boulevard	1 dBA CNEL	0 dBA CNEL
	South of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
I-280 northbound ramps	On-ramp at Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
	Off-ramp at Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
	On-ramp at Serramonte Boulevard	0 dBA CNEL	0 dBA CNEL
I-280 southbound ramps	On-ramp at Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
	Off-ramp at Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
	Off-ramp at Serramonte Boulevard	0 dBA CNEL	0 dBA CNEL
Callan Boulevard	North of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
	South of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
Campus Drive	West of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL
Skyline Boulevard	North of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL

Roadway	Segment	Estimated Noise Level Increase	
		Alternative 1	Alternative 2
	South of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL

Mechanical Equipment

The site plan shows a transformer and two generator locations on level four between the proposed office building and parking structure. The site plan also shows a 10-foot wall to the south of the level four mechanical yard, a chemical storage room of about the same height to the north of the mechanical yard, and the trash enclosures and the parking structure to the east of the mechanical yard. Rooftop equipment would include heat pump chillers, utility set fans for restroom and general exhaust core, air handling units, and other smaller equipment, which would not generate noise levels audible at the property lines. While two project alternatives have been proposed for this project, worst-case noise conditions are assumed for this analysis.

Typically, transformers up to 1,000 kVA generate noise levels up to 64 dB, as measured at 1 meter (3.28 feet). Assuming the transformer runs continuously during daytime and nighttime hours, the community noise equivalent level would be 71 dBA CNEL at a distance of 1 meter (3.28 feet).

For the medical building scenario, only one 600 kW generator would be required; however, under the tech office building scenario, one 600 kW generator would be required for the base building, and an additional 1,000 kW generator may be added in the future for tenants. Assuming worst-case conditions, two generators are assumed in this analysis. Each generator is expected to have an enclosure, which would reduce noise levels at 23 feet to 73 dBA. Emergency generators are typically tested monthly for a period of one hour between 7:00 a.m. and 10:00 p.m. Further, it is assumed that the City's nighttime restrictions would not apply during emergency conditions when the generators may run continuously during daytime and nighttime hours. At 23 feet, testing of the emergency generator would result in a community noise equivalent level of 62 dBA CNEL, assuming both generators are tested during the same 24-hour period.

Due to the orientation of the proposed office building and the location of the level four mechanical yard, the existing office and commercial buildings adjoining the project site would be well shielded from noise generated by the transformer and the emergency generators and would not be considered receptors for these noise sources. The 10-foot wall, chemical storage room, trash enclosures, and parking structure, in combination with the height of level four above the ground level, would provide a minimum 5 dBA attenuation for all remaining receptors surrounding the site. Assuming these noise attenuations, Table 11 summarizes the noise generated by the transformer and emergency generators propagated to the property lines of the surrounding land uses.

TABLE 11 Estimated Operational Noise Levels for Level Four Mechanical Equipment Sources

Receptor	Distance from Center of the Transformer	L_{eq} from Transformer Noise	Distance from Center of the Emergency Generators	L_{eq} from Emergency Generators	Combined CNEL	Noise Level Increase, dBA CNEL
South Residences	145 feet	26 dBA[a]	180 to 190 feet	50 dBA[a]	40 dBA[a]	0 dBA
North Commercial	285 feet	20 dBA[a]	225 to 240 feet	48 dBA[a]	38 dBA[a]	0 dBA
Northeast Residences & Commercial	710 feet	< 20 dBA[a]	700 to 725 feet	38 dBA[a]	28 dBA[a]	0 dBA
East Residences & Offices	1,075 feet	< 20 dBA[a]	1,135 to 1,170 feet	34 dBA[a]	24 dBA[a]	0 dBA

[a] Conservative 5 dBA attenuation assumed for 10-foot surrounding enclosures, parking structure, wall, and room.

Average noise levels due to transformer and generator operations would not exceed daytime or nighttime average ambient noise levels at any of the surrounding receptors. For all existing receptors, the noise level increase due to transformer and emergency generator noise would not be measurable or detectable (0 dBA CNEL increase). This is a less-than-significant impact.

Two types of Multistack heat pump chillers have been selected for the proposed project. These units would have noise levels of 71 and 72 dBA at 30 feet. Under worst-case conditions, two 71 dBA units and one 72 dBA unit would be located on the rooftop of the proposed tech office building. Utility set fans selected for the proposed project would include Greenheck USF-33 fans with noise levels up to 74 dBA at a distance of 5 feet. Both project alternatives would include one fan. Air handling units (AHU) selected for the proposed project are CMS (Custom Mechanical Systems, LLC) units, which radiate noise levels up to 75 dBA at a distance of 5 feet. For the medical building, two AHU units are expected, and for the tech building, three AHU units are expected. Under worst-case conditions, three heat pump chillers, three AHUs, and one fan operating simultaneously in the same general area of the roof would generate a combined noise level of 92 dBA L_{eq} at 5 feet Assuming worst-case operations each hour for a 24-hour period, the community noise equivalent level would be 99 dBA CNEL at 5 feet.

The site plan shows potential mechanical equipment located in a cluster approximately 100 feet from the western building façade and approximately 70 feet from the eastern building façade. Estimated noise levels at each receptor are calculated from the nearest mechanical equipment cluster. The site plan also shows a 15-foot metal cladded roof screen surrounding the rooftop. In combination with the elevation of these noise sources, the estimated attenuation would be a minimum of 20 dBA for all surrounding receptors. Table 12 summarizes the rooftop mechanical equipment noise levels propagated to the property lines of the surrounding land uses.

Average noise levels due to heat pump chillers, utility set fans, and AHUs noise would not exceed daytime or nighttime average ambient noise levels at any of the surrounding receptors. Additionally, the combined noise level from all these rooftop sources would not exceed daytime or nighttime average noise levels at any surrounding receptor. For all existing residential receptors, the noise level increase due to rooftop noise sources would not be measurable or detectable (0 dBA CNEL increase), while up to 1 dBA CNEL increase would occur at the adjoining office building. This is a less-than-significant impact.

TABLE 12 Estimated Operational Noise Levels for Rooftop Mechanical Equipment Sources

Receptor	Distance from Center of the Rooftop Equipment	Estimated L_{eq}				Combined CNEL, dBA	Noise Level Increase, dBA CNEL
		3 Heat Pump Chillers	Utility Set Fan	3 AHUs	Combined L_{eq}		
Adjoining Office	65 feet	49 dBA[a]	32 dBA[a]	37 dBA[a]	50 dBA[a]	56 dBA[a]	1 dBA
Adjoining Commercial	165 feet	41 dBA[a]	24 dBA[a]	29 dBA[a]	42 dBA[a]	48 dBA[a]	0 dBA
South Residences	170 feet	41 dBA[a]	24 dBA[a]	29 dBA[a]	41 dBA[a]	48 dBA[a]	0 dBA
North Commercial	230 feet	38 dBA[a]	21 dBA[a]	26 dBA[a]	39 dBA[a]	45 dBA[a]	0 dBA
Northeast Residences & Commercial	800 feet	28 dBA[a]	< 20 dBA[a]	< 20 dBA[a]	28 dBA[a]	35 dBA[a]	0 dBA
East Residences & Offices	1,245 feet	24 dBA[a]	< 20 dBA[a]	< 20 dBA[a]	24 dBA[a]	31 dBA[a]	0 dBA

[a] Conservative 20 dBA attenuation assumed for 15-foot metal cladded roof screen and elevation of noise sources above the ground.

Truck Loading and Unloading

The site plan shows a loading zone along the eastern building façade on level four, which is located between the transformer and emergency generator. Due to the orientation of the office building, all truck loading and unloading activities would be well-shielded from the existing office and commercial uses adjoining the project site. The elevation of level four, the 10-foot transformer wall, the chemical storage room, and the parking structure would provide a conservative 5 dBA attenuation for all other surrounding receptors.

The loading zone of the proposed office building is expected to have medium- and heavy-sized trucks, with up to four deliveries in a week. Truck delivery noise 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. Heavy trucks typically generate maximum instantaneous noise levels of 70 to 75 dBA at a distance of 50 feet. Smaller 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. Assuming a single truck would take up to 15 minutes to load/unload and only one loading/unloading activity would occur in a single hour, hourly average noise levels would range from 59 to 69 dBA L_{eq} for medium and heavy trucks, respectively. It is assumed that all deliveries and on-site maintenance activities would occur during daytime hours between 7:00 a.m. and 10:00 p.m. Assuming up to four deliveries in a single day during these daytime hours, the community noise equivalent level at 50 feet would be 59 dBA CNEL. This would represent worst-case conditions.

Table 13 summarizes the truck loading/unloading noise levels propagated to the property lines of the surrounding land uses.

Operational L_{eq} due to truck loading/unloading noise would not exceed daytime average ambient noise levels at any of the surrounding receptors. This is a less-than-significant impact.

For all existing receptors, the noise level increase due to truck loading/unloading noise sources would not be measurable or detectable (0 dBA CNEL increase).

TABLE 13 Estimated Operational Noise Levels for Truck Loading and Unloading Sources

Receptor	Distance from Center of the Loading Zone	L_{eq} from Heavy Truck Noise	L_{eq} from Medium Truck Noise	Combined CNEL	Noise Level Increase, dBA CNEL
South Residences	165 feet	54 dBA[a]	44 dBA[a]	46 dBA[a]	0 dBA[a]
North Commercial	265 feet	50 dBA[a]	40 dBA[a]	42 dBA[a]	0 dBA[a]
Northeast Residences & Commercial	690 feet	41 dBA[a]	31 dBA[a]	33 dBA[a]	0 dBA[a]
East Residences & Offices	1,075 feet	37 dBA[a]	27 dBA[a]	30 dBA[a]	0 dBA[a]

[a] Conservative 5 dBA attenuation assumed for 10-foot surrounding enclosures, parking structure, wall, and room.

Total Combined Project-Generated Noise

Operational noise levels produced by the proposed project combined (i.e., traffic, mechanical equipment, truck loading/unloading) would result in an increase of 2 dBA CNEL or less at all existing noise-sensitive receptors in the project vicinity. Therefore, the proposed project would not result in a substantial increase over ambient noise levels in the project vicinity.

Operational noise levels due to truck loading/unloading activities, rooftop mechanical equipment, and level four mechanical equipment would not exceed average ambient L_{eq} noise levels. Therefore, this is a less-than-significant impact.

Mitigation Measure 1b: None required.

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

The construction of the project may generate vibration when heavy equipment or impact tools (e.g., jackhammers, hoe rams) are used. Construction activities would include grading, foundation work, paving, and new building framing and finishing. According to the equipment list provided at the time of this study, impact or vibratory pile driving activities, which can cause excessive vibration, are not expected for the proposed project.

For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, 0.3 in/sec PPV for buildings that are found to be structurally sound but where structural damage is a major concern, and a conservative limit of 0.08 in/sec PPV for ancient buildings or buildings that are documented to be structurally weakened. No known ancient buildings or buildings that are documented to be structurally weakened adjoin the project area. Therefore, conservatively, groundborne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in a significant vibration impact.

Table 14 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 14 also summarizes the distances to the 0.3 in/sec PPV threshold for all conventional buildings.

TABLE 14 Vibration Source Levels for Construction Equipment

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

Source: Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, Office of Planning and Environment, U.S. Department of Transportation, September 2018, as modified by Illingworth & Rodkin, Inc., March 2023.

Table 15 summarizes the vibration levels at each of the surrounding buildings in the project vicinity. 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 damage to buildings on receiving land uses, not receptors at the nearest property lines. Therefore, the distances used to propagate construction vibration levels (as shown in Table 15), which are different than the distances used to propagate construction noise levels (as shown in Table 8), were estimated under the assumption that each piece of equipment from Table 14 was operating along the nearest boundary of the busy construction site, which would represent the worst-case scenario.

Project construction activities would potentially generate vibration levels up to 1.2 in/sec PPV at the existing office building adjoining the project site. A study completed by the US Bureau of Mines analyzed the effects of blast-induced vibration on buildings in USBM RI 8507.[6] The findings of this study have been applied to buildings affected by construction-generated vibrations.[7] As reported in USBM RI 8507[6] and reproduced by Dowding,[7] Figure 2 presents the damage probability, in terms of "threshold damage" (described above as cosmetic damage), "minor damage," and "major damage," at varying vibration levels. Threshold damage, or cosmetic damage, would entail hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage would include hairline cracking in masonry or

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

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

the loosening of plaster, and major structural damage would include wide cracking or shifting of foundation or bearing walls.

As shown in Figure 2, maximum vibration levels of 0.3 in/sec PPV or lower would result in virtually no measurable damage, while maximum vibration levels of 1.2 in/sec PPV would result in about 20% chance of cosmetic damage. No minor or major damage would be expected at the buildings immediately adjoining the project site.

Neither cosmetic, minor, or major damage would occur at historical or conventional buildings located 20 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.

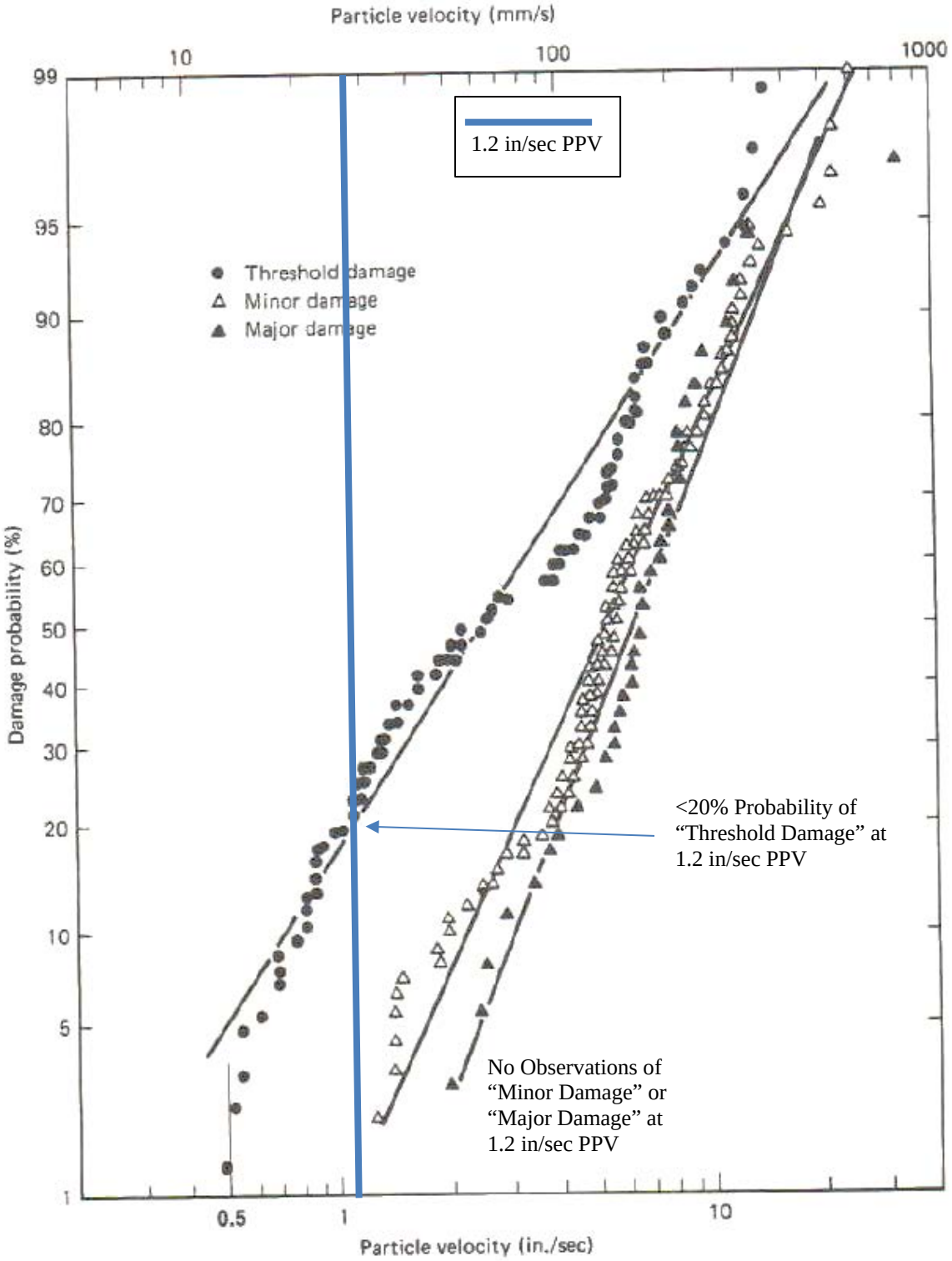
In summary, the construction of the project would potentially generate vibration levels exceeding the 0.3 in/sec PPV threshold at conventional properties adjoining the project site. This would be a potentially significant impact.

TABLE 15 Vibration Source Levels for Construction Equipment

Equipment		Estimated Vibration Levels at Structures Surrounding the Project Site, in/sec PPV					
		Adjoining Office (5 feet)	Adjoining Commercial (70 feet)	South Residences (80 feet)	North Commercial (175 feet)	NE Residences & Commercial (560 feet)	East Residences & Office (825 feet)
Clam shovel drop		**1.186**	0.065	0.056	0.07241	0.007	0.004
Hydromill (slurry wall)	in soil	0.047	0.003	0.002	0.001	0.0003	0.0002
	in rock	0.100	0.005	0.005	0.002	0.001	0.0004
Vibratory Roller		**1.233**	0.068	0.058	0.025	0.007	0.004
Hoe Ram		**0.523**	0.029	0.025	0.010	0.003	0.002
Large bulldozer		**0.523**	0.029	0. 025	0.010	0.003	0.002
Caisson drilling		**0.523**	0.029	0.025	0.010	0.003	0.002
Loaded trucks		**0.446**	0.024	0.021	0.009	0.002	0.002
Jackhammer		0.206	0.011	0.010	0.004	0.001	0.001
Small bulldozer		0.018	0.001	0.001	0.0004	0.0001	0.0001

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., March 2023.

FIGURE 2 Probability of Cracking and Fatigue from Repetitive Loading



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

Mitigation Measure 2:

The following measures are recommended to reduce vibration impacts from construction activities to a less-than-significant level:

- A list of all heavy construction equipment to be used for this project known to produce high vibration levels (e.g., tracked vehicles, vibratory compaction, jackhammers, hoe rams, clam shovel drop, and vibratory roller, etc.) shall be submitted to the City by the contractor. This list shall be used to identify equipment and activities that would potentially generate substantial vibration and to define the level of effort for reducing vibration levels below the thresholds.

- Place operating equipment on the construction site as far as possible from vibration-sensitive receptors.

- Use smaller equipment to minimize vibration levels to below 0.3 in/sec PPV shall be used at the property lines. For example, a smaller vibratory roller, such as the Caterpillar model CP433E vibratory compactor, could be used when compacting materials within 20 feet of the adjacent conventional building.

- Avoid using vibratory rollers and clam shovel drops near sensitive areas.

- Select demolition methods not involving impact tools.

- Modify/design or identify alternative construction methods to reduce vibration levels below the limits.

- Avoid dropping heavy equipment and use alternative methods for breaking up existing pavement, such as a pavement grinder, instead of dropping heavy objects, within 20 feet of the adjacent conventional building.

- Designate a person responsible for registering and investigating claims of excessive vibration. The contact information of such person shall be clearly posted on the construction site.

The implementation of these mitigation measures would reduce a potential impact to a less-than-significant level.

Impact 3: **Excessive Aircraft Noise.** The project site is located about 4.9 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 4.9 miles southeast of the project site. According to the *Comprehensive Airport Land Use Compatibility*

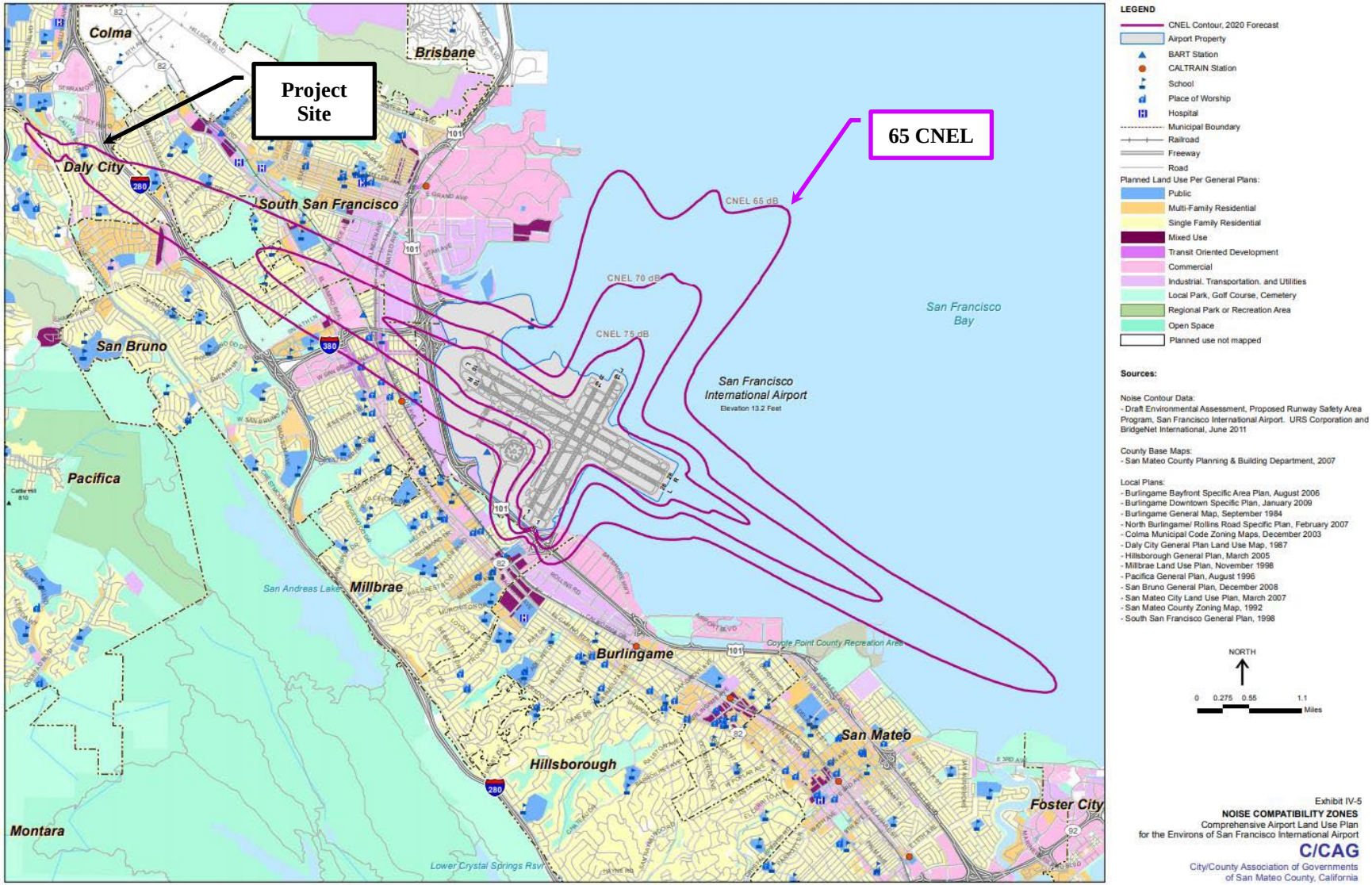
Plan for the Environs of San Francisco International Airport,[8] the project site lies well outside the 65 dBA CNEL/L_{dn} noise contour (see Figure 3), and the required safe and compatible threshold for exterior noise levels would be at or below 65 dBA CNEL for aircrafts. Therefore, the proposed project would be compatible with the exterior noise standards for aircraft noise.

Assuming standard construction materials, future interior noise levels resulting from aircraft would be below 50 dBA $L_{eq(1\text{-}hr)}$. 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.**

[8] 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 3 2020 CNEL Noise Contours for San Francisco International Airport Relative to Project Site



Cumulative Impacts

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

A significant cumulative traffic noise increase would occur if two criteria are met: 1) if the cumulative traffic noise level increase was 3 dBA CNEL or greater for future levels exceeding 60 dBA CNEL or was 5 dBA CNEL or greater for future levels at or below 60 dBA CNEL; and 2) if the project would make a "cumulatively considerable" contribution to the overall traffic noise increase. A "cumulatively considerable" contribution would be defined as an increase of 1 dBA CNEL or more attributable solely to the proposed project.

The traffic study included peak hour turning movements cumulative (no project), cumulative plus Alternative 1 project, and cumulative plus Alternative 2 project for each of the 17 intersections in the project site vicinity. All three of these traffic scenarios were compared to the existing traffic volumes to determine the noise level increase. The only roadway segment with a 3 dBA CNEL or more increase was Campus Drive, west of Hickey Boulevard. The same increase was calculated for cumulative (no project) and both cumulative plus project scenarios. Therefore, the project would not result in a cumulatively considerable contribution to the overall noise increase. This would be a less-than-significant impact.

There are no known approved projects surrounding the project site that would be constructed during the same timeframe as the proposed project. Therefore, the noise-sensitive receptors surrounding the project site would not be subject to cumulative construction impacts.

TABLE 16 Estimated Noise Level Increases of Cumulative Plus Project Traffic Volumes (for Alternatives 1 and 2) and Cumulative Traffic Volumes Over Existing Volumes at Receptors in the Project Vicinity

Roadway	Segment	Estimated Noise Level Increase Above Existing Volumes			Increase Due to Project Only	
		Cumulative (No Project)	Cumulative Plus Alternative 1	Cumulative Plus Alternative 2	Cumulative Plus Alternative 1	Cumulative Plus Alternative 2
Serravista Avenue	Gellert Boulevard to Marbly Avenue	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Marbly Avenue to Project Driveway	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Project Driveway to Victoria Street	0 dBA CNEL	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL
	South of Victoria Street	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
Hickey Boulevard	West of Skyline Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Skyline Boulevard to Campus Drive	2 dBA CNEL	2 dBA CNEL	2 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Campus Drive to Callan Boulevard	1 dBA CNEL	2 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL
	Callan Boulevard to Gellert Boulevard	0 dBA CNEL	1 dBA CNEL	0 dBA CNEL	1 dBA CNEL	0 dBA CNEL
	Gellert Boulevard to Project Driveway	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Project Driveway to I-280 southbound ramps	0 dBA CNEL	1 dBA CNEL	0 dBA CNEL	1 dBA CNEL	0 dBA CNEL
	I-280 southbound ramps to I-280 northbound ramps	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	I-280 northbound ramps to Junipero Serra Boulevard	0 dBA CNEL	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL

Roadway	Segment	Estimated Noise Level Increase Above Existing Volumes			Increase Due to Project Only	
		Cumulative (No Project)	Cumulative Plus Alternative 1	Cumulative Plus Alternative 2	Cumulative Plus Alternative 1	Cumulative Plus Alternative 2
	East of Junipero Serra Boulevard	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
Serramonte Boulevard	West of Gellert Boulevard	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Gellert Boulevard to I-280 southbound ramps	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	I-280 southbound ramps to I-280 northbound ramps	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	I-280 northbound ramps to Junipero Serra Boulevard	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	East of Junipero Serra Boulevard	2 dBA CNEL	2 dBA CNEL	2 dBA CNEL	0 dBA CNEL	0 dBA CNEL
Gellert Boulevard	North of Serramonte Boulevard	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Serramonte Boulevard to Hickey Boulevard	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Hickey Boulevard to Serravista Avenue	0 dBA CNEL	1 dBA CNEL	0 dBA CNEL	1 dBA CNEL	0 dBA CNEL
	Serravista Avenue to Victoria Street	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	South of Victoria Street	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
Marbly Avenue	South of Serravista Avenue	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
Victoria Street	West of Gellert Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL

Roadway	Segment	Estimated Noise Level Increase Above Existing Volumes			Increase Due to Project Only	
		Cumulative (No Project)	Cumulative Plus Alternative 1	Cumulative Plus Alternative 2	Cumulative Plus Alternative 1	Cumulative Plus Alternative 2
	Gellert Boulevard to Serravista Avenue	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	East of Serravista Avenue	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
Junipero Serra Boulevard	North of Serramonte Boulevard	0 dBA CNEL	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL
	Serramonte Boulevard to Hickey Boulevard	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	South of Hickey Boulevard	1 dBA CNEL	1 dBA CNEL	1 dBA CNEL	0 dBA CNEL	0 dBA CNEL
I-280 northbound ramps	On-ramp at Hickey Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Off-ramp at Hickey Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	On-ramp at Serramonte Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
I-280 southbound ramps	On-ramp at Hickey Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Off-ramp at Hickey Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	Off-ramp at Serramonte Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
Callan Boulevard	North of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	South of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
Campus Drive	West of Hickey Boulevard	6 dBA CNEL	6 dBA CNEL	6 dBA CNEL	0 dBA CNEL	0 dBA CNEL

Roadway	Segment	Estimated Noise Level Increase Above Existing Volumes			Increase Due to Project Only	
		Cumulative (No Project)	Cumulative Plus Alternative 1	Cumulative Plus Alternative 2	Cumulative Plus Alternative 1	Cumulative Plus Alternative 2
Skyline Boulevard	North of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL
	South of Hickey Boulevard	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL	0 dBA CNEL

APPENDIX

FIGURE A1 Daily Trend in Noise Levels at LT-1, Tuesday, January 31, 2023

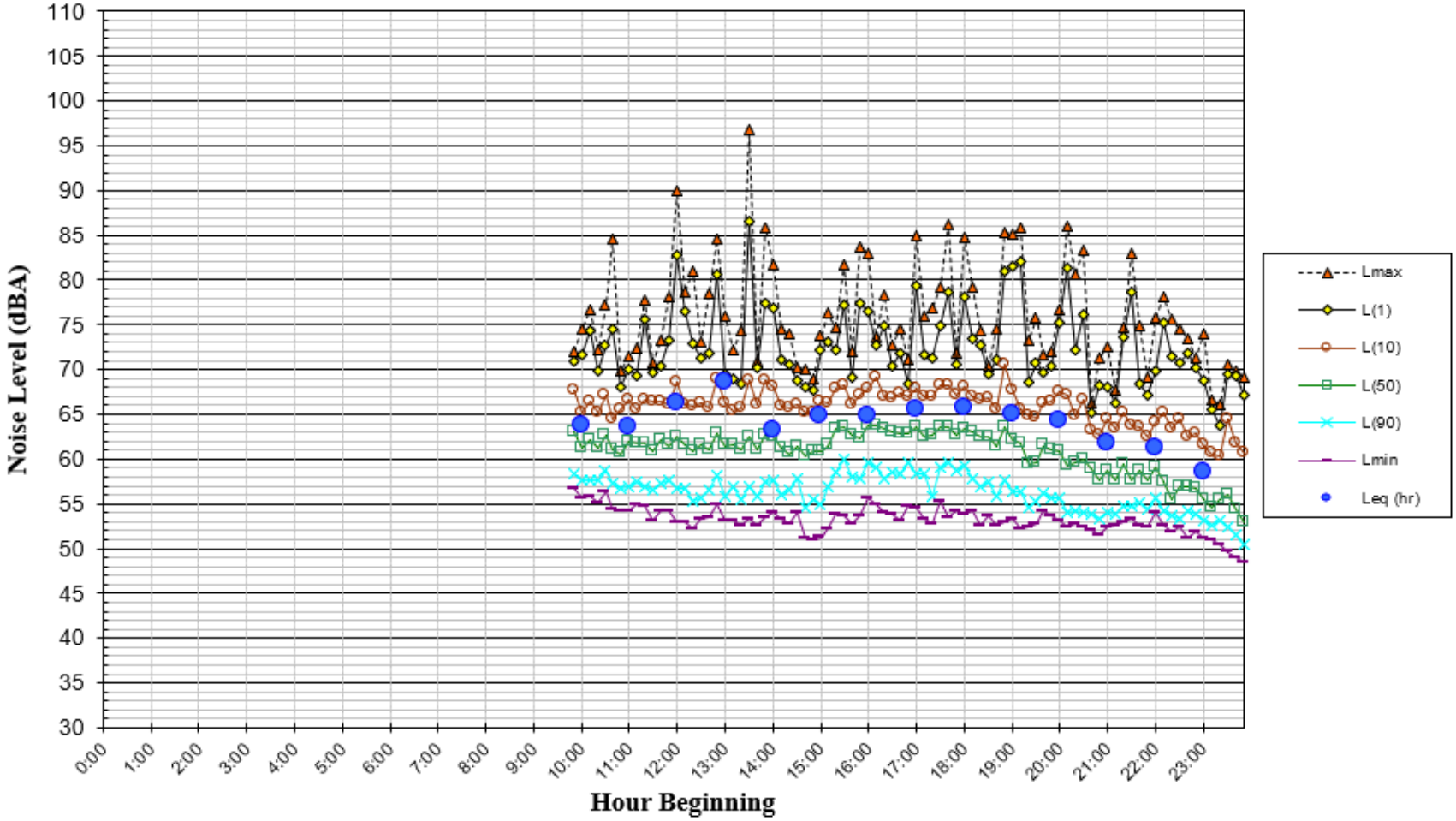


FIGURE A2 Daily Trend in Noise Levels at LT-1, Wednesday, February 1, 2023

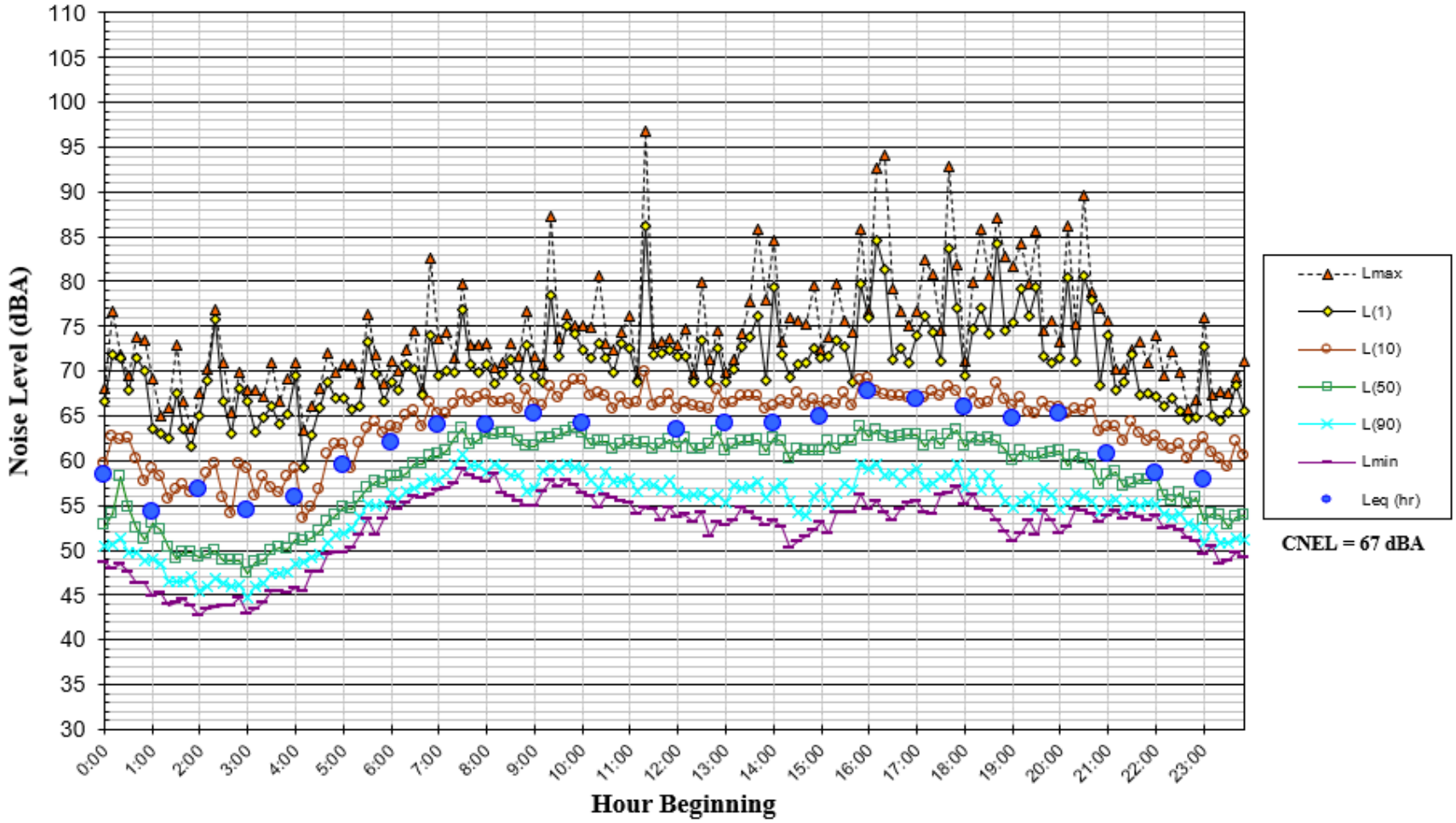


FIGURE A3 Daily Trend in Noise Levels at LT-1, Thursday, February 2, 2023

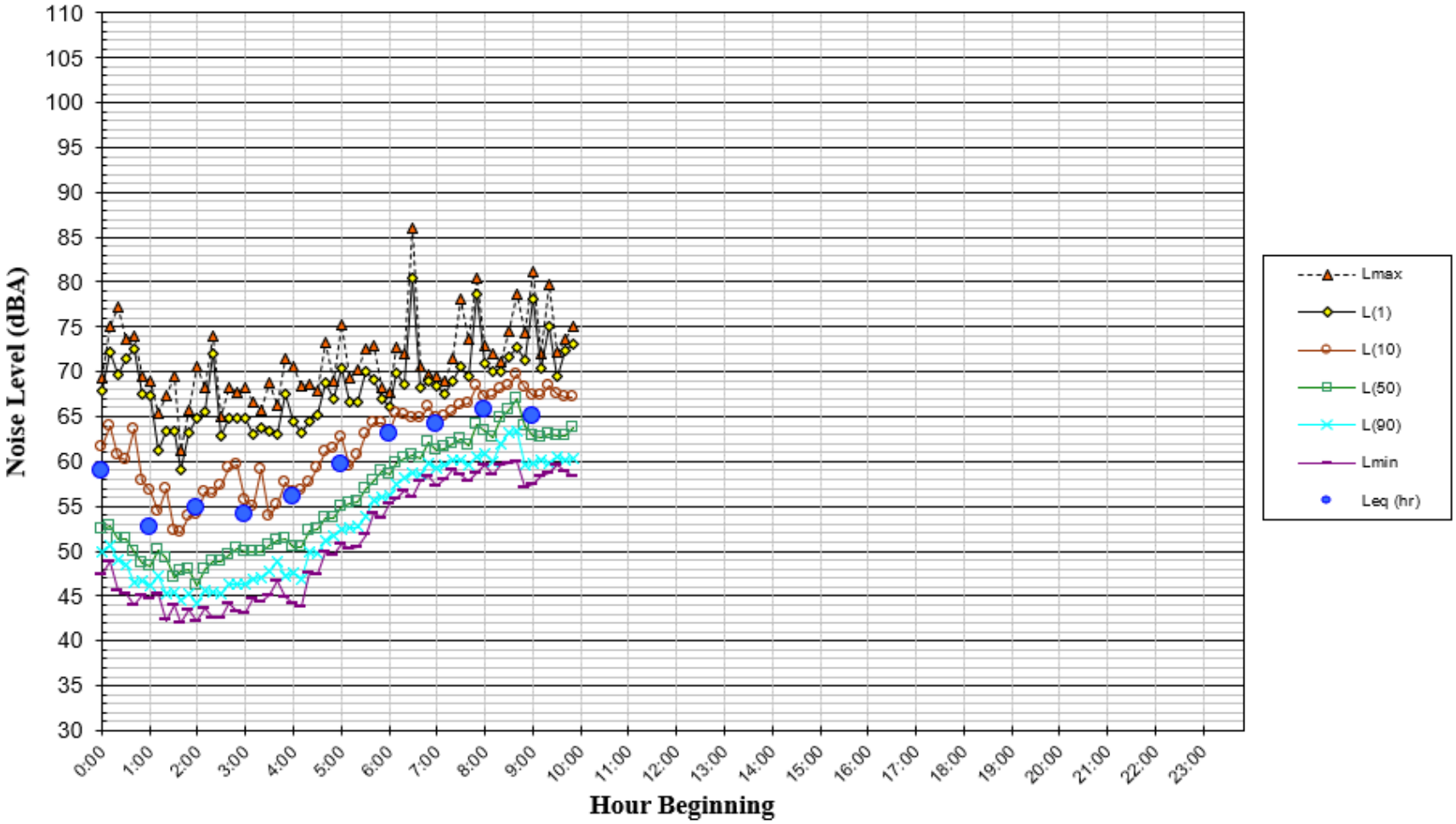


FIGURE A4 Daily Trend in Noise Levels at LT-2, Tuesday, January 31, 2023

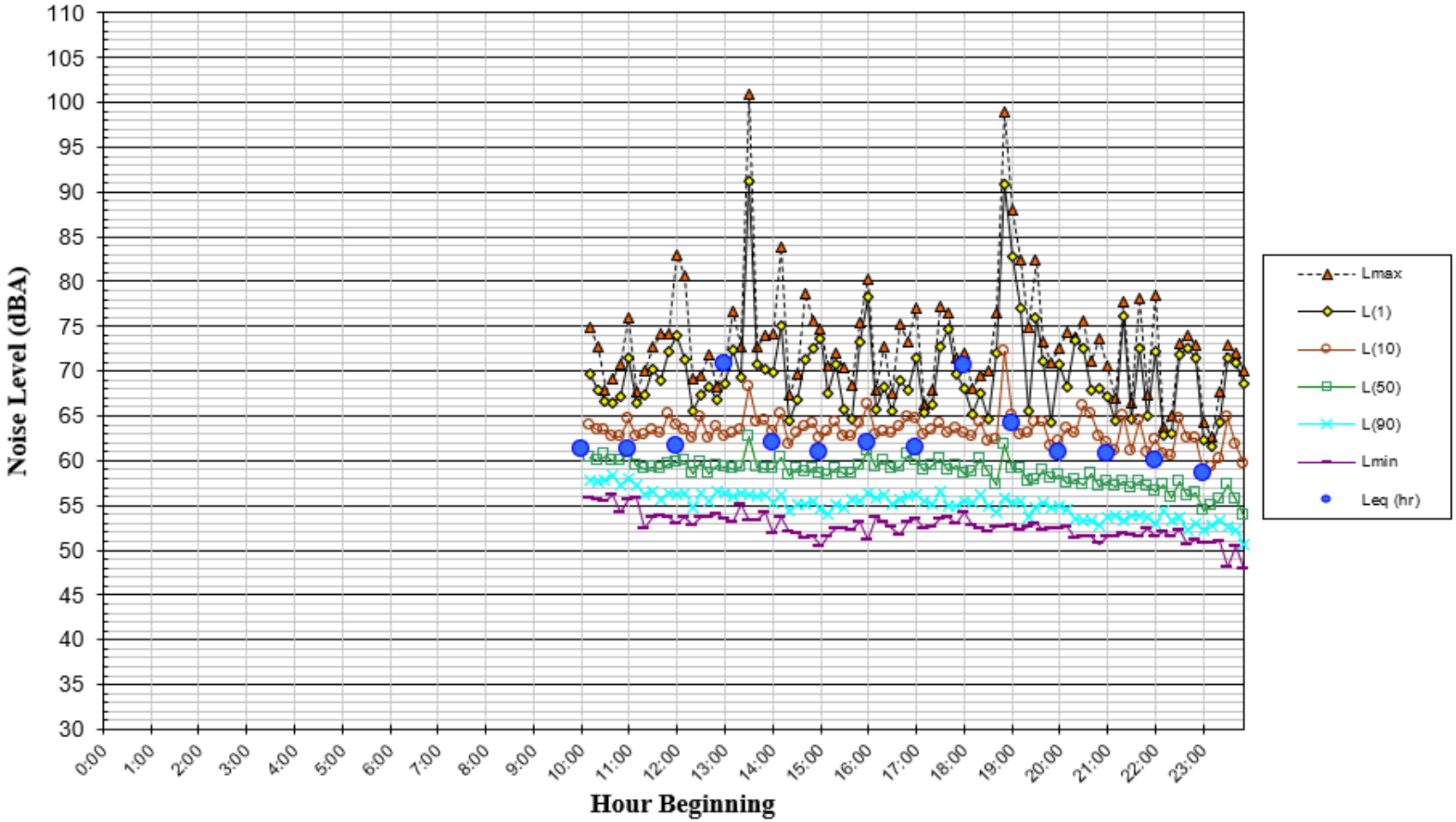


FIGURE A5 Daily Trend in Noise Levels at LT-2, Wednesday, February 1, 2023

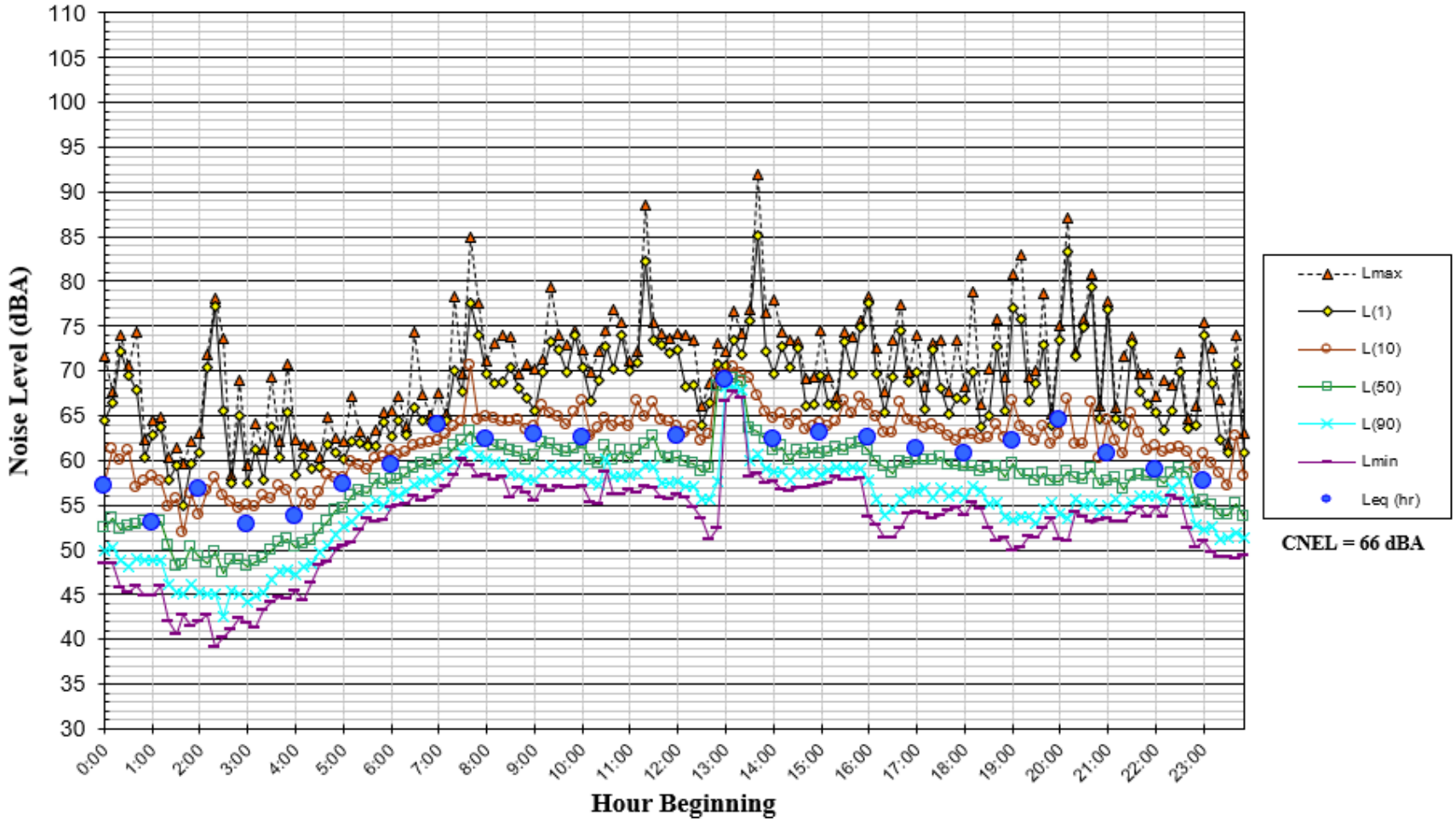


FIGURE A6 Daily Trend in Noise Levels at LT-2, Thursday, February 2, 2023

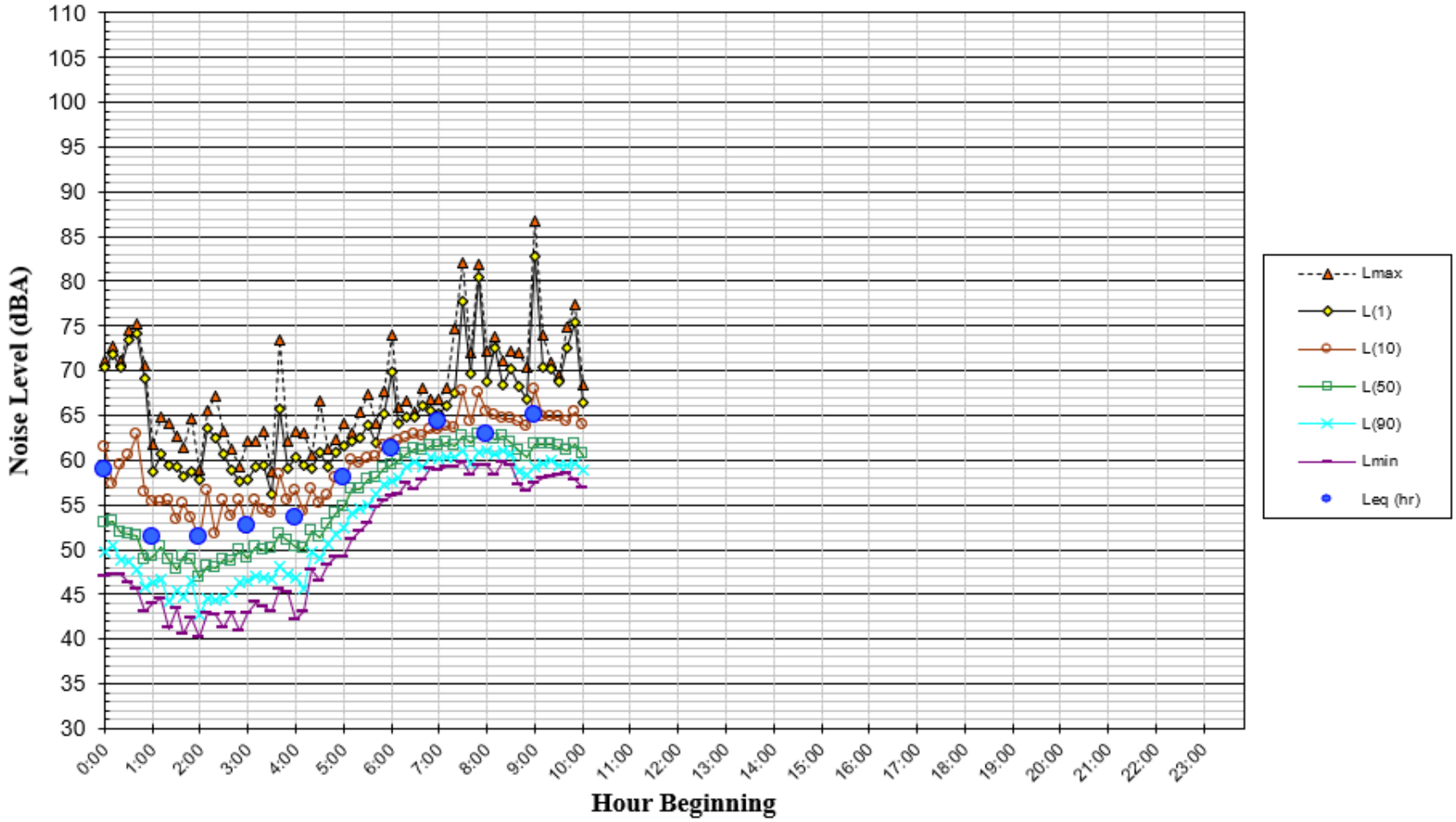


FIGURE A7 Daily Trend in Noise Levels at LT-3, Tuesday, January 31, 2023

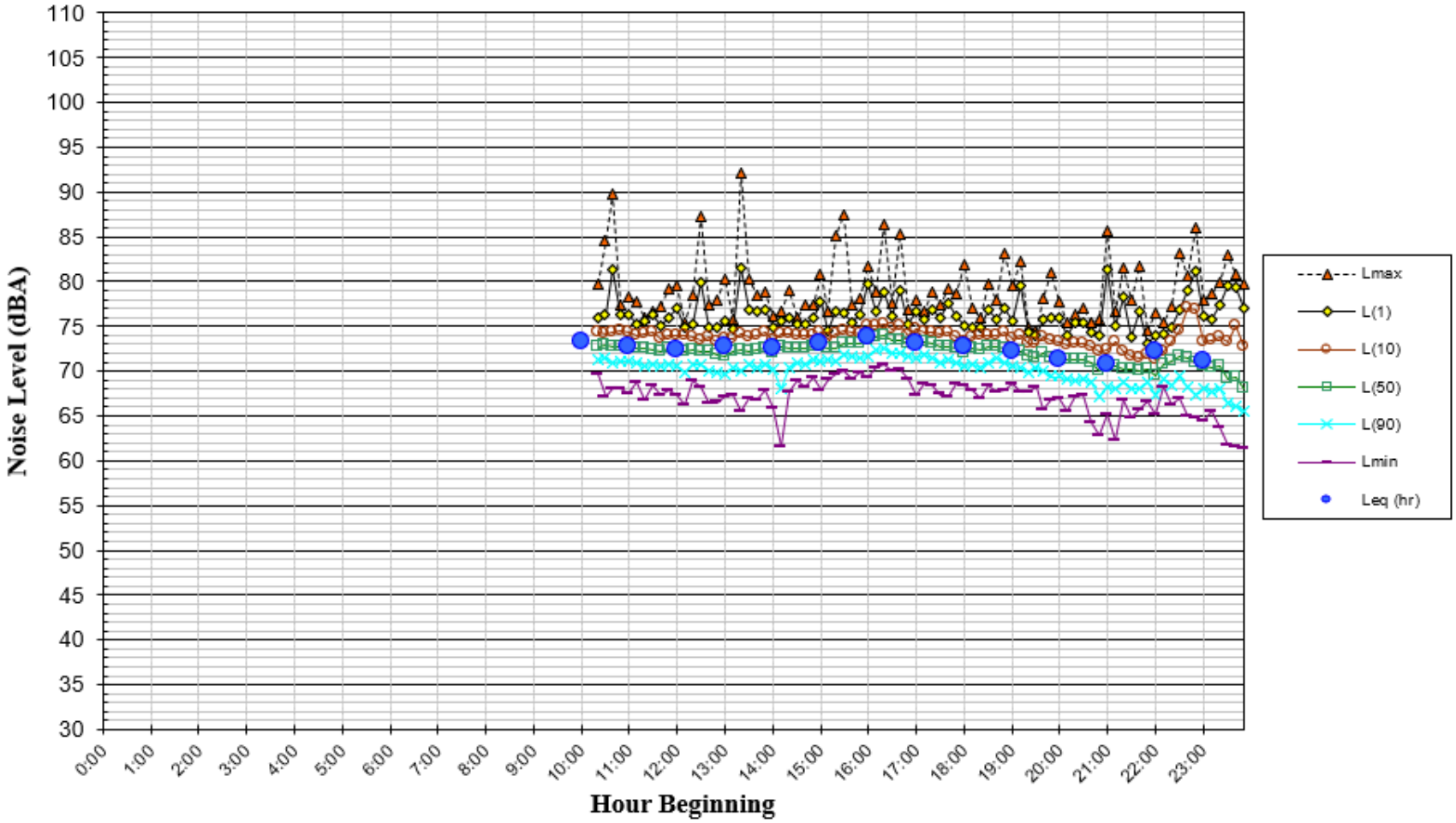


FIGURE A8 Daily Trend in Noise Levels at LT-3, Wednesday, February 1, 2023

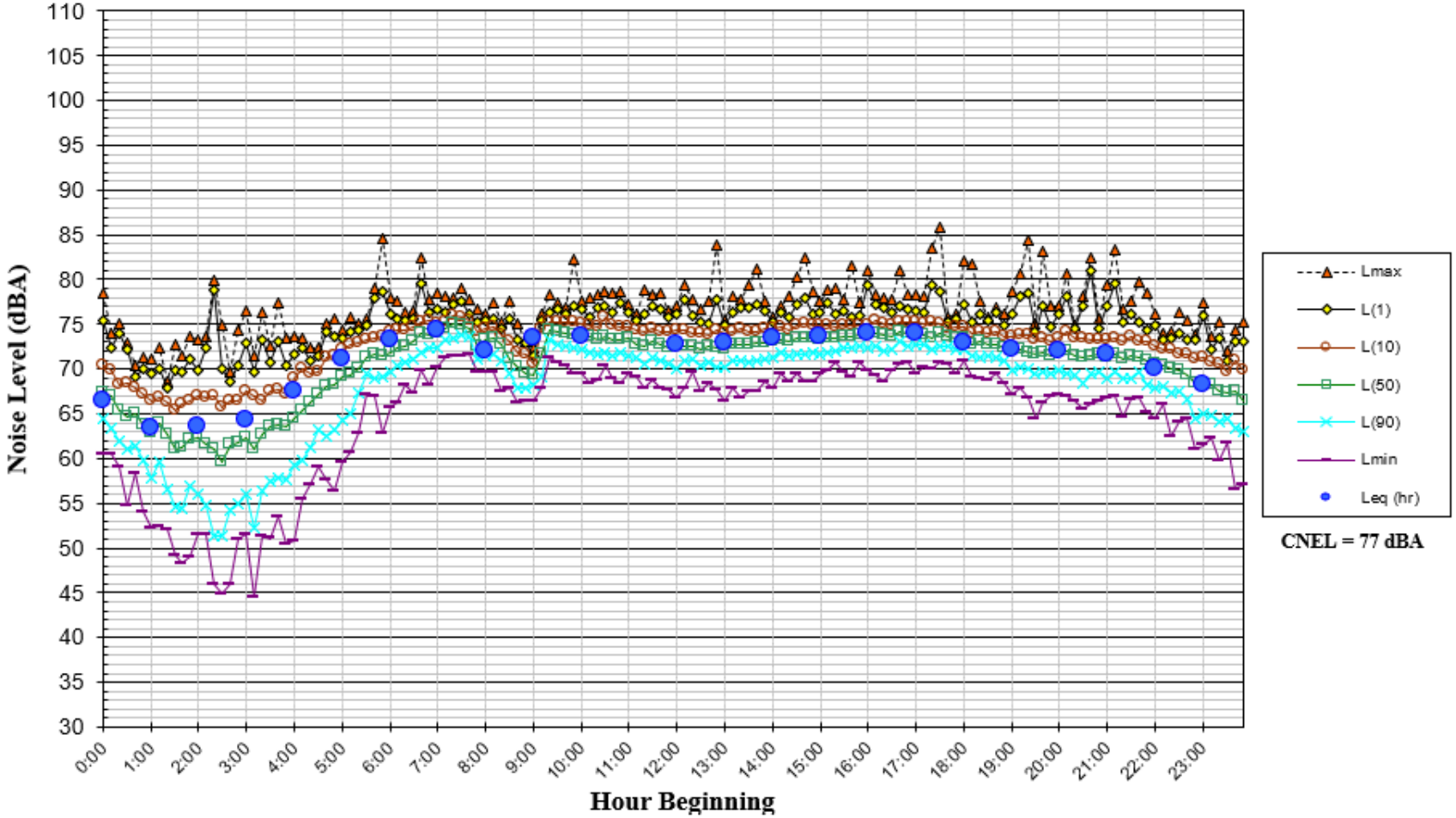


FIGURE A9 Daily Trend in Noise Levels at LT-3, Thursday, February 2, 2023