# Appendix H

# Noise/Vibration Assessment

# *125 KIRK AVENUE SUBDIVISION NOISE AND VIBRATION ASSESSMENT*

## *San José, California*

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## INTRODUCTION

The project proposes a residential development at 125 Kirk Avenue in San José, California. The project site consists of 1.47-acre flag lot accessed via Kirk Avenue to the north, with an existing single-family residence and two outbuildings. The existing buildings would be demolished, and the land cleared for the new development. The development will include 16 duplex homes, 2 SFD homes, 36 garage parking spaces, and 9 uncovered parking spaces. A new centrally located driveway will be constructed to provide access to the new units.

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

## SETTING

### Fundamentals of Environmental Noise

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

In addition to the concepts of pitch and loudness, there are several noise measurement scales 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 p.m. to 10:00 p.m.) and a 10 dB addition to nocturnal (10:00 p.m. to 7:00 a.m.) noise levels. The *Day/Night Average Sound Level* (*DNL* or $L_{dn}$) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

**Effects of Noise**

*Sleep and Speech Interference*

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

*Annoyance*

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

**TABLE 1 Definition of Acoustical Terms Used in this Report**

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

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

**TABLE 2 Typical Noise Levels in the Environment**

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

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

**Fundamentals of Groundborne Vibration**

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

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

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

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

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

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

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

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

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

| Velocity Level, PPV (in/sec) | Human Reaction | Effect on Buildings |
|---|---|---|
| 0.01 | Barely perceptible | No effect |
| 0.04 | Distinctly perceptible | Vibration unlikely to cause damage of any type to any structure |
| 0.08 | Distinctly perceptible to strongly perceptible | Recommended upper level of the vibration to which ruins and ancient monuments should be subjected |
| 0.1 | Strongly perceptible | Threshold at which there is a risk of damage to fragile buildings with no risk of damage to most buildings |
| 0.25 | Strongly perceptible to severe | Threshold at which there is a risk of damage to historic and some old buildings. |
| 0.3 | Strongly perceptible to severe | Threshold at which there is a risk of damage to older residential structures |
| 0.5 | Severe - Vibrations considered unpleasant | Threshold at which there is a risk of damage to new residential and modern commercial/industrial structures |

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

**TABLE 4 Typical Levels of Groundborne Vibration**

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

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

## Regulatory Background – Noise

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

### Federal

***Federal Transit Administration's Transit Noise and Vibration Impact Assessment Manual.*** The Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment Manual includes general assessment criteria for construction noise. During daytime hours, the hourly average noise level limit is 80 dBA $L_{eq}$ at residential land uses and 90 dBA $L_{eq}$ at commercial and industrial land uses.

## State of California

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

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

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

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

***2019 California Building Code, Title 24, Part 2.*** The current version of the California Building Code (CBC) requires interior noise levels in multi-family residential units attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA DNL/CNEL in any habitable room.

## Santa Clara County

***Santa Clara County Airport Land Use Commission Comprehensive Land Use Plan.*** The Comprehensive Land Use Plan (CLUP) adopted by the Santa Clara County Airport Land Use Commission contains standards for projects within the vicinity of San José International Airport which are relevant to this project;

4.3.2.1 Noise Compatibility Policies

N-1 The Community Noise Equivalent Level (CNEL) method of representing noise levels shall be used to determine if a specific land use is consistent with the CLUP.

N-2 In addition to the other policies herein, the Noise Compatibility Policies presented in Table 4-1 shall be used to determine if a specific land use is consistent with this CLUP.

N-3 Noise impacts shall be evaluated according to the Aircraft Noise Contours presented on Figure 5 (not shown in this report).

N-6 Noise level compatibility standards for other types of land uses shall be applied in the same manner as the above residential noise level criteria. Table 4-1 presents acceptable noise levels for other land uses in the vicinity of the Airport.

**Table 4 - 1**

**NOISE COMPATIBILITY POLICIES**

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

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

Source: Comprehensive Land Use Plan Santa Clara County, Norman Y Mineta San José International Airport, May 25, 2011, Amended May 23, 2019.

## City of San José

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

**EC-1.1** Locate new development in areas where noise levels are appropriate for the proposed uses. Consider federal, state, and City noise standards and guidelines as a part of new development review. Applicable standards and guidelines for land uses in San José include:

Interior Noise Levels

- The City's standard for interior noise levels in residences, hotels, motels, residential care facilities, and hospitals is 45 dBA DNL. Include appropriate site and building design, building construction and noise attenuation techniques in new development to meet this standard. For sites with exterior noise levels of 60 dBA DNL or more, an acoustical analysis following protocols in the City-adopted California Building Code is required to demonstrate that development projects can meet this standard. The acoustical analysis shall base required noise attenuation techniques on expected Envision General Plan traffic volumes to ensure land use compatibility and General Plan consistency over the life of this plan.

Exterior Noise Levels

- The City's acceptable exterior noise level objective is 60 dBA DNL or less for residential and most institutional land uses (Table EC-1). The acceptable exterior noise level objective is established for the City, except in the environs of the San José International Airport and the Downtown, as described below:

    - For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA DNL in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA DNL exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA DNL standard for noise from sources other than aircraft and elevated roadway segments.

Table EC-1: Land Use Compatibility Guidelines for Community Noise in San José

| LAND USE CATEGORY | EXTERIOR NOISE EXPOSURE (DNL IN DECIBELS (DBA)) 55 | 60 | 65 | 70 | 75 | 80 |
|---|---|---|---|---|---|---|
| 1. Residential, Hotels and Motels, Hospitals and Residential Care[1] | | | | | | |
| 2. Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds | | | | | | |
| 3. Schools, Libraries, Museums, Meeting Halls, Churches | | | | | | |
| 4. Office Buildings, Business Commercial, and Professional Offices | | | | | | |
| 5. Sports Arena, Outdoor Spectator Sports | | | | | | |
| 6. Public and Quasi-Public Auditoriums, Concert Halls, Amphitheaters | | | | | | |

[1]Noise mitigation to reduce interior noise levels pursuant to Policy EC-1.1 is required.

**Normally Acceptable:**

- Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

**Conditionally Acceptable:**

- Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.

**Unacceptable:**

- New construction or development should generally not be undertaken because mitigation is usually not feasible to comply with noise element policies.

Source: Envision San José 2040 General Plan, Adopted November 1, 2011, As Amended on May 16, 2019.

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

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

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

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

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

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

**EC-1.11** Require safe and compatible land uses within the Mineta International Airport noise zone (defined by the 65 CNEL contour as set forth in State law) and encourage aircraft operating procedures that minimize noise.

**Regulatory Background – Vibration**

**City of San José**

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

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

**Existing Noise Environment**

The project site is located at 125 Kirk Avenue in the City of San José. The project site is surrounded by existing residential uses to the north, south, east, and west. A school exists to the north, on the other side of Kirk Avenue. The noise environment at the site and in the surrounding area results primarily from local vehicular traffic along Kirk Avenue, as well as from additional background vehicular traffic along Madeline Drive and Hyland Avenue. Occasional aircraft flyovers associated with San José International Airport have some contribution to the noise environment, as well. The nearest railroad tracks are nearly three miles west of the site.

A noise monitoring survey consisting of two long-term noise measurements (LT-1 and LT-2) and three short-term noise measurements (ST-1 through ST-3) was made at the site and vicinity between Tuesday, November 29, 2022, and Wednesday, November 30, 2022. All measurement locations are shown in Figure 1.

Long-term noise measurement LT-1 was made approximately 85 feet southwest of the centerline of Kirk Avenue. Hourly average noise levels at LT-1 typically ranged from 53 to 58 dBA $L_{eq}$ during daytime hours (7:00 a.m. and 10:00 p.m.) and from 42 to 52 dBA $L_{eq}$ during nighttime hours (10:00 p.m. and 7:00 a.m.). The day-night average noise level between 12:00 p.m. on Tuesday, November 29, 2022, and 12:00 p.m. on Wednesday, November 30, 2022, was 57 dBA DNL. The daily trend in noise levels at LT-1 is shown in Figure A1 of Appendix A. The main source of noise at this location is traffic along Kirk Avenue. School activities from Linda Vista Elementary School across the street, and aircraft noise associated with Reid-Hillview County Airport and Norman Y. Mineta San Jose International Airport also contribute to the noise environment.

LT-2 was made at the rear of the project site, approximately 430 feet southwest of the centerline of Kirk Avenue. Hourly average noise levels at LT-2 typically ranged from 47 to 53 dBA $L_{eq}$ during daytime hours and from 34 to 46 dBA $L_{eq}$ during nighttime hours. The day-night average noise level between 12:00 p.m. on Tuesday, November 29, 2022, and 12:00 p.m. on Wednesday, November 30, 2022, was 50 dBA DNL. The daily trend in noise levels at LT-2 is shown in Figure A2 of Appendix A. The main sources of noise at this location are aircraft. Background traffic and school activity also contribute to the noise environment.

Short-term noise measurement ST-1 was made on Wednesday, November 30, 2022, between 11:40 a.m. and 11:50 a.m. As shown in Figure 1, location ST-1 was approximately 195 feet southwest of the centerline of Kirk Avenue. The main source of noise at this location is traffic along Kirk Avenue. School activities and aircraft also contributed to the noise environment. The 10-minute average noise level measured at this location was 47 dBA $L_{eq}$. Forty-three light vehicles on Kirk Avenue produced maximum noise levels ranging from 43 to 52 dBA $L_{max}$. Three trucks produced maximum noise levels ranging from 49 to 52 dBA $L_{max}$, and one bus produced maximum noise levels up to 54 dBA $L_{max}$. Aircraft produced maximum noise levels ranging from 46 to 61 dBA $L_{max}$.

Short-term noise measurement ST-2 was made on Wednesday, November 30, 2022, between 11:50 a.m. and 12:00 p.m. As shown in Figure 1, location ST-2 was near the center of the site, along the

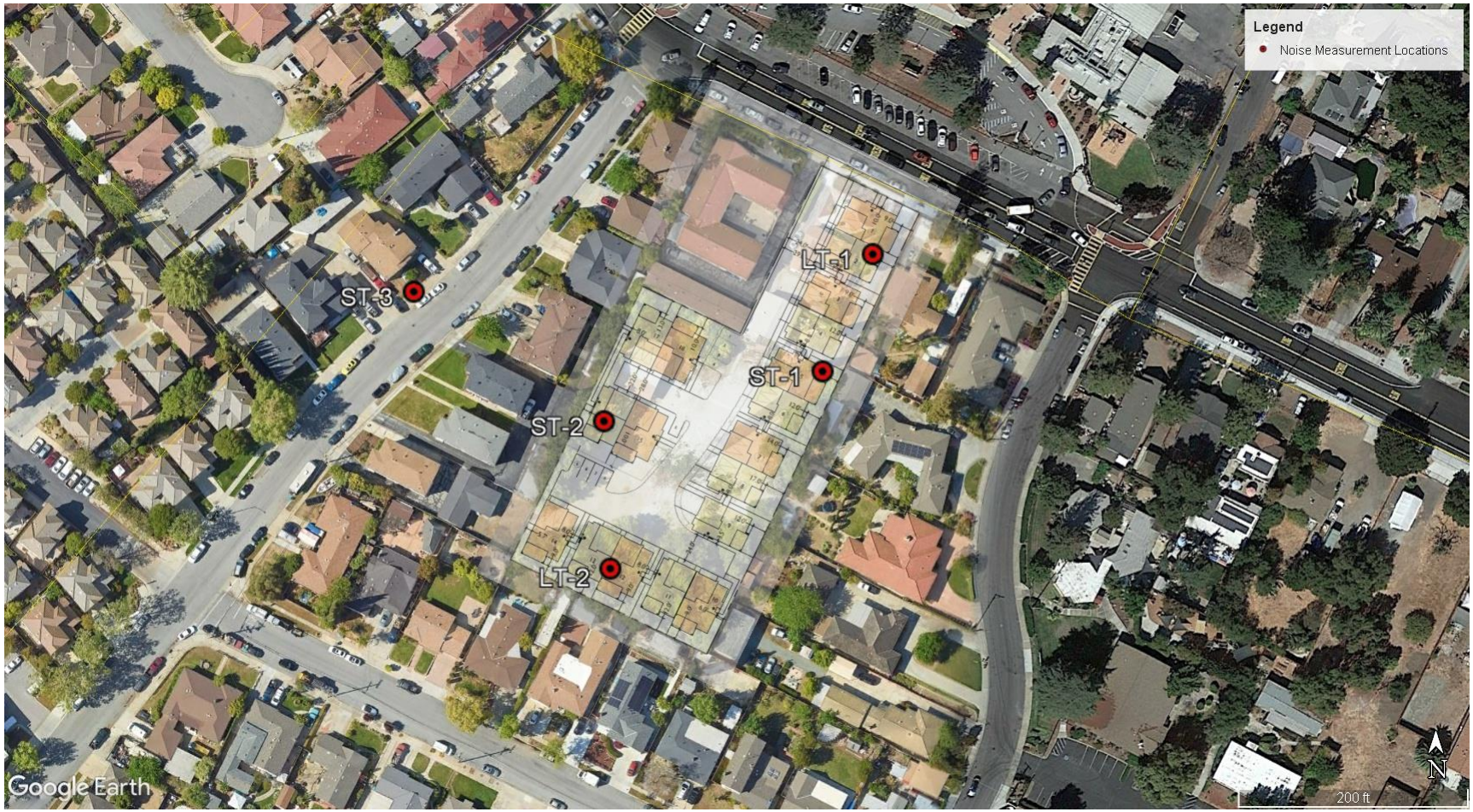
property line, approximately 320 feet southwest of the centerline of Kirk Avenue. The main source of noise at this location was aircraft. Background traffic noise and school activities also contributed to the noise environment. The 10-minute average noise level measured at this location was 42 dBA $L_{eq}$. Aircraft produced maximum noise levels ranging from 42 to 54 dBA $L_{max}$. Background traffic produced maximum noise levels ranging from 42 to 43 dBA $L_{max}$, and school activities produced maximum noise levels ranging from 38 to 39 dBA $L_{max}$.

Short-term noise measurement ST-3 was made on Wednesday, November 30, 2022, between 12:10 p.m. and 12:20 p.m. As shown in Figure 1, location ST-3 was approximately 28 feet northwest of the centerline of Madeline Drive. The main source of noise at this location was traffic along Kirk Avenue and Madeline Drive. Aircraft noise also contributed to the noise environment. The 10-minute average noise level measured at this location was 54 dBA $L_{eq}$. Eight vehicles on Madeline Drive produced maximum noise levels ranging from 51 to 63 dBA $L_{max}$. Aircraft produced maximum noise levels ranging from 50 to 67 dBA $L_{max}$. Results of the short-term noise measurements are summarized in Table 5.

**TABLE 5 Summary of Short-Term Noise Measurements (dBA)**

| Noise Measurement Location | Date, Time | Measured Noise Level, dBA | | | | | |
|---|---|---|---|---|---|---|---|
| | | $L_{max}$ | $L_{(1)}$ | $L_{(10)}$ | $L_{(50)}$ | $L_{(90)}$ | $L_{eq}$ |
| ST-1: ~195 feet southwest of the centerline of Kirk Avenue | 11/30/2022, 11:40-11:50 | 61 | 58 | 50 | 43 | 39 | 47 |
| ST-2: ~320 feet southwest of the centerline of Kirk Avenue | 11/30/2022, 11:50-12:00 | 54 | 52 | 45 | 40 | 37 | 42 |
| ST-3: ~28 feet northwest of the centerline of Madeline Drive | 11/30/2022, 12:10-12:20 | 67 | 66 | 58 | 46 | 40 | 54 |

**FIGURE 1 Aerial Image of the Project Site and Surrounding Area with the Noise Measurement Locations Identified**




Source: Google Earth, 2022. Modified by Illingworth & Rodkin, Inc., 2022

## PLAN CONSISTENCY ANALYSIS

### Noise and Land Use Compatibility

The Environmental Leadership Chapter in the Envision San José 2040 General Plan sets forth policies with the goal of minimizing the impact of noise on people through noise reduction and suppression techniques and through appropriate land use policies in the City of San José. The 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 60 dBA DNL or less for the proposed residential land uses.

- The City's acceptable interior noise level standard is 45 dBA DNL or less for the proposed residential land uses.

The future noise environment at the site would continue to result primarily from local vehicular traffic along Kirk Avenue, as well as from additional background vehicular traffic along Madeline Drive and Hyland Avenue. According to the *Envision San José 2040 General Plan Comprehensive Update EIR*,[1] the traffic noise level increase at the project site would be less than 1 dBA DNL by the year 2035. Additionally, the small increase in vehicle trips per day resulting from the project is not expected to result in a measurable traffic noise increase at the project site.

*Future Exterior Noise Environment*

It is assumed that each of the new homes will include outdoor use areas. Private balconies, decks, and front yards would not be considered outdoor use areas subject to the exterior noise thresholds, however, a backyard area would be subject to the City's thresholds. Future exterior noise levels at the assumed backyard area of the home nearest to Kirk Avenue would be approximately 58 dBA DNL, while the future exterior noise levels at the assumed backyard area of the home furthest from Kirk Avenue would be approximately 50 dBA DNL. Future noise levels at all outdoor use areas would be below the City's threshold of 60 dBA DNL.

*Future Interior Noise Environment*

Standard residential construction provides approximately 15 dBA of exterior-to-interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA DNL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA DNL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors,

[1] *Envision San José 2040 General Plan Comprehensive Update EIR*, State Clearinghouse Number 2009072096, File number PP09-011, June 2011.

sound rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

The northern façade of the residential building nearest to Kirk Avenue would be set back approximately 48 feet from the centerline of the roadway. At this distance, the unit nearest to Kirk Avenue would be exposed to future exterior noise levels up to 59 dBA DNL. Assuming windows to be partially open, future interior noise levels in these units would be up to 44 dBA DNL. All other residential units would be further from Kirk Avenue and exposed to lower traffic noise levels. Standard building construction would be sufficient to meet the interior noise requirements set forth by the City of San José of 45 dBA DNL.

## NOISE IMPACTS AND MITIGATION MEASURES

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

### Significance Criteria

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

- A significant noise impact would be identified if the project would generate a substantial temporary or permanent noise level increase over ambient noise levels at existing noise-sensitive receptors surrounding the project site and that would exceed applicable noise standards presented in the General Plan at existing noise-sensitive receptors surrounding the project site.

    - A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels substantially and exceed the FTA guidance level of 80 dBA $L_{eq}$ at nearby sensitive receptors. The City of San José considers the impact of large or complex projects involving substantial noise-generating activities and lasting more than 12 months significant when within 500 feet of residential land uses or within 200 feet of commercial land uses or offices.

    - A significant permanent noise level increase would occur if the project would result in: a) a noise level increase of 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) a noise level increase of 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.

    - A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan.

- A significant impact would be identified if the construction of the project would generate excessive vibration levels surrounding receptors. Groundborne vibration levels exceeding 0.08 in/sec PPV would have the potential to result in cosmetic damage to historic buildings, and groundborne vibration levels exceeding 0.2 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- A significant noise impact would be identified if the project would expose people residing or working in the project area to excessive aircraft noise levels.

**Impact 1a:** **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 would reduce noise levels. **This is a less-than-significant impact.**

The construction schedule assumed that construction would start early-January 2023 and the project would be built out over a period of approximately 11.5 months. Construction phases would include demolition, site preparation, grading, trenching, building construction, and architectural coating. 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.

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

While the City of San José 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*.[2] During daytime hours, an exterior threshold of 80 dBA $L_{eq}$ shall be enforced at residential land uses and 90 dBA $L_{eq}$ shall be enforced at commercial and industrial land uses.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The hauling of excavated materials and construction materials would generate truck trips on local roadways, as well. For the proposed project, pile driving, which generates excessive noise levels, would not occur. 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 6) from the equipment. Table 7 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 65 to 88 dBA $L_{eq}$ for residential 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.

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

**TABLE 6 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 7 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

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.

Equipment expected to be used in each construction stage are summarized in Tables 8 through 11, along with the quantity of each type of equipment and the range of expected noise levels, assuming the operation of the two loudest pieces of construction equipment for each construction stage. Table 8 shows the range of expected noise levels at residential land uses along the south, east, and west property lines, adjacent to the project site. Minor off-site grading of a driveway at 3830 Madeline Drive will also briefly occur. It is projected that construction activities would occur between 50 and 425 feet of these receptors. Table 9 shows the range of expected noise levels at the residence just north of the site, 133 Kirk Avenue, which would be partially shielded from construction noise by an intervening building. It is projected that construction activities would occur between 50 and 330 feet of this receptor. Table 10 shows the range of expected noise levels at the nearby playground at Linda Vista Elementary School, just north across Kirk Avenue from the project site. It is projected that construction activities would occur between 220 and 595 feet of this receptor. Table 11 shows the range of expected noise levels at single-family residences along Madeline Drive, which would be shielded from construction noise by intervening buildings. It is projected that construction activities would occur between 190 and 370 feet of these receptors.

**TABLE 8 Estimated Construction Noise Levels for the Residential Land-Uses along the South, East, and West Property Lines**

| Phase of Construction | Total Workdays | Construction Equipment (Quantity) | Estimated Construction Noise Level |
|---|---|---|---|
| Demolition | 25 days | Concrete/Industrial Saw (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (3) | (50 to 360 feet)<br>67 to 84 dBA $L_{eq}$ |
| Site Preparation | 3 days | Grader (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (1) | (50 to 395 feet)<br>65 to 83 dBA $L_{eq}$ |
| Grading/ Excavation | 5 days | Grader (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (2) | (50 to 395 feet)<br>65 to 83 dBA $L_{eq}$ |
| Trenching/ Foundation | 3 days | Tractor/Loader/Backhoe (1) [a]<br>Excavator (1) [a] | (50 to 395 feet)<br>61 to 78 dBA $L_{eq}$ |
| Building –Exterior | 279 days | Crane (1)<br>Forklift (1)<br>Generator Set (1) [a]<br>Tractor/Loader/Backhoe (1) [a]<br>Welder (3) | (50 to 395 feet)<br>61 to 79 dBA $L_{eq}$ |
| Building – Interior/ Architectural Coating | 13 days | Air Compressor (1) [aa] | (50 to 395 feet)<br>56 to 74 dBA $L_{eq}$ |
| Paving | 9 days | Cement and Mortar Mixer (1) [a]<br>Paver (1) [a]<br>Paving Equipment (1)<br>Roller (1)<br>Tractor/Loader/Backhoe (1) | (50 to 425 feet)<br>59 to 78 dBA $L_{eq}$ |

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

**TABLE 9 Estimated Construction Noise Levels for the Residential Land-Use at 133 Kirk Avenue (North of site)**

| Phase of Construction | Total Workdays | Construction Equipment (Quantity) | Estimated Construction Noise Level |
|---|---|---|---|
| Demolition | 25 days | Concrete/Industrial Saw (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (3) | (70 to 160 feet)<br>64 [b] to 81 dBA $L_{eq}$ |
| Site Preparation | 3 days | Grader (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (1) | (95 to 330 feet)<br>56 [b] to 77 dBA $L_{eq}$ |
| Grading/ Excavation | 5 days | Grader (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (2) | (95 to 330 feet)<br>56 [b] to 77 dBA $L_{eq}$ |
| Trenching/ Foundation | 3 days | Tractor/Loader/Backhoe (1) [a]<br>Excavator (1) [a] | (95 to 330 feet)<br>52 [b] to 73 dBA $L_{eq}$ |
| Building –Exterior | 279 days | Crane (1)<br>Forklift (1)<br>Generator Set (1) [a]<br>Tractor/Loader/Backhoe (1) [a]<br>Welder (3) | (95 to 330 feet)<br>53 [b] to 74 dBA $L_{eq}$ |
| Building – Interior/ Architectural Coating | 13 days | Air Compressor (1) | (95 to 330 feet)<br>47 [b] to 68 dBA $L_{eq}$ |
| Paving | 9 days | Cement and Mortar Mixer (1) [a]<br>Paver (1) [a]<br>Paving Equipment (1)<br>Roller (1)<br>Tractor/Loader/Backhoe (1) | (50 to 300 feet)<br>52 [b] to 76 dBA $L_{eq}$ |

[a] Denotes two loudest pieces of construction equipment per phase.
[b] Assumes a conservative reduction of 10 dBA due to existing intervening buildings.

**TABLE 10 Estimated Construction Noise Levels for Linda Vista Elementary School**

| Phase of Construction | Total Workdays | Construction Equipment (Quantity) | Estimated Construction Noise Level |
|---|---|---|---|
| Demolition | 25 days | Concrete/Industrial Saw (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (3) | (270 to 450 feet)<br>55 [b] to 69 dBA $L_{eq}$ |
| Site Preparation | 3 days | Grader (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (1) | (220 to 595 feet)<br>51 [b] to 70 dBA $L_{eq}$ |
| Grading/ Excavation | 5 days | Grader (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (2) | (220 to 595 feet)<br>51 [b] to 70 dBA $L_{eq}$ |
| Trenching/ Foundation | 3 days | Tractor/Loader/Backhoe (1) [a]<br>Excavator (1) [a] | (220 to 595 feet)<br>47 [b] to 66 dBA $L_{eq}$ |
| Building –Exterior | 279 days | Crane (1)<br>Forklift (1)<br>Generator Set (1) [a]<br>Tractor/Loader/Backhoe (1) [a]<br>Welder (3) | (220 to 595 feet)<br>48 [b] to 66 dBA $L_{eq}$ |
| Building – Interior/ Architectural Coating | 13 days | Air Compressor (1) | (220 to 595 feet)<br>42 [b] to 61 dBA $L_{eq}$ |
| Paving | 9 days | Cement and Mortar Mixer (1) [a]<br>Paver (1) [a]<br>Paving Equipment (1)<br>Roller (1)<br>Tractor/Loader/Backhoe (1) | (245 to 560 feet)<br>47 [b] to 64 dBA $L_{eq}$ |

[a] Denotes two loudest pieces of construction equipment per phase.
[b] Assumes a conservative reduction of 10 dBA due to existing intervening residential buildings.

**TABLE 11 Estimated Construction Noise Levels for Residential Land-Uses along Madeline Drive**

| Phase of Construction | Total Workdays | Construction Equipment (Quantity) | Estimated Construction Noise Level |
|---|---|---|---|
| Demolition | 25 days | Concrete/Industrial Saw (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (3) | (190 to 320 feet)<br>58 [b] to 62 [b] dBA $L_{eq}$ |
| Site Preparation | 3 days | Grader (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (1) | (200 to 370 feet)<br>55 [b] to 61 [b] dBA $L_{eq}$ |
| Grading/ Excavation | 5 days | Grader (1) [a]<br>Rubber-Tired Dozer (1) [a]<br>Tractor/Loader/Backhoe (2) | (200 to 370 feet)<br>55 [b] to 61 [b] dBA $L_{eq}$ |
| Trenching/ Foundation | 3 days | Tractor/Loader/Backhoe (1) [a]<br>Excavator (1) [a] | (200 to 370 feet)<br>51 [b] to 56 [b] dBA $L_{eq}$ |
| Building –Exterior | 279 days | Crane (1)<br>Forklift (1)<br>Generator Set (1) [a]<br>Tractor/Loader/Backhoe (1) [a]<br>Welder (3) | (200 to 370 feet)<br>52 [b] to 57 [b] dBA $L_{eq}$ |
| Building – Interior/ Architectural Coating | 13 days | Air Compressor (1) | (200 to 370 feet)<br>46 [b] to 52 [b] dBA $L_{eq}$ |
| Paving | 9 days | Cement and Mortar Mixer (1) [a]<br>Paver (1) [a]<br>Paving Equipment (1)<br>Roller (1)<br>Tractor/Loader/Backhoe (1) | (190 to 370 feet)<br>50 [b] to 56 [b] dBA $L_{eq}$ |

[a] Denotes two loudest pieces of construction equipment per phase.
[b] Assumes a conservative reduction of 10 dBA due to existing intervening residential buildings.

Nearby residences located along Kirk Avenue would have existing ambient noise levels represented by LT-1 of the monitoring survey, which ranged from 53 to 58 dBA $L_{eq}$ during daytime hours. The existing residences to the southwest of the project site and set back from Kirk Avenue by 460 feet or more would have ambient noise levels represented by LT-2, which ranged from 47 to 53 dBA $L_{eq}$ during daytime hours. All other residential properties sharing a property line with the project site would have ambient noise levels ranging from 47 to 58 dBA $L_{eq}$ during daytime hours. Other residential properties in the vicinity, such as homes along Madeline Drive, would have ambient daytime noise levels ranging from 50 to 56 dBA $L_{eq}$, as represented by ST-3. The playground area of Linda Vista Elementary School would have ambient daytime noise levels ranging from 50 to 55 dBA $L_{eq}$, as represented by ST-1.

As shown Table 8, construction noise levels at residential land uses along the south, east, and west property lines would range from 56 to 84 dBA $L_{eq}$ at various times throughout construction. Hourly average noise levels are calculated to intermittently exceed 80 dBA $L_{eq}$ during the first six weeks when demolition, grading and excavation are occurring adjacent (within about 75 feet) to a residence. Table 9 shows that construction noise levels at 133 Kirk Avenue would range from 50

to 81 dBA $L_{eq}$. Table 10 shows that construction noise levels at Linda Vista Elementary School would range from 42 to 70 dBA $L_{eq}$. And Table 11 shows that construction noise levels at residences along Madeline Drive would range from 46 to 62 dBA $L_{eq}$. Since project construction would last for a period less than one year, and noise levels exceeding 80 dBA $L_{eq}$ would only occur intermittently during the first six weeks at an individual residence, this temporary construction impact would be considered less than significant in accordance with Policy EC-1.7 of the City's General Plan.

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. The incorporation of construction best management practices as project conditions of approval would assist in assuring that construction noise would result in a less-than-significant temporary noise impact.

*Construction Best Management Practices*

Develop a construction noise control plan, including, but not limited to, the following available controls:

- Ensure that excavating, grading and filling activities, and other construction activities (including the loading and unloading of materials and truck movements) within 300 feet of residentially zoned property, including hotel properties, are limited to the hours of 7:00 a.m. to 6:00 p.m. on weekdays and between the hours of 9:00 a.m. and 6:00 p.m. on Saturdays. No construction is permitted on Sundays or holidays.

- 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.

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

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

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

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

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

- 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 measures would assist in reducing construction noise levels emanating from the site, limiting construction hours, and minimize disruption and annoyance.

**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 or exceed applicable standards at the noise-sensitive receptors in the project vicinity. **This is a less-than-significant impact.**

According to Policy EC-1.2 of the City's General Plan, a significant permanent noise increase would occur if the project would increase noise levels at noise-sensitive receptors by 3 dBA DNL or more where ambient noise levels exceed the "normally acceptable" noise level standard. Where ambient noise levels are at or below the "normally acceptable" noise level standard, noise level increases of 5 dBA DNL or more would be considered significant. The City's General Plan defines the "normally acceptable" outdoor noise level standard for the nearby residential land uses to be 60 dBA DNL. Existing ambient levels, based on the measurements made in the project vicinity, range from 50 to 58 dBA DNL. Therefore, a significant impact would occur if traffic or operational noise due to the proposed project would permanently increase ambient levels by 5 dBA DNL at residences not near Kirk Avenue, and by 3 dBA at residences near Kirk Avenue.

As mentioned above in the Noise and Land Use Compatibility section, the *Envision San José 2040 General Plan Comprehensive Update EIR*, the traffic noise level increase at the project site would be less than 1 dBA DNL by the year 2035. The small increase in vehicle trips per day resulting from the project is not expected to result in a measurable traffic noise increase at the project site. Therefore, project traffic noise would not result in a permanent noise increase of 3 dBA DNL or more at noise-sensitive receptors in the project vicinity.

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

**Impact 2: Exposure to Excessive Groundborne Vibration.** Construction-related vibration levels would potentially exceed applicable vibration thresholds at nearby sensitive land uses. **This is a potentially significant impact.**

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

According to the City's Historic Resource Inventory,[3] the nearest historical structure is located at 5325 Alum Rock Avenue, which is more than 1,370 feet from the project site. No other historical buildings are located in the vicinity of the project site.

According to Policy EC-2.3 of the City of San José General Plan, a vibration limit of 0.08 in/sec PPV shall be used to minimize the potential for cosmetic damage to sensitive historical structures, and a vibration limit of 0.20 in/sec PPV shall be used to minimize damage at buildings of normal conventional construction. The vibration limits contained in this policy are conservative and designed to provide the ultimate level of protection for existing buildings in San José. As discussed in detail below, vibration levels exceeding these thresholds would be capable of cosmetically damaging adjacent buildings. Cosmetic damage (also known as threshold damage) is defined as hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage is defined as hairline cracking in masonry or the loosening of plaster. Major structural damage is defined as wide cracking or the shifting of foundation or bearing walls.

Table 12 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 12 also summarizes the distances to the 0.08 in/sec PPV threshold for historical buildings and to the 0.2 in/sec PPV threshold for all other buildings. Since no historical buildings

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

are located within 60 feet of the site, the 0.08 in/sec PPV threshold would not be exceeded at any historical buildings during project construction and is not discussed further.

**TABLE 12 Vibration Source Levels for Construction Equipment**

| Equipment | | PPV at 25 ft. (in/sec) | Minimum Distance to Meet 0.08 in/sec PPV (feet) | Minimum Distance to Meet 0.2 in/sec PPV (feet) |
|---|---|---|---|---|
| Clam shovel drop | | 0.202 | 59 | 26 |
| Hydromill (slurry wall) | in soil | 0.008 | 4 | 2 |
| | in rock | 0.017 | 7 | 3 |
| Vibratory Roller | | 0.210 | 61 | 27 |
| Hoe Ram | | 0.089 | 28 | 13 |
| Large bulldozer | | 0.089 | 28 | 13 |
| Caisson drilling | | 0.089 | 28 | 13 |
| Loaded trucks | | 0.076 | 24 | 11 |
| Jackhammer | | 0.035 | 12 | 6 |
| Small bulldozer | | 0.003 | 2 | <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., November 2022.

Table 13 summarizes the possible vibration levels at nearest 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 13), which are different than the distances used to propagate construction noise levels (as shown in Tables 8 through 11), were estimated under the assumption that each piece of equipment from Table 12 was operating along the nearest boundary of the project site, which would represent the worst-case scenario.

Project construction activities would potentially generate vibration levels up to 1.233 in/sec PPV at the nearest single-family residences adjoining the project site if construction activities occurred within 5 feet of the property line. A study completed by the US Bureau of Mines analyzed the effects of blast-induced vibration on buildings in USBM RI 8507.[4] The findings of this study have been applied to buildings affected by construction-generated vibrations.[5] As reported in USBM RI 8507[4] and reproduced by Dowding,[5] Figure 2 presents the damage probability, in terms of "threshold damage," "minor damage," and "major damage," at varying vibration levels. Threshold

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

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

damage, which is described as cosmetic damage in this report, would entail hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage would include hairline cracking in masonry or the loosening of plaster, and major structural damage would include wide cracking or shifting of foundation or bearing walls.

As shown in Figure 2, maximum vibration levels of 1.233 in/sec PPV would result in a 30% chance of threshold or cosmetic damage and a 3% chance of minor damage at the nearest residential building located at 117 Kirk Avenue, if heavy equipment were to be used along the northeast property line. There is also a chance of threshold or cosmetic damage at 133 Kirk Avenue, 3876/3878 Madeline Drive, and 150 El Campo Drive if heavy equipment were to be used along property lines. Minor off-site grading of a driveway at 3830 Madeline Drive will also briefly occur. At this location, the use of heavy equipment within 30-feet, or use of light equipment within 15-feet of existing buildings could produce vibration levels exceeding 0.2 in/sec PPV. No threshold or cosmetic damage, or minor or major damage would be expected at all other residential buildings immediately adjoining the project site.

Heavy vibration-generating construction equipment, such as vibratory rollers or clam shovel drops, would have the potential to produce vibration levels exceeding 0.2 in/sec PPV if used within 30-feet of residential buildings adjoining the project site. Much of the other lighter equipment could potentially produce vibration levels exceeding 0.2 in/sec PPV if used within 15-feet of residential buildings adjoining the project site. At all other structures more than 30-feet from the property lines, construction would not generate vibration levels exceeding 0.2 in/sec PPV. 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.

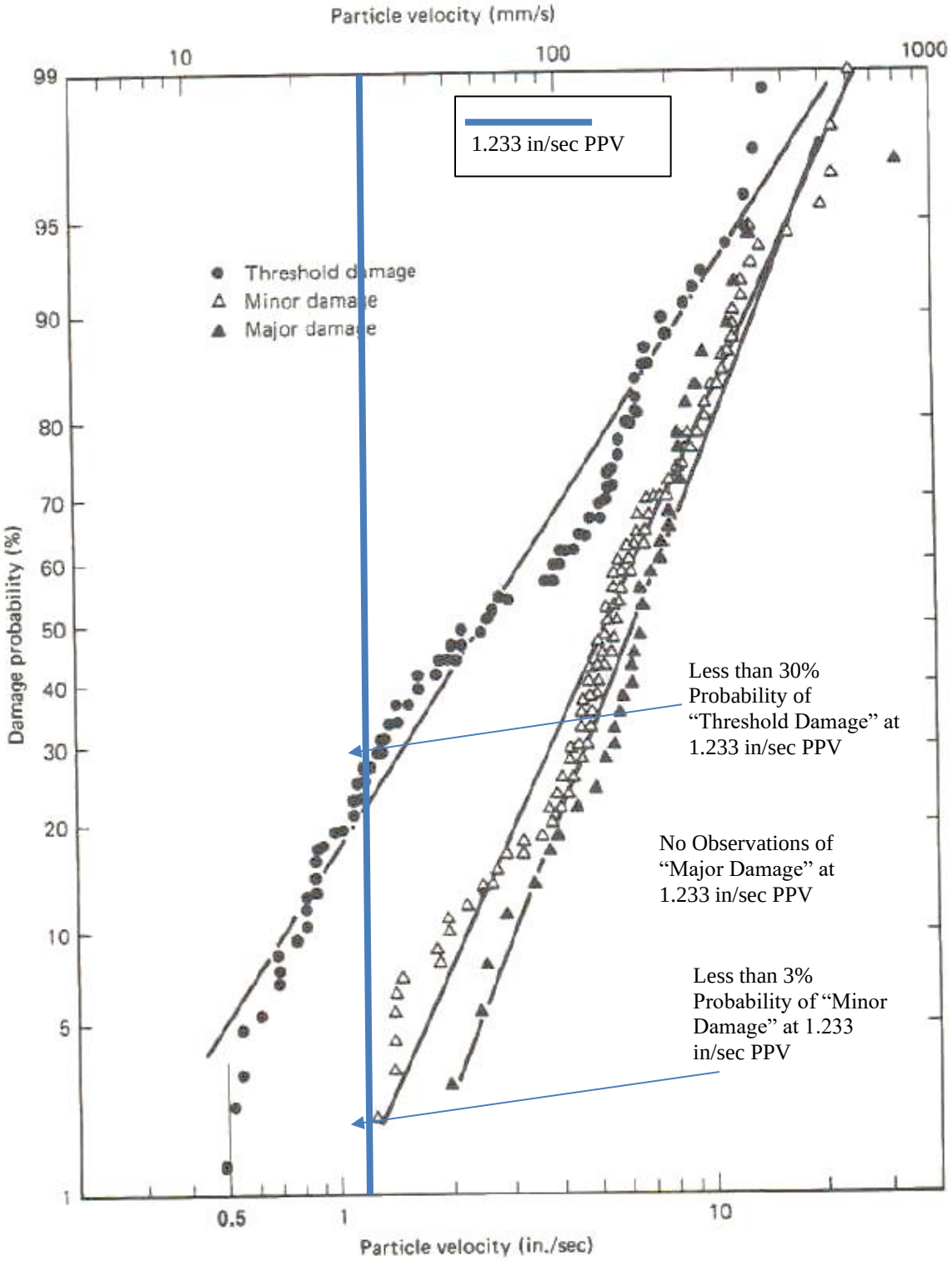
In summary, the construction of the project would potentially generate vibration levels exceeding the General Plan threshold of 0.2 in/sec PPV at nonhistorical properties in the project vicinity. This would be a potentially significant impact.

**TABLE 13 Vibration Source Levels for Construction Equipment**

| Equipment | | PPV (in/sec) | | | |
|---|---|---|---|---|---|
| | | 117 Kirk Ave. (5ft) | 133 Kirk Ave. & 3876/3878 Madeline Dr. (15ft) | 150 El Campo Dr. (25ft) | 3854 Madeline Dr. (30ft) |
| Clam shovel drop | | 1.186 | 0.354 | 0.202 | 0.165 |
| Hydromill (slurry wall) | In soil | 0.047 | 0.014 | 0.008 | 0.007 |
| | In rock | 0.100 | 0.030 | 0.017 | 0.014 |
| Vibratory Roller | | 1.233 | 0.368 | 0.210 | 0.172 |
| Hoe Ram | | 0.523 | 0.156 | 0.089 | 0.073 |
| Large bulldozer | | 0.523 | 0.156 | 0.089 | 0.073 |
| Caisson drilling | | 0.523 | 0.156 | 0.089 | 0.073 |
| Loaded trucks | | 0.446 | 0.133 | 0.076 | 0.062 |
| Jackhammer | | 0.206 | 0.061 | 0.035 | 0.029 |
| Small bulldozer | | 0.018 | 0.005 | 0.003 | 0.002 |

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., November 2022.

**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 shall be implemented where vibration levels due to construction activities would exceed 0.2 in/sec PPV at buildings adjoining the project site:

- 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.

- Smaller equipment to minimize vibration levels to below 0.2 in/sec PPV shall be used at the property lines adjoining adjacent buildings. For example, a smaller vibratory roller, such as the Caterpillar model CP433E vibratory compactor, could be used when compacting materials within 30 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 30 feet of the adjacent conventional buildings.

- 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 over 5 miles east of Norman Y. Mineta International Airport, and the noise environment attributable to aircraft is considered normally acceptable under the Santa Clara County ALUC noise compatibility policies for residential land uses. This is a **less-than-significant** impact.

Norman Y. Mineta San José International Airport is a public-use airport located approximately 5.1 miles east of the project site. According to the City's new Airport Master Plan Environmental Impact

Report,[6] the project site lies well outside the 60 dBA CNEL/DNL contour line (see Figure 3). According to Policy EC-1.11 of the City's General Plan, the required safe and compatible threshold for exterior noise levels would be at or below 65 dBA CNEL/DNL for aircrafts. Therefore, the proposed project would be compatible with the City's exterior noise standards for aircraft noise.

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

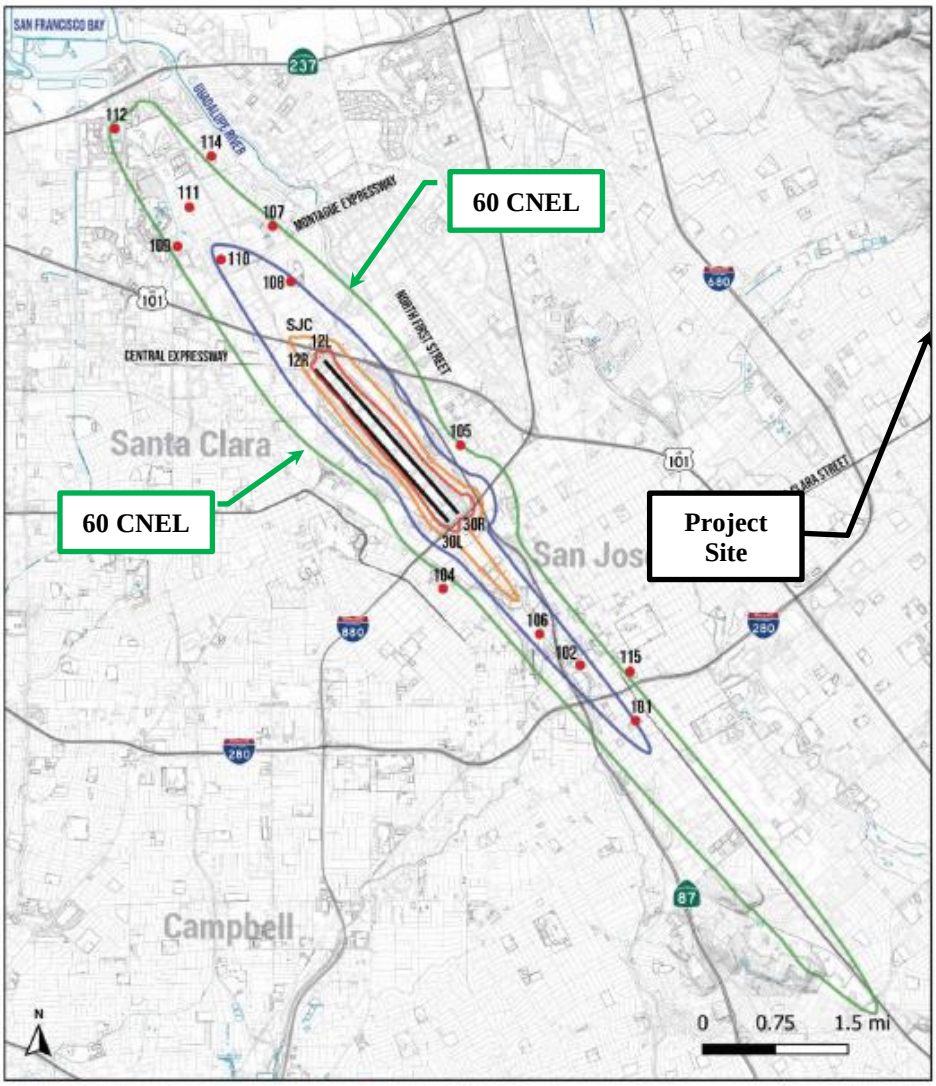
**Mitigation Measure 3:** **None required.**

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

**FIGURE 3 2037 CNEL Noise Contours for SJIA Relative to Project Site**

Figure 5
Scenario 2: With Project 2037 Noise Contour Map

SAN JOSE INTERNATIONAL AIRPORT | Environmental Impact Report FINAL | October 2019




NORMAN Y. MINETA SAN JOSE INTERNATIONAL AIRPORT

Noise Monitoring Station
101 Site ID
Runway
75 dBA and Greater CNEL Contour
70 dBA and Greater CNEL Contour
65 dBA and Greater CNEL Contour
60 dBA and Greater CNEL Contour

Figure 5 Scenario 2: With Project 2037 Noise Contour Map

Source: BridgeNet International 2019

**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 DNL or greater for future levels exceeding 60 dBA DNL or was 5 dBA DNL or greater for future levels at or below 60 dBA DNL; 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 DNL or more attributable solely to the proposed project.

A noise level increase of less than 1 dBA DNL is expected along every roadway segment, with and without the project. Therefore, cumulative traffic noise increases would not occur due to the proposed project.

From the City's website,[7] there are no planned or approved projects located within 1,000 feet of the proposed project site. Therefore, no cumulative construction impacts would occur in the project vicinity.

[7] https://gis.sanjoseca.gov/maps/devprojects/

# APPENDIX A – LONG-TERM NOISE DATA

**FIGURE A1**

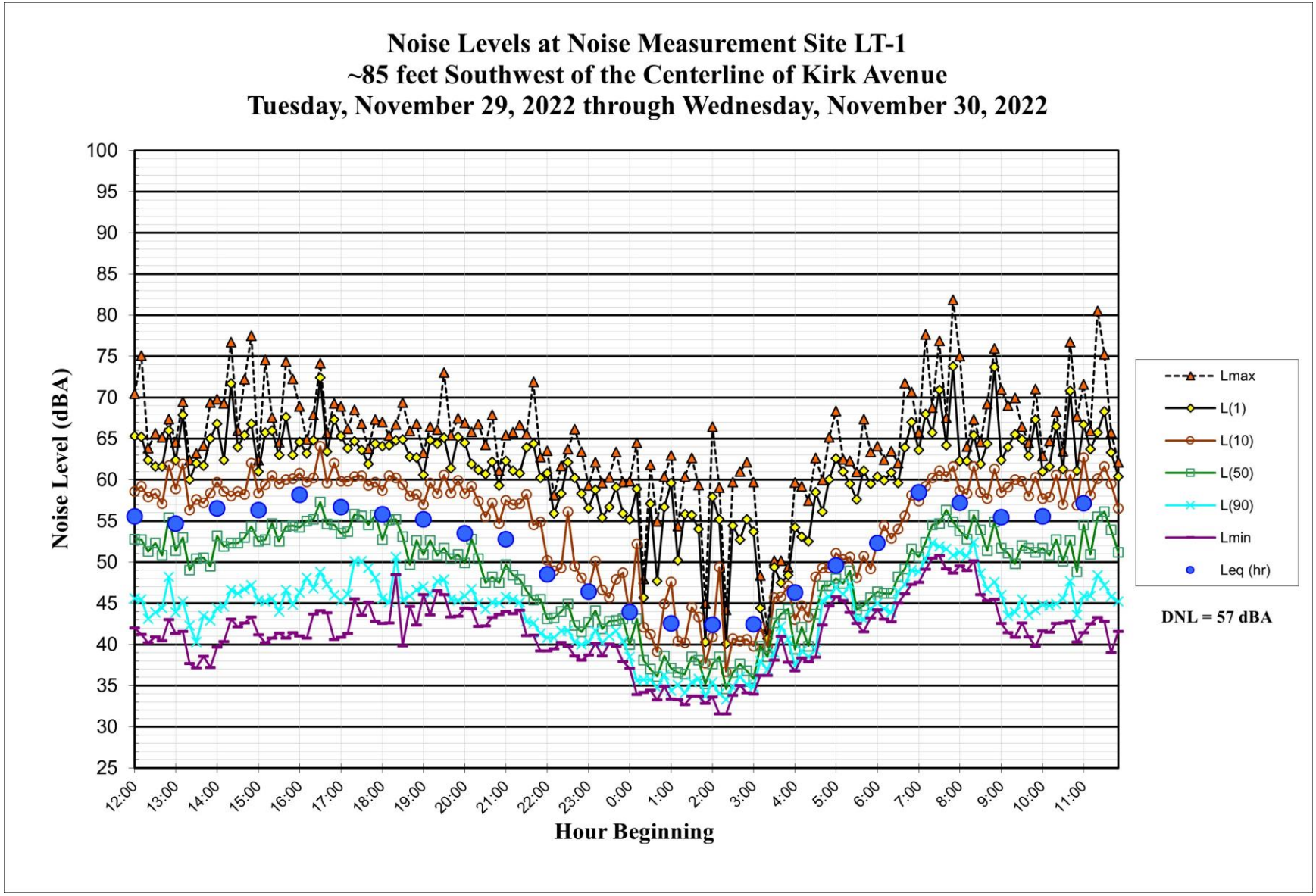
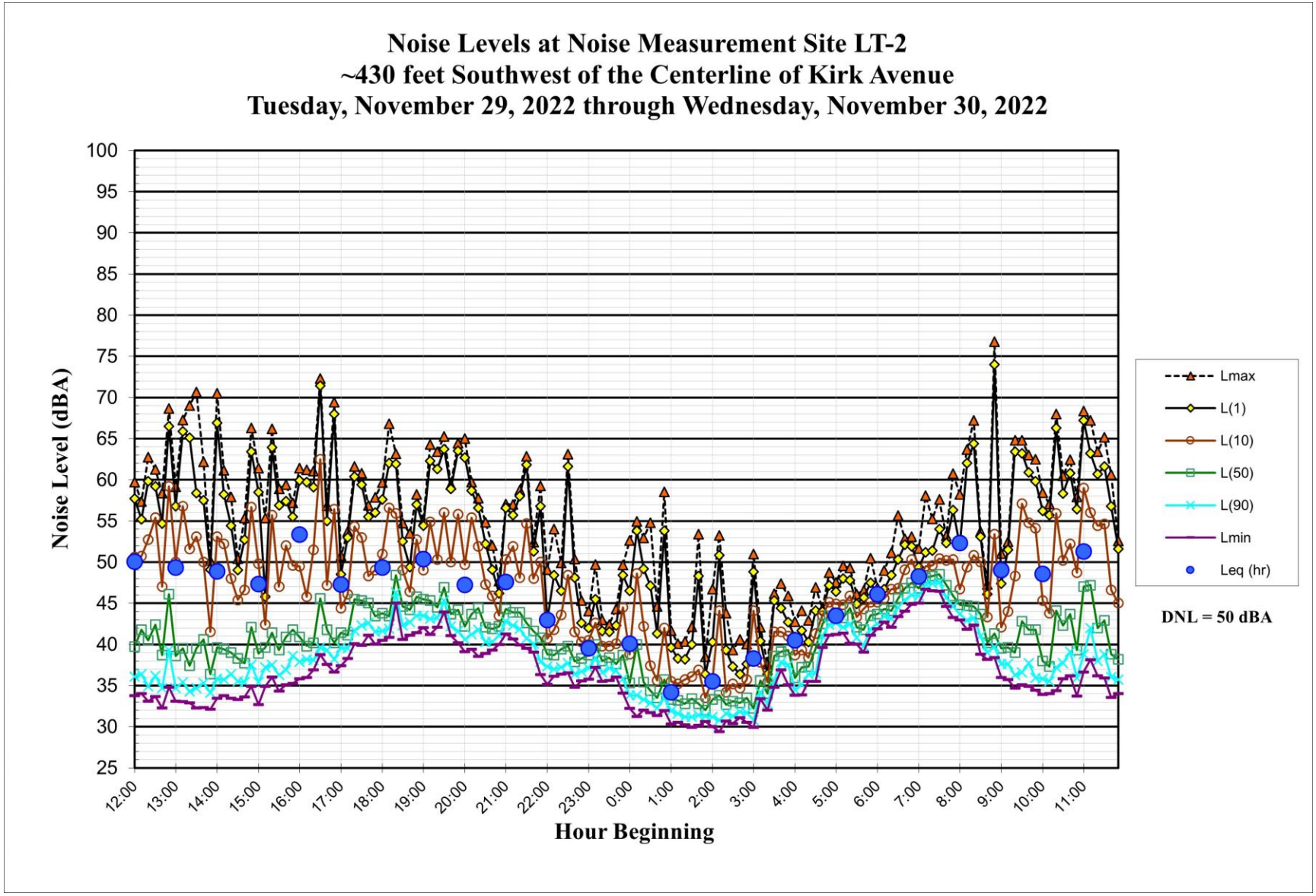

Noise Levels at Noise Measurement Site LT-1
~85 feet Southwest of the Centerline of Kirk Avenue
Tuesday, November 29, 2022 through Wednesday, November 30, 2022
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
DNL = 57 dBA

**FIGURE A2**


Noise Levels at Noise Measurement Site LT-2
~430 feet Southwest of the Centerline of Kirk Avenue
Tuesday, November 29, 2022 through Wednesday, November 30, 2022
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
DNL = 50 dBA