SILVERADO MEMORY CARE
NOISE AND VIBRATION ASSESSMENT

San Jose, California

September 28, 2023

Prepared for:

Steve Noack
Principal
2040 Bancroft Way, Suite 400
Berkeley, CA 94704

Prepared by:

Adwait Ambaskar
Michael Thill

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
429 East Cotati Avenue
Cotati, CA 94931
(707) 794-0400

Project: 23-094

INTRODUCTION

This project proposes the construction of a new two-story, 48,051 square foot, memory care community at 1975 Cambrianna Drive, San Jose, California. 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 the intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

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

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

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

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level* (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 of vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as paint flaking or minimal extension of cracks in building surfaces; minor, including limited surface cracking; or major, that may threaten the structural integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher. The damage criteria presented in Table 3 include several categories for ancient, fragile, and historic structures, the types of structures most at risk 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

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, 85 dBA L_{eq} at commercial uses and to 90 dBA L_{eq} at 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:

(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

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

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

2022 California Building Code, Title 24, Part 2. The current version of the California Building Code (CBC) requires interior noise levels in multi-family residential units attributable to exterior environmental noise sources to be limited to a level not exceeding 45 dBA 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 Mineta 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. 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 Norman Y. Mineta 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 Norman Y. Mineta San José International Airport noise zone (defined by the 65 CNEL contour as set forth in State law) and encourage aircraft operating procedures that minimize noise.

City of San José Municipal Code

20.30.700 Performance standards.

Noise. The sound pressure level generated by any use or combination of uses on a property shall not exceed the decibel levels indicated in Table 20-85 at any property line, except upon issuance and in compliance with a special use permit as provided in Chapter 20.100.

Table 20-85
Noise Standards

	Maximum Noise Level in Decibels at Property Line
Any residential or non-residential use	55

20.80.2030 - Criteria and standards (Part 21 – Stand-by/Backup Electrical Power Generation)

A. Any stand-by or backup electrical power generation facility shall meet all of the following criteria and standards listed below. Any electrical power generation uses that may be permitted with a site development permit, special use permit, or conditional use permit shall meet the standards and criteria below, provided that the director, planning commission, or city council, as the case may be, may relax such standards or impose stricter standards as a reasonable exercise of their discretion, upon a finding that such modifications are reasonably necessary in order to implement the general intent of this part and the purposes of this title.

B. The standards and criteria for stand-by and back-up electrical power generation uses are as follows:

1. Maximum noise levels, based upon a noise analysis by an acoustical engineer, will not exceed the applicable noise standards set forth in this title.

2. If the applicable maximum air quality or noise standards are exceeded in the open space, agricultural, or any commercial or industrial zoning district, a conditional

use permit issued in accordance with Part 6 of Chapter 20.100 of this title shall be required.

3. A Bay Area Air Quality Management District (BAAQMD) permit has been issued for the use or facility.

4. Operation of a temporary stand-by or backup power generation facility, by definition, shall not exceed a maximum time period of four (4) consecutive months in any twelve (12) month period.

5. Testing of generators is limited to 7:00 a.m. to 7:00 p.m., Monday through Friday.

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 1975 Cambrianna Drive, Lot A, adjacent to the 7 Magic Flowers Bilingual Montessori Preschool to the east. Single family residential land uses are located north and south of the site. The Campbell Union High School District is located to the west of the project site across Union Avenue. The noise environment in the vicinity of the project site results primarily from traffic along Union Avenue.

A noise monitoring survey, which included two long-term (LT-1 and LT-2) and two short-term (ST-1 and ST-2) noise measurements, was performed at the site beginning on Tuesday, July 11, 2023, and concluding on Thursday, July 13, 2023. All measurement locations are shown in Figure 1.

Long-term noise measurement site LT-1 was about 55 feet east of Union Avenue. Hourly average noise levels at LT-1 typically ranged from 63 to 70 dBA L_{eq} during daytime hours (between 7:00 a.m. and 10:00 p.m.) and from 50 to 64 dBA L_{eq} during nighttime hours (between 10:00 p.m. and 7:00 a.m.). The day-night average noise level measured on Wednesday, July 12, 2023, was 67 dBA DNL. The daily trends in noise levels at LT-1 are shown in Figures A1 through A3 in the Appendix of this report.

Long-term noise measurement site LT-2 was about 250 feet east of Union Avenue. Hourly average noise levels at LT-2 typically ranged from 49 to 61 dBA L_{eq} during daytime hours (between 7:00 a.m. and 10:00 p.m.) and from 38 to 53 dBA L_{eq} during nighttime hours (between 10:00 p.m. and 7:00 a.m.). The day-night average noise level measured on Wednesday, July 12, 2023, was 55 dBA DNL. The daily trends in noise levels at LT-2 are shown in Figures A4 through A6 in the Appendix of this report.

Two short-term noise measurements (ST-1 and ST-2) were also included as part of the noise monitoring survey. Table 4 summarizes the noise levels recorded at each short-term measurement location.

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}**
ST-1: South of project site; north of 3312 Jennifer Way (7/11/2023, 10:50 to 11:00 a.m.)	69	64	52	47	44	52
ST-2: North of project site; near Union Avenue and Byron Way intersection (7/11/2023, 10:50 to 11:00 a.m.)	79	69	59	54	45	59

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 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.

Future Exterior Noise Environment

The future noise environment at the project site would continue to result from traffic along Union Avenue. A review of the project's traffic study indicates an increase of 217 daily project trips at the site. This would result in a less than 1 dB DNL increase to the future noise levels in the area. Based on the Average Daily Traffic data published by the City[2], future noise levels along Union Avenue are calculated to increase by about 0 to 1 dBA DNL. This increase is applied to the results of the existing measurements made at the project site to give an estimate of the future noise environment. Therefore, future noise levels along the west boundary of the project site (about 55 feet east of Union Avenue), would be about 68 dBA DNL. Future noise levels along the east boundary of the project site (250 feet east of Union Avenue) would be about 56 dBA DNL.

The site plan shows a centrally located courtyard enclosed and fully shielded by the two-story memory care building, outdoor dining areas on the ground level along the east boundary of the building and roof decks located on the second floor of the building. A community garden is located at the southeast corner of the project site.

Future exterior noise levels at the centrally located courtyard would be about 53 dBA DNL assuming a 10 dB reduction from the building elements that enclose it. Future exterior noise levels at the dining areas on the ground level would be about 51 dBA DNL assuming a 10 dB shielding from building elements. The roof deck located on the northwest corner of the building would experience the highest future exterior noise levels since a portion of it directly faces Union Avenue traffic. Future exterior noise levels at this roof deck would reach about 65 dBA DNL assuming about 3 dB of shielding from the 6-foot glass safety railing. The community garden located at the southeast corner of the project site located about 210 feet away from the Union Avenue centerline would experience future exterior noise levels of about 50 dBA DNL assuming shielding from the memory care building.

[2] City of San Jose, "San Jose GIS open data"
https://gisdata-csj.opendata.arcgis.com/datasets/3f4978184afa48bb8353170e0d428623/explore

According to the City's acceptable exterior noise thresholds, a standard of 60 dBA DNL is to be used for useable outdoor activity areas excluding balconies and residential stoops/porches facing existing roadways. This 60 dBA DNL criteria is met by all outdoor use areas proposed by the project with the exception of the second-floor roof deck. Exterior noise levels at the memory care second floor roof deck facing Union Avenue would exceed the City's 60 dBA DNL threshold without additional noise control. Considering the purpose, location, and feasibility of additional noise control, a taller noise barrier would not be recommended. Residents would have the option to select other areas of the site for quiet outdoor enjoyment if they should choose to do so.

Future Interior Noise Environment

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. 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, sound rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant's discretion.

Future exterior noise levels along the western façade of the building facing Union Avenue were calculated to reach 68 dBA DNL. For the eastern façade, future exterior noise levels were calculated to reach 56 dBA DNL. Standard construction materials and methods would provide approximately 15 dBA of noise reduction bringing the noise levels at the facades down to 53 dBA DNL for the western façade and 41 dBA DNL for the eastern façade. Standard construction would satisfy the City's acceptable interior noise level of 45 dBA DNL for the eastern façade while standard construction with windows closed along with a forced-air mechanical ventilation would be required for the units along the western façade facing Union Avenue to bring the interior noise levels to an acceptable level.

Noise Insulation Features to Reduce Future Interior Noise Levels

The following noise insulation features shall be incorporated into the proposed project to reduce interior noise levels to 45 dBA DNL or less at residential interiors:

- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards. Preliminary calculations indicate that worst-case units along the westernmost perimeter of the building would require windows and doors having a minimum rating of 26 to 30 STC in order to achieve the interior noise threshold of 45 dBA DNL.

Conditions of Approval

A qualified acoustical specialist shall prepare a detailed analysis of interior residential noise levels resulting from all exterior sources during the design phase pursuant to requirements set forth in the San Jose General Plan and State Building Code. The study will review the final site plan, building elevations, and floor plans prior to construction and recommend building treatments to reduce residential interior noise levels to 45 dBA DNL or lower. Treatments would include, but are not limited to, sound-rated windows and doors, sound-rated wall and window constructions, acoustical caulking, protected ventilation openings, etc. The specific determination of what noise insulation treatments are necessary shall be conducted on a unit-by-unit basis during final design of the project. Results of the analysis, including the description of the necessary noise control treatments, shall be submitted to the City, along with the building plans and approved design, prior to issuance of a building permit.

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 Mitigation Measure 1a as project conditions of approval would result in a **less-than-significant** temporary noise impact.

Construction for the project would last for about 15 months starting in July 2024 and concluding by October 2025. Construction phases would likely include site preparation, grading, trenching/foundation, building exterior and interior construction 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.

Policy EC-1.7 of the City's General Plan requires that all construction operations within the City to use best available noise suppression devices and techniques and to limit construction hours near residential uses per the Municipal Code allowable hours, which are 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 that is 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.

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*.[3] During daytime hours, an exterior threshold of 80 dBA L_{eq} shall be enforced at residential land uses, 85 dBA L_{eq} at commercial land uses and 90 dBA L_{eq} 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, is not expected. The typical range of maximum instantaneous noise levels for the proposed project would be 70 to 90 dBA L_{max} at a distance of 50 feet (see Table 5) from the equipment. Table 6 shows the hourly average noise level ranges, by construction phase, typical for various types of projects. Hourly average noise levels generated by construction are about 65 to 88 dBA L_{eq} for residential memory care 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 results in lower construction noise levels at distant receptors.

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

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 on site.
II - Minimum required equipment present at site.

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

Based on the range of construction noise levels presented in Table 6 above for a residential project (65 to 88 dBA L_{eq} at 50 feet), noise levels at receptors in the vicinity of the project site are summarized in Table 7. Figure 2 shows the project site with an overlay of the site plan along with the closest noise sensitive receptors.

TABLE 7 Calculated Construction Noise Levels at Nearby Receptors

Hourly Average Construction Noise Levels, dBA Leq					
At 50 feet	**Campbell Union High School (R1) At 173 feet**	**North Receptors (R2) At 325 feet**	**7 Magic Flowers Montessori (R3) At 115 feet**	**Southeast Residences (R4) At 300 feet**	**South Residences (R5) At 240 feet**
65 to 88	54 to 77	49 to 72	58 to 81	49 to 72	51 to 74

FIGURE 2 Project Site with Nearest Noise-Sensitive Receptors

As shown in Table 7, construction noise levels would intermittently range from 49 to 81 dBA L_{eq} at the nearest noise-sensitive receptors when activities are focused near the center of the project site. Construction noise levels would not exceed the 80 dBA L_{eq} threshold at receptors located towards the west, north and south of the site. However, construction noise levels would exceed the exterior threshold of 80 dBA L_{eq} at the 7 Magic Flowers Montessori located towards the east of the site. With construction activities lasting over 12 months, this would be considered a significant impact.

Mitigation Measure 1a:

A construction noise logistics plan shall be prepared 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. Project construction operations shall use best available noise suppression devices and techniques including, but not limited to the following:

- Limit construction hours to between 7:00 a.m. and 7:00 p.m., Monday through Friday, unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence. Construction outside of these hours may be approved through a development permit based on a site-specific "construction noise mitigation plan" and a finding by the Director of

PBCE that the construction noise mitigation plan is adequate to prevent noise disturbance of affected residential uses.

- Construct solid plywood fences or similar around ground level construction sites adjacent to noise-sensitive receptors. A temporary 8-foot noise barrier shall be constructed along the property lines of the project site to the east to shield the adjacent 7 Magic Flowers Montessori. The noise barrier shall be solid over the face and at the base of the barrier in order to provide a 6 dBA noise reduction.

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

- Prohibit unnecessary idling of internal combustion engines.

- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors. Construct temporary noise barriers to screen stationary noise-generating equipment when located near adjoining sensitive land uses.

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

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

- Notify all adjacent residences, and other noise-sensitive land uses of the construction schedule, in writing, and provide a written schedule of "noisy" construction activities to the adjacent land uses and nearby residences.

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

With the implementation of GP Policy EC-1.7, Zoning Code requirements, and the above measures, temporary construction noise would be reduced to a **less-than-significant** level (80 dBA L_{eq} or less).

Impact 1b: **Permanent Noise Level Increase/Exceed Applicable Standards.** The proposed project is not expected to cause a substantial permanent noise level increase at the existing noise-sensitive land uses in the project vicinity or generate noise levels in excess of standards established in the City's General Plan or Municipal Code with the incorporation of standard conditions of project approval. **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 substantially increase noise levels at existing sensitive receptors in the project vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL at residences; or b) the noise level increase is 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater at residences. Existing ambient levels, based on the measurements made in the project vicinity, range from 55 to 67 dBA DNL. Therefore, a significant impact would occur if traffic or operational noise due to the proposed project would permanently increase ambient levels by 3 dBA DNL or more.

While the City's Noise Element does not include thresholds for residential buildings and other noise sensitive land uses, the City's Municipal Code (Zoning Ordinance) has noise limits of 55 dBA at receiving residential uses. Exceeding these limits would not be considered a significant impact under CEQA; however, it is recommended that these limits be considered for design features in the proposed building.

Project Traffic Increase

To determine noise level increases at existing residential land uses due to project-generated traffic, net project trip traffic volumes from the project traffic study were compared to the existing daily traffic conditions. The traffic study showed that the proposed development would generate an additional 217 daily trips compared to the existing conditions. Union Avenue carries an average of 17,450 daily trips[4], so the traffic noise increase would be less than 1 dBA DNL. This is a less-than-significant impact.

Mechanical Equipment

The site plan indicates an emergency generator located along the east portion of the memory care building, at the ground level. A typical emergency generator with a standard weather enclosure produces a maximum average noise level of 80 dBA at 7 meters (23 feet). At the nearest receptor (7 Magic Flowers Montessori) located about 50 feet away, the emergency generator would produce a maximum average noise level of about 73 dBA. Emergency generators are typically operated on a monthly basis during daytime hours for testing purposes. Additional noise control measures need to be implemented based on the specifications of the emergency generator (type, size, schedule, enclosure) to satisfy the City's noise limit of 55 dBA at the property line of receiving uses.

Various mechanical equipment for heating, ventilation, and cooling purposes, exhaust fans, and other similar equipment would likely be located on the roof of the proposed building. Noise levels received at nearby sensitive land uses would depend on system design level specifications, including the equipment location, type, size, capacity, and enclosure design. These details are typically not available until later phases of the project design and development review process.

The primary noise sources on the roof of the building would be the air conditioning condensing units, which cycle on and off based on the heating or cooling needs. To represent a credible worst-case

[4] City of San Jose, "San Jose GIS open data"
https://gisdata-csj.opendata.arcgis.com/datasets/3f4978184afa48bb8353170e0d428623/explore

scenario, up to eight clustered units were assumed to run continuously, producing hourly average noise levels of 75 dBA L_{eq} at a distance of 3 feet. The nearby receptors would not have direct line-of-sight to the rooftop equipment since it would be shielded by the rooftop edge of the building. Worst-case noise levels are calculated to be about 30 dB L_{eq} or less assuming shielding from the rooftop edge and reduction in noise levels when propagating to the closest receiver about 75 feet away. The associated DNL from the mechanical equipment (heating, ventilation, and air conditioning) would be 36 dBA or less at the nearest receptor to the east (7 Magic Flowers Montessori). These levels would not exceed the Municipal Code noise limits, nor measurably contribute to ambient DNL noise levels in the project vicinity (0 dBA DNL increase).

Condition of Approval

As a project condition of approval, mechanical equipment shall be selected and designed to reduce noise levels to meet the Municipal Code requirements at the nearby noise-sensitive land uses. A qualified acoustical consultant shall be retained to review mechanical noise as these systems are selected to determine specific noise reduction measures necessary to reduce noise to comply with the City's Municipal Code noise level requirements. Noise reduction measures could include, but are not limited to, selection of equipment that emits low noise levels and installation of noise barriers, such as enclosures and parapet walls, to block the line-of-sight between the noise source and the nearest receptors. Other alternate measures may be optimal, such as locating equipment in less noise-sensitive areas, such as along the building façades farthest from adjacent neighbors, where feasible. In addition, to reduce the potential for annoyance, it is recommended that adjacent land uses be notified of the proposed testing schedule of generators. Regular testing of the generator should occur between the hours of 7:00 a.m. and 7:00 p.m. and avoid noise-sensitive morning and evening hours in addition to avoiding weekend testing.

No equipment is anticipated for a project of this scale that would make meeting the applicable noise limits with standard noise control measures difficult. The operational noise levels produced (from project traffic, mechanical equipment) by the project would be well below ambient noise levels produced by local vehicle traffic and would not substantially increase the ambient noise environment at the nearest noise-sensitive receptors resulting in 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 be below 0.2 in/sec PPV at existing structures adjoining the project site. **This is a less-than-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 likely include grading, foundation work, paving, and new building framing and finishing. At the time of this study, impact or vibratory pile driving activities, which can cause excessive vibration, are not expected for the proposed project.

Policy EC-2.3 of the City of San José General Plan states that 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 0.2 in/sec PPV shall be used to minimize damage at buildings of normal conventional construction. No known historic structures are located in the vicinity of the project site. The 0.2 in/sec PPV threshold shall be used to evaluate impacts due to construction vibration. 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 8 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 8 also summarizes the distances to the 0.2 in/sec PPV threshold for buildings of conventional construction.

TABLE 8 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Minimum Distance to Meet 0.2 in/sec PPV (feet)
Clam shovel drop		0.202	26
Hydromill (slurry wall)	in soil	0.008	2
	in rock	0.017	3
Vibratory Roller		0.210	27
Hoe Ram		0.089	13
Large bulldozer		0.089	13
Caisson drilling		0.089	13
Loaded trucks		0.076	11
Jackhammer		0.035	6
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., September 2023.

Table 9 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 9), which are different than the distances used to propagate construction noise levels (as shown in Table 7), were estimated under the assumption that each piece of equipment from Table 8 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 0.172 in/sec PPV at the existing buildings near 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.[5] The findings of this study have been applied to buildings affected by construction-generated vibrations.[6] As reported in USBM RI 8507[6] and reproduced by Dowding,[7] Figure 3 presents the damage probability, in terms of "threshold damage" (described above as cosmetic damage), "minor damage," and "major damage," at varying vibration levels. Threshold damage, or cosmetic damage, would entail hairline cracking in plaster, the opening of old cracks, the loosening of paint or the dislodging of loose objects. Minor damage would include hairline cracking in masonry or the loosening of plaster, and major structural damage would include wide cracking or shifting of foundation or bearing walls.

As shown in Figure 3, maximum vibration levels of 0.172 in/sec PPV or lower would result in virtually no measurable damage. No cosmetic, minor or major damage would be expected at the buildings immediately adjoining 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 generate vibration levels of 0.172 in/sec PPV or less which is below the City's threshold and would not result in any cosmetic, minor, or major damage to any surrounding buildings. This is a less-than-significant impact.

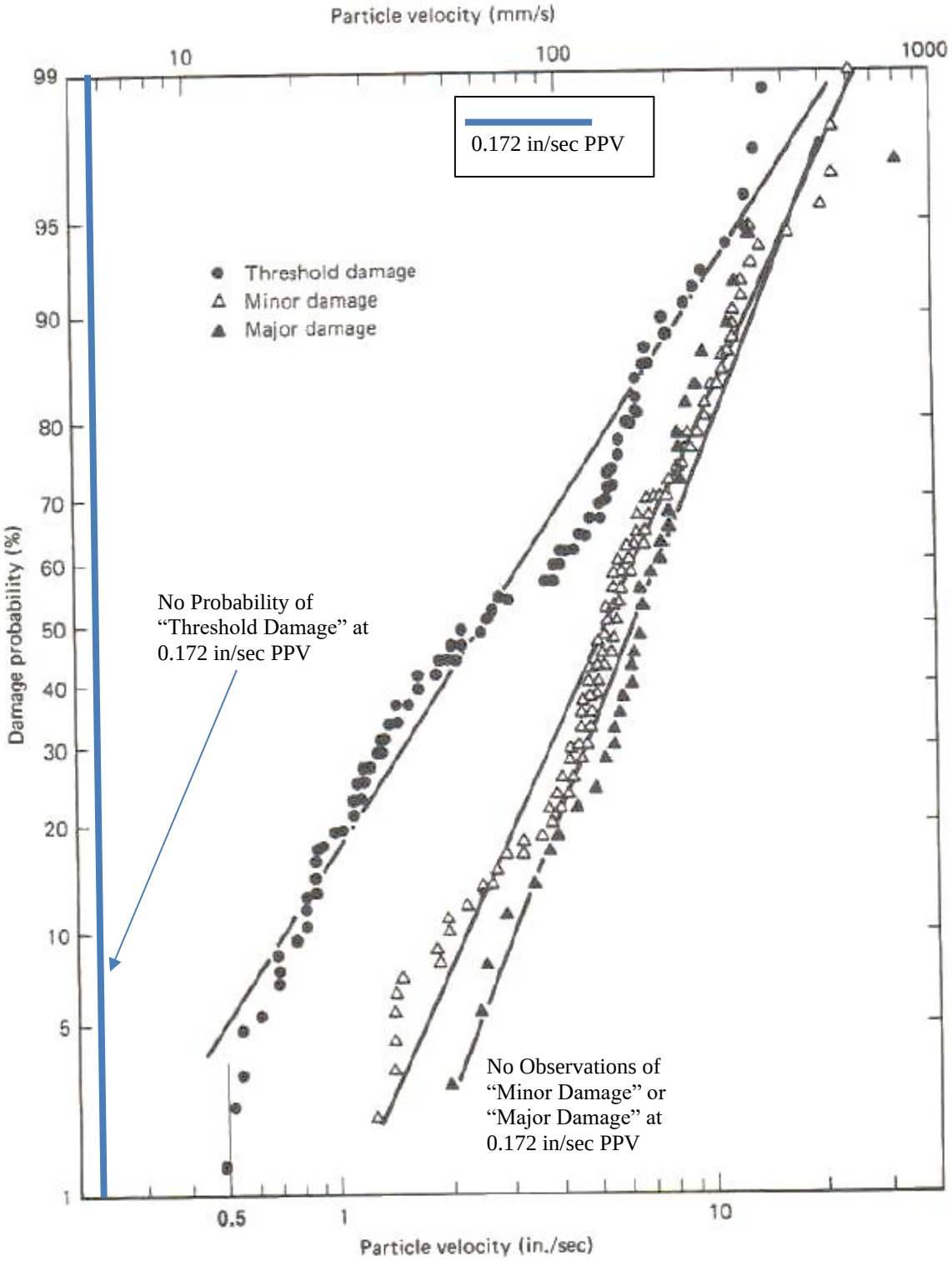
[5] Siskind, D.E., M.S. Stagg, J.W. Kopp, and C.H. Dowding, Structure Response and Damage Produced by Ground Vibration form Surface Mine Blasting, RI 8507, Bureau of Mines Report of Investigations, U.S. Department of the Interior Bureau of Mines, Washington, D.C., 1980.
[6] Dowding, C.H., Construction Vibrations, Prentice Hall, Upper Saddle River, 1996.

TABLE 9 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Estimated Vibration Levels at Structures Surrounding the Project Site, in/sec PPV			
			Campbell Union High School (145 feet)	North Residences (55 feet)	7 Magic Flowers Montessori (30 feet)	South Residences (60 feet)
Clam shovel drop		0.202	0.029	0.085	0.165	0.077
Hydromill (slurry wall)	in soil	0.008	0.001	0.003	0.007	0.003
	in rock	0.017	0.002	0.007	0.014	0.006
Vibratory Roller		0.210	0.030	0.088	0.172	0.080
Hoe Ram		0.089	0.013	0.037	0.073	0.034
Large bulldozer		0.089	0.013	0.037	0.073	0.034
Caisson drilling		0.089	0.013	0.037	0.073	0.034
Loaded trucks		0.076	0.011	0.032	0.062	0.029
Jackhammer		0.035	0.005	0.015	0.029	0.013
Small bulldozer		0.003	<0.001	0.001	0.002	0.001

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., September 2023.

FIGURE 3 Probability of Cracking and Fatigue from Repetitive Loading



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

Impact 3: **Exposure of Residents or Workers to Excessive Noise Levels in the Vicinity of a Private Airstrip or an Airport Land Use Plan.** The project site is located approximately 6 miles from the San José Mineta International Airport and lies outside the 60 dBA CNEL noise contour. **This is a less-than-significant impact.**

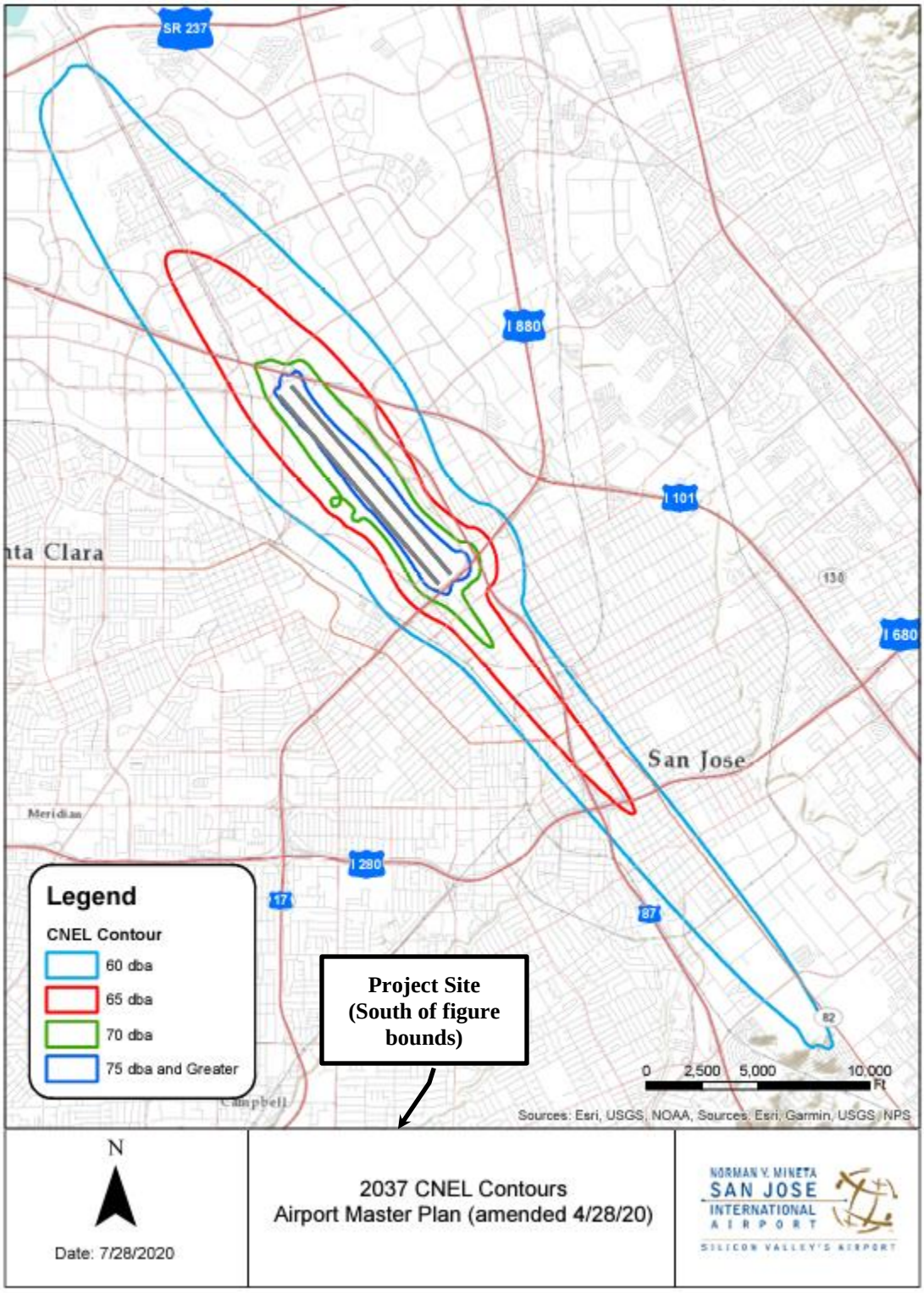
The Santa Clara County ALUC has jurisdiction over new land uses in the vicinity of airports and establishes 65 dBA CNEL as the maximum allowable noise level considered compatible with residential uses. CLUP Policy N-4 would prohibit residential or transient lodging within the 65 dB CNEL contour boundary unless it can be demonstrated that the resulting interior sound levels will be less than 45 dB CNEL.

Future noise levels expected from aircraft are best represented by the 2037 CNEL Contours noise exposure map published as part of the Airport Master Plan. Figure 4 depicts the 65 dBA CNEL noise contour that defines the noise impact boundary for new residential development. The project site lies outside the 2037 65 dBA CNEL and outside the 60 dBA CNEL noise contours shown in Figure 4. Noise levels resulting from aircraft would be less than 60 dBA CNEL at the project site and compatible with the proposed land use.

The 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.**

FIGURE 4 2037 Noise Contours for San José Mineta International Airport



Cumulative Impacts

Cumulative noise impacts could result from nearby, simultaneous construction projects. The following planned or approved projects are located within 1,000 feet of the proposed project:

- **1975 Cambrianna Drive –** This project is located about 500 feet east of the project site, adjacent to the 7 Magic Flowers Montessori. This project was not identified as a future receptor in this report. This project plans to construct 21 two-story single-family homes involving construction activities such as demolition, grading, trenching, building exterior and interior work and road paving. Construction is anticipated to start in October 2023 and is expected to be completed by July 2025. The 7 Magic Flowers Montessori is a shared receptor for both construction sites. The Public and Private Improvements portion of the 1975 Cambrianna Drive project involving demolition, rough grading and paving would likely be completed before construction for the Silverado Memory Care project starts. A significant cumulative construction impact could occur during the home construction phase of the 1975 Cambrianna Drive project and the proposed Silverado Memory Care project.

- **3235 Union Avenue –** This project is located to the west of the project site, west of the Campbell Union High School District (CUHSD). This project was not identified as a future receptor in this report. This project proposes to redevelop the corporation site of the CUHSD property with a residential subdivision of 40 single family detached homes. This would require demolition of two existing maintenance buildings, and removal of trees along with other construction activities such as site preparation, grading, trenching, building exterior and interior work and paving. It is anticipated that the construction of this project will likely be completed before the start of construction activities involved for the Silverado Memory Care project. A cumulative construction impact is hence not expected.

The 7 Magic Flowers Montessori would be considered a sensitive receptor during construction activities at both 1975 Cambrianna Drive and for the Silverado Memory care project site. However, it is important to note that only the occupants on the west side of the Montessori would be exposed to construction activities at the Silverado Memory Care site while only the occupants on east side of the Montessori would be exposed to construction activities at the 1975 Cambrianna Drive residential development site. With the implementation of construction noise and vibration mitigation measures included in the individual projects, construction noise and vibration levels would be reduced as much as possible at all surrounding sensitive receptors during construction of each individual project. Therefore, the potential cumulative construction impact would be less-than-significant. No other projects are located within 1,000 feet of the proposed project site.

APPENDIX

FIGURE A1 Daily Trend in Noise Levels at LT-1, Tuesday, July 11, 2023

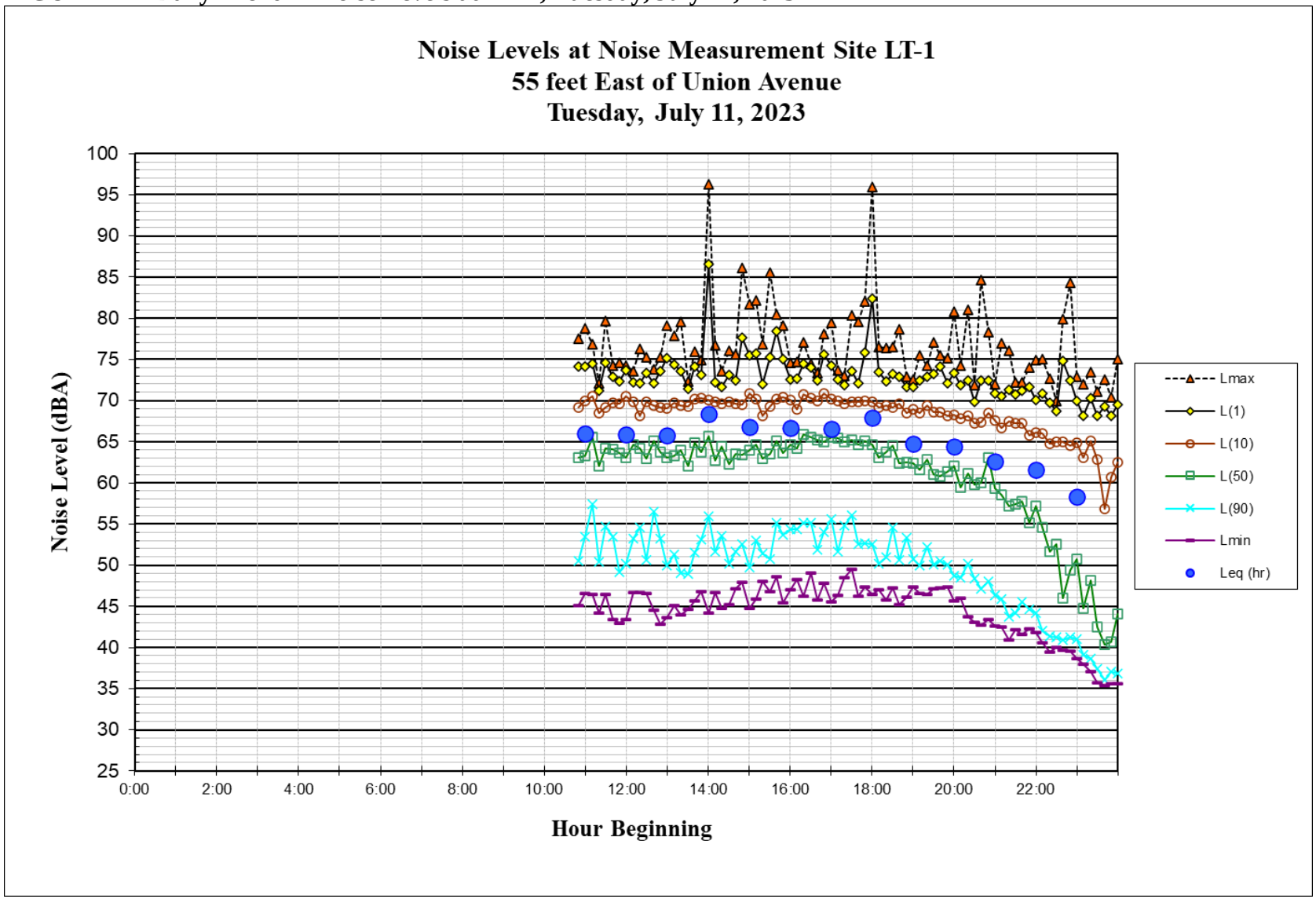


FIGURE A2 Daily Trend in Noise Levels at LT-1, Wednesday, July 12, 2023

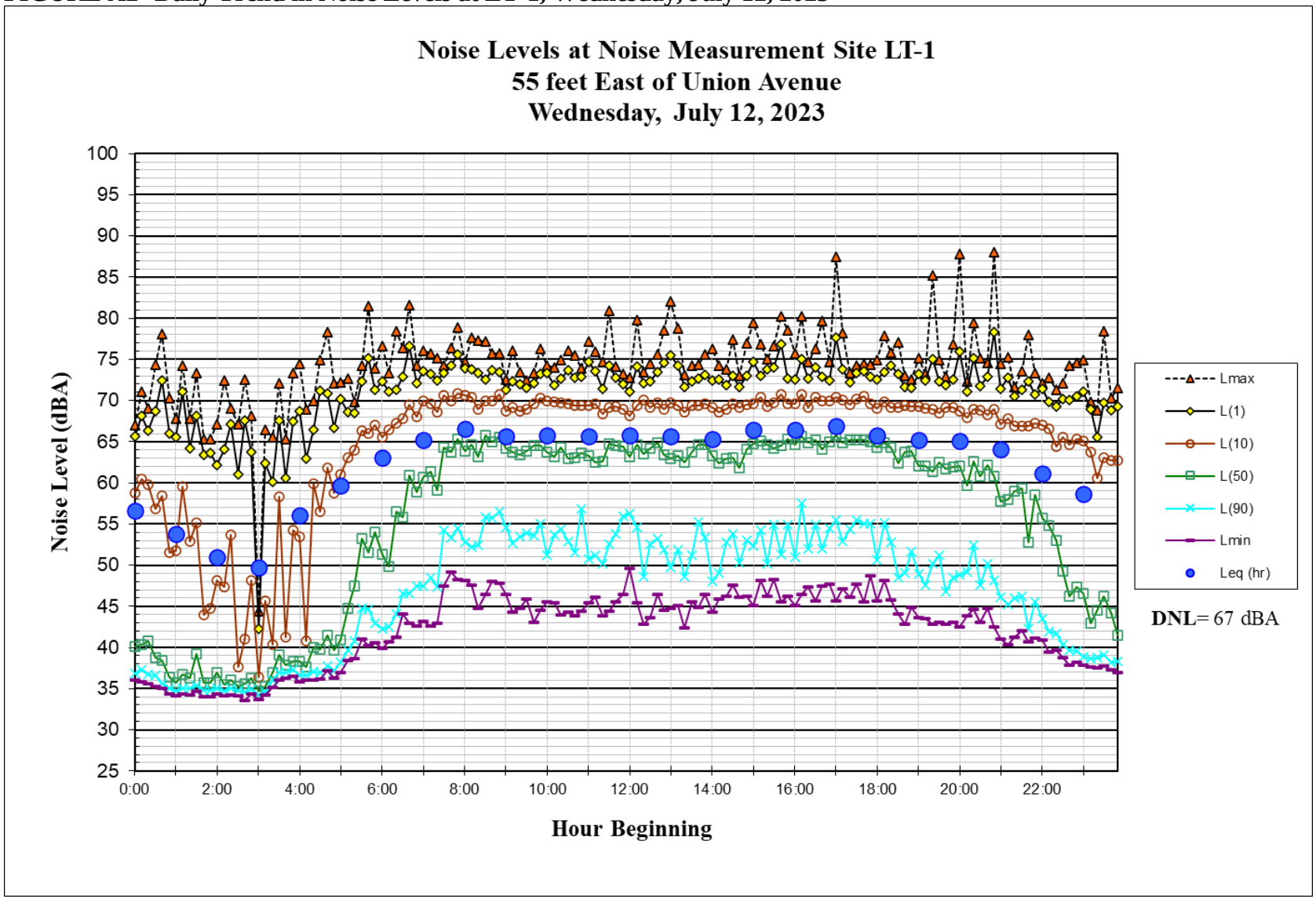


FIGURE A3 Daily Trend in Noise Levels at LT-1, Thursday, July 13, 2023

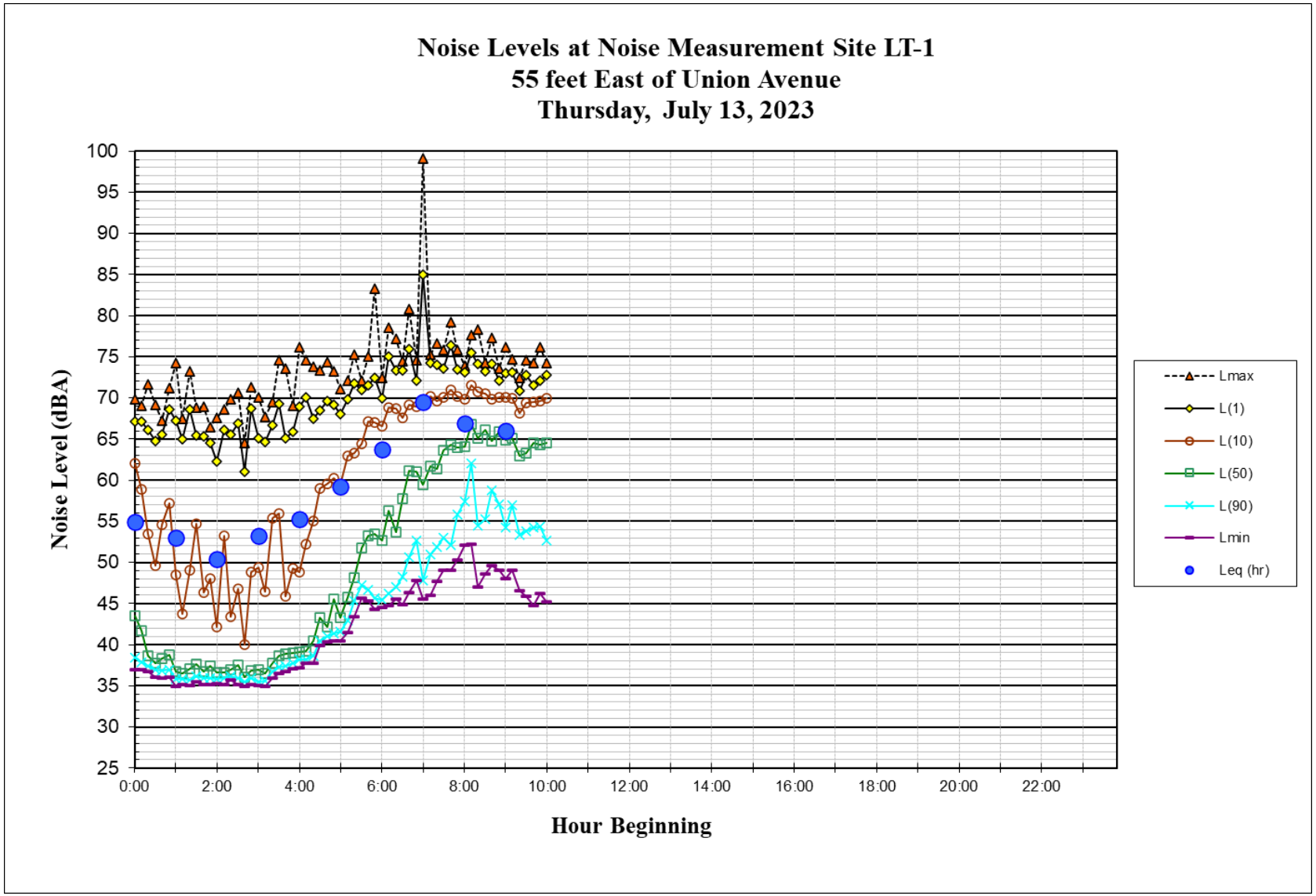


FIGURE A4 Daily Trend in Noise Levels at LT-2, Tuesday, July 11, 2023

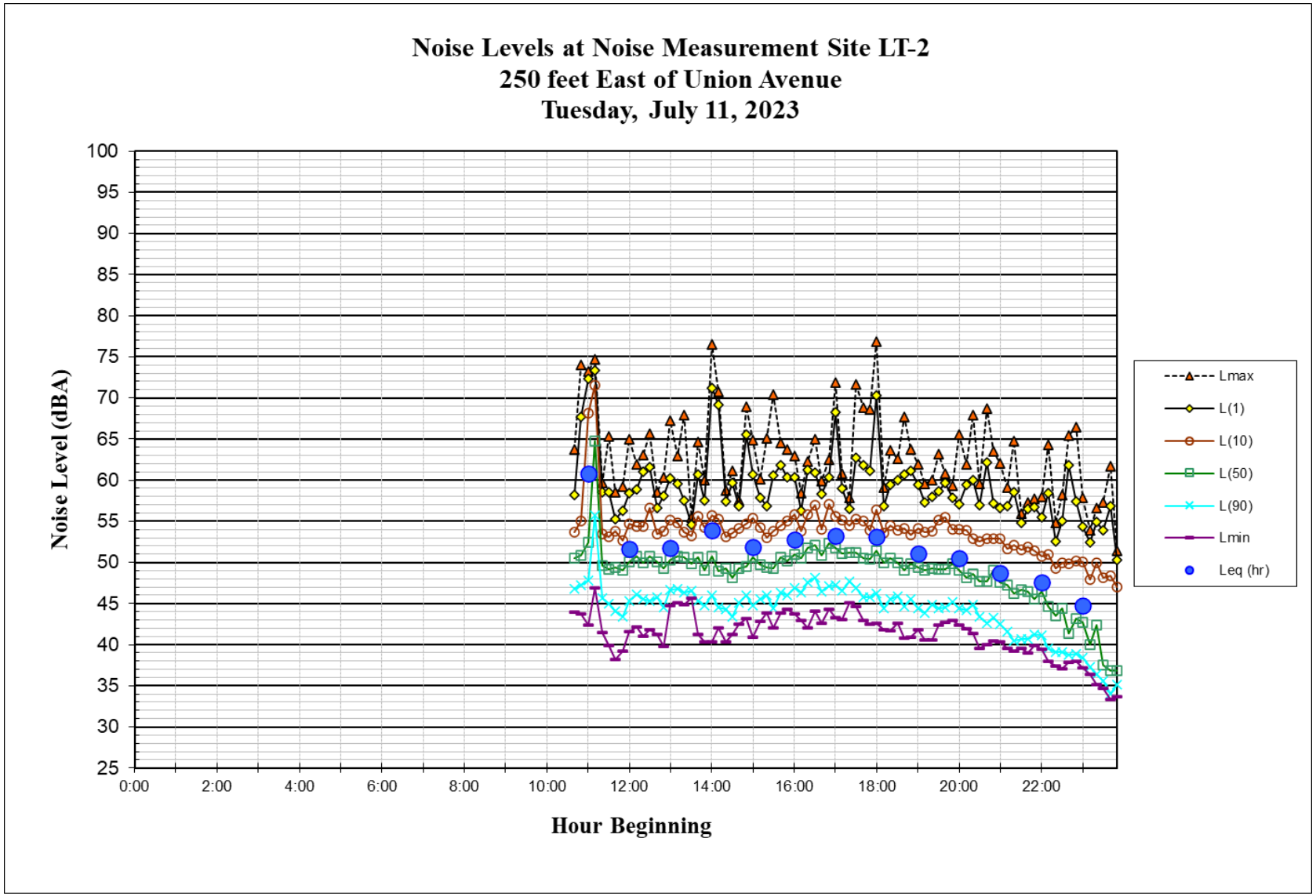


FIGURE A5 Daily Trend in Noise Levels at LT-2, Wednesday, July 12, 2023

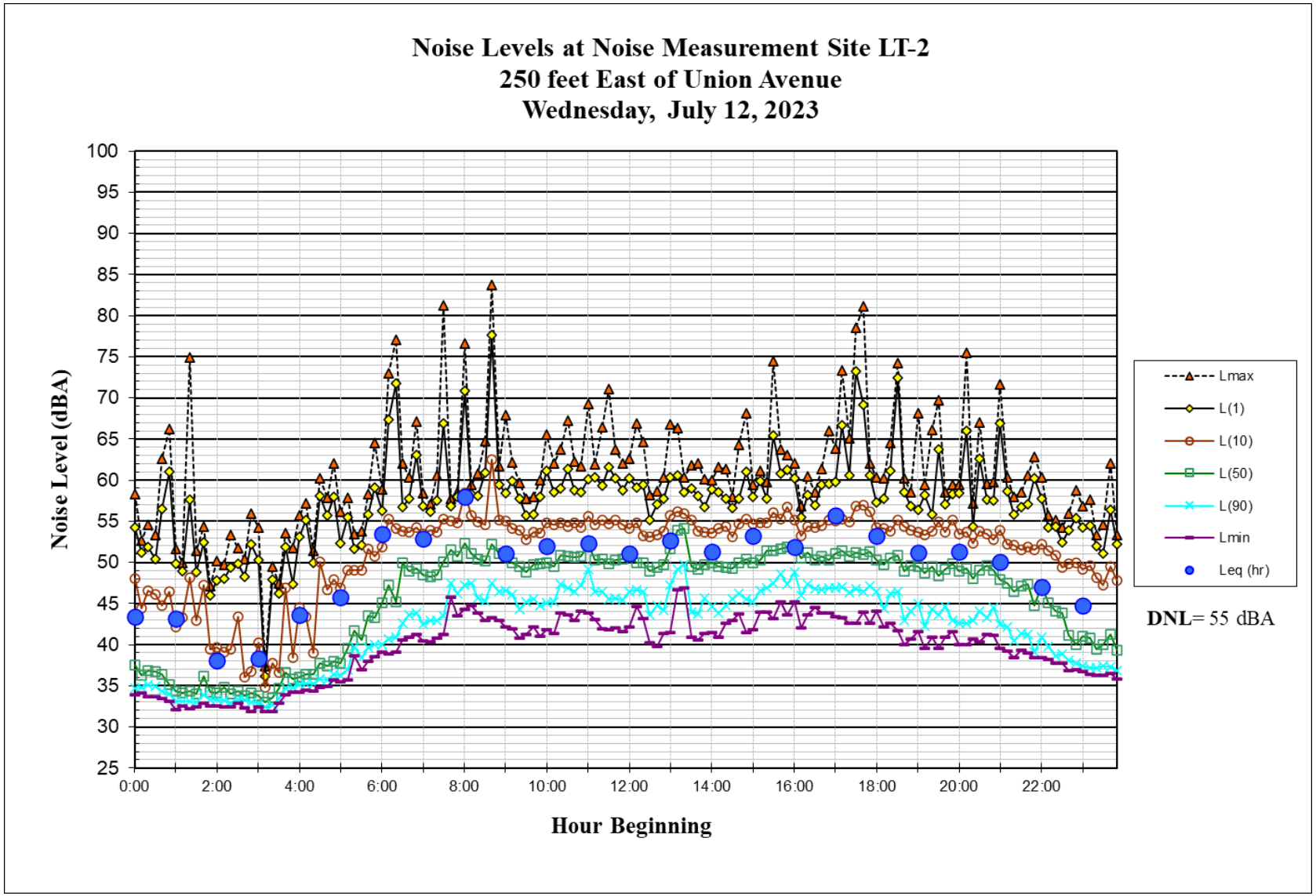


FIGURE A6 Daily Trend in Noise Levels at LT-2, Thursday, July 13, 2023