NOISE AND VIBRATION IMPACT ANALYSIS

MISSION VILLAS PROJECT

ROSEMEAD, CALIFORNIA

LSA

August 2022

NOISE AND VIBRATION IMPACT ANALYSIS

MISSION VILLAS PROJECT

ROSEMEAD, CALIFORNIA

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LIST OF ABBREVIATIONS AND ACRONYMS

ADT	average daily trips
ALUC	Airport Land Use Compatibility
CEQA	California Environmental Quality Act
City	City of Rosemead
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibel(s)
FHWA	Federal Highway Administration
ft	foot/feet
FTA	Federal Transit Administration
FTA Manual	FTA *Transit Noise and Vibration Impact Assessment Manual*
in/sec	inch/inches per second
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous sound level
mi	mile/miles
Noise Element	City of Rosemead General Plan Noise Element
PPV	peak particle velocity
project	Mission Villas Project
EMT	San Gabriel Valley Airport
RMS	root-mean-square
STC	Sound Transmission Class
VdB	vibration velocity decibels

INTRODUCTION

This noise and vibration impact analysis has been prepared to evaluate the potential noise and vibration impacts and reduction measures associated with the proposed Mission Villas Project (project) in Rosemead, California. This report is intended to satisfy the City of Rosemead's (City) requirement for a project-specific noise impact analysis by examining the impacts of the project site and evaluating noise reduction measures that the project may require.

PROJECT LOCATION AND DESCRIPTION

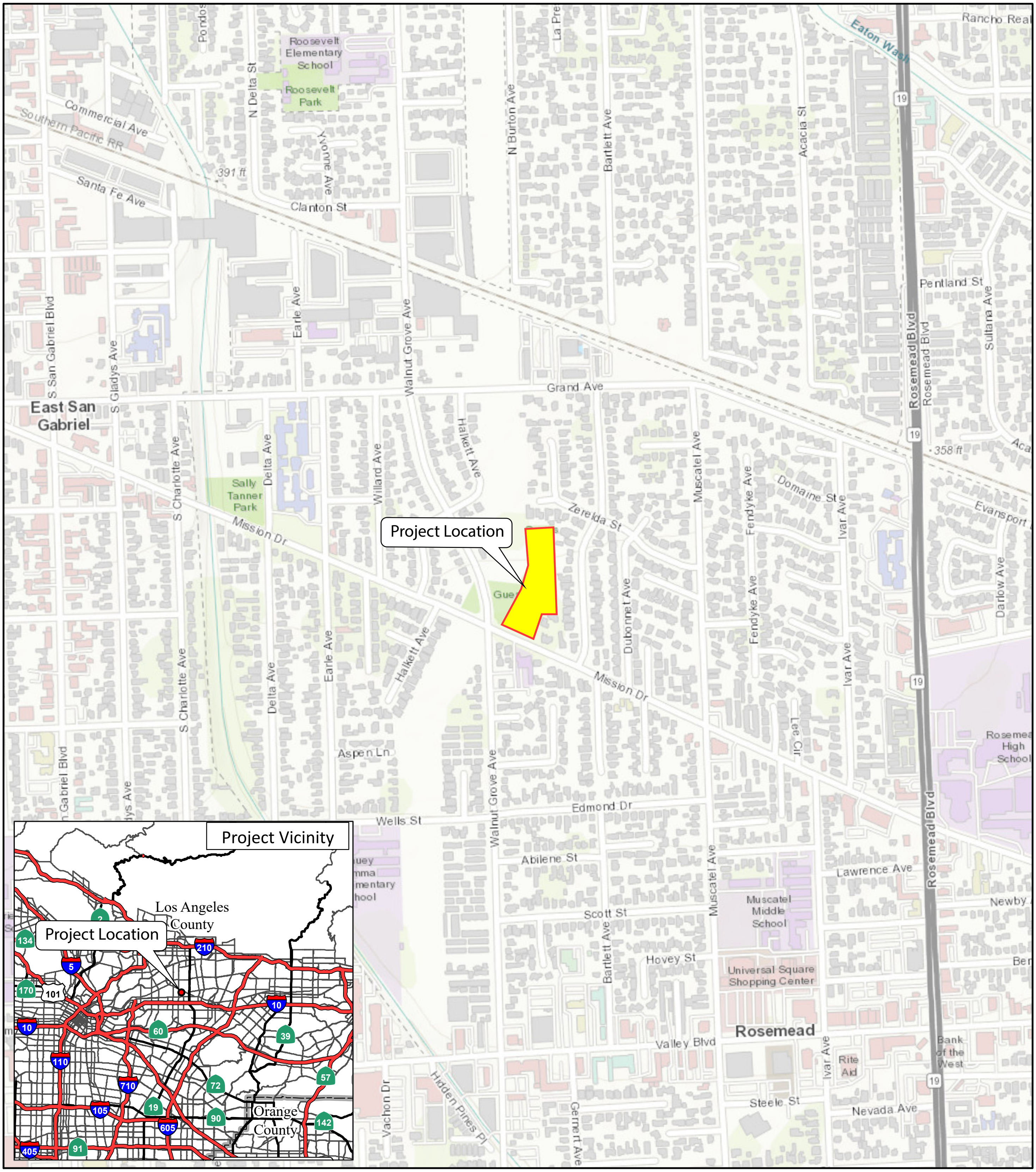
The proposed project is located northeast of the intersection of Walnut Grove Avenue and Mission Drive in Rosemead, California.

The project proposes to construct 37 residential units, including 29 single-family detached units and 8 duplex units as well as 17,298 square feet of open space area and 74 parking spaces on a 3.43-acre site. The site is currently vacant. The project site is surrounded by existing single-family homes immediately adjacent to the north and east, an existing church and single-family homes to the south opposite Mission Drive, as well as vacant land and agricultural uses to the west. Existing single-family homes are located to the west opposite the existing agricultural use and opposite Walnut Grove Avenue. The project's main entry will be from Mission Drive. Figures 1 and 2 show the project location and site plan, respectively.

EXISTING LAND USES IN THE PROJECT AREA

The project site is surrounded primarily by residential uses and vacant parcels. The areas adjacent to the project site include the following uses:

- **North:** Existing single-family residences;
- **East:** Existing single-family residences;
- **South:** Existing single-family residences and Sunrise House of Prayer opposite Mission Drive; and
- **West:** Existing single-family residences beyond agricultural and vacant land.



LSA

LEGEND

Project Site

FIGURE 1

0 400 800
FEET

Mission Villtas Project

Project Location

SOURCE: ArcGIS Online Topographic Map (2020)

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FIGURE 2

0 25 50
FEET

SOURCE: Architeyk

Mission Villas Project

Site Plan

NOISE AND VIBRATION FUNDAMENTALS

CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a sound wave, which results in the tone's range from high to low. Loudness is the strength of a sound, and it describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity is the average rate of sound energy transmitted through a unit area perpendicular to the direction in which the sound waves are traveling. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

MEASUREMENT OF SOUND

Sound intensity is measured with the A-weighted decibel (dBA) scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound, similar to the human ear's de-emphasis of these frequencies. Decibels (dB), unlike the linear scale (e.g., inches or pounds), are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 dB is 10 times more intense than 0 dB, 20 dB is 100 times more intense than 0 dB, and 30 dB is 1,000 times more intense than 0 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 0 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the sound's loudness. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound levels dissipate exponentially with distance from their noise sources. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dB for each doubling of distance in a hard site environment. Line-source sound levels decrease 4.5 dB for each doubling of distance in a relatively flat environment with absorptive vegetation.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and Community Noise Equivalent Level (CNEL) or the day-night average noise level (L_{dn}) based on A-weighted decibels. CNEL is the time-weighted average noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noises occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during relaxation hours. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The City uses the CNEL noise scale for long-term traffic noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts, which are increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to sound levels higher than 85 dBA. Exposure to high sound levels affects the entire system, with prolonged sound exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of sound exposure above 90 dBA would result in permanent cell damage. When the sound level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of sound is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by a feeling of pain in the ear (i.e., the threshold of pain). A sound level of 160–165 dBA will result in dizziness or a loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less developed areas.

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of sound measurement that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., the number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. 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. (All sound levels in this report are A-weighted unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period, respectively.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time. Usually a composite of sound from many sources from many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, 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 1991).

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	Reference level
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2022).

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items sitting on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile-driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet (ft) from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft . When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from street traffic will not exceed the impact criteria; however, construction of the project could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise.

Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and pile-driving to cause vibration of sufficient amplitudes to damage nearby buildings. Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize the potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as:

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where "L_v" is the vibration velocity in decibels (VdB), "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1×10^{-6} inches/second (in/sec) used in the United States.

REGULATORY SETTING

APPLICABLE NOISE STANDARDS

The applicable noise standards governing the project site include the criteria in the California Code of Regulations, the Noise Element of the City's General Plan (Noise Element), and the City of Rosemead Municipal Code.

California Code of Regulations

Interior noise levels for residential habitable rooms are regulated by Title 24 of the California Code of Regulations California Noise Insulation Standards. Title 24, Chapter 12, Section 1206.4, of the 2019 California Building Code requires that interior noise levels attributable to exterior sources not exceed 45 CNEL in any habitable room. A habitable room is a room used for living, sleeping, eating, or cooking. Bathrooms, closets, hallways, utility spaces, and similar areas are not considered habitable rooms for this regulation (Title 24 California Code of Regulations, Chapter 12, Section 1206.4).

City of Rosemead

Noise Element of the General Plan

The City of Rosemead General Plan addresses noise in its Noise Element (General Plan 2010). The Noise Element contains goals and policies for noise control and abatement in the City. General noise goals for Rosemead aim to attain a healthier and quieter environment for all citizens while maintaining a reasonable level of economic progress and development.

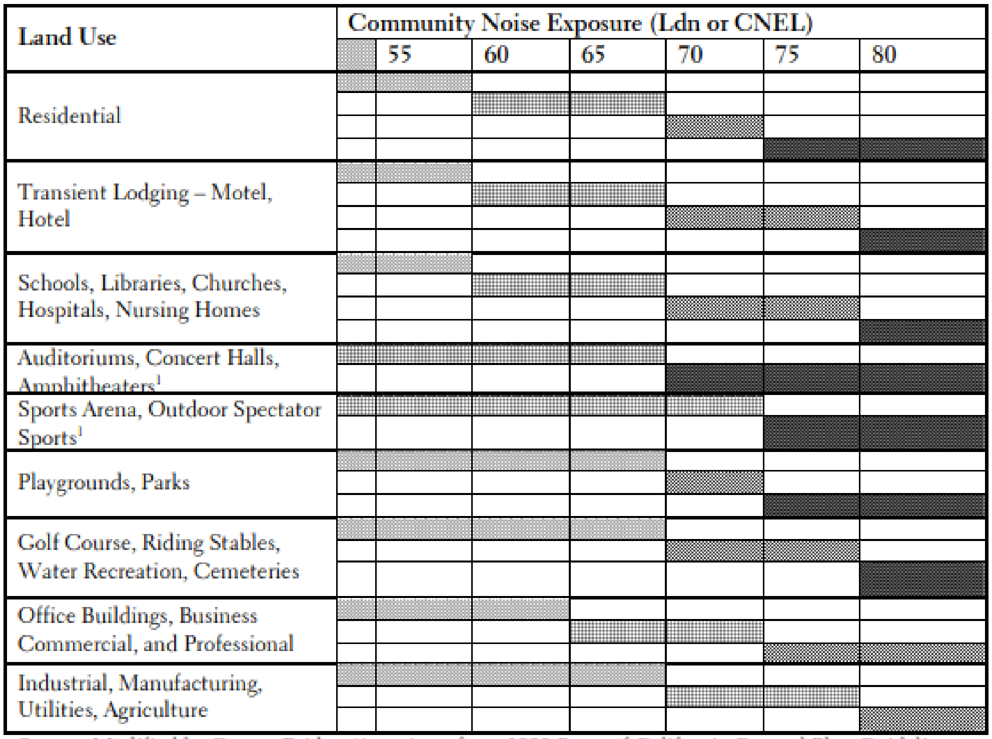
The City, consistent with the California Office of Planning and Research, has established land use compatibility guidelines for determining acceptable noise levels for specified land uses as shown in Table C. These land use compatibility guidelines are intended to be an advisory resource when considering changes in land use and policies, such as zoning modifications.

The Issues, Goals, and Policies as well as the Implementation Actions in the City's General Plan Noise Element are designed to provide noise-compatible land use relationships by establishing noise standards utilized for design and siting purposes and minimize noise impacts from significant noise generators. The following goals and policies are applicable to the proposed project:

Issues, Goal, and Policies

- **Goal 1: Effective incorporation of noise considerations into land use planning decisions.**
  - **Policy 1.1:** Ensure compliance with standards for interior and exterior noise established within the Noise Element and Zoning Code.
  - **Policy 1.4:** Encourage acoustical design in new construction

Table C: Noise/Land Use Compatibility Matrix



Source: Modified by Cotton/Bridges/Associates from 1998 State of California General Plan Guidelines.

Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved meet conventional Title 24 construction standards. No special noise insulation requirements.

Conditionally Acceptable: New construction or development shall be undertaken only after a detailed noise analysis is made and noise reduction measures are identified and included in the project design.

Normally Unacceptable: New construction or development is discouraged. If new construction is proposed, a detailed analysis is required, noise reduction measures must be identified, and noise insulation features included in the design.

Clearly Unacceptable: New construction or development clearly should not be undertaken.

- **Policy 1.5:** Require sound walls to be constructed in designated mixed-use districts where noise-sensitive land uses are located on adjacent properties.

Goal 3: Effective implementation of measures to control non-transportation noise impacts.

- **Policy 3.1:** Enforce provisions of the Community Noise Ordinance to mitigate noise conflicts.
- **Policy 3.2:** Require that potential sources of noise be considered when approving new development to reduce the possibility of adverse affects.
- **Policy 3.3**: Evaluate noise generated by construction activities to ensure compliance with the Community Noise Ordinance.
- **Policy 3.4**: Establish and maintain coordination among the City departments involved in noise abatement.

Implementation Actions

- **Goal 1: Effective incorporation of noise considerations into land use planning decisions.**
  - **Action 1.2:** Incorporate noise reduction features during site planning to mitigate anticipated noise impacts on affected noise sensitive land uses. The noise contours, illustrated on the Existing Noise Contours Map, identify areas within the City exposed to noise levels greater than 60dB CNEL and shall be used to identify locations of potential conflict. Require acoustical analyses, as appropriate, for proposed residential development within the 60 dB CNEL or higher contour. New developments will be permitted only if appropriate mitigation measures are included.
  - **Action 1.3:** Enforce provisions of the California Noise Insulation Standards (Title 24) that specify that indoor noise levels for multi-family residential living spaces shall not exceed 45 dB CNEL. The standard is defined as the combined effect of all noise sources, and is implemented when existing or future exterior noise levels exceed 60 dB CNEL. Title 24 further requires that the standard be applied to all new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings. The City will additionally apply the standard to single-family dwellings and condominium conversion projects.

City of Rosemead Municipal Code

Section 8.36.030 of the City's Municipal Code limits construction and demolition activities to between the hours of 7:00 a.m. and 8:00 p.m. on weekdays, including Saturday. Construction activities should not take place at any time on Sunday or a federal holiday. No person shall operate or allow the operation of any tools or equipment used in construction, drilling, repair, or alteration or demolition work outside of these hours to prevent noise disturbances.

Section 8.36.060 of the City's Municipal Code, Noise Standards, establishes limits on non-impulsive noise where no person shall maintain, create, operate, or cause noise on private property to not exceed the noise standards shown in Table D. The standards are applicable to all receptor properties within a designated noise zone. This section also establishes an allowable interior noise level of 45 dBA at all residential receptors during anytime of the day.

Table D: Maximum Sound Levels for Source Land Uses

Noise Zone	Type of Land Use (Receptor Property)	Time Interval	Allowable Exterior Noise Level (dBA)
I	Single-,double-or multiple family residential	Daytime[1]	60
		Nighttime[2]	45
II	Commercial	Daytime[1]	65
		Nighttime[2]	60
III	Industrial or manufacturing	Anytime	70

Source: Section 8.36.060(A) of the City of Rosemead *Municipal Code (2021).*
[1] Daytime means 7:00 a.m. to 10:00 p.m.
[2] Nighttime means 10:01 p.m. to 6:59 a.m.
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

Federal Transit Administration

Although the City does not have daytime construction noise level limits for activities that occur within the specified hours in Section 11.80.030(D)(7) to determine potential California Environmental Quality Act (CEQA) noise impacts, construction noise was assessed using criteria from the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018) (FTA Manual). Table E shows the FTA's General Assessment Construction Noise Criteria based on the composite noise levels per construction phase.

Table E: General Assessment Construction Noise Criteria

Land Use	Daytime 1-hour L_{eq} (dBA)	Nighttime 1-hour L_{eq} (dBA)
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
dBA = A-weighted decibels
L_{eq} = equivalent continuous sound level

APPLICABLE VIBRATION STANDARDS

Given the City of Rosemead has not established its own vibration impact criteria, the following information provides standards to which potential vibration impacts will be compared. Vibration standards included in the FTA Manual are used in this analysis for ground-borne vibration impacts on human annoyance and potential damage.

Federal Transit Administration

Table F provides the criteria for assessing the potential for interference or annoyance from vibration levels in a building. The criteria for annoyance impacts resulting from ground-borne vibration and noise are based on the average vibration levels during construction. Table G provides the criteria for assessing the potential for damage from vibration levels generated during construction to surrounding structures. The criteria for annoyance impacts resulting from ground-borne vibration and noise are based on the maximum vibration levels during construction at the project property

Table F: Interpretation of Vibration Criteria for Detailed Analysis

Land Use	Max L_v (VdB)[1]	Description of Use
Workshop	90	Vibration that is distinctly felt. Appropriate for workshops and similar areas not as sensitive to vibration.
Office	84	Vibration that can be felt. Appropriate for offices and similar areas not as sensitive to vibration.
Residential Day	78	Vibration that is barely felt. Adequate for computer equipment and low-power optical microscopes (up to 20×).
Residential Night and Operating Rooms	72	Vibration is not felt, but ground-borne noise may be audible inside quiet rooms. Suitable for medium-power microscopes (100×) and other equipment of low sensitivity.

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] As measured in 1/3-octave bands of frequency over a frequency range of 8 to 80 Hertz.
FTA = Federal Transit Administration
Max = maximum
L_V = velocity in decibels
VdB = vibration velocity decibels

Table G: Construction Vibration Damage Criteria

Building Category	PPV (in/sec)
Reinforced concrete, steel, or timber (no plaster)	0.50
Engineered concrete and masonry (no plaster)	0.30
Non-engineered timber and masonry buildings	0.20
Buildings extremely susceptible to vibration damage	0.12

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
FTA = Federal Transit Administration
PPV = peak particle velocity
in/sec = inch/inches per second

OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

The primary existing noise sources in the project area are transportation facilities. Traffic on Mission Drive and Walnut Grove Avenue are a steady source of ambient noise.

AMBIENT NOISE MEASUREMENTS

Long-Term Noise Measurements

Two long-term (24-hour) noise level measurements were conducted on June 21 through June 22, 2022, using two Larson Davis Spark 706RC Dosimeters, and one short term measurement using a Larson Davis 831 Sound Level Meter. Table H provides a summary of the measured hourly noise levels from the noise level measurements. Hourly noise levels at surrounding sensitive uses are as low as 37.3 dBA L_{eq} during nighttime hours and 43.0 dBA L_{eq} during daytime hours. Noise monitoring data results are provided in Appendix A. Figure 3 shows the noise monitoring locations.

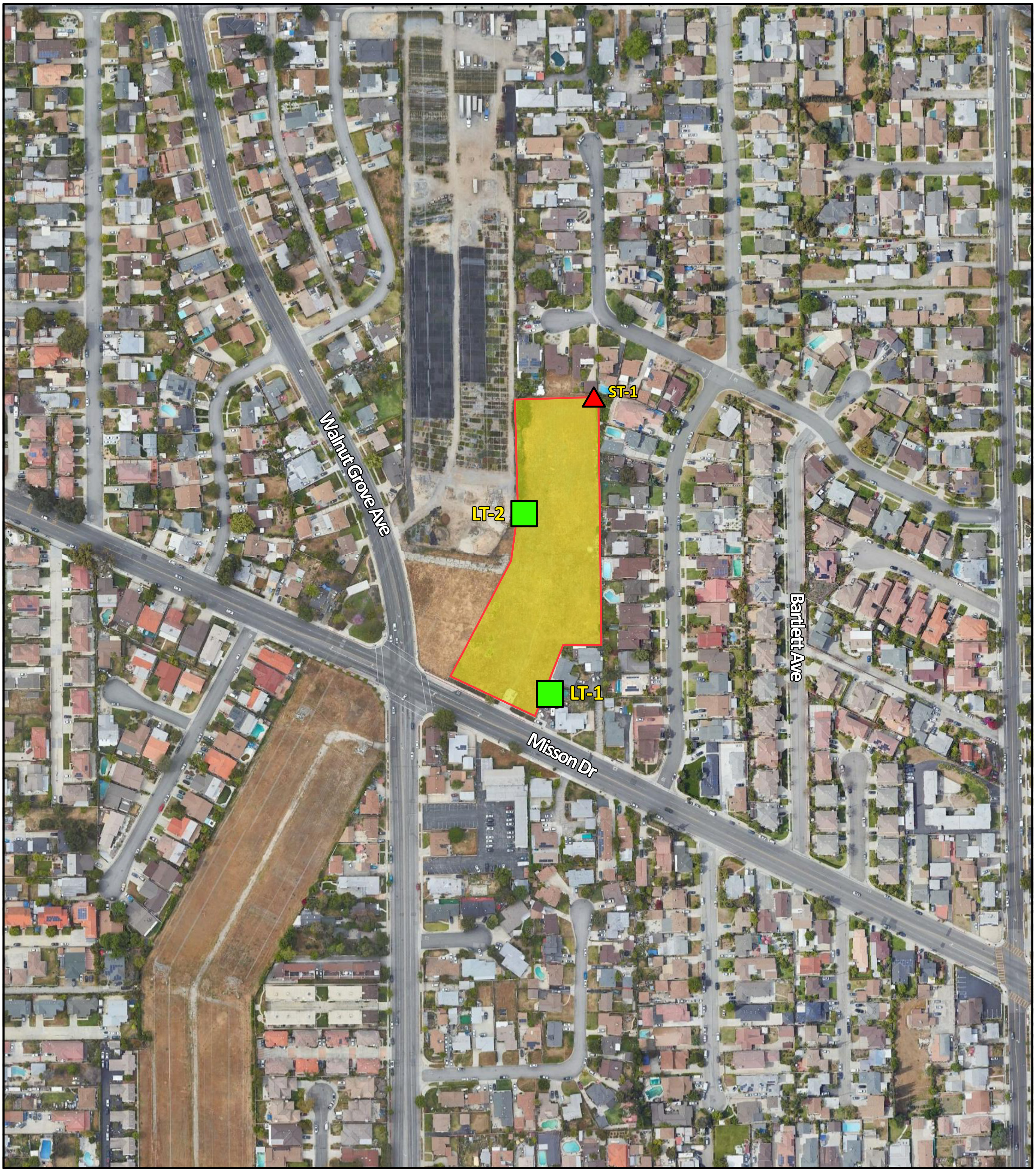
Table H: Existing Noise Level Measurements

Location	Location Description	Daytime Noise Levels[1] (dBA L_{eq})	Evening Noise Levels[2] (dBA L_{eq})	Nighttime Noise Levels[3] (dBA L_{eq})	Average Daily Noise Levels (dBA CNEL)
LT-1	Southern corner of project site, on a fence along the backyard of 8623 Mission Drive	50.9 – 62.5	49.2 – 56.1	42.6 – 52.1	57.0
LT-2	Western corner of project site, bordering a power line near a fence next to a power line tower.	47.6 – 59.8	45.4 – 54.3	41.9 – 50.7	55.2
ST-1[4]	Northeast corner of project site, south of 8612 Zerelda Street	43.0 – 55.2	40.8 – 49.7	37.3 – 46.1	50.6

Source: Compiled by LSA (August 2022).
1 Daytime Noise Levels = noise levels during the hours of 7:00 a.m. to 7:00 p.m.
2 Evening Noise Levels = noise levels during the hours of 7:00 p.m. to 10:00 p.m.
3 Nighttime Noise Levels = noise levels during the hours of 10:00 p.m. to 7:00 a.m.
4 Short-term measurement data estimated based on corresponding long-term
dBA = A-weighted decibels
ft = foot/feet
CNELL_{dn} = Day-night Level
L_{eq} = equivalent continuous sound level

EXISTING AIRCRAFT NOISE

Airport-related noise levels are primarily associated with aircraft engine noise made while aircraft are taking off, landing, or running their engines while still on the ground. The closest airport to the proposed project site is San Gabriel Valley Airport (EMT), formerly known as El Monte Airport, located approximately 2.6 miles (mi) east of the project site. Based on the Airport's Master Plan report (1995), the project is located well outside of the 60 dBA CNEL noise contour of the airport. Therefore, the project site is not expected to experience airport-related noise levels in excess of the City of Rosemead exterior standards. No further analysis is necessary.



LSA

LEGEND

- Project Site Boundary
- ST-1 - Short-Term Noise Monitoring Location
- LT-1 - Long-Term Noise Monitoring Location

FIGURE 3

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SOURCE: Google Earth 2021

Mission Villas Project

Noise Monitoring Locations

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PROJECT IMPACT ANALYSIS

SHORT-TERM CONSTRUCTION NOISE IMPACTS

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise-exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to 84 dBA L_{max}), the effect on longer-term ambient noise levels would be small when compared to existing daily traffic volumes on Mission Drive. Because construction-related vehicle trips would not approach existing daily traffic volumes, traffic noise would not increase by 3 dBA CNEL. A noise level increase of less than 3 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, short-term, construction-related impacts associated with worker commute and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during construction, which includes demolition, site preparation, grading, building construction, paving, and architectural coating on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table I lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor, taken from the Federal Highway Administration (FHWA) *Roadway Construction Noise Model* (FHWA 2006).

In addition to the reference maximum noise level, the usage factor provided in Table I is used to calculate the hourly noise level impact for each piece of equipment based on the following equation:

$$L_{eq}(equip) = E.L. + 10\log(U.F.) - 20\log\left(\frac{D}{50}\right)$$

where: *L_{eq} (equip)* = L_{eq} at a receiver resulting from the operation of a single piece of equipment over a specified time period.

E.L. = noise emission level of the particular piece of equipment at a reference distance of 50 ft.

U.F. = usage factor that accounts for the fraction of time that the equipment is in use over the specified period of time.

D = distance from the receiver to the piece of equipment.

Table I: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 Feet[2]
Auger Drill Rig	20	84
Backhoes	40	80
Compactor (ground)	20	80
Compressor	40	80
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Forklift	20	85
Front-end Loaders	40	80
Graders	40	85
Impact Pile Drivers	20	95
Jackhammers	20	85
Paver	50	77
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rock Drills	20	85
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Trencher	50	80
Welder	40	73

Source: *FHWA Roadway Construction Noise Model User's Guide,* Table 1 (FHWA 2006).
Note: Noise levels reported in this table are rounded to the nearest whole number.
1 Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.
2 Maximum noise levels were developed based on Specification 721.560 from the Central Artery/ Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
FHWA = Federal Highway Administration
L_{max} = maximum instantaneous sound level

Each piece of construction equipment operates as an individual point source. Using the following equation, a composite noise level can be calculated when multiple sources of noise operate simultaneously:

$$Leq\ (composite) = 10 * \log_{10}\left(\sum_{1}^{n} 10^{\frac{Ln}{10}}\right)$$

Using the equations from the methodology above, the reference information in Table I, and the construction equipment list provided, the composite noise level of each construction phase was calculated. The project construction composite noise levels at a distance of 50 feet would range from 74 dBA L_{eq} to 88 dBA L_{eq}, with the highest noise levels occurring during the site preparation and paving phases.

Once composite noise levels are calculated, reference noise levels can then be adjusted for distance using the following equation:

$$Leq\ (at\ distance\ X) = Leq\ (at\ 50\ feet) - 20 * \log_{10}\left(\frac{X}{50}\right)$$

In general, this equation shows that doubling the distance would decrease noise levels by 6 dBA, while halving the distance would increase noise levels by 6 dBA.

Table J shows the nearest sensitive uses to the project site, their distance from the center of construction activities, and composite noise levels expected during construction. These noise level projections do not consider intervening topography or barriers. Construction equipment calculations are provided in Appendix B.

Table J: Potential Construction Noise Impacts at Nearest Receptor

Receptor (Location)	Composite Noise Level (dBA L_{eq}) at 50 feet[1]	Distance (feet)	Composite Noise Level (dBA L_{eq})
Residences (East)	88	115	81
Residences (West)		350	71
Residences (North)		350	71
Residences (South)		430	69

Source: Compiled by LSA (2022).

1 The composite construction noise level represents the paving/site preparation phases, which are expected to result in the greatest noise level as compared to other phases.

dBA = A-weighted decibels

L_{eq} = equivalent continuous sound level

While construction noise will vary, it is expected that composite noise levels during construction at the nearest off-site sensitive residential use to the east would reach an average noise level of 81 dBA L_{eq} during daytime hours. These predicted noise levels would only occur when all construction equipment is operating simultaneously and, therefore, are assumed to be rather conservative in nature. While construction-related short-term noise levels have the potential to be higher than existing ambient noise levels in the project area under existing conditions, the noise impacts would no longer occur once project construction is completed.

As stated above, construction activities are regulated by the City's Noise Ordinance. The proposed project would comply with the construction hours specified in the City's Noise Ordinance, which states that construction activities are allowed between the hours of 7:00 a.m. to 8:00 p.m., Monday through Saturday, excluding Sunday and holidays.

As it relates to off-site uses, construction-related noise levels would remain below the daytime 90 dBA L_{eq} 1-hour construction noise level criteria established by the FTA for residential and similar sensitive uses and, therefore, would be considered less than significant. Best construction practices presented at the end of this analysis shall be implemented to minimize noise impacts to surrounding receptors.

SHORT-TERM CONSTRUCTION VIBRATION IMPACTS

This construction vibration impact analysis discusses the level of human annoyance using vibration levels in VdB and assesses the potential for building damages using vibration levels in PPV (in/sec). This is because vibration levels calculated in RMS are best for characterizing human response to building vibration, while calculating vibration levels in PPV is best for characterizing the potential for damage.

Table K shows the PPV and VdB values at 25 ft from the construction vibration source. As shown in Table K, bulldozers and other heavy-tracked construction equipment (expected to be used for this project) generate approximately 0.089 PPV in/sec or 87 VdB of ground-borne vibration when measured at 25 ft, based on the FTA Manual. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project construction boundary (assuming the construction equipment would be used at or near the project setback line).

Table K: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	L_V (VdB)[1]
Pile Driver (Impact), Typical	0.644	104
Pile Driver (Sonic), Typical	0.170	93
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large Bulldozer[2]	**0.089**	**87**
Caisson Drilling	0.089	87
Loaded Trucks[2]	**0.076**	**86**
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] RMS vibration velocity in decibels (VdB) is 1 μin/sec.
[2] Equipment shown in **bold** is expected to be used on site.
μin/sec = microinches per second
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inch/inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

The formulae for vibration transmission are provided below, and Tables L and M provide a summary of off-site construction vibration levels.

$$L_v dB\ (D) = L_v dB\ (25\ ft) - 30\ Log\ (D/25)$$

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

As shown in Table F, above, the threshold at which vibration levels would result in annoyance would be 78 VdB for daytime residential uses. As shown in Table G, the FTA guidelines indicate that for a non-engineered timber and masonry building, the construction vibration damage criterion is 0.2 in/sec in PPV.

Table L: Potential Construction Vibration Annoyance Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (VdB) at 25 ft[1]	Distance (ft)[2]	Vibration Level (VdB)
Residences (East)	87	115	67
Residences (West)		360	52
Residences (North)		360	52
Residences (South)		430	50

Source: Compiled by LSA (2022).

1 The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.

2 The reference distance is associated with the average condition, identified by the distance from the center of construction activities to surrounding uses.

ft = foot/feet

VdB = vibration velocity decibels

Table M: Potential Construction Vibration Damage Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (PPV) at 25 ft[1]	Distance (ft)[2]	Vibration Level (PPV)
Residences (East)	0.089	5	0.995
Residences (West)		250	0.352
Residences (North)		10	0.003
Residences (South)		100	0.011

Source: Compiled by LSA (2022).

1 The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.

2 The reference distance is associated with the peak condition, identified by the distance from the perimeter of construction activities to surrounding structures.

ft = foot/feet

PPV = peak particle velocity

Based on the information provided in Table L, vibration levels are expected to approach 67 VdB at the closest residential uses located immediately east of the project site, which is below the 78 VdB threshold for annoyance.

The closest structure to the project site is the residential uses to the east of site, approximately 5 ft from the limits of construction activity. It is expected that vibration levels generated by dump trucks and other large equipment that would be as close as 5 feet from the property line would generate ground-borne vibration levels of up to 0.995 PPV (in/sec) at the closest structure to the project site. This vibration level would exceed the 0.2 PPV (in/sec) threshold considered safe for non-engineered timber and masonry buildings. It is expected that construction activities utilizing heavy equipment would generate vibration levels greater than 0.2 in/sec in PPV when operating within 10 feet of the property line, which would result in a potentially significant impact. Therefore, the use of heavy equipment should be prohibited within 15 feet of existing structures to ensure that vibration levels are below the 0.2 PPV (in/sec) threshold. At 15 feet, dump trucks and other large equipment would generate ground-borne vibrations levels of up to 0.191 PPV (in/sec) at the closest structure to the project site and would not exceed the 0.2 PPV (in/sec) threshold. If heavy equipment is necessary within 15 feet of the east boundary of the project site, further vibration assessments as presented in mitigation measures (Mitigation Measure NOI-1) would be implemented to reduce potential impacts. Therefore, construction would not result in any vibration damage and impacts would be less than significant with the incorporation of Mitigation Measure NOI-1.

Mitigation Measure NOI-1 **Construction Vibration Damage.** Due to the close proximity to surrounding structures, the City of Rosemead (City) Director of Community Development, or designee, shall verify prior to issuance of demolition or grading permits, that the approved plans require that the construction contractor shall implement the following measures during project construction activities to ensure that damage does not occur at surrounding structures:

The use of heavy equipment shall be prohibited within 15 feet of existing structures. If heavy equipment is necessary within 15 feet of existing structures, the following measures shall be implemented:

- Identify structures that could be affected by ground-borne vibration and would be located within 15 feet of where heavy construction equipment would be used. This task shall be conducted by a qualified structural engineer as approved by the City's Director of Community Development or designee.

- Develop a vibration monitoring and construction contingency plan for approval by the City's Director of Community Development, or designee, to identify structures where monitoring would be conducted; set up a vibration monitoring schedule; define structure-specific vibration limits; and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions. Construction contingencies would be identified for when vibration levels approached the limits.

- At a minimum, monitor vibration during initial demolition activities. Monitoring results may indicate the need for more intensive measurements if vibration levels approach the 0.2 PPV (in/sec) threshold.

- When vibration levels approach the 0.2 PPV (in/sec) limit, suspend construction and implement contingencies as identified in the approved vibration monitoring and construction contingency plan to either lower vibration levels or secure the affected structures.

Implementation of Mitigation Measure NOI-1 would reduce impacts to a less than significant level by prohibiting heavy equipment within 15 feet of existing structures or requiring a vibration monitoring plan that would ensure that vibration levels are below the 0.2 PPV (in/sec) and vibration damage would not occur. Therefore, vibration impacts would be less than significant with mitigation. Because construction activities are regulated by the City's Municipal Code, which states that construction, maintenance, or demolition activities are not allowed between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturdays, or at any time on Sundays and federal holidays, vibration impacts would not occur during the more sensitive nighttime hours.

LONG-TERM OFF-SITE TRAFFIC NOISE IMPACTS

In order to assess the potential traffic impacts related to the proposed project, a *Trip Generation and Vehicle Miles Traveled (VMT) Screening Analysis* (EPD Solutions, Inc. 2022) has been prepared. Based on the analysis results, it was determined that a net additional 349 average daily trips (ADT) would be generated by the proposed project. The expected traffic volume on the adjacent segment of Mission Drive could be as low as 15,000 (City of Rosemead General Plan 2010). The following equation was used to determine the potential impacts of the project:

$$\text{Change in CNEL} = 10\ log_{10}\left[V_{e+p}/V_{existing}\right]$$

where: $V_{existing}$ = existing daily volumes
V_{e+p} = existing daily volumes plus project
Change in CNEL = increase in noise level due to the project

The results of the calculations show that an increase of approximately 0.1 dBA CNEL is expected along the streets adjacent to the project site. A noise level increase of less than 1 dBA would not be perceptible to the human ear; therefore, the traffic noise increase in the vicinity of the project site resulting from the proposed project would be less than significant. No mitigation is required.

LONG-TERM TRAFFIC-RELATED VIBRATION IMPACTS

The proposed project would not generate vibration levels related to on-site operations. In addition, vibration levels generated from project-related traffic on the adjacent roadways are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Vibration levels generated from project-related traffic on the adjacent roadways would be less than significant, and no mitigation measures are required.

BEST CONSTRUCTION PRACTICES

In addition to compliance with the City's Municipal Code allowed hours of construction of 7:00 a.m. to 8:00 p.m., Monday through Saturday, excluding Sunday and holidays, the following recommendations would reduce construction noise to the extent feasible:

- The project construction contractor should equip all construction equipment, fixed or mobile, with properly operating and maintained noise mufflers, consistent with manufacturer's standards.
- The project construction contractor should locate staging areas away from off-site sensitive uses during the later phases of project development.
- The project construction contractor should place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site whenever feasible.

LAND USE COMPATIBILITY

The dominant source of noise in the project vicinity is traffic noise from roadways in the vicinity of the project.

EXTERIOR NOISE ASSESSMENT

Based on the monitoring results shown in Table H, the existing measured noise levels at the project site closest to Mission Drive, approximately 95 feet away from Mission Drive centerline, is 57.0 dBA CNEL. Based on the project site plan, the rear yards of units 1-4 and 37 are approximately 45 feet away from Mission Drive centerline, resulting in estimated noise levels approaching 62 dBA, without accounting for shielding provided by the proposed 6ft wall, which would reduce the noise levels by 5 dBA or more, resulting in noise levels below 60 dBA. This level is below the City's 60 dBA CNEL exterior noise level standard. Therefore, no additional mitigation would be required.

INTERIOR NOISE ASSESSMENT

As discussed above, per the California Code of Regulations and the City's Implementation Actions, an interior noise level standard of 45 dBA CNEL or less is required for all noise-sensitive rooms. Based on the expected future exterior noise levels at the façades of the lots closest to Mission Drive approaching 62 dBA CNEL, a minimum noise reduction of 17 dBA would be required.

Based on reference information from transmission loss test reports for various Milgard windows (Milgard 2008), standard building construction along with standard windows, typically in the STC 25-28 range, a reduction of 25 dBA or more would be achieved with windows in a closed position. With a reduction of 25 dBA or more, interior noise levels would remain below the City's interior noise level standard of 45 dBA CNEL. The project includes a HVAC system for all unit so that windows can remained closed.

Once final plans are available to detail the exterior wall construction and a window manufacturer has been chosen, a Final Acoustical Report (FAR) would be required to confirm the reduction capability of the exterior façades and to identify any specific upgrades necessary to achieve an interior noise level of 45 dBA CNEL or below.

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APPENDIX A

NOISE MONITORING DATA

Noise Measurement Survey – 24 HR

Project Number: ESL2201.32
Project Name: Mission Villas

Test Personnel: Kevin Nguyendo
Equipment: Spark 706RC (SN:18905)

Site Number: LT-1 Date: 6/21/2022

Time: From 11:00 a.m. To 11:00 a.m.

Site Location: Southern corner on a fence along the backyard of 8623 Mission Dr, Rosemead, CA 91770.

Primary Noise Sources: Regular traffic noise on Mission Drive.

Comments: On a chain link fence all around.

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-1

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
11:00 AM	6/21/22	51.5	71.5	40.1
12:00 PM	6/21/22	50.9	62.6	39.5
1:00 PM	6/21/22	51.7	66.0	41.6
2:00 PM	6/21/22	52.1	67.2	41.1
3:00 PM	6/21/22	52.5	72.3	41.3
4:00 PM	6/21/22	52.3	70.5	39.7
5:00 PM	6/21/22	52.2	64.6	39.5
6:00 PM	6/21/22	54.6	76.6	41.3
7:00 PM	6/21/22	56.1	73.6	40.7
8:00 PM	6/21/22	52.0	75.3	39.0
9:00 PM	6/21/22	49.2	67.5	38.3
10:00 PM	6/21/22	47.6	68.6	37.5
11:00 PM	6/21/22	45.1	61.2	37.1
12:00 AM	6/22/22	44.7	61.6	37.1
1:00 AM	6/22/22	42.9	61.8	35.6
2:00 AM	6/22/22	42.6	60.5	36.2
3:00 AM	6/22/22	43.0	60.1	36.4
4:00 AM	6/22/22	48.3	68.3	37.0
5:00 AM	6/22/22	47.7	64.3	37.7
6:00 AM	6/22/22	52.1	70.1	42.0
7:00 AM	6/22/22	53.4	67.8	42.4
8:00 AM	6/22/22	62.5	87.3	44.7
9:00 AM	6/22/22	61.8	88.4	45.2
10:00 AM	6/22/22	55.1	74.4	42.7

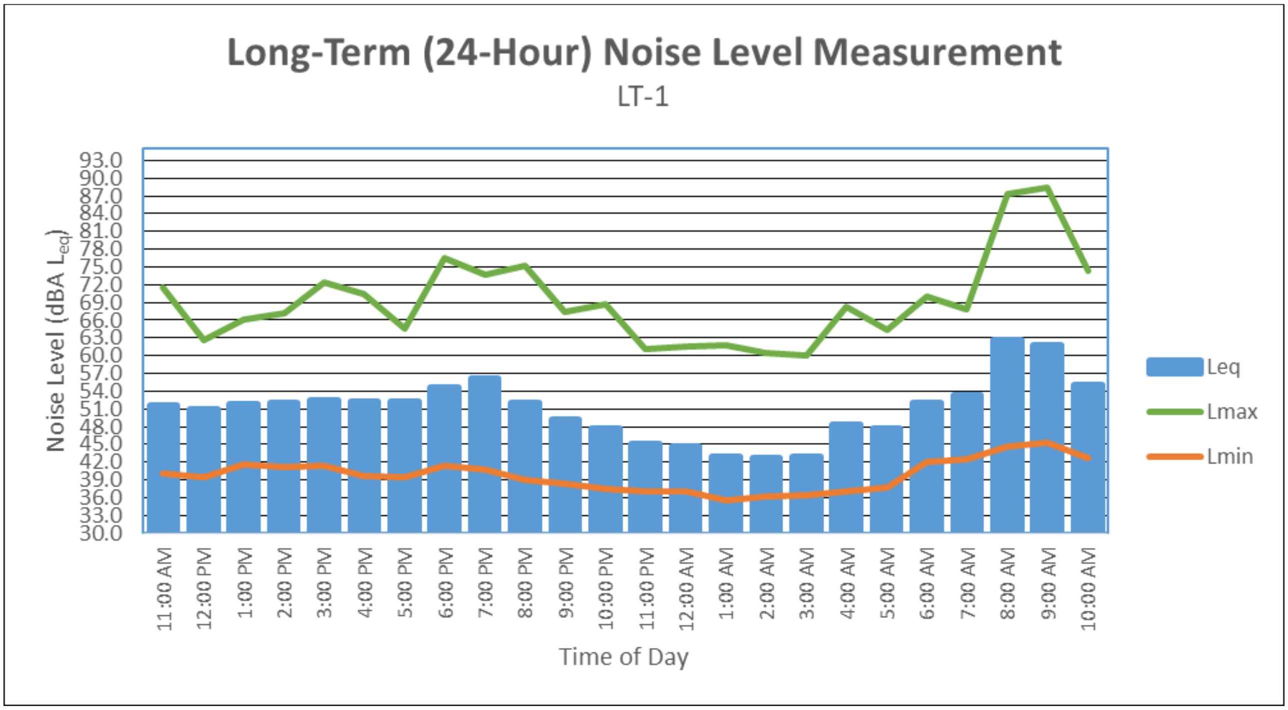
Source: Compiled by LSA Associates, Inc. (2022).

dBA = A-weighted decibel

L_{eq} = equivalent continuous sound level

L_{max} = maximum instantaneous noise level

L_{min} = minimum measured sound level



Long-Term (24-Hour) Noise Level Measurement
LT-1
Noise Level (dBA L_{eq})
93.0
90.0
87.0
84.0
81.0
78.0
75.0
72.0
69.0
66.0
63.0
60.0
57.0
54.0
51.0
48.0
45.0
42.0
39.0
36.0
33.0
30.0
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
Time of Day
Leq
Lmax
Lmin

Noise Measurement Survey – 24 HR

Project Number: ESL2201.32

Test Personnel: Kevin Nguyendo

Project Name: Mission Villas

Equipment: Spark 706RC (SN:18906)

Site Number: LT-2 Date: 5/27/22

Time: From 11:00 a.m. To 11:00 a.m.

Site Location: On the western corner bordering a power line near a fence next to a power Line tower and farm.

Primary Noise Sources: Farming vehicles operating in the property to the west of the project Site.

Comments: Chain link fence near monitor

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-2

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
11:00 AM	6/21/22	51.3	71.8	41.3
12:00 PM	6/21/22	48.6	60.9	40.9
1:00 PM	6/21/22	49.4	66.8	41.6
2:00 PM	6/21/22	49.3	60.3	41.6
3:00 PM	6/21/22	49.8	64.5	42.2
4:00 PM	6/21/22	48.3	62.7	40.9
5:00 PM	6/21/22	48.1	65.9	41.0
6:00 PM	6/21/22	47.6	64.0	41.3
7:00 PM	6/21/22	54.3	74.7	41.8
8:00 PM	6/21/22	46.4	65.9	41.3
9:00 PM	6/21/22	45.4	61.1	40.4
10:00 PM	6/21/22	43.9	60.9	40.3
11:00 PM	6/21/22	44.5	62.4	39.8
12:00 AM	6/22/22	41.9	51.6	39.1
1:00 AM	6/22/22	47.6	74.2	38.9
2:00 AM	6/22/22	42.3	62.9	39.5
3:00 AM	6/22/22	42.7	64.4	39.8
4:00 AM	6/22/22	47.5	67.2	40.3
5:00 AM	6/22/22	47.8	60.5	41.3
6:00 AM	6/22/22	50.7	68.4	43.7
7:00 AM	6/22/22	52.5	62.0	44.0
8:00 AM	6/22/22	58.2	78.9	44.6
9:00 AM	6/22/22	59.8	80.5	44.9
10:00 AM	6/22/22	55.9	77.4	43.8

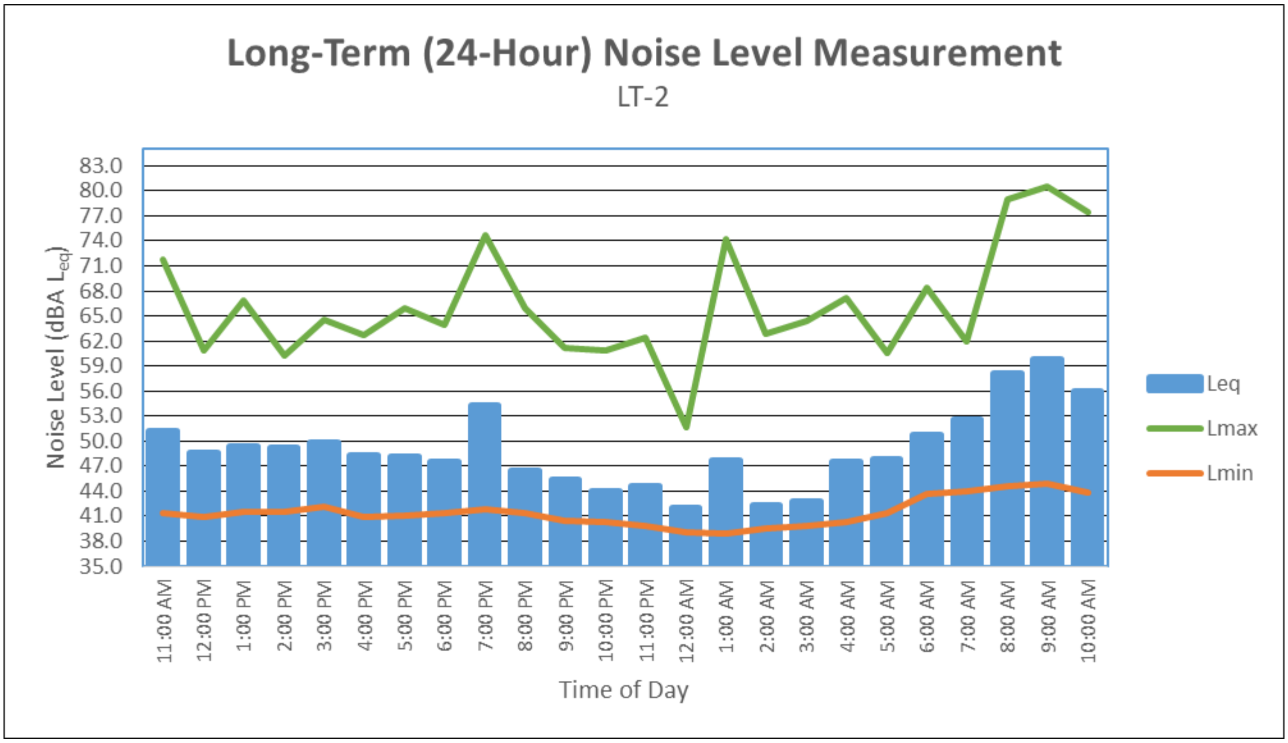
Source: Compiled by LSA Associates, Inc. (2022).

dBA = A-weighted decibel

L_{eq} = equivalent continuous sound level

L_{max} = maximum instantaneous noise level

L_{min} = minimum measured sound level



Long-Term (24-Hour) Noise Level Measurement
LT-2
83.0
80.0
77.0
74.0
71.0
68.0
65.0
62.0
59.0
56.0
53.0
50.0
47.0
44.0
41.0
38.0
35.0
Noise Level (dBA Leq)
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
Time of Day
Leq
Lmax
Lmin

Noise Measurement Survey

Project Number: ESL2201.32 Test Personnel: Kevin Nguyendo
Project Name: Mission Villas Equipment: Larson Davis 831

Site Number: ST-1 Date: 6/21/22 Time: From 11:14 a.m. To 11:34 a.m.

Site Location: Northeast corner of project site, south of 8612 Zerelda St.

Primary Noise Sources: Someone watering garden, birds chirping and generally quiet.

Measurement Results

	dBA
L_{eq}	45.1
L_{max}	52.8
L_{min}	33.3
L_{peak}	96.5
L_2	49.9
L_8	47.9
L_{25}	45.9
L_{50}	44.3
SEL	

Atmospheric Conditions:

Maximum Wind Velocity (mph)	
Average Wind Velocity (mph)	5
Temperature (F)	81
Relative Humidity (%)	36
Comments:	

Comments: File # 58.

Location Photo:

APPENDIX B

CONSTRUCTION NOISE CALCULATIONS

Construction Calculations

Phase: Demolition

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Leq
Concrete Saw	1	90	20	50	0.5	90	83
Excavator	3	81	40	50	0.5	81	82
Dozer	2	82	40	50	0.5	82	81
					Combined at 50 feet	**91**	**87**
					Combined at Receptor 115 feet	**84**	**80**
					Combined at Receptor 350 feet	**74**	**70**
					Combined at Receptor 430 feet	**72**	**68**

Phase: Site Preparation

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Leq
Dozer	3	82	40	50	0.5	82	83
Tractor	4	84	40	50	0.5	84	86
					Combined at 50 feet	**86**	**88**
					Combined at Receptor 110 feet	**79**	**81**
					Combined at Receptor 360 feet	**69**	**71**
					Combined at Receptor 430 feet	**67**	**69**

Phase: Grading

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Leq
Excavator	1	81	40	50	0.5	81	77
Grader	1	85	40	50	0.5	85	81
Dozer	1	82	40	50	0.5	82	78
Tractor	3	84	40	50	0.5	84	85
					Combined at 50 feet	**89**	**87**
					Combined at Receptor 115 feet	**82**	**80**
					Combined at Receptor 360 feet	**72**	**70**
					Combined at Receptor 430 feet	**71**	**69**

Phase:Building Construstion

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Leq
Crane	1	81	16	50	0.5	81	73
Man Lift	3	75	20	50	0.5	75	73
Generator	1	81	50	50	0.5	81	78
Tractor	3	84	40	50	0.5	84	85
Welder / Torch	1	74	40	50	0.5	74	70
					Combined at 50 feet	**87**	**86**
					Combined at Receptor 115 feet	**80**	**79**
					Combined at Receptor 360 feet	**70**	**69**
					Combined at Receptor 430 feet	**69**	**67**

Phase:Paving

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Leq
Tractor	1	84	40	50	0.5	84	80
Drum Mixer	2	80	50	50	0.5	80	80
Paver	1	77	50	50	0.5	77	74
All Other Equipment > 5 HP	2	85	50	50	0.5	85	85
Roller	2	80	20	50	0.5	80	76
					Combined at 50 feet	**89**	**88**
					Combined at Receptor 115 feet	**82**	**80**
					Combined at Receptor 360 feet	**72**	**71**
					Combined at Receptor 430 feet	**70**	**69**

Phase:Architectural Coating

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA) Lmax	Leq
Compressor (air)	1	78	40	50	0.5	78	74
					Combined at 50 feet	**78**	**74**
					Combined at Receptor 115 feet	**71**	**67**
					Combined at Receptor 360 feet	**61**	**57**
					Combined at Receptor 430 feet	**59**	**55**

Sources: RCNM

[1]- Percentage of time that a piece of equipment is operating at full power.
dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level