Cottonwood Village

NOISE IMPACT ANALYSIS

CITY OF MORENO VALLEY

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
ANSI	American National Standards Institute
Calveno	California Vehicle Noise
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
INCE	Institute of Noise Control Engineering
L_{eq}	Equivalent continuous (average) sound level
mph	Miles per hour
OPR	Office of Planning and Research
PPV	Peak particle velocity
Project	Cottonwood Village
REMEL	Reference Energy Mean Emission Level
RMS	Root-mean-square
VdB	Vibration Decibels

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise mitigation measures for the proposed Cottonwood Village development ("Project"). The Project site is located north of Cottonwood Avenue and east of Perris Boulevard in the City of Moreno Valley. The Project is proposing to develop 23 4-plex structures which consist of 92 multifamily (low-rise) residential dwelling units. This noise study has been prepared to satisfy applicable City of Moreno Valley noise standards and significance criteria based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (1)

SUMMARY OF CEQA SIGNIFICANCE FINDINGS

The results of this Cottonwood Village Noise Impact Analysis are summarized below based on the significance criteria in Section 4 of this report consistent with Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (1) Table ES-1 shows the findings of significance for each potential noise and/or vibration impact under CEQA before and after any required mitigation measures.

TABLE ES-1: SUMMARY OF CEQA SIGNIFICANCE FINDINGS

Analysis	Report Section	Significance Findings	
		Unmitigated	Mitigated
On-Site Traffic Noise	7	*Less Than Significant*	-
Operational Noise	9	*Less Than Significant*	-
Construction Noise	10	*Less Than Significant*	-
Construction Vibration		*Less Than Significant*	-

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1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed Cottonwood Village ("Project"). This noise study briefly describes the proposed Project, provides information regarding noise fundamentals, sets out the local regulatory setting, presents the study methods and procedures for transportation related CNEL traffic noise analysis, and evaluates the future exterior noise environment. In addition, this study includes an analysis of the potential Project-related long-term stationary-source operational noise as well as short-term construction noise and vibration impacts.

1.1 SITE LOCATION

The project site is located north of Cottonwood Avenue and east of Perris Boulevard in the City of Moreno Valley as shown on Exhibit 1-A. The proposed residential Project site is located within a residential community with existing single-family residential homes to the north, west and east. Cottonwood Avenue is located south of the Project site.

1.2 PROJECT DESCRIPTION

The Project is proposing to develop 23 4-plex structures which consist of 92 multifamily (low-rise) residential dwelling units. The Project site plan is shown on Exhibit 1-B. The proposed residential development is considered a noise-sensitive receiving land use and is not expected to include any specific type of operational noise levels beyond the typical noise sources associated with residential land use in the Project study area. However, to present a conservative approach, on-site Project-only operational noise sources are analyzed in this noise study and are expected to include: trash enclosure activity, pool/spa activity, mini soccer turf grass area, tot lot activity and parking lot vehicle movements.

EXHIBIT 1-A: LOCATION MAP

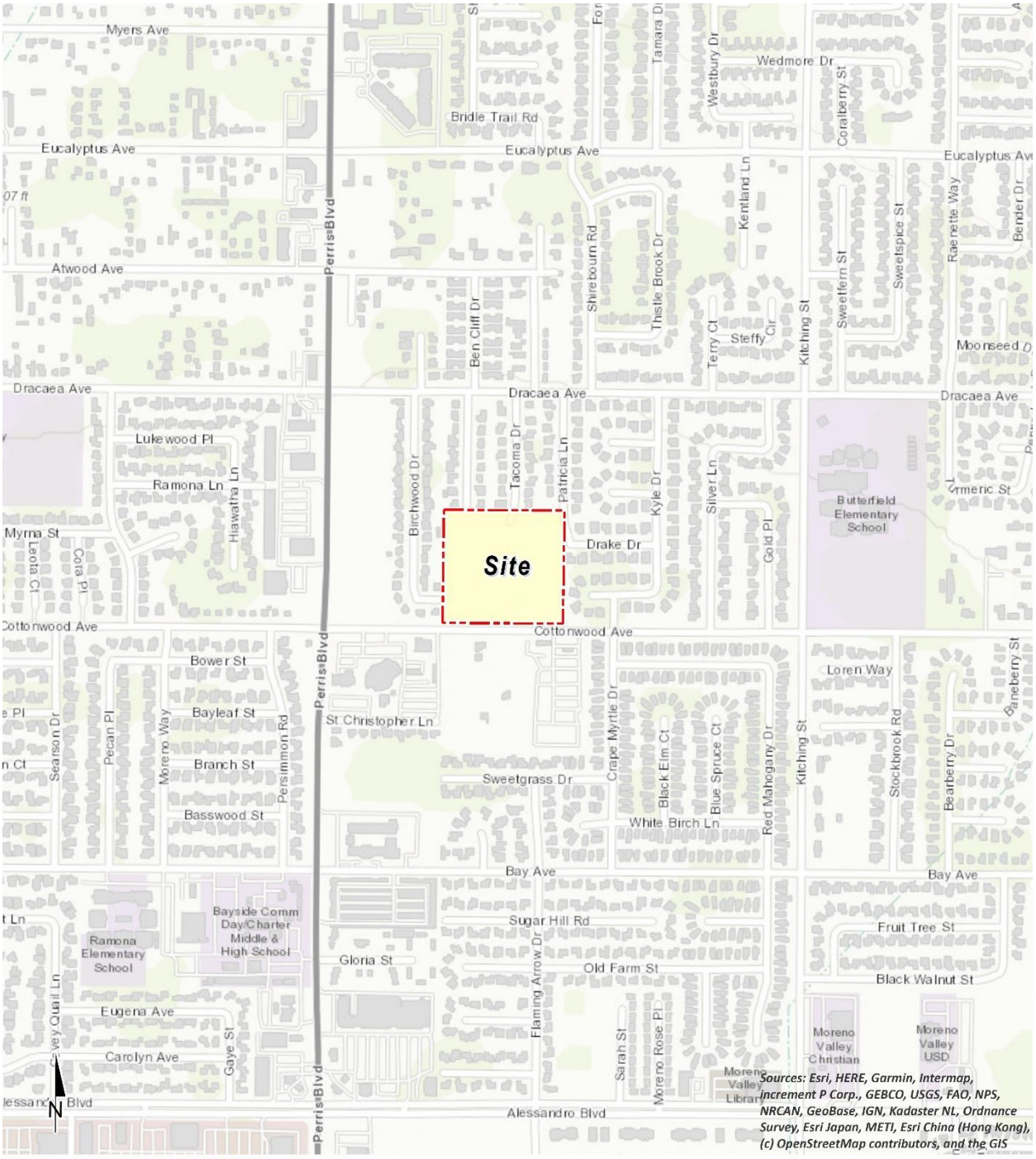
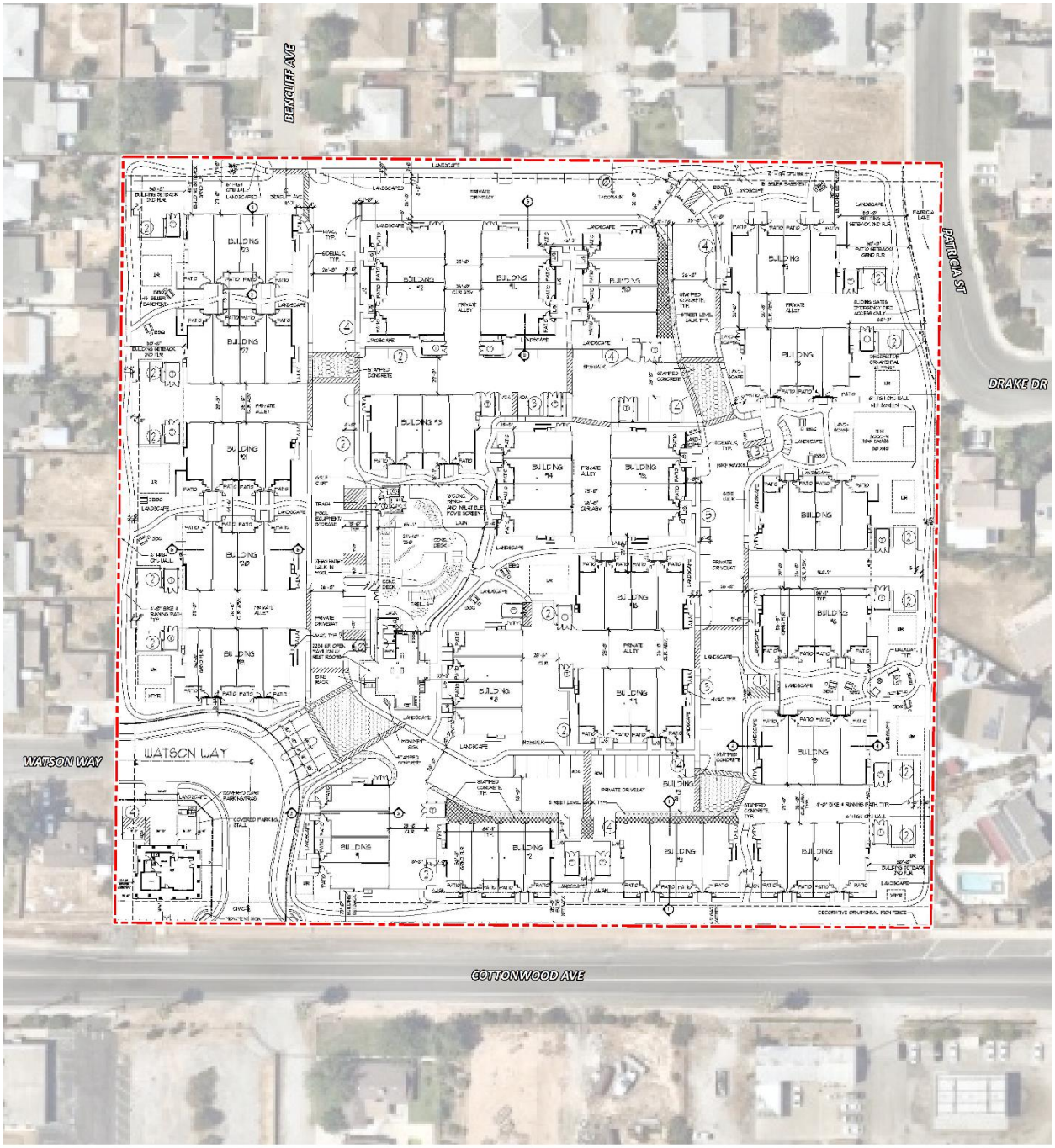


EXHIBIT 1-B: SITE PLAN



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2 FUNDAMENTALS

Noise is simply defined as "unwanted sound." Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. Noise is measured on a logarithmic scale of sound pressure level known as a decibel (dB). A-weighted decibels (dBA) approximate the subjective response of the human ear to broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies which are audible to the human ear. Exhibit 2-A presents a summary of the typical noise levels and their subjective loudness and effects that are described in more detail below.

EXHIBIT 2-A: TYPICAL NOISE LEVELS

COMMON OUTDOOR ACTIVITIES	COMMON INDOOR ACTIVITIES	A - WEIGHTED SOUND LEVEL dBA	SUBJECTIVE LOUDNESS	EFFECTS OF NOISE
THRESHOLD OF PAIN		140	INTOLERABLE OR DEAFENING	HEARING LOSS
NEAR JET ENGINE		130		
		120		
JET FLY-OVER AT 300m (1000 ft)	ROCK BAND	110		
LOUD AUTO HORN		100	VERY NOISY	
GAS LAWN MOWER AT 1m (3 ft)		90		
DIESEL TRUCK AT 15m (50 ft), at 80 km/hr (50 mph)	FOOD BLENDER AT 1m (3 ft)	80		SPEECH INTERFERENCE
NOISY URBAN AREA, DAYTIME	VACUUM CLEANER AT 3m (10 ft)	70	LOUD	
HEAVY TRAFFIC AT 90m (300 ft)	NORMAL SPEECH AT 1m (3 ft)	60		
QUIET URBAN DAYTIME	LARGE BUSINESS OFFICE	50	MODERATE	SLEEP DISTURBANCE
QUIET URBAN NIGHTTIME	THEATER, LARGE CONFERENCE ROOM (BACKGROUND)	40		
QUIET SUBURBAN NIGHTTIME	LIBRARY	30	FAINT	NO EFFECT
QUIET RURAL NIGHTTIME	BEDROOM AT NIGHT, CONCERT HALL (BACKGROUND)	20		
	BROADCAST/RECORDING STUDIO	10	VERY FAINT	
LOWEST THRESHOLD OF HUMAN HEARING	LOWEST THRESHOLD OF HUMAN HEARING	0		

Source: Environmental Protection Agency Office of Noise Abatement and Control, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA/ONAC 550/9-74-004) March 1974.

2.1 RANGE OF NOISE

Since the range of intensities that the human ear can detect is so large, the scale frequently used to measure intensity is a scale based on multiples of 10, the logarithmic scale. The scale for measuring intensity is the decibel scale. Each interval of 10 decibels indicates a sound energy ten times greater than before, which is perceived by the human ear as being roughly twice as loud. (2) The most common sounds vary between 40 dBA (very quiet) to 100 dBA (very loud). Normal conversation at three feet is roughly at 60 dBA, while loud jet engine noises equate to 110 dBA

at approximately 100 feet, which can cause serious discomfort. (3) Another important aspect of noise is the duration of the sound and the way it is described and distributed in time.

2.2 NOISE DESCRIPTORS

Environmental noise descriptors are generally based on averages, rather than instantaneous, noise levels. The most used figure is the equivalent level (L_{eq}). Equivalent sound levels are not measured directly but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (L_{eq}) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period (typically one hour) and is commonly used to describe the "energy average" noise levels within the environment.

Peak hour or equivalent noise levels, while useful, do not completely describe a given noise environment. Noise levels lower than peak hour may be disturbing if they occur during times when quiet is most desirable, namely evening and nighttime (sleeping) hours. To account for this, the Community Noise Equivalent Level (CNEL), representing a composite 24-hour noise level is utilized. The CNEL is the weighted average of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The time-of-day corrections require the addition of 5 decibels to dBA L_{eq} sound levels in the evening from 7:00 p.m. to 10:00 p.m., and the addition of 10 decibels to dBA L_{eq} sound levels at night between 10:00 p.m. and 7:00 a.m. These additions are made to account for the noise sensitive time periods during the evening and night hours when sound appears louder. CNEL does not represent the actual sound level heard at any time, but rather represents the total sound exposure. The City of Moreno Valley relies on the 24-hour CNEL level to assess land use compatibility with transportation related noise sources.

2.3 SOUND PROPAGATION

When sound propagates over a distance, it changes in level and frequency content. Based on guidance from the U.S. Department of Transportation, Federal Highway Administration (FHWA), Office of Environment and Planning, Noise and Air Quality Branch, the way noise reduces with distance depends on the following factors.

2.3.1 GEOMETRIC SPREADING

Sound from a localized source (i.e., a stationary point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source. (2)

2.3.2 GROUND ABSORPTION

The propagation path of noise from a highway to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 ft. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance from a line source. (4)

2.3.3 ATMOSPHERIC EFFECTS

Receivers located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects. (2)

2.3.4 SHIELDING

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Shielding by trees and other such vegetation typically only has an "out of sight, out of mind" effect. That is, the perception of noise impact tends to decrease when vegetation blocks the line-of-sight to nearby residents. However, for vegetation to provide a substantial, or even noticeable, noise reduction, the vegetation area must be at least 15 feet in height, 100 feet wide and dense enough to completely obstruct the line-of sight between the source and the receiver. This size of vegetation may provide up to 5 dBA of noise reduction. The Federal Highway Administration (FHWA) does not consider the planting of vegetation to be a noise abatement measure. (4)

2.3.5 REFLECTION

Field studies conducted by the FHWA have shown that the reflection from barriers and buildings does not substantially increase noise levels. (4) If all the noise striking a structure was reflected back to a given receiving point, the increase would be theoretically limited to 3 dBA. Further, not all the acoustical energy is reflected back to same point. Some of the energy would go over the structure, some is reflected to points other than the given receiving point, some is scattered by ground coverings (e.g., grass and other plants), and some is blocked by intervening structures and/or obstacles (e.g., the noise source itself). Additionally, some of the reflected energy is lost due to the longer path that the noise must travel. FHWA measurements made to quantify

reflective increases in traffic noise have not shown an increase of greater than 1-2 dBA; an increase that is not perceptible to the average human ear.

2.4 NOISE CONTROL

Noise control is the process of obtaining an acceptable noise environment for an observation point or receiver by controlling the noise source, transmission path, receiver, or all three. This concept is known as the source-path-receiver concept. In general, noise control measures can be applied to these three elements.

2.5 NOISE BARRIER ATTENUATION

Effective noise barriers can reduce noise levels by up to 10 to 15 dBA, cutting the loudness of traffic noise in half. A noise barrier is most effective when placed close to the noise source or receiver. Noise barriers, however, do have limitations. For a noise barrier to work, it must be high enough and long enough to block the path of the noise source. (4)

2.6 LAND USE COMPATIBILITY WITH NOISE

Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches, and residences are more sensitive to noise intrusion than are commercial or industrial developments and related activities. As ambient noise levels affect the perceived amenity or livability of a development, so too can the mismanagement of noise impacts impair the economic health and growth potential of a community by reducing the area's desirability as a place to live, shop and work. For this reason, land use compatibility with the noise environment is an important consideration in the planning and design process. The FHWA encourages State and Local government to regulate land development in such a way that noise-sensitive land uses are either prohibited from being located adjacent to a highway, or that the developments are planned, designed, and constructed in such a way that noise impacts are minimized. (5)

2.7 COMMUNITY RESPONSE TO NOISE

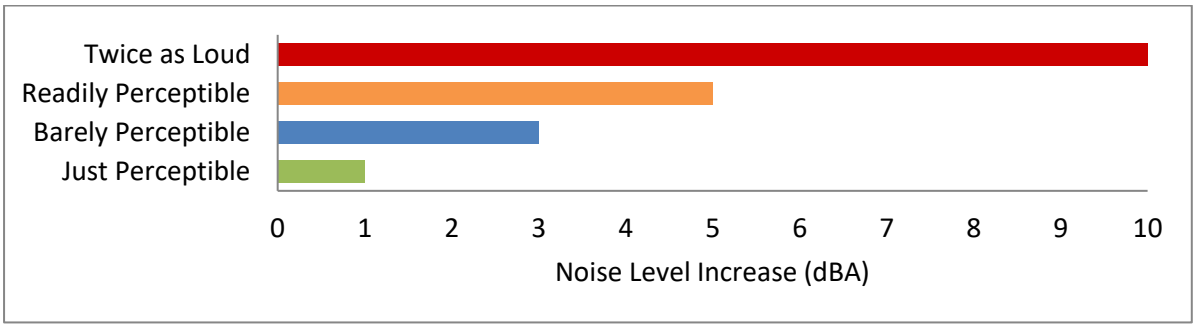
Community responses to noise varies depending upon everyone's susceptibility to noise and personal attitudes about noise. Several factors are related to the level of community annoyance including:

- Fear associated with noise producing activities.
- Socio-economic status and educational level.
- Perception that those affected are being unfairly treated.
- Attitudes regarding the usefulness of the noise-producing activity.
- Belief that the noise source can be controlled.

Approximately ten percent of the population has a very low tolerance for noise and will object to any noise not of their making. Consequently, even in the quietest environment, some complaints will occur. Twenty-five percent of the population will not complain even in very severe noise environments. Thus, a variety of reactions can be expected from people exposed to any given noise environment. (6) Surveys have shown that about ten percent of the people exposed to

traffic noise of 60 dBA will report being highly annoyed with the noise, and each increase of one dBA is associated with approximately two percent more people being highly annoyed. When traffic noise exceeds 60 dBA or aircraft noise exceeds 55 dBA, people may begin to complain. (6) Despite this variability in behavior on an individual level, the population can be expected to exhibit the following responses to changes in noise levels as shown on Exhibit 2-B. A change of 3 dBA is considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (4)

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



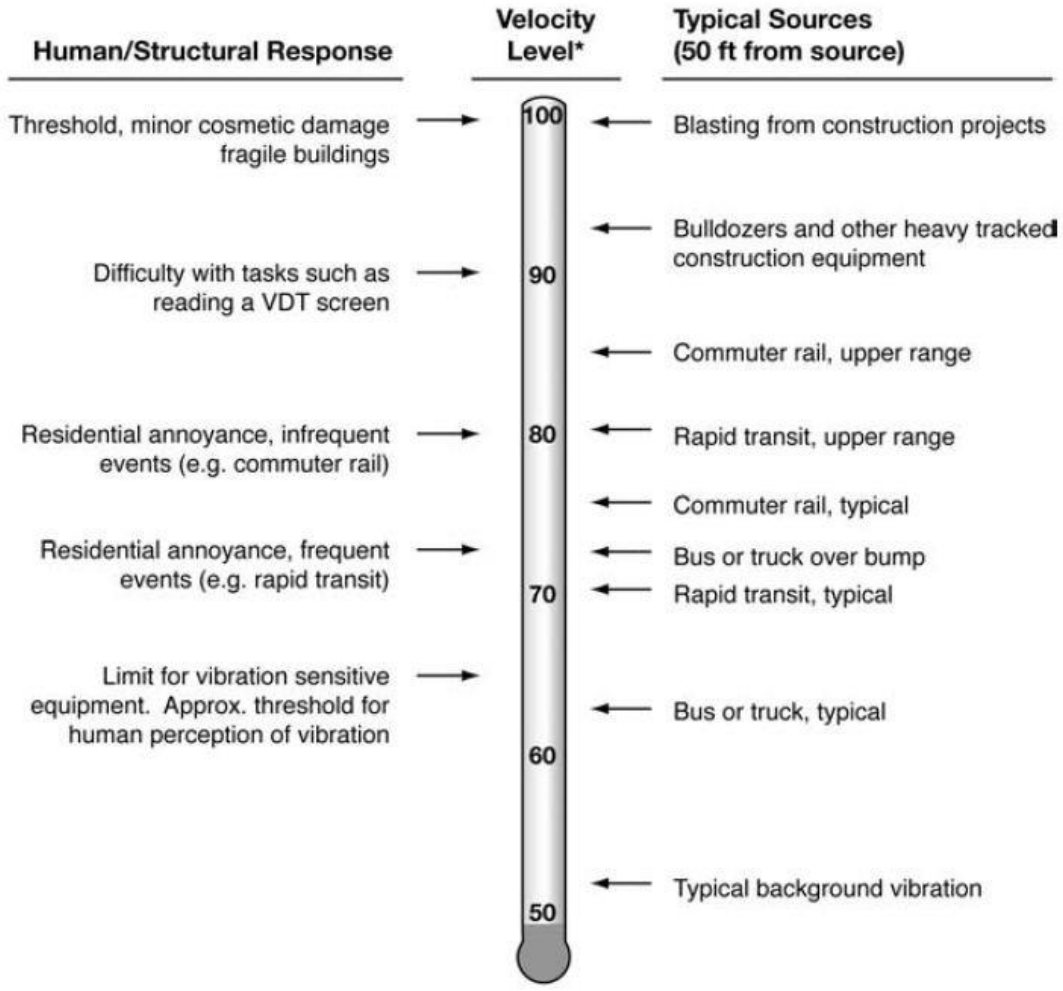
2.8 VIBRATION

Per the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* (7), vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such as explosions. As is the case with airborne sound, ground-borne vibrations may be described by amplitude and frequency.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings but is not always suitable for evaluating human response (annoyance) because it takes some time for the human body to respond to vibration signals. Instead, the human body responds to average vibration amplitude often described as the root mean square (RMS). The RMS amplitude is defined as the average of the squared amplitude of the signal and is most frequently used to describe the effect of vibration on the human body. Decibel notation (VdB) is commonly used to measure RMS. Decibel notation (VdB) serves to reduce the range of numbers used to describe human response to vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receivers for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment and/or activities.

The background vibration-velocity level in residential areas is generally 50 VdB. Ground-borne vibration is normally perceptible to humans at approximately 65 VdB. For most people, a vibration-velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If a roadway is smooth, the ground-borne vibration is rarely perceptible. The range of interest is from approximately 50 VdB, which is the typical background vibration-velocity level, to 100 VdB, which is the general threshold where minor damage can occur in fragile buildings. Exhibit 2-C illustrates common vibration sources and the human and structural response to ground-borne vibration.

EXHIBIT 2-C: TYPICAL LEVELS OF GROUND-BORNE VIBRATION



** RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second*

Source: Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual.

3 REGULATORY SETTING

To limit population exposure to physically and/or psychologically damaging as well as intrusive noise levels, the federal government, the State of California, various county governments, and most municipalities in the state have established standards and ordinances to control noise. In most areas, automobile and truck traffic is the major source of environmental noise. Traffic activity generally produces an average sound level that remains constant with time. Air and rail traffic, and commercial and industrial activities are also major sources of noise in some areas. Federal, state, and local agencies regulate different aspects of environmental noise. Federal and state agencies generally set noise standards for mobile sources such as aircraft and motor vehicles, while regulation of stationary sources is left to local agencies.

3.1 STATE OF CALIFORNIA NOISE REQUIREMENTS

The State of California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards, and provides guidance for local land use compatibility. State law requires that each county and city adopt a General Plan that includes a Noise Element which is to be prepared per guidelines adopted by the Governor's Office of Planning and Research (OPR). (8) The purpose of the Noise Element is to *limit the exposure of the community to excessive noise levels*. In addition, the California Environmental Quality Act (CEQA) requires that all known environmental effects of a project be analyzed, including environmental noise impacts.

3.2 STATE OF CALIFORNIA BUILDING CODE

The State of California's noise insulation standards for all residential units are codified in the California Code of Regulations (CCR), Title 24, Building Standards Administrative Code, Chapter 12, Section 1206. These noise standards are applied to new construction that contains dwelling units or sleeping units, such as residential and hotel or motel uses, in California for controlling interior noise levels resulting from exterior noise sources. For new buildings, the acceptable interior noise limit is 45 dBA CNEL in habitable rooms. (9)

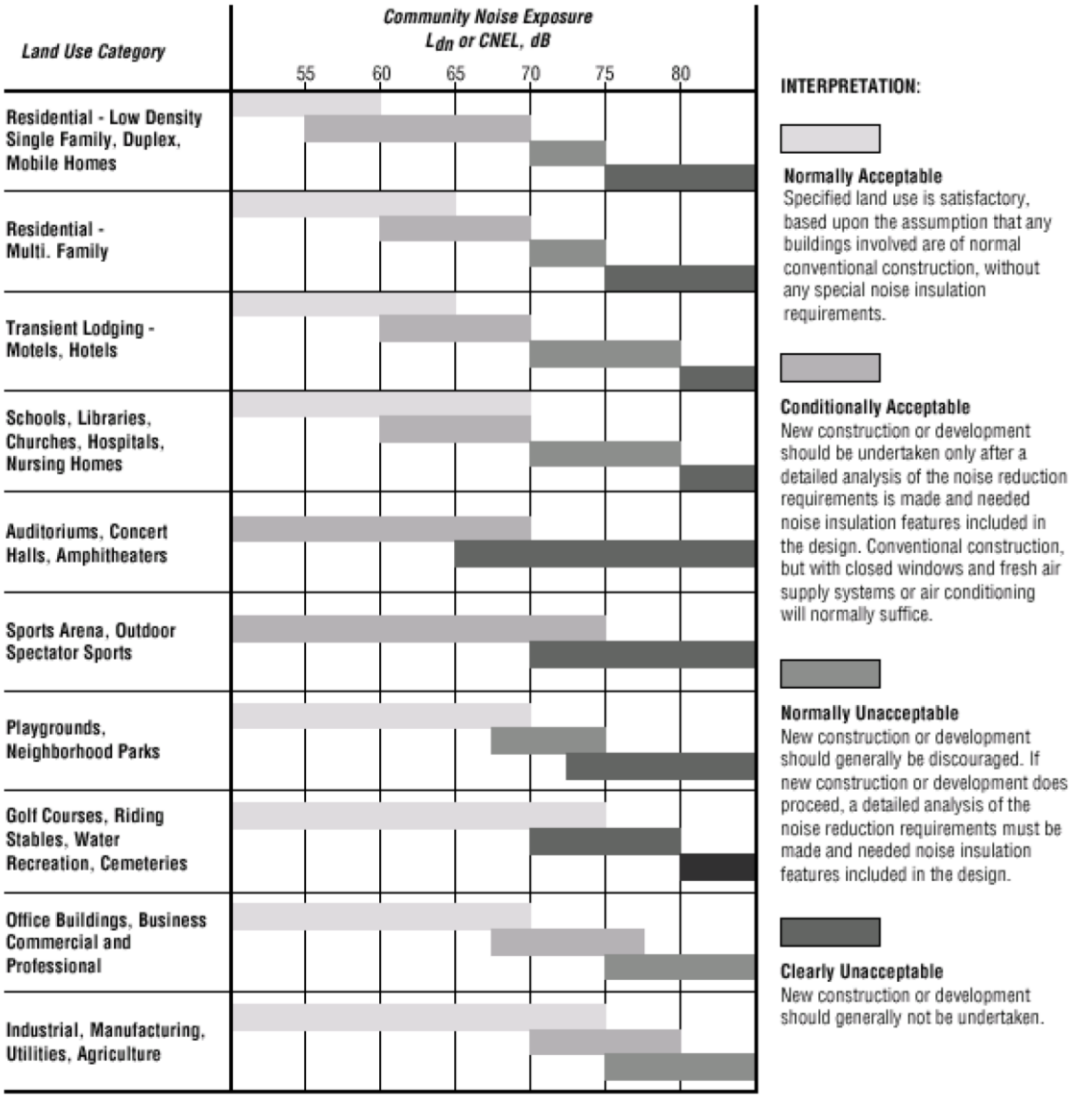
3.3 CITY OF MORENO VALLEY GENERAL PLAN SAFETY ELEMENT

The City of Moreno Valley has adopted a Safety Hazards Element (Chapter 6), of the General Plan which provides the noise background, fundamentals, community response, as well as planning and design considerations. While the General Plan provides background and noise fundamentals, it does not identify specific land use criteria to assess the impacts associated with off-site transportation-related noise impacts. Therefore, for this analysis, the off-site transportation noise criteria are derived from standards contained in the OPR *General Plan Guidelines*.

The OPR land use/noise compatibility standards are used by many California cities and counties and specify the maximum noise levels allowable for new developments impacted by transportation noise sources. The OPR land use/noise compatibility criteria, found in Figure 2 of the *General Plan Guidelines, Appendix D: Noise Element Guidelines,* identify the criteria for multi-

family residential land uses such as the Project, as shown on Exhibit 3-A. When the unmitigated exterior noise levels approach 65 dBA CNEL Project land use is considered *normally acceptable*. With exterior noise levels ranging from 60 to 70 dBA CNEL, multi-family residential land uses are considered *conditionally acceptable*, and with exterior noise levels greater than 70 dBA CNEL, they are considered *normally unacceptable*. For *conditionally acceptable* land use, *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. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.* For *normally unacceptable* land use, *new construction or development should generally 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.* (8)

EXHIBIT 3-A: LAND USE NOISE COMPATIBILITY CRITERIA



In addition, the General Plan contains the following noise polices related to the Project *to achieve acceptable levels of protection from natural and man-made hazards to life, health, and property*:

6.3.1 The following uses shall require mitigation to reduce noise exposure where current or future exterior noise levels exceed 20 CNEL above the desired interior noise level. Single and multiple family residential buildings shall achieve an interior noise level of 45 CNEL or less. Such buildings shall include sound-insulating windows, walls, roofs and ventilation systems. Sound barriers shall also be installed (e.g. masonry walls or walls with berms) between single-family residences and major roadways.

6.3.2 Discourage residential uses where current or projected exterior noise due to aircraft over flights will exceed 65 CNEL.

6.3.5 Enforce the California Administrative Code, Title 24 noise insulation standards for new multi-family housing developments, motels and hotels.

6.4.1 Site, landscape and architectural design features shall be encouraged to mitigate noise impacts for new developments, with a preference for noise barriers that avoid freeway sound barrier walls.

6.5.2 Construction activities shall be operated in a manner that limits noise impacts on surrounding uses.

Based on the City of Moreno Valley General Plan Policies for multi-family residential land use, this noise study has been prepared to satisfy the *conditionally acceptable* OPR land use/noise compatibility criteria with exterior noise levels ranging from 60 to 70 dBA CNEL and the 45 dBA CNEL interior noise level standard identified in General Plan Policy 6.3.1.

3.4 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from a designated fixed location or private property such as the Cottonwood Village Project, stationary-source (operational) noise such as the expected trash enclosure activity, pool/spa activity, mini soccer turf grass area, tot lot activity and parking lot vehicle movements are typically evaluated against standards established under a City's Municipal Code. The City of Moreno Valley Municipal Code included in Appendix 3.1, Chapter 11.80 *Noise Regulation*, provides performance standards and noise control guidelines for determining and mitigating non-transportation or stationary-source noise impacts from operations at private properties.

The City of Moreno Valley Municipal Code defines *Maximum Sound Levels (in dB(A)) for Source Land Uses* in Table 11.80.030-2 for *Residential* and *Commercial* land uses. Based on this standard, the operational noise level limits for residential land use, from Table 11.80.030-2, of 60 dBA L_{eq} during the daytime (8:00 a.m. to 10:00 p.m.) hours and 55 dBA L_{eq} during the nighttime (10:01 p.m. to 7:59 a.m.) hours shall apply to the operational noise source activities from the Project. Further, Section 11.80.030 (C) *Prohibited Acts*, *Nonimpulsive Sound Decibel Limits*, states: *No person shall maintain, create, operate or cause to be operated on private property any source of sound in such a manner as to create any nonimpulsive sound which exceeds the limits set forth for the source land use category (as defined in Section 11.80.020) in Table 11.80.030-2 when*

measured at a distance of two hundred (200) feet or more from the real property line of the source of the sound, if the sound occurs on a privately owned property. (10) Therefore, at a distance of 200 feet from the property line, the Project's operational noise levels shall not exceed the 60 dBA L_{eq} daytime and 55 dBA L_{eq} nighttime noise level standards for residential land uses, as shown on Table 3-1.

TABLE 3-1: OPERATIONAL NOISE STANDARDS AT 200 FEET FROM THE SOURCE

City	Source Land use	Noise Level Standards (dBA Leq)[1]	
		Daytime	Nighttime
Moreno Valley	Commercial	60	55

[1] City of Moreno Valley Municipal Code, Chapter 11.80 Noise Regulation, Table 11.80.030-2 Maximum Sound Levels (in dB(A)) for Source Land Uses when measured at a distance of 200 feet from the property line of the source land use (Appendix 3.1). Leq represents a steady state sound level containing the same total energy as a time varying signal over a given period. "Daytime" = 8:00 a.m. to 10:00 p.m.; "Nighttime" = 10:01 p.m. to 7:59 a.m.

The City of Moreno Valley Municipal Code also identifies continuous sound level limits in Table 11.80.030-1 based on the Center for Disease Control and Prevention and the National Institute for Occupational Safety and Health (NIOSH) noise exposure guidelines. A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The City of Moreno Valley noise level threshold starts at 90 dBA for more than eight hours per day, and for every increase, the exposure time is reduced. The City of Moreno Valley identifies noise level thresholds of 92 dBA for more than 6 hours per day, 95 dBA for more than 4 hour per day, 97 dBA for more than 3 hours per day, and up to 100 dBA for more than 2 hours per day. However, this noise study uses the more restrictive City of Moreno Valley residential noise level limits identified on Table 11.80.030-2 for source land uses in the Municipal Code, shown on Table 3-1 of this report, to evaluate the potential operational noise levels due to the operation of the Project.

3.5 CONSTRUCTION NOISE STANDARDS

To control noise impacts associated with the construction of the proposed Project, the City of Moreno Valley has established limits to the hours of operation. Section 11.80.030 (D)(7), *Construction and Demolition*, provides the following:

> *No person shall operate, or cause operation of any tools or equipment used in construction, drilling, repair, alteration, or demolition work between the hours of eight p.m. and seven a.m. the following day such that the sound there from creates a noise disturbance, except for emergency work by public service utilities or for other work approved by the city manager or designee.*

However, neither the City's General Plan nor Municipal Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers for CEQA analysis purposes. Therefore, a numerical construction threshold based on Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* is used for analysis of daytime construction impacts, as discussed below.

According to the FTA, local noise ordinances are typically not very useful in evaluating construction noise. They usually relate to nuisance and hours of allowed activity, and sometimes specify limits in terms of maximum levels, but are generally not practical for assessing the impact of a construction project. Project construction noise criteria should account for the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land use. Due to the lack of standardized construction noise thresholds, the FTA provides guidelines that can be considered reasonable criteria for construction noise assessment. The FTA considers a daytime exterior construction noise level of 80 dBA L_{eq} as a reasonable threshold for noise sensitive residential land use. (7 p. 179)

3.6 VIBRATION STANDARDS

Construction activity can result in varying degrees of ground-borne vibration, depending on the equipment and methods used, distance to the affected structures and soil type. Construction vibration is generally associated with pile driving and rock blasting. Other construction equipment such as air compressors, light trucks, hydraulic loaders, etc., generates little or no ground vibration. (7)

To analyze vibration impacts originating from the operation and construction of the Cottonwood Village, vibration-generating activities are appropriately evaluated against standards established under a City's Municipal Code, if such standards exist. However, the City of Moreno Valley does not identify specific vibration level limits. Therefore, for analysis purposes, the Caltrans *Transportation and Construction Vibration Guidance Manual*, (11 p. 38) Table 19, vibration damage are used in this noise study to assess potential temporary construction-related impacts at adjacent building locations. The construction vibration damage potential criteria include consideration of the building conditions. (3 p. 182) The existing buildings adjacent to the Project site can best be described as "older residential structures" with a maximum acceptable continuous vibration threshold of 0.3 PPV (in/sec).

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4 SIGNIFICANCE CRITERIA

The following significance criteria are based on currently adopted guidance provided by Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (1) For the purposes of this report, impacts would be potentially significant if the Project results in or causes:

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 ground-borne vibration or ground-borne 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, would the project expose people residing or working in the project area to excessive noise levels?

4.1 NOISE LEVEL INCREASES (THRESHOLD A)

Noise level increases resulting from the Project are evaluated based on the Appendix G CEQA Guidelines described above at the closest sensitive receiver locations. Under CEQA, consideration must be given to the magnitude of the increase, the existing ambient noise levels, and the location of noise-sensitive receivers to determine if a noise increase represents a significant adverse environmental impact. This approach *recognizes that there is no single noise increase that renders the noise impact significant.* (12)

This is primarily because of the wide variation in individual thresholds of annoyance and differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted—the so-called *ambient* environment. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will typically be judged. The Federal Interagency Committee on Noise (FICON) (13) developed guidance to be used for the assessment of project-generated increases in noise levels that consider the ambient noise level.

The FICON recommendations are based on studies that relate aircraft noise levels to the percentage of persons highly annoyed by aircraft noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, these recommendations are often used in environmental noise impact assessments involving the use of cumulative noise exposure metrics, such as the average-daily noise level (CNEL) and equivalent continuous noise level (L_{eq}). The FICON guidance provides an established source of criteria to assess the impacts of substantial temporary or permanent increase in ambient noise levels. Based on the FICON criteria, the amount to which a given noise level increase is considered acceptable is reduced when the without Project noise levels are already shown to exceed certain land-use specific exterior noise level criteria. The specific levels are based on typical responses to noise level increases of 5 dBA or *readily perceptible*, 3 dBA or *barely perceptible*, and 1.5 dBA depending on the underlying without Project noise levels for noise-sensitive uses. These levels of increases and their perceived acceptance are consistent with guidance provided by both the Federal Highway Administration (4 p. 9) and Caltrans (14 p. 2_48).

4.2 VIBRATION (THRESHOLD B)

As described in Section 3.5, the vibration impacts originating from the construction of the Cottonwood Village, vibration-generating activities are appropriately evaluated the thresholds of significance outlined in the Caltrans *Transportation and Construction Vibration Guidance Manual*, (11 p. 38). These guidelines identify the maximum acceptable continuous vibration building damage threshold of 0.3 PPV (in/sec) for "older residential structures" which is used in this noise study to assess potential impacts due to Project construction vibration levels.

4.3 CEQA GUIDELINES NOT FURTHER ANALYZED (THRESHOLD C)

The March Air Reserve Base/Inland Port Airport (MARB/IPA) is located approximately 3.4 miles southwest of the Project site. A review of the *March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan* (MARB/IPA LUCP) includes the policies for determining the land use compatibility shows that the Project is located outside the Airport Influence Area Boundary. (15). Therefore, the potential impacts under CEQA Appendix G (Threshold C) are *less than significant* and are not further analyzed in this noise study.

4.4 SIGNIFICANCE CRITERIA SUMMARY

Noise impacts shall be considered significant if any of the following occur as a direct result of the proposed development. Table 4-1 shows the significance criteria summary matrix that includes the allowable criteria used to identify potentially significant incremental noise level increases.

TABLE 4-1: SIGNIFICANCE CRITERIA SUMMARY

Analysis	Condition(s)	Significance Criteria	
		Daytime	Nighttime
On-Site Traffic[1]	Exterior Noise Compatibility Criteria	See Exhibit 3-A	
	Interior Noise Level Standard	45 dBA CNEL	
Operational	Exterior Noise Level Standards[2]	60 dBA L_{eq}	55 dBA L_{eq}
	If ambient is < 60 dBA Leq[3]	≥ 5 dBA L_{eq} Project increase	
	If ambient is 60 - 65 dBA Leq[3]	≥ 3 dBA L_{eq} Project increase	
	If ambient is > 65 dBA Leq[3]	≥ 1.5 dBA L_{eq} Project increase	
Construction	Noise Level Threshold[4]	80 dBA L_{eq}	
	Vibration Level Threshold[5]	0.3 PPV (in/sec)	

[1] City of Moreno Valley General Plan Policy 6.3.1
[2] City of Moreno Valley Municipal Code, Chapter 11.80 Noise Regulation, Table 11.80.030-2
[3] FICON, 1992.
[4] Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual.
[5] Caltrans Transportation and Construction Vibration Manual, April 2020 Table 19.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

5 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, 24-hour noise level measurements were taken at four locations in the Project study area. The receiver locations were selected to describe and document the existing noise environment within the Project study area. Exhibit 5-A provides the boundaries of the Project study area and the noise level measurement locations. To fully describe the existing noise conditions, noise level measurements were collected by Urban Crossroads, Inc. on Wednesday, June 2, 2021. Appendix 5.1 includes study area photos.

5.1 MEASUREMENT PROCEDURE AND CRITERIA

To describe the existing noise environment, the hourly noise levels were measured during typical weekday conditions over a 24-hour period. By collecting individual hourly noise level measurements, it is possible to describe the equivalent daytime and nighttime hourly noise levels. The long-term noise readings were recorded using Piccolo Type 2 integrating sound level meter and dataloggers. The Piccolo sound level meters were calibrated using a Larson-Davis calibrator, Model CAL 150. All noise meters were programmed in "slow" mode to record noise levels in "A" weighted form. The sound level meters and microphones were equipped with a windscreen during all measurements. All noise level measurement equipment satisfies the American National Standards Institute (ANSI) standard specifications for sound level meters ANSI S1.4-2014/IEC 61672-1:2013. (16)

5.2 NOISE MEASUREMENT LOCATIONS

The long-term noise level measurements were positioned as close to the nearest sensitive receiver locations as possible to assess the existing ambient hourly noise levels surrounding the Project site. Both Caltrans and the FTA recognize that it is not reasonable to collect noise level measurements that can fully represent every part of a private yard, patio, deck, or balcony normally used for human activity when estimating impacts for new development projects. This is demonstrated in the Caltrans general site location guidelines which indicate that, *sites must be free of noise contamination by sources other than sources of interest. Avoid sites located near sources such as barking dogs, lawnmowers, pool pumps, and air conditioners unless it is the express intent of the analyst to measure these sources*. (2) Further, FTA guidance states, t*hat it is not necessary nor recommended that existing noise exposure be determined by measuring at every noise-sensitive location in the project area. Rather, the recommended approach is to characterize the noise environment for clusters of sites based on measurements or estimates at representative locations in the community*. (7)

Based on recommendations of Caltrans and the FTA, it is not necessary to collect measurements at each individual building or residence, because each receiver measurement represents a group of buildings that share acoustical equivalence. (7) In other words, the area represented by the receiver shares similar shielding, terrain, and geometric relationship to the reference noise source. Receivers represent a location of noise sensitive areas and are used to estimate the future noise level impacts. Collecting reference ambient noise level measurements at the nearby sensitive receiver locations allows for a comparison of the before and after Project noise levels

and is necessary to assess potential noise impacts due to the Project's contribution to the ambient noise levels.

5.3 NOISE MEASUREMENT RESULTS

The noise measurements presented below focus on the equivalent or the hourly energy average sound levels (L_{eq}). The equivalent sound level (L_{eq}) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. Table 5-1 identifies the hourly daytime (8:00 a.m. to 10:00 p.m.) and nighttime (10:01 p.m. to 7:59 a.m.) noise levels at each noise level measurement location.

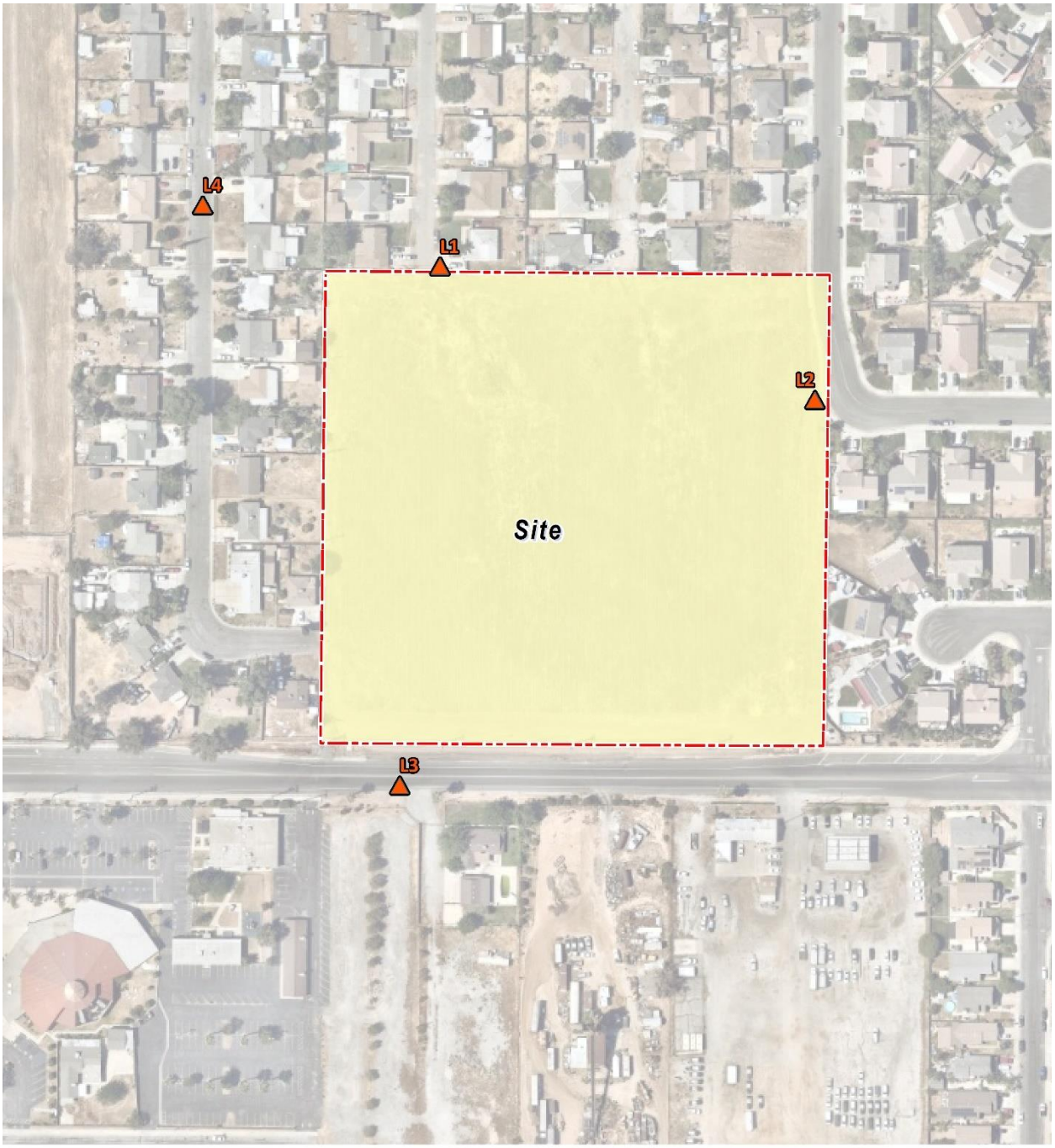
TABLE 5-1: 24-HOUR AMBIENT NOISE LEVEL MEASUREMENTS

Location[1]	Description	Energy Average Noise Level (dBA L_{eq})[2]	
		Daytime	Nighttime
L1	Located north of the Project site near existing single-family residential home at 13372 Bencliff Avenue.	50.6	46.8
L2	Located east of the Project site near existing single-family residential home at 25251 Drake Drive.	47.1	45.4
L3	Located south of the Project site near existing single-family residential home at 25165 Cottonwood Avenue.	65.3	62.2
L4	Located west of the Project site near existing single-family residential home at 13360 Birchwood Drive.	57.2	55.1

[1] See Exhibit 5-A for the noise level measurement locations.
[2] Energy (logarithmic) equivalent levels. The long-term 24-hour measurement worksheets are included in Appendix 5.2. "Daytime" = 8:00 a.m. to 10:00 p.m.; "Nighttime" = 10:01 p.m. to 7:59 a.m.

Table 5-1 provides the equivalent noise levels used to describe the daytime and nighttime ambient conditions. These daytime and nighttime equivalent noise levels represent the energy average of all hourly noise levels observed during these time periods expressed as a single number. Appendix 5.2 provides summary worksheets of the noise levels for each of the daytime and nighttime hours.

EXHIBIT 5-A: NOISE MEASUREMENT LOCATIONS



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6 TRAFFIC NOISE METHODS AND PROCEDURES

The following section outlines the methods and procedures used to estimate and analyze the future traffic noise environment. Consistent with the City of Moreno Valley General Plan Policies for multi-family residential land use, all transportation related noise levels are presented in terms of the 24-hour CNEL's.

6.1 FHWA TRAFFIC NOISE PREDICTION MODEL

The estimated roadway noise impacts from vehicular traffic were calculated using a computer program that replicates the Federal Highway Administration (FHWA) Traffic Noise Prediction Model- FHWA-RD-77-108. (17) The FHWA Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). In California the national REMELs are substituted with the California Vehicle Noise (Calveno) Emission Levels. (18) Adjustments are then made to the REMEL to account for: the roadway classification (e.g., collector, secondary, major or arterial), the roadway active width (i.e., the distance between the center of the outermost travel lanes on each side of the roadway), the total average daily traffic (ADT), the travel speed, the percentages of automobiles, medium trucks, and heavy trucks in the traffic volume, the roadway grade, the angle of view (e.g., whether the roadway view is blocked), the site conditions ("hard" or "soft" relates to the absorption of the ground, pavement, or landscaping), and the percentage of total ADT which flows each hour throughout a 24-hour period.

6.2 ON-SITE TRAFFIC NOISE PREDICTION MODEL INPUTS

The on-site roadway parameters including the ADT volumes used for this analysis are presented on Table 6-1. Based on the City of Moreno Valley General Plan Environmental Impact Report, Cottonwood Avenue is classified as a 4-lane Divided Minor Arterial. (19) To predict the future on-site noise environment at the Project site, the City of Moreno Valley General Plan Environmental Impact Report *Daily Capacity Volumes* were used.

TABLE 6-1: ON-SITE ROADWAY PARAMETERS

Roadway	Lanes	Classification[1]	Design Capacity (ADT)[2]	Speed (MPH)[3]	Site Conditions
Cottonwood Ave.	2	Minor Arterial	30,000	45	Soft

[1] City of Moreno Valley General Plan EIR, Figure 5.2-6 Proposed Circulation Plan
[2] City of Moreno Valley General Plan EIR, Section 5.2 Traffic/Circulation, Tables 5.2-5 to 5.2-7.
[3] Posted Speed Limit

The traffic volumes shown on Table 6-1 reflect future long-range traffic conditions needed to assess the future on-site traffic noise environment and to identify potential mitigation measures (if any) that address the worst-case future conditions. For the purposes of this analysis, soft site conditions were used to analyze the on-site traffic noise impacts for the Project study area. Soft site conditions account for the sound propagation loss over natural surfaces such as normal earth

and ground vegetation. Research conducted by Caltrans has shown that the use of soft site conditions is appropriate for the application of the FHWA traffic noise prediction model used in this analysis. (20) Table 6-2 presents the time-of-day vehicle splits by vehicle type, and Table 6-3 presents the total traffic flow distributions (vehicle mixes) used for this analysis. The vehicle mix provides the hourly distribution percentages of automobile, medium trucks, and heavy trucks for input into the FHWA Model based on roadway types.

TABLE 6-2: TIME OF DAY VEHICLE SPLITS

Vehicle Type	Time of Day Splits[1]			Total of Time of Day Splits
	Daytime	Evening	Nighttime	
Autos	77.50%	12.90%	9.60%	100.00%
Medium Trucks	84.80%	4.90%	10.30%	100.00%
Heavy Trucks	86.50%	2.70%	10.80%	100.00%

[1] Typical Southern California time of day vehicle splits.
"Daytime" = 7:00 a.m. to 7:00 p.m.; "Evening" = 7:00 p.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

TABLE 6-3: DISTRIBUTION OF TRAFFIC FLOW BY VEHICLE TYPE (VEHICLE MIX)

Roadway	Total % Traffic Flow			Total
	Autos	Medium Trucks	Heavy Trucks	
All Roadways[1]	97.42%	1.84%	0.74%	100.00%

[1] Typical Southern California vehicle mix.

The site plan is used to identify the relationship between the roadway centerline elevation, the pad elevation and the centerline distance to any intervening noise barriers, and the building façade. The exterior noise level impacts were placed five feet above the pad elevation at the proposed building façade for first-floor level analysis. All second-floor receivers were located 14 feet above the proposed finished floor elevation.

7 ON-SITE TRANSPORTATION NOISE IMPACTS

An on-site exterior noise impact analysis has been completed to determine the noise exposure levels that would result from adjacent transportation noise sources in the Project study area, and to identify potential noise mitigation measures that would achieve acceptable Project exterior and interior noise levels. The primary source of transportation noise affecting the Project site is from Cottonwood Avenue. The Project will also experience some background traffic noise from the Project's internal local streets, however, due to the distance, topography and low traffic volume/speed, traffic noise from these roads will not make a significant contribution to the noise environment.

7.1 ON-SITE EXTERIOR NOISE ANALYSIS

Using the FHWA traffic noise prediction model and the parameters outlined in Tables 6-1 to 6-3, the expected future exterior noise levels are calculated for buildings facing Cottonwood Avenue. Table 7-1 presents a summary of future exterior noise level impacts in the in the outdoor living areas (patios). The on-site traffic noise level impacts indicate that the outdoor areas adjacent to Cottonwood Avenue will experience unmitigated exterior noise levels of ranging from 68.2 to 68.6 dBA CNEL. The on-site traffic noise analysis calculations are provided in Appendix 7.1.

According to the *Land Use Compatibility for Community Noise Exposure* level shown on Exhibit 3-A, this noise analysis shows that the unmitigated exterior noise levels for the Project's multi-family residential land use are considered *conditionally acceptable* with exterior noise levels ranging from 60 to 70 dBA CNEL. For *conditionally acceptable* land use, *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. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.*

TABLE 7-1: EXTERIOR NOISE LEVELS (CNEL)

Receiver Location	Roadway	Unmitigated Noise Level (dBA CNEL)	Land Use Compatibility[1]
Bldg_1	Cottonwood Ave.	68.6	*Conditionally Acceptable*
Bldg_2, 3 & 4	Cottonwood Ave.	68.2	*Conditionally Acceptable*

[1] Based on the General Plan land use compatibility standards for multi-family residential land use as shown on Exhibit 3-A.

Therefore, no exterior noise mitigation is required to satisfy the General Plan compatibility standards for multi-family residential land use and this noise study provides the following detailed analysis of the interior noise reduction requirements and identifies the needed noise insulation features to satisfy the City of Moreno Valley 45 dBA CNEL interior noise level standard identified in General Plan Policy 6.3.1.

7.2 INTERIOR NOISE ANALYSIS

To ensure that the Project provides an acceptable interior noise environment, this analysis relies on the City of Moreno Valley 45 dBA CNEL interior noise limit for new construction.

7.2.1 NOISE REDUCTION METHODOLOGY

The interior noise level is the difference between the predicted exterior noise level at the building façade and the noise reduction of the structure. Typical building construction will provide a Noise Reduction (NR) of approximately 12 dBA with "windows open" and a minimum 25 dBA noise reduction with "windows closed." (4) (21) However, sound leaks, cracks and openings within the window assembly can greatly diminish its effectiveness in reducing noise. Several methods are used to improve interior noise reduction, including: [1] weather-stripped solid core exterior doors; [2] upgraded dual glazed windows; [3] mechanical ventilation/air conditioning; and [4] exterior wall/roof assembles free of cut outs or openings.

7.2.2 INTERIOR NOISE LEVEL ASSESSMENT

Tables 7-2 to 7-3 show that all the residential units will require a windows-closed condition and a means of mechanical ventilation (e.g. air conditioning). Table 7-2 shows that the future noise levels at the first-floor building façade are estimated to range from 67.9 to 68.7 dBA CNEL with interior noise levels ranging from 34.9 to 36.7 dBA CNEL. The first-floor interior noise level analysis shows that the City of Moreno Valley 45 dBA CNEL interior noise standards can be satisfied using standard windows with a minimum STC rating of 27 for all units based on the minimum 25 dBA interior noise reduction for typical construction.

Table 7-3 shows the future noise levels at the second-floor building façade are estimated to range from 67.8 to 68.6 dBA CNEL with interior noise levels ranging from 34.8 to 36.6 dBA CNEL. The second-floor interior noise level analysis shows that the City of Moreno Valley 45 dBA CNEL interior noise standards can be satisfied using standard windows with a minimum STC rating of 27 for all units, based on the minimum 25 dBA interior noise reduction for typical construction.

TABLE 7-2: FIRST FLOOR INTERIOR TRAFFIC NOISE LEVELS

Receiver Location	Roadway	Noise Level at Façade[1]	Estimated Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]
Bldg_1	Cottonwood Ave.	68.7	23.7	32.0	No	36.7
Bldg_2, 3 & 4	Cottonwood Ave.	67.9	22.9	33.0	No	34.9

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise limits.
[3] Estimated minimum interior noise reduction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.

TABLE 7-3: SECOND FLOOR INTERIOR TRAFFIC NOISE LEVELS

Receiver Location	Roadway	Noise Level at Façade[1]	Estimated Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]
Bldg_1	Cottonwood Ave.	68.6	23.6	32.0	No	36.6
Bldg_2, 3 & 4	Cottonwood Ave.	67.8	22.8	33.0	No	34.8

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise limits.
[3] Estimated minimum interior noise reduction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.

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8 SENSITIVE RECEIVER LOCATIONS

To assess the potential for long-term operational and short-term construction noise impacts, the following sensitive receiver locations, as shown on Exhibit 8-A, were identified as representative locations for analysis. Sensitive receivers are generally defined as locations where people reside or where the presence of unwanted sound could otherwise adversely affect the use of the land. Noise-sensitive land uses are generally considered to include schools, hospitals, single-family dwellings, mobile home parks, churches, libraries, and recreation areas.

Moderately noise-sensitive land uses typically include multi-family dwellings, hotels, motels, dormitories, out-patient clinics, cemeteries, golf courses, country clubs, athletic/tennis clubs, and equestrian clubs. Land uses that are considered relatively insensitive to noise include business, commercial, and professional developments. Land uses that are typically not affected by noise include: industrial, manufacturing, utilities, agriculture, undeveloped land, parking lots, warehousing, liquid and solid waste facilities, salvage yards, and transit terminals.

The selection of receiver locations is based on FHWA guidelines and is consistent with additional guidance provided by Caltrans and the FTA, as previously described in Section 5.2. Other sensitive land uses in the Project study area that are located at greater distances than those identified in this noise study will experience lower noise levels than those presented in this report due to the additional attenuation from distance and the shielding of intervening structures. Distance is measured in a straight line from the project boundary to each receiver location. To describe the potential off-site Project noise levels, five receiver locations in the vicinity of the Project site were identified. All distances are measured from the Project site boundary to the outdoor living areas (e.g., private backyards) or at the building façade, whichever is closer to the Project site.

R1: Location R1 represents the existing noise sensitive residence located at 13371 Bencliff Avenue north of the Project site. R1 is placed in the private outdoor living areas (backyard) facing the Project site. A 24-hour noise measurement near this location, L1, is used to describe the existing ambient noise environment.

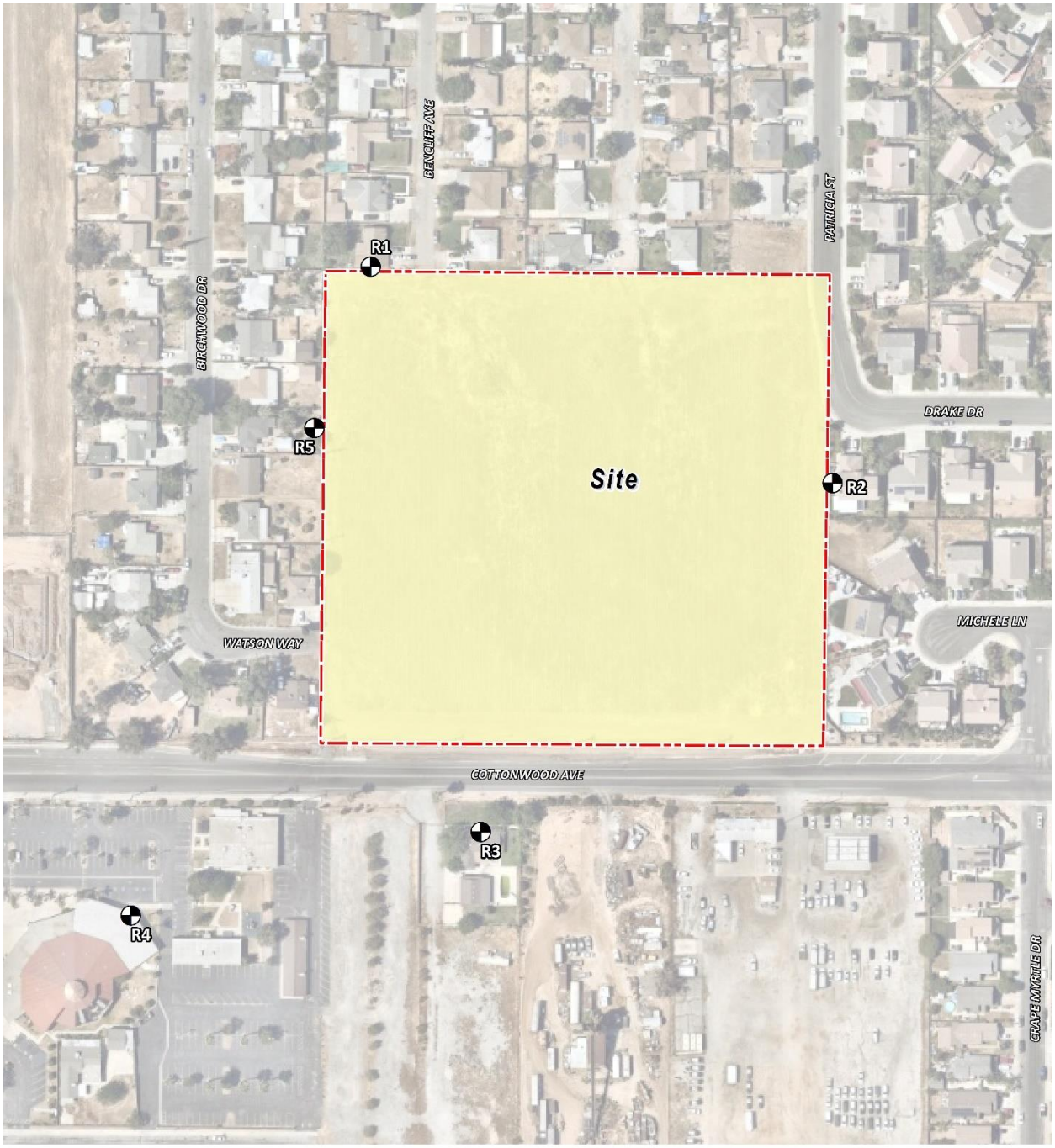
R2: Location R2 represents the existing noise sensitive residence located at 25251 Drake Drive east of the Project site. R2 is placed in the private outdoor living areas (backyard) facing the Project site. A 24-hour noise measurement was taken near this location, L2, to describe the existing ambient noise environment.

R3: Location R3 represents the existing noise sensitive residence located at 25165 Cottonwood Avenue, south of the Project site. R3 is placed at the building façade facing the Project site. A 24-hour noise measurement near this location, L3, is used to describe the existing ambient noise environment.

R4: Location R4 represents the existing Saint Christopher Parish located at 25075 Cottonwood Avenue south of the Project site. A 24-hour noise measurement near this location, L3, is used to describe the existing ambient noise environment.

R5: Location R5 represents the existing noise sensitive residence located at 13410 Birchwood Drive west of the Project site. A 24-hour noise measurement near this location, L4, is used to describe the existing ambient noise environment.

EXHIBIT 9-A: RECEIVER LOCATIONS



9 OPERATIONAL NOISE IMPACTS

This section analyzes the potential stationary-source (i.e., on-site) operational noise impacts at the nearest receiver locations, identified in Section 8, resulting from the operation of the proposed Cottonwood Village Project.

9.1 OPERATIONAL NOISE SOURCES

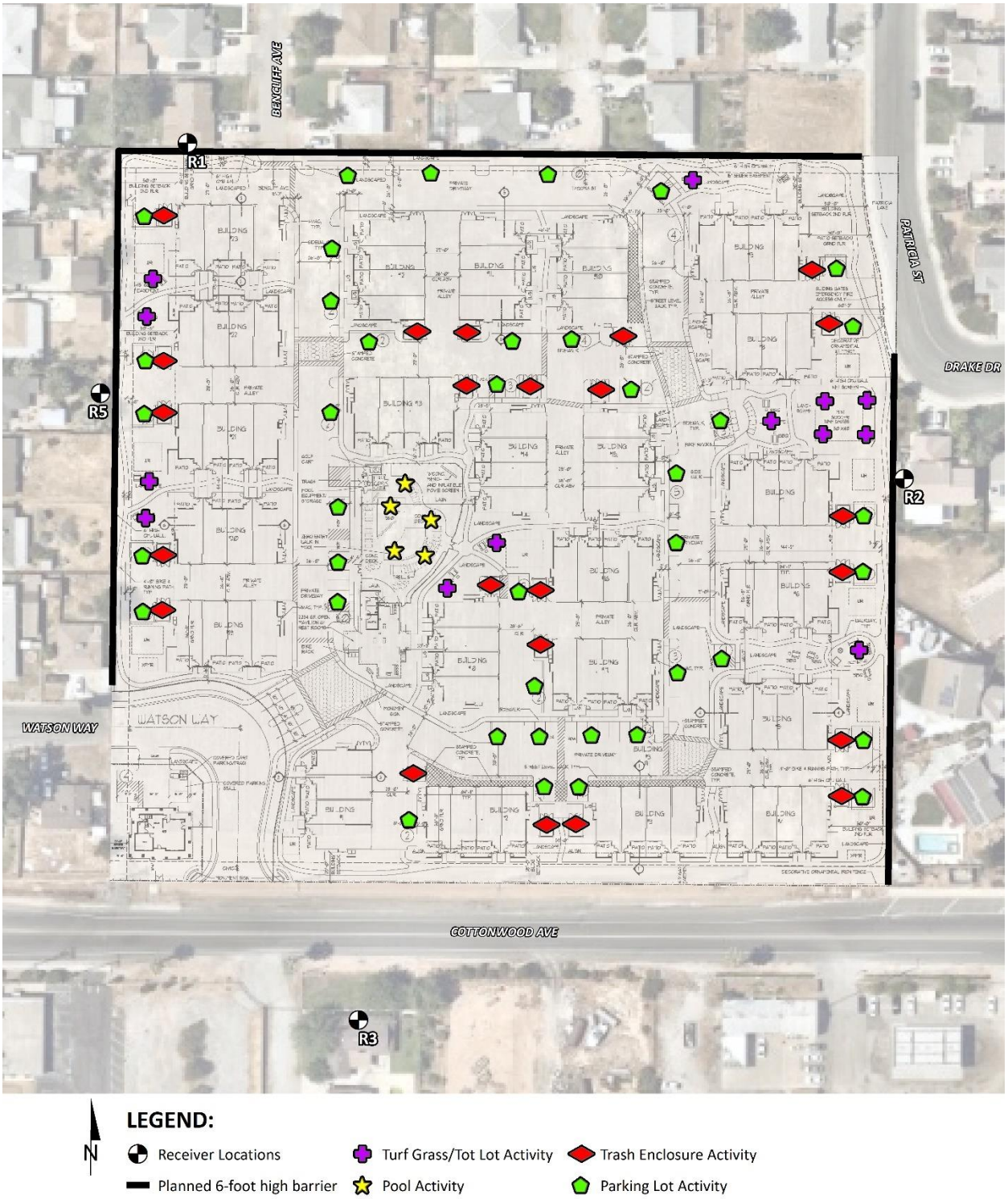
This operational noise analysis is intended to describe noise level impacts associated with the expected typical of daytime and nighttime activities at the Project site. The proposed multi-family residential development is considered a noise-sensitive receiving land use and is not expected to include any specific type of operational noise levels beyond the typical noise sources associated with residential land use in the Project study area. However, to present a conservative approach, on-site Project-only operational noise sources are analyzed in this noise study and are expected to include: trash enclosure activity, pool activity, mini soccer turf grass area, tot lot activity and parking lot activity.

9.2 REFERENCE NOISE LEVELS

To estimate the operational noise impacts, reference noise level measurements were collected from similar types of activities to represent the noise levels expected with the development of the proposed Project. While sound pressure levels (e.g., L_{eq}) quantify in decibels the intensity of given sound sources at a reference distance, sound power levels (L_w) are connected to the sound source and are independent of distance. Sound pressure levels vary substantially with distance from the source and diminish because of intervening obstacles and barriers, air absorption, wind, and other factors. Sound power is the acoustical energy emitted by the sound source and is an absolute value that is not affected by the environment. The reference project operational noise levels are based on the Project related noise sources shown on Exhibit 9-A. The reference project operational sound power levels are summarized below:

- Turf Grass/Tot Lot Activity: 75.1 dBA L_w based on reference noise levels collected by Urban Crossroads includes kids playing on swing sets, youth soccer and other background play activities.
- Pool Activity: 86.4 dBA L_w based on reference noise levels collected by Urban Crossroads at an existing outdoor community pool. The pool activity noise levels include kids playing, running, screaming, splashing, playing with a ball, and parents talking.
- Trash Enclosure Activity: 89 dBA L_w based on reference noise level measurements describing trash enclosure event activity collected by Urban Crossroads, Inc. Trash enclosure activity is estimated for ten minutes each hour.
- Parking Lot Activity: 73.4 dBA L_w based on reference noise level measurements describing parking lot vehicle activity collected by Urban Crossroads, Inc

EXHIBIT 9-A: OPERATIONAL NOISE SOURCE LOCATIONS



9.3 CADNAA NOISE PREDICTION MODEL

To fully describe the exterior operational noise levels from the Project, Urban Crossroads, Inc. developed a noise prediction model using the CadnaA (Computer Aided Noise Abatement) computer program. CadnaA can analyze multiple types of noise sources using the spatially accurate Project site plan, georeferenced Nearmap aerial imagery, topography, buildings, and barriers in its calculations to predict outdoor noise levels.

Using the ISO 9613 protocol, CadnaA will calculate the distance from each noise source to the noise receiver locations, using the ground absorption, distance, and barrier/building attenuation inputs to provide a summary of noise level at each receiver and the partial noise level contributions by noise source. Consistent with the ISO 9613 protocol, the CadnaA noise prediction model relies on the reference sound power level (L_w) to describe individual noise sources. While sound pressure levels (e.g., L_{eq}) quantify in decibels the intensity of given sound sources at a reference distance, sound power levels (L_w) are connected to the sound source and are independent of distance. Sound pressure levels vary substantially with distance from the source and diminish because of intervening obstacles and barriers, air absorption, wind, and other factors. Sound power is the acoustical energy emitted by the sound source and is an absolute value that is not affected by the environment.

The operational noise level calculations provided in this noise study account for the distance attenuation provided due to geometric spreading, when sound from a localized stationary source (i.e., a point source) propagates uniformly outward in a spherical pattern. A default ground attenuation factor of 0.5 was used in the noise analysis to account for mixed ground representing a combination of hard and soft surfaces. Appendix 9.1 includes the detailed noise model inputs used to estimate the Project operational noise levels presented in this section.

9.4 PROJECT OPERATIONAL NOISE LEVELS

Using the reference noise levels to represent the proposed Project operations that include trash enclosure activity, pool activity, mini soccer turf grass area, tot lot activity and parking lot activity, Urban Crossroads, Inc. calculated the unmitigated operational source noise levels that are expected to be generated at the Project site and the Project-related noise level increases that would be experienced at each of the sensitive receiver locations. Table 9-1 shows the unmitigated Project operational noise levels. The hourly noise levels at the off-site receiver locations are expected to range from 36.9 to 46.7 dBA L_{eq}. Appendix 9.1 includes the detailed noise model inputs used to estimate the Project operational noise levels presented in this section.

TABLE 9-1: PROJECT OPERATIONAL NOISE LEVELS

Noise Source[1]	Operational Noise Levels by Receiver Location (dBA L_{eq})				
	R1	R2	R3	R4	R5
Turf Grass/Tot Lot Activity	29.6	39.0	28.1	22.7	35.8
Pool Activity	33.3	32.3	37.4	32.6	36.0
Trash Enclosure Activity	41.1	43.2	40.3	33.7	44.9
Parking Lot Activity	33.5	36.9	33.9	27.1	38.8
Total (All Noise Sources)	**42.6**	**45.5**	**42.9**	**36.9**	**46.7**

[1] See Exhibit 9-A for the noise source locations. CadnaA noise model calculations are included in Appendix 9.1.

9.5 PROJECT OPERATIONAL NOISE LEVEL COMPLIANCE

To demonstrate compliance with local noise regulations, the Project-only operational noise levels are evaluated against exterior noise level thresholds based on the City of Moreno Valley exterior noise level standards at the nearest noise-sensitive receiver locations. Based on the CadnaA noise prediction model results that account for the noise attenuation due to distance from the noise source activities, Table 9-2 shows the operational noise levels associated with the Cottonwood Village Project will satisfy the City of Moreno Valley 60 dBA L_{eq} daytime and 55 dBA L_{eq} nighttime exterior noise level standards at the nearest receiver locations. Therefore, the operational noise impacts are considered *less than significant* at the nearest noise-sensitive receiver locations.

TABLE 9-2: OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location[1]	Project Operational Noise Levels (dBA Leq)[2]	Noise Level Standards (dBA Leq)[3]		Noise Level Standards Exceeded?[4]	
		Daytime	Nighttime	Daytime	Nighttime
R1	42.6	60.0	55.0	No	No
R2	45.5	60.0	55.0	No	No
R3	42.9	60.0	55.0	No	No
R4	36.9	60.0	55.0	No	No
R5	46.7	60.0	55.0	No	No

[1] See Exhibit 8-A for the receiver locations.
[2] Proposed Project operational noise levels as shown on Table 9-1.
[3] City of Moreno Valley Municipal Code, Chapter 11.80 Noise Regulation, Table 11.80.030-2 (Appendix 3.1)
[4] Do the estimated Project operational noise source activities exceed the noise level standards?
"Daytime" = 8:00 a.m. to 10:00 p.m.; "Nighttime" = 10:01 p.m. to 7:59 a.m.

9.6 PROJECT OPERATIONAL NOISE LEVEL INCREASES

To describe the Project operational noise level increases, the Project operational noise levels are combined with the existing ambient noise levels measurements for the nearest receiver locations potentially impacted by Project operational noise sources. Since the units used to measure noise, decibels (dB), are logarithmic units, the Project-operational and existing ambient noise levels cannot be combined using standard arithmetic equations. (2) Instead, they must be logarithmically added using the following base equation:

$$SPL_{Total} = 10\log_{10}[10^{SPL1/10} + 10^{SPL2/10} + \ldots 10^{SPLn/10}]$$

Where "SPL1," "SPL2," etc. are equal to the sound pressure levels being combined, or in this case, the Project-operational and existing ambient noise levels. The difference between the combined Project and ambient noise levels describes the Project noise level increases to the existing ambient noise environment. Noise levels that would be experienced at receiver locations when Project-source noise is added to the daytime and nighttime ambient conditions are presented on Tables 9-3 and 9-4, respectively.

As indicated on Tables 9-3 and 9-4, the Project will generate an unmitigated daytime and nighttime operational noise level increases ranging from 0.0 to 3.1 dBA L_{eq} at the nearest receiver locations. In effect, the amount to which a given noise level increase is considered acceptable is reduced based on existing ambient noise conditions. Based on the significance criteria presented in Table 4-1, the Project-related operational noise level increases will satisfy the operational noise level increase criteria at the nearest sensitive receiver locations and the impact will be *less than significant.*

TABLE 9-3: DAYTIME PROJECT OPERATIONAL NOISE LEVEL INCREASES

Receiver Location[1]	Total Project Operational Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Project Increase[6]	Increase Criteria[7]	Increase Criteria Exceeded?
R1	42.6	L1	50.6	51.2	0.6	5.0	No
R2	45.5	L2	47.1	49.4	2.3	5.0	No
R3	42.9	L3	65.3	65.3	0.0	1.5	No
R4	36.9	L3	65.3	65.3	0.0	1.5	No
R5	46.7	L4	57.2	57.6	0.4	5.0	No

[1] See Exhibit 8-A for the receiver locations.
[2] Total Project operational noise levels as shown on Table 9-2.
[3] Reference noise level measurement locations as shown on Exhibit 5-A.
[4] Observed daytime ambient noise levels as shown on Table 5-1.
[5] Represents the combined ambient conditions plus the Project activities.
[6] The noise level increase expected with the addition of the proposed Project activities.
[7] Significance increase criteria as shown on Table 4-1.

TABLE 9-4: NIGHTTIME OPERATIONAL NOISE LEVEL INCREASES

Receiver Location[1]	Total Project Operational Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Project Increase[6]	Increase Criteria[7]	Increase Criteria Exceeded?
R1	42.6	L1	46.8	48.2	1.4	5.0	No
R2	45.5	L2	45.4	48.5	3.1	5.0	No
R3	42.9	L3	62.2	62.3	0.1	3.0	No
R4	36.9	L3	62.2	62.2	0.0	3.0	No
R5	46.7	L4	55.1	55.7	0.6	5.0	No

[1] See Exhibit 8-A for the receiver locations.
[2] Total Project operational noise levels as shown on Table 9-2.
[3] Reference noise level measurement locations as shown on Exhibit 5-A.
[4] Observed nighttime ambient noise levels as shown on Table 5-1.
[5] Represents the combined ambient conditions plus the Project activities.
[6] The noise level increase expected with the addition of the proposed Project activities.
[7] Significance increase criteria as shown on Table 4-1.

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10 CONSTRUCTION IMPACTS

This section analyzes potential impacts resulting from the short-term construction activities associated with the development of the Project. Exhibit 10-A shows the construction noise source locations in relation to the nearby sensitive receiver locations previously described in Section 8. To prevent high levels of construction noise from impacting noise-sensitive land uses, Section 11.80.030 (D)(7), of the City of Moreno Valley Municipal Code limits construction activities to the hours from 7:00 a.m. to 8:00 p.m.

10.1 CONSTRUCTION NOISE LEVELS

Noise generated by the Project construction equipment will include a combination of trucks, power tools, concrete mixers, and portable generators that when combined can reach high levels. The number and mix of construction equipment are expected to occur in the following stages:

- Site Preparation
- Grading
- Building Construction
- Paving
- Architectural Coating

10.2 CONSTRUCTION REFERENCE NOISE LEVELS

To describe peak construction noise activities, this construction noise analysis was prepared using reference noise level measurements published in the Update of Noise Database for Prediction of Noise on Construction and Open Sites by the Department for Environment, Food and Rural Affairs (DEFRA). (22). The DEFRA database provides the most recent and comprehensive source of reference construction noise levels. Table 10-1 provides a summary of the DEFRA construction reference noise level measurements expressed in hourly average dBA Leq using the estimated FHWA Roadway Construction Noise Model (RCNM) usage factors (23) to describe the typical construction activities for each stage of Project construction.

EXHIBIT 10-A: TYPICAL CONSTRUCTION NOISE SOURCE LOCATIONS

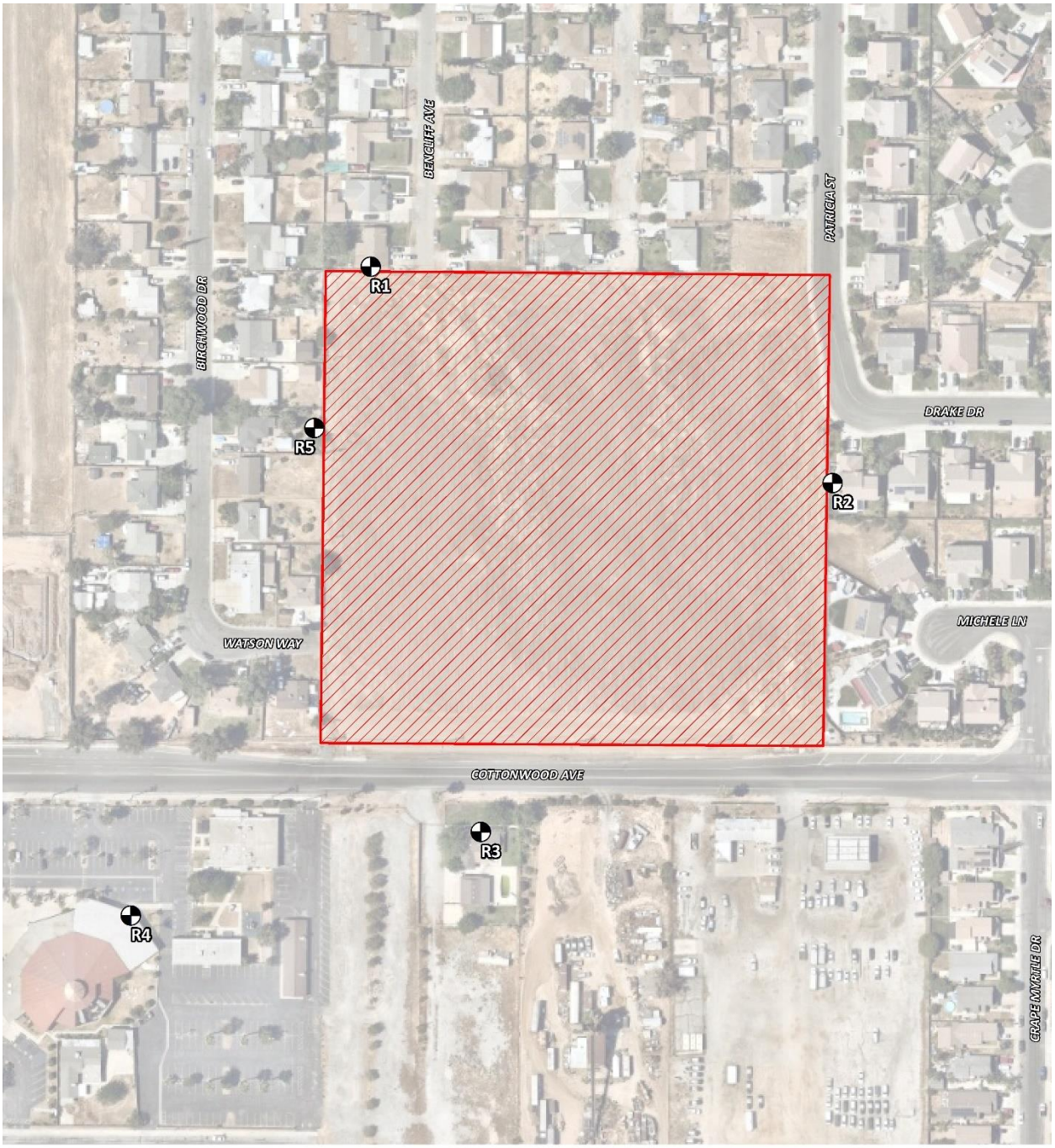

TABLE 10-1: CONSTRUCTION REFERENCE NOISE LEVELS

Construction Stage	Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA L_{eq})[1]	Highest Reference Noise Level (dBA L_{eq})
Site Preparation	Crawler Tractors	77	77
	Hauling Trucks	71	
	Rubber Tired Dozers	71	
Grading	Graders	79	79
	Excavators	64	
	Compactors	67	
Building Construction	Cranes	67	72
	Tractors	72	
	Welders	65	
Paving	Pavers	70	70
	Paving Equipment	69	
	Rollers	69	
Architectural Coating	Cranes	67	67
	Air Compressors	67	
	Generator Sets	67	

[1] Update of Noise Database for Prediction of Noise on Construction and Open Sites by the Department for Environment, Food and Rural Affairs (DEFRA) expressed in hourly average L_{eq} based on estimated usage factors from the FHWA Roadway Construction Noise Model (RCNM).

10.3 CONSTRUCTION NOISE ANALYSIS

Using the reference construction equipment noise levels and the CadnaA noise prediction model, calculations of the Project construction noise level impacts at the nearby sensitive receiver locations were completed. To assess the worst-case construction noise levels, the Project construction noise analysis relies on the highest noise level impacts when the equipment with the highest reference noise level is operating at the closest point from the edge of primary construction activity (Project site boundary) to each receiver location. As shown on Table 10-2, the highest construction noise levels are expected to range from 53.7 to 61.7 dBA L_{eq} at the nearest receiver locations. Appendix 10.1 includes the detailed CadnaA construction noise model inputs.

The construction noise analysis presents a conservative approach with the highest noise-level-producing equipment for each stage of Project construction operating at the closest point from primary construction activity to the nearby sensitive receiver locations. This scenario is unlikely to occur during typical construction activities and likely overstates the construction noise levels which will be experienced at each receiver location.

TABLE 10-2: CONSTRUCTION EQUIPMENT NOISE LEVEL SUMMARY

Receiver Location[1]	Construction Noise Levels (dBA L_{eq})					
	Site Preparation	Grading	Building Construction	Paving	Architectural Coating	Highest Levels[2]
R1	76.3	78.3	71.3	69.3	66.3	78.3
R2	76.5	78.5	71.5	69.5	66.5	78.5
R3	69.9	71.9	64.9	62.9	59.9	71.9
R4	63.7	65.7	58.7	56.7	53.7	65.7
R5	75.7	77.7	70.7	68.7	65.7	77.7

[1] Noise receiver locations are shown on Exhibit 10-A.
[2] Construction noise level calculations based on distance from the construction activity, which is measured from the Project site boundary to the nearest receiver locations. CadnaA construction noise model inputs are included in Appendix 10.1.

10.4 CONSTRUCTION NOISE LEVEL COMPLIANCE

To evaluate whether the Project will generate potentially significant short-term noise levels at nearest receiver locations, a construction-related daytime noise level threshold of 80 dBA L_{eq} is used as a reasonable threshold to assess the daytime construction noise level impacts. The construction noise analysis shows that the nearest receiver locations will satisfy the reasonable daytime 80 dBA L_{eq} significance threshold during Project construction activities as shown on Table 10-3. Therefore, the noise impacts due to Project construction noise are considered *less than significant* at all receiver locations.

TABLE 10-3: CONSTRUCTION NOISE LEVEL COMPLIANCE

Receiver Location[1]	Construction Noise Levels (dBA L_{eq})		
	Highest Construction Noise Levels[2]	Threshold[3]	Threshold Exceeded?[4]
R1	78.3	80	No
R2	78.5	80	No
R3	71.9	80	No
R4	65.7	80	No
R5	77.7	80	No

[1] Noise receiver locations are shown on Exhibit 10-A.
[2] Highest construction noise level calculations based on distance from the construction noise source activity to the nearest receiver locations as shown on Table 10-2.
[3] Construction noise level thresholds as shown on Table 4-1.
[4] Do the estimated Project construction noise levels exceed the construction noise level threshold?

10.5 CONSTRUCTION VIBRATION IMPACTS

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures and soil type. It is expected that ground-borne vibration from Project construction activities would cause only intermittent, localized intrusion. Ground-borne vibration levels resulting from typical construction activities occurring within the Project site were estimated by data published by the Federal Transit Administration (FTA). (7) However, while vehicular traffic is rarely perceptible, construction has the potential to result in varying degrees of temporary ground vibration, depending on the specific construction activities and equipment used. Ground vibration levels associated with various types of construction equipment are summarized on Table 10-4. Based on the representative vibration levels presented for various construction equipment types, it is possible to estimate the potential Project construction vibration levels using the following vibration assessment methods defined by the FTA. To describe the human response (annoyance) associated with vibration impacts the FTA provides the following equation: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

TABLE 10-4: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment	PPV (in/sec) at 25 feet
Small bulldozer	0.003
Jackhammer	0.035
Loaded Trucks	0.076
Large bulldozer	0.089

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual

Using the vibration source level of construction equipment provided on Table 10-4 and the construction vibration assessment methodology published by the FTA, it is possible to estimate the Project vibration impacts. Table 10-5 presents the expected Project related vibration levels at the nearby receiver locations. At distances ranging from 12 to 337 feet from the Project construction activities, construction vibration velocity levels are estimated to range from 0.002 to 0.268 in/sec PPV. Based on maximum acceptable continuous vibration threshold of 0.3 PPV (in/sec) for older residential buildings, the typical Project construction vibration levels will satisfy the building damage thresholds at all receiver locations. Therefore, the Project-related vibration impacts are considered *less than significant* during the construction activities at the Project site.

In addition, the typical construction vibration levels at the nearest sensitive receiver locations are unlikely to be sustained during the entire construction period but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site boundaries.

TABLE 10-5: PROJECT CONSTRUCTION VIBRATION LEVELS

Receiver[1]	Distance to Const. Activity (Feet)[2]	Typical Construction Vibration Levels PPV (in/sec)[3]					Thresholds PPV (in/sec)[4]	Thresholds Exceeded?[5]
		Small bulldozer	Jackhammer	Loaded Trucks	Large bulldozer	Highest Vibration Level		
R1	12'	0.009	0.105	0.229	0.268	0.268	0.3	No
R2	12'	0.009	0.105	0.229	0.268	0.268	0.3	No
R3	116'	0.000	0.004	0.008	0.009	0.009	0.3	No
R4	12'	0.009	0.105	0.229	0.268	0.268	0.3	No
R5	337'	0.000	0.001	0.002	0.002	0.002	0.3	No

[1] Receiver locations are shown on Exhibit 10-A.
[2] Distance from receiver location to Project construction boundary (Project site boundary).
[3] Based on the Vibration Source Levels of Construction Equipment (Table 10-4).
[4] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 19, p. 38.
[5] Does the peak vibration exceed the acceptable vibration thresholds?
"PPV" = Peak Particle Velocity

11 REFERENCES

1. **State of California.** *California Environmental Quality Act, Appendix G.* 2018.
2. **California Department of Transportation Environmental Program.** *Technical Noise Supplement - A Technical Supplement to the Traffic Noise Analysis Protocol.* Sacramento, CA : s.n., September 2013.
3. **Environmental Protection Agency Office of Noise Abatement and Control.** *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* March 1974. EPA/ONAC 550/9/74-004.
4. **U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch.** *Highway Traffic Noise Analysis and Abatement Policy and Guidance.* December 2011.
5. **U.S. Department of Transportation, Federal Highway Administration.** *Highway Traffic Noise in the United States, Problem and Response.* April 2000. p. 3.
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9. **State of California.** California Code of Regulations, Title 24, Part 2, Volume 1, Chapter 12, Section 1206.4, Allowable Interior Noise Level. *ICC Digital Coes.* [Online] 2019. https://codes.iccsafe.org/content/CABCV12019/chapter-12-interior-environment.
10. **City of Moreno Valley.** *Municipal Code, Chapter 11.80 Noise Regulation.*
11. **California Department of Transportation.** *Transportation and Construction Vibration Guidance Manual.* April 2020.
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13. **Federal Interagency Committee on Noise.** *Federal Agency Review of Selected Airport Noise Analysis Issues.* August 1992.
14. **California Department of Transportation.** *Technical Noise Supplement.* November 2009.
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18. **California Department of Transportation Environmental Program, Office of Environmental Engineering.** *Use of California Vehicle Noise Reference Energy Mean Emission Levels (Calveno REMELs) in FHWA Highway Traffic Noise Prediction.* September 1995. TAN 95-03.
19. **City of Moreno Valley.** *General Plan Environmental Impact Report.* July 2006.
20. **California Department of Transportation.** *Traffic Noise Attenuation as a Function of Ground and Vegetation Final Report.* June 1995. FHWA/CA/TL-95/23.

21. —. *Traffic Noise Analysis Protocol.* May 2011.

22. **Department of Environment, Food and Rural Affiars (Defra).** *Update of Noise Database for Prediction of Noise on Construction and Open Sites.* 2004.

23. **FHWA.** *Roadway Construction Noise Model.* January 2006.

12 CERTIFICATION

The contents of this noise study report represent an accurate depiction of the noise environment and impacts associated with the proposed Cottonwood Village Project. The information contained in this noise study report is based on the best available data at the time of preparation. If you have any questions, please contact me directly at (949) 584-3148.

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EDUCATION

Master of Science in Civil and Environmental Engineering
California Polytechnic State University, San Luis Obispo • December, 1993

Bachelor of Science in City and Regional Planning
California Polytechnic State University, San Luis Obispo • June, 1992

PROFESSIONAL REGISTRATIONS

PE – Registered Professional Traffic Engineer – TR 2537 • January, 2009
AICP – American Institute of Certified Planners – 013011 • June, 1997–January 1, 2012
PTP – Professional Transportation Planner • May, 2007 – May, 2013
INCE – Institute of Noise Control Engineering • March, 2004

PROFESSIONAL AFFILIATIONS

ASA – Acoustical Society of America
ITE – Institute of Transportation Engineers

PROFESSIONAL CERTIFICATIONS

Certified Acoustical Consultant – County of San Diego • March, 2018
Certified Acoustical Consultant – County of Orange • February, 2011
FHWA-NHI-142051 Highway Traffic Noise Certificate of Training • February, 2013

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APPENDIX 3.1:

CITY OF MORENO VALLEY MUNICIPAL CODE

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Chapter 11.80 NOISE REGULATION

11.80.010 Legislative findings.

It is found and declared that:

A. Excessive sound within the limits of the city is a condition which has existed for some time, and the amount and intensity of such sound is increasing.

B. Such excessive sound is a detriment to the public health, safety, and welfare and quality of life of the residents of the city.

C. The necessity in the public interest for the provisions and prohibitions hereinafter contained and enacted is declared as a matter of legislative determination and public policy, and it is further declared that the provisions and prohibitions hereinafter contained and enacted are in pursuance of and for the purpose of securing and promoting the public health, safety, welfare and quality of life of the city and its inhabitants. (Ord. 740 § 1.2, 2007)

11.80.020 Definitions.

For purposes of this chapter, certain words and phrases used herein are defined as follows:

"A-weighted sound level" means the sound pressure level in decibels as measured with a sound level meter using the A-weighting network. The unit of measurement is the dB(A).

"Commercial" means all uses of land not otherwise classified as residential, as defined in this section.

"Construction" means any site preparation, and/or any assembly, erection, repair, or alteration, excluding demolition, of any structure, or improvements to real property.

"Continuous airborne sound" means sound that is measured by the slow-response setting of a meter manufactured to the specifications of ANSI Section 1.4-1983 (R2006) "Specification for Sound Level Meters," or its successor.

"Daytime" means eight a.m. to ten p.m. the same day.

"Decibel" (dB) means a unit for measuring the amplitude of sound, equal to twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound measured to the reference pressure, which is twenty (20) microPascals (twenty (20) microNewtons per square meter.)

"Demolition" means any dismantling, intentional destruction or removal of structures or other improvements to real property.

"Disturb" means to interrupt, interfere with, or hinder the enjoyment of peace or quiet or the normal listening activities or the sleep, rest or mental concentration of the hearer.

"Emergency" means any occurrence or set of circumstances involving actual or imminent physical trauma or significant property damage which necessitates immediate action. Economic loss alone shall not constitute an emergency. It shall be the burden of an alleged violator to prove an "emergency."

"Emergency work" means any work made necessary to restore property to a safe condition following an emergency, or to protect persons or property threatened by an imminent emergency, to the extent such work is, in fact, necessary to protect persons or property from exposure to imminent danger or damage.

"Frequency" means the number of complete oscillation cycles per unit of time.

"Impulsive sound" means sound of short duration, usually less than one second, with an abrupt onset and rapid decay. Examples of sources of impulsive sound include explosions, drop forge impacts, and discharge of firearms.

"Nighttime" means 10:01 p.m. to 7:59 a.m. the following day.

"Noise disturbance" means any sound which:

1. Disturbs a reasonable person of normal sensitivities;

2. Exceeds the sound level limits set forth in this chapter; or

3. Is plainly audible as defined in this section. Where no specific distance is set forth for the determination of audibility, references to noise disturbance shall be deemed to mean plainly audible at a distance of two hundred (200) feet from the real property line of the source of the sound, if the sound occurs on privately owned property, or from the source of the sound, if the sound occurs on public right-of-way, public space or other publicly owned property.

"Person" means any person, person's firm, association, copartnership, joint venture, corporation, or any entity public or private in nature.

"Plainly audible" means that the sound or noise produced or reproduced by any particular source, can be clearly distinguished from ambient noise by a person using his/her normal hearing faculties.

"Public right-of-way" means any street, avenue, boulevard, sidewalk, bike path or alley, or similar place normally accessible to the public which is owned or controlled by a governmental entity.

"Public space" means any park, recreational or community facility, or lot which contains at least one building that is open to the general public during its hours of operation.

"Residential" means all uses of land primarily for dwelling units, as well as hospitals, schools, colleges and universities, and places of religious assembly.

"Sound" means an oscillation in pressure, particle displacement, particle velocity or other physical parameter, in a medium with internal forces that causes compression and rarefaction of that medium capable of producing an auditory impression. The description of sound may include any characteristic of such sound, including duration, intensity and frequency.

"Sound level" means the weighted sound pressure level as measured in dB(A) by a sound level meter and as specified in American National Standards Institute (ANSI) specifications for sound-level meters (ANSI Section 1.4-1971 (R1976)). If the frequency weighting employed is not indicated, the A-weighting shall apply.

"Sound level meter" means an instrument, demonstrably capable of accurately measuring sound levels as defined above.

All technical definitions not defined above shall be in accordance with applicable publications and standards of the American National Standards Institute (ANSI). (Ord. 740 § 1.2, 2007)

11.80.030 Prohibited acts.

A. General Prohibition. It is unlawful and a violation of this chapter to maintain, make, cause, or allow the making of any sound that causes a noise disturbance, as defined in Section 11.80.020.

B. Sound causing permanent hearing loss.

1. Sound level limits. Based on statistics from the Center for Disease Control and Prevention and the National Institute for Occupational Safety and Health, Table 1 and Table 1-A specify sound level limits which, if exceeded, will have a high probability of producing permanent hearing loss in anyone in the area where the sound levels are being exceeded. No sound shall be permitted within the city which exceeds the parameters set forth in Tables 11.80.030-1 and 11.80.030-1-A of this chapter:

Table 11.80.030-1

MAXIMUM CONTINUOUS SOUND LEVELS*

Duration per Day Continuous Hours	**Sound level [db(A)]**
8	90
6	92
4	95
3	97

2	100
1.5	102
1	105
0.5	110
0.25	115

* When the daily sound exposure is composed of two or more periods of sound exposure at different levels, the combined effect of all such periods shall constitute a violation of this section if the sum of the percent of allowed period of sound exposure at each level exceeds 100 percent

Table 11.80.030-1A

MAXIMUM IMPULSIVE SOUND LEVELS

Number of Repetitions per 24-Hour Period	Sound level [dB(A)]
1	145
10	135
100	125

2. Exemptions. No violation shall exist if the only persons exposed to sound levels in excess of those listed in Tables 11.80.030-1 and 11.80.030-1A are exposed as a result of:

a. Trespass;

b. Invitation upon private property by the person causing or permitting the sound; or

c. Employment by the person or a contractor of the person causing or permitting the sound.

C. Nonimpulsive Sound Decibel Limits. No person shall maintain, create, operate or cause to be operated on private property any source of sound in such a manner as to create any nonimplusive sound which exceeds the limits set forth for the source land use category (as defined in Section 11.80.020) in Table 11.80.030-2 when measured at a distance of two hundred (200) feet or more from the real property line of the source of the sound, if the sound occurs on privately owned property, or from the source of the sound, if the sound occurs on public right-of-way, public space or other publicly owned property. Any source of sound in violation of this subsection shall be deemed prima facie to be a noise disturbance.

Table 11.80.030-2

MAXIMUM SOUND LEVELS (IN dB(A)) FOR SOURCE LAND USES

Residential		Commercial	
Daytime	**Nighttime**	**Daytime**	**Nighttime**
60	55	65	60

D. Specific Prohibitions. In addition to the general prohibitions set out in subsection A of this section, and unless otherwise exempted by this chapter, the following specific acts, or the causing or permitting thereof, are regulated as follows:

1. Motor Vehicles. No person shall operate or cause to be operated a public or private motor vehicle, or combination of vehicles towed by a motor vehicle, that creates a sound exceeding the sound level limits in Table 11.80.030-2 when the vehicle(s) are not otherwise subject to noise regulations provided for by the California Vehicle Code.

2. Radios, Televisions, Electronic Audio Equipment, Musical Instruments or Similar Devices from a Stationary Source. No person shall operate, play or permit the operation or playing of any radio, tape player, television, electronic audio equipment, musical instrument, sound amplifier or other mechanical or electronic sound making device that produces, reproduces or amplifies sound in such a manner as to create a noise disturbance. However, this subsection shall not apply to any use or activity exempted in subsection E of this section and any use or activity for which a special permit has been issued pursuant to Section 11.80.040.

3. Radios, Electronic Audio Equipment, or Similar Devices from a Mobile Source Such as a Motor Vehicle. Sound amplification or reproduction equipment on or in a motor vehicle is subject to regulation in accordance with the California Vehicle Code when upon the public right-of-way. When upon public space or publicly owned property other than the public right-of-way or upon private property open to the public, sound amplification or reproduction equipment shall not be operated in such a manner that it is plainly audible at a distance of fifty (50) feet in any direction from the vehicle.

4. Portable, Hand-Held Music or Sound Amplification or Reproduction Equipment. Such equipment shall not be operated on a public right-of-way, public space or other publicly owned property in such a manner as to be plainly audible at a distance of fifty (50) feet in any direction from the operator.

5. Loudspeakers and Public Address Systems.

a. Except as permitted by Section 11.80.040, no person shall operate, or permit the operation of, any loudspeaker, public address system or similar device, for any commercial purpose:

1. Which produces, reproduces or amplifies sound in such a manner as to create a noise disturbance; or

2. During nighttime hours on a public right-of-way, public space or other publicly owned property.

b. No person shall operate, or permit the operation of, any loudspeaker, public address system or similar device, for any noncommercial purpose, during nighttime hours in such a manner as to create a noise disturbance.

6. Animals. No person shall own, possess or harbor an animal or bird that howls, barks, meows, squawks, or makes other sounds that:

a. Create a noise disturbance;

b. Are of frequent or continued duration for ten (10) or more consecutive minutes and are plainly audible at a distance of fifty (50) feet from the real property line of the source of the sound; or

c. Are intermittent for a period of thirty (30) or more minutes and are plainly audible at a distance of fifty (50) feet from the real property line of the source of the sound.

7. Construction and Demolition. No person shall operate or cause the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between the hours of eight p.m. and seven a.m. the following day such that the sound there from creates a noise disturbance, except for emergency work by public service utilities or for other work approved by the city manager or designee. This section shall not apply to the use of power tools as provided in subsection (D)(9) of this section.

8. Emergency Signaling Devices. No person shall intentionally sound or permit the sounding outdoors of any fire, burglar or civil defense alarm, siren or whistle, or similar stationary emergency signaling device, except for emergency purposes or for testing as follows:

a. Testing of a stationary emergency signaling device shall not occur between seven p.m. and seven a.m. the following day;

b. Testing of a stationary emergency signaling device shall use only the minimum cycle test time, in no case to exceed sixty (60) seconds;

c. Testing of a complete emergency signaling system, including the functioning of the signaling device and the personnel response to the signaling device, shall not occur more than once in each calendar month. Such testing shall only occur only on weekdays between seven a.m. and seven p.m. and shall be exempt from the time limit specified in subsection (D)(8)(2) of this section.

9. Power Tools. No person shall operate or permit the operation of any mechanically, electrically or gasoline motor-driven tool during nighttime hours so as to cause a noise disturbance across a residential real property boundary.

10. Pumps, Air Conditioners, Air-Handling Equipment and Other Continuously Operating Equipment. Notwithstanding the general prohibitions of subsection a of this section, no person shall operate or permit the operation of any pump, air

conditioning, air-handling or other continuously operating motorized equipment in a state of disrepair or in a manner which otherwise creates a noise disturbance distinguishable from normal operating sounds.

E. Exemptions. The following uses and activities shall be exempt from the sound level regulations except the maximum sound levels provided in Tables 11.80.030-1 and 11.80.030-1A:

1. Sounds resulting from any authorized emergency vehicle when responding to an emergency call or acting in time of an emergency.

2. Sounds resulting from emergency work as defined in Section 11.80.020

3. Any aircraft operated in conformity with, or pursuant to, federal law, federal air regulations and air traffic control instruction used pursuant to and within the duly adopted federal air regulations; and any aircraft operating under technical difficulties in any kind of distress, under emergency orders of air traffic control, or being operated pursuant to and subsequent to the declaration of an emergency under federal air regulations.

4. All sounds coming from the normal operations of interstate motor and rail carriers, to the extent that local regulation of sound levels of such vehicles has been preempted by the Noise Control Act of 1972 (42 U.S.C. § 4901 et seq.) or other applicable federal laws or regulations

5. Sounds from the operation of motor vehicles, to the extent they are regulated by the California Vehicle Code.

6. Any constitutionally protected noncommercial speech or expression conducted within or upon a any public right-of-way, public space or other publicly owned property constituting an open or a designated public forum in compliance with any applicable reasonable time, place and manner restrictions on such speech or expression or otherwise pursuant to legal authority.

7. Sounds produced at otherwise lawful and permitted city-sponsored events, organized sporting events, school assemblies, school playground activities, by permitted fireworks, and by permitted parades on public right-of-way, public space or other publicly owned property.

8. An event for which a temporary use permit or special event permit has been issued under other provisions of this code, where the provisions of Section 11.80.040 are met, the permit granted expressly grants an exemption from specific standards contained in this chapter, and the permittee and all persons under the permittee's reasonable control actually comply with all conditions of such permit. Violation of any condition of such a permit related to sound or sound equipment shall be a violation of this chapter and punishable as such.

F. Nothing in this chapter shall be construed to limit, modify or repeal any other regulation elsewhere in this code relating to the regulation of noise sources, nor shall any such other regulation be read to permit the emission of noise in violation of any provision of this chapter. (Ord. 740 § 1.2, 2007)

11.80.040 Special provisions for temporary use and special event permits.

The exemption by permit set forth in Section 11.80.030(E)(8) shall be subject to the following requirements and conditions:

A. The permit application shall include the name, address and telephone number of the permit applicant; the date, hours and location for which the permit is requested; and the nature of the event or activity. It shall also specify the types of sounds and/or sound equipment to be permitted, the proposed duration of such sound, the specific standards from which the sound is to be exempted, and the reasons for each requested exemption.

B. The permit shall be issued provided the proposed activity meets the requirements of this section and the issuing official determines that the sound to be emitted at the event as proposed would not be detrimental to the public health, safety or welfare, that the event cannot reasonably achieve its legitimate aims and purposes without the exemption and that the sound levels proposed will not unreasonably damage the peace and quiet enjoyment of the lawful users of surrounding properties, nor constitute a public nuisance.

C. The official issuing the permit may prescribe any reasonable conditions or requirements he/she deems necessary to minimize noise disturbances upon the community or the surrounding neighborhood, and/or to protect the health, safety or welfare of the public, including participants in the permitted event, including use of mufflers, screens or other sound-attenuating devices.

D. Any permit granted must be in writing and shall contain all conditions upon which the permit shall be effective.

E. No more than six events requiring a sound limit exemption may be held at any particular location upon privately owned or controlled property per calendar year, provided further that the number of events shall not exceed the number permitted under the regulations for the type of permit issued. For purposes of this subsection, "location" means a legal parcel of real property or a complete shopping or commercial center or mall sharing common parking and access even if comprised of multiple legal parcels.

F. The exemption from sound limits under such permit shall not exceed maximum period of four hours in one twenty-four (24) hour day.

G. The permit will only be granted for hours between nine a.m. and ten p.m. on all days other than Friday and Saturday; and, on Friday and Saturday, between the hours of nine a.m. and one a.m. of the following day, except in the following circumstances:

1. A permit may be granted for hours between nine a.m. on New Year's Eve and one a.m. the following day (New Year's Day).

2. A permit may be granted for hours between nine a.m. and two a.m. the following day if there are no residences, hospitals, or nursing homes within a 0.5 mile radius of the property where the function is taking place.

H. Functions for which the permits are issued shall be limited to a continuous airborne sound level not to exceed seventy (70) dB(A), as measured two hundred (200) feet from the real property boundary of the source property if on private property, or from the source if on public right-of-way, public space or other publicly owned property. (Ord. 740 § 1.2, 2007)

11.80.050 Measurement or assessment of sound.

A. Measurement With Sound Meter.

1. The measurement of sound shall be made with a sound level meter meeting the standards prescribed by ANSI Section 1.4-1983 (R2006). The instruments shall be maintained in calibration and good working order. A calibration check shall be made of the system at the time of any sound level measurement. Measurements recorded shall be taken so as to provide a proper representation of the source of the sound. The microphone during measurement shall be positioned so as not to create any unnatural enhancement or diminution of the measured sound. A windscreen for the microphone shall be used at all times. However, a violation of this chapter may occur without the occasion of the measurements being made as otherwise provided.

2. The slow meter response of the sound level meter shall be used in order to best determine the average amplitude.

3. The measurement shall be made at any point on the property into which the sound is being transmitted and shall be made at least three feet away from any ground, wall, floor, ceiling, roof and other plane surface.

4. In case of multiple occupancy of a property, the measurement may be made at any point inside the premises to which any complainant has right of legal private occupancy; provided that the measurement shall not be made within three feet of any ground, wall, floor, ceiling, roof or other plane surface.

5. All measurements of sound provided for in this chapter will be made by qualified officials of the city who are designated by the city manager or designee to operate the apparatus used to make the measurements.

B. Assessment Without Sound Level Meter. Any police officer, code enforcement officer, or other official designated by the city manager or designee who hears a noise or sound that is plainly audible, as defined in Section 11.80.020, in violation of this chapter, may enforce this chapter and shall assess the noise or sound according to the following standards:

1. The primary means of detection shall be by means of the official's normal hearing faculties, not artificially enhanced.

2. The official shall first attempt to have a direct line of sight and hearing to the vehicle or real property from which the sound or noise emanates so that the official can readily identify the offending source of the sound or noise and the distance involved. If the official is unable to have a direct line of sight and hearing to the vehicle or real property from which the sound or noise emanates, then the official shall confirm the source of the sound or noise by approaching the suspected vehicle or real property until the official is able to obtain a direct line of sight and hearing, and confirm the source of the sound or noise that was heard at the place of the original assessment of the sound or noise.

3. The official need not be required to identify song titles, artists, or lyrics in order to establish a violation. (Ord. 740 § 1.2, 2007)

11.80.060 Violation.

A. Violation of Sound Level Limits. Any person violating any of the provisions of this chapter shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punishable by a fine not to exceed one thousand dollars ($1,000.00) and/or six months in the county jail, or both. Notwithstanding the foregoing, any violation of the provisions of this chapter may, in the discretion of the citing officer or the city attorney, be cited and/or prosecuted as an infraction or be subject to civil citation pursuant to Chapter 1.10.

B. Joint and Several Responsibility. In addition to the person causing the offending sound, the owner, tenant or lessee of property, or a manager, overseer or agent, or any other person lawfully entitled to possess the property from which the offending sound is emitted at the time the offending sound is emitted, shall be responsible for compliance with this chapter if the additionally responsible party knows or should have known of the offending noise disturbance. It shall not be a lawful defense to assert that some other person caused the sound. The lawful possessor or operator of the premises shall be responsible for operating or maintaining the premises in compliance with this chapter and may be cited regardless of whether or not the person actually causing the sound is also cited.

C. Violation May be Declared a Public Nuisance. The operation or maintenance of any device, equipment, instrument, vehicle or machinery in violation of any provisions of this chapter which endangers the public health, safety and quality of life of residents in the area is declared to be a public nuisance, and may be subject to abatement summarily or by a restraining order or injunction issued

by a court of competent jurisdiction. (Ord. 824 § 1.2, 2011; Ord. 740 § 1.2, 2007)

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APPENDIX 5.1:

STUDY AREA PHOTOS

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JN:14173 Study Area Photos

L1_E
33, 55' 35.040000"117, 13' 25.240000"

L1_N
33, 55' 35.010000"117, 13' 25.270000"

L1_S
33, 55' 35.020000"117, 13' 25.240000"

L1_W
33, 55' 35.020000"117, 13' 25.270000"

L2_E
33, 55' 33.310000"117, 13' 19.370000"

L2_N
33, 55' 33.350000"117, 13' 19.370000"

JN:14173 Study Area Photos

L2_S
33, 55' 33.290000"117, 13' 19.370000"

L2_W
33, 55' 33.350000"117, 13' 19.370000"

L3_E
33, 55' 28.230000"117, 13' 25.760000"

L3_N
33, 55' 28.250000"117, 13' 25.790000"

L3_S
33, 55' 28.270000"117, 13' 25.820000"

L3_W
33, 55' 28.280000"117, 13' 25.790000"

JN:14173 Study Area Photos

L4_E
33, 55' 35.750000"117, 13' 28.900000"

L4_N
33, 55' 35.790000"117, 13' 28.920000"

L4_S
33, 55' 35.750000"117, 13' 28.920000"

L4_W
33, 55' 35.810000"117, 13' 28.950000"

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APPENDIX 5.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

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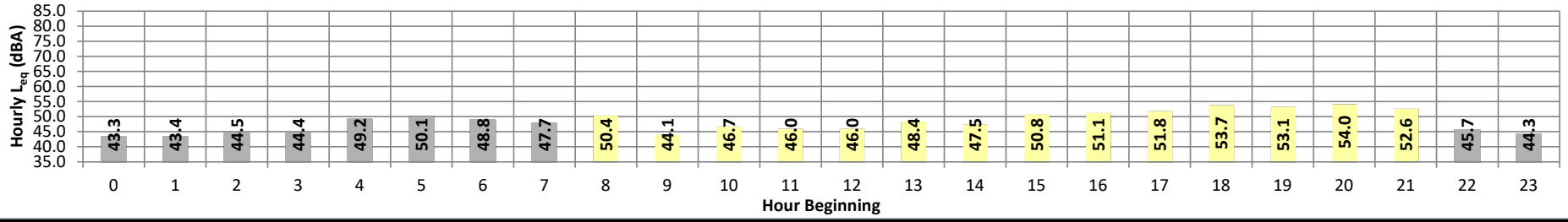
24-Hour Noise Level Measurement Summary

Date: Wednesday, June 2, 2021 | *Location:* L1 - Located north of the Project site near existing single- | *Meter:* Piccolo II | *JN:* 14173

Project: Cottonwood Village | *Source:* family residential home at 13372 Bencliff Avenue. | *Analyst:* B. Lawson

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	43.3	48.7	41.1	48.2	47.7	46.5	45.7	43.6	42.5	41.5	41.3	41.2	43.3	10.0	53.3
	1	43.4	48.4	41.9	47.6	47.0	45.6	44.8	43.4	42.9	42.3	42.2	42.0	43.4	10.0	53.4
	2	44.5	47.5	42.9	47.3	47.0	46.3	45.9	44.8	44.1	43.3	43.2	43.0	44.5	10.0	54.5
	3	44.4	47.5	42.7	47.2	46.9	46.2	45.9	44.7	44.0	43.2	43.0	42.9	44.4	10.0	54.4
	4	49.2	53.2	47.2	52.9	52.6	51.8	51.0	49.5	48.7	47.7	47.5	47.3	49.2	10.0	59.2
	5	50.1	54.2	48.2	53.7	53.3	52.5	51.9	50.4	49.7	48.8	48.6	48.4	50.1	10.0	60.1
	6	48.8	52.2	47.4	51.9	51.6	50.7	50.1	49.1	48.5	47.8	47.7	47.5	48.8	10.0	58.8
	7	47.7	50.2	46.3	49.9	49.6	49.1	48.8	48.0	47.5	46.7	46.6	46.4	47.7	0.0	47.7
Day	8	50.4	57.4	44.4	57.0	56.6	55.3	54.2	52.1	46.0	44.9	44.7	44.5	50.4	0.0	50.4
	9	44.1	50.9	39.5	50.4	49.9	48.4	47.2	45.0	43.1	40.3	39.9	39.6	44.1	0.0	44.1
	10	46.7	53.9	40.7	53.5	52.9	51.2	49.9	47.4	45.1	43.2	43.0	40.8	46.7	0.0	46.7
	11	46.0	52.1	41.3	51.7	51.2	50.3	49.4	46.7	44.7	42.0	41.8	41.5	46.0	0.0	46.0
	12	46.0	51.1	41.5	50.5	50.2	49.3	48.7	47.1	45.2	42.4	42.0	41.6	46.0	0.0	46.0
	13	48.4	55.5	43.3	55.0	54.4	53.4	52.2	49.1	46.7	44.2	43.8	43.4	48.4	0.0	48.4
	14	47.5	53.5	43.3	52.8	52.2	51.2	50.0	48.2	46.7	44.2	43.9	43.5	47.5	0.0	47.5
	15	50.8	56.8	45.7	56.1	55.4	54.4	53.7	51.9	49.7	46.8	46.3	45.9	50.8	0.0	50.8
	16	51.1	58.3	45.5	57.9	57.5	56.3	55.1	51.4	49.6	46.5	46.1	45.6	51.1	0.0	51.1
	17	51.8	60.4	45.6	60.0	59.4	57.2	56.1	51.7	49.4	46.7	46.2	45.7	51.8	0.0	51.8
	18	53.7	61.4	47.3	60.5	59.8	58.6	57.3	54.3	52.3	48.7	48.1	47.5	53.7	0.0	53.7
	19	53.1	60.8	47.2	59.9	59.2	57.8	57.1	54.2	50.8	48.3	47.9	47.4	53.1	5.0	58.1
	20	54.0	62.8	46.7	62.1	61.3	59.4	58.3	54.7	51.4	47.7	47.2	46.8	54.0	5.0	59.0
	21	52.6	61.2	45.6	60.2	59.4	58.0	57.0	52.9	50.1	46.9	46.4	45.8	52.6	5.0	57.6
Night	22	45.7	52.6	41.9	51.9	51.2	49.7	48.6	46.0	44.4	42.6	42.3	42.0	45.7	10.0	55.7
	23	44.3	48.7	41.6	48.3	47.9	47.1	46.5	44.9	43.7	42.2	41.9	41.7	44.3	10.0	54.3

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	44.1	50.9	39.5	50.4	49.9	48.4	47.2	45.0	43.1	40.3	39.9	39.6
	Max	54.0	62.8	47.3	62.1	61.3	59.4	58.3	54.7	52.3	48.7	48.1	47.5
Energy Average		50.7	Average:		56.3	55.7	54.3	53.3	50.5	47.9	45.2	44.8	44.3
Night	Min	43.3	47.5	41.1	47.2	46.9	45.6	44.8	43.4	42.5	41.5	41.3	41.2
	Max	50.1	54.2	48.2	53.7	53.3	52.5	51.9	50.4	49.7	48.8	48.6	48.4
Energy Average		46.8	Average:		49.9	49.5	48.6	47.9	46.4	45.6	44.6	44.4	44.2

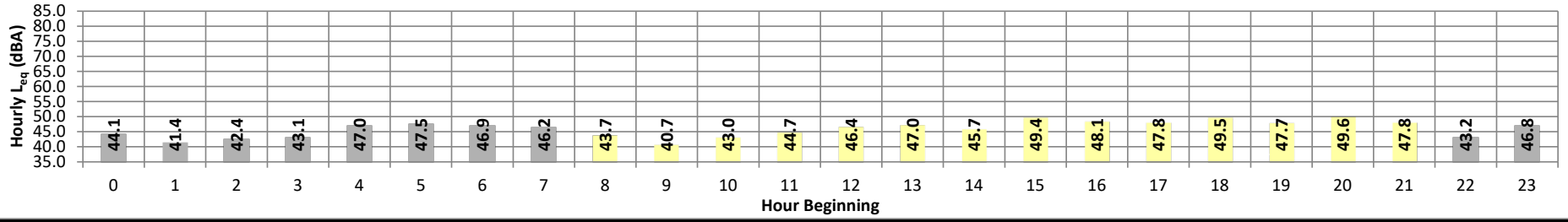
24-Hour	L_{eq} (dBA) Daytime (8am-10pm)	Nighttime (10pm-8am)
49.5	**50.6**	**46.8**

24-Hour Noise Level Measurement Summary

Date: Wednesday, June 2, 2021 *Location:* L2 - Located east of the Project site near existing single-family *Meter:* Piccolo II *JN:* 14173

Project: Cottonwood Village *Source:* residential home at 25251 Drake Drive. *Analyst:* B. Lawson

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	44.1	52.6	39.4	52.2	51.8	50.8	49.3	42.3	40.9	39.9	39.8	39.5	44.1	10.0	54.1
	1	41.4	45.0	40.0	44.7	44.4	43.6	43.0	41.6	41.0	40.4	40.3	40.1	41.4	10.0	51.4
	2	42.4	46.3	40.8	46.0	45.6	44.5	43.8	42.6	42.0	41.2	41.1	40.9	42.4	10.0	52.4
	3	43.1	48.3	40.7	48.0	47.6	46.7	45.9	43.1	42.1	41.1	41.0	40.8	43.1	10.0	53.1
	4	47.0	52.2	45.1	51.7	51.0	49.5	48.9	47.1	46.4	45.6	45.4	45.2	47.0	10.0	57.0
	5	47.5	50.7	45.9	50.4	50.1	49.5	49.1	47.9	47.1	46.3	46.2	46.0	47.5	10.0	57.5
	6	46.9	49.6	45.5	49.4	49.1	48.6	48.2	47.2	46.7	45.9	45.8	45.6	46.9	10.0	56.9
	7	46.2	50.2	44.5	49.8	49.4	48.4	47.8	46.6	45.9	45.0	44.8	44.6	46.2	0.0	46.2
Day	8	43.7	49.0	40.9	48.6	48.2	47.2	46.3	44.3	42.7	41.5	41.3	41.1	43.7	0.0	43.7
	9	40.7	46.3	37.4	46.0	45.5	44.6	43.8	41.1	39.6	38.1	37.8	37.5	40.7	0.0	40.7
	10	43.0	49.6	36.9	49.4	49.0	48.1	47.2	44.2	40.5	37.8	37.4	37.0	43.0	0.0	43.0
	11	44.7	51.9	38.2	51.4	51.0	49.8	49.0	46.0	42.0	39.0	38.6	38.3	44.7	0.0	44.7
	12	46.4	55.6	39.7	55.2	54.7	52.8	50.6	46.0	43.4	40.6	40.2	39.9	46.4	0.0	46.4
	13	47.0	53.1	42.0	52.7	52.3	51.1	50.6	48.2	44.8	42.9	42.5	42.2	47.0	0.0	47.0
	14	45.7	50.4	42.3	49.9	49.5	48.7	48.0	46.3	45.1	43.2	42.8	42.4	45.7	0.0	45.7
	15	49.4	55.5	44.9	55.0	54.7	53.4	52.7	50.1	48.4	45.9	45.5	45.0	49.4	0.0	49.4
	16	48.1	53.6	44.0	53.2	52.6	51.4	50.7	48.8	47.6	44.9	44.5	44.1	48.1	0.0	48.1
	17	47.8	54.2	44.1	53.4	52.6	51.1	50.2	48.3	47.1	45.1	44.7	44.3	47.8	0.0	47.8
	18	49.5	57.2	43.9	56.7	56.1	55.3	54.0	48.8	46.9	44.8	44.4	44.1	49.5	0.0	49.5
	19	47.7	54.1	43.8	53.6	52.9	51.4	50.4	48.0	46.7	44.7	44.4	44.0	47.7	5.0	52.7
	20	49.6	56.3	44.3	56.0	55.7	54.4	53.6	50.1	47.6	45.1	44.8	44.4	49.6	5.0	54.6
	21	47.8	54.3	43.3	53.9	53.5	52.2	51.2	48.5	46.4	44.2	43.9	43.5	47.8	5.0	52.8
Night	22	43.2	48.7	40.4	48.2	47.6	46.3	45.5	43.7	42.4	41.0	40.7	40.5	43.2	10.0	53.2
	23	46.8	59.0	40.1	58.3	57.3	53.5	50.1	44.4	42.1	40.7	40.5	40.2	46.8	10.0	56.8

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	40.7	46.3	36.9	46.0	45.5	44.6	43.8	41.1	39.6	37.8	37.4	37.0
	Max	49.6	57.2	44.9	56.7	56.1	55.3	54.0	50.1	48.4	45.9	45.5	45.0
Energy Average		47.2	Average:		52.5	52.0	50.8	49.9	47.1	44.9	42.7	42.4	42.0
Night	Min	41.4	45.0	39.4	44.7	44.4	43.6	43.0	41.6	40.9	39.9	39.8	39.5
	Max	47.5	59.0	45.9	58.3	57.3	53.5	50.1	47.9	47.1	46.3	46.2	46.0
Energy Average		45.4	Average:		49.9	49.4	48.1	47.2	44.7	43.7	42.7	42.6	42.4

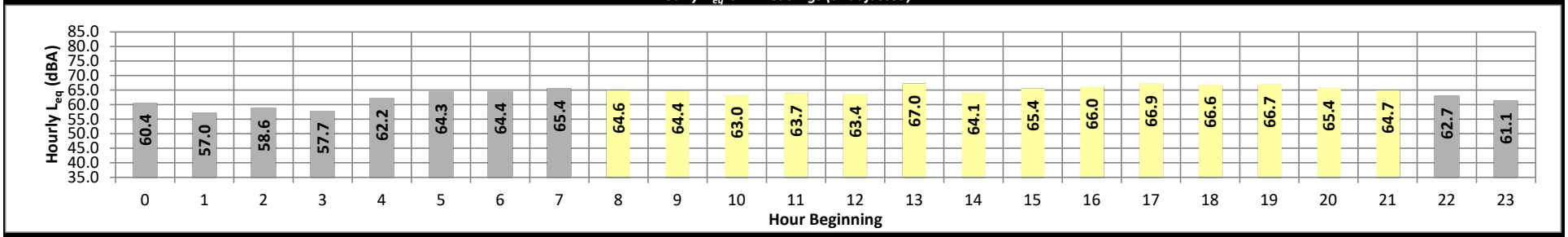
24-Hour	L_{eq} (dBA) Daytime (8am-10pm)	Nighttime (10pm-8am)
46.5	47.1	45.4

24-Hour Noise Level Measurement Summary

Date: Wednesday, June 2, 2021 | *Location:* L3 - Located south of the Project site near existing single-family residential home at 25165 Cottonwood Avenue. | *Meter:* Piccolo II | *JN:* 14173

Project: Cottonwood Village | *Source:* | *Analyst:* B. Lawson

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	60.4	72.7	45.8	72.4	71.7	68.4	65.7	56.4	50.2	46.6	46.3	46.0	60.4	10.0	70.4
	1	57.0	69.3	46.3	68.8	67.9	64.6	61.9	53.1	48.5	46.8	46.6	46.4	57.0	10.0	67.0
	2	58.6	70.3	47.9	70.0	69.5	66.5	63.7	55.1	50.6	48.5	48.2	48.0	58.6	10.0	68.6
	3	57.7	83.3	48.1	82.5	81.1	76.2	72.6	55.7	50.9	48.6	48.4	48.2	57.7	10.0	67.7
	4	62.2	72.6	52.6	72.3	71.7	69.5	67.7	60.7	56.1	53.2	53.0	52.7	62.2	10.0	72.2
	5	64.3	77.3	53.5	76.8	75.9	72.3	69.8	62.9	57.5	54.1	53.8	53.6	64.3	10.0	74.3
	6	64.4	75.1	53.8	74.8	74.3	72.0	70.1	64.9	58.7	54.4	54.1	53.9	64.4	10.0	74.4
	7	65.4	75.8	57.2	75.3	74.5	72.6	71.4	67.3	63.1	57.9	57.5	57.2	65.4	0.0	65.4
Day	8	64.6	84.8	49.0	84.1	82.8	77.8	73.3	65.5	59.1	50.4	49.7	49.2	64.6	0.0	64.6
	9	64.4	77.9	47.0	77.4	76.0	72.3	70.0	65.2	58.6	48.6	47.8	47.2	64.4	0.0	64.4
	10	63.0	74.0	46.0	73.6	72.6	70.1	68.4	62.8	54.7	47.2	46.6	46.2	63.0	0.0	63.0
	11	63.7	73.6	47.3	73.3	72.6	70.2	68.7	64.3	58.7	49.0	48.0	47.4	63.7	0.0	63.7
	12	63.4	73.2	47.9	72.7	72.0	69.7	68.3	64.2	58.6	49.7	48.7	48.0	63.4	0.0	63.4
	13	67.0	79.5	50.7	79.1	78.3	73.9	70.3	65.4	60.7	52.4	51.5	50.8	67.0	0.0	67.0
	14	64.1	73.3	50.1	73.0	72.5	70.6	69.1	65.0	59.2	51.6	50.8	50.2	64.1	0.0	64.1
	15	65.4	73.5	53.5	73.2	72.6	71.1	70.2	66.7	62.1	55.7	54.7	53.7	65.4	0.0	65.4
	16	66.0	74.5	53.3	74.2	73.6	71.6	70.5	67.3	62.7	55.0	54.1	53.5	66.0	0.0	66.0
	17	66.9	76.6	54.2	76.2	75.3	72.8	71.5	68.1	63.4	55.9	55.0	54.3	66.9	0.0	66.9
	18	66.6	78.1	53.6	77.4	76.4	74.7	72.8	68.3	63.2	55.3	54.4	53.7	66.6	0.0	66.6
	19	66.7	83.2	52.9	82.5	81.0	76.5	74.1	67.4	61.4	54.1	53.6	53.0	66.7	5.0	71.7
	20	65.4	74.4	53.6	74.1	73.5	71.6	70.4	66.6	60.8	54.7	54.2	53.7	65.4	5.0	70.4
	21	64.7	75.5	51.9	75.3	74.6	72.2	70.5	65.0	59.0	53.3	52.6	52.1	64.7	5.0	69.7
Night	22	62.7	73.2	48.4	72.9	72.3	70.1	68.6	61.6	54.4	49.5	48.9	48.5	62.7	10.0	72.7
	23	61.1	72.5	47.0	72.2	71.6	68.8	66.7	58.8	52.2	48.0	47.6	47.1	61.1	10.0	71.1

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	63.0	73.2	46.0	72.7	72.0	69.7	68.3	62.8	54.7	47.2	46.6	46.2
	Max	67.0	84.8	54.2	84.1	82.8	77.8	74.1	68.3	63.4	55.9	55.0	54.3
Energy Average		65.3	Average:		76.2	75.3	72.5	70.6	65.8	60.2	52.3	51.5	50.9
Night	Min	57.0	69.3	45.8	68.8	67.9	64.6	61.9	53.1	48.5	46.6	46.3	46.0
	Max	65.4	83.3	57.2	82.5	81.1	76.2	72.6	67.3	63.1	57.9	57.5	57.2
Energy Average		62.2	Average:		73.8	73.1	70.1	67.8	59.6	54.2	50.8	50.4	50.1

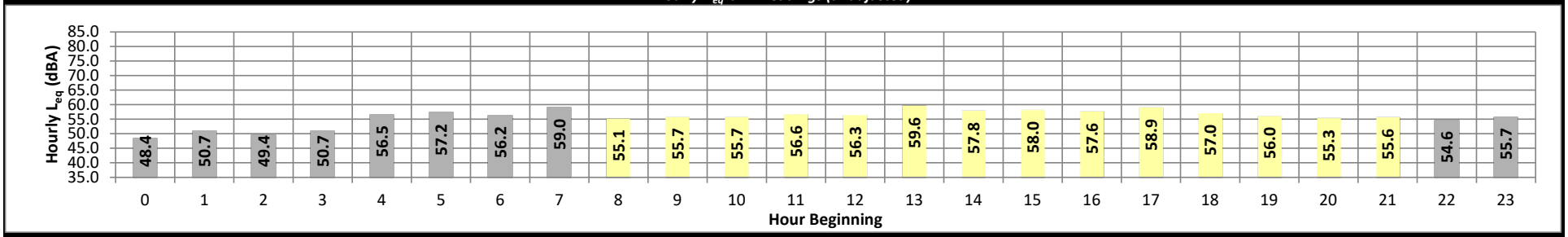
L_{eq} (dBA)		
24-Hour	*Daytime (8am-10pm)*	*Nighttime (10pm-8am)*
64.3	**65.3**	**62.2**

24-Hour Noise Level Measurement Summary

Date: Wednesday, June 2, 2021 | *Location:* L4 - Located west of the Project site near existing single-family residential home at 13360 Birchwood Drive. | *Meter:* Piccolo II | *JN:* 14173

Project: Cottonwood Village | *Source:* | *Analyst:* B. Lawson

Hourly L_{eq} dBA Readings (unadjusted)



Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%	L_{eq}	Adj.	Adj. L_{eq}
Night	0	48.4	55.5	44.4	54.9	54.3	53.1	52.1	48.6	47.0	45.1	44.8	44.5	48.4	10.0	58.4
	1	50.7	61.0	45.1	60.6	59.9	56.8	54.3	49.5	48.0	45.8	45.5	45.2	50.7	10.0	60.7
	2	49.4	53.5	46.5	53.2	52.9	52.4	51.9	50.2	48.8	47.1	46.9	46.6	49.4	10.0	59.4
	3	50.7	59.2	46.7	58.3	57.1	54.1	52.9	51.1	49.6	47.6	47.2	46.8	50.7	10.0	60.7
	4	56.5	67.5	51.0	67.1	66.0	62.3	59.9	54.8	53.2	51.6	51.3	51.1	56.5	10.0	66.5
	5	57.2	66.8	52.8	66.5	65.6	62.0	59.4	56.4	55.3	53.8	53.4	53.0	57.2	10.0	67.2
	6	56.2	66.7	50.8	66.3	65.4	62.5	60.2	54.5	53.1	51.5	51.3	50.9	56.2	10.0	66.2
	7	59.0	72.2	50.4	71.6	70.5	65.5	61.2	55.1	53.9	51.6	51.2	50.7	59.0	0.0	59.0
Day	8	55.1	65.0	48.6	64.6	63.8	61.1	58.4	54.2	52.9	50.2	49.7	49.0	55.1	0.0	55.1
	9	55.7	69.2	47.8	68.1	65.9	60.9	57.3	53.4	52.1	49.7	49.1	48.3	55.7	0.0	55.7
	10	55.7	67.1	48.6	66.6	65.5	61.5	58.7	53.9	52.4	50.3	49.8	49.0	55.7	0.0	55.7
	11	56.6	68.2	49.2	67.7	66.5	62.5	59.8	54.7	53.0	50.8	50.2	49.5	56.6	0.0	56.6
	12	56.3	68.7	48.8	68.0	66.7	62.0	58.1	54.4	53.0	50.5	49.9	49.2	56.3	0.0	56.3
	13	59.6	73.1	50.4	72.5	71.1	65.5	61.3	55.9	54.1	51.7	51.3	50.7	59.6	0.0	59.6
	14	57.8	69.4	51.1	68.8	67.5	62.8	60.4	56.6	54.9	52.4	52.0	51.4	57.8	0.0	57.8
	15	58.0	67.8	52.3	67.3	66.3	62.9	60.9	58.0	55.9	53.4	53.0	52.5	58.0	0.0	58.0
	16	57.6	66.7	52.0	66.3	65.5	62.4	60.5	57.6	55.6	53.2	52.7	52.2	57.6	0.0	57.6
	17	58.9	69.3	52.0	68.6	67.4	64.4	62.6	58.1	56.2	53.3	52.8	52.2	58.9	0.0	58.9
	18	57.0	66.2	50.8	65.8	65.0	62.3	60.3	56.9	54.9	52.2	51.7	51.1	57.0	0.0	57.0
	19	56.0	67.4	48.7	66.8	65.7	61.8	59.2	54.7	52.3	49.7	49.3	48.9	56.0	5.0	61.0
	20	55.3	65.6	49.2	65.1	64.1	60.3	57.9	54.9	52.9	50.2	49.8	49.3	55.3	5.0	60.3
	21	55.6	66.9	48.5	66.5	65.4	61.4	58.9	54.3	52.1	49.5	49.1	48.7	55.6	5.0	60.6
Night	22	54.6	67.2	45.8	66.7	65.8	61.6	57.8	51.4	49.0	46.5	46.2	45.9	54.6	10.0	64.6
	23	55.7	66.8	45.5	66.0	64.9	61.4	58.3	55.5	53.1	46.4	46.1	45.6	55.7	10.0	65.7

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	55.1	65.0	47.8	64.6	63.8	60.3	57.3	53.4	52.1	49.5	49.1	48.3
	Max	59.6	73.1	52.3	72.5	71.1	65.5	62.6	58.1	56.2	53.4	53.0	52.5
Energy Average		57.0	Average:		67.3	66.2	62.3	59.6	55.5	53.7	51.2	50.7	50.1
Night	Min	48.4	53.5	44.4	53.2	52.9	52.4	51.9	48.6	47.0	45.1	44.8	44.5
	Max	59.0	72.2	52.8	71.6	70.5	65.5	61.2	56.4	55.3	53.8	53.4	53.0
Energy Average		55.1	Average:		63.1	62.3	59.2	56.8	52.7	51.1	48.7	48.4	48.0

24-Hour	L_{eq} (dBA) Daytime (8am-10pm)	Nighttime (10pm-8am)
56.3	**57.2**	**55.1**

APPENDIX 7.1:

ON-SITE TRAFFIC NOISE LEVEL CALCULATIONS

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 10/1/2012

Scenario: Backyard With Wall
Road Name: Cottonwood Ave.
Lot No: Bldg_1

Project Name: Cottonwood Village
Job Number: 14173
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	30,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	3,000 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	50 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	61.0 feet
Centerline Dist. to Observer:	71.0 feet
Barrier Distance to Observer:	10.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	0.0%

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	73.6%	13.6%	10.2%	97.40%
Medium Trucks:	0.9%	0.0%	0.9%	1.84%
Heavy Trucks:	0.4%	0.0%	0.4%	0.74%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	66.641
Medium Trucks:	66.508
Heavy Trucks:	66.521

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	69.34	2.82	-1.97	-1.20	*-0.98*	0.000	0.000
Medium Trucks:	77.62	-14.42	-1.96	-1.20	*-1.15*	0.000	0.000
Heavy Trucks:	82.14	-18.37	-1.96	-1.20	*-1.60*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	69.0	66.9	65.6	59.5	68.0	68.6
Medium Trucks:	60.0	38.8	31.3	40.0	46.2	46.3
Heavy Trucks:	60.6	35.3	31.9	36.5	42.7	42.8
Vehicle Noise:	70.0	66.9	65.6	59.6	68.0	68.6

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	69.0	66.9	65.6	59.5	68.0	68.6
Medium Trucks:	60.0	38.8	31.3	40.0	46.2	46.3
Heavy Trucks:	60.6	35.3	31.9	36.5	42.7	42.8
Vehicle Noise:	70.0	66.9	65.6	59.6	68.0	68.6

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 10/1/2012

Scenario: Backyard With Wall
Road Name: Cottonwood Ave.
Lot No: Bldg_2, 3 & 4

Project Name: Cottonwood Village
Job Number: 14173
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	30,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	3,000 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	50 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	65.0 feet
Centerline Dist. to Observer:	75.0 feet
Barrier Distance to Observer:	10.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	0.0%

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	73.6%	13.6%	10.2%	97.40%
Medium Trucks:	0.9%	0.0%	0.9%	1.84%
Heavy Trucks:	0.4%	0.0%	0.4%	0.74%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	70.887
Medium Trucks:	70.762
Heavy Trucks:	70.775

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	69.34	2.82	-2.38	-1.20	*-0.99*	0.000	0.000
Medium Trucks:	77.62	-14.42	-2.37	-1.20	*-1.15*	0.000	0.000
Heavy Trucks:	82.14	-18.37	-2.37	-1.20	*-1.58*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	68.6	66.5	65.2	59.1	67.6	68.2
Medium Trucks:	59.6	38.4	30.9	39.6	45.8	45.8
Heavy Trucks:	60.2	34.8	31.5	36.1	42.3	42.4
Vehicle Noise:	69.6	66.5	65.2	59.2	67.6	68.2

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	68.6	66.5	65.2	59.1	67.6	68.2
Medium Trucks:	59.6	38.4	30.9	39.6	45.8	45.8
Heavy Trucks:	60.2	34.8	31.5	36.1	42.3	42.4
Vehicle Noise:	69.6	66.5	65.2	59.2	67.6	68.2

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 10/1/2012

Scenario: First Floor With Wall
Road Name: Cottonwood Ave.
Lot No: Bldg_1

Project Name: Cottonwood Village
Job Number: 14173
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	30,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	3,000 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	50 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	61.0 feet
Centerline Dist. to Observer:	70.0 feet
Barrier Distance to Observer:	9.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	0.0%

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	73.6%	13.6%	10.2%	97.40%
Medium Trucks:	0.9%	0.0%	0.9%	1.84%
Heavy Trucks:	0.4%	0.0%	0.4%	0.74%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	65.574
Medium Trucks:	65.439
Heavy Trucks:	65.453

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	69.34	2.82	-1.87	-1.20	*-1.09*	0.000	0.000
Medium Trucks:	77.62	-14.42	-1.86	-1.20	*-1.26*	0.000	0.000
Heavy Trucks:	82.14	-18.37	-1.86	-1.20	*-1.72*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	69.1	67.0	65.7	59.6	68.1	68.7
Medium Trucks:	60.1	38.9	31.4	40.1	46.3	46.4
Heavy Trucks:	60.7	35.4	32.0	36.6	42.8	42.9
Vehicle Noise:	70.1	67.0	65.7	59.7	68.1	68.7

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	69.1	67.0	65.7	59.6	68.1	68.7
Medium Trucks:	60.1	38.9	31.4	40.1	46.3	46.4
Heavy Trucks:	60.7	35.4	32.0	36.6	42.8	42.9
Vehicle Noise:	70.1	67.0	65.7	59.7	68.1	68.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 10/1/2012

Scenario: First Floor With Wall
Road Name: Cottonwood Ave.
Lot No: Bldg_2, 3 & 4

Project Name: Cottonwood Village
Job Number: 14173
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	30,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	3,000 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	50 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	65.0 feet
Centerline Dist. to Observer:	78.0 feet
Barrier Distance to Observer:	13.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	0.0%

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	73.6%	13.6%	10.2%	97.40%
Medium Trucks:	0.9%	0.0%	0.9%	1.84%
Heavy Trucks:	0.4%	0.0%	0.4%	0.74%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	74.054
Medium Trucks:	73.934
Heavy Trucks:	73.946

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	69.34	2.82	-2.66	-1.20	*-0.75*	0.000	0.000
Medium Trucks:	77.62	-14.42	-2.65	-1.20	*-0.90*	0.000	0.000
Heavy Trucks:	82.14	-18.37	-2.65	-1.20	*-1.33*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	68.3	66.2	64.9	58.9	67.3	67.9
Medium Trucks:	59.4	38.1	30.6	39.4	45.5	45.6
Heavy Trucks:	59.9	34.6	31.2	35.8	42.0	42.1
Vehicle Noise:	69.3	66.2	64.9	58.9	67.3	67.9

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	68.3	66.2	64.9	58.9	67.3	67.9
Medium Trucks:	59.4	38.1	30.6	39.4	45.5	45.6
Heavy Trucks:	59.9	34.6	31.2	35.8	42.0	42.1
Vehicle Noise:	69.3	66.2	64.9	58.9	67.3	67.9

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 10/1/2012

Scenario: Second Floor With Wall
Road Name: Cottonwood Ave.
Lot No: Bldg_1

Project Name: Cottonwood Village
Job Number: 14173
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	30,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	3,000 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	50 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	61.0 feet
Centerline Dist. to Observer:	70.0 feet
Barrier Distance to Observer:	9.0 feet
Observer Height (Above Pad):	14.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	0.0%

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	73.6%	13.6%	10.2%	97.40%
Medium Trucks:	0.9%	0.0%	0.9%	1.84%
Heavy Trucks:	0.4%	0.0%	0.4%	0.74%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	66.866
Medium Trucks:	66.423
Heavy Trucks:	65.658

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	69.34	2.82	-2.00	-1.20	*-6.12*	0.000	0.000
Medium Trucks:	77.62	-14.42	-1.95	-1.20	*-6.57*	0.000	0.000
Heavy Trucks:	82.14	-18.37	-1.88	-1.20	*-7.74*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	69.0	66.8	65.5	59.5	67.9	68.6
Medium Trucks:	60.1	38.8	31.3	40.1	46.2	46.3
Heavy Trucks:	60.7	35.3	31.9	36.6	42.8	42.9
Vehicle Noise:	70.0	66.9	65.5	59.6	68.0	68.6

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	69.0	66.8	65.5	59.5	67.9	68.6
Medium Trucks:	60.1	38.8	31.3	40.1	46.2	46.3
Heavy Trucks:	60.7	35.3	31.9	36.6	42.8	42.9
Vehicle Noise:	70.0	66.9	65.5	59.6	68.0	68.6

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 10/1/2012

Scenario: Second Floor With Wall
Road Name: Cottonwood Ave.
Lot No: Bldg_2, 3 & 4

Project Name: Cottonwood Village
Job Number: 14173
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	30,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	3,000 vehicles
Vehicle Speed:	45 mph
Near/Far Lane Distance:	50 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	65.0 feet
Centerline Dist. to Observer:	78.0 feet
Barrier Distance to Observer:	13.0 feet
Observer Height (Above Pad):	14.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	0.0%

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	73.6%	13.6%	10.2%	97.40%
Medium Trucks:	0.9%	0.0%	0.9%	1.84%
Heavy Trucks:	0.4%	0.0%	0.4%	0.74%

Noise Source Elevations (in feet)

Autos:	0.000		
Medium Trucks:	2.297		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	75.200
Medium Trucks:	74.806
Heavy Trucks:	74.128

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	69.34	2.82	-2.76	-1.20	*-4.75*	0.000	0.000
Medium Trucks:	77.62	-14.42	-2.73	-1.20	*-5.16*	0.000	0.000
Heavy Trucks:	82.14	-18.37	-2.67	-1.20	*-6.23*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	68.2	66.1	64.8	58.8	67.2	67.8
Medium Trucks:	59.3	38.0	30.5	39.3	45.4	45.5
Heavy Trucks:	59.9	34.5	31.1	35.8	42.0	42.1
Vehicle Noise:	69.3	66.1	64.8	58.8	67.2	67.8

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	68.2	66.1	64.8	58.8	67.2	67.8
Medium Trucks:	59.3	38.0	30.5	39.3	45.4	45.5
Heavy Trucks:	59.9	34.5	31.1	35.8	42.0	42.1
Vehicle Noise:	69.3	66.1	64.8	58.8	67.2	67.8

APPENDIX 9.1:

CADNAA OPERATIONAL NOISE MODEL INPUTS

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14173 - Cottonwood Village

CadnaA Noise Prediction Model: 14173-02_Construction.cna
Date: 22.06.21
Analyst: B. Lawson

Calculation Configuration

Configuration	
Parameter	Value
General	
Country	(user defined)
Max. Error (dB)	0.00
Max. Search Radius (#(Unit,LEN))	2000.01
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (#(Unit,LEN))	999.99
Min. Length of Section (#(Unit,LEN))	1.01
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	960.00
Reference Time Night (min)	480.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	5.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	2
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rvcr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Incl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (#(Unit,TEMP))	10
rel. Humidity (%)	70
Ground Absorption G	0.50
Wind Speed for Dir. (#(Unit,SPEED))	3.0
Roads (TNM)	
Railways (FTA/FRA)	
Aircraft (???)	
Strictly acc. to AzB	

Receiver Noise Levels

Name	M.	ID	Level Lr			Limit. Value			Land Use			Height		Coordinates		
			Day	Night	CNEL	Day	Night	CNEL	Type	Auto	Noise Type			X	Y	Z
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)				(ft)		(ft)	(ft)	(ft)
RECEIVERS		R1	78.2	78.2	84.9	60.0	55.0	0.0				5.00	a	6266202.70	2282099.15	5.00
RECEIVERS		R2	78.4	78.4	85.1	60.0	55.0	0.0				5.00	a	6266810.47	2281814.39	5.00
RECEIVERS		R3	71.8	71.8	78.5	60.0	55.0	0.0				5.00	a	6266347.79	2281355.12	5.00
RECEIVERS		R4	65.6	65.6	72.3	60.0	55.0	0.0				5.00	a	6265887.15	2281245.29	5.00
RECEIVERS		R5	77.7	77.7	84.4	60.0	55.0	0.0				5.00	a	6266128.98	2281886.90	5.00

Point Source(s)

Name	M.	ID	Result. PWL			Lw / Li			Operating Time			K0	Height	Coordinates		
			Day	Evening	Night	Type	Value	norm.	Day	Special	Night			X	Y	Z
			(dBA)	(dBA)	(dBA)			dB(A)	(min)	(min)	(min)	(dB)	(ft)	(ft)	(ft)	(ft)

Barrier(s)

Name	M.	ID	Absorption		Z-Ext.	Cantilever		Height				Coordinates			
			left	right		horz.	vert.	Begin		End		x	y	z	Ground
					(ft)	(ft)	(ft)	(ft)		(ft)		(ft)	(ft)	(ft)	(ft)
BARRIEREXISTING		0						0.00	a			6266801.92	2281920.51	0.00	0.00
												6266796.83	2281469.63	0.00	0.00
BARRIEREXISTING		0						0.00	a			6266774.53	2282087.70	0.00	0.00
												6266144.11	2282092.60	0.00	0.00
												6266138.88	2281639.13	0.00	0.00

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APPENDIX 10.1:

CADNAA CONSTRUCTION NOISE MODEL INPUTS

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14173 - Cottonwood Village

CadnaA Noise Prediction Model: 14173-02_Construction.cna
Date: 22.06.21
Analyst: B. Lawson

Calculation Configuration

Configuration	
Parameter	Value
General	
Country	(user defined)
Max. Error (dB)	0.00
Max. Search Radius (#(Unit,LEN))	2000.01
Min. Dist Src to Rcvr	0.00
Partition	
Raster Factor	0.50
Max. Length of Section (#(Unit,LEN))	999.99
Min. Length of Section (#(Unit,LEN))	1.01
Min. Length of Section (%)	0.00
Proj. Line Sources	On
Proj. Area Sources	On
Ref. Time	
Reference Time Day (min)	960.00
Reference Time Night (min)	480.00
Daytime Penalty (dB)	0.00
Recr. Time Penalty (dB)	5.00
Night-time Penalty (dB)	10.00
DTM	
Standard Height (m)	0.00
Model of Terrain	Triangulation
Reflection	
max. Order of Reflection	2
Search Radius Src	100.00
Search Radius Rcvr	100.00
Max. Distance Source - Rcvr	1000.00 1000.00
Min. Distance Rvcr - Reflector	1.00 1.00
Min. Distance Source - Reflector	0.10
Industrial (ISO 9613)	
Lateral Diffraction	some Obj
Obst. within Area Src do not shield	On
Screening	Incl. Ground Att. over Barrier
	Dz with limit (20/25)
Barrier Coefficients C1,2,3	3.0 20.0 0.0
Temperature (#(Unit,TEMP))	10
rel. Humidity (%)	70
Ground Absorption G	0.50
Wind Speed for Dir. (#(Unit,SPEED))	3.0
Roads (TNM)	
Railways (FTA/FRA)	
Aircraft (???)	
Strictly acc. to AzB	

Receiver Noise Levels

Name	M.	ID	Level Lr			Limit. Value			Land Use			Height		Coordinates		
			Day	Night	CNEL	Day	Night	CNEL	Type	Auto	Noise Type			X	Y	Z
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)				(ft)		(ft)	(ft)	(ft)
RECEIVERS		R1	78.2	78.2	84.9	60.0	55.0	0.0				5.00	a	6266202.70	2282099.15	5.00
RECEIVERS		R2	78.4	78.4	85.1	60.0	55.0	0.0				5.00	a	6266810.47	2281814.39	5.00
RECEIVERS		R3	71.8	71.8	78.5	60.0	55.0	0.0				5.00	a	6266347.79	2281355.12	5.00
RECEIVERS		R4	65.6	65.6	72.3	60.0	55.0	0.0				5.00	a	6265887.15	2281245.29	5.00
RECEIVERS		R5	77.7	77.7	84.4	60.0	55.0	0.0				5.00	a	6266128.98	2281886.90	5.00

Point Source(s)

Name	M.	ID	Result. PWL			Lw / Li			Operating Time			K0	Height	Coordinates		
			Day	Evening	Night	Type	Value	norm.	Day	Special	Night			X	Y	Z
			(dBA)	(dBA)	(dBA)			dB(A)	(min)	(min)	(min)	(dB)	(ft)	(ft)	(ft)	(ft)

Barrier(s)

Name	M.	ID	Absorption		Z-Ext.	Cantilever		Height				Coordinates			
			left	right		horz.	vert.	Begin		End		x	y	z	Ground
					(ft)	(ft)	(ft)	(ft)		(ft)		(ft)	(ft)	(ft)	(ft)
BARRIEREXISTING		0						0.00	a			6266801.92	2281920.51	0.00	0.00
												6266796.83	2281469.63	0.00	0.00
BARRIEREXISTING		0						0.00	a			6266774.53	2282087.70	0.00	0.00
												6266144.11	2282092.60	0.00	0.00
												6266138.88	2281639.13	0.00	0.00

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