Mountain View Affordable Housing Community

NOISE IMPACT ANALYSIS

CITY OF LAKE FOREST

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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
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HUD	Department of Housing and Urban Development
INCE	Institute of Noise Control Engineering
L_{eq}	Equivalent continuous (average) sound level
L_{max}	Maximum level measured over the time interval
L_{min}	Minimum level measured over the time interval
mph	Miles per hour
PPV	Peak Particle Velocity
Project	Mountain View Affordable Housing Community
REMEL	Reference Energy Mean Emission Level
RMS	Root-mean-square
VdB	Vibration Decibels

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this Noise Impact Analysis to determine the potential impacts and the necessary mitigation measures for the proposed Mountain View Affordable Housing Community development ("Project"). The Project site is located at 24551 Raymond Way in the City of Lake Forest. The Project proposes the development of a 71-unit affordable housing apartment building, with 12 of the 71 units (approximately 15%) being developed as Permanent Supportive Housing (PSH) units (PSH units serve people who are homeless or at risk of homelessness). The project will replace an existing office building on 1.95 acres. This study has been prepared consistent with applicable City of Lake Forest noise standards to address Appendix G of the California Environmental Quality Act (CEQA) Guidelines (1) consistent with the City of Lake Forest CEQA Significance Thresholds Guide (1) as well as The Noise Guidebook, prepared by the Department of Housing and Urban Development (HUD). (3)

ON-SITE TRAFFIC NOISE ANALYSIS

A noise impact analysis has been completed to determine the future noise levels 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 traffic noise affecting the Project site is anticipated to be from Packer Place and Raymond Way. The Project will also experience some background traffic noise impacts from other local streets, however, traffic noise from these roadways will not expected to make a significant contribution to the noise environment.

EXTERIOR NOISE LEVELS

The future exterior traffic noise levels are shown to range from 63.2 to 65.0 dBA CNEL at the residential building facades for units facing Parker Place Raymond Way and El Toro Road. Therefore, no exterior noise mitigation measures are required to satisfy the HUD Acceptable noise level of not exceeding 65 dB at the proposed housing and City of Lake Forest 65 dBA CNEL exterior noise level standards for the residential land use and the on-site traffic noise impacts are considered *less than significant*.

INTERIOR NOISE LEVELS

This noise analysis evaluates the interior noise levels at the Project buildings based on the City of Lake Forest and HUD 45 dBA CNEL interior noise level standards. The Project buildings are shown to require a Noise Reduction (NR) of up to 20.0 dBA and a windows-closed condition requiring a means of mechanical ventilation (e.g. air conditioning). With the following standard building construction noise reduction measures, the Project will satisfy the interior noise level standards:

- Windows/Sliding Glass Doors: All units require windows and sliding glass doors that have well-fitted, well-weather-stripped assemblies, and minimum sound transmission class (STC) ratings of 27.
- Exterior Doors (Non-Glass): All exterior doors shall be well weather-stripped and have well-sealed perimeter gaps to achieve minimum sound transmission class (STC) ratings of 27. (3)

- Exterior Walls: At any penetrations of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar to form an airtight seal.
- Roof: Roof sheathing of wood construction shall be per manufacturer's specification or caulked plywood of at least one-half inch thick. Ceilings shall be per manufacturer's specification or well-sealed gypsum board of at least one-half inch thick. Insulation with at least a rating of R-19 shall be used in the attic space.
- Ventilation: Arrangements for any habitable room shall be such that any exterior door or window can be kept closed when the room is in use and still receive circulated air. A forced air circulation system (e.g. air conditioning) or active ventilation system (e.g. fresh air supply) shall be provided which satisfies the requirements of the Uniform Building Code.

OPERATIONAL NOISE ANALYSIS

Using reference noise levels to represent the expected noise sources from the Mountain View Affordable Housing Community site, this analysis estimates the Project-related stationary-source noise levels at nearby off-site sensitive receiver locations. The normal activities associated with the proposed Mountain View Affordable Housing Community are anticipated to include a tot lot playground, community lounge and fireplace, outdoor kitchen with BBQ, trash enclosure and roof-top air conditioning units. The operational noise analysis shows that the Project-related stationary-source noise levels at the nearby sensitive receiver locations will satisfy the City of Lake Forest exterior noise level standards. Therefore, the operational noise level impacts associated with the proposed Project activities, such as the tot lot playground, community lounge and fireplace, outdoor kitchen with BBQ, trash enclosure and roof-top air conditioning units, are considered *less than significant*.

CONSTRUCTION NOISE ANALYSIS

Construction-related noise impacts are expected to create short-term and intermittent high-level noise conditions at receivers surrounding the Project site when certain activities occur at the closest point to the nearby receiver locations from primary Project construction activity. Using sample reference noise levels to represent the planned construction activities of the Mountain View Affordable Housing Community site, this analysis estimates the Project-related construction noise levels at nearby sensitive receiver locations. Since the City of Lake Forest General Plan, Municipal Code, and *CEQA Significance Thresholds Guide* do not identify specific construction noise level thresholds, a threshold is identified based on the National Institute for Occupational Safety and Health (NIOSH) limits for construction noise. The results of the analysis show that the Project-related short-term construction noise levels are expected to range from 56.2 to 73.7 dBA L_{eq} and will satisfy the 85 dBA L_{eq} threshold identified by NIOSH at all receiver locations.

CONSTRUCTION VIBRATION ANALYSIS

At distances ranging from 67 to 204 feet from primary Project construction activity area, construction vibration velocity levels are expected to range from 0.004 to 0.020 in/sec PPV. Based on the results of the analysis, the Project construction vibration levels will remain below

the Caltrans building damage threshold of 0.3 in/sec PPV and human annoyance threshold of 0.04 in/sec PPV at all receiver locations. The Project-related vibration impacts at the nearby sensitive receiver locations, therefore, represent a *less than significant* impact Project construction activities.

CONSTRUCTION NOISE AND VIBRATION BEST PRACTICES

Though construction noise and vibration are temporary, intermittent, will be short in duration, and will not present any long-term impacts, the following best practices, while not required, would further reduce noise and vibration levels produced by the construction equipment to the nearby sensitive residential land uses. The following best practices are consistent with measures identified in the *City of Lake Forest CEQA Significance Thresholds Guide*, as follows:

- *Use noise control devices such as equipment mufflers, enclosures, and barriers. Natural and artificial barriers such as ground elevation changes and existing buildings can shield construction noise. Stage construction operations as far from noise sensitive uses as possible.*
- *Avoid residential areas when planning haul truck routes.*
- *Maintain all sound-reducing devices and restrictions throughout the construction period.*
- *Change the timing and/or sequence of the noisiest construction operations to avoid sensitive times of day.*

SUMMARY OF CEQA SIGNIFICANCE FINDINGS

The results of this Mountain View Affordable Housing Community 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. (2) 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 described below.

TABLE ES-1: SUMMARY OF CEQA SIGNIFICANCE FINDINGS

Analysis	Report Section	Significance Findings	
		Unmitigated	Mitigated
On-Site Traffic Noise Levels	8	*Less Than Significant*	*n/a*
Operational Noise Levels	10	*Less Than Significant*	*n/a*
Construction Noise Levels	11	*Less Than Significant*	*n/a*
Construction Vibration Levels		*Less Than Significant*	*n/a*

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1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed Mountain View Affordable Housing Community ("Project"). This report briefly describes the proposed Project, provides information regarding noise fundamentals, describes the local regulatory setting, provides the study methods and procedures for transportation noise analysis, and evaluates the future exterior noise environment. In addition, this study includes an analysis of the potential Project-related long-term operational noise and short-term construction noise and vibration impacts.

1.1 SITE LOCATION

The proposed Mountain View Affordable Housing Community Project is located at 24551 Raymond Way in the City of Lake Forest as shown on Exhibit 1-A. The Project site is currently occupied by the Mountain View Business Center. Existing residential uses are located west and north of the Project site, with office and commercial retail uses located east and south of the Project site.

1.2 PROJECT DESCRIPTION

As indicated on Exhibit 1-B, the Project proposes the development of a 71-unit affordable housing apartment building, with 12 of the 71 units (approximately 15%) being developed as Permanent Supportive Housing (PSH) units (PSH units serve people who are homeless or at risk of homelessness). The project will replace an existing office building on 1.95 acres. The on-site Project-only operational noise sources are expected to include: tot lot playground, community lounge and fireplace, outdoor kitchen with BBQ, trash enclosure and roof-top air conditioning units.

EXHIBIT 1-A: LOCATION MAP

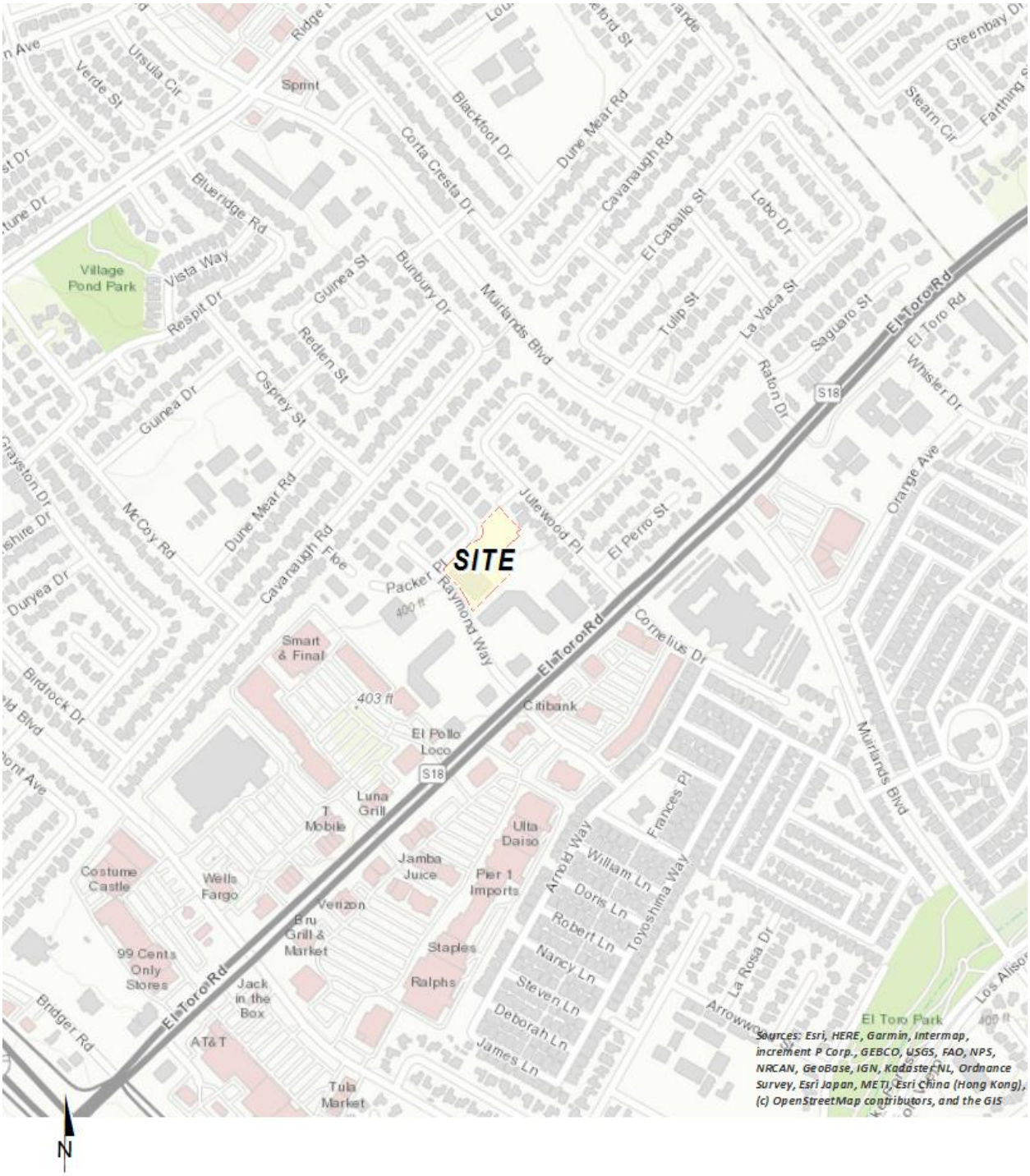
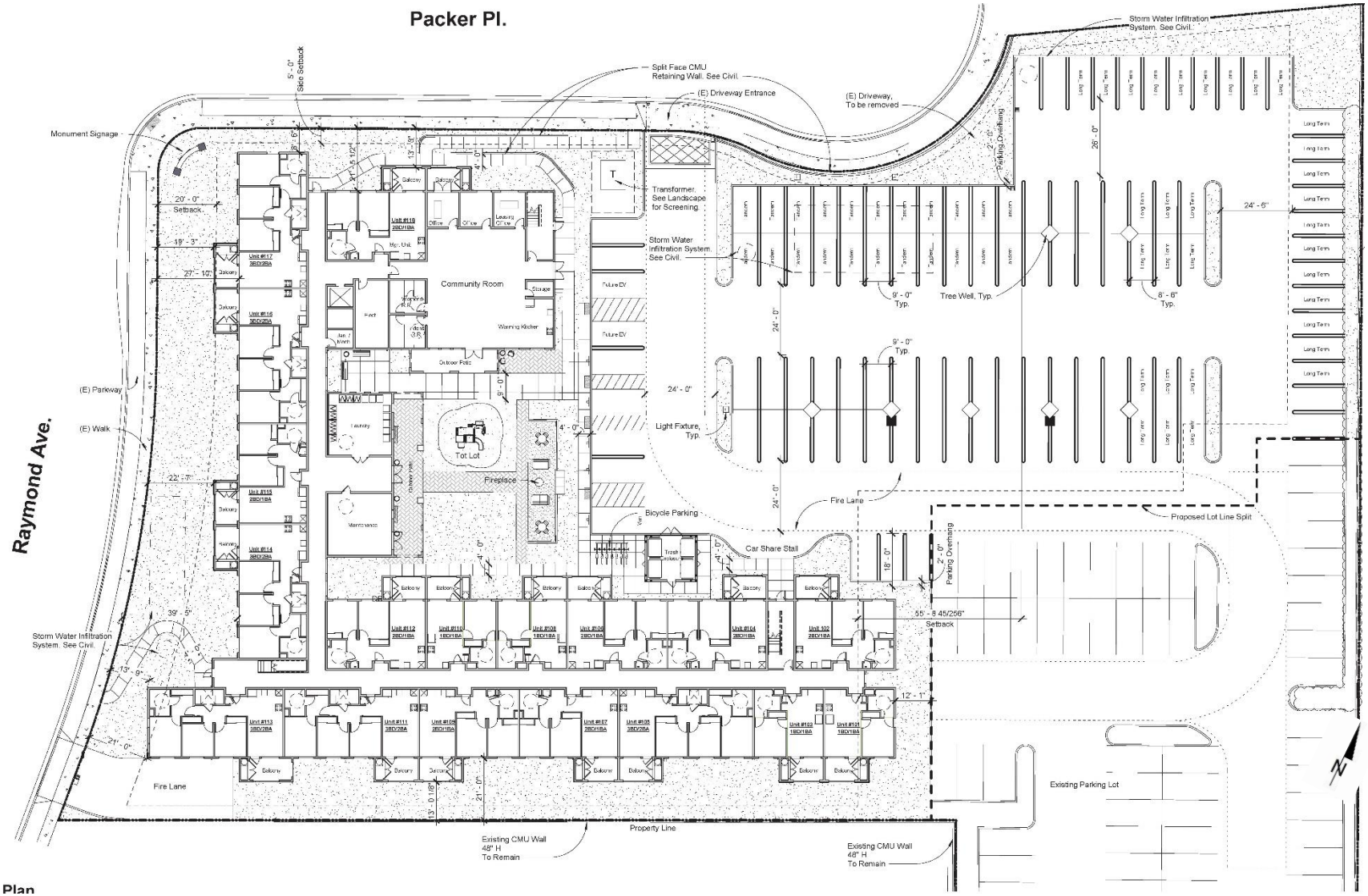


EXHIBIT 1-B: SITE PLAN



ite Plan

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2 FUNDAMENTALS

Noise has been 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		

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. (4) 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. (5) 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 commonly 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 and is commonly used to describe the "average" noise levels within the environment.

To describe the time-varying character of environmental noise, the statistical or percentile noise descriptors L_{50}, L_{25}, L_8 and L_2, are commonly used. The percentile noise descriptors are the noise levels equaled or exceeded during 50 percent, 25 percent, 8 percent and 2 percent of a stated time. Sound levels associated with the L_2 and L_8 typically describe transient or short-term events, while levels associated with the L_{50} describe the steady state (or median) noise conditions. The City of Lake Forest relies on the percentile noise levels to describe the stationary source noise level limits. While the L_{50} describes the noise levels occurring 50 percent of the time, the L_{eq} accounts for the total energy (average) observed for the entire hour. Therefore, the L_{eq} noise descriptor is generally 1-2 dBA higher than the L_{50} noise level.

Peak hour or average 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 Lake Forest and HUD 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. 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. (4)

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. (6)

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. (4)

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 resident. 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 FHWA does not consider the planting of vegetation to be a noise abatement measure. (6)

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. (6)

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. (7)

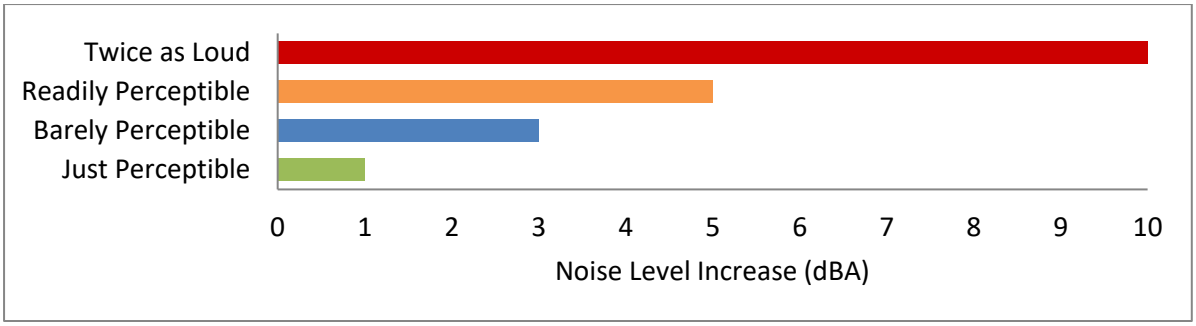
2.7 COMMUNITY RESPONSE TO NOISE

Community responses to noise may range from registering a complaint by telephone or letter, to initiating court action, 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. Another 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. (8) 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. (8) 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. An increase or decrease of 1 dBA cannot be perceived except in carefully controlled laboratory experiments (4), a change of 3 dBA are considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (6)

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



2.8 EXPOSURE TO HIGH NOISE LEVELS

The Occupational Safety and Health Administration (OSHA) sets legal limits on noise exposure in the workplace. The permissible exposure limit (PEL) for a worker over an eight-hour day is 90 dBA. The OSHA standard uses a 5 dBA exchange rate. This means that when the noise level is increased by 5 dBA, the amount of time a person can be exposed to a certain noise level to receive the same dose is cut in half. The National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise induced hearing loss. NIOSH also recommends a 3 dBA exchange rate so that every increase by 3 dBA doubles the amount of the noise and halves the recommended amount of exposure time. (9)

OSHA has implemented requirements to protect all workers in general industry (e.g. the manufacturing and the service sectors) for employers to implement a Hearing Conservation Program where workers are exposed to a time weighted average noise level of 85 dBA or higher over an eight-hour work shift. Hearing Conservation Programs require employers to measure noise levels, provide free annual hearing exams and free hearing protection, provide training, and conduct evaluations of the adequacy of the hearing protectors in use unless changes to tools, equipment and schedules are made so that they are less noisy and worker exposure to noise is less than the 85 dBA. This noise study does not evaluate the noise exposure of workers within a project or construction site based on CEQA requirements, and instead, evaluates Project-related operational and construction noise levels at the nearby sensitive receiver locations in the Project study area.

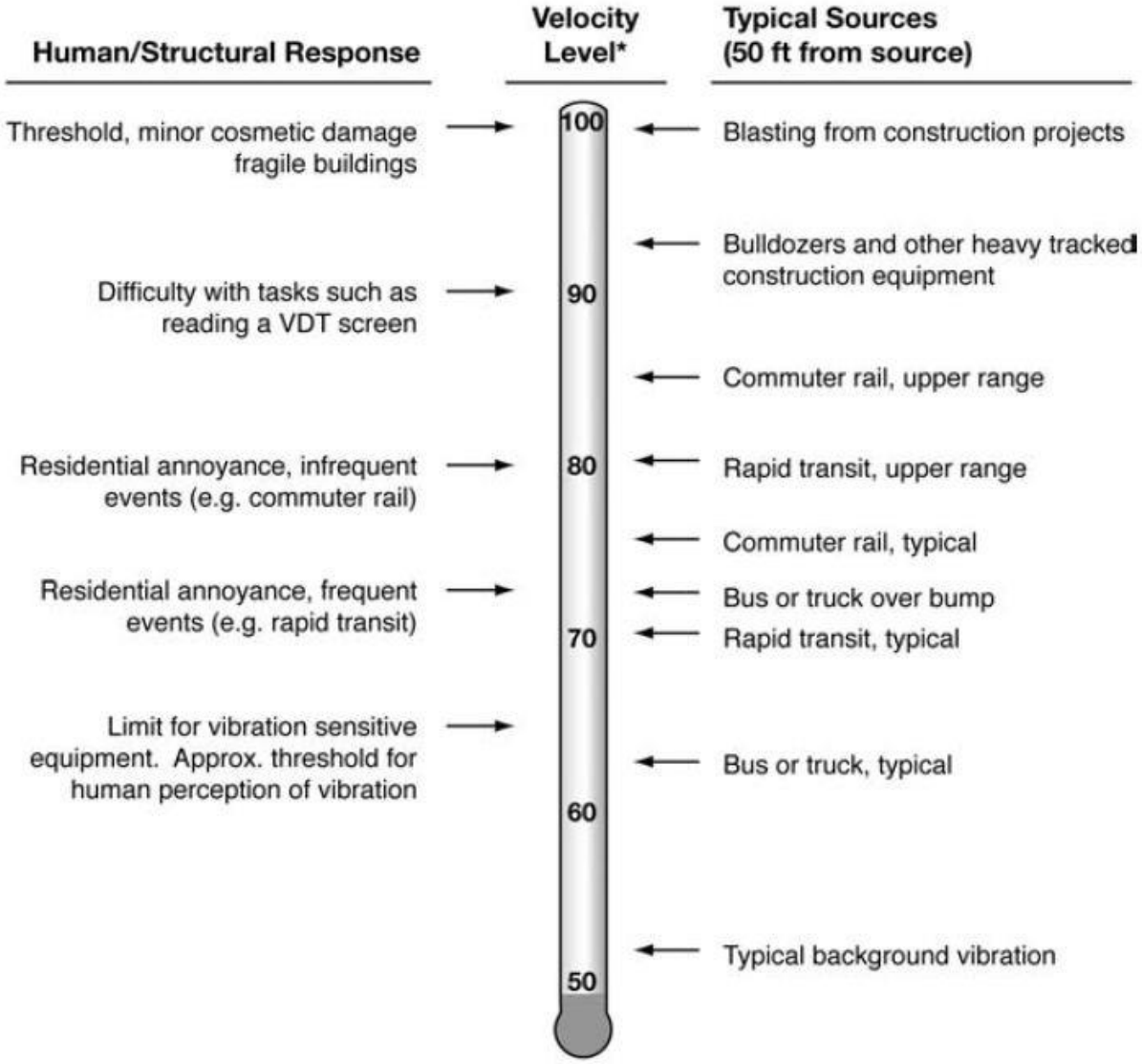
2.9 VIBRATION

Per the Federal Transit Administration (FTA) *Transit Noise Impact and Vibration Assessment* (10), 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), 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 Impact and Vibration Assessment.

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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 DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT STANDARDS

The Department of Housing and Urban Development (HUD) noise standards are used in this report to evaluate Project compliance with exterior and interior noise level standards as a requirement of Project financing. The Code of Federal Regulation (CFR) identifies *Environmental Criteria and Standards* in Section 24 CFR Part 51. (9) Section 51.101(a)(8) identifies the exterior noise goal of 65 dBA CNEL or below for new developments, and an interior noise level goal of 45 dBA CNEL in Section 51.101(a)(9). Further, Section 51.103(c) includes the *Site Acceptability Standards* consistent with the exterior and interior noise goals which are used in this analysis.

Based on the residential land use noise criteria and the HUD transportation noise standards, this noise study has been prepared to satisfy an exterior noise level of less than 65 dBA CNEL and an interior noise level of less than 45 dBA CNEL. The 65 dBA CNEL exterior noise standards typically apply to outdoor areas where people congregate. In the case of residential projects, the standards typically apply to private yards of single-family homes and first floor patio areas for multi-family units. Appendix 3.1 includes the HUD noise standards used in this report.

3.2 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. (11) 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. The State of California's noise insulation standards are codified in the California Code of Regulations, Title 24, Building Standards Administrative Code, Part 2, and the California Building Code. These noise standards are applied to new construction in California for the purpose of controlling interior noise levels resulting from exterior noise sources. The regulations specify that acoustical studies must be prepared when noise-sensitive structures, such as residential buildings, schools, or hospitals, are developed near major transportation noise sources, and where such noise sources create an exterior noise level of 60 dBA CNEL or higher.

Acoustical studies that accompany building plans for noise-sensitive land uses must demonstrate that the structure has been designed to limit interior noise in habitable rooms to acceptable noise levels. For new residential buildings, schools, and hospitals, the acceptable interior noise limit for new construction is 45 dBA CNEL.

3.3 CITY OF LAKE FOREST GENERAL PLAN SAFETY AND NOISE ELEMENT

The City of Lake Forest has adopted a Safety and Noise Element of the General Plan to address public safety and quality of life issues. (12) The Safety and Noise Element specifies the maximum exterior and interior noise levels for new developments impacted by transportation noise sources such as arterial roads, freeways, airports, and railroads. In addition, the Safety and Noise Element identifies noise standards designed to protect, create, and maintain an environment free from noise that may jeopardize the health or welfare of sensitive receivers, or degrade quality of life.

3.3.1 LAND USE COMPATIBILITY

The noise criteria identified in the City of Lake Forest Safety and Noise Element are guidelines to evaluate the land use compatibility of transportation related noise. The land use compatibility criteria, shown on Exhibit 3-A, provides the City with a planning tool to gauge the compatibility of land uses relative to existing and future exterior noise levels. The *Noise/Land Use Noise Compatibility Matrix* (Table SN-3) in the City of Lake Forest General Plan provides guidelines to evaluate the acceptability of transportation related noise level impacts.

These guidelines are based on the Governor's Office of Planning and Research and are used to assess the long-term traffic noise impacts on land uses. Noise-sensitive land uses such as single-family residential homes and schools are considered *normally acceptable* with exterior noise levels below 60 dBA CNEL and *conditionally acceptable* with noise levels below 65 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 are included in the design*. (12)

EXHIBIT 3-A: NOISE/LAND USE NOISE COMPATIBILITY MATRIX

Land Use Categories	Community Noise Equivalent Level (CNEL)						
	55	60	65	70	75	80	
Residential - Single Family, Multi-family, duplex	A	A	B	C	C		
Residential - Mobile Homes	A	A	B	C	C		
Transient Lodging - Motels, Hotels	A	A	B	B	C	C	
Schools, Libraries, Churches, Hospitals, Nursing/Convalescent Homes, Preschools, Day Care Centers(1)	A	A	B	C	C		
Auditoriums, Concert Halls, Amphitheaters, Meeting Halls	B	B	C	C			
Sports Arenas, Outdoor Spectator Sport, Amusement Parks	A	A	A	B	B		
Playgrounds, Neighborhood Parks	A	A	A	B	C		
Golf Courses, Riding Stables, Cemeteries	A	A	A	A	B	C	C
Office and Professional Buildings	A	A	A	B	B	C	
Commercial Retail, Banks, Restaurants, Theaters	A	A	A	A	B	B	C
Industrial, Manufacturing, Utilities, Wholesale, Service Stations	A	A	A	A	B	B	B
Agriculture	A	A	A	A	A	A	A

Zone A - Normally Acceptable

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

Zone B - Conditionally Acceptable

New construction or development should be undertaken only after detailed analysis of the noise reduction requirement is made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditionaing, will normally suffice.

Zone C - Normally Unacceptable

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Notes:

(1) Religious institutions (Churches, synagogues, temples and other places of worship) of a small size (occupancy of 100 persons or less) may occupy existing buildings within areas of exterior noise levels ranging from 65 to 75 dB CNEL without providing additional noise insulation for the building.

(2) Shaded areas indicate new construction or development should generally not be undertaken.

3.3.2 TRANSPORTATION NOISE STANDARDS

The City of Lake Forest has published the *CEQA Significance Thresholds Guide* that identifies exterior and interior noise level standards, as shown on Exhibit 3-B. (1) The City of Lake Forest General Plan and *CEQA Significance Thresholds Guide* provides specific noise level standards for all land use categories that are used to regulate transportation-related noise levels for noise sensitive uses.

EXHIBIT 3-B: INTERIOR AND EXTERIOR NOISE STANDARDS

Land Use Categories	Noise Standards[1]	
	Interior[2,3]	Exterior
Residential - Single Family, multi-family, duplex, mobile home	CNEL 45 dB	CNEL 65 dB[4]
Residential - Transient lodging, hotels, motels, nursing homes, hospitals	CNEL 45 dB	CNEL 65 dB[4]
Private offices, church sanctuaries, libraries, board rooms, conference rooms, theaters, auditoriums, concert halls, meeting halls, etc.	L_{eq}(12) 45 dB(A)[2,6]	-
Schools	L_{eq}(12) 45 dB(A)	CNEL 65 dB[5]
General offices, reception, clerical, etc.	L_{eq}(12) 50 dB(A)	-
Bank lobby, retail store, restaurant, typing pool, etc.	L_{eq}(12) 55 dB(A)	-
Manufacturing, kitchen, warehousing, etc.	L_{eq}(12) 65 dB(A)	-
Parks, playgrounds	-	CNEL 65 dB[5]
Golf courses, outdoor spectator sports, amusement parks	-	CNEL 70 dB[5]

[1] "CNEL" = Community Noise Equivalent Level; "L_{eq}(12)" = The A-weighted equivalent sound level averaged over a 12-hour period (usually the hours of operation).
[2] Noise standard with windows closed. Mechanical ventilation shall be provided per UBC requirements to provide a habitable environment.
[3] Indoor environment excluding bathrooms, toilets, closets, and corridors.
[4] Outdoor environment limited to rear yard of single-family homes, multi-family patios and balconies (with a depth of 6' or more) and common recreation areas.
[5] Outdoor environment limited to playground areas, picnic areas, and other areas of frequent human use.
[6] Religious institutions (Churches, temples, and other places of worship) of a small size (occupancy of 100 persons or less) may occupy existing buildings within areas of exterior noise levels ranging from 65 to 75 dB CNEL without providing additional noise insulation for the building.

For noise-sensitive land uses such as the residential homes of the Project, the Safety and Noise Element and *CEQA Significance Thresholds Guide* requires an exterior noise level not to exceed 65 dBA CNEL within outdoor living areas (e.g., rear yards, patios and balconies 6-feet or greater, or common recreation areas). Further, school uses within the proposed Project are required to comply with an exterior noise level of 65 dBA CNEL at outdoor environments (e.g., playground areas, picnic areas, and other areas of frequent human use). This approach is consistent with Tables SN-2 and SN-3 of the General Plan Safety and Noise Element and the *CEQA Significance Thresholds Guide*.

3.4 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from a designated fixed location or private property such as the Project, stationary-source (operational) noise such as the proposed tot lot playground, community lounge and fireplace, outdoor kitchen with BBQ, trash enclosure and roof-top air conditioning units are typically evaluated against standards established under a jurisdiction's Municipal Code.

The Project operational noise impacts are governed by the City of Lake Forest Municipal Code, Title 11 – *Peace and Safety*, Division II – *Offenses Against Public Peace*, Chapter 11.16 – *Noise Control*, included in Appendix 3.2. The Municipal Code indicates the *Noise Standards* outlined in Section 11.16.040(A) shall apply to all residential property. The *Noise Standards* limit the allowable exterior noise level to 55 dBA during the daytime hours (7:00 a.m. to 10:00 p.m.), and 50 dBA during the nighttime hours (10:00 p.m. to 7:00 a.m.), as shown on Table 3-1. (13) To assess the stationary noise sources in the Project study area, the Municipal Code, Sections 11.16.040(B)(1-5), identify percentile noise level standards. The percentile noise levels represent the noise level standard (as show on Table 3-1) for residential land use for a cumulative period of more than thirty minutes (L_{50}) in any hour. These standards shall not be exceeded for a cumulative period of 30 minutes (L_{50}), or the standard plus 5 dBA cannot be exceeded for a cumulative period of more than 15 minutes (L_{25}) in any hour, or the standard plus 10 dBA for a cumulative period of more than 5 minutes (L_8) in any hour, or the standard plus 15 dBA for a cumulative period of more than 1 minute (L_2) in any hour, or the standard plus 20 dBA at any time (L_{max}). (13) These standards are consistent with those identified for operational noise in the *CEQA Significance Thresholds Guide*.

TABLE 3-1: STATIONARY-SOURCE NOISE LEVEL STANDARDS

Land Use	Time Period	Maximum Permissible Exterior Noise Levels[2]				
		L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)
Residential[1]	Daytime (7:00 a.m. - 10:00 p.m.)	55	60	65	70	75
	Nighttime (10:00 p.m. - 7:00 a.m.)	50	55	60	65	70

[1] Source: Sections 11.16.040(A) & (B) of the City of Lake Forest Municipal Code.
[2] The percent noise level is the level exceeded "n" percent of the time during the measurement period. L_{25} is the noise level exceeded 25% of the time.

3.5 CONSTRUCTION NOISE STANDARDS

Noise from construction activities are typically limited to the hours of operation established under a City's Municipal Code. However, both the City of Lake Forest Municipal Code and *CEQA Significance Thresholds Guide* consider construction noise exempt from the Municipal Code stationary-source noise level standards (Section 11.16.060 of the Municipal Code), and do not establish a numeric maximum acceptable construction-source noise level threshold for potentially affected receivers, which would allow for a quantified determination of potential

impacts under CEQA. Therefore, the following construction noise level threshold is used in this noise study.

To evaluate whether the Project will generate potentially significant construction noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the *Criteria for Recommended Standard: Occupational Noise Exposure* prepared by the National Institute for Occupational Safety and Health (NIOSH). (14) 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 construction related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3 dBA increase, the exposure time is cut in half. This results in noise level thresholds of 88 dBA for more than four hours per day, 92 dBA for more than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. (14) For the purposes of this analysis, the lowest, more conservative construction noise level threshold of 85 dBA L_{eq} is used as an acceptable threshold for construction noise at the nearby sensitive receiver locations. Since this construction-related noise level threshold represents the energy average of the noise source over a given time, they are expressed as L_{eq} noise levels. Therefore, the noise level threshold of 85 dBA L_{eq} over a period of eight hours or more is used to evaluate the potential Project-related construction noise level impacts at the nearby sensitive receiver locations.

The 85 dBA L_{eq} threshold is also consistent with the FTA *Transit Noise and Vibration Impact Assessment* criteria for construction noise which identifies an hourly construction noise level threshold of 90 dBA L_{eq} during daytime hours, and 80 dBA L_{eq} during nighttime hours for construction for general assessment at noise-sensitive uses (e.g., residential, medical/hospital, school, etc.). (10) Detailed assessment, according to the FTA, identifies an 8-hour dBA L_{eq} noise level threshold specific to noise-sensitive uses of 80 dBA L_{eq}. Therefore, the Noise Study relies on the NIOSH 85 dBA L_{eq} threshold, consistent with FTA general and detailed assessment criteria for noise-sensitive uses and represents an appropriate threshold for construction noise analysis.

3.6 CONSTRUCTION VIBRATION STANDARDS

The City of Lake Forest General Plan and Municipal Code do not identify specific vibration level standards. Therefore, applicable vibration standards identified by the California Department of Transportation ("Caltrans") *Transportation and Construction Vibration Guidance Manual* are used in this report. (16) According to the Caltrans vibration manual, large bulldozers, and loaded trucks used during construction activities can produce vibration which can potentially cause annoyance at sensitive land uses within the Project study area, or damage to adjacent structures. The Caltrans vibration manual establishes thresholds for determining potential vibration impacts resulting in building damage for older residential structures of 0.3 in/sec PPV, and for human annoyance of 0.04 in/sec PPV. These Caltrans thresholds are used in this analysis to assess potential impacts at the adjacent sensitive uses to the Project site.

4 SIGNIFICANCE CRITERIA

The following significance criteria from California Environmental Quality Act (CEQA) and the Housing and Urban Development (HUD) have been used to assess the potential Project noise level impacts.

4.1 CEQA GUIDELINES

The following significance criteria are based on currently adopted guidance provided by Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (2) 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?

While HUD and the City of Lake Forest General Plan Guidelines provide direction on noise compatibility and establish noise standards by land use type that are sufficient to assess the significance of noise impacts, they do not define the levels at which increases are considered substantial for use under Guideline A. CEQA Appendix G Guideline C applies to nearby public and private airports, if any, and the Project's land use compatibility.

The closest airport to the Project site is John Wayne Airport which is located approximately 10 miles northwest of the Project site, and therefore, the Project site is not located within two miles of a public airport or within an airport land use plan; nor is the Project within the vicinity of a private airstrip. As such, the Project site would not be exposed to excessive noise levels from airport operations, and therefore, impacts are considered *less than significant,* and no further noise analysis is provided under Guideline C.

4.2 HUD GUIDELINES

The Housing and Urban Development (HUD) Builder's Certificate of Plan, Specifications, & Site details identify the following noise-related checklist items:

- Is the property located within 1000 feet of a highway, freeway or heavily traveled road?
- Is the property located within 3000 feet of a railroad?
- Is the property located within one mile of a civil airfield or 5 miles of a military airfield.

This Noise Impact Analysis describes the potential noise level impacts associated with the nearby roadways within 1000 feet of the Project site. This includes the El Toro Road, Packer Place and Raymond Way. The nearest rail line is located approximately 2,400 feet northeast of the Project site. However, the rail line is located below grade and there is substantial existing residential

development between the Project site and rail line. Therefore, since there is no direct line of sight to the rail line, the potential rail noise levels are considered *less than significant* and will be overshadowed by the traffic noise levels on nearby roads. The closest airport to the Project site is John Wayne Airport which is located approximately 10 miles northwest of the Project site, and therefore, the Project site is not located within one mile of a civil airfield or 5 miles of a military airfield. As such, the Project site would not be exposed to excessive noise levels from airport operations, and therefore, impacts are considered *less than significant*

4.3 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.

ON-SITE TRAFFIC NOISE

- If the on-site noise levels:
    - exceed the exterior noise level standard of 65 dBA CNEL for outdoor areas (e.g., rear yard of single-family homes, multi-family patios and balconies (with a depth of six feet or more), common recreation areas, playgrounds, or picnic areas); or
    - exceed an interior noise level of 45 dBA CNEL for noise-sensitive uses (HUD and City of Lake Forest CEQA Significance Thresholds Guide, Table 3-1).

OPERATIONAL NOISE

- If Project-related operational (stationary source) noise levels exceed the exterior 55 dBA L_{50} daytime or 50 dBA L_{50} nighttime noise level standards for sensitive land uses. These standards shall not be exceeded for a cumulative period of 30 minutes (L_{50}), or the standard plus 5 dBA cannot be exceeded for a cumulative period of more than 15 minutes (L_{25}) in any hour, or the standard plus 10 dBA for a cumulative period of more than 5 minutes (L_8) in any hour, or the standard plus 15 dBA for a cumulative period of more than 1 minute (L_2) in any hour, or the standard plus 20 dBA at any time (L_{max}) (Sections 11.16.040(A) & (B) of the City of Lake Forest Municipal Code, and Table 3-2 of the City of Lake Forest CEQA Significance Thresholds Guide).

CONSTRUCTION NOISE AND VIBRATION

- If Project-related construction activities create noise levels which exceed the 85 dBA L_{eq} acceptable noise level threshold at the nearby sensitive receiver locations (NIOSH, Criteria for Recommended Standard: Occupational Noise Exposure); or
- If Project-related construction activities generate vibration levels which exceed the Caltrans building damage vibration level threshold for older residential structures of 0.3 in/sec PPV, or the *distinctly perceptible* human annoyance vibration level threshold of 0.04 in/sec PPV at nearby sensitive receiver locations (Caltrans Transportation and Construction Vibration Guidance Manual, Tables 19 & 20).

TABLE 4-1: SIGNIFICANCE CRITERIA SUMMARY

Analysis	Receiving Land Use	Condition(s)	Significance Criteria	
			Daytime	Nighttime
On-Site Traffic Noise[1]	Residential & School	Exterior Noise Level Standard	65 dBA CNEL	
		Interior Noise Level Standard	45 dBA CNEL	
Operational Noise[1]	Noise-Sensitive	Exterior Noise Level Standards	See Table 3-1.	
Construction Noise & Vibration	Noise-Sensitive	Noise Level Threshold[2]	85 dBA L_{eq}	n/a
		Vibration Level Threshold (Building Damage)[3]	0.3 in/sec PPV	n/a
		Vibration Level Threshold (Distinctly Perceptible)[3]	0.04 in/sec PPV	n/a

[1] Source: HUD and the City of Lake Forest CEQA Thresholds Guide.
[2] Source: NIOSH, Criteria for Recommended Standard: Occupational Noise Exposure, June 1998.
[3] Source: Caltrans Transportation and Construction Vibration Guidance Manual, September 2013, Tables 19 & 20.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.; "n/a" = No nighttime construction activity is permitted, so no nighttime construction noise level limits are identified; "PPV" = peak particle velocity

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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 Monday, December 16th, 2019. 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 daytime and nighttime hourly noise levels and calculate the 24-hour CNEL. 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*. (4) 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*. (10)

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. (10) 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 average or equivalent 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 (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) noise levels at each noise level measurement location. Appendix 5.2 provides a summary of the existing hourly ambient noise levels described below:

- Location L1 represents the noise levels by the northern corner of the Project site near existing single-family residential homes. The noise levels at this location consist primarily of parking lot vehicle movements and traffic on Packer Place. The noise level measurements collected show an overall 24-hour exterior noise level of 59.0 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 54.0 dBA L_{eq} with an average nighttime noise level of 51.9 dBA L_{eq}.
- Location L2 represents the noise levels on east of the Project site near Montessori Children's School House. The noise levels at this location consist primarily of parking lot vehicle movements as well as activity from children playing at Montessori Children's School House. The noise level measurements collected show an overall 24-hour exterior noise level of 58.8 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 52.7 dBA L_{eq} with an average nighttime noise level of 52.0 dBA L_{eq}.
- Location L3 represents the noise levels west of the Project site near existing multi-family homes. The noise level measurements collected show an overall 24-hour exterior noise level of 62.5 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 57.8 dBA L_{eq} with an average nighttime noise level of 55.5 dBA L_{eq}. The noise levels at this location consist primarily of traffic noise from Packer Place.
- Location L4 represents the noise levels northwest of the Project site on Packer Place near existing multi-family residential homes. The 24-hour CNEL indicates that the overall exterior noise level is 58.0 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 54.6 dBA L_{eq} with an average nighttime noise level of 49.8 dBA L_{eq}. Traffic on Packer Place represents the primary source of noise at this location.

Table 5-1 provides the (energy average) noise levels used to describe the daytime and nighttime ambient conditions. These daytime and nighttime energy average noise levels represent the 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 hour as well as the minimum, maximum, L_1, L_2, L_5, L_8, L_{25}, L_{50}, L_{90}, L_{95}, and L_{99} percentile noise levels observed during the daytime and nighttime periods. The background ambient noise levels in the Project study area are dominated by the transportation-related noise associated with surface streets as well as parking lot vehicle movements from nearby businesses. This includes the auto and heavy truck activities on study area roadway segments near the noise level measurement locations. The 24-hour existing noise level measurement results are shown on Table 5-1.

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

Location[1]	Description	Energy Average Noise Level (dBA L_{eq})[2]		CNEL
		Daytime	Nighttime	
L1	Located by the northern corner of the Project site near existing single-family residential homes.	54.0	51.9	59.0
L2	Located east of the Project site near Montessori Children's School House.	52.7	52.0	58.8
L3	Located west of the Project site near existing multi-family homes.	57.8	55.5	62.5
L4	Located northwest of the Project site on Packer Place near existing multi-family residential homes.	54.6	49.8	58.0

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

EXHIBIT 5-A: NOISE MEASUREMENT LOCATIONS

6 METHODS AND PROCEDURES

The following section outlines the methods and procedures used to model and analyze the potential future Project-related impacts related to the future traffic noise environment.

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.

The on-site roadway parameters including the average daily traffic (ADT) volumes used for this study are presented on Table 6-1. Future traffic volumes on City of Lake Forest roadways were estimated based on General Plan Circulation Element roadway capacity volumes by classification. (19) Soft site conditions were used to analyze the traffic noise impacts within the Project study area which account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. Research by Caltrans shows 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 6-1: ON-SITE ROADWAY PARAMETERS

Roadway Segment	Lanes	Classification[1]	Future ADT Volume[2]	Speed (mph)	Site Conditions
Packer Pl.	2	Collector	10,000	40	Soft
Raymond Way	2	Collector	10,000	40	Soft
El Toro Road	8	Principal Arterial	70,000	40	Soft

[1] Road classifications based upon the City of Lake Forest General Plan Circulation Element, Figure C-1.
[2] Roadway volumes were estimated from the City of Lake Forest General Plan Circulation Element Representative Roadway Capacities.

Table 6-2 presents the time of day vehicle splits and Table 6-3 presents the traffic flow distributions (vehicle mix) used for this analysis. The vehicle mix provides the distribution percentages of automobile, medium trucks, and heavy trucks for input into the FHWA noise prediction model.

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] Source: Typical Southern California vehicle mix & County of Orange Land Use/Noise Compatibility Manual, December 1993. "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)

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

[1] Source: County of Orange Land Use/Noise Compatibility Manual, December 1993.

To predict the future noise environment at the Project site, coordinate information was collected to identify the noise transmission path between the noise source and the receiver. The coordinate information is based on the Project site plan and its relationship to the adjacent roadways. 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 receivers are placed five feet above the pad elevation in outdoor living areas or at the proposed building façade for first-floor exterior noise level analysis. Second-floor receivers are located at a height of 15 feet, third-floor receivers are located at a height of 25 feet and fourth-floor receivers are located a height of 35 feet.

6.4 CONSTRUCTION VIBRATION ASSESSMENT METHODOLOGY

This analysis focuses on the potential ground-borne vibration associated with vehicular traffic and construction activities. Ground-borne vibration levels from automobile traffic are generally overshadowed by vibration generated by heavy trucks that roll over the same uneven roadway surfaces. However, due to the rapid drop-off rate of ground-borne vibration and the short duration of the associated events, vehicular traffic-induced ground-borne vibration is rarely perceptible beyond the roadway right-of-way, and rarely results in vibration levels that cause damage to buildings in the vicinity.

While vehicular traffic is rarely perceptible, construction activity 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 6-4. Based on the reference vibration levels provided by the Federal Transit Administration (FTA) for various construction equipment types, it is possible to estimate the potential building damage and human response (annoyance) using the following vibration assessment methods defined by the FTA and Caltrans. To describe the potential vibration impacts, the following equation is used: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

TABLE 6-4: 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

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7 ON-SITE TRAFFIC NOISE IMPACTS

A noise impact analysis has been completed to determine the noise exposure levels that would result from adjacent and dominant traffic 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 traffic noise affecting the Project site is anticipated to be from Packer Place, Raymond Way and El Toro Road. The Project will also experience some background traffic noise impacts from other local streets, however traffic noise from these roadways is not expected to make a significant contribution to the noise environment.

7.1 EXTERIOR NOISE ANALYSIS

Using the FHWA traffic noise prediction model, and the parameters outlined in Section 6, the expected future exterior noise levels are calculated at the noise-sensitive residential uses within the Project site. Table 7-1 presents a summary of future exterior noise level impacts at the first, second, third and fourth floor building façade. The on-site traffic noise analysis calculations are provided in Appendix 7.1. The future unmitigated exterior traffic noise levels are shown to range from 58.9 to 65.0 dBA CNEL at the residential building facades for units facing Parker Place Raymond Way, and El Toro Road. Therefore, no exterior noise mitigation measures are required to satisfy HUD and the City of Lake Forest 65 dBA CNEL exterior noise level standards for the residential land use and the on-site traffic noise impacts are *less than significant*.

TABLE 7-1: UNMITIGATED EXTERIOR TRAFFIC NOISE LEVELS AT BUILDING FACADES

Unit	Roadway	Unmitigated Exterior Noise Level (dBA CNEL)[1]			
		1st Floor	2nd Floor	3rd Floor	4th Floor
118	Packer Pl.	65.0	64.9	64.5	64.0
116	Raymond Way	64.4	64.3	64.0	63.6
115	Raymond Way	64.0	63.9	63.6	63.2
101	El Toro Road	58.9	58.9	58.9	58.9

[1] Exterior noise calculations at the building façade are shown in Appendix 7.1.

7.2 INTERIOR NOISE ANALYSIS

To ensure that the interior noise levels comply with the interior noise level standards, future exterior noise levels were calculated at the first, second, third and fourth floor building façades where residential units are located.

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." (6) (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

Table 7-2 shows that the Project buildings will require a windows-closed condition and a means of mechanical ventilation (e.g. air conditioning). Table 7-2 shows that the future exterior noise levels at the building façades are expected to range from 58.9 to 65.0 dBA CNEL. The interior noise level analysis shows that the HUD and City of Lake Forest 45 dBA CNEL residential interior noise level standard can be satisfied using standard windows and sliding glass doors with minimum STC ratings of 27. The interior noise level assessment shows that interior noise levels will be *less than significant*.

TABLE 7-1: INTERIOR NOISE IMPACTS (CNEL)

Unit	Floor	Noise Level at Façade[1]	Required Interior NR[2]	Minimum Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold	Threshold Exceeded?
118	1	65.0	20.0	25	No	40.0	45	No
	2	64.9	19.9	25	No	39.9	45	No
	3	64.5	19.5	25	No	39.5	45	No
	4	64.0	19.0	25	No	39.0	45	No
116	1	64.4	19.4	25	No	39.4	45	No
	2	64.3	19.3	25	No	39.3	45	No
	3	64.0	19.0	25	No	39.0	45	No
	4	63.6	18.6	25	No	38.6	45	No
115	1	64.0	19.0	25	No	39.0	45	No
	2	63.9	18.9	25	No	38.9	45	No
	3	63.6	18.6	25	No	38.6	45	No
	4	63.2	18.2	25	No	38.2	45	No
101	1	58.9	13.9	25	No	33.9	45	No
	2	58.9	13.9	25	No	33.9	45	No
	3	58.9	13.9	25	No	33.9	45	No
	4	58.9	13.9	25	No	33.9	45	No

[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 standard for residential uses.
[3] Minimum interior noise reduction with standard building construction.
[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.
"NR" = Noise Reduction

8 RECEIVER LOCATIONS

To assess the potential for long-term operational and short-term construction noise impacts, the following receiver locations as shown on Exhibit 9-A were identified as representative locations for focused analysis based on the *City of Lake Forest CEQA Significance Thresholds Guide* which defines noise-sensitive uses as *residential (single-family, multi-family, mobile home); hotels; motels; nursing homes; hospitals; parks, playgrounds and recreation areas; and schools*. (1) 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.

Sensitive receivers near the Project site include existing nearby residential homes, as described below. Other sensitive land uses in the Project study area that are located at greater distances than those identified in this report will experience lower noise levels than those presented in this report due to the additional attenuation from distance and the shielding of intervening structures.

R1: Located approximately 22 feet from the Project site, R1 represents existing residential homes on Bendricon Lane. A 24-hour noise measurement was taken near this location, L1, to describe the existing ambient noise environment.

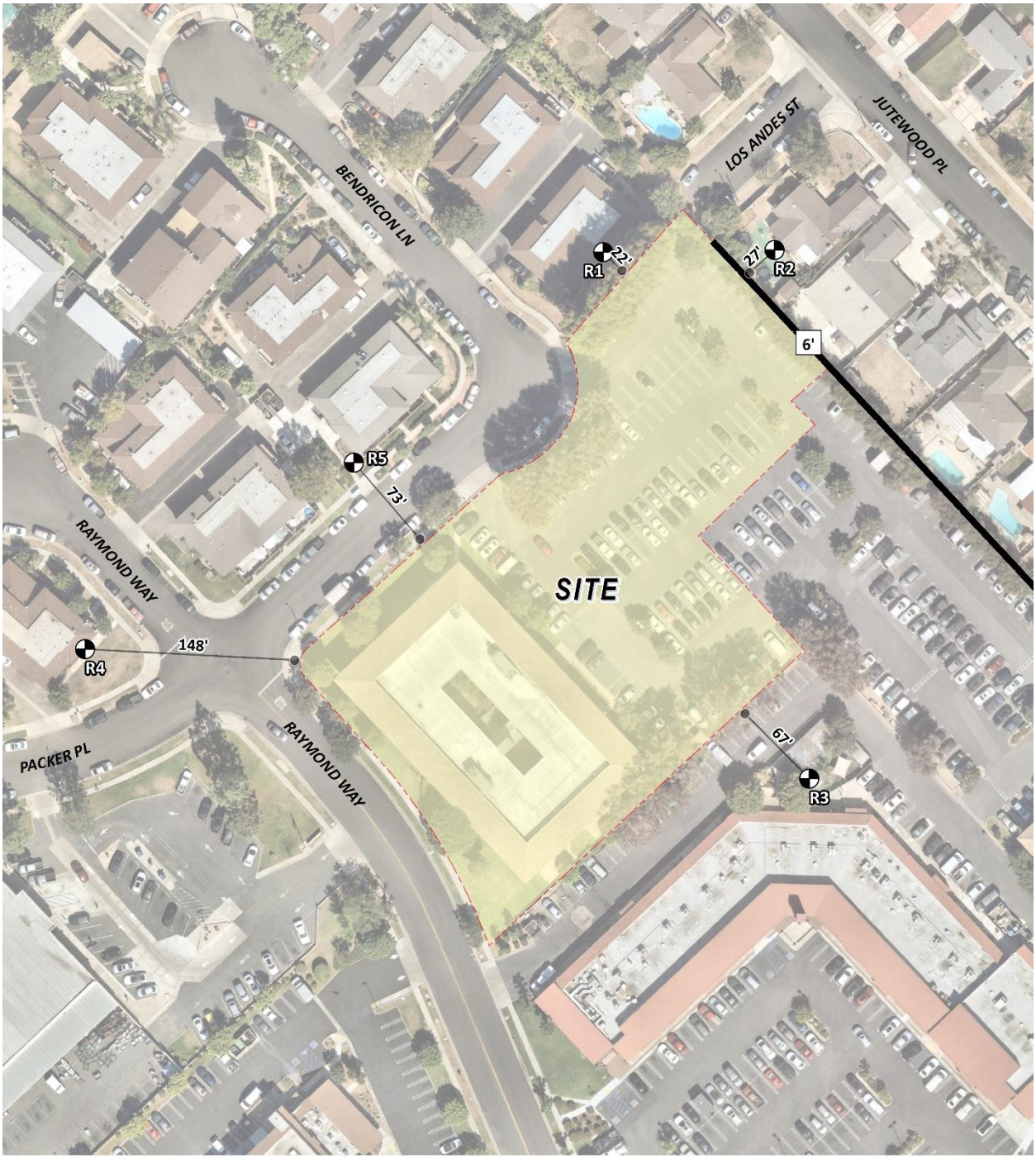
R2: Location R2 represents the existing residential homes located at 24592 Jutewood Place approximately 27 feet from the Project site boundary. A 24-hour noise measurement was taken near this location, L1, to describe the existing ambient noise environment.

R3: Location R3 represents the existing Montessori Children's School House east of Raymond Way approximately 67 feet from the Project site boundary. A 24-hour noise measurement near this location, L2, is used to describe the existing ambient noise environment.

R4: Location R4 represents the existing multi-family residential homes at 23421 Packer Place approximately 148 feet from 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 multi-family residential homes at 24532 Bendricon Lane approximately 73 feet from the Project site. A 24-hour noise measurement was taken near this location, L4, to describe the existing ambient noise environment.

EXHIBIT 8-A: RECEIVER LOCATIONS



9 OPERATIONAL NOISE IMPACTS

This section analyzes the potential stationary-source operational noise impacts at the nearby receiver locations, identified in Section 8, resulting from the operation of the proposed Mountain View Affordable Housing Community Project. Exhibit 9-A identifies the noise source locations used to assess the operational noise levels.

9.1 OPERATIONAL NOISE SOURCES

It is expected the on-site Project-related noise sources will include: tot lot playground, community lounge and fireplace, outdoor kitchen with BBQ, trash enclosure and roof-top air conditioning units. This noise analysis is intended to describe noise level impacts associated with the typical operational activities at the Project site.

9.2 REFERENCE NOISE LEVELS

To estimate the Project 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. This section provides a detailed description of the reference noise level measurements shown on Table 9-1 used to estimate the Project operational noise impacts. It is important to note that the following projected noise levels assume the worst-case noise environment with the tot lot playground, community lounge and fireplace, outdoor kitchen with BBQ, trash enclosure and roof-top air conditioning units all operating at the same time. These noise level impacts will likely vary throughout the day.

9.2.1 MEASUREMENT PROCEDURES

The reference noise level measurements presented in this section were collected using Larson Davis Lxt Type 1 and Piccolo Type 2 integrating sound level meters and dataloggers. All sound level meters were calibrated using a Larson-Davis calibrator, Model CAL 200, was programmed in "slow" mode to record noise levels in "A" weighted form and was located at approximately five feet above the ground elevation for each measurement. 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)

EXHIBIT 9-A: OPERATIONAL NOISE SOURCE LOCATIONS

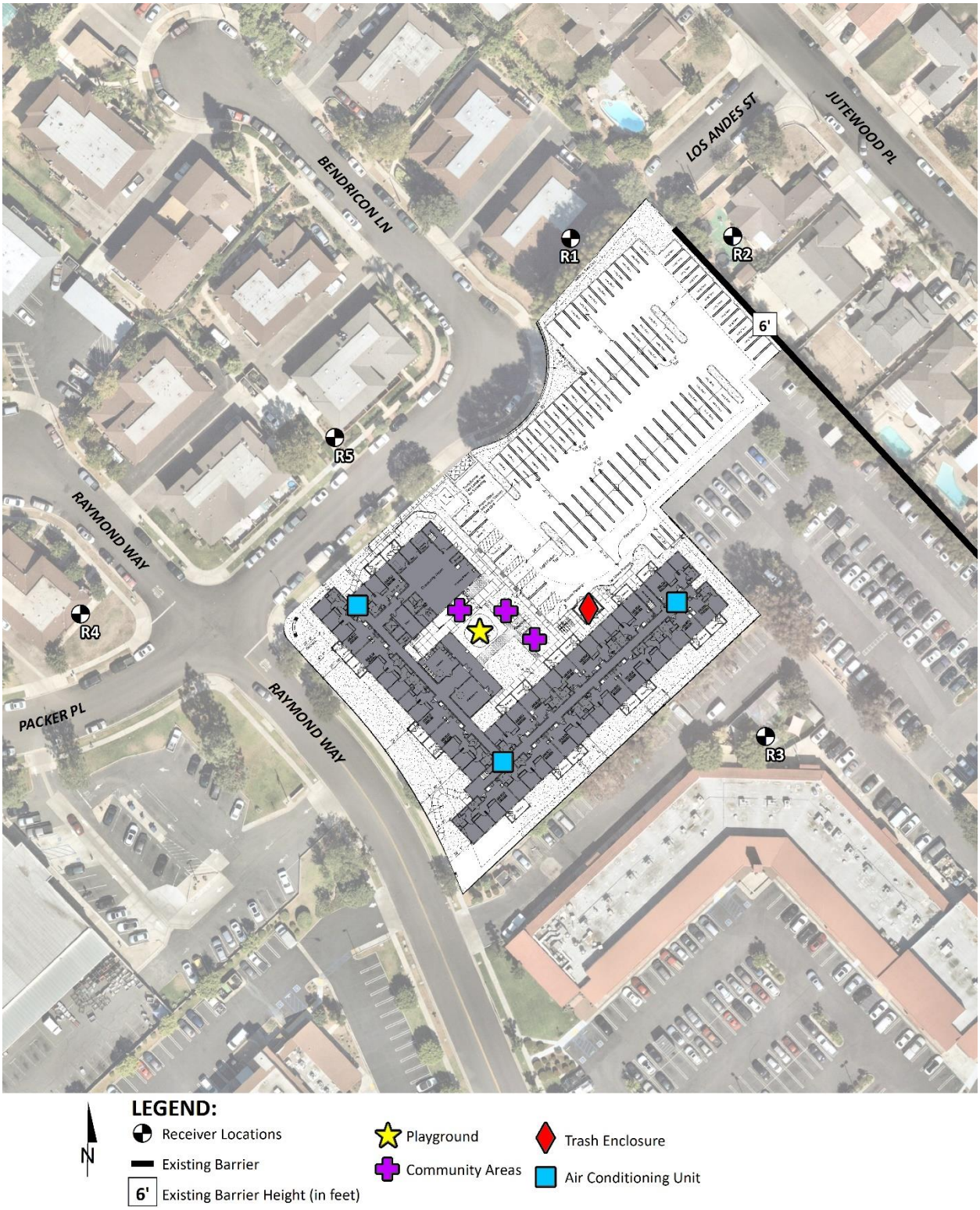


TABLE 9-1: REFERENCE NOISE LEVEL MEASUREMENTS

Noise Source	Duration (hh:mm:ss)	Ref. Distance (Feet)	Noise Source Height (Feet)	Min./Hour[5]		Reference Noise Level (dBA L_{eq})		Sound Power Level (dBA)[6]
				Day	Night	@ Ref. Dist.	@ 50 Feet	
Playground Activities[1]	00:15:00	5'	4'	60	0	63.4	43.4	75.1
Community Area[2]	00:08:00	10'	5'	60	0	73.8	59.8	91.5
Trash Enclosure[3]	00:00:32	5'	5'	20	20	77.3	57.3	89.0
Air Conditioning Unit[4]	96:00:00	5'	5'	39	28	77.2	57.2	88.9

[1] As measured by Urban Crossroads, Inc. at the Founder's Park in Ladera Ranch.
[2] As measured by Urban Crossroads, Inc. on the Patio at Louie's by the Bay in the City of Newport Beach.
[3] As measured by Urban Crossroads, Inc. at a commercial and office park trash enclosure in the City of Costa Mesa.
[4] As measured by Urban Crossroads, Inc. at the Santee Walmart located at 170 Town Center Parkway.
[5] Anticipated duration (minutes within the hour) of noise activity during typical hourly conditions expected at the Project site. "Day" = 7:00 a.m. to 7:00 p.m.; "Evening" = 7:00 p.m. to 10:00 p.m.; "Night" = 10:00 p.m. to 7:00 a.m.
[6] Sound power level represents the total amount of acoustical energy (noise level) produced by a sound source independent of distance or surroundings. Sound power levels calculated using the CadnaA noise model at the reference distance to the noise source. Numbers may vary due to size differences between point and area noise sources.

9.2.2 PLAYGROUND ACTIVITIES

To represent the potential noise level impacts associated with the Project's tot lot playground area, a reference noise level measurement was collected on Wednesday, October 8th, 2014 at the Founders Park in the unincorporated community of Ladera Ranch in the County of Orange. The reference noise levels collected at the Founders Park are expected to reflect the noise level activities within the playgrounds and tot lots at the Project site, since the reference noise level measurement includes parents speaking on cell phones, kids playing on swing sets, and background girls youth soccer games, with coaches shouting instructions and people cheering and clapping. Using the uniform reference distance of 50 feet, the reference playground activity noise level is 43.4 dBA L_{eq}. The playground activities are estimated to occur for 60 minutes during the peak hour conditions.

9.2.3 COMMUNITY AREAS

To describe the outdoor common areas (community lounge and fireplace, outdoor kitchen with BBQ), a reference noise level measurement was taken at the Louie's by the Bay in Newport Beach. At 50 feet, the reference noise level is 59.8 dBA L_{eq} at a noise source height of 5 feet. The reference noise level measurement includes outdoor eating activities with patrons laughing and talking. Courtyard activities are limited to the daytime and evening hours.

9.2.4 TRASH ENCLOSURE

To describe the noise levels associated with a trash enclosure, Urban Crossroads collected a reference noise level measurement at an existing commercial and office park trash enclosure within a parking lot on the northeast corner of Baker Street and Red Hill Avenue. The measured reference noise level at the uniform 50-foot reference distance is 57.3 dBA L_{eq} for the trash enclosure activity. The trash enclosure activity noise levels include two metal gates opening and closing, metal scraping against concrete floor sounds, dumpster movement on metal wheels,

trash dropping into the metal dumpster, and background parking lot vehicle movements. Noise associated with trash enclosure activities is conservatively expected to occur for 20 minutes per hour.

9.2.5 AIR CONDITIONING UNITS

To assess the impacts created by the roof-top air conditioning units at the Project buildings, reference noise levels measurements were taken over a four-day total duration at the Santee Walmart. Located at 170 Town Center Parkway in the City of Santee, the noise level measurements describe mechanical roof-top air conditioning units on the roof of an existing Walmart store, with additional roof-top units operating in the background. The reference noise level represents Lennox SCA120 series 10-ton model packaged air conditioning units. At 5 feet from the closest roof-top air conditioning unit, the highest exterior noise level from all four days of the measurement period was measured at 77.2 dBA L_{eq}. Using the uniform reference distance of 50 feet, the noise level is 57.2 dBA L_{eq}. The operating conditions of the reference noise level measurement reflect peak summer cooling requirements. The air conditioning units were observed to operate 39 minutes during the daytime and evening hours and 28 minutes per hour during the nighttime hours.

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 the noise level of multiple types of noise sources and calculates the noise levels at any location using the spatially accurate Project site plan and includes the effects of topography, buildings, and multiple barriers in its calculations using the latest standards to predict outdoor noise impacts. Appendix 9.1 includes the detailed noise model inputs used to estimate the Project operational noise levels presented in this section. Using the spatially accurate Project site plan and flown aerial imagery from Nearmap, a CadnaA noise prediction model of the Project study area was developed. The noise model provides a three-dimensional representation of the Project study area using the following key data inputs:

- Ground absorption;
- Multiple reflections at buildings and barriers;
- Reference noise level sources by type (area, point, etc.) and noise source heights;
- Multiple noise receiver locations and heights;
- Topography and earthen berms;
- Barrier and building heights.

Using the ISO 9613 protocol, the CadnaA noise prediction model 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 calculations at each receiver location and the partial noise level contributions by noise source. The reference sound power level (PWL) for the highest noise source expected at the Project site was input into the CadnaA noise prediction model. While sound pressure levels (e.g. L_{eq}) quantify in decibels the intensity of given sound sources at a reference distance, sound power levels (PWL) are connected

to the sound source and are independent of distance. Sound pressure levels vary substantially with distance from the source and diminish as a result 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. Hard site conditions are used in the operational noise analysis which result in noise levels that attenuate (or decrease) at a rate of 6.0 dBA for each doubling of distance from a point source, based on existing conditions in the Project study area.

9.4 PROJECT OPERATIONAL NOISE LEVELS

Using the reference noise levels to represent the proposed Project operations that include tot lot playground, community lounge and fireplace, outdoor kitchen with BBQ, trash enclosure and roof-top air conditioning units, Urban Crossroads, Inc. calculated the 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 9-2 shows the Project operational noise levels during the daytime hours of 7:00 a.m. to 10:00 p.m. The daytime hourly noise levels at the off-site receiver locations are expected to range from 41.0 to 49.9 dBA L_{eq}.

TABLE 9-2: DAYTIME PROJECT OPERATIONAL NOISE LEVELS

Noise Source	Operational Noise Levels by Receiver Location (dBA Leq)				
	R1	R2	R3	R4	R5
Playground Activities	29.1	23.3	7.1	5.0	11.7
Community Area	48.8	44.5	28.9	25.9	40.1
Trash Enclosure	38.8	33.3	19.2	15.5	40.5
Air Conditioning Unit	41.4	41.1	41.4	40.8	44.1
Total (All Noise Sources)	**49.9**	**46.4**	**41.7**	**41.0**	**46.7**

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

Table 9-3 shows the Project operational noise levels during the nighttime hours of 10:00 p.m. to 7:00 a.m. The nighttime hourly noise levels at the off-site receiver locations are expected to range from 38.4 to 43.7 dBA L_{eq}. The differences between the daytime and nighttime noise levels is largely related to the duration of noise activity (Table 9-1). No Project playground or community area operational activities are expected during the nighttime hours from 10:00 p.m. to 7:00 a.m. Appendix 9.1 includes the detailed noise model inputs including the existing perimeter walls used to estimate the Project operational noise levels presented in this section.

TABLE 9-3: NIGHTTIME PROJECT OPERATIONAL NOISE LEVELS

Noise Source	Operational Noise Levels by Receiver Location (dBA Leq)				
	R1	R2	R3	R4	R5
Playground Activities	0.0	0.0	0.0	0.0	0.0
Community Area	0.0	0.0	0.0	0.0	0.0
Trash Enclosure	37.8	32.3	18.2	14.5	39.5
Air Conditioning Unit	39.0	38.7	39.0	38.4	41.7
Total (All Noise Sources)	**41.5**	**39.6**	**39.0**	**38.4**	**43.7**

[1] See Exhibit 9-A for the noise source and receiver locations.
[2] 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 the City of Lake Forest exterior noise level standards at nearby noise-sensitive receiver locations. Table 9-4 shows the operational noise levels associated with Mountain View Affordable Housing Community Project will satisfy the City of Lake Forest 55 dBA L_{eq} daytime and 50 dBA L_{eq} nighttime exterior noise level standards at all nearby receiver locations. Therefore, the operational noise impacts are considered *less than significant* at the nearby noise-sensitive receiver locations.

TABLE 9-4: OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location[1]	Project Operational Noise Levels (dBA Leq)[2]		Noise Level Standards (dBA Leq)[3]		Threshold Exceeded?[4]	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
R1	49.9	41.5	55	50	No	No
R2	46.4	39.6	55	50	No	No
R3	46.4	39.0	55	50	No	No
R4	41.0	38.4	55	50	No	No
R5	46.7	43.7	55	50	No	No

[1] See Exhibit 9-A for the noise source and receiver locations.
[2] Proposed Project operational noise levels as shown on Tables 9-2 and 9-3.
[3] City of Lake Forest exterior noise level standards for residential land use, as shown on Table 3-1.
[4] Do the estimated Project operational noise source activities exceed the noise level standards?
"Day" = 7:00 a.m. to 7:00 p.m.; "Night" = 10:00 p.m. to 7:00 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 nearby 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. (4) 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 describe 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 9-5 and 9-6, respectively. As indicated on Tables 9-5 and 9-6, the Project will generate an unmitigated daytime and nighttime operational noise level increases ranging from 0.1 to 1.4 dBA L_{eq} at the nearby receiver locations. Project-related operational noise level increases will satisfy the operational noise level increase significance criteria presented in Table 4-1, the increases at the sensitive receiver locations will be *less than significant.*

TABLE 9-5: 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?[7]
R1	49.9	L1	54.0	55.4	1.4	5.0	No
R2	46.4	L1	54.0	54.7	0.7	5.0	No
R3	46.4	L2	52.7	53.6	0.9	5.0	No
R4	41.0	L3	57.8	57.9	0.1	5.0	No
R5	46.7	L4	54.6	55.3	0.7	5.0	No

[1] See Exhibit 8-A for the sensitive receiver locations.
[2] Total Project daytime 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 Criteria as defined in Section 4.

TABLE 9-6: 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?[7]
R1	41.5	L1	51.9	52.3	0.4	5.0	No
R2	39.6	L1	51.9	52.1	0.2	5.0	No
R3	39.0	L2	52.0	52.2	0.2	5.0	No
R4	38.4	L3	55.5	55.6	0.1	5.0	No
R5	43.7	L4	49.8	50.8	1.0	5.0	No

[1] See Exhibit 8-A for the sensitive receiver locations.
[2] Total Project nighttime operational noise levels as shown on Table 9-3.
[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 Criteria as defined in Section 4.

TABLE 9-5: NIGHTTIME OPERATIONAL NOISE LEVEL CONTRIBUTIONS

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?[7]
R1	26.7	L1	44.1	44.2	0.1	5.0	No
R2	37.3	L2	48.1	48.4	0.3	5.0	No
R3	44.6	L3	41.7	46.4	4.7	5.0	No
R4	42.2	L3	41.7	45.0	3.3	5.0	No
R5	42.0	L3	41.7	44.9	3.2	5.0	No
R6	40.8	L3	41.7	44.3	2.6	5.0	No
R7	40.7	L3	41.7	44.2	2.5	5.0	No
R8	33.7	L3	41.7	42.3	0.6	5.0	No

[1] See Exhibit 8-A for the sensitive 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 Criteria as defined in Section 4.

10 CONSTRUCTION ANALYSIS

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 activity boundaries in relation to the nearby sensitive receiver locations.

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:

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

This construction noise analysis was prepared using reference noise level measurements taken by Urban Crossroads, Inc. to describe the typical construction activity noise levels for each stage of Project construction. The construction reference noise level measurements represent a list of typical construction activity noise levels. Noise levels generated by heavy construction equipment can range from approximately 68 dBA to in excess of 80 dBA when measured at 50 feet. Hard site conditions are used in the construction noise analysis which result in noise levels that attenuate (or decrease) at a rate of 6 dBA for each doubling of distance from a point source (i.e. construction equipment). For example, a noise level of 80 dBA measured at 50 feet from the noise source to the receiver would be reduced to 74 dBA at 100 feet from the source to the receiver and would be further reduced to 68 dBA at 200 feet from the source to the receiver.

10.2 CONSTRUCTION REFERENCE NOISE LEVELS

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 construction activity area for each stage of construction to the nearest receiver location. Appendix 10.1 includes the detailed CadnaA construction noise model inputs.

EXHIBIT 10-A: CONSTRUCTION NOISE SOURCE LOCATIONS

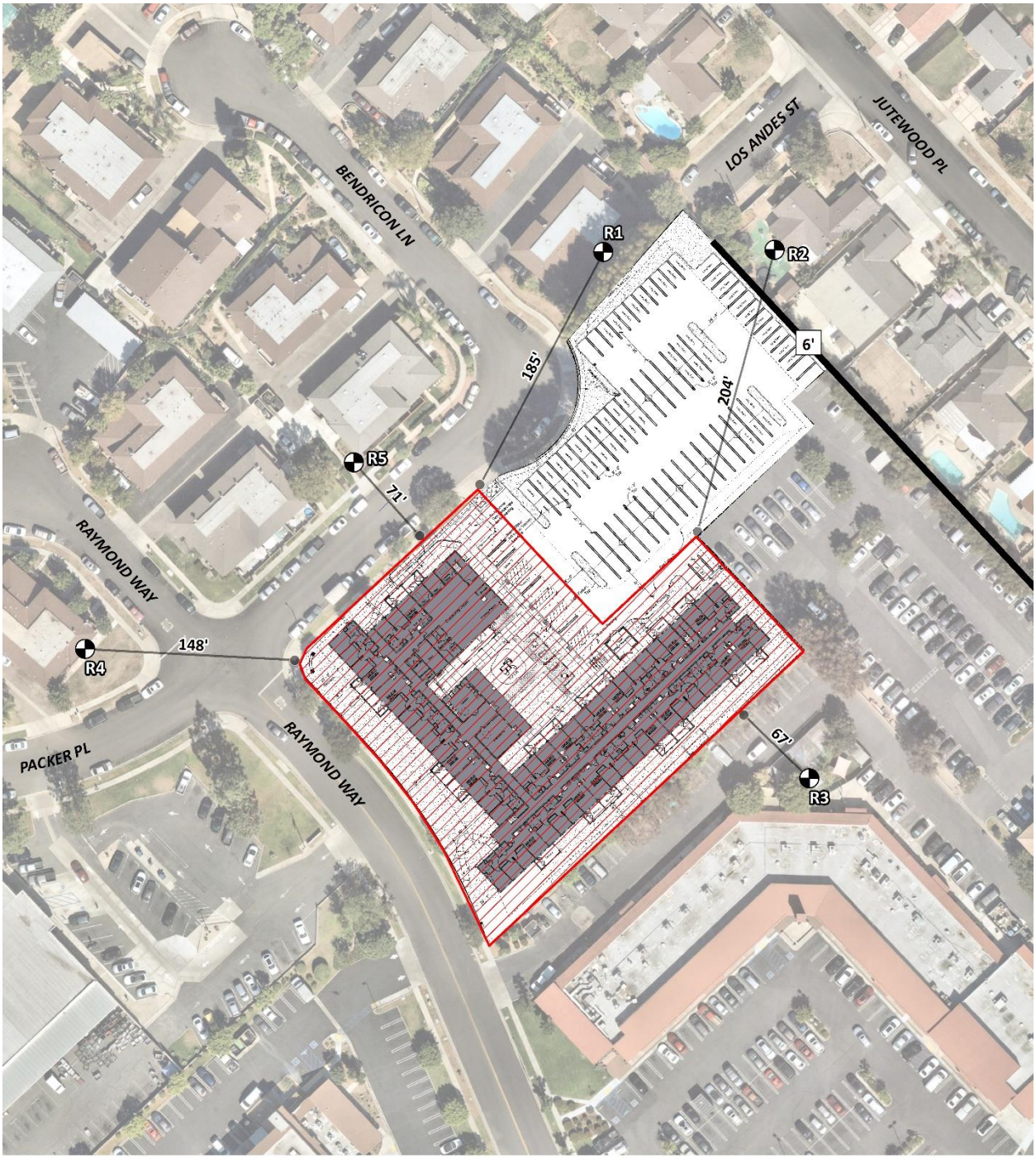


TABLE 10-1: CONSTRUCTION REFERENCE NOISE LEVELS

Construction Stage	Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA L_{eq})	Highest Reference Noise Level (dBA L_{eq})
Demolition	Demolition Activity	67.9	71.9
	Backhoe	64.2	
	Water Truck Pass-By & Backup Alarm	71.9	
Site Preparation	Scraper, Water Truck, & Dozer Activity	75.3	75.3
	Backhoe	64.2	
	Water Truck Pass-By & Backup Alarm	71.9	
Grading	Rough Grading Activities	73.5	73.5
	Water Truck Pass-By & Backup Alarm	71.9	
	Construction Vehicle Maintenance Activities	67.5	
Building Construction	Foundation Trenching	68.2	71.6
	Framing	62.3	
	Concrete Mixer Backup Alarms & Air Brakes	71.6	
Paving	Concrete Mixer Truck Movements	71.2	71.2
	Concrete Paver Activities	65.6	
	Concrete Mixer Pour & Paving Activities	65.9	
Architectural Coating	Air Compressors	65.2	65.2
	Generator	64.9	
	Crane	62.3	

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.

10.3 CONSTRUCTION NOISE LEVEL COMPLIANCE

The construction noise analysis shows that the highest construction noise levels will occur when construction activities take place at the closest point from the edge of the construction activity areas to each of the nearby receiver locations. As shown on Table 10-2, the unmitigated construction noise levels are expected to range from 56.2 to 73.7 dBA L_{eq} at the nearby receiver locations. Project construction noise levels are considered exempt if activities occur within the hours specified in the City of Lake Forest Municipal Code Section 11.16.060 of 7:00 a.m. to 8:00 p.m. on weekdays, including Saturdays.

To evaluate whether the Project will generate potentially significant short-term noise levels at nearby receiver locations a construction-related the NIOSH noise level threshold of 85 dBA L_{eq} is used as acceptable thresholds for construction noise at the nearby sensitive receiver locations. The construction noise analysis shows that the noise sensitive residential receiver locations will satisfy the 85 dBA L_{eq} significance threshold during Project construction activities as shown on Table 10-3. Therefore, the noise impacts due to Project construction noise is considered *less than significant* at all noise sensitive receiver locations

TABLE 10-2: UNMITIGATED CONSTRUCTION EQUIPMENT NOISE LEVEL SUMMARY

Receiver Location[1]	Construction Noise Levels (dBA L_{eq})						
	Demolition	Site Preparation	Grading	Building Construction	Paving	Architectural Coating	Highest Levels[2]
R1	70.3	73.7	71.9	70.0	69.6	63.6	73.7
R2	69.5	72.9	71.1	69.2	68.8	62.8	72.9
R3	67.5	70.9	69.1	67.2	66.8	60.8	70.9
R4	62.9	66.3	64.5	62.6	62.2	56.2	66.3
R5	67.8	71.2	69.4	67.5	67.1	61.1	71.2

[1] Construction noise source and receiver locations are shown on Exhibit 10-A.
[2] Construction noise level calculations based on distance from the construction noise source activity to nearby receiver locations. CadnaA construction noise model inputs are included in Appendix 10.1.

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	73.7	85	No
R2	72.9	85	No
R3	70.9	85	No
R4	66.3	85	No
R5	71.2	85	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 nearby 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?

10.4 CONSTRUCTION VIBRATION ANALYSIS

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. The proposed Project's construction activities most likely to cause vibration impacts are:

- Heavy Construction Equipment: Although all heavy mobile construction equipment has the potential of causing at least some perceptible vibration, the vibration is usually short-term and is not of sufficient magnitude to cause building damage.
- Trucks: Trucks hauling building materials to construction sites can be sources of vibration intrusion if the haul routes pass through residential neighborhoods on streets with bumps or potholes. Repairing the bumps and potholes generally eliminates the problem.

Ground-borne vibration levels resulting from construction activities occurring within the Project site were estimated by data published by the Federal Transit Administration (FTA). Using the vibration source level of construction equipment provided on Table 6-4 and the construction vibration assessment methodology published by the FTA, it is possible to estimate the Project vibration impacts. Table 10-6 presents the expected Project related vibration levels at distances ranging from 67 to 204 feet from the primary area of Project construction activity.

Based on the reference vibration levels provided by the FTA, a large bulldozer represents the peak source of vibration with a reference velocity of 0.089 in/sec PPV at 25 feet. At distances ranging from 67 to 204 feet from primary Project construction activities, construction vibration velocity levels are expected to range from 0.004 to 0.020 in/sec PPV. Table 11-9 shows that the Project construction vibration levels will remain below the Caltrans building damage threshold of 0.3 in/sec PPV at all receiver locations.

Compared with the Caltrans construction vibration standard for human annoyance, the proposed Project construction activities will remain below the *distinctly perceptible* vibration standard of 0.04 in/sec PPV at all receiver locations. The Project-related vibration impacts at the nearby sensitive receiver locations, therefore, represent a *less than significant* impact Project construction activities.

TABLE 10-6: UNMITIGATED CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver[1]	Distance to Const. Activity (Feet)	Receiver PPV Levels (in/sec)[2]					Thresholds (in/sec PPV)		Threshold Exceeded?[3]	
		Small Bulldozer (< 80k lbs)	Jack-hammer	Loaded Trucks	Large Bulldozer (> 80k lbs)	Highest Vibration Level	Human Annoyance	Building Damage	Human Annoyance	Building Damage
R1	185'	0.000	0.002	0.004	0.004	0.004	0.04	0.3	No	No
R2	204'	0.000	0.002	0.003	0.004	0.004	0.04	0.3	No	No
R3	67'	0.001	0.008	0.017	0.020	0.020	0.04	0.3	No	No
R4	148'	0.000	0.002	0.005	0.006	0.006	0.04	0.3	No	No
R5	71'	0.001	0.007	0.016	0.019	0.019	0.04	0.3	No	No

[1] Receiver locations are shown on Exhibit 10-A.
[2] Based on the Vibration Source Levels of Construction Equipment included on Table 6-4.
[3] Does the peak vibration exceed the acceptable vibration thresholds?
"PPV" = Peak Particle Velocity

11 REFERENCES

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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.

12 CERTIFICATION

The contents of this report represent an accurate depiction of the noise environment and impacts associated with the proposed Mountain View Affordable Housing Community Project. The information contained in this report is based on the best available data at the time of preparation. If you have any questions, please contact me directly at (949) 336-5979.

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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 Orange • February, 2011
FHWA-NHI-142051 Highway Traffic Noise Certificate of Training • February, 2013

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APPENDIX 3.1:

HUD NOISE STANDARDS

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24 CFR Part 51 - Environmental Criteria and Standards

Subpart B - Noise Abatement and Control

For more information visit: www.hud.gov

Sec. 51.100 Purpose and authority.

a. It is the purpose of this subpart B to:

1. Call attention to the threat of noise pollution;
2. Encourage the control of noise at its source in cooperation with other Federal departments and agencies;
3. Encourage land use patterns for housing and other noise sensitive urban needs that will provide a suitable separation between them and major noise sources;
4. Generally prohibit HUD support for new construction of noise sensitive uses on sites having unacceptable noise exposure;
5. Provide policy on the use of structural and other noise attenuation measures where needed; and
6. Provide policy to guide implementation of various HUD programs.

b. Authority. Specific authorities for noise abatement and control are contained in the Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq.); and the General Services Administration, Federal Management Circular 75-2; Compatible Land Uses at Federal Airfields.

[44 FR 40861, July 12, 1979, as amended at 61 FR 13333, Mar. 26, 1996]

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Sec. 51.101 General policy.

a. It is HUD's general policy to provide minimum national standards applicable to HUD programs to protect citizens against excessive noise in their communities and places of residence.

1. Planning assistance. HUD requires that grantees give adequate consideration to noise exposures and sources of noise as an integral part of the urban environment when HUD assistance is provided for planning purposes, as follows:

   i. Particular emphasis shall be placed on the importance of compatible land use planning in relation to airports, highways and other sources of high noise.

   ii. Applicants shall take into consideration HUD environmental standards impacting the use of land.

2. Activities subject to 24 CFR part 58.

   i. Responsible entities under 24 CFR part 58 must take into consideration the noise criteria and standards in the environmental review process and consider ameliorative actions when noise sensitive land development is proposed in noise exposed areas. Responsible entities shall address deviations from the standards in their environmental reviews as required in 24 CFR part 58.

   ii. Where activities are planned in a noisy area, and HUD assistance is contemplated later for housing and/or other noise sensitive activities, the responsible entity risks denial of the HUD assistance unless the HUD standards are met.

3. HUD support for new construction. HUD assistance for the construction of new noise sensitive uses is prohibited generally for projects with unacceptable noise exposures and is discouraged for projects with normally unacceptable noise exposure. (Standards of acceptability are contained in Sec. 51.103(c).) This policy applies to all HUD programs providing assistance, subsidy or insurance for housing, manufactured home parks, nursing homes, hospitals, and all programs providing assistance or insurance for land development, redevelopment or any other provision of facilities and services which are directed to making land available for housing or noise sensitive development. The policy does not apply to research demonstration projects which do not result in new construction or reconstruction, flood insurance, interstate land sales registration, or any action or emergency

assistance under disaster assistance provisions or appropriations which are provided to save lives, protect property, protect public health and safety, remove debris and wreckage, or assistance that has the effect of restoring facilities substantially as they existed prior to the disaster.

4. HUD support for existing construction. Noise exposure by itself will not result in the denial of HUD support for the resale and purchase of otherwise acceptable existing buildings. However, environmental noise is a marketability factor which HUD will consider in determining the amount of insurance or other assistance that may be given.
5. HUD support of modernization and rehabilitation. For modernization projects located in all noise exposed areas, HUD shall encourage noise attenuation features in alterations. For major or substantial rehabilitation projects in the Normally Unacceptable and Unacceptable noise zones, HUD actively shall seek to have project sponsors incorporate noise attenuation features, given the extent and nature of the rehabilitation being undertaken and the level or exterior noise exposure. In Unacceptable noise zones, HUD shall strongly encourage conversion of noise-exposed sites to land uses compatible with the high noise levels.
6. Research, guidance and publications. HUD shall maintain a continuing program designed to provide new knowledge of noise abatement and control to public and private bodies, to develop improved methods for anticipating noise encroachment, to develop noise abatement measures through land use and building construction practices, and to foster better understanding of the consequences of noise. It shall be HUD's policy to issue guidance documents periodically to assist HUD personnel in assigning an acceptability category to projects in accordance with noise exposure standards, in evaluating noise attenuation measures, and in advising local agencies about noise abatement strategies. The guidance documents shall be updated periodically in accordance with advances in the state-of-the-art.
7. Construction equipment, building equipment and appliances. HUD shall encourage the use of quieter construction equipment and methods in population centers, the use of quieter equipment and appliances in buildings, and the use of appropriate noise abatement techniques in the design of residential structures with potential noise problems.
8. Exterior noise goals. It is a HUD goal that exterior noise levels do not exceed a day-night average sound level of 55 decibels. This level is recommended by the Environmental Protection Agency as a goal for outdoors in residential areas. The levels recommended by EPA are not standards and do not take into account cost or feasibility. For the purposes of this regulation and to meet other program objectives, sites with a day-night average sound level of 65 and below are acceptable and are allowable (see Standards in Sec. 51.103(c)).
9. Interior noise goals. It is a HUD goal that the interior auditory environment shall not exceed a day-night average sound level of 45 decibels. Attenuation measures to meet these interior goals shall be employed where feasible. Emphasis shall be given to noise sensitive interior spaces such as bedrooms. Minimum attenuation requirements are prescribed in Sec. 51.104(a).
10. Acoustical privacy in multifamily buildings. HUD shall require the use of building design and acoustical treatment to afford acoustical privacy in multifamily buildings pursuant to requirements of the Minimum Property Standards.

[44 FR 40861, July 12, 1979, as amended at 50 FR 9268, Mar. 7, 1985; 61 FR 13333, Mar. 26, 1996]

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Sec. 51.102 Responsibilities.

a. Surveillance of noise problem areas. Appropriate field staff shall maintain surveillance of potential noise problem areas and advise local officials, developers, and planning groups of the unacceptability of sites because of noise exposure at the earliest possible time in the decision process. Every attempt shall be made to insure that applicants' site choices are consistent with the policy and standards contained herein.

b. Notice to applicants. At the earliest possible stage, HUD program staff shall:

1. Determine the suitability of the acoustical environment of proposed projects;
2. Notify applicants of any adverse or questionable situations; and
3. Assure that prospective applicants are apprised of the standards contained herein so that future site choices will be consistent with these standards.

c. Interdepartmental coordination. HUD shall foster appropriate coordination between field offices and other departments and agencies, particularly the Environmental Protection Agency, the Department of Transportation, Department of Defense representatives, and the Department of Veterans Affairs. HUD staff shall utilize the acceptability standards in commenting on the prospective impacts of transportation facilities and other noise generators in the Environmental Impact Statement review process.

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Sec. 51.103 Criteria and standards.

These standards apply to all programs as indicated in Sec. 51.101.

a. Measure of external noise environments. The magnitude of the external noise environment at a site is determined by the value of the

day-night average sound level produced as the result of the accumulation of noise from all sources contributing to the external noise environment at the site. Day-night average sound level, abbreviated as DNL and symbolized as Ldn, is the 24-hour average sound level, in decibels, obtained after addition of 10 decibels to sound levels in the night from 10 p.m. to 7 a.m. Mathematical expressions for average sound level and day-night average sound level are stated in the Appendix I to this subpart.

b. Loud impulsive sounds. On an interim basis, when loud impulsive sounds, such as explosions or sonic booms, are experienced at a site, the day-night average sound level produced by the loud impulsive sounds alone shall have 8 decibels added to it in assessing the acceptability of the site (see Appendix I to this subpart). Alternatively, the C-weighted day-night average sound level (LCdn) may be used without the 8 decibel addition, as indicated in Sec. 51.106(a)(3). Methods for assessing the contribution of loud impulsive sounds to day-night average sound level at a site and mathematical expressions for determining whether a sound is classed as "loud impulsive" are provided in the Appendix I to this subpart.

c. Exterior standards.

1. The degree of acceptability of the noise environment at a site is determined by the sound levels external to buildings or other facilities containing noise sensitive uses. The standards shall usually apply at a location 2 meters (6.5 feet) from the building housing noise sensitive activities in the direction of the predominant noise source. Where the building location is undetermined, the standards shall apply 2 meters (6.5 feet) from the building setback line nearest to the predominant noise source. The standards shall also apply at other locations where it is determined that quiet outdoor space is required in an area ancillary to the principal use on the site.
2. The noise environment inside a building is considered acceptable if:

   i. The noise environment external to the building complies with these standards, and

   ii. the building is constructed in a manner common to the area or, if of uncommon construction, has at least the equivalent noise attenuation characteristics.

Site Acceptability Standards

	Day-night average sound level (in decibels)	Special approvals and requirements
Acceptable	Not exceeding 65 dB(1)	None
Normally Unacceptable	Above 65 dB but not exceeding 75 dB.	Special Approvals (2) Environmental Review (3) Attenuation (4)
Unacceptable	Above 75 dB	Special Approvals (2) Environmental Review (3) Attenuation (5)

Notes:

1. Acceptable threshold may be shifted to 70 dB in special circumstances pursuant to Sec. 51.105(a).
2. See Sec. 51.104(b) for requirements.
3. See Sec. 51.104(b) for requirements.
4. 5 dB additional attenuation required for sites above 65 dB but not exceeding 70 dB and 10 dB additional attenuation required for sites above 70 dB but not exceeding 75 dB. (See Sec. 51.104(a).)
5. Attenuation measures to be submitted to the Assistant Secretary for CPD for approval on a case-by-case basis.

[44 FR 40861, July 12, 1979, as amended at 49 FR 12214, Mar. 29, 1984]

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Sec. 51.104 Special requirements.

a. Noise attenuation. Noise attenuation measures are those required in addition to attenuation provided by buildings as commonly constructed in the area, and requiring open windows for ventilation. Measures that reduce external noise at a site shall be used wherever practicable in preference to the incorporation of additional noise attenuation in buildings. Building designs and construction techniques that provide more noise attenuation than typical construction may be employed also to meet the noise attenuation requirements.

1. Normally unacceptable noise zones and unacceptable noise zones. Approvals in Normally Unacceptable Noise Zones require a minimum of 5 decibels additional sound attenuation for buildings having noise-sensitive uses if the day-night average sound level is greater than 65 decibels but does not exceed 70 decibels, or a minimum of 10 decibels of additional sound attenuation if the day-night average sound level is greater than 70 decibels but does not exceed 75 decibels.

2. Noise attenuation measures in Unacceptable Noise Zones require the approval of the Assistant Secretary for Community Planning and Development, or the Certifying Officer for activities subject to 24 CFR part 58. (See Sec. 51.104(b)(2).)

b. Environmental review requirements. Environmental reviews shall be conducted pursuant to the requirements of 24 CFR parts 50 and 58, as applicable, or other environmental regulations issued by the Department. These requirements are hereby modified for all projects proposed in the Normally Unacceptable and Unacceptable noise exposure zones as follows:

1. Normally unacceptable noise zone.

   i. All projects located in the Normally Unacceptable Noise Zone require a Special Environmental Clearance except an EIS is required for a proposed project located in a largely undeveloped area, or where the HUD action is likely to encourage the establishment of incompatible land use in this noise zone.

   ii. When an EIS is required, the concurrence of the Program Assistant Secretary is also required before a project can be approved. For the purposes of this paragraph, an area will be considered as largely undeveloped unless the area within a 2-mile radius of the project boundary is more than 50 percent developed for urban uses and infrastructure (particularly water and sewers) is available and has capacity to serve the project.

   iii. All other projects in the Normally Unacceptable zone require a Special Environmental Clearance, except where an EIS is required for other reasons pursuant to HUD environmental policies.

2. Unacceptable noise zone. An EIS is required prior to the approval of projects with unacceptable noise exposure. Projects in or partially in an Unacceptable Noise Zone shall be submitted to the Assistant Secretary for Community Planning and Development, or the Certifying Officer for activities subject to 24 CFR part 58, for approval. The Assistant Secretary or the Certifying Officer may waive the EIS requirement in cases where noise is the only environmental issue and no outdoor noise sensitive activity will take place on the site. In such cases, an environmental review shall be made pursuant to the requirements of 24 CFR parts 50 or 58, as appropriate.

[44 FR 40861, July 12, 1979, as amended at 61 FR 13333, Mar. 26, 1996]

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Sec. 51.105 Exceptions.

a. Flexibility for non-acoustic benefits. Where it is determined that program objectives cannot be achieved on sites meeting the acceptability standard of 65 decibels, the Acceptable Zone may be shifted to Ldn 70 on a case-by-case basis if all the following conditions are satisfied:

1. The project does not require an Environmental Impact Statement under provisions of Sec. 51.104(b)(1) and noise is the only environmental issue.
2. The project has received a Special Environmental Clearance and has received the concurrence of the Environmental Clearance Officer.
3. The project meets other program goals to provide housing in proximity to employment, public facilities and transportation.
4. The project is in conformance with local goals and maintains the character of the neighborhood.
5. The project sponsor has set forth reasons, acceptable to HUD, as to why the noise attenuation measures that would normally be required for new construction in the Ldn 65 to Ldn 70 zone cannot be met.
6. Other sites which are not exposed to noise above Ldn 65 and which meet program objectives are generally not available.

The above factors shall be documented and made part of the project file.

[44 FR 40861, July 12, 1979, as amended at 61 FR 13334, Mar. 26, 1996]

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Sec. 51.106 Implementation.

a. Use of available data. HUD field staff shall make maximum use of noise data prepared by others when such data are determined to be current and adequately projected into the future and are in terms of the following:

1. Sites in the vicinity of airports. The noise environment around airports is described sometimes in terms of Noise Exposure Forecasts, abbreviated as NEF or, in the State of California, as Community Noise Equivalent Level, abbreviated as CNEL. The

noise environment for sites in the vicinity of airports for which day-night average sound level data are not available may be evaluated from NEF or CNEL analyses using the following conversions to DNL: DNL ˜ NEF+35 DNL ˜ CNEL

2. Sites in the vicinity of highways. Highway projects receiving Federal aid are subject to noise analyses under the procedures of the Federal Highway Administration. Where such analyses are available they may be used to assess sites subject to the requirements of this standard. The Federal Highway Administration employs two alternate sound level descriptors: (i) The A-weighted sound level not exceeded more than 10 percent of the time for the highway design hour traffic flow, symbolized as L10; or (ii) the equivalent sound level for the design hour, symbolized as Leq. The day-night average sound level may be estimated from the design hour L10 or Leq values by the following relationships, provided heavy trucks do not exceed 10 percent of the total traffic flow in vehicles per 24 hours and the traffic flow between 10 p.m. and 7 a.m. does not exceed 15 percent of the average daily traffic flow in vehicles per 24 hours: DNL ˜ L10 (design hour)–3 decibels DNL ˜ Leg (design hour) decibels Where the auto/truck mix and time of day relationships as stated in this section do not exist, the HUD Noise Assessment Guidelines or other noise analysis shall be used.
3. Sites in the vicinity of installations producing loud impulsive sounds. Certain Department of Defense installations produce loud impulsive sounds from artillery firing and bombing practice ranges. Noise analyses for these facilities sometimes encompass sites that may be subject to the requirements of this standard. Where such analyses are available they may be used on an interim basis to establish the acceptability of sites under this standard. The Department of Defense uses day-night average sound level based on C-weighted sound level, symbolized LCdn, for the analysis of loud impulsive sounds. Where such analyses are provided, the 8 decibel addition specified in Sec. 51.103(b), is not required, and the same numerical values of day-night average sound level used on an interim basis to determine site suitability for non-impulsive sounds apply to the LCdn.
4. Use of areawide acoustical data. HUD encourages the preparation and use of areawide acoustical information, such as noise contours for airports. Where such new or revised contours become available for airports (civil or military) and military installations they shall first be referred to the HUD State Office (Environmental Officer) for review, evaluation and decision on appropriateness for use by HUD. The HUD State Office shall submit revised contours to the Assistant Secretary for Community Planning and Development for review, evaluation and decision whenever the area affected is changed by 20 percent or more, or whenever it is determined that the new contours will have a significant effect on HUD programs, or whenever the contours are not provided in a methodology acceptable under Sec. 51.106(a)(1) or in other cases where the HUD State Office determines that Headquarters review is warranted. For other areawide acoustical data, review is required only where existing areawide data are being utilized and where such data have been changed to reflect changes in the measurement methodology or underlying noise source assumptions. Requests for determination on usage of new or revised areawide data shall include the following:

   i. Maps showing old, if applicable, and new noise contours, along with brief description of data source and methodology.

   ii. Impact on existing and prospective urbanized areas and on development activity.

   iii. Impact on HUD-assisted projects currently in processing.

   iv. Impact on future HUD program activity. Where a field office has determined that immediate approval of new areawide data is necessary and warranted in limited geographic areas, the request for approval should state the circumstances warranting such approval. Actions on proposed projects shall not be undertaken while new areawide noise data are being considered for HUD use except where the proposed location is affected in the same manner under both the old and new noise data.

b. Site assessments. Compliance with the standards contained in Sec. 51.103(c) shall, where necessary, be determined using noise assessment guidelines, handbooks, technical documents and procedures issued by the Department.

c. Variations in site noise levels. In many instances the noise environment will vary across a site, with portions of the site being in an Acceptable noise environment and other portions in a Normally Unacceptable noise environment. The standards in Sec. 51.103(c) shall apply to the portions of a building or buildings used for residential purposes and for ancillary noise sensitive open spaces.

d. Noise measurements. Where noise assessments result in a finding that the site is borderline or questionable, or is controversial, noise measurements may be performed. Where it is determined that noise measurements are required, such measurements will be conducted in accordance with methods and measurement criteria established by the Department. Locations for noise measurements will depend on the location of noise sensitive uses that are nearest to the predominant noise source (see Sec. 51.103(c)).

e. Projections of noise exposure. In addition to assessing existing exposure, future conditions should be projected. To the extent possible, noise exposure shall be projected to be representative of conditions that are expected to exist at a time at least 10 years beyond the date of the project or action under review.

f. Reduction of site noise by use of berms and/or barriers. If it is determined by adequate analysis that a berm and/or barrier will reduce noise at a housing site, and if the barrier is existing or there are assurances that it will be in place prior to occupancy, the environmental noise analysis for the site may reflect the benefits afforded by the berm and/or barrier. In the environmental review process under Sec. 51.104(b), the location height and design of the berm and/or barrier shall be evaluated to determine its effectiveness, and impact on design and aesthetic quality, circulation and other environmental factors.

[44 FR 40861, July 12, 1979, as amended at 61 FR 13334, Mar. 26, 1996]

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Appendix I to Subpart B to Part 51--Definition of Acoustical Quantities

1. Sound Level. The quantity in decibels measured with an instrument satisfying requirements of American National Standard Specification for Type 1 Sound Level Meters S1.4-1971. Fast time-averaging and A-frequency weighting are to be used, unless others are specified. The sound level meter with the A-weighting is progressively less sensitive to sounds of frequency below 1,000 hertz (cycles per second), somewhat as is the ear. With fast time averaging the sound level meter responds particularly to recent sounds almost as quickly as does the ear in judging the loudness of a sound.
2. Average Sound Level. Average sound level, in decibels, is the level of the mean-square A-weighted sound pressure during the stated time period, with reference to the square of the standard reference sound pressure of 20 micropascals.Day-night average sound level, abbreviated as DNL, and symbolized mathematically as Ldn is defined as:[GRAPHIC OMITTED] Time t is in seconds, so the limits shown in hours and minutes are actually interpreted in seconds. LA(t) is the time varying value of A-weighted sound level, the quantity in decibels measured by an instrument satisfying requirements of American National Standard Specification for Type 1 Sound Level Meters S1.4-1971.3.
3. Loud Impulsive Sounds. When loud impulsive sounds such as sonic booms or explosions are anticipated contributors to the noise environment at a site, the contribution to day-night average sound level produced by the loud impulsive sounds shall have 8 decibels added to it in assessing the acceptability of a site. A loud impulsive sound is defined for the purpose of this regulation as one for which:

   i. The sound is definable as a discrete event wherein the sound level increases to a maximum and then decreases in a total time interval of approximately one second or less to the ambient background level that exists without the sound; and

   ii. The maximum sound level (obtained with slow averaging time and A-weighting of a Type 1 sound level meter whose characteristics comply with ANSI S1.4-1971) exceeds the sound level prior to the onset of the event by at least 6 decibels; and

   iii. The maximum sound level obtained with fast averaging time of a sound level meter exceeds the maximum value obtained with slow averaging time by at least 4 decibels.

   [44 FR 40861, July 12, 1979; 49 FR 10253, Mar. 20, 1984; 49 FR 12214, Mar. 29, 1984]

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APPENDIX 3.2:

CITY OF LAKE FOREST MUNICIPAL CODE

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Chapter 11.16 NOISE CONTROL

11.16.010 Declaration of policy.

In order to control unnecessary, excessive and annoying sounds, it is hereby declared to be the policy of the City to prohibit such sounds generated from all sources as specified in this chapter.

It is determined that certain sound levels are detrimental to the public health, welfare and safety, and contrary to public interest. (Ord. 171 § 1, 2007)

11.16.020 Definitions.

The following words, phrases and terms as used in this chapter shall have the meaning as indicated below:

"Ambient noise level" shall mean the all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding the alleged offensive noise, at the location and approximate time at which a comparison with the alleged offensive noise is to be made.

"Cumulative period" shall mean an additive period of time composed of individual time segments which may be continuous or interrupted.

"Decibel (dB)" shall mean a unit which denotes the ratio between two (2) quantities which are proportional to power: the number of decibels corresponding to the ratio of two (2) amounts of power is ten (10) times the logarithm to the base ten (10) of this ratio.

"Dwelling unit" shall have the same meaning as in Section 9.04.030(D).

"Emergency machinery, vehicle or work" shall mean any machinery, vehicle or work used, employed or performed in an effort to protect, provide or restore safe conditions in the community or for the citizenry, or work by private or public utilities when restoring utility service.

"Fixed noise source" shall mean a stationary device which creates sounds while fixed or motionless, including but not limited to industrial and commercial machinery and equipment, pumps, fans, compressors, generators, air conditioners and refrigeration equipment.

"Grading" shall mean any excavating or filling of earth material, or any combination thereof, conducted at a site to prepare said site for construction or other improvements thereon.

"Impact noise" shall mean the noise produced by the collision of one (1) mass in motion with a second mass which may be either in motion or at rest.

"Mobile noise source" shall mean any noise source other than a fixed noise source.

"Noise level" shall mean the "A" weighted sound pressure level in decibels obtained by using a sound level meter at slow response with a reference pressure of twenty (20) micronewtons per square meter. The unit of measurement shall be designated as dBa.

"Person" shall mean a person, firm, association, copartnership, joint venture, corporation or any entity, public or private in nature.

"Residential property" shall mean a parcel of real property that is developed and used either in part or in whole for residential purposes, other than transient uses such as hotels and transitory lodgings.

"Simple tone noise" shall mean a noise characterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished.

"Sound level meter" shall mean an instrument meeting American National Standard Institute's Standard S1.4-1971 for Type 1 or Type 2 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

"Sound pressure level" of a sound, in decibels, shall mean twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound to a reference pressure, which reference pressure shall be explicitly stated. (Ord. 297 § 14, 2017; Ord. 171 § 1, 2007)

11.16.025 Measurement of noise levels.

Any noise level measurements made pursuant to the provisions of this chapter shall be performed using a sound level meter as defined in Section 11.16.020. The location selected for measuring exterior noise levels shall be at any point on the affected property. Interior noise measurements shall be made within the affected dwelling unit. The measurement shall be made at a point at least four (4) feet from the wall, ceiling, or floor nearest the alleged offensive noise source and may be made with the windows of the affected unit open. (Ord. 171 § 1, 2007)

11.16.030 Designated noise zone.

The entire territory of the City of Lake Forest is hereby designated as "Noise Zone 1." (Ord. 171 § 1, 2007)

11.16.040 Exterior noise standards.

A. The following noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

NOISE STANDARDS

Noise Zone	Noise Level	Time Period
1	55 dBa	7:00 a.m.—10.00 p.m.
1	50 dBa	10:00 p.m.—7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dBa.

B. It shall be unlawful for any person at any location to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, to exceed:

1. The noise standard for a cumulative period of more than thirty (30) minutes in any hour; or
2. The noise standard plus five (5) dBa for a cumulative period of more than fifteen (15) minutes in any hour; or
3. The noise standard plus ten (10) dBa for a cumulative period of more than five (5) minutes in any hour; or
4. The noise standard plus fifteen (15) dBa for a cumulative period of more than one (1) minute in any hour; or
5. The noise standard plus twenty (20) dBa for any period of time.

C. In the event the ambient noise level exceeds any of the first four (4) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth (5th) noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level. (Ord. 171 § 1, 2007)

11.16.050 Interior noise standards.

A. The following interior noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

INTERIOR NOISE STANDARDS

Noise Zone	Noise Level	Time Period

1	55 dBa	7:00 a.m.—10:00 p.m.
1	45 dBa	10:00 p.m.—7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dBa.

B. It shall be unlawful for any person at any location to create any noise, or to allow the creation of any noise, on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured within any other dwelling unit on any residential property, to exceed:

1. The interior noise standard for a cumulative period of more than five (5) minutes in any hour; or

2. The interior noise standard plus five (5) dBa for a cumulative period of more than one (1) minute in any hour; or

3. The interior noise standard plus ten (10) dBa for any period of time.

C. In the event the ambient noise level exceeds either of the first two (2) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the third (3rd) noise limit category the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level. (Ord. 171 § 1, 2007)

11.16.060 Exemptions.

The following activities shall be exempted from the provisions of this chapter:

A. Activities not constituting "special events" conducted on the grounds of any public or private nursery, elementary, intermediate or secondary school or college.

B. "Special events" as defined in Section 5.05.020 provided said events are conducted pursuant to a special event permit issued as described in Chapter 5.05. However, this exemption shall not preclude use of the standards set forth in Section 11.16.040 ("Exterior noise standards") or Section 11.16.050 ("Interior noise standards") as a guide for the application, review, or issuance of a special event permit.

C. Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work.

D. Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a Federal holiday.

E. All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions.

F. Mobile noise sources associated with agricultural operations, provided such operations do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a Federal holiday.

G. Mobile noise sources associated with agricultural pest control through pesticide application, provided that the application is made in accordance with restricted material permits issued by or regulations enforced by the Agricultural Commissioner.

H. Noise sources associated with the maintenance of real property, provided said activities take place between 7:00 a.m. and 8:00 p.m. on any day except Sunday or a Federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a Federal holiday.

I. Any activity to the extent regulation thereof has been preempted by State or Federal law.

J. Noise sources associated with solid waste collection and removal, provided such activities take place between 6:00 a.m. and 6:00 p.m. Monday through Friday where audible in residential areas; or between 7:00 a.m. and 6:00 p.m. on Saturdays where audible in residential areas; or between 5:00 a.m. and 9:00 p.m. any day where such activity is not audible in residential areas; or as otherwise provided in an approved franchise agreement between a waste hauler and the City. (Ord. 300 § 7, 2017; Ord. 171 § 1, 2007)

11.16.070 Schools, hospitals and churches—Special provisions.

It is unlawful for any person to create any noise which causes the noise level at any school, hospital or church while the same is in use to exceed the noise limits as specified in Section 11.16.040 prescribed for the assigned noise zone in which the school, hospital or church is located, or which noise level unreasonably interferes with the use of such institutions or which unreasonably disturbs or annoys patients in the hospital, provided conspicuous signs are displayed in three (3) separate locations within one-tenth (1/10) of a mile of the institution indicating the presence of a school, church or hospital. (Ord. 171 § 1, 2007)

11.16.080 Motor vehicle racing.

It is unlawful to conduct motor vehicle racing, testing, timing or similar noise-producing activities at raceways, speedways, off-road vehicle courses, drag strips or other similar places, including, but not limited to, the operation of midget race cars, drag cars, motorcycles, off-road vehicles, and specialty automobiles, between the hours of eleven-thirty p.m. and eight a.m. (Ord. 171 § 1, 2007)

11.16.090 Enforcement.

The City's law enforcement personnel, the County Health Officer and their duly authorized representatives are authorized, pursuant to Penal Code Section 836.5, to arrest any person without a warrant when they have reasonable cause to believe that such person has committed a misdemeanor in their presence.

No person shall interfere with, oppose or resist any authorized person charged with the enforcement of this chapter while such person is engaged in the performance of his duty. (Ord. 171 § 1, 2007)

11.16.100 Variance procedure.

The owner or operator of a noise source which violates any of the provisions of this chapter may file an application with the Health Officer for a variance from the provisions thereof wherein said owner or operator shall set forth all actions taken to comply with said provisions, the reasons why immediate compliance cannot be achieved, a proposed method of achieving compliance, and a proposed time schedule for its accomplishment. Said application shall be accompanied by a fee in the amount of seventy-five dollars ($75.00). A separate application shall be filed for each noise source; provided, however, that several mobile sources under common ownership, or several fixed sources on a single property may be combined into one (1) application. Upon receipt of said application and fee, the Health Officer shall refer it with his recommendation thereon within thirty (30) days to the Noise Variance Board for action thereon in accordance with the provisions of this chapter.

An applicant for a variance shall remain subject to prosecution under the terms of this chapter until a variance is granted. (Ord. 171 § 1, 2007)

11.16.110 Noise Variance Board.

The City Council shall, by resolution, appoint the Noise Variance Board, which may be composed of the City Council, Planning Commission, or any other members the City Council may select. The City Council may adopt reasonable rules and regulations for procedures to be used by the Board in carrying out its functions under the provisions of this chapter, or may allow the Board to establish such rules and regulations.

The Noise Variance Board shall evaluate all applications for variance from the requirements of this chapter and may grant said variances with respect to time for compliance, subject to such terms, conditions and requirements as it may deem reasonable to achieve maximum compliance with the provisions of this chapter. Said terms, conditions, and requirements may include but shall not be limited to limitations on noise levels and operating hours. Each such variance shall set forth in detail the approved method of achieving maximum compliance and a time schedule for its accomplishment. In its determinations said Board shall consider the magnitude of nuisance caused by the offensive noise; the uses of property within the area of impingement by the noise; the time factors related to study, design, financing and construction of remedial work; the economic factors related to age and useful life of equipment; and the general public interest and welfare. Any variance granted by said Board shall be by resolution and shall be transmitted to the Development Services Department and the Health Officer for enforcement. Any violation of the terms of said variance shall be unlawful.

Meetings of the Noise Variance Board shall be held at such times and locations as said Board shall determine. All such meetings shall be open to the public.

APPENDIX 5.1:

STUDY AREA PHOTOS

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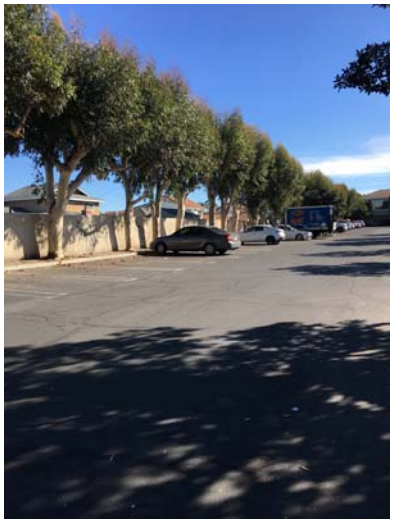
JN: 13058 Study Area Photos



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L1_S
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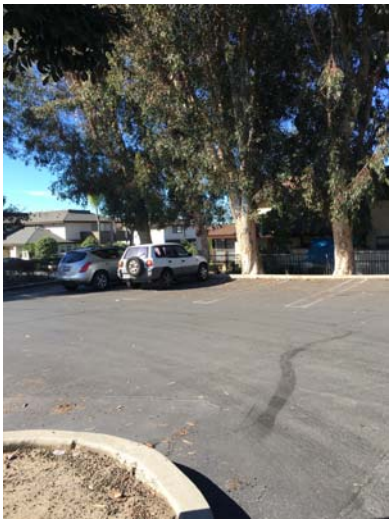

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L2_N
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JN: 13058 Study Area Photos

L2_S
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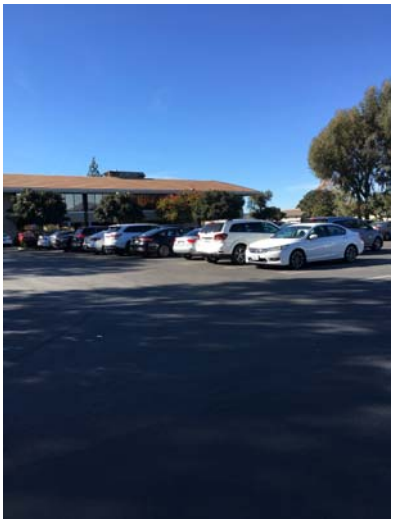

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L3_E
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L3_N
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L3_S
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L3_W
33, 37' 19.300000", 117, 42' 9.820000"

JN: 13058 Study Area Photos

L4_E
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L4_N
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L4_S
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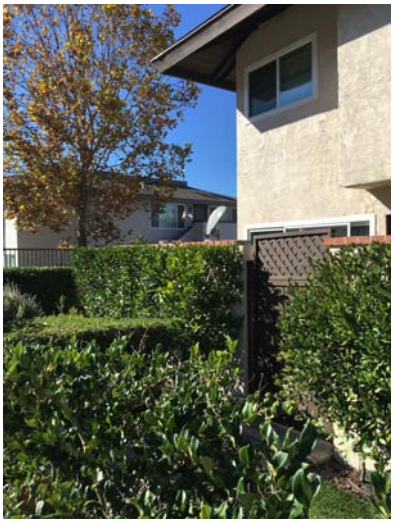

L4_W
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APPENDIX 5.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

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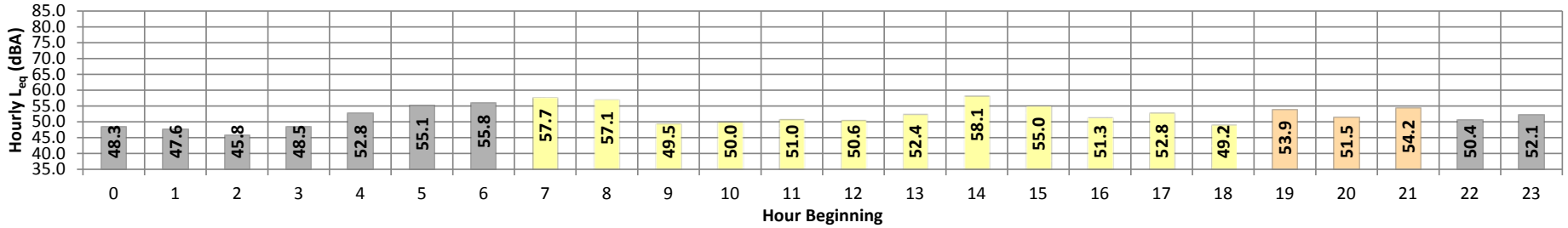
24-Hour Noise Level Measurement Summary

Date: Monday, December 16, 2019 *Location:* L1 - Located by the northern corner of the Project site near existing single-family residential homes. *Meter:* Piccolo II *JN:* 13058

Project: El Toro Road Residential *Analyst:* P. Mara

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	48.3	55.0	45.7	54.2	53.0	51.0	50.1	48.6	47.6	46.4	46.1	45.8	48.3	10.0	58.3
	1	47.6	53.0	44.1	52.5	52.1	51.1	50.5	48.4	46.6	44.8	44.5	44.2	47.6	10.0	57.6
	2	45.8	50.3	43.1	50.0	49.7	48.8	48.2	46.2	45.1	43.7	43.5	43.2	45.8	10.0	55.8
	3	48.5	52.0	45.8	51.8	51.6	51.0	50.5	49.2	47.9	46.5	46.3	45.9	48.5	10.0	58.5
	4	52.8	56.6	50.5	56.3	55.9	55.0	54.6	53.4	52.3	51.1	50.9	50.6	52.8	10.0	62.8
	5	55.1	57.8	53.3	57.6	57.3	56.8	56.5	55.6	54.9	53.8	53.6	53.4	55.1	10.0	65.1
	6	55.8	60.5	53.6	60.2	59.6	58.4	57.6	56.2	55.3	54.1	53.9	53.7	55.8	10.0	65.8
Day	7	57.7	62.9	55.7	62.5	61.9	60.4	59.7	58.0	57.1	56.1	56.0	55.8	57.7	0.0	57.7
	8	57.1	65.1	49.8	64.7	64.2	62.9	62.0	57.7	53.9	50.6	50.2	49.9	57.1	0.0	57.1
	9	49.5	59.1	44.0	58.5	57.7	55.6	53.8	48.9	46.5	44.6	44.4	44.1	49.5	0.0	49.5
	10	50.0	59.7	44.2	59.3	58.7	56.4	54.4	49.0	46.7	44.9	44.7	44.3	50.0	0.0	50.0
	11	51.0	60.8	44.9	60.3	59.6	57.2	54.9	50.1	47.7	45.7	45.4	45.0	51.0	0.0	51.0
	12	50.6	59.3	45.4	58.7	58.0	56.2	54.6	50.3	48.1	46.1	45.8	45.5	50.6	0.0	50.6
	13	52.4	64.2	45.7	63.0	61.5	58.2	55.9	51.3	49.3	46.7	46.3	45.8	52.4	0.0	52.4
	14	58.1	65.7	52.3	65.3	64.7	62.9	61.4	58.8	56.4	53.6	53.0	52.5	58.1	0.0	58.1
	15	55.0	62.2	48.2	61.8	61.3	59.7	58.5	56.1	54.1	49.3	48.9	48.4	55.0	0.0	55.0
	16	51.3	58.7	47.6	58.3	57.7	55.9	54.4	51.2	49.9	48.2	48.0	47.7	51.3	0.0	51.3
	17	52.8	61.1	47.0	60.7	60.2	58.4	56.7	53.0	50.9	47.9	47.6	47.2	52.8	0.0	52.8
	18	49.2	56.2	45.4	55.9	55.3	54.0	52.8	49.0	47.6	46.0	45.8	45.5	49.2	0.0	49.2
Evening	19	53.9	58.8	50.8	58.5	58.1	57.0	56.5	54.6	52.9	51.4	51.2	50.9	53.9	5.0	58.9
	20	51.5	56.7	48.1	56.1	55.6	54.5	54.0	52.4	50.5	48.8	48.5	48.2	51.5	5.0	56.5
	21	54.2	58.2	52.0	57.9	57.5	56.8	56.4	54.9	53.3	52.5	52.3	52.1	54.2	5.0	59.2
Night	22	50.4	55.6	48.0	55.2	54.8	53.7	53.0	50.7	49.7	48.5	48.3	48.0	50.4	10.0	60.4
	23	52.1	55.3	50.0	55.1	54.8	54.1	53.7	52.6	51.8	50.6	50.3	50.1	52.1	10.0	62.1

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	49.2	56.2	44.0	55.9	55.3	54.0	52.8	48.9	46.5	44.6	44.4	44.1
	Max	58.1	65.7	55.7	65.3	64.7	62.9	62.0	58.8	57.1	56.1	56.0	55.8
Energy Average		54.1	Average:		60.7	60.1	58.2	56.6	52.8	50.7	48.3	48.0	47.6
Evening	Min	51.5	56.7	48.1	56.1	55.6	54.5	54.0	52.4	50.5	48.8	48.5	48.2
	Max	54.2	58.8	52.0	58.5	58.1	57.0	56.5	54.9	53.3	52.5	52.3	52.1
Energy Average		53.4	Average:		57.5	57.1	56.1	55.6	54.0	52.3	50.9	50.7	50.4
Night	Min	45.8	50.3	43.1	50.0	49.7	48.8	48.2	46.2	45.1	43.7	43.5	43.2
	Max	55.8	60.5	53.6	60.2	59.6	58.4	57.6	56.2	55.3	54.1	53.9	53.7
Energy Average		51.9	Average:		54.8	54.3	53.3	52.8	51.2	50.1	48.8	48.6	48.3

L_{eq} (dBA)

24-Hour	*Daytime*	*Nighttime*
53.3	**54.0**	**51.9**

24-Hour CNEL (dBA)

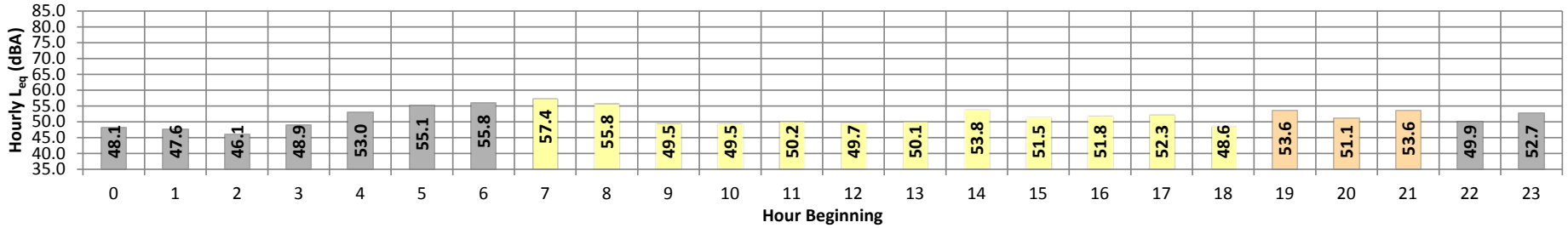
59.0

24-Hour Noise Level Measurement Summary

Date: Monday, December 16, 2019 *Location:* L2 - Located east of the Project site near Montessori Children's School House. *Meter:* Piccolo II *JN:* 13058

Project: El Toro Road Residential *Analyst:* P. Mara

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	48.1	53.5	45.5	53.1	52.5	51.1	50.2	48.3	47.4	46.2	45.9	45.6	48.1	10.0	58.1
	1	47.6	53.6	43.8	53.2	52.8	51.9	51.4	47.7	46.1	44.6	44.3	43.9	47.6	10.0	57.6
	2	46.1	50.7	43.3	50.4	50.0	49.1	48.4	46.7	45.4	44.0	43.7	43.4	46.1	10.0	56.1
	3	48.9	52.3	46.7	52.0	51.7	51.1	50.7	49.5	48.6	47.3	47.1	46.8	48.9	10.0	58.9
	4	53.0	58.5	50.7	57.8	57.3	55.7	55.2	53.2	52.3	51.3	51.1	50.8	53.0	10.0	63.0
	5	55.1	57.4	53.5	57.1	56.9	56.5	56.3	55.6	54.9	54.0	53.8	53.6	55.1	10.0	65.1
	6	55.8	60.9	53.8	60.4	59.7	58.5	57.7	56.2	55.2	54.3	54.1	53.9	55.8	10.0	65.8
Day	7	57.4	62.0	55.7	61.5	61.0	59.7	58.9	57.6	56.9	56.0	55.9	55.7	57.4	0.0	57.4
	8	55.8	65.0	50.4	64.6	64.0	61.7	59.7	54.9	53.2	51.2	50.8	50.5	55.8	0.0	55.8
	9	49.5	57.2	45.0	56.5	55.8	54.4	53.3	49.6	47.9	45.8	45.4	45.1	49.5	0.0	49.5
	10	49.5	58.2	44.4	57.3	56.5	54.5	52.8	49.6	47.4	45.1	44.8	44.5	49.5	0.0	49.5
	11	50.2	58.7	44.6	58.3	57.8	56.0	54.9	49.6	47.6	45.3	45.0	44.7	50.2	0.0	50.2
	12	49.7	58.0	45.0	57.5	56.8	55.6	54.0	49.3	47.4	45.7	45.5	45.2	49.7	0.0	49.7
	13	50.1	58.4	45.2	57.8	57.2	55.2	53.6	50.2	48.0	46.0	45.6	45.3	50.1	0.0	50.1
	14	53.8	63.0	47.9	62.4	61.7	60.1	58.0	53.0	51.2	48.8	48.4	48.0	53.8	0.0	53.8
	15	51.5	60.1	46.0	59.7	59.2	57.7	56.5	50.8	48.4	46.6	46.4	46.1	51.5	0.0	51.5
	16	51.8	60.0	47.9	59.6	58.9	56.6	54.8	51.8	50.1	48.5	48.2	48.0	51.8	0.0	51.8
	17	52.3	57.6	47.2	57.1	56.6	55.6	55.0	53.3	51.6	48.1	47.8	47.3	52.3	0.0	52.3
	18	48.6	55.5	45.2	54.9	54.0	52.2	51.1	48.9	47.5	45.9	45.6	45.3	48.6	0.0	48.6
Evening	19	53.6	58.8	50.4	58.5	58.0	56.9	56.2	54.4	52.7	51.1	50.8	50.5	53.6	5.0	58.6
	20	51.1	55.4	47.5	55.0	54.6	54.0	53.6	52.3	50.3	48.1	47.9	47.6	51.1	5.0	56.1
	21	53.6	57.2	51.7	56.8	56.5	55.5	55.1	54.2	53.2	52.3	52.0	51.8	53.6	5.0	58.6
Night	22	49.9	55.1	47.4	54.7	54.3	53.2	52.3	50.2	49.1	47.9	47.7	47.5	49.9	10.0	59.9
	23	52.7	55.8	50.6	55.6	55.3	54.6	54.2	53.3	52.4	51.2	50.9	50.7	52.7	10.0	62.7

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	48.6	55.5	44.4	54.9	54.0	52.2	51.1	48.9	47.4	45.1	44.8	44.5
	Max	57.4	65.0	55.7	64.6	64.0	61.7	59.7	57.6	56.9	56.0	55.9	55.7
Energy Average		52.6	Average:		58.9	58.3	56.6	55.2	51.6	49.8	47.8	47.5	47.1
Evening	Min	51.1	55.4	47.5	55.0	54.6	54.0	53.6	52.3	50.3	48.1	47.9	47.6
	Max	53.6	58.8	51.7	58.5	58.0	56.9	56.2	54.4	53.2	52.3	52.0	51.8
Energy Average		52.9	Average:		56.8	56.4	55.5	55.0	53.6	52.1	50.5	50.2	50.0
Night	Min	46.1	50.7	43.3	50.4	50.0	49.1	48.4	46.7	45.4	44.0	43.7	43.4
	Max	55.8	60.9	53.8	60.4	59.7	58.5	57.7	56.2	55.2	54.3	54.1	53.9
Energy Average		52.0	Average:		54.9	54.5	53.5	52.9	51.2	50.2	49.0	48.7	48.5

L_{eq} (dBA)

24-Hour	Daytime	Nighttime
52.4	52.7	52.0

24-Hour CNEL (dBA)

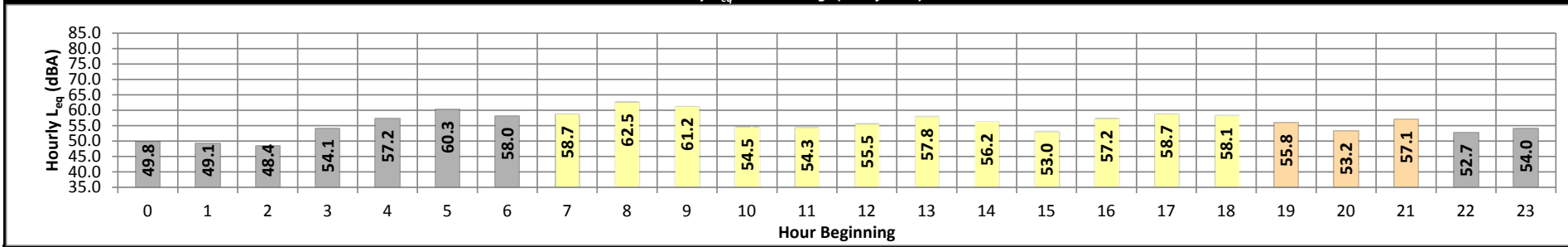
58.8

24-Hour Noise Level Measurement Summary

Date: Monday, December 16, 2019 *Location:* L3 - Located west of the Project site near existing multi-family homes. *Meter:* Piccolo II *JN:* 13058

Project: El Toro Road Residential *Analyst:* P. Mara

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	49.8	53.2	48.3	53.0	52.6	51.6	51.0	50.2	49.6	48.7	48.6	48.4	49.8	10.0	59.8
	1	49.1	53.9	46.7	53.5	53.1	52.0	51.3	49.7	48.3	47.2	47.0	46.8	49.1	10.0	59.1
	2	48.4	52.6	46.2	52.3	51.9	50.8	50.2	49.0	47.9	46.7	46.5	46.3	48.4	10.0	58.4
	3	54.1	61.6	48.1	61.2	60.1	59.3	58.8	55.2	51.5	48.7	48.5	48.3	54.1	10.0	64.1
	4	57.2	61.5	55.4	61.3	60.8	59.7	59.0	57.4	56.7	55.8	55.7	55.5	57.2	10.0	67.2
	5	60.3	65.5	56.4	65.3	65.2	64.5	63.9	60.9	58.6	57.3	56.8	56.5	60.3	10.0	70.3
	6	58.0	65.9	54.5	65.4	64.8	63.0	61.5	57.8	56.1	55.0	54.8	54.6	58.0	10.0	68.0
Day	7	58.7	66.9	55.7	66.0	65.1	62.8	61.8	58.6	57.2	56.2	56.0	55.8	58.7	0.0	58.7
	8	62.5	71.9	52.6	71.4	70.9	69.8	68.8	61.1	56.2	53.6	53.1	52.8	62.5	0.0	62.5
	9	61.2	70.3	47.4	70.0	69.7	68.8	67.4	59.2	54.5	48.6	48.0	47.5	61.2	0.0	61.2
	10	54.5	63.2	46.7	62.8	62.4	61.0	59.8	54.3	50.6	47.6	47.2	46.9	54.5	0.0	54.5
	11	54.3	63.3	46.5	62.7	62.2	60.6	59.6	54.4	50.2	47.4	47.1	46.7	54.3	0.0	54.3
	12	55.5	65.2	49.6	64.2	63.3	61.5	60.2	54.8	52.6	50.6	50.2	49.8	55.5	0.0	55.5
	13	57.8	71.3	48.5	70.0	68.0	64.4	62.7	54.8	52.0	49.7	49.2	48.7	57.8	0.0	57.8
	14	56.2	66.8	48.3	65.7	64.6	62.4	60.6	56.2	52.4	49.3	48.9	48.5	56.2	0.0	56.2
	15	53.0	61.1	48.0	60.3	59.5	57.8	56.8	53.5	50.9	48.8	48.5	48.1	53.0	0.0	53.0
	16	57.2	68.0	49.1	66.9	65.9	62.7	61.2	57.0	53.6	50.4	50.0	49.3	57.2	0.0	57.2
	17	58.7	70.4	49.2	69.4	68.1	64.7	63.3	58.0	54.3	50.8	50.2	49.4	58.7	0.0	58.7
	18	58.1	69.4	47.8	68.6	67.3	64.3	62.6	57.9	54.1	49.4	48.6	48.0	58.1	0.0	58.1
Evening	19	55.8	62.6	52.3	62.0	61.3	59.8	58.9	56.2	54.3	52.9	52.7	52.4	55.8	5.0	60.8
	20	53.2	59.9	49.8	59.4	58.9	57.0	56.1	53.8	51.9	50.3	50.1	49.9	53.2	5.0	58.2
	21	57.1	67.9	51.8	67.4	66.8	63.7	60.2	54.7	53.5	52.4	52.2	51.9	57.1	5.0	62.1
Night	22	52.7	57.5	50.4	57.0	56.5	55.5	54.7	53.0	52.0	50.9	50.7	50.5	52.7	10.0	62.7
	23	54.0	59.7	51.5	59.2	58.8	57.4	56.2	54.1	53.2	52.1	51.9	51.6	54.0	10.0	64.0

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	53.0	61.1	46.5	60.3	59.5	57.8	56.8	53.5	50.2	47.4	47.1	46.7
	Max	62.5	71.9	55.7	71.4	70.9	69.8	68.8	61.1	57.2	56.2	56.0	55.8
Energy Average		58.2	Average:		66.5	65.6	63.4	62.1	56.6	53.2	50.2	49.8	49.3
Evening	Min	53.2	59.9	49.8	59.4	58.9	57.0	56.1	53.8	51.9	50.3	50.1	49.9
	Max	57.1	67.9	52.3	67.4	66.8	63.7	60.2	56.2	54.3	52.9	52.7	52.4
Energy Average		55.7	Average:		62.9	62.3	60.2	58.4	54.9	53.2	51.9	51.7	51.4
Night	Min	48.4	52.6	46.2	52.3	51.9	50.8	50.2	49.0	47.9	46.7	46.5	46.3
	Max	60.3	65.9	56.4	65.4	65.2	64.5	63.9	60.9	58.6	57.3	56.8	56.5
Energy Average		55.5	Average:		58.7	58.2	57.1	56.3	54.1	52.7	51.4	51.2	50.9

L_{eq} (dBA)

24-Hour	Daytime	Nighttime
57.1	57.8	55.5

24-Hour CNEL (dBA)

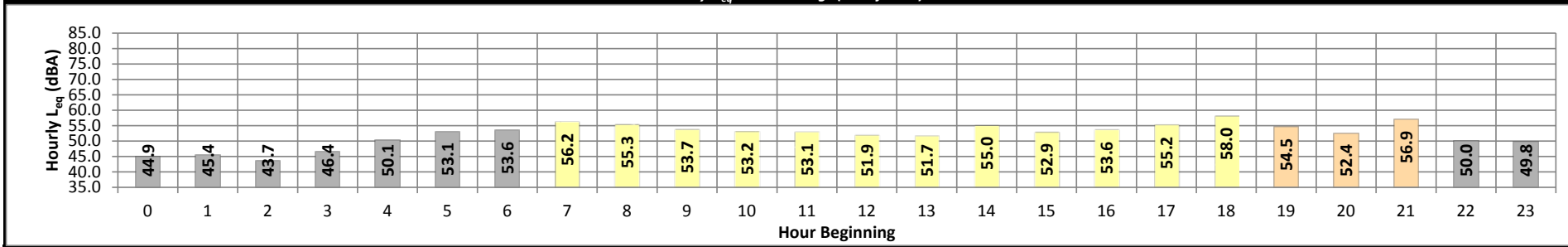
62.5

24-Hour Noise Level Measurement Summary

Date: Monday, December 16, 2019 *Location:* L4 - Located northwest of the Project site on Packer Place near existing multi-family residential homes. *Meter:* Piccolo II *JN:* 13058

Project: El Toro Road Residential *Analyst:* P. Mara

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	44.9	49.1	42.8	48.8	48.4	47.3	46.6	45.2	44.4	43.3	43.1	42.8	44.9	10.0	54.9
	1	45.4	52.0	41.6	51.5	50.9	49.5	48.3	45.9	44.2	42.5	42.1	41.7	45.4	10.0	55.4
	2	43.7	50.1	40.1	49.7	49.2	48.0	47.0	44.1	42.4	40.7	40.5	40.2	43.7	10.0	53.7
	3	46.4	52.4	42.7	52.1	51.7	50.1	49.2	47.5	44.9	43.3	43.0	42.8	46.4	10.0	56.4
	4	50.1	55.1	47.6	54.8	54.4	53.2	52.4	50.5	49.5	48.2	47.9	47.7	50.1	10.0	60.1
	5	53.1	59.8	50.6	59.5	58.6	56.2	55.1	53.1	52.2	51.1	50.9	50.7	53.1	10.0	63.1
	6	53.6	60.8	50.2	60.3	59.6	57.8	56.6	53.7	52.2	50.7	50.5	50.3	53.6	10.0	63.6
Day	7	56.2	64.5	52.6	63.9	63.1	60.6	58.9	56.0	54.6	53.2	53.0	52.7	56.2	0.0	56.2
	8	55.3	73.9	49.2	73.4	72.7	70.4	68.4	59.9	55.4	50.4	49.9	49.4	55.3	0.0	55.3
	9	53.7	65.4	43.1	64.7	63.7	60.7	58.6	52.1	47.6	44.0	43.6	43.2	53.7	0.0	53.7
	10	53.2	64.6	43.4	64.0	62.9	60.3	57.8	51.7	48.2	44.5	44.0	43.6	53.2	0.0	53.2
	11	53.1	64.8	43.1	64.2	63.1	59.5	57.0	52.1	48.1	44.2	43.8	43.3	53.1	0.0	53.1
	12	51.9	62.7	43.7	62.1	61.1	58.3	56.3	51.4	47.8	44.4	44.1	43.8	51.9	0.0	51.9
	13	51.7	61.0	42.9	60.5	59.9	57.8	56.1	51.6	48.5	44.2	43.6	43.0	51.7	0.0	51.7
	14	55.0	65.5	47.5	64.9	63.8	60.6	58.5	54.6	52.2	48.9	48.2	47.6	55.0	0.0	55.0
	15	52.9	63.9	45.6	63.3	62.1	58.9	56.8	51.9	49.2	46.5	46.2	45.7	52.9	0.0	52.9
	16	53.6	64.5	46.1	63.6	62.5	59.8	57.9	52.8	49.8	47.1	46.7	46.2	53.6	0.0	53.6
	17	55.2	67.8	45.8	66.3	65.2	61.4	59.1	53.7	50.6	46.8	46.4	46.0	55.2	0.0	55.2
	18	58.0	68.2	44.4	67.5	67.1	66.0	64.5	55.7	51.0	46.5	45.5	44.6	58.0	0.0	58.0
Evening	19	54.5	64.6	48.7	63.7	62.8	59.4	58.0	54.5	51.6	49.6	49.3	48.9	54.5	5.0	59.5
	20	52.4	63.2	46.1	62.1	60.9	58.2	55.9	52.1	49.9	46.7	46.5	46.2	52.4	5.0	57.4
	21	56.9	66.4	52.9	65.5	65.2	62.6	60.4	56.4	54.2	53.2	53.1	53.0	56.9	5.0	61.9
Night	22	50.0	57.9	46.0	57.4	56.8	55.2	53.6	49.8	48.1	46.6	46.3	46.1	50.0	10.0	60.0
	23	49.8	54.0	47.4	53.7	53.3	52.3	51.6	50.3	49.3	48.0	47.8	47.5	49.8	10.0	59.8

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	51.7	61.0	42.9	60.5	59.9	57.8	56.1	51.4	47.6	44.0	43.6	43.0
	Max	58.0	73.9	52.6	73.4	72.7	70.4	68.4	59.9	55.4	53.2	53.0	52.7
Energy Average		54.5	Average:		64.9	63.9	61.2	59.2	53.6	50.2	46.7	46.3	45.8
Evening	Min	52.4	63.2	46.1	62.1	60.9	58.2	55.9	52.1	49.9	46.7	46.5	46.2
	Max	56.9	66.4	52.9	65.5	65.2	62.6	60.4	56.4	54.2	53.2	53.1	53.0
Energy Average		55.0	Average:		63.8	63.0	60.1	58.1	54.3	51.9	49.8	49.6	49.3
Night	Min	43.7	49.1	40.1	48.8	48.4	47.3	46.6	44.1	42.4	40.7	40.5	40.2
	Max	53.6	60.8	50.6	60.3	59.6	57.8	56.6	53.7	52.2	51.1	50.9	50.7
Energy Average		49.8	Average:		54.2	53.7	52.2	51.2	48.9	47.4	46.0	45.8	45.5

L_{eq} (dBA)

24-Hour	Daytime	Nighttime
53.4	54.6	49.8

24-Hour CNEL (dBA)

58.0

APPENDIX 7.1:

ON-SITE TRAFFIC NOISE LEVEL CALCULATIONS

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: First Floor With Wall
Road Name: Packer Pl.
Lot No: 118

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	45.0 feet
Centerline Dist. to Observer:	53.0 feet
Barrier Distance to Observer:	8.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	52.134
Medium Trucks:	52.058
Heavy Trucks:	52.135

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-0.38	-1.20	*-1.36*	0.000	0.000
Medium Trucks:	76.31	-18.68	-0.37	-1.20	*-1.57*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-0.38	-1.20	*-2.01*	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:	64.3	62.4	60.7	54.6	63.2	63.9
Medium Trucks:	56.1	54.6	48.2	46.7	55.1	55.3
Heavy Trucks:	57.0	55.5	46.5	47.7	56.1	56.2
Vehicle Noise:	65.6	63.8	61.1	56.0	64.5	65.0

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	64.3	62.4	60.7	54.6	63.2	63.9
Medium Trucks:	56.1	54.6	48.2	46.7	55.1	55.3
Heavy Trucks:	57.0	55.5	46.5	47.7	56.1	56.2
Vehicle Noise:	65.6	63.8	61.1	56.0	64.5	65.0

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: First Floor With Wall
Road Name: Raymond Ave.
Lot No: 116

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	50.0 feet
Centerline Dist. to Observer:	58.0 feet
Barrier Distance to Observer:	8.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	57.210
Medium Trucks:	57.140
Heavy Trucks:	57.210

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-0.98	-1.20	*-1.37*	0.000	0.000
Medium Trucks:	76.31	-18.68	-0.97	-1.20	*-1.55*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-0.98	-1.20	*-1.95*	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:	63.7	61.8	60.1	54.0	62.6	63.2
Medium Trucks:	55.5	54.0	47.6	46.0	54.5	54.7
Heavy Trucks:	56.3	54.9	45.9	47.1	55.5	55.6
Vehicle Noise:	65.0	63.2	60.5	55.4	63.9	64.4

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.7	61.8	60.1	54.0	62.6	63.2
Medium Trucks:	55.5	54.0	47.6	46.0	54.5	54.7
Heavy Trucks:	56.3	54.9	45.9	47.1	55.5	55.6
Vehicle Noise:	65.0	63.2	60.5	55.4	63.9	64.4

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: First Floor With Wall
Road Name: Raymond Ave.
Lot No: 115

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	54.0 feet
Centerline Dist. to Observer:	62.0 feet
Barrier Distance to Observer:	8.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	61.262
Medium Trucks:	61.196
Heavy Trucks:	61.262

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-1.43	-1.20	*-1.37*	0.000	0.000
Medium Trucks:	76.31	-18.68	-1.42	-1.20	*-1.54*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-1.43	-1.20	*-1.91*	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:	63.3	61.4	59.6	53.6	62.2	62.8
Medium Trucks:	55.0	53.5	47.1	45.6	54.1	54.3
Heavy Trucks:	55.9	54.5	45.4	46.7	55.0	55.2
Vehicle Noise:	64.5	62.7	60.0	54.9	63.5	64.0

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.3	61.4	59.6	53.6	62.2	62.8
Medium Trucks:	55.0	53.5	47.1	45.6	54.1	54.3
Heavy Trucks:	55.9	54.5	45.4	46.7	55.0	55.2
Vehicle Noise:	64.5	62.7	60.0	54.9	63.5	64.0

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Second Floor With Wall
Road Name: Packer Pl.
Lot No: 118

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	45.0 feet
Centerline Dist. to Observer:	53.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	15.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	53.647
Medium Trucks:	53.198
Heavy Trucks:	52.516

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-0.56	-1.20	*-7.31*	0.000	0.000
Medium Trucks:	76.31	-18.68	-0.51	-1.20	*-7.87*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-0.42	-1.20	*-9.05*	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:	64.2	62.3	60.5	54.4	63.1	63.7
Medium Trucks:	55.9	54.4	48.1	46.5	55.0	55.2
Heavy Trucks:	56.9	55.5	46.4	47.7	56.0	56.2
Vehicle Noise:	65.4	63.6	60.9	55.8	64.4	64.9

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	64.2	62.3	60.5	54.4	63.1	63.7
Medium Trucks:	55.9	54.4	48.1	46.5	55.0	55.2
Heavy Trucks:	56.9	55.5	46.4	47.7	56.0	56.2
Vehicle Noise:	65.4	63.6	60.9	55.8	64.4	64.9

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Second Floor With Wall
Road Name: Raymond Ave.
Lot No: 116

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	50.0 feet
Centerline Dist. to Observer:	58.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	15.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	58.592
Medium Trucks:	58.181
Heavy Trucks:	57.558

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-1.14	-1.20	*-7.44*	0.000	0.000
Medium Trucks:	76.31	-18.68	-1.09	-1.20	*-7.95*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-1.02	-1.20	*-9.02*	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:	63.6	61.7	59.9	53.9	62.5	63.1
Medium Trucks:	55.3	53.8	47.5	45.9	54.4	54.6
Heavy Trucks:	56.3	54.9	45.8	47.1	55.5	55.6
Vehicle Noise:	64.8	63.1	60.3	55.2	63.8	64.3

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.6	61.7	59.9	53.9	62.5	63.1
Medium Trucks:	55.3	53.8	47.5	45.9	54.4	54.6
Heavy Trucks:	56.3	54.9	45.8	47.1	55.5	55.6
Vehicle Noise:	64.8	63.1	60.3	55.2	63.8	64.3

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Second Floor With Wall
Road Name: Raymond Ave.
Lot No: 115

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	54.0 feet
Centerline Dist. to Observer:	62.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	15.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	62.554
Medium Trucks:	62.169
Heavy Trucks:	61.587

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-1.56	-1.20	*-7.52*	0.000	0.000
Medium Trucks:	76.31	-18.68	-1.52	-1.20	*-8.00*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-1.46	-1.20	*-9.00*	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:	63.2	61.3	59.5	53.4	62.1	62.7
Medium Trucks:	54.9	53.4	47.0	45.5	54.0	54.2
Heavy Trucks:	55.9	54.4	45.4	46.7	55.0	55.1
Vehicle Noise:	64.4	62.6	59.9	54.8	63.4	63.9

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.2	61.3	59.5	53.4	62.1	62.7
Medium Trucks:	54.9	53.4	47.0	45.5	54.0	54.2
Heavy Trucks:	55.9	54.4	45.4	46.7	55.0	55.1
Vehicle Noise:	64.4	62.6	59.9	54.8	63.4	63.9

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Third Floor With Wall
Road Name: Packer Pl.
Lot No: 118

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	45.0 feet
Centerline Dist. to Observer:	53.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	25.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	56.903
Medium Trucks:	56.125
Heavy Trucks:	54.752

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-0.95	-1.20	*-13.23*	0.000	0.000
Medium Trucks:	76.31	-18.68	-0.86	-1.20	*-14.11*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-0.69	-1.20	*-15.95*	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:	63.8	61.9	60.1	54.1	62.7	63.3
Medium Trucks:	55.6	54.1	47.7	46.2	54.6	54.9
Heavy Trucks:	56.6	55.2	46.2	47.4	55.8	55.9
Vehicle Noise:	65.1	63.3	60.5	55.5	64.0	64.5

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.8	61.9	60.1	54.1	62.7	63.3
Medium Trucks:	55.6	54.1	47.7	46.2	54.6	54.9
Heavy Trucks:	56.6	55.2	46.2	47.4	55.8	55.9
Vehicle Noise:	65.1	63.3	60.5	55.5	64.0	64.5

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Third Floor With Wall
Road Name: Raymond Ave.
Lot No: 116

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	50.0 feet
Centerline Dist. to Observer:	58.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	25.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	61.587
Medium Trucks:	60.869
Heavy Trucks:	59.605

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-1.46	-1.20	*-13.59*	0.000	0.000
Medium Trucks:	76.31	-18.68	-1.38	-1.20	*-14.41*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-1.25	-1.20	*-16.09*	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:	63.3	61.4	59.6	53.5	62.2	62.8
Medium Trucks:	55.1	53.5	47.2	45.6	54.1	54.3
Heavy Trucks:	56.1	54.7	45.6	46.9	55.2	55.4
Vehicle Noise:	64.5	62.8	60.0	54.9	63.5	64.0

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.3	61.4	59.6	53.5	62.2	62.8
Medium Trucks:	55.1	53.5	47.2	45.6	54.1	54.3
Heavy Trucks:	56.1	54.7	45.6	46.9	55.2	55.4
Vehicle Noise:	64.5	62.8	60.0	54.9	63.5	64.0

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Third Floor With Wall
Road Name: Raymond Ave.
Lot No: 115

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	54.0 feet
Centerline Dist. to Observer:	62.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	25.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	65.368
Medium Trucks:	64.692
Heavy Trucks:	63.504

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-1.85	-1.20	*-13.85*	0.000	0.000
Medium Trucks:	76.31	-18.68	-1.78	-1.20	*-14.61*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-1.66	-1.20	*-16.19*	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:	62.9	61.0	59.2	53.2	61.8	62.4
Medium Trucks:	54.7	53.1	46.8	45.2	53.7	53.9
Heavy Trucks:	55.7	54.2	45.2	46.5	54.8	54.9
Vehicle Noise:	64.1	62.4	59.6	54.5	63.1	63.6

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	62.9	61.0	59.2	53.2	61.8	62.4
Medium Trucks:	54.7	53.1	46.8	45.2	53.7	53.9
Heavy Trucks:	55.7	54.2	45.2	46.5	54.8	54.9
Vehicle Noise:	64.1	62.4	59.6	54.5	63.1	63.6

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Fourth Floor With Wall
Road Name: Packer Pl.
Lot No: 118

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	45.0 feet
Centerline Dist. to Observer:	53.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	35.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	61.628
Medium Trucks:	60.581
Heavy Trucks:	58.632

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-1.47	-1.20	*-18.11*	0.000	0.000
Medium Trucks:	76.31	-18.68	-1.35	-1.20	*-19.25*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-1.14	-1.20	*-21.65*	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:	63.3	61.4	59.6	53.5	62.2	62.8
Medium Trucks:	55.1	53.6	47.2	45.7	54.1	54.4
Heavy Trucks:	56.2	54.8	45.7	47.0	55.3	55.5
Vehicle Noise:	64.6	62.8	60.0	54.9	63.5	64.0

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.3	61.4	59.6	53.5	62.2	62.8
Medium Trucks:	55.1	53.6	47.2	45.7	54.1	54.4
Heavy Trucks:	56.2	54.8	45.7	47.0	55.3	55.5
Vehicle Noise:	64.6	62.8	60.0	54.9	63.5	64.0

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Fourth Floor With Wall
Road Name: Raymond Ave.
Lot No: 116

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	50.0 feet
Centerline Dist. to Observer:	58.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	35.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	65.977
Medium Trucks:	65.000
Heavy Trucks:	63.188

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-1.91	-1.20	*-18.80*	0.000	0.000
Medium Trucks:	76.31	-18.68	-1.81	-1.20	*-19.86*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-1.63	-1.20	*-22.08*	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:	62.8	60.9	59.1	53.1	61.7	62.3
Medium Trucks:	54.6	53.1	46.8	45.2	53.7	53.9
Heavy Trucks:	55.7	54.3	45.2	46.5	54.8	55.0
Vehicle Noise:	64.1	62.3	59.6	54.5	63.1	63.6

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	62.8	60.9	59.1	53.1	61.7	62.3
Medium Trucks:	54.6	53.1	46.8	45.2	53.7	53.9
Heavy Trucks:	55.7	54.3	45.2	46.5	54.8	55.0
Vehicle Noise:	64.1	62.3	59.6	54.5	63.1	63.6

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - 6/2/2013

Scenario: Fourth Floor With Wall
Road Name: Raymond Ave.
Lot No: 115

Project Name: El Toro Road Residential
Job Number: 13058
Analyst: P. Mara

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	10,000 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,000 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	20 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	54.0 feet
Centerline Dist. to Observer:	62.0 feet
Barrier Distance to Observer:	8.0 feet
Observer Height (Above Pad):	35.0 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:	77.5%	12.9%	9.6%	97.42%
Medium Trucks:	84.8%	4.9%	10.3%	1.84%
Heavy Trucks:	86.5%	2.7%	10.8%	0.74%

Noise Source Elevations (in feet)

Autos:	2.000		
Medium Trucks:	4.000		
Heavy Trucks:	8.006	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	69.520
Medium Trucks:	68.593
Heavy Trucks:	66.878

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-1.44	-2.25	-1.20	*-19.28*	0.000	0.000
Medium Trucks:	76.31	-18.68	-2.16	-1.20	*-20.28*	0.000	0.000
Heavy Trucks:	81.16	-22.63	-2.00	-1.20	*-22.38*	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:	62.5	60.6	58.8	52.8	61.4	62.0
Medium Trucks:	54.3	52.8	46.4	44.9	53.3	53.6
Heavy Trucks:	55.3	53.9	44.9	46.1	54.5	54.6
Vehicle Noise:	63.8	62.0	59.2	54.1	62.7	63.2

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	62.5	60.6	58.8	52.8	61.4	62.0
Medium Trucks:	54.3	52.8	46.4	44.9	53.3	53.6
Heavy Trucks:	55.3	53.9	44.9	46.1	54.5	54.6
Vehicle Noise:	63.8	62.0	59.2	54.1	62.7	63.2

APPENDIX 9.1:

OPERATIONAL NOISE LEVEL CALCULATIONS

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13058

CadnaA Noise Prediction Model
13058_01.cna
Date:
24.02.20
Analyst:
B. Lawson

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)
R1		R1	49.9	41.4	50.0	55.0	50.0	0.0				5.00	a	6119923.18	2173389.61	5.00
R2		R2	46.4	39.6	47.5	55.0	50.0	0.0				5.00	a	6120040.71	2173391.09	5.00
R3		R3	41.6	39.0	45.7	55.0	50.0	0.0				5.00	a	6120064.58	2173027.68	5.00
R4		R4	40.9	38.4	45.1	55.0	50.0	0.0				5.00	a	6119567.05	2173116.72	5.00
R5		R5	46.7	43.7	50.5	55.0	50.0	0.0				5.00	a	6119751.73	2173244.85	5.00

Point Source(s)

Name	M.	ID	Result. PWL			Lw / Li			Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.	Height		Coordinates		
			Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area		Day	Special	Night						X	Y	Z
			(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)	dB(A)		(ft^2)		(min)	(min)	(min)	(dB)	(Hz)		(ft)		(ft)	(ft)	(ft)
POINTSOURCE		AC01	88.9	88.9	88.9	Lw	88.9		0.0	0.0	0.0				585.00	0.00	252.00	0.0	500	(none)	5.00	g	6120000.17	2173125.32	50.00
POINTSOURCE		AC02	88.9	88.9	88.9	Lw	88.9		0.0	0.0	0.0				585.00	0.00	252.00	0.0	500	(none)	5.00	g	6119873.69	2173009.41	50.00
POINTSOURCE		AC03	88.9	88.9	88.9	Lw	88.9		0.0	0.0	0.0				585.00	0.00	252.00	0.0	500	(none)	5.00	g	6119768.35	2173123.05	50.00
POINTSOURCE		COURT01	91.5	91.5	91.5	Lw	91.5		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6119875.95	2173119.28	5.00
POINTSOURCE		COURT02	91.5	91.5	91.5	Lw	91.5		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6119896.72	2173098.51	5.00
POINTSOURCE		COURT03	91.5	91.5	91.5	Lw	91.5		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6119842.35	2173119.65	5.00
POINTSOURCE		PLAY	75.1	75.1	75.1	Lw	75.1		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6119857.07	2173104.55	4.00
POINTSOURCE		TRASH	89.0	89.0	89.0	Lw	89		0.0	0.0	0.0				300.00	0.00	180.00	0.0	500	(none)	5.00	a	6119935.98	2173120.79	5.00

Barrier(s)

Name	M.	ID	Absorption		Z-Ext.	Cantilever		Height			
			left	right		horz.	vert.	Begin		End	
					(ft)	(ft)	(ft)	(ft)		(ft)	
BARRIERS		BARRIERS00001						6.00	a		

Building(s)

Name	M.	ID	RB	Residents	Absorption	Height	
						Begin	
						(ft)	
BUILDING		BUILDING00001	x	0		45.00	a

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APPENDIX 10.1:

CONSTRUCTION NOISE LEVEL CALCULATIONS

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13058

CadnaA Noise Prediction Model
13058_01Construction.cna
Date:
24.02.20
Analyst:
B. Lawson

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)
R1		R1	73.6	73.6	80.3	85.0	0.0	0.0				5.00	a	6119923.18	2173389.61	5.00
R2		R2	72.9	72.9	79.6	85.0	0.0	0.0				5.00	a	6120040.71	2173391.09	5.00
R3		R3	70.9	70.9	77.6	85.0	0.0	0.0				5.00	a	6120064.58	2173027.68	5.00
R4		R4	66.3	66.3	72.9	85.0	0.0	0.0				5.00	a	6119567.05	2173116.72	5.00
R5		R5	71.1	71.1	77.8	85.0	0.0	0.0				5.00	a	6119751.73	2173244.85	5.00

Area Source(s)

Name	M.	ID	Result. PWL			Result. PWL''			Lw / Li			Correction			Sound Reduction		Attenuation	Operating Time			K0	Freq.	Direct.	Moving Pt. Src		
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area		Day	Special	Night				Number		
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)	dB(A)		(ft^2)		(min)	(min)	(min)	(dB)	(Hz)		Day	Evening	Night
SITEBOUNDARY		SITEBOUNDARY00001	114.3	114.3	114.3	75.3	75.3	75.3	Lw''	75.3		0.0	0.0	0.0							0.0	500	(none)			

Barrier(s)

Name	M.	ID	Absorption		Z-Ext.	Cantilever		Height				
			left	right		horz.	vert.	Begin			End	
					(ft)	(ft)	(ft)	(ft)			(ft)	
BARRIERS		BARRIERS00001						6.00	a			

Building(s)

Name	M.	ID	RB	Residents	Absorption	Height	
						Begin	
						(ft)	
BUILDING		BUILDING00001	x	0		45.00	a

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