Casa Loma Residential

NOISE IMPACT ANALYSIS

CITY OF REDLANDS

PREPARED BY:

Bill Lawson, PE, INCE
blawson@urbanxroads.com
(949) 336-5979

JANUARY 18, 2020

TABLE OF CONTENTS

APPENDICES

LIST OF EXHIBITS

LIST OF TABLES

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
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	Casa Loma Residential
REMEL	Reference Energy Mean Emission Level
RMS	Root-mean-square
VdB	Vibration Decibels

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise mitigation measures for the proposed Casa Loma Residential ("Project"). The Project site is located south of Lugonia Avenue and west of University Street in the City of Redlands. The Project is proposed to consist of 147 multi-family dwelling units in four 3-story residential buildings. This study has been prepared consistent with applicable City of Redlands noise standards, and significance criteria based on guidance provided by Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (1)

OFF-SITE NOISE ANALYSIS

Traffic generated by the operation of the proposed Project will influence the traffic noise levels in surrounding off-site areas. To quantify the traffic noise increases on the surrounding off-site areas, the changes in traffic noise levels on 4 roadway segments surrounding the Project site were calculated based on the change in the average daily traffic (ADT) volumes. The traffic noise levels provided in this analysis are based on the traffic forecasts found in *Casa Loma Residential Traffic Impact Analysis*. (2) To assess the off-site noise level impacts associated with the proposed Project, noise contour boundaries were developed for Existing, Year 2021 Cumulative, and Year 2040 Buildout traffic conditions. The analysis shows that the unmitigated Project-related traffic noise level increases under all traffic scenarios will be *less than significant*.

ON-SITE NOISE ANALYSIS

A noise impact analysis has been completed to determine the on-site traffic noise exposure levels that would result from nearby transportation noise sources, 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 University Street and Lugonia Avenue. No exterior noise mitigation is required to satisfy the City of Redlands General Plan Noise Element exterior land use/noise level compatibility criteria for multi-family residential uses.

To satisfy the City of Redlands 45 dBA CNEL residential interior noise level standards, the planned assisted living multi-family residential will require a noise reduction (NR) of up to 22.7 dBA and a windows-closed condition requiring a means of mechanical ventilation (e.g. air conditioning). Therefore, the future on-site interior traffic noise impacts will be *less than significant* with the following typical building construction measures:

- Windows: All residential lots require first and second-floor windows and sliding glass doors that have well-fitted, well-weather-stripped assemblies, with minimum sound transmission class (STC) ratings of 27.
- Doors (Non-Glass): All exterior doors shall be well weather-stripped and have minimum STC ratings of 25. Well-sealed perimeter gaps around the doors are essential to achieve the optimal STC rating. (3)

- 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 Casa Loma Residential site, this analysis estimates the Project-related stationary-source operational noise levels at nearby receiver locations. The typical activities associated with the proposed Casa Loma Residential are anticipated to include roof-top air conditioning units, trash enclosure activity, parking lot vehicle movements, courtyard activity, outdoor pool/spa activity and dog park activity. The operational noise analysis shows that Project activities will satisfy the City of Redlands daytime and nighttime exterior noise level thresholds at all receiver locations.

Further, this analysis demonstrates that the Project operational noise levels will not contribute a long-term operational noise level impact to the existing ambient noise environment at any of the sensitive receiver locations. Therefore, the operational noise level impacts associated with the proposed 24-hour seven days per week Project activities, such as the roof-top air conditioning units, trash enclosure activity, parking lot vehicle movements, courtyard activity, outdoor pool/spa activity and dog park activity, are considered *less than significant*.

CONSTRUCTION NOISE ANALYSIS

On-site construction noise represents a short-term increase on the ambient noise levels associated with the development of the Project on nearby receivers. Construction-related noise impacts are expected to create temporary and intermittent high-level noise conditions at receivers surrounding the Project site when certain activities occur at the Project site boundary. Using sample reference noise levels to represent the planned construction activities of Casa Loma Residential site, this analysis estimates the Project-related construction noise levels at nearby sensitive receiver locations. Since the City of Redlands General Plan and Municipal Codes do not identify specific construction noise level limits, this analysis relies on the 85 dBA Leq threshold identified by the National Institute for Occupational Safety and Health (NIOSH) to quantify and determine potential construction noise level impacts. This analysis shows that the Project-related short-term construction noise levels are estimated to range from 72.1 to 76.7 dBA L_{eq} and will satisfy the 85 dBA L_{eq} threshold identified by the National Institute for Occupational Safety and Health (NIOSH). (4) and therefore, the noise level impacts at the nearby sensitive receiver locations are considered *less than significant*.

SUMMARY OF CEQA SIGNIFICANCE FINDINGS

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

ES-1: SUMMARY OF CEQA SIGNIFICANCE FINDINGS

Analysis	Report Section	Significance Findings	
		Unmitigated	Mitigated
Off-Site Traffic Noise Levels	7	*Less Than Significant*	*n/a*
On-Site Interior 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		*Potentially Significant*	*Less Than Significant*

This page intentionally left blank

1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed Casa Loma Residential ("Project"). This noise study 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 Casa Loma Residential Project is located south of Lugonia Avenue and west of University Street in the City of Redlands, as shown on Exhibit 1-A. The Project site is currently vacant. Existing land uses near the site include residential land uses to the west on Occidental Drive, the Palm Village residential community to the north and the ReNew Redlands apartment community to the east. The San Bernardino Airport is located approximately 3.4 miles northwest of the Project site.

1.2 PROJECT DESCRIPTION

The Project is to consist of 147 multi-family residential dwelling units, as shown on Exhibit 1-B. The proposed Project would develop four 3-story residential buildings. It is anticipated that the Project would be developed in a single phase with an anticipated Opening Year of 2021. The on-site Project-related operational noise sources are expected to include: roof-top air conditioning units, trash enclosure activity, parking lot vehicle movements, courtyard activity, outdoor pool/spa activity and dog park activity.

EXHIBIT 1-A: LOCATION MAP

EXHIBIT 1-B: SITE PLAN

This page intentionally left blank

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. (5) 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. (6) 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 Redlands 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 Redlands 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. (5)

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. (7)

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. (5)

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. (7)

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. (7)

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. (8)

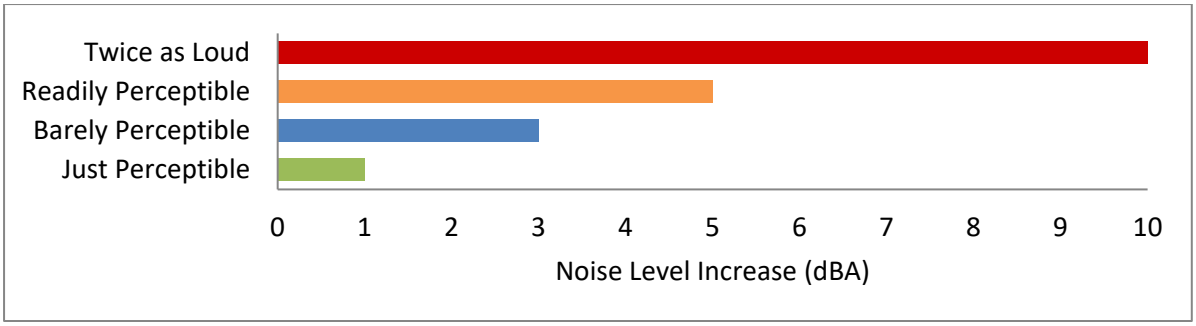
2.7 COMMUNITY RESPONSE TO NOISE

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. (9) 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. (9) 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 (10), a change of 3 dBA are considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (7)

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. (11)

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.

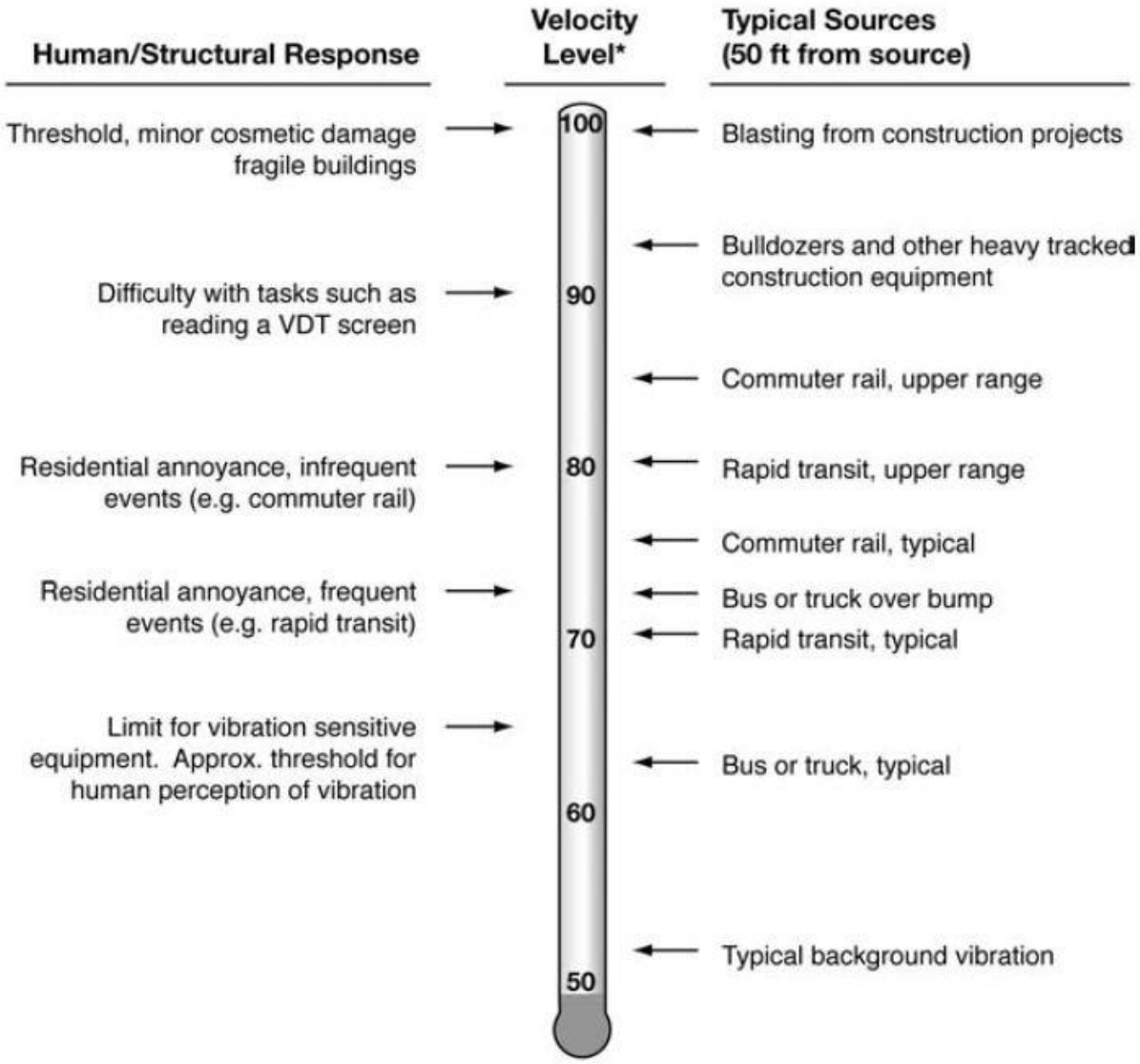
2.9 VIBRATION

Per the Federal Transit Administration (FTA) *Transit Noise Impact and Vibration Assessment* (12), 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.

This page intentionally left blank

3 REGULATORY SETTING

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

3.1 STATE OF CALIFORNIA NOISE REQUIREMENTS

The State of California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards, and provides guidance for local land use compatibility. State law requires that each county and city adopt a General Plan that includes a Noise Element which is to be prepared per guidelines adopted by the Governor's Office of Planning and Research. (13) 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 REDLANDS NOISE ELEMENT

The City of Redlands has adopted a Noise Element of the General to control and abate environmental noise, and to protect the citizens of the City of Redlands from excessive exposure to noise. (15) The Noise Element specifies the maximum allowable exterior noise levels for new developments impacted by transportation noise sources such as arterial roads, freeways, airports and railroads. In addition, the Noise Element identifies several polices to minimize the impacts of excessive noise levels throughout the community and establishes noise level requirements for all land uses. The noise standards identified in the City of Redlands General Plan (Table 7-10) are guidelines to evaluate the land use compatibility of transportation-related noise. The

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 Compatibility Matrix and Interpretation* table describes categories of compatibility and not specific noise standards. Noise-sensitive residential land use is considered *clearly compatible* (Zone A) with unmitigated exterior noise levels of less than 60 dBA CNEL, and *normally incompatible* (Zone C) with unmitigated exterior noise levels below 75 dBA CNEL. For Zone C, *normally incompatible* land use, *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.* (15)

EXHIBIT 3-A: NOISE/LAND USE COMPATIBILITY MATRIX

Land Use Categories		Community Noise Equivalent Level (CNEL)							
Categories	**Uses**	**<**	**60**	**65**	**70**	**75**	**80**	**85**	**>**
RESIDENTIAL	Single Family, Duplex Multiple Family	A	C	C	C	D	D	D	
RESIDENTIAL	Mobile Homes	A	C	C	C	D	D	D	
COMMERCIAL Regional, District	Hotel, Motel, Transient Lodging	A	A	B	B	C	C	D	
COMMERCIAL Regional, Village District, Special	Commercial Retail, Bank, Restaurant, Movie Theater	A	A	A	A	B	B	C	
COMMERCIAL INDUSTRIAL INSTITUTIONAL	Office Building, Research & Dev., Professional Offices, City Office Building	A	A	A	B	B	C	D	
COMMERCIAL Recreation INSTITUTIONAL Civic Center	Amphitheater, Concert Hall, Auditorium, Meeting Hall	B	B	C	C	D	D	D	
COMMERCIAL Recreation	Childrens Amusement Park, Miniature Golf Course, Go-cart Track, Equestrian Center, Sports Club	A	A	A	A	B	B	B	
COMMERCIAL General, Special INDUSTRIAL, INSTITUTIONAL	Automobile Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B	
INSTITUTIONAL General	Hospital, Church, Library, Schools Classroom	A	A	B	C	C	D	D	
OPEN SPACE	Parks	A	A	A	B	C	D	D	
OPEN SPACE	Golf Course, Cemeteries, Nature Centers, Wildlife Reserves, Wildlife Habitat	A	A	A	A	B	C	C	
AGRICULTURE	Agriculture	A	A	A	A	A	A	A	

Zone A CLEARLY COMPATIBLE	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 NORMALLY COMPATIBLE	New construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.
ZONE C NORMALLY INCOMPATIBLE	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.
ZONE D CLEARLY INCOMPATIBLE	New construction or development should generally not be undertaken.

Source: Mestre Greve Associates; Guidelines for the Preparation and Content of the Noise Element of the General Plan, prepared by the California Department of Health Services in coordination with The Governor's Office of Planning and Research. Adapted to the City of Redlands' standards.

3.4 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from a designated fixed location or private property such as the Casa Loma Residential Project, stationary-source (operational) noise such as the expected roof-top air conditioning units, trash enclosure activity, parking lot vehicle movements, courtyard activity, outdoor pool/spa activity and dog park activity are typically evaluated against standards established under a jurisdiction's Municipal Code. The City of Redlands Municipal Code noise standards are provided in Appendix 3.1.

The City of Redlands Municipal Code, Chapter 8.06 establishes the noise level standards for stationary noise sources. The Project's residential land use will potentially impact nearby noise-sensitive uses in the Project study area. For noise-sensitive residential and institutional uses in the Project study area, Section 8.06.070 identifies the base exterior noise level standard of 60 dBA L_{eq} during the daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA L_{eq} during the nighttime hours (10:00 p.m. to 7:00 a.m.). (16)

TABLE 3-1: OPERATIONAL NOISE STANDARDS

Land Use[1]	Time Period	Exterior Noise Level Standards (dBA L_{eq})[2]
Residential, Institutional	Daytime (7:00 a.m. to 10:00 p.m.)	60
	Nighttime (10:00 p.m. to 7:00 a.m.)	50

[1] Source: City of Redlands Municipal Code, Section 8.06.070 (Appendix 3.1).
[2] L_{eq} represents a steady state sound level containing the same total energy as a time varying signal over a given sample period.

3.5 CONSTRUCTION NOISE STANDARDS

To analyze noise impacts originating from the construction of the Casa Loma Residential Project, noise from construction activities are typically limited to the hours of operation established under a jurisdiction's Municipal Code. Section 8.06.090(F) the City of Redlands Municipal Code, provided in Appendix 3.1, indicates that construction activity is considered exempt from the noise level standards between the hours of 7:00 a.m. to 6:00 p.m. Monday to Saturdays; with no activity allowed on Sundays or holidays. (16) However, neither the City of Redlands General Plan and Municipal Codes establish numeric maximum acceptable construction source noise levels at potentially affected receivers, which would allow for a quantified determination of what CEQA constitutes a *substantial temporary or periodic noise increase*. 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). (4) 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. (4) 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.). (12) 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 Redlands Municipal Code, Section 8.06.020, defines the vibration perception threshold as 0.01 inches per second (in/sec) RMS. As such, this noise study uses the City of Redlands Municipal Code vibration perception threshold of 0.01 in/sec RMS to assess the potential vibration impacts due to Project construction.

4 SIGNIFICANCE CRITERIA

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

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

B. Generation of excessive ground-borne vibration or ground-borne noise levels?

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

While the City of Redlands 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 Project site is not located within an airport land use plan or within 2 miles of a public airport, or within the vicinity of a private airstrip. Therefore, the Project would not result in potential noise impacts for people residing or working at the Project site. As such, the Project does not have the potential to expose people residing or working in the Project area to excessive noise levels and no impact would occur. No further analysis of CEQA Guideline C is required.

4.1 NOISE-SENSITIVE RECEIVERS

Noise level increases resulting from the Project are evaluated based on the Appendix G CEQA Guidelines described above at the closest sensitive receiver locations. Under CEQA, consideration must be given to the magnitude of the increase, the existing ambient noise levels, and the location of noise-sensitive receivers to determine if a noise increase represents a significant adverse environmental impact. This approach recognizes *that there is no single noise increase that renders the noise impact significant.* (17) This is primarily because of the wide variation in individual thresholds of annoyance and differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted—the so-called *ambient* environment.

In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will typically be judged. The Federal Interagency Committee on Noise (FICON) (18) developed guidance to be used for the assessment of project-generated increases in noise levels that consider the ambient noise level. The FICON recommendations are based on studies that relate aircraft noise levels to the percentage of persons highly annoyed by aircraft noise. Although the FICON recommendations were specifically developed to assess aircraft noise

impacts, these recommendations are often used in environmental noise impact assessments involving the use of cumulative noise exposure metrics, such as the average-daily noise level (i.e., CNEL) or median noise level (L_{50}).

As previously stated, the approach used in this noise study recognizes *that there is no single noise increase that renders the noise impact significant*, based on a 2008 California Court of Appeal ruling on Gray v. County of Madera. (17) For example, if the ambient noise environment is quiet (<60 dBA) and the new noise source greatly increases the noise levels, an impact may occur if the noise criteria may be exceeded. Therefore, for this analysis, FICON identifies a *readily perceptible* 5 dBA or greater project-related noise level increase is considered a significant impact when the noise criteria for a given land use is exceeded. Per the FICON, in areas where the without project noise levels range from 60 to 65 dBA, a 3 dBA *barely perceptible* noise level increase appears to be appropriate for most people. When the without project noise levels already exceed 65 dBA, any increase in community noise louder than 1.5 dBA or greater is considered a significant impact if the noise criteria for a given land use is exceeded, since it likely contributes to an existing noise exposure exceedance. Table 4-1 below provides a summary of the potential noise impact significance criteria, based on guidance from FICON.

TABLE 4-1: SIGNIFICANCE OF NOISE IMPACTS AT NOISE-SENSITIVE RECEIVERS

Without Project Noise Level	Potential Significant Impact
< 60 dBA	5 dBA or more
60 - 65 dBA	3 dBA or more
> 65 dBA	1.5 dBA or more

Federal Interagency Committee on Noise (FICON), 1992.

4.2 SIGNIFICANCE CRITERIA SUMMARY

Noise impacts shall be considered significant if any of the following occur as a direct result of the proposed development. Table 4-2 shows the significance criteria summary matrix.

OFF-SITE TRAFFIC NOISE

- When the noise levels at existing and future noise-sensitive land uses (e.g., residential, hospital, etc.):
    - are less than 60 dBA CNEL and the Project creates a *readily perceptible* 5 dBA CNEL or greater Project-related noise level increase; or
    - range from 60 to 65 dBA CNEL and the Project creates a *barely perceptible* 3 dBA CNEL or greater Project-related noise level increase; or
    - already exceed 65 dBA CNEL, and the Project creates a community noise level increase of greater than 1.5 dBA CNEL (FICON, 1992).

ON-SITE TRAFFIC NOISE

- If the on-site noise levels:
    - exceed an interior noise level of 45 dBA CNEL for residential uses (City of Redlands General Plan Noise Element).

OPERATIONAL NOISE

- If Project-related operational (stationary-source) noise levels exceed the base exterior noise level standard of 60 dBA L_{eq} during the daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA L_{eq} during the nighttime hours (10:00 p.m. to 7:00 a.m.) for noise-sensitive residential and institutional uses in the Project study area, Section 8.06.070 identifies (16).
    - When the noise levels at existing and future noise-sensitive land uses (e.g., residential, etc.):
    - are less than 60 dBA L_{eq} and the Project creates a readily perceptible 5 dBA L_{eq} or greater Project-related noise level increase; or
    - range from 60 to 65 dBA L_{eq} and the Project creates a barely perceptible 3 dBA L_{eq} or greater Project-related noise level increase; or
    - already exceed 65 dBA L_{eq}, and the Project creates a community noise level impact of greater than 1.5 dBA L_{eq} (FICON, 1992).

CONSTRUCTION NOISE AND VIBRATION

- If Project-related construction activities:
    - occur at any time other than the permitted hours of 7:00 a.m. to 6:00 p.m. Monday to Saturdays; with no activity allowed on Sundays or holidays (City of Redlands Municipal Code, Section 8.06.090(F)); or
    - 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).
- If short-term Project generated construction vibration levels exceed the City of Redlands acceptable vibration standard of 0.01 in/sec (RMS) at sensitive receiver locations (City of Redlands Municipal Code, Section 8.06.020).

TABLE 4-2: SIGNIFICANCE CRITERIA SUMMARY

Analysis	Receiving Land Use	Condition(s)	Significance Criteria	
			Daytime	Nighttime
Off-Site Traffic	Noise-Sensitive[1]	If ambient is < 60 dBA CNEL	≥ 5 dBA CNEL Project increase	
		If ambient is 60 - 65 dBA CNEL	≥ 3 dBA CNEL Project increase	
		If ambient is > 65 dBA CNEL	≥ 1.5 dBA CNEL Project increase	
On-Site Traffic	Residential[2]	Interior Noise Level Standard	45 dBA CNEL	
Operational	Residential[3]	Exterior Noise Level Standards	60 dBA L_{eq}	50 dBA L_{eq}
	Noise-Sensitive[1]	if ambient is < 60 dBA L_{eq}	≥ 5 dBA L_{eq} Project increase	
		if ambient is 60 - 65 dBA L_{eq}	≥ 3 dBA L_{eq} Project increase	
		if ambient is > 65 dBA L_{eq}	≥ 1.5 dBA L_{eq} Project increase	
Construction	Noise-Sensitive	Permitted between 7:00 a.m. to 6:00 p.m. Monday to Saturdays; with no activity allowed on Sundays or holidays.[4]		
		Noise Level Threshold[5]	85 dBA L_{eq}	n/a
		Vibration Level Threshold[6]	0.01 in/sec RMS	n/a

[1] Source: FICON, 1992.
[2] Source: City of Redlands General Plan Noise Element.
[3] Source: City of Redlands Municipal Code, Section 8.06.070 (Appendix 3.1).
[4] Source: City of Redlands Municipal Code, Section 8.06.090 (F) (Appendix 3.1).
[5] Source: NIOSH, Criteria for Recommended Standard: Occupational Noise Exposure, June 1998.
[6] Source: City of Redlands Municipal Code, Section 8.06.020 (Appendix 3.1).
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.; "n/a" = construction activities are not planned during the nighttime hours; "RMS" = root-mean-square velocity.

5 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, 24-hour noise level measurements were taken at six locations in the Project study area. The receiver locations were selected to describe and document the existing noise environment within the Project study area. Exhibit 5-A provides the boundaries of the Project study area and the noise level measurement locations. To fully describe the existing noise conditions, noise level measurements were collected by Urban Crossroads, Inc. on Wednesday, September 25th, 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. (19)

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*. (5) 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*. (12)

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. (12) 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 on East Lugonia Avenue near the existing single-family residence at 1051 East Lugonia Avenue. The noise levels at this location consist primarily of traffic noise from East Lugonia Avenue. The noise level measurements collected show an overall 24-hour exterior noise level of 74.5 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 70.6 dBA L_{eq} with an average nighttime noise level of 66.9 dBA L_{eq}.
- Location L2 represents the noise levels in the northwest corner of the Palm Village Apartment community near existing carports. The ambient noise levels at this location account for the parking lot activity in the Palm Village Apartment community and background traffic from East Lugonia Avenue. The noise level measurements collected show an overall 24-hour exterior noise level of 60.2 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 56.5 dBA L_{eq} with an average nighttime noise level of 52.1 dBA L_{eq}.
- Location L3 represents noise levels adjacent to Project site in the southwest of the corner of the Palm Village Apartment community. Noise levels at this location consist primarily of noise from the apartment air conditioning units. The noise level measurements collected show an overall 24-hour exterior noise level of 73.9 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 67.9 dBA L_{eq} with an average nighttime noise level of 67.1 dBA L_{eq}.
- Location L4 represents the noise levels east of project site on North University Street near ReNew Redlands apartment community. The noise level measurements collected show an overall 24-hour exterior noise level of 63.6 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 58.7 dBA L_{eq} with an average nighttime noise level of 56.5 dBA L_{eq}. Noise levels at this location consist primarily of traffic noise from North University Street.
- Location L5 represents the noise levels on Occidental Drive near the southwestern corner of the Project site. The 24-hour CNEL indicates that the overall exterior noise level is 58.1 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 54.1 dBA L_{eq} with an average nighttime noise level of 50.9 dBA L_{eq}. Traffic noise from Occidental Drive represents the primary source of noise at this location.
- Location L6 represents the noise levels west of the Project site on Occidental Drive near existing single-family homes. The 24-hour CNEL indicates that the overall exterior noise level is 58.1 dBA CNEL. The energy (logarithmic) average daytime noise level was calculated at 54.1 dBA L_{eq} with an average nighttime noise level of 50.9 dBA L_{eq}. Traffic on Occidental Drive 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 East Lugonia Avenue and University Street as well as other surface streets. 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 on East Lugonia Avenue south of single - family residence at 1051 East Lugonia Avenue.	70.6	66.9	74.5
L2	Located in the northwest corner of the Palm Village Apartment complex near existing carport.	56.5	52.7	60.2
L3	Located adjacent to Project site in the southwest of the corner of the Palm Village apartment community.	67.9	67.1	73.9
L4	Located east of project site on North University Street near multi-family apartment community.	58.7	56.5	63.6
L5	Located on Occidental Drive adjacent to the southwestern corner of the Project site.	54.1	50.9	58.1
L6	Located west of the Project site on Occidental Drive near existing single-family homes.	55.7	51.2	58.9

[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 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. (20) 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. (21) Adjustments are then made to the REMEL to account for: the roadway classification (e.g., collector, secondary, major or arterial), the roadway active width (i.e., the distance between the center of the outermost travel lanes on each side of the roadway), the total average daily traffic (ADT), the travel speed, the percentages of automobiles, medium trucks, and heavy trucks in the traffic volume, the roadway grade, the angle of view (e.g., whether the roadway view is blocked), the site conditions ("hard" or "soft" relates to the absorption of the ground, pavement, or landscaping), and the percentage of total ADT which flows each hour throughout a 24-hour period.

6.1.1 OFF-SITE TRAFFIC NOISE PREDICTION MODEL INPUTS

Table 6-1 presents the roadway parameters used to assess the Project's off-site transportation noise impacts. Table 6-1 identifies the 4 study area roadway segments, the distance from the centerline to adjacent land use based on the roadway facility type, and the posted vehicle speeds. For this analysis, soft site conditions are used to analyze the off-site traffic noise impacts within the Project study area. Soft site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. Caltrans' research has shown that the use of soft site conditions is appropriate for the application of the FHWA traffic noise prediction model as used in this off-site traffic noise analysis. (22)

The Existing, Year 2021, and Year 2040 average daily traffic volumes derived from the peak hour turning movements used for this study are presented on Table 6-2 and are provided by *Casa Loma Residential Traffic Impact Analysis*. (2) Table 6-3 presents the time of day vehicle splits and Table 6-4 presents the traffic flow distributions (vehicle mix) used for this analysis. The vehicle mix provides the hourly distribution percentages of automobile, medium trucks, and heavy trucks for input into the FHWA noise prediction model.

TABLE 6-1: OFF-SITE ROADWAY PARAMETERS

ID	Roadway	Segment	City	Roadway Facility Type	Distance From Centerline To Nearest Adjacent Land Use (Feet)[1]	Vehicle Speed (mph)
1	University St.	s/o Lugonia Av.	Redlands	Minor Arterial	44'	40
2	University St.	s/o Cornell Av.	Tustin	Minor Arterial	44'	40
3	University St.	s/o Brockton	Redlands	Minor Arterial	44'	40
4	Lugonia Av.	w/o University St.	Redlands	Minor Arterial	44'	40

[1] Distance to adjacent land use is based upon the right-of-way distances for each roadway facility type

TABLE 6-2: AVERAGE DAILY TRAFFIC VOLUMES

ID	Roadway	Segment	Average Daily Traffic[1]					
			Existing		Year 2021		Year 2040	
			Without Project	With Project	Without Project	With Project	Without Project	With Project
1	University St.	s/o Lugonia Av.	11,406	11,658	12,392	12,644	12,392	12,644
2	University St.	s/o Cornell Av.	12,215	12,947	13,234	13,966	13,234	13,966
3	University St.	s/o Brockton	13,387	14,119	14,452	15,184	14,452	15,184
4	Lugonia Av.	w/o University St.	20,703	20,840	23,325	23,462	26,940	27,077

[1] Source: Casa Loma Residential Traffic Impact Analysis.

TABLE 6-3: 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.
"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 6-4: DISTRIBUTION OF TRAFFIC FLOW BY VEHICLE TYPE (VEHICLE MIX)

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

6.1.2 ON-SITE TRAFFIC NOISE PREDICTION MODEL INPUTS

The on-site roadway parameters including the average daily traffic (ADT) volumes used for this study are presented on Table 6-5. Future traffic volumes on University Street and Lugonia Avenue are based on *Casa Loma Residential Traffic Impact Analysis* Horizon Year 2040 with Project volumes. (2) As previously described, Table 6-3 presents the time of day vehicle splits and Table 6-4 presents the traffic flow distributions (vehicle mix) used for this analysis. The vehicle mix provides the hourly distribution percentages of automobile, medium trucks, and heavy trucks for input into the FHWA noise prediction model.

TABLE 6-5: ON-SITE ROADWAY PARAMETERS

Roadway	Lanes	Facility Type	Future ADT Volume[1]	Posted Speed Limits (mph)	Site Conditions
University St.	4	Minor Arterial	12,916	40	Soft
Lugonia Av.	4	Minor Arterial	27,101	40	Soft

[1] Derived from the Horizon Year 2040 with Project Average Daily Traffic volumes from Casa Loma Residential Traffic Impact Analysis.

6.2 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 6-6. 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 6-6: 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.

7 OFF-SITE TRANSPORTATION NOISE IMPACTS

To assess the off-site transportation CNEL noise level impacts associated with development of the proposed Project, noise contours were developed based on *Casa Loma Residential Traffic Impact Analysis*. (2) Noise contour boundaries represent the equal levels of noise exposure and are measured in CNEL from the center of the roadway. Noise contours were developed for the following traffic scenarios:

- Existing Conditions Without Project: This scenario refers to the existing present-day noise conditions without the proposed Project.
    - Existing With Project: This scenario refers to the existing present-day noise conditions with the proposed Project.
- Year 2021 Cumulative Without the Project: This scenario refers to Year 2021 cumulative noise conditions without the proposed Project.
    - Year 2021 Cumulative Year With Project: This scenario includes all cumulative projects identified in the *Traffic Impact Analysis*.
- Year 2040 Buildout Without Project: This scenario refers to the background noise conditions at Horizon Year 2040 without the proposed Project.
    - Year 2040 Buildout With Project: This scenario corresponds to Year 2040 Buildout conditions, and includes all cumulative projects identified in the *Traffic Impact Analysis*.

7.1 TRAFFIC NOISE CONTOURS

Noise contours were used to assess the Project's incremental traffic-related noise impacts at land uses adjacent to roadways conveying Project traffic. The noise contours represent the distance to noise levels of a constant value and are measured from the center of the roadway for the 70, 65, and 60 dBA noise levels. The noise contours do not consider the effect of any existing noise barriers or topography that may attenuate ambient noise levels. In addition, because the noise contours reflect modeling of vehicular noise on area roadways, they appropriately do not reflect noise contributions from the surrounding stationary noise sources within the Project study area. Tables 7-1 and 7-6 present a summary of the exterior traffic noise levels, without barrier attenuation, for the 4 study area roadway segments analyzed from the without Project to the with Project conditions for Existing, Year 2021 Cumulative, and Year 2040 Buildout conditions. Appendix 7.1 includes a summary of the traffic noise level contours for each of the traffic scenarios.

TABLE 7-1: EXISTING WITHOUT PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Receiving Land Use[1]	CNEL at Receiving Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	University St.	s/o Lugonia Av.	Residential	67.2	RW	61	132
2	University St.	s/o Cornell Av.	Institutional	67.5	RW	64	138
3	University St.	s/o Brockton	Residential/Institutional	67.9	RW	68	147
4	Lugonia Av.	w/o University St.	Residential	69.8	RW	91	197

[1] Sources: City of Redlands General Plan Land Use Map (Figure 4-1).
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-2: EXISTING WITH PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Receiving Land Use[1]	CNEL at Receiving Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	University St.	s/o Lugonia Av.	Residential	67.3	RW	62	134
2	University St.	s/o Cornell Av.	Institutional	67.7	RW	67	144
3	University St.	s/o Brockton	Residential/Institutional	68.1	RW	71	152
4	Lugonia Av.	w/o University St.	Residential	69.8	RW	92	197

[1] Sources: City of Redlands General Plan Land Use Map (Figure 4-1).
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-3: YEAR 2021 CUMULATIVE WITHOUT PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Receiving Land Use[1]	CNEL at Receiving Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	University St.	s/o Lugonia Av.	Residential	67.5	RW	65	140
2	University St.	s/o Cornell Av.	Institutional	67.8	RW	68	146
3	University St.	s/o Brockton	Residential/Institutional	68.2	RW	72	155
4	Lugonia Av.	w/o University St.	Residential	70.3	46	99	213

[1] Sources: City of Redlands General Plan Land Use Map (Figure 4-1).
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-4: YEAR 2021 CUMULATIVE WITH PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Receiving Land Use[1]	CNEL at Receiving Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	University St.	s/o Lugonia Av.	Residential	67.6	RW	66	141
2	University St.	s/o Cornell Av.	Institutional	68.0	RW	70	151
3	University St.	s/o Brockton	Residential/Institutional	68.4	RW	74	160
4	Lugonia Av.	w/o University St.	Residential	70.3	46	99	214

[1] Sources: City of Redlands General Plan Land Use Map (Figure 4-1).
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-5: YEAR 2040 BUILDOUT WITHOUT PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Receiving Land Use[1]	CNEL at Receiving Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	University St.	s/o Lugonia Av.	Residential	67.5	RW	65	140
2	University St.	s/o Cornell Av.	Institutional	67.8	RW	68	146
3	University St.	s/o Brockton	Residential/Institutional	68.2	RW	72	155
4	Lugonia Av.	w/o University St.	Residential	70.9	50	109	234

[1] Sources: City of Redlands General Plan Land Use Map (Figure 4-1).
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-6: YEAR 2040 BUILDOUT WITH PROJECT CONDITIONS NOISE CONTOURS

ID	Road	Segment	Receiving Land Use[1]	CNEL at Receiving Land Use (dBA)[2]	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	University St.	s/o Lugonia Av.	Residential	67.6	RW	66	141
2	University St.	s/o Cornell Av.	Institutional	68.0	RW	70	151
3	University St.	s/o Brockton	Residential/Institutional	68.4	RW	74	160
4	Lugonia Av.	w/o University St.	Residential	70.9	51	109	235

[1] Sources: City of Redlands General Plan Land Use Map (Figure 4-1).
[2] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.
"RW" = Location of the respective noise contour falls within the right-of-way of the road.

7.2 EXISTING PROJECT TRAFFIC NOISE LEVEL CONTRIBUTIONS

An analysis of Existing traffic noise levels plus traffic noise generated by the proposed Project has been included in this report. However, the analysis of existing traffic noise levels plus traffic noise generated by the proposed Project scenario will not actually occur since the Project would not be fully constructed and operational until Year 2021 cumulative conditions.

Table 7-1 shows the Existing without Project conditions CNEL noise levels. The Existing without Project exterior noise levels are expected to range from 67.2 to 69.8 dBA CNEL, without accounting for any noise attenuation features such as noise barriers or topography. Table 7-2 shows the Existing with Project conditions range from 67.3 to 69.8 dBA CNEL. Table 7-7 shows that the Project off-site traffic noise level increases range from 0.0 to 0.2 dBA CNEL on the study area roadway segments.

7.3 YEAR 2021 CUMULATIVE PROJECT TRAFFIC NOISE LEVEL CONTRIBUTIONS

Table 7-3 presents the Year 2021 Cumulative without Project conditions CNEL noise levels. The Year 2021 Cumulative without Project exterior noise levels are expected to range from 67.5 to 70.3 dBA CNEL, without accounting for any noise attenuation features such as noise barriers or topography.

Table 7-4 shows the Year 2021 Cumulative with Project conditions range from 67.6 to 70.3 dBA CNEL. Table 7-8 shows that the Project off-site traffic noise level increases range from 0.0 to 0.2 dBA CNEL. Based on the significance criteria for off-site traffic noise presented in Table 4-2, land uses adjacent to the study area roadway segments would experience *less than significant* noise level impacts due to unmitigated Project-related traffic noise levels.

7.4 YEAR 2040 BUILDOUT PROJECT TRAFFIC NOISE LEVEL CONTRIBUTIONS

Table 7-5 presents the Year 2040 Buildout without Project conditions CNEL noise levels. The Year 2040 Buildout without Project exterior noise levels are expected to range from 67.5 to 70.9 dBA CNEL, without accounting for any noise attenuation features such as noise barriers or topography.

Table 7-6 shows the Year 2040 Buildout with Project conditions range from 67.6 to 70.9 dBA CNEL. Table 7-9 shows that the Project off-site traffic noise level increases range from 0.0 to 0.2 dBA CNEL. Based on the significance criteria for off-site traffic noise presented in Table 4-2, land uses adjacent to the study area roadway segments would experience *less than significant* noise level impacts due to unmitigated Project-related traffic noise levels.

TABLE 7-7: EXISTING WITH PROJECT TRAFFIC NOISE LEVEL INCREASES

ID	Road	Segment	Adjacent Land Use[1]	CNEL at Receiving Land Use (dBA)[1]			Noise-Sensitive Land Use?	Exterior Noise Standard	Incremental Noise Level Increase Threshold[2]	
				No Project	With Project	Project Addition			Limit	Exceeded?
1	University St.	s/o Lugonia Av.	Industrial and Office	67.2	67.3	0.1	Yes	65	1.5	No
2	University St.	s/o Cornell Av.	Commercial/Business	67.5	67.7	0.2	Yes	65	1.5	No
3	University St.	s/o Brockton	Residential	67.9	68.1	0.2	Yes	65	1.5	No
4	Lugonia Av.	w/o University St.	Residential/Institutional	69.8	69.8	0.0	Yes	65	1.5	No

[1] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[2] Does the Project create an incremental noise level increase exceeding the significance criteria (Table 4-2)?

TABLE 7-8: YEAR 2021 CUMULATIVE WITH PROJECT TRAFFIC NOISE LEVEL INCREASES

ID	Road	Segment	Adjacent Land Use[1]	CNEL at Receiving Land Use (dBA)[1]			Noise-Sensitive Land Use?	Exterior Noise Standard	Incremental Noise Level Increase Threshold[2]	
				No Project	With Project	Project Addition			Limit	Exceeded?
1	University St.	s/o Lugonia Av.	Industrial and Office	67.5	67.6	0.1	Yes	65	1.5	No
2	University St.	s/o Cornell Av.	Commercial/Business	67.8	68.0	0.2	Yes	65	1.5	No
3	University St.	s/o Brockton	Residential	68.2	68.4	0.2	Yes	65	1.5	No
4	Lugonia Av.	w/o University St.	Residential/Institutional	70.3	70.3	0.0	Yes	65	1.5	No

[1] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[2] Does the Project create an incremental noise level increase exceeding the significance criteria (Table 4-2)?

TABLE 7-9: YEAR 2040 BUILDOUT WITH PROJECT TRAFFIC NOISE LEVEL INCREASES

ID	Road	Segment	Adjacent Land Use[1]	CNEL at Receiving Land Use (dBA)[1]			Noise-Sensitive Land Use?	Exterior Noise Standard	Incremental Noise Level Increase Threshold[2]	
				No Project	With Project	Project Addition			Limit	Exceeded?
1	University St.	s/o Lugonia Av.	Industrial and Office	67.5	67.6	0.1	Yes	65	1.5	No
2	University St.	s/o Cornell Av.	Commercial/Business	67.8	68.0	0.2	Yes	65	1.5	No
3	University St.	s/o Brockton	Residential	68.2	68.4	0.2	Yes	65	1.5	No
4	Lugonia Av.	w/o University St.	Residential/Institutional	70.9	70.9	0.0	Yes	65	1.5	No

[1] The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the nearest adjacent land use.
[2] Does the Project create an incremental noise level increase exceeding the significance criteria (Table 4-2)?

8 ON-SITE NOISE IMPACTS

An on-site exterior noise impact analysis has been completed to determine the noise exposure levels that would result from adjacent 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 University Street and Lugonia Avenue. The Project will also experience some background traffic noise impacts from the Project's internal local streets, however, due to the distance, topography and low traffic volume/speed, traffic noise from these roads will not make a significant contribution to the noise environment.

8.1 EXTERIOR NOISE ANALYSIS

Using the FHWA traffic noise prediction model and the parameters outlined in Section 6, the expected future exterior noise levels at each building were calculated. Table 8-1 presents a summary of future exterior noise levels at the first-floor building facades within the Project site. The on-site traffic noise level analysis indicates that the multi-family residential units adjacent to University Street and Lugonia Avenue will experience unmitigated exterior noise levels ranging from 64.2 to 67.7 dBA CNEL. The on-site traffic noise analysis calculations are provided in Appendix 8.1.

No exterior noise mitigation is required to satisfy the City of Redlands General Plan Noise Element exterior land use/noise level compatibility criteria for multi-family residential uses. As shown on Table 8-1, the Project residential uses are shown to experience *normally incompatible (Zone C)* exterior noise levels of 64.2 to 67.7 dBA CNEL. For *normally incompatible* exterior noise levels the Noise Element compatibility criteria requires that *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.* (15) To demonstrate that the Project satisfies these requirements, additional interior noise analysis is provided in this noise study to satisfy the General Plan Noise Element interior noise level standards.

TABLE 8-1: EXTERIOR TRAFFIC NOISE LEVELS

On-Site Receiver Location	Roadway	Unmitigated Exterior Noise Level (dBA CNEL)	Noise Element Land Use Compatibility[1]	Resulting Requirements[1]
Bldg. 4	Lugonia Av.	67.7	*Normally Incompatible*	windows closed with a means of mechanical ventilation (e.g. air conditioning)
Bldg. 1	University St.	64.2	*Normally Incompatible*	

[1] Based on the City of Redlands Noise Element Table 7-10 Noise/Land Use Compatibility Matrix criteria, as shown on Exhibit 3-A of this noise study.

Table 8-2 presents a summary of future exterior noise levels at the 1st, 2nd and 3rd floor building facades where residential units are located. The on-site transportation analysis indicates that the unmitigated exterior noise levels will range from 68.5 to 73.2 dBA CNEL at the building façades. The on-site traffic noise analysis calculations at the building facades are provided in Appendix 8.1.

TABLE 8-2: EXTERIOR TRAFFIC NOISE LEVELS AT RESIDENTIAL BUILDING FACADES

On-Site Receiver Location	Roadway	Unmitigated Exterior Noise Level (dBA CNEL)[1]		
		1st Floor	2nd Floor	3rd Floor
Bldg. 4	Lugonia Av.	67.7	67.6	67.3
Bldg. 1	University St.	64.2	64.1	63.9

[1] Exterior noise calculations at the building façade are shown in Appendix 8.1.

8.2 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 1st, 2nd and, 3rd floor building facades where residential units are located.

8.2.1 NOISE REDUCTION METHODOLOGY

The interior noise level is the difference between the predicted exterior noise level at the building facade 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." (7) (23) 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.

8.2.2 INTERIOR NOISE REDUCTION CALCULATIONS

The noise reduction characteristics of a building are determined by combining the transmission loss of each of the building components that make up the building. Each unique component has a transmission loss value. For residential units, the critical building components include the roof, walls, windows, doors, and attic configuration and insulation characteristics. The total noise reduction is dependent upon the transmission loss of each element and the surface area of that element in relation to the total surface area of the room. To account for the acoustic energy absorbed within a room, the absorption coefficients for individual surface areas such as drywall and carpet are used to calculate the interior room effects. The calculated building noise reduction includes both the transmission loss associated with the exterior wall assembly and the room absorption characteristics.

Noise reduction calculations are based on the architectural floor plans prepared by Architects Orange. (24) The floor plans for the interior rooms with exterior walls of Casa Loma Residential Project were used to estimate the "windows closed" interior noise levels. To satisfy the City of Redlands NR requirements for exterior noise levels, the calculations were completed using standard windows with a minimum Sound Transmission Class (STC) of 27. As shown on Table 8-3, the calculated interior noise reduction with standard windows (STC 27) will range from 27.3 to 28.3 dBA CNEL. The interior noise reduction calculations are included in Appendix 8.2 for each floor plan.

TABLE 8-3: INTERIOR NOISE REDUCTION CALCULATIONS

Floor Plan	Room	Calculated Noise Reduction[1]
Unit A1	Bedroom	27.8
Unit A2	Bedroom	27.8
Unit B1	Bedroom	27.3
Unit B2	Bedroom	27.8
Unit B3	Bedroom	28.3
Minimum Interior Noise Reduction:		27.3

[1] Interior noise reduction calculations included in Appendix 8.2.

8.2.3 INTERIOR NOISE LEVEL ASSESSMENT

Tables 8-4 to 8-6 show that the multi-family residential units within the Project building will require a windows-closed condition and a means of mechanical ventilation (e.g. air conditioning). Table 8-4 shows that the future unmitigated exterior noise levels at the first-floor building façades are expected to range from 64.2 to 67.7 dBA CNEL. The first-floor interior noise level analysis shows that the City of Redlands 45 dBA CNEL with windows-closed interior noise standards can be satisfied using standard windows with a minimum STC rating of 27 for all units, based on the minimum calculated interior noise reduction for all rooms previously shown on Table 8-3.

Tables 8-5 to 8-6 provide the interior noise level assessment for the second and third floor building facades. Tables 8-5 to 8-6 also indicate that the City of Redlands 45 dBA CNEL multi-family residential interior noise standards can be satisfied using standard windows and doors with minimum STC ratings of 27 for units facing Lugonia Avenue and University Street. The interior noise level assessment shows that interior noise levels will be *less than significant*.

TABLE 8-4: FIRST-FLOOR INTERIOR NOISE IMPACTS (CNEL)

Receiver Location	Unit Plan	Noise Level at Façade[1]	Required Interior NR[2]	Minimum Calculated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold	Threshold Exceeded?
Bldg. 4 Lugonia Av.	A1	67.7	22.7	27.8	No	39.9	45	No
	A2	67.7	22.7	27.8	No	39.9	45	No
	B1	67.7	22.7	27.3	No	40.4	45	No
	B2	67.7	22.7	27.8	No	39.9	45	No
	B3	67.7	22.7	28.3	No	39.4	45	No
Bldg. 1 University St.	A1	64.2	19.2	27.8	No	36.4	45	No
	A2	64.2	19.2	27.8	No	36.4	45	No
	B1	64.2	19.2	27.3	No	36.9	45	No
	B2	64.2	19.2	27.8	No	36.4	45	No
	B3	64.2	19.2	28.3	No	35.9	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 City of Redlands General Plan 45 dBA CNEL interior noise standard for residential uses.
[3] Minimum calculated interior noise reduction from all rooms for each unit plan as shown on Table 8-2.
[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

TABLE 8-5: SECOND-FLOOR INTERIOR NOISE IMPACTS (CNEL)

Receiver Location	Unit Plan	Noise Level at Façade[1]	Required Interior NR[2]	Minimum Calculated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold	Threshold Exceeded?
Bldg. 4 Lugonia Av.	A1	67.6	22.6	27.8	No	39.8	45	No
	A2	67.6	22.6	27.8	No	39.8	45	No
	B1	67.6	22.6	27.3	No	40.3	45	No
	B2	67.6	22.6	27.8	No	39.8	45	No
	B3	67.6	22.6	28.3	No	39.3	45	No
Bldg. 1 University St.	A1	64.1	19.1	27.8	No	36.3	45	No
	A2	64.1	19.1	27.8	No	36.3	45	No
	B1	64.1	19.1	27.3	No	36.8	45	No
	B2	64.1	19.1	27.8	No	36.3	45	No
	B3	64.1	19.1	28.3	No	35.8	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 City of Redlands General Plan 45 dBA CNEL interior noise standard for residential uses.
[3] Minimum calculated interior noise reduction from all rooms for each unit plan as shown on Table 8-2.
[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

TABLE 8-6: THIRD-FLOOR INTERIOR NOISE IMPACTS (CNEL)

Receiver Location	Unit Plan	Noise Level at Façade[1]	Required Interior NR[2]	Minimum Calculated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold	Threshold Exceeded?
Bldg. 4 Lugonia Av.	A1	67.3	22.3	27.8	No	39.5	45	No
	A2	67.3	22.3	27.8	No	39.5	45	No
	B1	67.3	22.3	27.3	No	40.0	45	No
	B2	67.3	22.3	27.8	No	39.5	45	No
	B3	67.3	22.3	28.3	No	39.0	45	No
Bldg. 1 University St.	A1	63.9	18.9	27.8	No	36.1	45	No
	A2	63.9	18.9	27.8	No	36.1	45	No
	B1	63.9	18.9	27.3	No	36.6	45	No
	B2	63.9	18.9	27.8	No	36.1	45	No
	B3	63.9	18.9	28.3	No	35.6	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 City of Redlands General Plan 45 dBA CNEL interior noise standard for residential uses.
[3] Minimum calculated interior noise reduction from all rooms for each unit plan as shown on Table 8-2.
[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

This page intentionally left blank

9 RECEIVER LOCATIONS

To assess the potential for construction noise impacts, the following receiver locations, as shown on Exhibit 9-A, were identified as representative locations for analysis. Sensitive receivers are generally defined as locations where people reside or where the presence of unwanted sound could otherwise adversely affect the use of the land. Noise-sensitive land uses are generally considered to include schools, hospitals, single-family dwellings, mobile home parks, churches, libraries, and recreation areas. Moderately noise-sensitive land uses typically include multi-family dwellings, hotels, motels, dormitories, out-patient clinics, cemeteries, golf courses, country clubs, athletic/tennis clubs, and equestrian clubs. Land uses that are considered relatively insensitive to noise include business, commercial, and professional developments. Land uses that are typically not affected by noise include: industrial, manufacturing, utilities, agriculture, undeveloped land, parking lots, warehousing, liquid and solid waste facilities, salvage yards, and transit terminals.

Receiver locations are generally located in outdoor living areas (e.g., backyards) or areas of frequent use at a distance of 10 feet from any existing or proposed barriers or at the building façade, whichever is closer to the Project site, based on FHWA guidance, and consistent with additional guidance provided by Caltrans and the FTA, as previously described in Section 5.2.

R1: Located approximately 157 feet north of the Project site, R1 represents the existing residential homes north of East Lugonia Avenue. A 24-hour noise measurement was taken near this location, L1, to describe the existing ambient noise environment.

R2: Location R2 represents the existing apartment complex located about 19 feet east of the Project site within the Palm Village Apartment community. A 24-hour noise measurement was taken near this location, L2, to describe the existing ambient noise environment.

R3: Location R3 represents the Palm Village Apartment community approximately 22 feet north from the Project site. A 24-hour noise measurement near this location, L3, is used to describe the existing ambient noise environment.

R4: Location R4 represents the ReNew Redlands apartment community on the east side of North University Street at about 131 feet from the Project site. A 24-hour noise measurement near this location, L4, is used to describe the existing ambient noise environment.

R5: Location R5 represents the existing residential homes about 24 feet south of the Project site. A 24-hour noise measurement was taken near this location, L5, to describe the existing ambient noise environment.

R6: Location R6 represents the existing residential homes on the east side of Occidental drive about 80 feet from the Project site. A 24-hour noise measurement was taken near this location, L6, to describe the existing ambient noise environment.

EXHIBIT 9-A: RECEIVER LOCATIONS

10 OPERATIONAL NOISE IMPACTS

This section analyzes the potential stationary-source operational noise impacts at the nearby receiver locations, identified in Section 9, resulting from the operation of the proposed Casa Loma Residential Project. Exhibit 10-A identifies the noise source locations used to assess the operational noise levels.

10.1 OPERATIONAL NOISE SOURCES

The proposed Project will be developed to support multi-family residential land use. It is expected the on-site Project-related noise sources will include: roof-top air conditioning units, trash enclosure activity, parking lot vehicle movements, courtyard activity, outdoor pool/spa activity and dog park activity. This noise analysis is intended to describe noise level impacts associated with the typical multi-family residential operational activities at the Project site.

10.2 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 10-1 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 roof-top air conditioning units, trash enclosure activity, parking lot vehicle movements, courtyard activity, outdoor pool/spa activity and dog park activity all operating at the same time. These noise level impacts will likely vary throughout the day.

10.2.1 MEASUREMENT PROCEDURES

The reference noise level measurements presented in this section were collected using 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. (19)

EXHIBIT 10-A: OPERATIONAL NOISE SOURCE LOCATIONS

TABLE 10-1: REFERENCE NOISE LEVEL MEASUREMENTS

Noise Source	Duration (hh:mm:ss)	Ref. Distance (Feet)	Noise Source Height (Feet)	Min./Hour[7]		Reference Noise Level (dBA L_{eq})		Sound Power Level (dBA)[8]
				Day	Night	@ Ref. Dist.	@ 50 Feet	
Roof-Top Air Conditioning Units[1]	96:00:00	5'	5'	39	28	77.2	57.2	88.9
Trash Enclosure Activity[2]	00:00:32	5'	5'	60	0	77.3	57.3	89.0
Parking Lot Vehicle Movements[3]	00:23:00	10'	5'	60	60	57.9	47.4	88.6
Courtyard Activity[4]	00:08:00	10'	4'	60	0	73.8	59.8	91.5
Pool/Spa Activity[5]	00:10:00	5'	4'	60	0	68.7	48.7	80.4
Dog Park Activity[6]	00:15:00	5'	4'	60'	0	62.8	42.8	74.5

[1] As measured by Urban Crossroads, Inc. on 7/27/2015 at the Santee Walmart located at 170 Town Center Parkway.
[2] As measured by Urban Crossroads, Inc. on 5/3/2018 at a commercial and office park trash enclosure in the City of Costa Mesa.
[3] As measured by Urban Crossroads, Inc. on 5/17/2017 at the Panasonic Avionics Corporation parking lot in the City of Lake Forest.
[4] As measured by Urban Crossroads, Inc. on 9/21/2019 on the Patio at Louie's by the Bay in the City of Newport Beach.
[5] As measured by Urban Crossroads, Inc. on 7/5/2017 at the Covenant Hill Clubhouse pool in Ladera Ranch.
[6] As measured by Urban Crossroads, Inc. on 10/8/2014 at the La Paws Dog Park in Mission Viejo, CA.
[7] Anticipated duration (minutes within the hour) of noise activity during typical hourly conditions expected at the Project site. "Day" = 7:00 a.m. to 10:00 p.m.; "Night" = 10:00 p.m. to 7:00 a.m.
[8] 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.

10.2.2 ROOF-TOP 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 on July 27th, 2015. 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 with measured temperatures approaching 96 degrees Fahrenheit (°F) with average daytime temperatures of 82°F. The roof-top air condition units were observed to operate the most during the daytime hours for a total of 39 minutes per hour. The noise attenuation provided by a parapet wall is not reflected in this reference noise level measurement.

10.2.3 TRASH ENCLOSURE ACTIVITY

To describe the noise levels associated with a trash enclosure, Urban Crossroads collected a reference noise level measurement on May 3rd, 2018 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 49.0 dBA L_{eq} for the trash enclosure activity. The trash enclosure activity noise levels include two metal gates

opening and closing, the metal gates scraping against a concrete floor, dumpster movement on metal wheels, trash dropping into the metal dumpster, and background parking lot vehicle movements. Noise associated with trash enclosure activities is expected to occur for 60 minutes per hour to represent worst-case conditions.

10.2.4 PARKING LOT VEHICLE MOVEMENTS

To determine the noise levels associated with parking lot vehicle movements, Urban Crossroads collected reference noise level measurements over a 24-hour period on May 17th, 2017 at the parking lot for the Panasonic Avionics Corporation in the City of Lake Forest. The peak hour of activity measured over the 24-hour noise level measurement period occurred between 12:00 p.m. to 1:00 p.m., or the typical lunch hour for employees working in the area. The measured reference noise level at 50 feet from parking lot vehicle movements was measured at 41.7 dBA L_{eq}. The parking lot noise levels are mainly due to cars pulling in and out of spaces during peak lunch hour activity and employees talking. Noise associated with parking lot vehicle movements is expected to operate for the entire hour (60 minutes).

10.2.5 COURTYARD ACTIVITY

To describe the outdoor common area courtyards activity areas, a reference noise level measurement was taken at the Louie's by the Bay in Newport Beach on September 21, 2019. At 50 feet, the reference noise level is 59.8 dBA L_{eq} at a noise source height of 4 feet. The reference noise level measurement includes outdoor eating, drinking, with laughing and talking.

10.2.6 POOL/SPA ACTIVITY

To represent the noise levels associated with pool activities, Urban Crossroads collected a reference noise level measurement on July 5th, 2017 at the Covenant Hill Clubhouse Pool in the unincorporated community of Ladera Ranch in the County of Orange. The measured reference noise level at the uniform 50-foot reference distance is 48.7 dBA L_{eq} for pool activity. The pool activity noise levels include kids playing, running, screaming, splashing, playing with a ball, and parents talking. Noise associated with pool activities is expected to occur for the entire hour (60 minutes).

10.2.7 DOG PARK ACTIVITY

To describe the potential noise level impacts associated with a dog park, a reference noise level measurement was collected on Wednesday, October 8th, 2014 at La Paws Dog Park in the City of Mission Viejo. The reference noise level measurement at the dog park includes people talking, dogs running, playing fetch, chasing each other, growling, barking and dog owners talking on cell phones. As observed during the noise level measurement, the dual entry gate of the La Paws Dog Park was identified as a key source of noise when opened and closed due to metal hinges squeaking and the metal to metal contact with the gate and its closure. At the normalized reference distance of 50 feet from the noise source, the reference noise level is 42.8 dBA L_{eq}. The dog park activities are estimated to operate continuously for up to 60 minutes during the peak hour conditions.

10.3 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 height;
- 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.

10.4 PROJECT OPERATIONAL NOISE LEVELS

Using the reference noise levels to represent the proposed Project operations that include roof-top air conditioning units, trash enclosure activity, parking lot vehicle movements, courtyard activity, outdoor pool/spa activity and dog park activity, 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. Tables 10-2 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 45.8 to 54.6 dBA L_{eq}.

TABLE 10-2: PROJECT OPERATIONAL NOISE LEVELS (DAYTIME)

Noise Source	Operational Noise Levels by Receiver Location (dBA Leq)					
	R1	R2	R3	R4	R5	R6
Roof-Top Air Conditioning Units	44.4	47.1	49.5	45.4	45.5	47.7
Trash Enclosure Activity	41.3	43.2	52.7	32.1	45.5	50.1
Parking Lot Vehicle Movements	33.2	29.4	39.2	29.9	36.7	39.6
Courtyard Activity	28.6	46.7	32.7	25.7	30.7	29.1
Pool/Spa Activity	9.0	12.1	18.1	15.2	13.8	14.1
Dog Park Activity	39.2	37.1	24.3	17.9	21.6	30.6
Total (All Noise Sources)	**47.2**	**51.0**	**54.6**	**45.8**	**48.9**	**52.4**

[1] See Exhibit 10-A for the receiver and noise source locations.

Tables 10-3 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 42.5 to 47.7 dBA L_{eq}. The differences between the daytime and nighttime noise levels is largely related to the duration of noise activity (Table 10-1). Noise activity associated with the trash enclosures, courtyard, pool/spa and dog park are expected to be limited to the daytime hours between 7:00 a.m. and 10:00 p.m. Appendix 10.1 includes the detailed noise model inputs including the existing perimeter walls used to estimate the Project operational noise levels presented in this section.

TABLE 10-3: PROJECT OPERATIONAL NOISE LEVELS (NIGHTTIME)

Noise Source	Operational Noise Levels by Receiver Location (dBA Leq)					
	R1	R2	R3	R4	R5	R6
Roof-Top Air Conditioning Units	41.9	44.7	47.0	43.0	43.1	45.2
Trash Enclosure Activity	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]
Parking Lot Vehicle Movements	33.2	29.4	39.2	29.9	36.7	39.6
Courtyard Activity	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]
Pool/Spa Activity	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]
Dog Park Activity	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]
Total (All Noise Sources)	**42.5**	**44.8**	**47.7**	**43.2**	**44.0**	**46.3**

[1] See Exhibit 10-A for the receiver and noise source locations.
[2] No planned nighttime noise activity.

10.5 PROJECT OPERATIONAL NOISE LEVEL COMPLIANCE

To demonstrate compliance with local noise regulations, the Project-only operational noise levels are evaluated against exterior noise level thresholds based on the City of Redlands exterior noise level standards at nearby noise-sensitive receiver locations. Table 10-4 shows the operational

noise levels associated with Casa Loma Residential Project will satisfy the City of Redlands 60 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 10-4: 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	47.2	42.5	60	50	No	No
R2	51.0	44.8	60	50	No	No
R3	54.6	47.7	60	50	No	No
R4	45.8	43.2	60	50	No	No
R5	48.9	44.0	60	50	No	No
R6	52.4	46.3	60	50	No	No

[1] See Exhibit 10-A for the noise receiver locations.
[2] Proposed Project operational noise levels as shown on Tables 10-2 and 10-3.
[3] City of Redlands 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?
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

10.6 PROJECT OPERATIONAL NOISE LEVEL CONTRIBUTIONS

To describe the Project operational noise level contributions, 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. (5) 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 contributions 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 10-5 and 10-6, respectively. As indicated on Tables 10-5 and 10-6, the Project will generate an unmitigated daytime and nighttime operational noise level increases ranging from 0.0 to 1.7 dBA L_{eq} at the nearby receiver locations. Project-related operational noise level contributions will satisfy the operational noise level increase significance criteria presented in Table 4-2, the increases at the sensitive receiver locations will be *less than significant.*

TABLE 10-5: DAYTIME PROJECT 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]	Incremental Threshold[7]	Incremental Threshold Exceeded?[7]
R1	47.2	L1	70.6	70.6	0.0	1.5	No
R2	51.0	L2	56.5	57.6	1.1	5.0	No
R3	54.6	L3	67.9	68.1	0.2	1.5	No
R4	45.8	L4	58.7	58.9	0.2	5.0	No
R5	48.9	L5	54.1	55.2	1.1	5.0	No
R6	52.4	L6	55.7	57.4	1.7	5.0	No

[1] See Exhibit 10-A for the sensitive receiver locations.
[2] Total Project operational noise levels as shown on Table 10-4.
[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 10-6: 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]	Incremental Threshold[7]	Incremental Threshold Exceeded?[7]
R1	37.5	L1	66.9	66.9	0.0	1.5	No
R2	42.2	L2	52.7	53.1	0.4	5.0	No
R3	41.6	L3	67.1	67.1	0.0	1.5	No
R4	43.5	L4	56.5	56.7	0.2	5.0	No
R5	42.8	L5	50.9	51.5	0.6	5.0	No
R6	42.9	L6	51.2	51.8	0.6	5.0	No

[1] See Exhibit 10-A for the sensitive receiver locations.
[2] Total Project operational noise levels as shown on Table 10-4.
[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.

10.7 REFLECTION

Field studies conducted by the FHWA have shown that the reflection from barriers and buildings does not substantially increase noise levels. (7) If all the noise striking a structure was reflected back to a given receiving point, the increase would be theoretically limited to 3 dBA. Further, not all the acoustical energy is reflected back to same point. Some of the energy would go over the structure, some is reflected to points other than the given receiving point, some is scattered by ground coverings (e.g., grass and other plants), and some is blocked by intervening structures and/or obstacles (e.g., the noise source itself). Additionally, some of the reflected energy is lost due to the longer path that the noise must travel. FHWA measurements made to quantify reflective increases in traffic noise have not shown an increase of greater than 1-2 dBA; an increase that is not perceptible to the average human ear.

11 CONSTRUCTION IMPACTS

This section analyzes potential impacts resulting from the short-term construction activities associated with the development of the Project. Exhibit 10-A shows the construction noise source locations in relation to the nearby sensitive receiver locations previously described in Section 9.

11.1 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 is 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 typical construction noise levels when multiple pieces of equipment are operating simultaneously at a construction site.

Noise levels generated by heavy construction equipment can range from approximately 68 dBA to more than 80 dBA when measured at 50 feet. However, these noise levels diminish with distance from the construction site at a rate of 6 dBA per doubling of distance. 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.

11.2 PROJECT CONSTRUCTION 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 primary construction activity (Project site boundary) to each receiver location. Appendix 11.1 includes the detailed CadnaA construction noise model inputs.

EXHIBIT 11-A: CONSTRUCTION NOISE SOURCE LOCATIONS

TABLE 11-1: 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.

11.3 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 primary Project construction activity to each of the nearby receiver locations. As shown on Table 11-2, the unmitigated construction noise levels are expected to range from 72.1 to 76.7 dBA L_{eq} at the nearby noise sensitive residential receiver locations.

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. Therefore, the noise impacts due to Project construction noise is considered *less than significant* at all noise sensitive receiver locations.

TABLE 11-2: CONSTRUCTION EQUIPMENT NOISE LEVEL COMPLIANCE

Receiver Location[1]	Construction Noise Levels (dBA L_{eq})		
	Highest Construction Noise Levels[2]	Threshold[3]	Threshold Exceeded?[4]
R1	68.6	85	No
R2	77.4	85	No
R3	75.3	85	No
R4	72.1	85	No
R5	76.7	85	No
R6	73.9	85	No

[1] Noise receiver locations are shown on Exhibit 11-A.
[2] Estimated construction noise levels during peak operating conditions, as shown on Table 11-1.
[3] Construction noise thresholds as shown on Table 4-2.
[4] Do the estimated Project construction noise levels satisfy the construction noise level threshold?

11.4 CONSTRUCTION VIBRATION IMPACTS

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures and soil type. It is expected that ground-borne vibration from Project construction activities would cause only intermittent, localized intrusion. 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 while operating close to buildings, 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). Construction activities that would have the potential to generate low levels of ground-borne vibration within the Project site include grading. Using the vibration source level of construction equipment provided on Table 6-6 and the construction vibration assessment methodology published by the FTA, it is possible to estimate the Project vibration impacts. Table 11-3 presents the expected Project related vibration levels at each of the sensitive receiver locations.

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 20 to 118 feet from Project construction activities, construction vibration velocity levels are expected to approach 0.124 in/sec PPV, as shown on Table 11-3. To assess the human perception of vibration levels in PPV the velocities are converted to RMS vibration levels based

on the Caltrans *Transportation and Construction Vibration Guidance Manual* conversion factor of 0.71. Table 11-3 shows the highest construction vibration levels in RMS are expected to approach 0.088 in/sec RMS and will exceed the City of Redlands perceptible vibration threshold of 0.01 in/sec RMS at receiver locations R2, R3, and R5. The Project-related vibration impacts will be *potentially significant* during the construction activities at the Project site and mitigation is required.

TABLE 11-3: UNMITIGATED PROJECT CONSTRUCTION VIBRATION LEVELS

Receiver[1]	Distance to Const. Activity (Feet)	Receiver Levels (in/sec) PPV[2]					Velocity Levels (in/sec) RMS[3]	Threshold (in/sec) RMS[4]	Threshold Exceeded?[5]
		Small Bulldozer	Jack-hammer	Loaded Trucks	Large Bulldozer	Peak Vibration			
R1	161'	0.0002	0.0021	0.0047	0.0054	0.0054	0.0039	0.01	No
R2	12'	0.0090	0.1052	0.2285	0.2676	0.2676	0.1900	0.01	Yes
R3	26'	0.0028	0.0330	0.0717	0.0839	0.0839	0.0596	0.01	Yes
R4	118'	0.0003	0.0034	0.0074	0.0087	0.0087	0.0062	0.01	No
R5	20'	0.0042	0.0489	0.1062	0.1244	0.1244	0.0883	0.01	Yes
R6	90'	0.0004	0.0051	0.0111	0.0130	0.0130	0.0093	0.01	No

[1] Receiver locations are shown on Exhibit 11-A.
[2] Based on the Vibration Source Levels of Construction Equipment included on Table 6-6.
[3] Vibration levels in PPV are converted to RMS velocity using a 0.71 conversion factor identified in the Caltrans Transportation and Construction Vibration Guidance Manual, September 2013.
[4] Source: City of Redlands Municipal Code, Sections 8.06.020.
[5] Does the vibration level exceed the maximum acceptable vibration threshold?

Therefore, no large loaded trucks and dozers shall be used on-site during Project construction activities capable of generating vibration levels in excess of 0.01 in/sec RMS at nearby sensitive receiver locations, and a 50-foot buffer zone from adjacent occupied sensitive residential uses shall be required in which no jack hammers are permitted to be used. With the mitigation measures identified in this report, the mitigated vibration levels will satisfy the City of Redlands perceptible vibration threshold of 0.01 in/sec RMS at all receiver locations, as shown on Table 11-4.

TABLE 11-4: MITIGATED CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver[1]	Distance to Const. Activity (Feet)	Receiver Levels (in/sec) PPV[2]					Velocity Levels (in/sec) RMS[3]	Threshold (in/sec) RMS[4]	Threshold Exceeded?[5]
		Small Bulldozer	Jack-hammer	Loaded Trucks	Large Bulldozer	Peak Vibration			
R1	161'	0.0002	0.0021	-[6]	-[6]	0.0021	0.0015	0.01	No
R2	50'	0.0011	0.0124	-[6]	-[6]	0.0124	0.0088	0.01	No
R3	50'	0.0011	0.0124	-[6]	-[6]	0.0124	0.0088	0.01	No
R4	118'	0.0003	0.0034	-[6]	-[6]	0.0034	0.0024	0.01	No
R5	50'	0.0011	0.0124	-[6]	-[6]	0.0124	0.0088	0.01	No
R6	90'	0.0004	0.0051	-[6]	-[6]	0.0051	0.0036	0.01	No

[1] Receiver locations are shown on Exhibit 11-A.
[2] Based on the Vibration Source Levels of Construction Equipment included on Table 6-6.
[3] Vibration levels in PPV are converted to RMS velocity using a 0.71 conversion factor identified in the Caltrans Transportation and Construction Vibration Guidance Manual, September 2013.
[4] Source: City of Redlands Municipal Code, Sections 8.06.020.
[5] Does the vibration level exceed the maximum acceptable vibration threshold?
[6] Large loaded trucks and bulldozers shall not be allowed on-site during Project construction unless the construction contractor can demonstrate they will not exceed the 0.01 in/sec RMS threshold of the City of Redlands.

Further, the Project-related construction vibration levels do not represent levels capable of causing building damage to nearby residential homes. The FTA identifies construction vibration levels capable of building damage ranging from 0.12 to 0.50 in/sec PPV. (12) The peak Project-construction vibration levels approaching 0.012 in/sec PPV, are below the FTA vibration level thresholds for building damage at the residential homes near the Project site. In addition, the impacts at the site of the closest sensitive receivers are unlikely to be sustained during the entire construction period but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site perimeter. Construction at the Project site will be restricted to daytime hours consistent with City requirements thereby eliminating potential vibration impact during the sensitive nighttime hours.

12 REFERENCES

1. **State of California.** *California Environmental Quality Act, Appendix G & Amendments and Additions to the State CEQA Guidelines.* 2019.
2. **Linscott, Law & Greenspan, Engineers.** *Casa Loma Residential Traffic Impact Analysis Report.* March 2019.
3. **Harris, Cyril M.** *Noise Control in Buildings.* s.l. : McGraw-Hill, Inc., 1994.
4. **National Institute for Occupational Safety and Health.** *Criteria for Recommended Standard: Occupational Noise Exposure.* June 1998.
5. **California Department of Transportation Environmental Program.** *Technical Noise Supplement - A Technical Supplement to the Traffic Noise Analysis Protocol.* Sacramento, CA : s.n., September 2013.
6. **Environmental Protection Agency Office of Noise Abatement and Control.** *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* March 1974. EPA/ONAC 550/9/74-004.
7. **U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch.** *Highway Traffic Noise Analysis and Abatement Policy and Guidance.* December 2011.
8. **U.S. Department of Transportation, Federal Highway Administration.** *Highway Traffic Noise in the United States, Problem and Response.* April 2000. p. 3.
9. **U.S. Environmental Protection Agency Office of Noise Abatement and Control.** *Noise Effects Handbook-A Desk Reference to Health and Welfare Effects of Noise.* October 1979 (revised July 1981). EPA 550/9/82/106.
10. **California Department of Transportation.** *Technical Noise Supplement.* November 2009.
11. **Occupational Safety and Health Administration.** *Standard 29 CRF, Part 1910.*
12. **U.S. Department of Transportation, Federal Transit Administration.** *Transit Noise and Vibration Impact Assessment.* September 2018.
13. **Office of Planning and Research.** *State of California General Plan Guidelines.* 2017.
14. **State of California.** *2019 California Green Building Standards Code.* January 2020.
15. **City of Redlands.** *General Plan, 7.5 Noise.* December 2017.
16. —. *Municipal Code, Chapter 8.06.*
17. **California Court of Appeal.** *Gray v. County of Madera, F053661.* 167 Cal.App.4th 1099; - Cal.Rptr.3d, October 2008.
18. **Federal Interagency Committee on Noise.** *Federal Agency Review of Selected Airport Noise Analysis Issues.* August 1992.
19. **American National Standards Institute (ANSI).** *Specification for Sound Level Meters ANSI S1.4-2014/IEC 61672-1:2013.*
20. **U.S. Department of Transportation, Federal Highway Administration.** *FHWA Highway Traffic Noise Prediction Model.* December 1978. FHWA-RD-77-108.
21. **California Department of Transportation Environmental Program, Office of Environmental Engineering.** *Use of California Vehicle Noise Reference Energy Mean Emission Levels (Calveno REMELs) in FHWA Highway Traffic Noise Prediction.* September 1995. TAN 95-03.

22. **California Department of Transportation.** *Traffic Noise Attenuation as a Function of Ground and Vegetation Final Report.* June 1995. FHWA/CA/TL-95/23.

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

24. **Architects Orange.** *The Residence at Casa Loma.* March 2018.

13 CERTIFICATION

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

Bill Lawson, P.E., INCE
Principal
URBAN CROSSROADS, INC.
260 E. Baker Street, Suite 200
Costa Mesa, CA 92626
(949) 336-5979
blawson@urbanxroads.com

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

This page intentionally left blank

APPENDIX 3.1:

CITY OF REDLANDS MUNICIPAL CODE, CHAPTER 8.06

This page intentionally left blank

Chapter 8.06
COMMUNITY NOISE CONTROL

8.06.010: PURPOSE:

The purpose of this chapter is to implement the noise control provisions of the Redlands general plan by establishing comprehensive regulations for the control of noise within the city. (Ord. 2579 § 1, 2004)

8.06.020: DEFINITIONS:

The following words and phrases shall have the meanings set out in this section. All terminology used in this chapter, not defined below, shall be in conformance with applicable publications of the American National Standards Institute (ANSI) or its successor body.

A-WEIGHTED SOUND LEVEL: The sound level in decibels as measured on a sound level meter using the A-weighting network. The level so read is designated dBA.

AMBIENT NOISE LEVEL: 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.

COMMERCIAL: Generally consisting of uses permitted in the commercial zones as set forth in title 18 of this code or adopted specific plans.

CONSTRUCTION: Any site preparation, grading, assembly, erection, substantial repair, alteration and related material handling and disposition, or similar activity, for or on public or private rights of way, structures, utilities or public or private property.

CUMULATIVE PERIOD: An additive period of time composed of individual time segments that may be continuous or interrupted.

DECIBEL: A unit for measuring the amplitude of a sound, equal to twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound measured to the reference pressure, which is twenty (20) micropascals.

DEMOLITION: Any dismantling, intentional destruction or removal of structures, utilities, public or private right of way surfaces or similar improvements on public or private property.

EMERGENCY WORK: Any work performed for the purpose of preventing or alleviating the physical trauma or property damage which requires immediate mitigation.

FIXED NOISE SOURCE: A stationary device which creates sounds while fixed or motionless including, but not limited to, residential, agricultural, industrial and commercial machinery and equipment, pumps, fans, compressors, air conditioners or refrigeration equipment.

INDUSTRIAL: Generally consisting of uses permitted in the industrial zones as set forth in title 18 of this code or adopted specific plans.

LICENSED: The possession of a license or a permit issued by the appropriate jurisdictional authority; or, where no permits or licenses are issued, the sanctioning of the activity by the jurisdiction as noted in public record.

MOBILE NOISE SOURCE: Any noise source other than a fixed noise source.

MOTOR VEHICLE: Shall include any and all self-propelled vehicles as defined in the California Vehicle Code.

MUFFLER OR SOUND DISSIPATIVE DEVICE: A device consisting of a series of chambers or baffle plates, or other mechanical design, for the purpose of receiving exhaust gas from an internal combustion engine and effective in reducing noise.

NOISE CONTROL OFFICER ("NCO"): The code enforcement division of the city or such other employees of the city so designated by the city manager to enforce this chapter.

NOISE DISTURBANCE: Any sound not in compliance with the quantitative standards as listed herein which either:

A. Endangers or injures the safety or health of human beings or animals;

B. Annoys or disturbs reasonable persons of normal sensitivities;

C. Endangers or injures personal or real property; or

D. Violates section 8.06.030 or 8.06.090 of this chapter.

NOISE SENSITIVE ZONE: Any area designated as such pursuant to this chapter for the purpose of ensuring exceptional quiet.

NOISE ZONE: Any defined areas or regions of a generally consistent land use wherein the ambient noise levels are within a range of five (5) dB.

PERSON: Any individual, association, partnership or corporation, and includes any officer, employee, department, agency or instrumentality of a state or any political subdivision of a state.

POWERED MODEL VEHICLE: Any self-propelled, airborne, waterborne or landborne plane, vessel or vehicle which is not designed to carry persons including, but not limited to, any model airplane, boat, car or rocket.

PUBLIC RIGHT OF WAY: Any street, avenue, boulevard, highway, sidewalk, alley or similar place owned or controlled by a governmental entity.

PUBLIC SPACE: Any real property or structure thereon which is owned or controlled by a governmental entity.

RESIDENTIAL: Generally consisting of uses as permitted in the residential zones as set forth in title 18 of this code or adopted specific plans.

SOUND AMPLIFYING EQUIPMENT: Any device for the amplification of the human voice, music or any other sound, excluding standard automobile radios or stereo systems when used and heard only by the occupants of the vehicle in which the radio or stereo system is installed, excluding warning devices on authorized emergency vehicles or horns or other warning devices on any vehicle used only for traffic safety purposes.

SOUND LEVEL METER: An instrument, including a microphone, amplifier, output meter and frequency weighting networks for the measurement of sound levels which meets or exceeds the requirements of the American National Standard Institute's S1.4-1971, or the most recent revision thereof, for type 1 or type 2 sound level meters.

SOUND TRUCK: Any motor vehicle regardless of motive power, whether in motion or stationary, having mounted thereon or attached thereto, any sound amplifying equipment.

VIBRATION PERCEPTION THRESHOLD: The minimum ground or structure borne vibrational motion necessary to cause a normal person to be aware of the vibration by such direct means as, but not limited to, sensation by touch or visual observation of moving objects. The perception threshold shall be presumed to be a motion velocity of 0.01 inches per second over the range of one to one hundred (100) Hz.

WEEKDAY: Any day, Monday through Friday, which is not a legal holiday. (Ord. 2579 § 1, 2004)

8.06.030: GENERAL NOISE REGULATIONS:

It shall be unlawful for any person to wilfully or negligently make, or cause to be made, any loud, unnecessary or unusual noise which disturbs the peace and quiet of any neighborhood or which causes discomfort or annoyance to a reasonable person of normal sensitivity in the area. The factors that may be considered in determining whether a violation of this chapter exists include, but are not limited to, the following:

A. The sound level of the objectionable noise;

B. The sound level of the ambient noise;

C. The proximity of the noise to residential living or sleeping facilities;

D. The nature and zoning of the area within which the noise emanates;

E. The number of persons affected by the noise;

F. The time of day or night the noise occurs;

G. The duration of the noise;

H. The tonal, informational or musical content of the noise;

I. Whether the noise is continuous, recurrent or intermittent;

J. Whether the noise is produced by a commercial or noncommercial activity;

K. Whether the nature of the noise is usual or unusual;

L. Whether the origin of the noise is natural or unnatural; and

M. Whether the noise occurs on a weekday, weekend or a holiday. (Ord. 2579 § 1, 2004)

8.06.040: ENFORCEMENT AUTHORITY:

A. The NCO and the NCO's duly authorized representatives may enforce the provisions of this chapter.

B. The NCO and its authorized representatives shall have satisfactorily completed an instructional program as recommended by the measuring instrument's manufacturer.

C. No person shall interfere with, oppose or resist the NCO or any authorized person charged with the enforcement of this chapter when such persons are engaged in the performance of their duties. (Ord. 2579 § 1, 2004)

8.06.050: NOISE MEASUREMENT PROCEDURE:

The NCO, equipped with sound level measurement equipment satisfying the requirements in section 8.06.020 of this chapter, may investigate any complaint relating to a violation of this

chapter. The investigation shall consist of a measurement and the gathering of data to adequately define the noise problem and include, but not be limited to, the following:

A. Type of noise source;

B. Location of noise source relative to the complainant's property;

C. Time period during which noise source is considered by complainant to be intrusive;

D. Total duration of noise produced by noise source; and

E. Date and time of noise measurement survey. (Ord. 2579 § 1, 2004)

8.06.060: NOISE MEASUREMENT METHODOLOGY:

A. Utilizing the A-weighting scale of the sound level meter and the "slow" meter response (use "fast" response for impulsive type sounds), the noise level shall be measured at a position or positions at any point on the receiver's property deemed appropriate to determine whether the noise level complies with this chapter.

B. The microphone shall be located four (4) to five feet (5') above the ground; ten feet (10') or more from the nearest reflective surface, where possible. However, in those cases where another elevation is deemed appropriate, the latter shall be utilized. If the noise complaint is related to interior noise levels, interior noise measurements shall be made within the affected residential building or unit. The measurements shall be made at a point at least four feet (4') from the wall, ceiling or floor nearest the noise source, with the windows closed.

C. Calibration of the measurement equipment, utilizing an acoustic calibrator, shall be performed immediately prior to recording any noise data. Standard maintenance of the measuring equipment shall be in accordance with the manufacturer's recommendations.

D. No outdoor measurements shall be taken:

1. During periods when wind speeds (including gusts) exceed fifteen (15) miles per hour;

2. Without a windscreen, as recommended by the measuring instrument's manufacturer, properly attached to the measuring instrument;

3. Under any condition that allows the measuring instrument to become wet (e.g., rain or condensation); or

4. When the ambient temperature is out of the range of the tolerance of the measuring instrument. (Ord. 2579 § 1, 2004)

8.06.070: EXTERIOR NOISE LIMITS:

A. The noise standards for the categories of land uses identified in table 1 of this section shall, unless otherwise specifically indicated, apply to all such property within a designated zone.

TABLE 1

MAXIMUM PERMISSIBLE SOUND LEVELS
BY RECEIVING LAND USE

Receiving Land Use Category	Time Period	Noise Level - dBA
Single-family residential districts	10:00 P.M. - 7:00 A.M. 7:00 A.M. - 10:00 P.M.	50 60
Multi-family residential districts; public space; institutional	10:00 P.M. - 7:00 A.M. 7:00 A.M. - 10:00 P.M.	50 60
Commercial	10:00 P.M. - 7:00 A.M. 7:00 A.M. - 10:00 P.M.	60 65
Industrial	Any time	75

B. No person shall operate, or cause to be operated, any source of sound at any location within the city or allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person which causes the noise level when measured on any other property to exceed:

1. The noise standard for that land use specified in table 1 of this section for a cumulative period of more than thirty (30) minutes in any hour; or

2. The noise standard specified in table 1 of this section plus five (5) dB for a cumulative period of more than fifteen (15) minutes in any hour; or

3. The noise standard specified in table 1 of this section plus ten (10) dB for a cumulative period of more than five (5) minutes in any hour; or

4. The noise standard specified in table 1 of this section plus fifteen (15) dB for a cumulative period of more than one minute in any hour; or

5. The noise standard specified in table 1 of this section plus twenty (20) dB or the maximum measured ambient level, for any period of time.

C. If the measured ambient level exceeds the allowable noise exposure standard within any of the first four (4) noise limit categories above, the allowable noise exposure standard shall be adjusted in five (5) dB increments in each category as appropriate to encompass or reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.

D. The ambient noise shall be measured at the same location along the property line utilized in subsection 8.06.060B of this chapter, with the alleged offending noise source inoperative. If the alleged offending noise source cannot be shut down, the ambient noise shall be estimated by performing a measurement in the same general area of the source but at a sufficient distance that the noise from the source is at least ten (10) dB below the ambient in order that only the ambient level be measured. If the difference between the ambient and the noise source is five (5) to ten (10) dB, then the level of the ambient itself can be reasonably determined by subtracting a one decibel correction to account for the contribution of the source.

E. In the event the alleged offensive noise contains a steady, audible tone such as a whine, screech, hum, or is a repetitive noise such as hammering or riveting, or contains music or speech conveying informational content, the standard limits set forth in table 1 of this section shall be reduced by five (5) dB. (Ord. 2579 § 1, 2004)

8.06.080: INTERIOR NOISE STANDARDS:

A. No person shall operate or cause to be operated any source of sound, or allow the creation of any noise, which causes the noise level when measured inside a neighboring receiving occupied building to exceed the following standards:

1. The noise standard for that land use specified in table 2 of this section for a cumulative period of more than five (5) minutes in any hour.

2. The noise standard for that land use specified in table 2 of this section plus five (5) dB for a cumulative period of more than one minute in any hour.

3. The noise standard for that land use specified in table 2 of this section plus ten (10) dB for the maximum measured ambient noise level for any period of time.

B. If the measured ambient level exceeds the allowable exterior noise exposure standard in table 1 of this chapter, the allowable interior noise exposure level shall be adjusted in five (5) dB increments as appropriate to reflect the ambient noise level.

TABLE 2

MAXIMUM PERMISSIBLE INTERIOR SOUND
LEVELS BY RECEIVING LAND USE

Receiving Land Use Category	Time Period	Noise Level - dBA
Single-family residential districts	Any time	45
Multi-family residential districts; institutional; hotels	Any time	45
Commercial	Any time	50
Industrial	Any time	60

(Ord. 2579 § 1, 2004)

8.06.090: NOISE DISTURBANCES PROHIBITED:

The following acts, and the causing or permitting thereof, are declared to be in violation of this chapter:

A. Radio, Television Set, Etc.: Operating, playing, or permitting the operation or playing of any radio, television set, phonograph, drum, musical instrument or similar device which produces or reproduces sound:

1. Between the hours of ten o'clock (10:00) P.M. and seven o'clock (7:00) A.M. in such a manner as to create a noise disturbance across a residential or commercial real property line or at any time to violate the provisions of section 8.06.030 or 8.06.070 of this chapter.

2. In such a manner as to exceed the levels set forth for public space in table 1 of this chapter, measured at a distance of at least fifty feet (50') from such device operating on a public right of way or public space.

B. Loudspeaker Or Stereo Systems: Using or operating for any purpose any loudspeaker, loudspeaker system, stereo system or similar device between the hours of ten o'clock (10:00) P.M. and seven o'clock (7:00) A.M., such that the sound therefrom creates a noise disturbance across a residential property line, or at any time violates the provisions of section 8.06.030 or 8.06.070 of this chapter, except for noncommercial public speaking, public assembly or activity for which an exemption has been provided for in either this section or section 8.06.120 of this chapter.

C. Street Sales: Offering for sale, selling anything, or advertising by shouting or outcry within the city except by permit issued by the city. This subsection shall not be construed to prohibit the selling by outcry of merchandise, food or beverages at licensed sporting events, parades, fairs, circuses or other similar licensed public entertainment events.

D. Animals And Birds: Owning, possessing or harboring any animal or bird which frequently, or for long duration, howls, barks, meows, squawks or makes other sound which creates a noise disturbance across a residential or commercial real property line or within a noise sensitive zone.

E. Loading And Unloading: Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, refuse containers or similar objects between the hours of ten o'clock (10:00) P.M. and six o'clock (6:00) A.M. in such a manner as to cause a noise disturbance across a residential real property line or at any time to violate section 8.06.030 of this chapter.

F. Construction And/Or Demolition: Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between weekday hours of six o'clock (6:00) P.M. and seven o'clock (7:00) A.M., including Saturdays, or at any time on Sundays or holidays, such that the sound therefrom creates a noise disturbance across a residential or commercial real property line, except for emergency work by public service utilities, the city or another governmental entity. All mobile or stationary internal combustion engine powered equipment or machinery shall be equipped with exhaust and air intake silencers in proper working order, or suitable to meet the standards set forth herein.

G. Vibration: Operating or permitting the operation of any device that creates a vibration which is above the vibration perception threshold of an individual at or beyond the property boundary of the source if on private property or at one hundred fifty feet (150') from the source if on a public space or public right of way.

H. Powered Model Vehicles: Operating or permitting the operation of powered model vehicles:

1. Between the hours of seven o'clock (7:00) P.M. and seven o'clock (7:00) A.M. so as to create a noise disturbance across a residential or commercial real property line or at any time in violation of section 8.06.030 of this chapter.

2. In such a manner as to exceed the levels set forth for public space land use in table 1 of this chapter measured at a distance not less than one hundred feet (100') from any point on the path of a vehicle operating on public space or public right of way.

I. Stationary, Nonemergency Signaling Devices:

1. Sounding or permitting the sounding of any electronically amplified signal from any stationary bell, chime, siren, whistle or similar device intended primarily for nonemergency purposes, from any place for more than ten (10) seconds in any hourly period.

2. Places of worship and public and private schools shall be exempt from the operation of this subsection.

J. Emergency Signaling Devices:

1. Alarms, Sirens, Whistles: The intentional sounding or permitting the sounding outdoors of any fire, burglar or civil defense alarm, siren, whistle or similar stationary emergency signaling device, except for emergency purposes or for testing as provided in subsection J2 of this section.

2. Testing:

a. Testing of a stationary emergency signaling device shall not occur before seven o'clock (7:00) A.M. or after seven o'clock (7:00) P.M. Any such testing shall use only the minimum cycle test time. In no case shall such test time exceed sixty (60) seconds.

b. Testing of the complete emergency signaling system, including the functioning of the signaling device, and the personnel response to the signaling device, shall not occur more than once in each calendar month. Such testing shall not occur before seven o'clock (7:00) A.M. or after ten o'clock (10:00) P.M. The time limit specified in subsection J2a of this section shall not apply to such complete system testing.

3. Burglar, Fire, Motor Vehicle Alarms: Sounding or permitting the sounding of any exterior burglar or fire alarm or any motor vehicle burglar alarm unless such alarm is terminated within five (5) minutes of activation.

K. Noise Sensitive Zones: Creating or causing the creation of any sound within any noise sensitive zone, so as to exceed the specified land use noise standards set forth in table 1 of this chapter and subsection 8.06.070B of this chapter, or so as to interfere with the functions of such activity or annoy the occupants in the activity, provided that conspicuous signs are displayed indicating the presence of the zone.

L. Domestic Power Tools And Machinery:

1. Operating or permitting the operation of any mechanically powered saw, sander, drill, grinder, lawn or garden tool, or similar tool between ten o'clock (10:00) P.M. and seven o'clock (7:00) A.M., so as to create a noise disturbance across a residential or commercial real property line.

2. Motor, machinery and pumps, such as swimming pool equipment, shall be sufficiently enclosed or muffled and maintained so as not to create a noise disturbance in accordance with table 1, section 8.06.070 of this chapter.

M. Places Of Public Entertainment: Operating or permitting the operation or playing of any loudspeaker, musical instrument or other source of sound in any place of public entertainment that exceeds ninety five (95) dBA as read on the slow response of a sound level meter at any point normally occupied by a customer, without a conspicuous and legible sign with minimum one inch (1") letter height stating:

WARNING! SOUND LEVELS WITHIN MAY CAUSE HEARING IMPAIRMENT.

(Ord. 2579 § 1, 2004)

8.06.100: RESIDENTIAL AIR CONDITIONING OR AIR HANDLING EQUIPMENT:

It shall be unlawful to operate or permit the operation of any air conditioning or air handling equipment in such a manner as to exceed the sound levels set forth in table 1, section 8.06.070 of this chapter. (Ord. 2579 § 1, 2004)

8.06.110: TAMPERING:

The following acts or the causing thereof are prohibited:

A. The removal or rendering inoperative, other than for purposes of maintenance, repair or replacement, of any noise control device or element thereof of any product required to meet specified noise emission limits under federal, state or local law.

B. The removal of any noise label from any product identified in subsection A of this section.

C. The use of a product identified in subsection A of this section, which has had a noise control device or element thereof or noise label removed or rendered inoperative. (Ord. 2579 § 1, 2004)

8.06.120: EXEMPTIONS:

A. Emergency Exemption: This chapter shall not apply to:

1. The emission of sound for the purpose of alerting persons to the existence of an emergency such as, but not limited to, loudspeakers, horns, sirens, whistles or other similar devices which emit sound, only for the time required to make notification of the emergency condition; or

2. The emission of sound in the performance of emergency work or the temporary provision of essential services such as, but not limited to, utility system repairs or upgrades, infrastructure repairs, structural repairs and other unscheduled, infrequent and nonrecurring activities, required to protect persons and property from physical harm or loss of essential services.

B. Warning Devices: This chapter shall not apply to warning devices necessary for the protection of public safety. Police, fire and ambulance sirens and train horns are exempt from this chapter.

C. Outdoor Activities: This chapter shall not apply to occasional outdoor public gatherings, public dances, shows, and sporting and entertainment events conducted within city parks and city owned facilities, including events conducted at the Redlands Bowl, provided such events are conducted pursuant to a permit or license issued by the city.

D. School Activities: This chapter shall not apply to activities and operations conducted on the grounds of any public or private elementary, intermediate or secondary school or colleges and universities.

E. Hospital: This chapter shall not apply to activities and operations conducted within the grounds of the Redlands Community Hospital provided that said activities and operations are in compliance with the acoustical provisions of the hospital's conditional use permit.

F. Minor Maintenance Of Residential Property: This chapter shall not apply to noise sources associated with the minor maintenance of residential property, provided such activities take place between the hours of seven o'clock (7:00) A.M. to eight o'clock (8:00) P.M. on weekdays, and seven o'clock (7:00) A.M. to eight o'clock (8:00) P.M. on weekends and legal holidays, and provided that such activities generate no more than ninety (90) dBA at or within the real property line of the residential property. Activities covered under this provision include, but are not limited to, maintenance of landscaping and minor repair of residential dwellings or ancillary structures.

G. Construction Activity: This chapter shall not apply to noise sources associated with new construction, remodeling, rehabilitation or grading of any property provided such activities take place between the hours of seven o'clock (7:00) A.M. and six o'clock (6:00) P.M. on weekdays, including Saturdays, with no activities taking place at any time on Sundays or federal holidays. All motorized equipment used in such activity shall be equipped with functioning mufflers.

H. Agricultural Operations: This chapter shall not apply to mobile noise sources associated with agricultural operations for use in maintenance, cultivation, planting and harvesting of agricultural areas provided said activities take place between the hours of seven o'clock (7:00) A.M. to eight o'clock (8:00) P.M. on weekdays, including Saturdays, with no

activities taking place at any time on Sundays or federal holidays. All motorized equipment used in such activity shall be equipped with functioning mufflers.

I. Chapter Application: This chapter shall not apply to any activity in which state or federal law has preempted the regulation of such activity. (Ord. 2579 § 1, 2004)

8.06.130: PREEXISTING NOISE SOURCES:

Those commercial and industrial operations in existence prior to the date of adoption hereof, if in compliance with the city's zoning laws, may be granted a period from such date within which to comply with this chapter.

A. Such compliance period shall be based on the estimated cost to make the equipment comply, as follows:

1. If the cost is one thousand dollars ($1,000.00) or less, ninety (90) days;

2. If the cost is one thousand dollars ($1,000.00) to five thousand dollars ($5,000.00), one year;

3. If the cost is five thousand dollars ($5,000.00) to twenty thousand dollars ($20,000.00), two (2) years; or

4. If the cost is greater than twenty thousand dollars ($20,000.00) or more, three (3) years.

B. At the time of request for extended compliance periods in subsections A2 through A4 of this section, any person requesting such extension shall submit a plan for such compliance, including temporary mitigation of such noise levels to within five (5) dBA of the complying level. Such extended period and temporary mitigation shall not exceed one year beyond the initial compliance period. If the compliance period is granted, mitigation measures included in the plan must be completed within ninety (90) days from the date of approval of the compliance period.

C. If, at the end of the compliance period, it is shown that compliance with the provisions herein constitute a hardship in terms of technical and economical feasibility, additional applications for exception may be granted on an annual basis until such time as compliance may be effected, provided the temporary mitigation remains in place.

D. Requests for extended compliance periods or exceptions shall be submitted to the city's planning commission with the submittal of plans and other information as required by the community development director. Such applications shall be filed by the owner of the property affected thereby or the owner's authorized agent, with the community development director, on forms furnished by the director, which shall set forth fully the

nature of the proposed use, and the facts sufficient to justify the granting of the compliance period in accordance with the provisions of this chapter.

E. The applicant shall furnish to the director an accurate list of the names and addresses of all property owners to whom notice must be given as provided in this chapter.

F. Each such application shall be accompanied by a filing and processing fee in the amount established by resolution of the city council. Any applicant may withdraw his application by filing a written request to do so at any time prior to final action thereon, provided that there shall be no refund of fees. (Ord. 2579 § 1, 2004)

8.06.140: VIOLATION; PENALTY:

A. It is illegal to use, occupy or maintain property in violation of this chapter.

B. Violation of this chapter shall be a misdemeanor, but may be prosecuted as either a misdemeanor or an infraction in the discretion of the city attorney.

C. Any person who violates the provisions of this chapter is guilty of a separate offense for each day, or portion thereof, during which the violation continues.

D. Violation of this chapter that threatens to be continuing in nature is a public nuisance which may be abated or enjoined in accordance with the law. (Ord. 2579 § 1, 2004)

APPENDIX 5.1:

STUDY AREA PHOTOS

This page intentionally left blank

L1_E
34, 4' 12.800000", 117, 10' 5.370000"

L1_N
34, 4' 12.840000", 117, 10' 4.710000"

L1_S
34, 4' 12.750000", 117, 10' 5.510000"

L1_W
34, 4' 12.820000", 117, 10' 5.320000"

L2_E
34, 4' 10.960000", 117, 10' 7.570000"

L2_N
34, 4' 10.890000", 117, 10' 7.540000"

JN: 11860 Study Area Photos

L2_S
34, 4' 10.890000", 117, 10' 7.540000"

L2_W
34, 4' 10.970000", 117, 10' 7.570000"

L3_E
34, 4' 8.610000", 117, 10' 6.770000"

L3_environment_noise_source
34, 4' 8.720000", 117, 10' 6.860000"

L3_N
34, 4' 11.340000", 117, 10' 7.240000"

L3_S
34, 4' 8.510000", 117, 10' 6.500000"

L3_W
34, 4' 8.720000", 117, 10' 6.860000"

L4_E
34, 4' 6.950000", 117, 10' 1.030000"

L4_N
34, 4' 7.470000", 117, 10' 1.750000"

L4_S
34, 4' 6.850000", 117, 10' 0.980000"

L4_W
34, 4' 7.040000", 117, 10' 1.060000"

L5_E
34, 4' 5.780000", 117, 10' 9.740000"

JN: 11860 Study Area Photos

L5_N
34, 4' 8.840000", 117, 10' 9.740000"

L5_S
34, 4' 6.080000", 117, 10' 9.930000"

L5_W
34, 4' 5.790000", 117, 10' 9.660000"

L6_H
34, 4' 9.310000", 117, 10' 10.240000"

L6_N
34, 4' 9.460000", 117, 10' 10.320000"

L6_S
34, 4' 9.400000", 117, 10' 10.400000"

APPENDIX 5.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

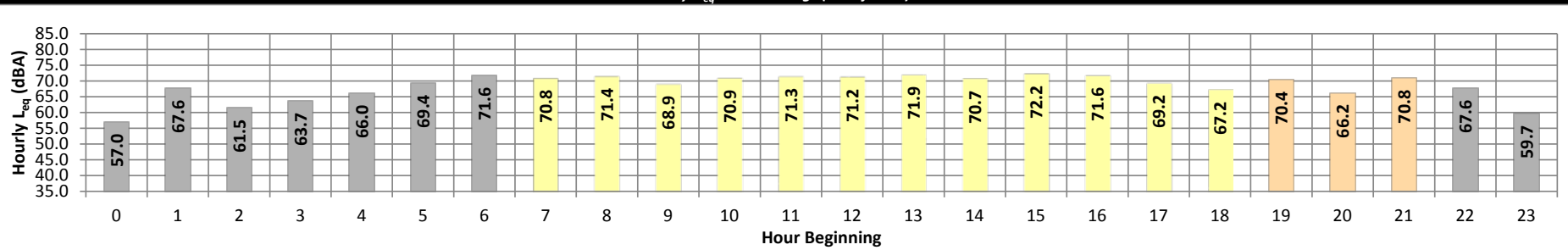
This page intentionally left blank

24-Hour Noise Level Measurement Summary

Date: Wednesday, September 25, 2019 *Location:* L1 - Located on East Lugonia Avenue south of single family home at 1051 East Lugonia Avenue. *Meter:* Piccolo I *JN:* 11860

Project: Casa Loma 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	57.0	76.4	42.2	69.0	67.0	63.0	60.0	51.0	48.0	44.0	43.0	42.0	57.0	10.0	67.0
	1	67.6	97.8	41.2	75.0	71.0	66.0	62.0	51.0	46.0	43.0	42.0	41.0	67.6	10.0	77.6
	2	61.5	85.7	42.5	73.0	70.0	67.0	64.0	53.0	49.0	44.0	43.0	43.0	61.5	10.0	71.5
	3	63.7	89.1	44.4	74.0	72.0	69.0	67.0	58.0	51.0	47.0	46.0	45.0	63.7	10.0	73.7
	4	66.0	85.4	46.4	77.0	75.0	72.0	70.0	64.0	57.0	51.0	49.0	47.0	66.0	10.0	76.0
	5	69.4	88.6	50.9	80.0	77.0	74.0	73.0	68.0	63.0	54.0	54.0	52.0	69.4	10.0	79.4
	6	71.6	93.5	52.5	79.0	78.0	76.0	75.0	72.0	68.0	58.0	56.0	55.0	71.6	10.0	81.6
Day	7	70.8	88.4	47.7	80.0	78.0	75.0	74.0	71.0	67.0	57.0	55.0	52.0	70.8	0.0	70.8
	8	71.4	95.2	46.9	81.0	79.0	75.0	73.0	69.0	64.0	54.0	52.0	50.0	71.4	0.0	71.4
	9	68.9	86.1	45.9	79.0	77.0	74.0	73.0	69.0	64.0	53.0	51.0	49.0	68.9	0.0	68.9
	10	70.9	96.7	48.1	80.0	78.0	75.0	73.0	69.0	64.0	55.0	53.0	51.0	70.9	0.0	70.9
	11	71.3	96.3	47.4	81.0	79.0	75.0	73.0	69.0	65.0	56.0	53.0	50.0	71.3	0.0	71.3
	12	71.2	96.0	48.5	80.0	78.0	75.0	74.0	69.0	64.0	55.0	53.0	51.0	71.2	0.0	71.2
	13	71.9	98.5	49.8	81.0	78.0	75.0	73.0	70.0	65.0	57.0	54.0	52.0	71.9	0.0	71.9
	14	70.7	97.9	51.5	79.0	77.0	74.0	73.0	70.0	66.0	58.0	56.0	53.0	70.7	0.0	70.7
	15	72.2	100.8	51.2	79.0	77.0	75.0	73.0	70.0	66.0	58.0	56.0	54.0	72.2	0.0	72.2
	16	71.6	96.9	53.1	79.0	77.0	75.0	73.0	70.0	67.0	59.0	57.0	55.0	71.6	0.0	71.6
	17	69.2	86.2	51.5	78.0	76.0	74.0	73.0	69.0	65.0	57.0	55.0	53.0	69.2	0.0	69.2
	18	67.2	81.9	49.5	75.0	74.0	72.0	71.0	68.0	64.0	54.0	53.0	51.0	67.2	0.0	67.2
Evening	19	70.4	94.9	49.5	81.0	77.0	73.0	71.0	67.0	62.0	54.0	53.0	51.0	70.4	5.0	75.4
	20	66.2	87.5	46.0	77.0	73.0	70.0	69.0	64.0	58.0	51.0	50.0	47.0	66.2	5.0	71.2
	21	70.8	98.5	45.1	76.0	73.0	69.0	68.0	61.0	55.0	49.0	48.0	46.0	70.8	5.0	75.8
Night	22	67.6	97.1	44.7	75.0	72.0	68.0	66.0	59.0	52.0	48.0	47.0	46.0	67.6	10.0	77.6
	23	59.7	81.2	41.2	71.0	69.0	66.0	64.0	55.0	49.0	43.0	42.0	41.0	59.7	10.0	69.7

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	67.2	81.9	45.9	75.0	74.0	72.0	71.0	68.0	64.0	53.0	51.0	49.0
	Max	72.2	100.8	53.1	81.0	79.0	75.0	74.0	71.0	67.0	59.0	57.0	55.0
Energy Average		70.8	Average:		79.3	77.3	74.5	73.0	69.4	65.1	56.1	54.0	51.8
Evening	Min	66.2	87.5	45.1	76.0	73.0	69.0	68.0	61.0	55.0	49.0	48.0	46.0
	Max	70.8	98.5	49.5	81.0	77.0	73.0	71.0	67.0	62.0	54.0	53.0	51.0
Energy Average		69.6	Average:		78.0	74.3	70.7	69.3	64.0	58.3	51.3	50.3	48.0
Night	Min	57.0	76.4	41.2	69.0	67.0	63.0	60.0	51.0	46.0	43.0	42.0	41.0
	Max	71.6	97.8	52.5	80.0	78.0	76.0	75.0	72.0	68.0	58.0	56.0	55.0
Energy Average		66.9	Average:		74.8	72.3	69.0	66.8	59.0	53.7	48.0	46.9	45.8

L_{eq} (dBA)

24-Hour	*Daytime*	*Nighttime*
69.5	**70.6**	**66.9**

24-Hour CNEL (dBA)

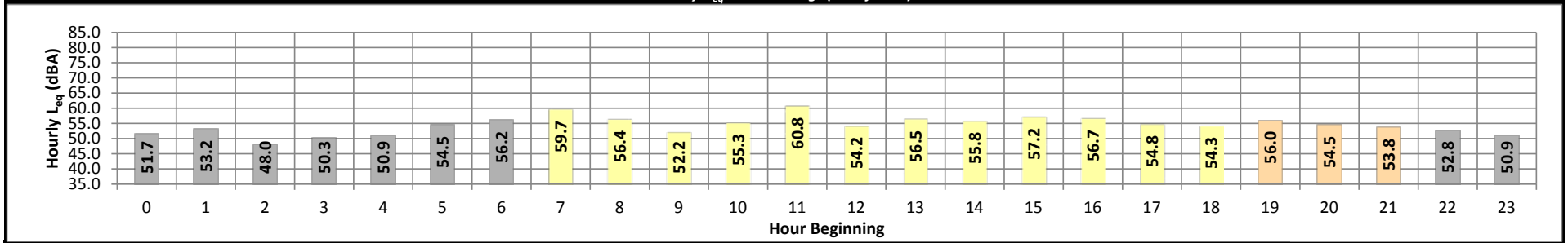
74.5

24-Hour Noise Level Measurement Summary

Date: Wednesday, September 25, 2019 *Location:* L2 - Located in the northwest corner of the Palm Village Apartment comlex near parking hoods. *Meter:* Piccolo I *JN:* 11860

Project: Casa Loma 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	51.7	65.9	40.5	58.0	57.0	57.0	57.0	50.0	47.0	44.0	42.0	41.0	51.7	10.0	61.7
	1	53.2	73.9	41.0	63.0	57.0	56.0	56.0	49.0	47.0	46.0	45.0	45.0	53.2	10.0	63.2
	2	48.0	67.0	39.2	55.0	53.0	51.0	49.0	47.0	46.0	45.0	45.0	43.0	48.0	10.0	58.0
	3	50.3	67.7	42.3	59.0	57.0	55.0	52.0	49.0	47.0	46.0	45.0	44.0	50.3	10.0	60.3
	4	50.9	66.8	45.1	58.0	56.0	54.0	53.0	51.0	49.0	46.0	46.0	45.0	50.9	10.0	60.9
	5	54.5	71.8	45.7	62.0	60.0	58.0	57.0	55.0	52.0	49.0	48.0	47.0	54.5	10.0	64.5
	6	56.2	72.9	47.0	63.0	61.0	59.0	59.0	57.0	54.0	50.0	49.0	47.0	56.2	10.0	66.2
Day	7	59.7	77.0	40.9	74.0	73.0	60.0	58.0	54.0	52.0	47.0	45.0	42.0	59.7	0.0	59.7
	8	56.4	81.9	39.4	65.0	62.0	58.0	56.0	53.0	50.0	44.0	43.0	41.0	56.4	0.0	56.4
	9	52.2	66.9	39.1	60.0	59.0	57.0	55.0	52.0	50.0	43.0	42.0	40.0	52.2	0.0	52.2
	10	55.3	79.7	41.8	64.0	62.0	59.0	57.0	53.0	51.0	45.0	44.0	43.0	55.3	0.0	55.3
	11	60.8	87.7	38.9	73.0	71.0	63.0	60.0	54.0	51.0	45.0	44.0	41.0	60.8	0.0	60.8
	12	54.2	70.3	41.7	62.0	61.0	59.0	57.0	54.0	51.0	46.0	45.0	43.0	54.2	0.0	54.2
	13	56.5	80.0	43.9	65.0	62.0	59.0	58.0	55.0	53.0	48.0	47.0	45.0	56.5	0.0	56.5
	14	55.8	73.5	44.6	63.0	61.0	59.0	58.0	55.0	53.0	49.0	48.0	47.0	55.8	0.0	55.8
	15	57.2	82.1	44.6	63.0	62.0	59.0	58.0	56.0	54.0	50.0	49.0	46.0	57.2	0.0	57.2
	16	56.7	78.6	46.2	65.0	62.0	59.0	58.0	56.0	54.0	50.0	49.0	47.0	56.7	0.0	56.7
	17	54.8	74.3	45.8	62.0	61.0	58.0	57.0	55.0	53.0	49.0	48.0	47.0	54.8	0.0	54.8
	18	54.3	66.0	46.2	59.0	58.0	57.0	56.0	55.0	53.0	50.0	48.0	47.0	54.3	0.0	54.3
Evening	19	56.0	74.8	46.6	63.0	60.0	58.0	57.0	55.0	54.0	53.0	52.0	51.0	56.0	5.0	61.0
	20	54.5	79.9	43.9	59.0	57.0	55.0	55.0	54.0	52.0	49.0	49.0	46.0	54.5	5.0	59.5
	21	53.8	76.6	42.2	61.0	58.0	55.0	54.0	51.0	50.0	49.0	49.0	48.0	53.8	5.0	58.8
Night	22	52.8	77.7	40.7	61.0	57.0	53.0	52.0	50.0	49.0	44.0	43.0	41.0	52.8	10.0	62.8
	23	50.9	68.4	42.1	55.0	54.0	52.0	52.0	51.0	50.0	48.0	47.0	45.0	50.9	10.0	60.9

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	52.2	66.0	38.9	59.0	58.0	57.0	55.0	52.0	50.0	43.0	42.0	40.0
	Max	60.8	87.7	46.2	74.0	73.0	63.0	60.0	56.0	54.0	50.0	49.0	47.0
Energy Average		56.8	Average:		64.6	62.8	58.9	57.3	54.3	52.1	47.2	46.0	44.1
Evening	Min	53.8	74.8	42.2	59.0	57.0	55.0	54.0	51.0	50.0	49.0	49.0	46.0
	Max	56.0	79.9	46.6	63.0	60.0	58.0	57.0	55.0	54.0	53.0	52.0	51.0
Energy Average		54.9	Average:		61.0	58.3	56.0	55.3	53.3	52.0	50.3	50.0	48.3
Night	Min	48.0	65.9	39.2	55.0	53.0	51.0	49.0	47.0	46.0	44.0	42.0	41.0
	Max	56.2	77.7	47.0	63.0	61.0	59.0	59.0	57.0	54.0	50.0	49.0	47.0
Energy Average		52.7	Average:		59.3	56.9	55.0	54.1	51.0	49.0	46.4	45.6	44.2

L_{eq} (dBA)

24-Hour	*Daytime*	*Nighttime*
55.4	**56.5**	**52.7**

24-Hour CNEL (dBA)

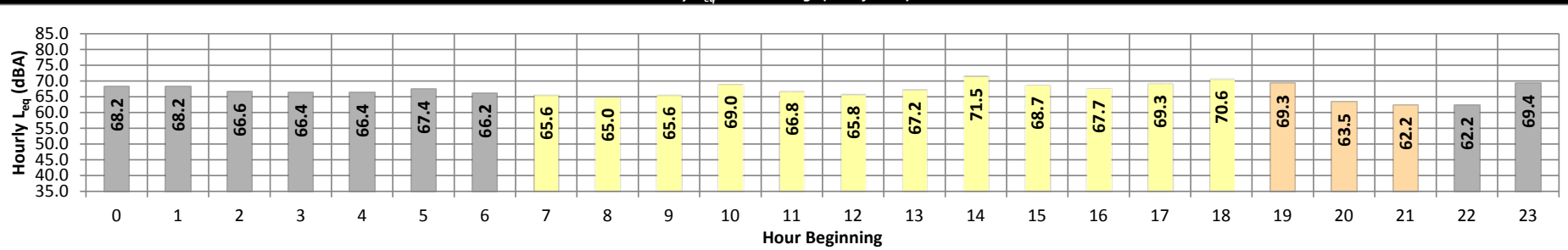
60.2

24-Hour Noise Level Measurement Summary

Date: Wednesday, September 25, 2019 *Location:* L3 - Located adjacent to Project site in the southwest of the corner of the Palm Village Apartment complex. *Meter:* Piccolo I *JN:* 11860

Project: Casa Loma 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	68.2	81.7	54.8	71.0	71.0	70.0	70.0	69.0	68.0	59.0	58.0	57.0	68.2	10.0	78.2
	1	68.2	78.2	52.1	71.0	70.0	70.0	69.0	68.0	68.0	64.0	56.0	54.0	68.2	10.0	78.2
	2	66.6	76.5	52.6	71.0	71.0	70.0	69.0	68.0	67.0	57.0	56.0	55.0	66.6	10.0	76.6
	3	66.4	78.1	55.2	71.0	70.0	69.0	69.0	68.0	66.0	59.0	58.0	57.0	66.4	10.0	76.4
	4	66.4	80.1	55.6	72.0	71.0	71.0	70.0	68.0	64.0	60.0	59.0	58.0	66.4	10.0	76.4
	5	67.4	86.6	59.4	73.0	72.0	70.0	70.0	68.0	65.0	62.0	62.0	61.0	67.4	10.0	77.4
	6	66.2	78.6	59.3	72.0	70.0	69.0	68.0	66.0	65.0	63.0	62.0	61.0	66.2	10.0	76.2
Day	7	65.6	79.4	55.6	73.0	71.0	69.0	68.0	66.0	64.0	60.0	59.0	58.0	65.6	0.0	65.6
	8	65.0	77.0	53.8	71.0	70.0	69.0	69.0	65.0	62.0	59.0	58.0	56.0	65.0	0.0	65.0
	9	65.6	82.4	54.1	72.0	71.0	69.0	68.0	66.0	64.0	60.0	59.0	57.0	65.6	0.0	65.6
	10	69.0	82.9	54.8	78.0	77.0	76.0	74.0	67.0	63.0	59.0	59.0	57.0	69.0	0.0	69.0
	11	66.8	87.3	53.8	75.0	73.0	71.0	69.0	67.0	64.0	59.0	58.0	57.0	66.8	0.0	66.8
	12	65.8	78.6	54.8	71.0	70.0	69.0	68.0	67.0	64.0	60.0	59.0	58.0	65.8	0.0	65.8
	13	67.2	80.4	55.1	72.0	72.0	71.0	71.0	68.0	65.0	61.0	60.0	58.0	67.2	0.0	67.2
	14	71.5	78.0	68.6	73.0	73.0	72.0	72.0	71.0	71.0	70.0	70.0	69.0	71.5	0.0	71.5
	15	68.7	82.5	59.0	74.0	73.0	72.0	71.0	69.0	67.0	63.0	62.0	61.0	68.7	0.0	68.7
	16	67.7	79.3	59.4	72.0	71.0	70.0	69.0	68.0	67.0	63.0	63.0	61.0	67.7	0.0	67.7
	17	69.3	82.6	60.0	74.0	72.0	72.0	71.0	70.0	69.0	64.0	63.0	62.0	69.3	0.0	69.3
	18	70.6	79.2	67.7	73.0	72.0	72.0	71.0	70.0	70.0	69.0	69.0	68.0	70.6	0.0	70.6
Evening	19	69.3	78.0	57.3	72.0	72.0	71.0	71.0	70.0	69.0	63.0	62.0	60.0	69.3	5.0	74.3
	20	63.5	78.6	53.3	68.0	67.0	65.0	65.0	64.0	63.0	60.0	59.0	57.0	63.5	5.0	68.5
	21	62.2	77.7	52.1	67.0	66.0	65.0	64.0	63.0	61.0	58.0	56.0	55.0	62.2	5.0	67.2
Night	22	62.2	74.8	53.8	68.0	66.0	65.0	64.0	63.0	61.0	59.0	58.0	57.0	62.2	10.0	72.2
	23	69.4	76.1	54.4	71.0	71.0	70.0	70.0	70.0	69.0	63.0	59.0	58.0	69.4	10.0	79.4

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	65.0	77.0	53.8	71.0	70.0	69.0	68.0	65.0	62.0	59.0	58.0	56.0
	Max	71.5	87.3	68.6	78.0	77.0	76.0	74.0	71.0	71.0	70.0	70.0	69.0
Energy Average		68.2	Average:		73.2	72.1	71.0	70.1	67.8	65.8	62.3	61.6	60.2
Evening	Min	62.2	77.7	52.1	67.0	66.0	65.0	64.0	63.0	61.0	58.0	56.0	55.0
	Max	69.3	78.6	57.3	72.0	72.0	71.0	71.0	70.0	69.0	63.0	62.0	60.0
Energy Average		66.2	Average:		69.0	68.3	67.0	66.7	65.7	64.3	60.3	59.0	57.3
Night	Min	62.2	74.8	52.1	68.0	66.0	65.0	64.0	63.0	61.0	57.0	56.0	54.0
	Max	69.4	86.6	59.4	73.0	72.0	71.0	70.0	70.0	69.0	64.0	62.0	61.0
Energy Average		67.1	Average:		71.1	70.2	69.3	68.8	67.6	65.9	60.7	58.7	57.6

L_{eq} (dBA)		
24-Hour	Daytime	Nighttime
67.6	67.9	67.1

24-Hour CNEL (dBA)

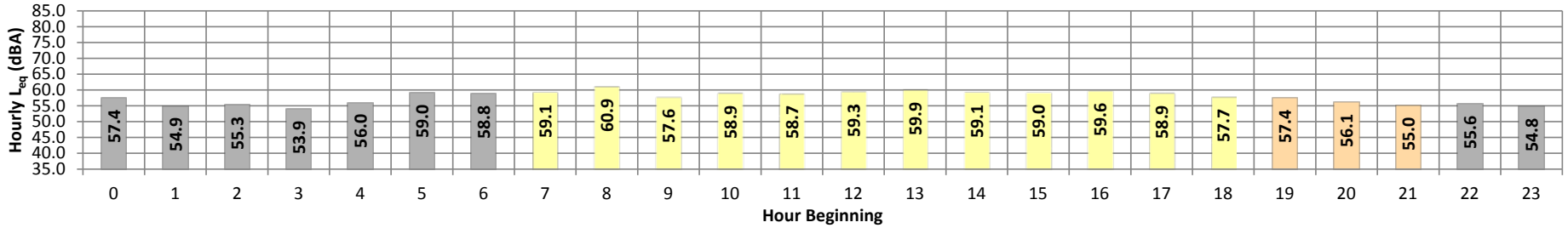
73.9

24-Hour Noise Level Measurement Summary

Date: Wednesday, September 25, 2019 *Location:* L4 - Located east of project site on North University Street near multi-family apartment complex. *Meter:* Piccolo I *JN:* 11860

Project: Casa Loma 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	57.4	74.5	48.8	65.0	65.0	62.0	60.0	55.0	54.0	52.0	50.0	49.0	57.4	10.0	67.4
	1	54.9	73.6	44.2	65.0	65.0	60.0	58.0	52.0	50.0	46.0	45.0	44.0	54.9	10.0	64.9
	2	55.3	72.7	43.5	63.0	61.0	60.0	60.0	54.0	50.0	44.0	44.0	43.0	55.3	10.0	65.3
	3	53.9	72.9	43.5	63.0	61.0	59.0	57.0	53.0	50.0	46.0	45.0	44.0	53.9	10.0	63.9
	4	56.0	71.5	45.8	63.0	62.0	60.0	59.0	57.0	53.0	49.0	48.0	46.0	56.0	10.0	66.0
	5	59.0	80.2	46.5	68.0	65.0	62.0	61.0	58.0	55.0	51.0	50.0	48.0	59.0	10.0	69.0
	6	58.8	73.6	49.8	66.0	64.0	62.0	61.0	59.0	57.0	52.0	52.0	50.0	58.8	10.0	68.8
Day	7	59.1	77.2	43.3	68.0	66.0	63.0	62.0	59.0	56.0	50.0	48.0	45.0	59.1	0.0	59.1
	8	60.9	80.2	41.9	72.0	70.0	66.0	64.0	59.0	56.0	49.0	47.0	44.0	60.9	0.0	60.9
	9	57.6	78.2	40.7	67.0	64.0	61.0	60.0	57.0	54.0	47.0	45.0	42.0	57.6	0.0	57.6
	10	58.9	75.4	41.7	68.0	67.0	64.0	62.0	59.0	56.0	49.0	47.0	43.0	58.9	0.0	58.9
	11	58.7	78.2	41.9	67.0	65.0	62.0	61.0	58.0	56.0	49.0	47.0	44.0	58.7	0.0	58.7
	12	59.3	81.3	43.9	68.0	66.0	63.0	61.0	58.0	56.0	50.0	48.0	45.0	59.3	0.0	59.3
	13	59.9	77.0	51.8	69.0	67.0	63.0	62.0	59.0	57.0	53.0	53.0	52.0	59.9	0.0	59.9
	14	59.1	76.8	48.7	67.0	64.0	62.0	61.0	59.0	57.0	53.0	51.0	50.0	59.1	0.0	59.1
	15	59.0	76.9	51.8	66.0	64.0	62.0	61.0	59.0	57.0	54.0	53.0	52.0	59.0	0.0	59.0
	16	59.6	78.5	50.9	68.0	65.0	62.0	61.0	59.0	57.0	54.0	53.0	52.0	59.6	0.0	59.6
	17	58.9	75.6	48.7	65.0	63.0	62.0	61.0	59.0	57.0	53.0	52.0	50.0	58.9	0.0	58.9
	18	57.7	74.5	49.5	65.0	63.0	61.0	60.0	58.0	56.0	52.0	52.0	50.0	57.7	0.0	57.7
Evening	19	57.4	75.7	50.0	65.0	62.0	60.0	59.0	57.0	55.0	52.0	52.0	51.0	57.4	5.0	62.4
	20	56.1	72.6	48.5	62.0	61.0	60.0	59.0	57.0	54.0	51.0	50.0	49.0	56.1	5.0	61.1
	21	55.0	74.1	45.9	63.0	61.0	59.0	58.0	55.0	52.0	49.0	48.0	48.0	55.0	5.0	60.0
Night	22	55.6	73.7	51.0	62.0	61.0	59.0	58.0	55.0	53.0	52.0	52.0	51.0	55.6	10.0	65.6
	23	54.8	72.0	51.6	61.0	59.0	57.0	56.0	54.0	53.0	53.0	52.0	52.0	54.8	10.0	64.8

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	57.6	74.5	40.7	65.0	63.0	61.0	60.0	57.0	54.0	47.0	45.0	42.0
	Max	60.9	81.3	51.8	72.0	70.0	66.0	64.0	59.0	57.0	54.0	53.0	52.0
Energy Average		59.1	Average:		67.5	65.3	62.6	61.3	58.6	56.3	51.1	49.7	47.4
Evening	Min	55.0	72.6	45.9	62.0	61.0	59.0	58.0	55.0	52.0	49.0	48.0	48.0
	Max	57.4	75.7	50.0	65.0	62.0	60.0	59.0	57.0	55.0	52.0	52.0	51.0
Energy Average		56.3	Average:		63.3	61.3	59.7	58.7	56.3	53.7	50.7	50.0	49.3
Night	Min	53.9	71.5	43.5	61.0	59.0	57.0	56.0	52.0	50.0	44.0	44.0	43.0
	Max	59.0	80.2	51.6	68.0	65.0	62.0	61.0	59.0	57.0	53.0	52.0	52.0
Energy Average		56.5	Average:		64.0	62.6	60.1	58.9	55.2	52.8	49.4	48.7	47.4

L_{eq} (dBA)		
24-Hour	Daytime	Nighttime
58.0	58.7	56.5

24-Hour CNEL (dBA)

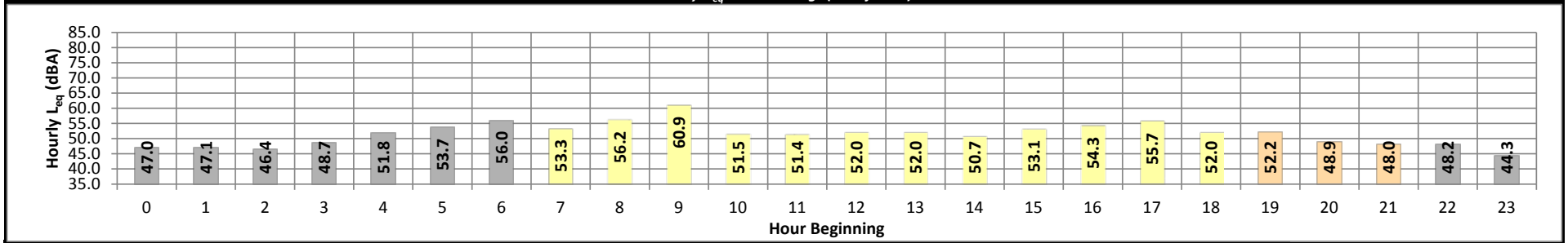
63.6

24-Hour Noise Level Measurement Summary

Date: Wednesday, September 25, 2019 *Location:* L5 - Located on Occidental Drive adjacent to the southwestern corner of the project site. *Meter:* Piccolo I *JN:* 11860

Project: Casa Loma 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	47.0	61.7	40.8	53.0	51.0	50.0	49.0	47.0	45.0	43.0	42.0	41.0	47.0	10.0	57.0
	1	47.1	65.6	40.7	59.0	54.0	49.0	47.0	44.0	43.0	42.0	41.0	41.0	47.1	10.0	57.1
	2	46.4	66.5	41.6	52.0	51.0	49.0	48.0	46.0	45.0	43.0	42.0	41.0	46.4	10.0	56.4
	3	48.7	71.1	42.1	55.0	53.0	51.0	50.0	48.0	47.0	44.0	43.0	43.0	48.7	10.0	58.7
	4	51.8	71.0	44.8	57.0	56.0	54.0	54.0	52.0	50.0	47.0	47.0	46.0	51.8	10.0	61.8
	5	53.7	72.0	48.5	60.0	58.0	56.0	55.0	53.0	52.0	50.0	50.0	49.0	53.7	10.0	63.7
	6	56.0	73.8	49.5	67.0	65.0	59.0	57.0	54.0	53.0	51.0	51.0	50.0	56.0	10.0	66.0
Day	7	53.3	74.9	41.8	64.0	62.0	57.0	55.0	51.0	49.0	46.0	44.0	43.0	53.3	0.0	53.3
	8	56.2	84.6	37.9	66.0	62.0	55.0	53.0	48.0	44.0	40.0	40.0	39.0	56.2	0.0	56.2
	9	60.9	77.4	39.3	72.0	71.0	70.0	66.0	54.0	46.0	41.0	40.0	39.0	60.9	0.0	60.9
	10	51.5	73.1	39.6	64.0	61.0	55.0	52.0	47.0	44.0	42.0	41.0	40.0	51.5	0.0	51.5
	11	51.4	73.6	38.3	62.0	60.0	55.0	53.0	48.0	45.0	41.0	40.0	39.0	51.4	0.0	51.4
	12	52.0	70.9	41.7	63.0	61.0	57.0	54.0	49.0	47.0	44.0	43.0	43.0	52.0	0.0	52.0
	13	52.0	75.2	43.9	62.0	60.0	55.0	53.0	49.0	47.0	45.0	45.0	44.0	52.0	0.0	52.0
	14	50.7	69.5	44.4	59.0	57.0	54.0	53.0	49.0	48.0	46.0	46.0	45.0	50.7	0.0	50.7
	15	53.1	72.2	45.3	64.0	61.0	56.0	55.0	51.0	49.0	47.0	47.0	46.0	53.1	0.0	53.1
	16	54.3	76.9	46.0	65.0	62.0	58.0	56.0	52.0	50.0	48.0	48.0	47.0	54.3	0.0	54.3
	17	55.7	83.4	46.2	64.0	61.0	58.0	56.0	53.0	50.0	48.0	47.0	47.0	55.7	0.0	55.7
	18	52.0	77.1	44.9	62.0	60.0	54.0	52.0	49.0	48.0	46.0	46.0	45.0	52.0	0.0	52.0
Evening	19	52.2	71.7	45.6	62.0	60.0	57.0	54.1	50.0	48.0	47.0	46.0	46.0	52.2	5.0	57.2
	20	48.9	71.9	42.6	57.0	53.0	51.0	50.0	47.0	46.0	44.0	44.0	43.0	48.9	5.0	53.9
	21	48.0	67.9	41.7	59.0	56.0	51.0	48.0	45.0	44.0	42.0	42.0	42.0	48.0	5.0	53.0
Night	22	48.2	72.5	40.9	58.0	53.0	48.0	47.0	45.0	44.0	43.0	42.0	41.0	48.2	10.0	58.2
	23	44.3	69.6	37.9	51.0	48.0	46.0	45.0	41.0	40.0	39.0	39.0	38.0	44.3	10.0	54.3

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	50.7	69.5	37.9	59.0	57.0	54.0	52.0	47.0	44.0	40.0	40.0	39.0
	Max	60.9	84.6	46.2	72.0	71.0	70.0	66.0	54.0	50.0	48.0	48.0	47.0
Energy Average		54.7	Average:		63.9	61.5	57.0	54.8	50.0	47.3	44.5	43.9	43.1
Evening	Min	48.0	67.9	41.7	57.0	53.0	51.0	48.0	45.0	44.0	42.0	42.0	42.0
	Max	52.2	71.9	45.6	62.0	60.0	57.0	54.1	50.0	48.0	47.0	46.0	46.0
Energy Average		50.1	Average:		59.3	56.3	53.0	50.7	47.3	46.0	44.3	44.0	43.7
Night	Min	44.3	61.7	37.9	51.0	48.0	46.0	45.0	41.0	40.0	39.0	39.0	38.0
	Max	56.0	73.8	49.5	67.0	65.0	59.0	57.0	54.0	53.0	51.0	51.0	50.0
Energy Average		50.9	Average:		56.9	54.3	51.3	50.2	47.8	46.6	44.7	44.1	43.3

L_{eq} (dBA)

24-Hour	*Daytime*	*Nighttime*
53.2	**54.1**	**50.9**

24-Hour CNEL (dBA)

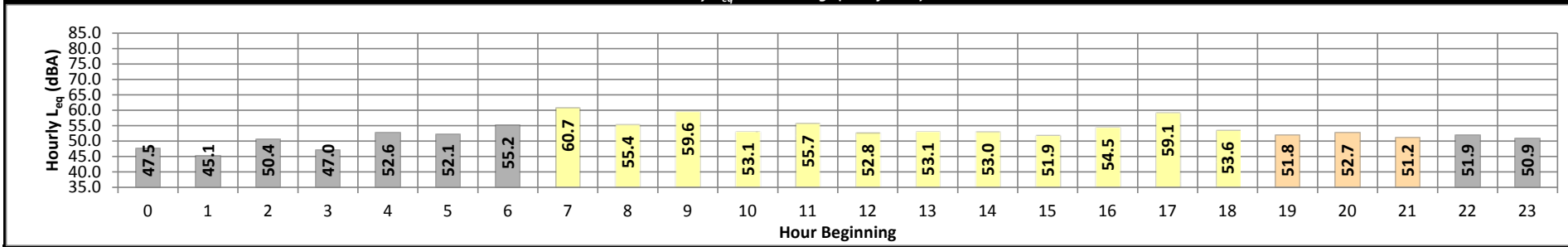
58.1

24-Hour Noise Level Measurement Summary

Date: Wednesday, September 25, 2019 *Location:* L6 - Located west of the project site on Occidental Drive near existing single-family homes. *Meter:* Piccolo II *JN:* 11860

Project: Loma Casa 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	47.5	53.5	43.8	53.2	52.8	51.7	50.7	47.7	46.2	44.6	44.3	43.9	47.5	10.0	57.5
	1	45.1	52.6	40.9	52.1	51.5	49.7	48.2	45.3	43.5	41.6	41.3	41.0	45.1	10.0	55.1
	2	50.4	63.4	40.0	62.4	61.1	58.6	54.9	46.9	43.2	40.6	40.3	40.1	50.4	10.0	60.4
	3	47.0	55.4	42.3	54.8	54.2	52.4	50.4	47.0	45.1	43.0	42.7	42.4	47.0	10.0	57.0
	4	52.6	66.1	43.7	65.4	63.9	58.6	55.0	49.1	46.9	44.5	44.1	43.8	52.6	10.0	62.6
	5	52.1	58.9	48.4	58.5	57.9	56.4	55.1	52.3	50.8	49.0	48.8	48.5	52.1	10.0	62.1
	6	55.2	63.5	50.0	62.9	62.1	60.2	58.7	55.2	53.3	50.9	50.5	50.1	55.2	10.0	65.2
Day	7	60.7	70.4	50.7	70.0	69.1	67.1	66.0	61.2	56.0	52.0	51.3	50.8	60.7	0.0	60.7
	8	55.4	65.1	47.5	64.7	64.0	61.8	59.7	54.7	52.3	48.7	48.1	47.6	55.4	0.0	55.4
	9	59.6	69.2	51.5	68.6	68.0	66.7	65.2	57.2	54.4	52.3	52.0	51.7	59.6	0.0	59.6
	10	53.1	62.0	44.4	61.4	60.7	58.7	57.4	53.5	50.6	46.1	45.2	44.6	53.1	0.0	53.1
	11	55.7	64.7	47.1	64.3	63.7	62.0	60.6	55.8	52.2	48.1	47.6	47.2	55.7	0.0	55.7
	12	52.8	62.0	42.6	61.6	61.0	58.9	57.2	52.9	49.7	44.7	43.7	42.8	52.8	0.0	52.8
	13	53.1	63.4	42.9	63.0	62.4	59.9	57.6	52.5	49.1	44.4	43.7	43.1	53.1	0.0	53.1
	14	53.0	63.8	44.4	63.4	62.6	59.4	57.2	51.7	49.3	45.6	44.9	44.5	53.0	0.0	53.0
	15	51.9	60.8	45.6	60.3	59.7	57.2	55.4	52.0	49.9	46.7	46.1	45.7	51.9	0.0	51.9
	16	54.5	64.1	45.8	63.7	63.4	62.0	59.4	53.2	51.0	47.1	46.5	46.0	54.5	0.0	54.5
	17	59.1	73.0	46.6	72.3	71.0	65.9	62.0	53.6	51.3	48.0	47.4	46.7	59.1	0.0	59.1
	18	53.6	63.3	45.7	62.8	62.0	59.3	57.6	53.6	50.5	47.0	46.4	45.8	53.6	0.0	53.6
Evening	19	51.8	60.8	45.1	60.2	59.5	57.1	55.7	52.2	49.3	46.0	45.6	45.2	51.8	5.0	56.8
	20	52.7	62.6	45.7	62.3	61.6	59.4	56.9	51.8	49.4	46.6	46.2	45.8	52.7	5.0	57.7
	21	51.2	63.8	44.5	63.2	61.2	56.6	54.0	49.3	47.3	45.3	45.0	44.7	51.2	5.0	56.2
Night	22	51.9	62.0	46.3	61.3	60.7	58.5	56.0	50.9	48.4	46.7	46.6	46.4	51.9	10.0	61.9
	23	50.9	59.9	47.5	59.4	58.7	56.1	54.2	49.8	48.8	47.9	47.8	47.6	50.9	10.0	60.9

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	51.9	60.8	42.6	60.3	59.7	57.2	55.4	51.7	49.1	44.4	43.7	42.8
	Max	60.7	73.0	51.5	72.3	71.0	67.1	66.0	61.2	56.0	52.3	52.0	51.7
Energy Average		56.3	Average:		64.7	64.0	61.6	59.6	54.3	51.3	47.6	46.9	46.4
Evening	Min	51.2	60.8	44.5	60.2	59.5	56.6	54.0	49.3	47.3	45.3	45.0	44.7
	Max	52.7	63.8	45.7	63.2	61.6	59.4	56.9	52.2	49.4	46.6	46.2	45.8
Energy Average		51.9	Average:		61.9	60.8	57.7	55.6	51.1	48.6	46.0	45.6	45.2
Night	Min	45.1	52.6	40.0	52.1	51.5	49.7	48.2	45.3	43.2	40.6	40.3	40.1
	Max	55.2	66.1	50.0	65.4	63.9	60.2	58.7	55.2	53.3	50.9	50.5	50.1
Energy Average		51.2	Average:		58.9	58.1	55.8	53.7	49.4	47.4	45.4	45.2	44.9

L_{eq} (dBA)

24-Hour	*Daytime*	*Nighttime*
54.5	**55.7**	**51.2**

24-Hour CNEL (dBA)

58.9

APPENDIX 7.1:

OFF-SITE TRAFFIC NOISE LEVEL CONTOURS

This page intentionally left blank

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing
Road Name: University St.
Road Segment: s/o Lugonia Av.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	11,406 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,141 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.87	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-18.11	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-22.06	1.31	-1.20	-5.50	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:	65.7	63.8	62.1	56.0	64.6	65.2
Medium Trucks:	59.7	58.2	51.9	50.3	58.8	59.0
Heavy Trucks:	61.0	59.6	50.6	51.8	60.2	60.3
Vehicle Noise:	67.7	66.0	62.7	58.2	66.7	67.2

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	27	57	123	266
CNEL:	28	61	132	285

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing
Road Name: University St.
Road Segment: s/o Cornell Av.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,215 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,222 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.57	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.81	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.76	1.31	-1.20	-5.50	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:	66.0	64.1	62.4	56.3	64.9	65.5
Medium Trucks:	60.0	58.5	52.1	50.6	59.1	59.3
Heavy Trucks:	61.3	59.9	50.9	52.1	60.5	60.6
Vehicle Noise:	68.0	66.3	63.0	58.5	67.0	67.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	60	129	278
CNEL:	30	64	138	298

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing
Road Name: University St.
Road Segment: s/o Brockton
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	13,387 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,339 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.17	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.41	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.37	1.31	-1.20	-5.50	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:	66.4	64.5	62.7	56.7	65.3	65.9
Medium Trucks:	60.4	58.9	52.5	51.0	59.5	59.7
Heavy Trucks:	61.7	60.3	51.3	52.5	60.9	61.0
Vehicle Noise:	68.4	66.7	63.4	58.9	67.4	67.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	30	64	137	296
CNEL:	32	68	147	317

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: Existing
Road Name: Lugonia Av.
Road Segment: w/o University St.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	20,703 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,070 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	1.72	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-15.52	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-19.47	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	68.3	66.4	64.6	58.6	67.2	67.8
Medium Trucks:	62.3	60.8	54.4	52.9	61.4	61.6
Heavy Trucks:	63.6	62.2	53.2	54.4	62.8	62.9
Vehicle Noise:	70.3	68.6	65.3	60.8	69.3	69.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	40	85	184	396
CNEL:	42	91	197	423

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: E + P | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Lugonia Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	11,658 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,166 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.77	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-18.01	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.97	1.31	-1.20	-5.50	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:	65.8	63.9	62.1	56.1	64.7	65.3
Medium Trucks:	59.8	58.3	51.9	50.4	58.9	59.1
Heavy Trucks:	61.1	59.7	50.7	51.9	60.3	60.4
Vehicle Noise:	67.8	66.1	62.8	58.3	66.8	67.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	27	58	125	270
CNEL:	29	62	134	289

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: E + P | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Cornell Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,947 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,295 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.32	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.56	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.51	1.31	-1.20	-5.50	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:	66.3	64.4	62.6	56.6	65.2	65.8
Medium Trucks:	60.3	58.8	52.4	50.9	59.3	59.5
Heavy Trucks:	61.6	60.2	51.1	52.4	60.7	60.9
Vehicle Noise:	68.3	66.6	63.3	58.7	67.3	67.7

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	29	62	134	289
CNEL:	31	67	144	310

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: E + P | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Brockton

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	14,119 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,412 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	0.06	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.18	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.14	1.31	-1.20	-5.50	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:	66.6	64.7	63.0	56.9	65.5	66.2
Medium Trucks:	60.6	59.1	52.8	51.2	59.7	59.9
Heavy Trucks:	62.0	60.5	51.5	52.8	61.1	61.2
Vehicle Noise:	68.7	66.9	63.7	59.1	67.6	68.1

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	31	66	142	306
CNEL:	33	71	152	328

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: E + P | Project Name: Casa Loma Residential
Road Name: Lugonia Av. | Job Number: 11860
Road Segment: w/o University St.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	20,840 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,084 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	1.75	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-15.49	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-19.44	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	68.3	66.4	64.7	58.6	67.2	67.8
Medium Trucks:	62.3	60.8	54.5	52.9	61.4	61.6
Heavy Trucks:	63.7	62.2	53.2	54.4	62.8	62.9
Vehicle Noise:	70.4	68.6	65.3	60.8	69.3	69.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	40	86	184	397
CNEL:	43	92	197	425

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: OYC 2020 | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Lugonia Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,392 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,239 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.51	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.75	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.70	1.31	-1.20	-5.50	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:	66.1	64.2	62.4	56.4	65.0	65.6
Medium Trucks:	60.1	58.6	52.2	50.7	59.1	59.4
Heavy Trucks:	61.4	60.0	50.9	52.2	60.5	60.7
Vehicle Noise:	68.1	66.4	63.1	58.5	67.1	67.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	61	130	281
CNEL:	30	65	140	301

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: OYC 2020 | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Cornell Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	13,234 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,323 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.22	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.46	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.42	1.31	-1.20	-5.50	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:	66.4	64.5	62.7	56.6	65.3	65.9
Medium Trucks:	60.4	58.9	52.5	51.0	59.4	59.6
Heavy Trucks:	61.7	60.3	51.2	52.5	60.8	61.0
Vehicle Noise:	68.4	66.7	63.4	58.8	67.4	67.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	29	63	136	293
CNEL:	31	68	146	314

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: OYC 2020 | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Brockton

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	14,452 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,445 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	0.16	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.08	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.03	1.31	-1.20	-5.50	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:	66.7	64.8	63.1	57.0	65.6	66.3
Medium Trucks:	60.7	59.2	52.9	51.3	59.8	60.0
Heavy Trucks:	62.1	60.6	51.6	52.9	61.2	61.3
Vehicle Noise:	68.8	67.0	63.8	59.2	67.7	68.2

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	31	67	144	311
CNEL:	33	72	155	333

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: OYC 2020 | Project Name: Casa Loma Residential
Road Name: Lugonia Av. | Job Number: 11860
Road Segment: w/o University St.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,325 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,333 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	2.24	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-15.00	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-18.96	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	68.8	66.9	65.2	59.1	67.7	68.3
Medium Trucks:	62.8	61.3	55.0	53.4	61.9	62.1
Heavy Trucks:	64.1	62.7	53.7	54.9	63.3	63.4
Vehicle Noise:	70.8	69.1	65.8	61.3	69.8	70.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	43	92	199	428
CNEL:	46	99	213	458

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: OYC 2020 + P
Road Name: University St.
Road Segment: s/o Lugonia Av.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,644 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,264 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.42	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.66	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.61	1.31	-1.20	-5.50	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:	66.2	64.3	62.5	56.4	65.1	65.7
Medium Trucks:	60.2	58.7	52.3	50.8	59.2	59.4
Heavy Trucks:	61.5	60.1	51.0	52.3	60.6	60.8
Vehicle Noise:	68.2	66.5	63.2	58.6	67.2	67.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	61	132	285
CNEL:	30	66	141	305

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: OYC 2020 + P
Road Name: University St.
Road Segment: s/o Cornell Av.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	13,966 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,397 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	0.01	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.23	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.18	1.31	-1.20	-5.50	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:	66.6	64.7	62.9	56.9	65.5	66.1
Medium Trucks:	60.6	59.1	52.7	51.2	59.6	59.9
Heavy Trucks:	61.9	60.5	51.5	52.7	61.1	61.2
Vehicle Noise:	68.6	66.9	63.6	59.1	67.6	68.0

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	30	66	141	304
CNEL:	33	70	151	326

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: OYC 2020 + P
Road Name: University St.
Road Segment: s/o Brockton
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	15,184 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,518 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	0.37	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-16.86	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-20.82	1.31	-1.20	-5.50	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:	67.0	65.1	63.3	57.2	65.9	66.5
Medium Trucks:	61.0	59.5	53.1	51.5	60.0	60.2
Heavy Trucks:	62.3	60.9	51.8	53.1	61.4	61.6
Vehicle Noise:	69.0	67.3	64.0	59.4	68.0	68.4

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	32	69	149	322
CNEL:	34	74	160	344

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: OYC 2020 + P
Road Name: Lugonia Av.
Road Segment: w/o University St.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,462 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,346 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	2.26	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-14.97	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-18.93	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	68.9	67.0	65.2	59.1	67.8	68.4
Medium Trucks:	62.9	61.3	55.0	53.4	61.9	62.1
Heavy Trucks:	64.2	62.8	53.7	55.0	63.3	63.4
Vehicle Noise:	70.9	69.1	65.9	61.3	69.8	70.3

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	43	93	200	430
CNEL:	46	99	214	460

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: HY 2040 | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Lugonia Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,392 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,239 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.51	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.75	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.70	1.31	-1.20	-5.50	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:	66.1	64.2	62.4	56.4	65.0	65.6
Medium Trucks:	60.1	58.6	52.2	50.7	59.1	59.4
Heavy Trucks:	61.4	60.0	50.9	52.2	60.5	60.7
Vehicle Noise:	68.1	66.4	63.1	58.5	67.1	67.5

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	61	130	281
CNEL:	30	65	140	301

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: HY 2040 | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Cornell Av.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	13,234 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,323 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.22	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.46	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.42	1.31	-1.20	-5.50	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:	66.4	64.5	62.7	56.6	65.3	65.9
Medium Trucks:	60.4	58.9	52.5	51.0	59.4	59.6
Heavy Trucks:	61.7	60.3	51.2	52.5	60.8	61.0
Vehicle Noise:	68.4	66.7	63.4	58.8	67.4	67.8

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	29	63	136	293
CNEL:	31	68	146	314

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: HY 2040 | Project Name: Casa Loma Residential
Road Name: University St. | Job Number: 11860
Road Segment: s/o Brockton

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	14,452 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,445 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	0.16	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.08	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.03	1.31	-1.20	-5.50	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:	66.7	64.8	63.1	57.0	65.6	66.3
Medium Trucks:	60.7	59.2	52.9	51.3	59.8	60.0
Heavy Trucks:	62.1	60.6	51.6	52.9	61.2	61.3
Vehicle Noise:	68.8	67.0	63.8	59.2	67.7	68.2

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	31	67	144	311
CNEL:	33	72	155	333

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: HY 2040 | Project Name: Casa Loma Residential
Road Name: Lugonia Av. | Job Number: 11860
Road Segment: w/o University St.

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	26,940 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,694 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	2.86	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-14.37	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-18.33	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	69.5	67.6	65.8	59.7	68.4	69.0
Medium Trucks:	63.5	61.9	55.6	54.0	62.5	62.7
Heavy Trucks:	64.8	63.4	54.3	55.6	63.9	64.0
Vehicle Noise:	71.5	69.7	66.5	61.9	70.4	70.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	47	102	219	471
CNEL:	50	109	234	505

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: HY 2040 + P
Road Name: University St.
Road Segment: s/o Lugonia Av.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,644 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,264 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	-0.42	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.66	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.61	1.31	-1.20	-5.50	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:	66.2	64.3	62.5	56.4	65.1	65.7
Medium Trucks:	60.2	58.7	52.3	50.8	59.2	59.4
Heavy Trucks:	61.5	60.1	51.0	52.3	60.6	60.8
Vehicle Noise:	68.2	66.5	63.2	58.6	67.2	67.6

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	28	61	132	285
CNEL:	30	66	141	305

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: HY 2040 + P
Road Name: University St.
Road Segment: s/o Cornell Av.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	13,966 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,397 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	0.01	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-17.23	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-21.18	1.31	-1.20	-5.50	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:	66.6	64.7	62.9	56.9	65.5	66.1
Medium Trucks:	60.6	59.1	52.7	51.2	59.6	59.9
Heavy Trucks:	61.9	60.5	51.5	52.7	61.1	61.2
Vehicle Noise:	68.6	66.9	63.6	59.1	67.6	68.0

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	30	66	141	304
CNEL:	33	70	151	326

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: HY 2040 + P
Road Name: University St.
Road Segment: s/o Brockton
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	15,184 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,518 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	0.37	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-16.86	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-20.82	1.31	-1.20	-5.50	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:	67.0	65.1	63.3	57.2	65.9	66.5
Medium Trucks:	61.0	59.5	53.1	51.5	60.0	60.2
Heavy Trucks:	62.3	60.9	51.8	53.1	61.4	61.6
Vehicle Noise:	69.0	67.3	64.0	59.4	68.0	68.4

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	32	69	149	322
CNEL:	34	74	160	344

Wednesday, January 15, 2020

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

Scenario: HY 2040 + P
Road Name: Lugonia Av.
Road Segment: w/o University St.
Project Name: Casa Loma Residential
Job Number: 11860

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	27,077 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,708 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	44.0 feet
Centerline Dist. to Observer:	44.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Road Grade:	0.0%
Left View:	-90.0 degrees
Right View:	90.0 degrees

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

Lane Equivalent Distance (in feet)

Autos:	40.460
Medium Trucks:	40.241
Heavy Trucks:	40.262

FHWA Noise Model Calculations

VehicleType	REMEL	Traffic Flow	Distance	Finite Road	Fresnel	Barrier Atten	Berm Atten
Autos:	66.51	2.89	1.28	-1.20	-4.61	0.000	0.000
Medium Trucks:	77.72	-14.35	1.31	-1.20	-4.87	0.000	0.000
Heavy Trucks:	82.99	-18.31	1.31	-1.20	-5.50	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	Leq Peak Hour	Leq Day	Leq Evening	Leq Night	Ldn	CNEL
Autos:	69.5	67.6	65.8	59.8	68.4	69.0
Medium Trucks:	63.5	62.0	55.6	54.1	62.5	62.8
Heavy Trucks:	64.8	63.4	54.3	55.6	63.9	64.1
Vehicle Noise:	71.5	69.8	66.5	61.9	70.5	70.9

Centerline Distance to Noise Contour (in feet)

	70 dBA	65 dBA	60 dBA	55 dBA
Ldn:	47	102	220	473
CNEL:	51	109	235	506

Wednesday, January 15, 2020

APPENDIX 8.1:

ON-SITE TRAFFIC NOISE LEVEL CALCULATIONS

This page intentionally left blank

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

Scenario: First Floor With Wall
Road Name: Lugonia Av.
Lot No: Bldg. 4

Project Name: Casa Loma Residential
Job Number: 11860
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	27,101 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,710 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 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:	69.0 feet
Barrier Distance to Observer:	19.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	34.7 feet
Road Elevation:	31.3 feet
Barrier Elevation:	32.5 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:	31.340		
Medium Trucks:	33.637		
Heavy Trucks:	39.346	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	67.133
Medium Trucks:	66.886
Heavy Trucks:	66.612

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	2.89	-2.02	-1.20	*-0.81*	0.000	0.000
Medium Trucks:	76.31	-14.35	-2.00	-1.20	*-1.04*	0.000	0.000
Heavy Trucks:	81.16	-18.30	-1.97	-1.20	*-1.75*	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:	67.0	65.1	63.4	57.3	65.9	66.5
Medium Trucks:	58.8	57.3	50.9	49.4	57.8	58.0
Heavy Trucks:	59.7	58.3	49.2	50.5	58.8	59.0
Vehicle Noise:	68.3	66.5	63.8	58.7	67.2	67.7

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	67.0	65.1	63.4	57.3	65.9	66.5
Medium Trucks:	58.8	57.3	50.9	49.4	57.8	58.0
Heavy Trucks:	59.7	58.3	49.2	50.5	58.8	59.0
Vehicle Noise:	68.3	66.5	63.8	58.7	67.2	67.7

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

Scenario: First Floor With Wall
Road Name: University St.
Lot No: Bldg. 1

Project Name: Casa Loma Residential
Job Number: 11860
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,916 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,292 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	73.0 feet
Centerline Dist. to Observer:	73.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	40.5 feet
Road Elevation:	42.4 feet
Barrier Elevation:	40.5 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:	42.400		
Medium Trucks:	44.697		
Heavy Trucks:	50.406	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	70.814
Medium Trucks:	70.751
Heavy Trucks:	70.916

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-0.33	-2.37	-1.20	*-4.85*	0.000	0.000
Medium Trucks:	76.31	-17.57	-2.36	-1.20	*-5.01*	0.000	0.000
Heavy Trucks:	81.16	-21.52	-2.38	-1.20	*-5.39*	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:	63.5	61.6	59.8	53.7	62.4	63.0
Medium Trucks:	55.2	53.7	47.3	45.8	54.2	54.5
Heavy Trucks:	56.1	54.6	45.6	46.8	55.2	55.3
Vehicle Noise:	64.7	62.9	60.2	55.1	63.7	64.2

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.5	61.6	59.8	53.7	62.4	63.0
Medium Trucks:	55.2	53.7	47.3	45.8	54.2	54.5
Heavy Trucks:	56.1	54.6	45.6	46.8	55.2	55.3
Vehicle Noise:	64.7	62.9	60.2	55.1	63.7	64.2

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

Scenario: Second Floor With Wall
Road Name: Lugonia Av.
Lot No: Bldg. 4

Project Name: Casa Loma Residential
Job Number: 11860
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	27,101 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,710 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 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:	69.0 feet
Barrier Distance to Observer:	19.0 feet
Observer Height (Above Pad):	14.0 feet
Pad Elevation:	34.7 feet
Road Elevation:	31.3 feet
Barrier Elevation:	32.5 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:	31.340		
Medium Trucks:	33.637		
Heavy Trucks:	39.346	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	68.836
Medium Trucks:	68.293
Heavy Trucks:	67.264

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	2.89	-2.19	-1.20	*-3.75*	0.000	0.000
Medium Trucks:	76.31	-14.35	-2.13	-1.20	*-4.26*	0.000	0.000
Heavy Trucks:	81.16	-18.30	-2.04	-1.20	*-5.68*	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:	66.9	65.0	63.2	57.1	65.8	66.4
Medium Trucks:	58.6	57.1	50.8	49.2	57.7	57.9
Heavy Trucks:	59.6	58.2	49.2	50.4	58.8	58.9
Vehicle Noise:	68.1	66.3	63.6	58.5	67.1	67.6

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	66.9	65.0	63.2	57.1	65.8	66.4
Medium Trucks:	58.6	57.1	50.8	49.2	57.7	57.9
Heavy Trucks:	59.6	58.2	49.2	50.4	58.8	58.9
Vehicle Noise:	68.1	66.3	63.6	58.5	67.1	67.6

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

Scenario: Second Floor With Wall
Road Name: University St.
Lot No: Bldg. 1

Project Name: Casa Loma Residential
Job Number: 11860
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,916 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,292 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	73.0 feet
Centerline Dist. to Observer:	73.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	14.0 feet
Pad Elevation:	40.5 feet
Road Elevation:	42.4 feet
Barrier Elevation:	40.5 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:	42.400		
Medium Trucks:	44.697		
Heavy Trucks:	50.406	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	71.773
Medium Trucks:	71.422
Heavy Trucks:	70.864

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-0.33	-2.46	-1.20	*-12.75*	0.000	0.000
Medium Trucks:	76.31	-17.57	-2.43	-1.20	*-13.17*	0.000	0.000
Heavy Trucks:	81.16	-21.52	-2.38	-1.20	*-14.24*	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:	63.4	61.5	59.7	53.7	62.3	62.9
Medium Trucks:	55.1	53.6	47.3	45.7	54.2	54.4
Heavy Trucks:	56.1	54.6	45.6	46.9	55.2	55.3
Vehicle Noise:	64.6	62.8	60.1	55.0	63.6	64.1

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.4	61.5	59.7	53.7	62.3	62.9
Medium Trucks:	55.1	53.6	47.3	45.7	54.2	54.4
Heavy Trucks:	56.1	54.6	45.6	46.9	55.2	55.3
Vehicle Noise:	64.6	62.8	60.1	55.0	63.6	64.1

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

Scenario: Third Floor With Wall
Road Name: Lugonia Av.
Lot No: Bldg. 4

Project Name: Casa Loma Residential
Job Number: 11860
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	27,101 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,710 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 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:	69.0 feet
Barrier Distance to Observer:	19.0 feet
Observer Height (Above Pad):	25.0 feet
Pad Elevation:	34.7 feet
Road Elevation:	31.3 feet
Barrier Elevation:	32.5 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:	31.340		
Medium Trucks:	33.637		
Heavy Trucks:	39.346	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	72.397
Medium Trucks:	71.528
Heavy Trucks:	69.651

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	2.89	-2.51	-1.20	*-8.41*	0.000	0.000
Medium Trucks:	76.31	-14.35	-2.44	-1.20	*-9.23*	0.000	0.000
Heavy Trucks:	81.16	-18.30	-2.26	-1.20	*-11.45*	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:	66.5	64.6	62.9	56.8	65.4	66.0
Medium Trucks:	58.3	56.8	50.5	48.9	57.4	57.6
Heavy Trucks:	59.4	58.0	48.9	50.2	58.5	58.7
Vehicle Noise:	67.8	66.0	63.3	58.2	66.8	67.3

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	66.5	64.6	62.9	56.8	65.4	66.0
Medium Trucks:	58.3	56.8	50.5	48.9	57.4	57.6
Heavy Trucks:	59.4	58.0	48.9	50.2	58.5	58.7
Vehicle Noise:	67.8	66.0	63.3	58.2	66.8	67.3

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

Scenario: Third Floor With Wall
Road Name: University St.
Lot No: Bldg. 1

Project Name: Casa Loma Residential
Job Number: 11860
Analyst: B. Lawson

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	12,916 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	1,292 vehicles
Vehicle Speed:	40 mph
Near/Far Lane Distance:	36 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	73.0 feet
Centerline Dist. to Observer:	73.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	25.0 feet
Pad Elevation:	40.5 feet
Road Elevation:	42.4 feet
Barrier Elevation:	40.5 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:	42.400		
Medium Trucks:	44.697		
Heavy Trucks:	50.406	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	74.422
Medium Trucks:	73.741
Heavy Trucks:	72.338

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	67.36	-0.33	-2.69	-1.20	*-20.99*	0.000	0.000
Medium Trucks:	76.31	-17.57	-2.63	-1.20	*-21.73*	0.000	0.000
Heavy Trucks:	81.16	-21.52	-2.51	-1.20	*-23.60*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	63.1	61.2	59.5	53.4	62.0	62.6
Medium Trucks:	54.9	53.4	47.0	45.5	54.0	54.2
Heavy Trucks:	55.9	54.5	45.5	46.7	55.1	55.2
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:	63.1	61.2	59.5	53.4	62.0	62.6
Medium Trucks:	54.9	53.4	47.0	45.5	54.0	54.2
Heavy Trucks:	55.9	54.5	45.5	46.7	55.1	55.2
Vehicle Noise:	64.4	62.6	59.9	54.8	63.4	63.9

APPENDIX 8.2:

INTERIOR NOISE LEVEL REDUCTION CALCULATIONS

This page intentionally left blank

INTERIOR NOISE REDUCTIONS

Project Name: Casa Loma — *Job Number:* 11860

Floor Plan: Unit A1 — *Analyst:* B. Lawson

Room: Master

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	*Source*	*Wall Area*	*STC*	*Transmission Loss (dB) by Frequency (Hz)*						*Fractional Area S/(10^(TL/10))*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*dB*
Stucco	David Harris p. 371	78.0	46	27	42	44	46	49	54	0.1556	0.0049	0.0031	0.0020	0.0010	0.0003	
Slider Windows	ABC	30.0	27	17	20	23	31	31	29	0.5986	0.3000	0.1504	0.0238	0.0238	0.0378	
Hung Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Glass Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Fixed Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		108								0.0070	0.0028	0.0014	0.0002	0.0002	0.0004	
Composite Exterior Wall Sound Transmission Loss		10*LOG(1/t)								21.56	25.49	28.47	36.22	36.39	34.53	33.21

(2) Room Effects (Absorption)

Room Surface/ Material	*Source*	*Area*	*NRC*	*Absorption Coefficients by Frequency (Hz)*						*Absorption (Sabins)*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Floor - Carpet	David Harris p. 347	165.9	0.30	0.15	0.17	0.12	0.32	0.52	0.30	24.88	28.20	19.91	53.1	86.3	49.8	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	165.9	0.50	0.10	0.08	0.05	0.03	0.03	0.03	16.59	13.27	8.29	4.98	4.98	4.98	
Walls - Drywall	David Harris p. 348	466.2	0.50	0.10	0.08	0.05	0.03	0.03	0.03	46.62	37.30	23.31	13.99	13.99	13.99	
Totals		797.96								88.09	78.766	51.51	72.044	105.22	68.726	97.53
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-0.88	-1.37	-3.22	-1.76	-0.11	-1.96	-0.44

(3) Adjustment Factor

Sound Source Adjustment Factor										-6.00	-6.00	-6.00	-6.00	-6.00	-6.00	-6.00

(4) Calculated Interior Noise Reduction (dBA)

	125	*250*	*500*	*1000*	*2000*	*4000*	*dBA*
(Transmission Loss + Room Effects + Adjustment Factor)	14.67	18.12	19.26	28.46	30.27	26.56	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	30.77	26.72	22.46	28.46	29.07	25.56	
Noise Reduction (dBA)	30.65	26.60	22.33	28.34	28.95	25.44	**27.8**

INTERIOR NOISE REDUCTIONS

Project Name: Casa Loma — *Job Number:* 11860

Floor Plan: Unit A2 — *Analyst:* B. Lawson

Room: Master

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	*Source*	*Wall Area*	*STC*	*Transmission Loss (dB) by Frequency (Hz)*						*Fractional Area S/(10^(TL/10))*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*dB*
Stucco	David Harris p. 371	83.4	46	27	42	44	46	49	54	0.1664	0.0053	0.0033	0.0021	0.0010	0.0003	
Slider Windows	ABC	30.0	27	17	20	23	31	31	29	0.5986	0.3000	0.1504	0.0238	0.0238	0.0378	
Hung Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Glass Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Fixed Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		113.4								0.0067	0.0027	0.0014	0.0002	0.0002	0.0003	
Composite Exterior Wall Sound Transmission Loss		10*LOG(1/t)								21.71	25.70	28.68	36.41	36.59	34.74	33.41

(2) Room Effects (Absorption)

Room Surface/ Material	*Source*	*Area*	*NRC*	*Absorption Coefficients by Frequency (Hz)*						*Absorption (Sabins)*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Floor - Carpet	David Harris p. 347	168.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	25.20	28.56	20.16	53.76	87.4	50.40	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	168.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	16.80	13.44	8.40	5.04	5.04	5.04	
Walls - Drywall	David Harris p. 348	468.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	46.80	37.44	23.40	14.04	14.04	14.04	
Totals		804								88.8	79.44	51.96	72.84	106.44	69.48	98.7
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-1.06	-1.55	-3.39	-1.92	-0.28	-2.13	-0.60

(3) Adjustment Factor

Sound Source Adjustment Factor										-6.00	-6.00	-6.00	-6.00	-6.00	-6.00	-6.00

(4) Calculated Interior Noise Reduction (dBA)

	125	*250*	*500*	*1000*	*2000*	*4000*	*dBA*
(Transmission Loss + Room Effects + Adjustment Factor)	14.65	18.15	19.29	28.49	30.31	26.61	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	30.75	26.75	22.49	28.49	29.11	25.61	
Noise Reduction (dBA)	30.62	26.63	22.37	28.36	28.99	25.48	**27.8**

INTERIOR NOISE REDUCTIONS

Project Name: Casa Loma — *Job Number:* 11860

Floor Plan: Unit B1 — *Analyst:* B. Lawson

Room: Master

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	*Source*	*Wall Area*	*STC*	*Transmission Loss (dB) by Frequency (Hz)*						*Fractional Area S/(10^(TL/10))*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*dB*
Stucco	David Harris p. 371	77.1	46	27	42	44	46	49	54	0.1538	0.0049	0.0031	0.0019	0.0010	0.0003	
Slider Windows	ABC	30.0	27	17	20	23	31	31	29	0.5986	0.3000	0.1504	0.0238	0.0238	0.0378	
Hung Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Glass Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Fixed Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		107.1								0.0070	0.0028	0.0014	0.0002	0.0002	0.0004	
Composite Exterior Wall Sound Transmission Loss		10*LOG(1/t)								21.53	25.46	28.44	36.19	36.35	34.49	33.18

(2) Room Effects (Absorption)

Room Surface/ Material	*Source*	*Area*	*NRC*	*Absorption Coefficients by Frequency (Hz)*						*Absorption (Sabins)*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Floor - Carpet	David Harris p. 347	143.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	21.5	24.3	17.2	45.8	74.4	42.9	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	143.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	14.30	11.44	7.15	4.29	4.29	4.29	
Walls - Drywall	David Harris p. 348	432.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	43.20	34.56	21.60	12.96	12.96	12.96	
Totals		718								78.95	70.31	45.91	63.01	91.61	60.15	84.1
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-1.32	-1.83	-3.68	-2.30	-0.68	-2.51	-1.05

(3) Adjustment Factor

Sound Source Adjustment Factor										-6.00	-6.00	-6.00	-6.00	-6.00	-6.00	-6.00

(4) Calculated Interior Noise Reduction (dBA)

	125	*250*	*500*	*1000*	*2000*	*4000*	*dBA*
(Transmission Loss + Room Effects + Adjustment Factor)	14.21	17.63	18.76	27.88	29.67	25.99	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	30.31	26.23	21.96	27.88	28.47	24.99	
Noise Reduction (dBA)	30.18	26.10	21.84	27.76	28.35	24.86	**27.3**

INTERIOR NOISE REDUCTIONS

Project Name: Casa Loma — *Job Number:* 11860

Floor Plan: Unit B2 — *Analyst:* B. Lawson

Room: Master

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	*Source*	*Wall Area*	*STC*	*Transmission Loss (dB) by Frequency (Hz)*						*Fractional Area S/(10^(TL/10))*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*dB*
Stucco	David Harris p. 371	75.3	46	27	42	44	46	49	54	0.1502	0.0048	0.0030	0.0019	0.0009	0.0003	
Slider Windows	ABC	30.0	27	17	20	23	31	31	29	0.5986	0.3000	0.1504	0.0238	0.0238	0.0378	
Hung Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Glass Doors	Milgard	0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Fixed Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		105.3								0.0071	0.0029	0.0015	0.0002	0.0002	0.0004	
Composite Exterior Wall Sound Transmission Loss		10*LOG(1/t)								21.48	25.38	28.37	36.12	36.28	34.42	33.11

(2) Room Effects (Absorption)

Room Surface/ Material	*Source*	*Area*	*NRC*	*Absorption Coefficients by Frequency (Hz)*						*Absorption (Sabins)*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Floor - Carpet	David Harris p. 347	163.8	0.30	0.15	0.17	0.12	0.32	0.52	0.30	24.57	27.85	19.66	52.42	85.18	49.14	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	163.8	0.50	0.10	0.08	0.05	0.03	0.03	0.03	16.38	13.10	8.19	4.91	4.91	4.91	
Walls - Drywall	David Harris p. 348	462.6	0.50	0.10	0.08	0.05	0.03	0.03	0.03	46.26	37.01	23.13	13.88	13.88	13.88	
Totals		790.2								87.21	77.958	50.976	71.208	103.97	67.932	96.29
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									-0.82	-1.31	-3.15	-1.70	-0.06	-1.90	-0.39

(3) Adjustment Factor

Sound Source Adjustment Factor										-6.00	-6.00	-6.00	-6.00	-6.00	-6.00	-6.00

(4) Calculated Interior Noise Reduction (dBA)

	125	*250*	*500*	*1000*	*2000*	*4000*	*dBA*
(Transmission Loss + Room Effects + Adjustment Factor)	14.66	18.08	19.22	28.42	30.23	26.52	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	30.76	26.68	22.42	28.42	29.03	25.52	
Noise Reduction (dBA)	30.64	26.55	22.29	28.30	28.90	25.39	**27.8**

INTERIOR NOISE REDUCTIONS

Project Name: Casa Loma — *Job Number:* 11860

Floor Plan: Unit B3 — *Analyst:* B. Lawson

Room: Master

(1) Transmission Loss Calculations (Exterior Wall)

Exterior Wall Assembly	*Source*	*Wall Area*	*STC*	*Transmission Loss (dB) by Frequency (Hz)*						*Fractional Area S/(10^(TL/10))*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*dB*
Stucco	David Harris p. 371	42.0	46	27	42	44	46	49	54	0.0838	0.0027	0.0017	0.0011	0.0005	0.0002	
Slider Windows	ABC	30.0	27	17	20	23	31	31	29	0.5986	0.3000	0.1504	0.0238	0.0238	0.0378	
Hung Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Glass Doors		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Fixed Windows		0.0	0	0	0	0	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
										0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Totals		72								0.0095	0.0042	0.0021	0.0003	0.0003	0.0005	
Composite Exterior Wall Sound Transmission Loss		10*LOG(1/t)								20.23	23.76	26.75	34.61	34.71	32.78	31.55

(2) Room Effects (Absorption)

Room Surface/ Material	*Source*	*Area*	*NRC*	*Absorption Coefficients by Frequency (Hz)*						*Absorption (Sabins)*						
				125	*250*	*500*	*1000*	*2000*	*4000*	*125*	*250*	*500*	*1000*	*2000*	*4000*	
Floor - Carpet	David Harris p. 347	180.0	0.30	0.15	0.17	0.12	0.32	0.52	0.30	27.00	30.60	21.60	57.60	93.60	54.00	
Floor - Vinyl	David Harris p. 347	0.0	0.05	0.02	0.03	0.05	0.03	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00	
Ceiling - Drywall	David Harris p. 348	180.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	18.00	14.40	9.00	5.40	5.40	5.40	
Walls - Drywall	David Harris p. 348	486.0	0.50	0.10	0.08	0.05	0.03	0.03	0.03	48.60	38.88	24.30	14.58	14.58	14.58	
Totals		846								93.6	83.88	54.9	77.58	113.58	73.98	105.85
Room Effect	10*log (Room Absorption in Sabins)/(Exterior Wall Area)									1.14	0.66	-1.18	0.32	1.98	0.12	1.67

(3) Adjustment Factor

Sound Source Adjustment Factor										-6.00	-6.00	-6.00	-6.00	-6.00	-6.00	-6.00

(4) Calculated Interior Noise Reduction (dBA)

	125	*250*	*500*	*1000*	*2000*	*4000*	*dBA*
(Transmission Loss + Room Effects + Adjustment Factor)	15.37	18.43	19.58	28.94	30.69	26.90	
Octave Band Frequency Correction Factors for A-Weighted Sound Levels	16.10	8.60	3.20	0.00	-1.20	-1.00	
A-Weighted Sound Levels	31.47	27.03	22.78	28.94	29.49	25.90	
Noise Reduction (dBA)	31.35	26.90	22.65	28.81	29.36	25.78	**28.3**

This page intentionally left blank

APPENDIX 10.1:

CADNAA OPERATIONAL NOISE MODEL INPUTS

This page intentionally left blank

11860

CadnaA Noise Prediction Model
11860_02.cna
Date:
18.01.20
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	47.2	42.5	49.7	60.0	50.0	0.0				5.00	a	6283258.06	2334330.92	5.00
R2		R2	51.0	44.8	52.5	60.0	50.0	0.0				5.00	a	6283409.65	2334101.72	5.00
R3		R3	54.5	47.7	55.6	60.0	50.0	0.0				5.00	a	6283510.17	2333898.25	5.00
R4		R4	45.7	43.2	49.9	60.0	50.0	0.0				5.00	a	6283954.61	2333770.48	5.00
R5		R5	48.9	44.0	51.3	60.0	50.0	0.0				5.00	a	6283284.47	2333539.92	5.00
R6		R6	52.3	46.3	54.0	60.0	50.0	0.0				5.00	a	6283153.03	2333840.47	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		AC20	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	6283343.72	2334129.44	44.00
POINTSOURCE		AC21	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	6283342.36	2334072.85	44.00
POINTSOURCE		AC22	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	6283342.70	2334011.15	44.00
POINTSOURCE		AC23	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	6283341.68	2333963.08	44.00
POINTSOURCE		AC24	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	6283343.33	2333805.32	44.00
POINTSOURCE		AC25	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	6283344.20	2333732.40	44.00
POINTSOURCE		AC26	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	6283343.33	2333662.96	44.00
POINTSOURCE		AC27	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	6283491.77	2333649.94	44.00
POINTSOURCE		AC28	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	6283444.89	2333650.80	44.00
POINTSOURCE		AC29	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	6283444.89	2333714.17	44.00
POINTSOURCE		AC30	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	6283449.23	2333783.62	44.00
POINTSOURCE		AC31	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	6283493.50	2333781.01	44.00
POINTSOURCE		AC32	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	6283640.20	2333807.05	44.00
POINTSOURCE		AC33	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	6283709.65	2333805.32	44.00
POINTSOURCE		AC34	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	6283762.60	2333805.32	44.00
POINTSOURCE		AC35	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	6283760.86	2333724.59	44.00
POINTSOURCE		AC36	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	6283757.39	2333660.35	44.00
POINTSOURCE		AC37	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	6283707.04	2333660.35	44.00
POINTSOURCE		AC38	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	6283645.41	2333662.09	44.00
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)	4.00	a	6283393.93	2333785.60	4.00
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)	4.00	a	6283391.50	2333739.84	4.00
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)	4.00	a	6283392.54	2333697.21	4.00
POINTSOURCE		COURT04	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)	4.00	a	6283392.19	2333658.73	4.00
POINTSOURCE		COURT05	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)	4.00	a	6283513.17	2333699.98	4.00
POINTSOURCE		DOG01	74.5	74.5	74.5	Lw	74.5		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6283371.05	2334159.28	4.00
POINTSOURCE		DOG02	74.5	74.5	74.5	Lw	74.5		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6283350.25	2334158.93	4.00
POINTSOURCE		DOG03	74.5	74.5	74.5	Lw	74.5		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6283329.45	2334159.28	4.00
POINTSOURCE		DOG04	74.5	74.5	74.5	Lw	74.5		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6283312.12	2334159.28	4.00
POINTSOURCE		DOG05	74.5	74.5	74.5	Lw	74.5		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6283293.05	2334159.62	4.00
POINTSOURCE		POOL01	80.4	80.4	80.4	Lw	80.4		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6283693.42	2333757.17	4.00
POINTSOURCE		POOL02	80.4	80.4	80.4	Lw	80.4		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6283693.07	2333708.99	4.00
POINTSOURCE		POOL03	80.4	80.4	80.4	Lw	80.4		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	4.00	a	6283657.37	2333734.64	4.00
POINTSOURCE		TRASH01	89.0	89.0	89.0	Lw	89		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6283350.60	2333925.64	5.00

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		TRASH02	89.0	89.0	89.0	Lw	89		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6283581.80	2333801.20	5.00
POINTSOURCE		TRASH03	89.0	89.0	89.0	Lw	89		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6283325.98	2333856.31	5.00
POINTSOURCE		TRASH04	89.0	89.0	89.0	Lw	89		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6283600.87	2333871.91	5.00
POINTSOURCE		TRASH05	89.0	89.0	89.0	Lw	89		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6283583.19	2333816.45	5.00
POINTSOURCE		TRASH06	89.0	89.0	89.0	Lw	89		0.0	0.0	0.0				900.00	0.00	0.00	0.0	500	(none)	5.00	a	6283402.26	2333582.82	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
AREASOURCE		PARKING01	82.7	82.7	82.7	47.4	47.4	47.4	Lw''	47.4		0.0	0.0	0.0							0.0	500	(none)			
AREASOURCE		PARKING02	83.3	83.3	83.3	47.4	47.4	47.4	Lw''	47.4		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		
BARRIERS		BARRIERS00002						4.00	a		
BARRIERS		BARRIERS00003						5.00	a		
BARRIERS		BARRIERS00004						5.00	a		

Building(s)

Name	M.	ID	RB	Residents	Absorption	Height	
						Begin	
						(ft)	
BUILDING		BUILDING00001	x	0		39.00	a
BUILDING		BUILDING00002	x	0		39.00	a
BUILDING		BUILDING00003	x	0		39.00	a
BUILDING		BUILDING00004	x	0		39.00	a

APPENDIX 11.1:

CADNAA CONSTRUCTION NOISE MODEL INPUTS

This page intentionally left blank

11860

CadnaA Noise Prediction Model
11860_02 Construction.cna
Date:
18.01.20
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	68.5	68.5	75.2	60.0	50.0	0.0				5.00	a	6283258.06	2334330.92	5.00
R2		R2	77.4	77.4	84.0	60.0	50.0	0.0				5.00	a	6283409.65	2334101.72	5.00
R3		R3	75.3	75.3	82.0	60.0	50.0	0.0				5.00	a	6283510.17	2333898.25	5.00
R4		R4	72.1	72.1	78.8	60.0	50.0	0.0				5.00	a	6283954.61	2333770.48	5.00
R5		R5	76.7	76.7	83.4	60.0	50.0	0.0				5.00	a	6283284.47	2333539.92	5.00
R6		R6	73.9	73.9	80.5	60.0	50.0	0.0				5.00	a	6283153.03	2333840.47	5.00
R6		R6	75.3	75.3	82.0	60.0	50.0	0.0				5.00	a	6283703.22	2333508.26	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	120.7	120.7	120.7	77.3	77.3	77.3	Lw	120.7		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		
BARRIERS		BARRIERS00002						4.00	a		
BARRIERS		BARRIERS00003						5.00	a		
BARRIERS		BARRIERS00004						5.00	a		

Building(s)

Name	M.	ID	RB	Residents	Absorption	Height	
						Begin	
						(ft)	
BUILDING		BUILDING00001	x	0		39.00	a
BUILDING		BUILDING00002	x	0		39.00	a
BUILDING		BUILDING00003	x	0		39.00	a
BUILDING		BUILDING00004	x	0		39.00	a

This page intentionally left blank