Second Street Housing

NOISE AND VIBRATION ANALYSIS

CITY OF CORONA

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
ANSI	American National Standards Institute
Calveno	California Vehicle Noise
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
Hz	Hertz
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
MARB/IPA	March Air Reserve Base / Inland Port Airport
mph	Miles per hour
OPR	Office of Planning and Research
PPV	Peak particle velocity
Project	Second Street Housing
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 potential noise impacts and the necessary noise mitigation measures, if any, for the proposed. Second Street Housing development ("Project"). The Project site is located on the southwest corner of Buena Vista Avenue and 2nd Street in the City of Corona. It is our understanding that the Project consists of 25 supportive housing dwelling units.

The results of this Second Street Housing Noise and Vibration 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. All impacts are considered less than significant with mitigation incorporated.

TABLE ES-1: SUMMARY OF CEQA SIGNIFICANCE FINDINGS

Analysis	Report Section	Significance Findings	
		Unmitigated	Mitigated
Off-Site Traffic Noise	7	*Less Than Significant*	-
On-Site Traffic Noise	8	*Significant*	*Less Than Significant*
Operational Noise	10	*Less Than Significant*	-
Construction Noise	11	*Less Than Significant*	-
Construction Vibration		*Less Than Significant*	-
Nighttime Concrete Pour		*Less Than Significant*	-

EXTERIOR NOISE LEVELS

This noise analysis shows that the Project will satisfy the City of Corona 65 dBA CNEL exterior noise level standards for residential land uses.

INTERIOR NOISE ABATEMENT

The unit facing 2nd Street will experience future unmitigated noise levels ranging up to 76.3 dBA CNEL at the building façade. The interior noise level analysis shows that the City of Corona 45 dBA CNEL with windows closed interior noise standards can be satisfied at all floors using standard construction and upgraded windows with a minimum STC rating of 36 for all units facing 2nd Street. For units facing the interior, typical building construction will suffice since it will provide a Noise Reduction (NR) of approximately 12 dBA with "windows open" and a minimum 25 dBA noise reduction with "windows closed." (2) (3) Therefore, to meet the City of Corona 45 dBA CNEL interior noise standards for residential land use the Project will implement Noise-1:

Noise-1: The Project shall provide the following or equivalent noise abatement measures:

- Windows & Glass Doors: First-story facades facing 2nd Street require windows and glass doors with well-fitted, well-weather-stripped assemblies with minimum sound transmission class (STC) ratings of 34.

- Doors (Non-Glass): All exterior doors shall be well weather-stripped. Well-sealed perimeter gaps around the doors are essential to achieve the optimal STC rating. (4)
- 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 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 receives 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.

With the interior noise abatement measures provided in this study, the proposed Project is expected to satisfy the City of Corona 45 dBA CNEL interior noise level standards for residential development.

1 INTRODUCTION

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

1.1 SITE LOCATION

The proposed project is located on the southwest corner of Buena Vista Avenue and 2nd Street in the City of Corona. The Project site is located approximately 220 feet south of the centerline of California State Route 91 (CA-91).

1.2 PROJECT DESCRIPTION

It is our understanding that the Project consists of 25 supportive housing dwelling units. The Project is located at APN 118-270-055 in the City of Corona, as shown in Exhibit 1. A preliminary site plan for the proposed Project is shown in Exhibit 2. The proposed project is anticipated to be constructed and fully operational by the year 2026.

EXHIBIT 1-A: LOCATION MAP

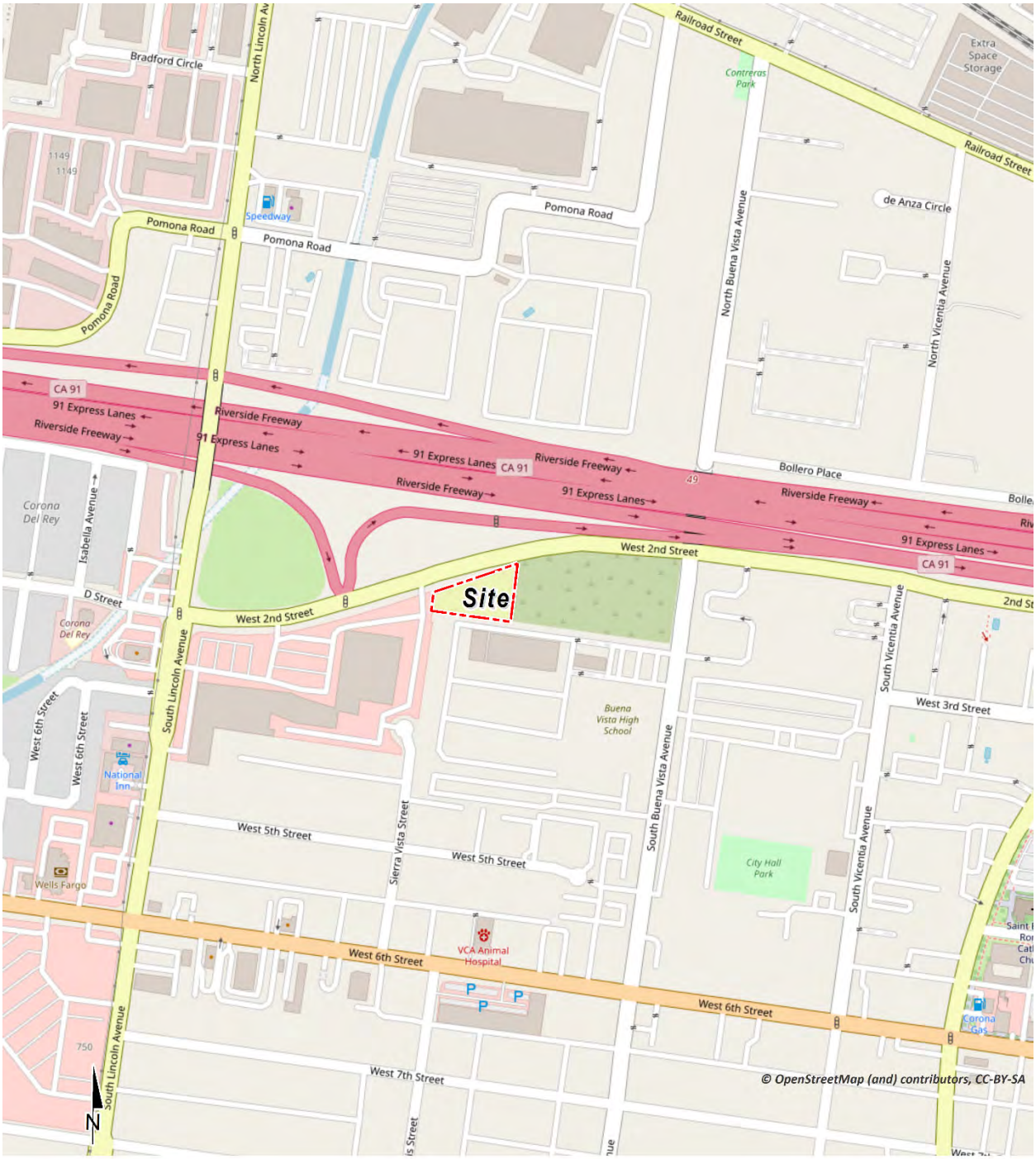

EXHIBIT 1-A: SITE PLAN

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2 FUNDAMENTALS

Noise is simply defined as "unwanted sound." Sound becomes unwanted when it interferes with normal activities, causes actual physical harm, or has adverse health effects. 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, which are described in more detail below.

EXHIBIT 2-A: TYPICAL NOISE LEVELS

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

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

2.1 RANGE OF NOISE

Since the range of intensities that the human ear can detect is so large, the scale frequently used to measure intensity is a scale based on multiples of 10, the logarithmic scale. The scale for measuring intensity is the decibel scale. Each interval of 10 decibels indicates a sound energy ten times greater than before, which is perceived by the human ear as being roughly twice as loud (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 used figure is the equivalent level (L_{eq}). Equivalent sound levels are not measured directly but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (L_{eq}) represents a steady-state sound level containing the same total energy as a time-varying signal over a given sample period (typically one hour) and is commonly used to describe the "average" noise levels within the environment.

To describe the time-varying character of environmental noise, the City of Corona relies on the L_{50}, L_{25}, L_8, $L_{2, \text{ and } Lmax}$ percentile noise levels to describe the stationary source noise level limits. 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_8 and L_2 typically describe transient or short-term events, while levels associated with the L_{50} describe the base or typical noise conditions. The City of Corona 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.

Peak hour or average noise levels, while useful, do not completely describe a given noise environment, however. 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 Corona relies on the 24-hour CNEL level to assess land use compatibility with transportation-related noise sources.

2.3 SOUND PROPAGATION

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

2.3.1 GEOMETRIC SPREADING

Sound from a localized source (i.e., a stationary point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling

of distance from a point source. Highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source (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 feet. 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 the nearest residents. However, for vegetation to provide a substantial, or even noticeable, noise reduction, the vegetation area must be at least 15 feet in height, 100 feet wide, and dense enough to completely obstruct the line of sight between the source and the receiver. This size of vegetation may provide up to 5 dBA of noise reduction. The Federal Highway Administration (FHWA) does not consider the planting of vegetation to be a noise abatement measure (7).

2.3.5 REFLECTION

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

2.4 NOISE CONTROL

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

2.5 NOISE BARRIER ATTENUATION

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

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 governments 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).

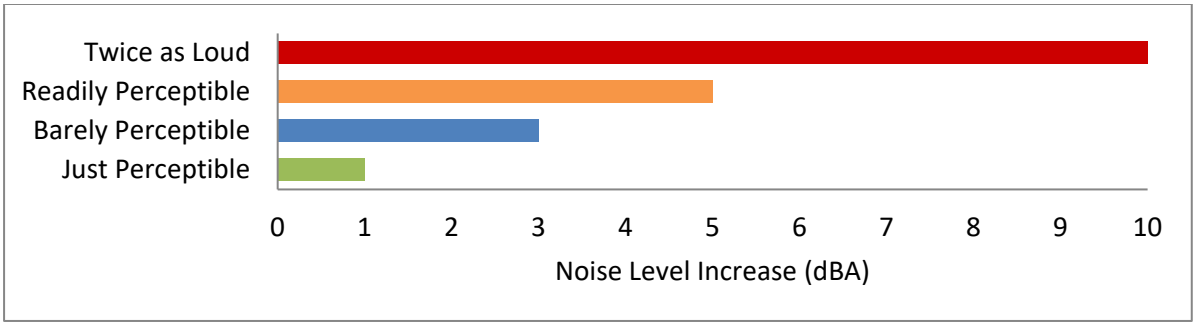
2.7 COMMUNITY RESPONSE TO NOISE

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

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

Approximately ten percent of the population has a very low tolerance for noise and will object to any noise not of their making. Consequently, even in the quietest environment, some complaints will occur. Twenty-five percent of the population will not complain even in very severe noise environments. Thus, a variety of reactions can be expected from people exposed to any given noise environment (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 in Exhibit 2-B. A change of 3 dBA is considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (7)

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



2.8 VIBRATION

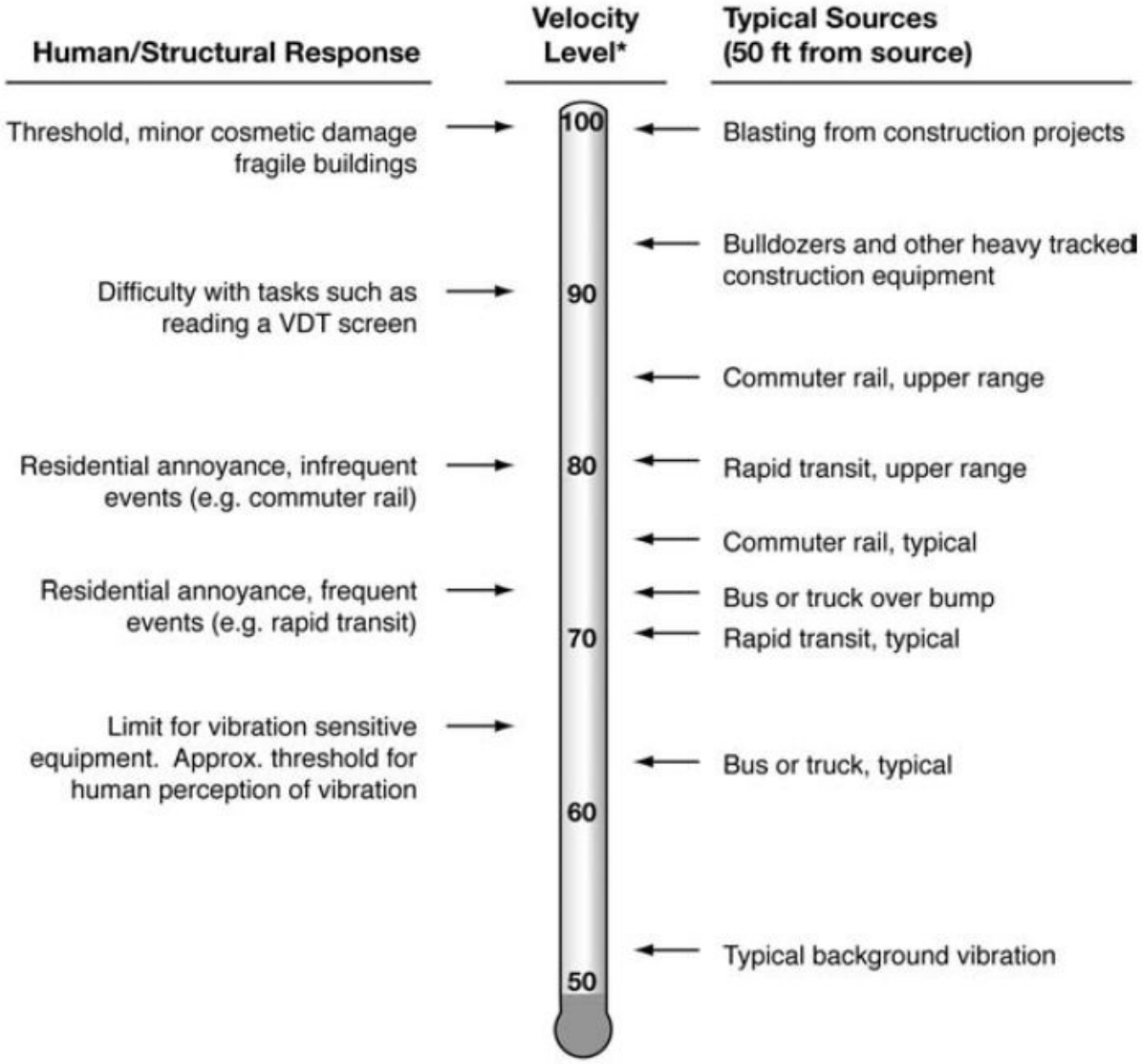
Per the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* (10), vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such as explosions. As is the case with airborne sound, ground-borne vibrations may be described by amplitude and frequency.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings but is not always suitable for evaluating human response (annoyance) because it takes some time for the human body to respond to vibration signals. Instead, the human body responds to average vibration amplitude,

often described as the root mean square (RMS). The RMS amplitude is defined as the average of the squared amplitude of the signal and is most frequently used to describe the effect of vibration on the human body. Decibel notation (VdB) is commonly used to measure RMS. Decibel notation (VdB) serves to reduce the range of numbers used to describe human response to vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receivers for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and the sick), and vibration-sensitive equipment and/or activities.

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

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



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

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

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3 REGULATORY SETTING

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

3.1 STATE OF CALIFORNIA NOISE REQUIREMENTS

The State of California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards, and provides guidance for local land use compatibility. State law requires that each county and city adopt a General Plan that includes a Noise Element, which is to be prepared per guidelines adopted by the Governor's Office of Planning and Research (OPR). (11) The purpose of the Noise Element is to *limit the exposure of the community to excessive noise levels*. In addition, the California Environmental Quality Act (CEQA) requires that all known environmental effects of a project be analyzed, including environmental noise impacts.

3.2 CITY OF CORONA GENERAL PLAN NOISE ELEMENT

The City of Corona has adopted a General Plan Noise Element to control and abate environmental noise, and to protect the citizens of the City of Corona from excessive exposure to noise. (12) 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 policies to minimize the impacts of excessive noise levels throughout the community and establishes noise level requirements for all land uses. To protect City of Corona residents from excessive noise, the Noise Element contains the following four goals:

- *N-1 Protect residents, visitors, and noise-sensitive land uses from the adverse human health and environmental impacts created by excessive noise levels from transportation sources by requiring proactive mitigation.*
- *N-2 Prevent and mitigate the adverse impacts of excessive ambient noise exposure on residents, employees, visitors, and noise-sensitive land uses.*
- *N-3 Discourage the spillover or encroachment of unacceptable noise levels from mixed use, commercial, and industrial land uses on to noise sensitive land uses.*
- *N-4 Minimize noise impacts created by railroad transit and airport operations and flight patterns on residential areas and other "noise sensitive" land use areas.*

The noise criteria identified in the City of Corona Noise Element (Table N-1) are guidelines to evaluate the land use compatibility of transportation-related noise. The compatibility criteria, shown in 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 Levels and Land Use Compatibility Guidelines* describe categories of compatibility and not specific noise standards.

3.2.1 NOISE LEVELS AND LAND USE COMPATIBILITY

The proposed Second Street Housing contains residential land uses are considered *clearly compatible* with unmitigated exterior noise levels of less than 60 dBA CNEL, *normally compatible* with unmitigated exterior noise levels above 70 dBA CNEL, and *clearly incompatible* with unmitigated exterior noise levels above 70 dBA CNEL. For *normally compatible* land use, *new construction should be undertaken only after detailed analysis of the noise reduction requirements and needed noise insulation features are determined. Conventional construction, with windows closed and fresh air supply or air conditioning, will normally suffice.* For *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.* For *clearly incompatible* land use, *new construction or development should generally not be undertaken.*

3.2.2 LAND USE NOISE STANDARDS

The City of Corona General Plan Noise Element specifies the maximum noise levels allowable for new developments impacted by transportation noise sources such as arterial roads, freeways, airports and railroads. For noise-sensitive residential land uses, Table N-2 *Interior and Exterior Noise Standards* of the Noise Element indicates that the exterior noise levels shall not exceed 65 dBA CNEL and interior noise levels of 45 dBA CNEL. The 65 dBA CNEL exterior noise standards typically apply to outdoor areas where people congregate, such as common areas of multi-family developments or back yards of single-family residential uses. The City of Corona does not identify any exterior noise standards for the Project's commercial or industrial land use activities. The City of Corona transportation noise standards are shown in Exhibit 3-B.

EXHIBIT 3-A: NOISE LEVELS AND LAND USE COMPATIBILITY GUIDELINES

Land Use Categories		Community Noise Equivalent Level (CNEL)						
Categories	**Uses**	**<55**	**60**	**65**	**70**	**75**	**80>**	
Residential	Single Family, Duplex	A	A	B	B	D	D	D
	Multiple Family	A	A	B	B	C	D	D
	Hotel, Motel Lodging	A	A	B	C	C	D	D
Commercial Regional, District	Commercial Retail, Bank, Restaurant, Movie Theatre	A	A	B	B	C	C	D
Commercial Regional, Village District, Special	Commercial Retail, Bank, Restaurant, Movie Theatre	A	A	A	A	B	B	C
Commercial Office, Institution	Office Building, R&D, Professional Offices, City Office Building	A	A	A	B	B	C	D
Rec. Institutional Civic Center	Amphitheatre, Concert Auditorium, Meeting Hall	B	B	C	C	D	D	D
Commercial Recreation	Amusement Park, Miniature Golf, Sports Club, Equestrian Center	A	A	A	B	B	D	D
Commercial, General, Special, Industrial, and Institutional	Auto Service Station, Auto Dealer, Manu-facturing, 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	Local, Community, and Regional Parks	A	A	A	B	C	D	D
Open Space	Golf Course, Cemetery, Nature Centers Wildlife Reserves and Habitat	A	A	A	A	B	C	C

Zone A: Clearly Compatible: Specified land use is satisfactory, based on the assumption that any buildings involved are of conventional construction without any special noise insulation requirements.
Zone B: Normally Compatible: New construction should be undertaken only after detailed analysis of the noise reduction requirements and needed noise insulation features are determined. Conventional construction, with closed windows and fresh air supply 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 development should generally not be undertaken.

EXHIBIT 3-B: INTERIOR AND EXTERIOR NOISE STANDARDS

Land Use Categories		Average CNEL	
Categories	**Uses**	**Interior[1]**	**Exterior[2]**
Residential	Single Family, Duplex, Multiple Family	45[3]	65
	Mobile Home	NA	65[4]
Commercial; Industrial; and Institutional	Hotel, Motel, Transient Lodging	45	65[5]
	Commercial Retail, Bank, Restaurant; Sports Club	55	NA
	Office Building, Research and Develop. Professional Offices, City Offices	50	NA
	Amphitheatre, Concert Hall Auditorium, Meeting Hall	45	NA
	Gymnasium (Multipurpose)	50	NA
	Manufacturing, Warehousing, Wholesale, Utilities	65	NA
	Movie Theatres	45	NA
Institutional	Hospital, Schools' classroom	45	65
	Church, Library	45	NA
	Parks	NA	65

Notes:
1. Indoor environment excluding bathrooms, toilets, closets, corridors.
2. Outdoor environment limited to: private yard of single family, multi-family private patio or balcony that is served by a means of exit from inside, mobile home park, hospital patio, park's picnic area, school's playground, and hotel and motel recreation area.
3. Noise level requirement with closed windows. Mechanical ventilating system or other means of natural ventilation shall be provided as of Chapter 12, Section 1205 of UBC.
4. Exterior noise level should be such that interior noise level will not exceed 45 CNEL.
5. Except those areas affected by aircraft noise.

3.3 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from the Second Street Housing, operational source noise such as air conditioning units, parking lot activity, swimming pool/spa activity, outdoor activities, and trash enclosure activity are typically evaluated against standards established under a City's Municipal Code. The City of Corona Municipal Code, Section 17.84.040 *Noise*, provides noise control guidelines for determining and mitigating non-transportation or stationary-source noise impacts from operations at private properties. The City of Corona Municipal Code defines *Stationary Noise Source Standards* in Section 17.84.040[C][2], Table 1, for different land uses. For noise-sensitive residential properties, the Municipal Code identifies operational noise level limits for the daytime (7:00 a.m. to 10:00 p.m.) hours of 55 dBA L_{50} and 50 dBA L_{50} during the nighttime (10:00 p.m. to 7:00 a.m.) hours. (13) These standards shall apply for a cumulative period of 30 minutes in any hour, as well as plus 5 dBA cannot be exceeded for a cumulative period of more than 15 minutes in any hour, or the standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour, or the standard plus 15 dBA for a cumulative period of more than 1 minute in any hour, or the standard plus 20 dBA for any period of time. The City of Corona Municipal Code noise standards are shown in Table 3-1 and included in Appendix 3.1.

TABLE 3-1: OPERATIONAL NOISE STANDARDS

Jurisdiction	Land Use	Time Period	Exterior Noise Level Standards (dBA Leq)[2]				
			L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)
City of Corona[1]	Residential	Daytime	55	60	65	70	75
		Nighttime	50	55	60	65	70
	Commercial	Daytime	65	70	75	80	85
		Nighttime	60	65	70	75	80
	Industrial	Daytime	75	80	85	90	95
		Nighttime	70	75	80	85	90

[1] City of Corona Municipal Code, Section 17.84.040 Noise (Appendix 3.1).
[2] The percent noise level is the level exceeded "n" percent of the time during the measurement period. L50 is the noise level exceeded 50% of the time.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

The percentile noise descriptors are provided to ensure that the duration of the noise source is fully considered. However, due to the relatively constant intensity of the Project's operational activities, the L_{50} or average L_{eq} noise level metrics best describe the air conditioning units, parking lot activity, swimming pool/spa activity, outdoor activities, and trash enclosure activity. In addition, the L_{eq} noise level metric accounts for noise fluctuations over time by averaging the louder and quieter events and giving more weight to the louder events. In addition, due to the mathematical relationship between the median (L_{50}) and the mean (L_{eq}), the L_{eq} will always be larger than or equal to the L_{50}. The more variable the noise becomes, the larger the L_{eq} becomes in comparison to the L_{50}. Therefore, this noise study conservatively relies on the average L_{eq} sound level limits to describe the Project's operational noise levels.

3.4 CONSTRUCTION NOISE STANDARDS

To analyze noise impacts originating from the construction of the Second Street Housing, noise from construction activities is typically evaluated against standards established under a City's Municipal Code. To analyze noise impacts originating from the construction of the Second Street Housing Project, noise from construction activities is typically evaluated against standards established under a City's Municipal Code. The City of Corona Municipal Code, Section 17.84.040[D][2], states that construction noise is prohibited between the hours of 8:00 p.m. to 7:00 a.m., Monday through Saturday and 6:00 p.m. to 10:00 a.m. on Sundays and federal holidays. While the City establishes limits to the hours during which construction activity may take place, neither the City's General Plan nor Municipal Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers. Therefore, a numerical construction threshold based on the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual is used for the analysis of daytime construction impacts, as discussed below.

According to the FTA, local noise ordinances are typically not very useful in evaluating construction noise. They usually relate to nuisance and hours of allowed activity and sometimes specify limits in terms of maximum levels but are generally not practical for assessing the impact

of a construction project. Project construction noise criteria should account for the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land use. Due to the lack of standardized construction noise thresholds, the FTA provides guidelines that can be considered reasonable criteria for construction noise assessment. The FTA considers a daytime exterior construction noise level of 80 dBA L_{eq} and a nighttime exterior construction noise level of 70 dBA L_{eq} as a reasonable threshold for noise-sensitive residential land use. (10 p. 179)

3.5 CONSTRUCTION VIBRATION STANDARDS

To analyze the vibration impacts originating from the construction of the Project, vibration from construction activities is typically evaluated against standards established under a City's Municipal Code. The City of Corona Municipal Code, Section 17.84.050, identifies a vibration velocity standard of 0.05 in/sec root-mean-square (RMS) for sensitive land uses, which is used in this analysis as the basis for determining the relative significance of potential Project-related vibration impacts. Typically, the human response at the perception threshold for vibration includes annoyance in residential areas, as previously shown in Exhibit 2-B, when vibration levels expressed in vibration decibels (VdB) approach 75 VdB. The City of Corona, however, identifies a vibration perception threshold of 0.05 in/sec at any point on the affected property. For vibration levels expressed in velocity, the human body responds to the average vibration amplitude, often described as the root mean square (RMS). Therefore, the City of Corona vibration standard of 0.05 in/sec in RMS velocity levels is used in this analysis to assess the human perception of vibration levels due to Project-related construction activities.

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. (11) 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 Corona 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.

4.1 CEQA GUIDELINES NOT FURTHER ANALYZED

Since the Project is located more than two miles away from the nearest airport, the potential impacts are considered *less than significant,* and no further noise analysis is provided under Guideline C.

4.2 NOISE-SENSITIVE RECEIVERS

Noise level increases resulting from the Project are evaluated based on the Appendix G CEQA Guidelines described above at the nearest noise-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 (14). This approach recognizes that there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding human reactions of annoyance and dissatisfaction, primarily because of the wide variation in individual thresholds of annoyance and differing individual experiences with noise. Thus, an effective 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) (15) developed guidance to be used for the assessment of project-generated increases in noise levels that consider the ambient noise level. The FICON recommendations are based on studies that relate aircraft noise levels to the percentage of persons highly annoyed by aircraft noise. Although the FICON recommendations

were specifically developed to assess aircraft noise impacts, these recommendations are often used in environmental noise impact assessments involving the use of cumulative noise exposure metrics, such as the average-daily noise level (CNEL) and equivalent continuous noise level (L_{eq}).

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 (14). 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 existing noise levels are below 60 dBA. 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.

The FICON guidance provides an established source of criteria to assess the impacts of substantial temporary or permanent increases in ambient noise levels. Based on the FICON criteria, the amount to which a given noise level increase is considered acceptable is reduced when the without Project noise levels are already shown to exceed certain land-use specific exterior noise level criteria. The specific levels are based on typical responses to noise level increases of 5 dBA or *readily perceptible*, 3 dBA or *barely perceptible*, and 1.5 dBA depending on the underlying without Project noise levels for noise-sensitive uses. These levels of increases and their perceived acceptance are consistent with guidance provided by both the Federal Highway Administration (7 p. 9) and Caltrans (16 p. 2_48).

4.3 NON-NOISE-SENSITIVE RECEIVERS

The City of Corona General Plan Noise Element (Table N-1) *Noise Levels and Land Use Compatibility Guidelines* were used to establish the satisfactory noise levels of significance for non-noise-sensitive land uses in the Project study area. As previously shown in Exhibit 3-A, the clearly compatible exterior noise level for non-noise-sensitive land use, such as commercial or industrial land use, is 70 dBA CNEL. To determine if Project-related traffic noise level increases are significant at off-site non-noise-sensitive land uses, a *barely perceptible* 3 dBA criteria is used. When the without Project noise levels are greater than the *clearly compatible* 70 dBA CNEL land use compatibility criteria at non-noise sensitive land uses, a *barely perceptible* 3 dBA or greater noise level increase is considered a significant impact since the noise level criteria is already exceeded.

4.4 SIGNIFICANCE CRITERIA SUMMARY

Noise impacts shall be considered significant if any of the following occur as a direct result of the proposed development. Table 4-1 shows the significance criteria summary matrix.

TABLE 4-1: 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	
	Non-Noise-Sensitive[2]	if ambient is > 70 dBA CNEL	≥ 3 dBA CNEL Project increase	
On-Site Traffic	Residential[3]	Exterior Noise Level	65 dBA CNEL	
		Interior Noise Level	45 dBA CNEL	
Operational	Noise-Sensitive	Exterior Noise Level Standards[4]	See Table 3-1	
		if ambient is < 60 dBA L_{eq}[1]	≥ 5 dBA L_{eq} Project increase	
		if ambient is 60 - 65 dBA L_{eq}[1]	≥ 3 dBA L_{eq} Project increase	
		if ambient is > 65 dBA L_{eq}[1]	≥ 1.5 dBA L_{eq} Project increase	
	Non-Noise-Sensitive[2]	If ambient is > 70 dBA CNEL	≥ 3 dBA CNEL Project increase	
Construction	Noise-Sensitive	Prohibited between the hours of 8:00 p.m. to 7:00 a.m., Monday through Saturday and 6:00 p.m. to 10:00 a.m. on Sundays and federal holidays.[5]		
		Noise Level Threshold[6]	80 dBA L_{eq}	70 dBA L_{eq}
		Vibration Level Threshold[7]	0.05 in/sec RMS	

[1] FICON, 1992.
[2] City of Corona General Plan Noise Element (Table N-1)
[3] City of Corona General Plan Noise Element Table N-2 Interior and Exterior Noise Standards.
[4] City of Corona Municipal Code, Section 17.84.040 Noise[C][2] (Appendix 3.1).
[5] City of Corona Municipal Code, Section 17.84.040[D][2] Noise (Appendix 3.1).
[6] Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, 2018.
[7] City of Corona Municipal Code, Section 17.84.050 Vibration (Appendix 3.1).
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.; "RMS" = root-mean-square

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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 Tuesday, November 3rd, 2020. 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. (17)

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*. (10)

Based on recommendations of Caltrans and the FTA, it is not necessary to collect measurements at each individual building or residence, because each receiver measurement represents a group of buildings that share acoustical equivalence. (10) In other words, the area represented by the receiver shares similar shielding, terrain, and geometric relationship to the reference noise source. Receivers represent a location of noise sensitive areas and are used to estimate the future noise level impacts. Collecting reference ambient noise level measurements at the nearby sensitive receiver locations allows for a comparison of the before and after Project noise levels

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

5.3 NOISE MEASUREMENT RESULTS

The noise measurements presented below focus on the average or equivalent sound levels (L_{eq}). The equivalent sound level (L_{eq}) represents a steady-state sound level containing the same total energy as a time-varying signal over a given sample period. Table 5-1 identifies the hourly daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) noise levels at each noise level measurement location. Appendix 5.2 provides a summary of the existing hourly ambient noise levels.

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 southeast of the site near the Corona City Hall	43.3	44.4	50.8
L2	Located east of the site near the Citrus Circle Apartment Homes Complex	63.7	62.2	69.1
L3	Located south of the site near the Corona-Norco Adult Education School	43.6	44.8	51.1
L4	Located south of the site near the Vista Del Sol Apartments at 923 W 5th Street	50.8	50.6	57.3
L5	Located West of the site near the residence at 1001 W 5th Street	50.6	52.9	59.3
L6	Located north of the site near the residence at 104 N Buena Vista Ave	52.6	52.7	52.6

[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.

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 CA-91 as well as nearby surface streets.

EXHIBIT 5-A: NOISE MEASUREMENT LOCATIONS

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6 METHODS AND PROCEDURES

The following section outlines the methods and procedures used to model and analyze the future traffic noise environment. Consistent with the *Noise Levels and Land Use Compatibility Guidelines*, all transportation related noise levels are presented in terms of the 24-hour CNEL's.

6.1 TRAFFIC NOISE PREDICTION MODEL

The expected roadway noise level increases from vehicular traffic were calculated by Urban Crossroads, Inc. using a computer program that replicates the Federal Highway Administration (FHWA) traffic noise prediction model. (18) The FHWA Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). 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 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 in Table 6-1. Based on the City of Corona General Plan Circulation Element, 2nd Street is classified as a Secondary 4-lane, and Buena Vista Avenue is classified as a Collector. (19) Future average daily traffic volumes needed to assess the future on-site traffic noise environment and to identify the appropriate noise abatement measures that address the worst-case future noise conditions, shown in Table 6-1, were obtained from Caltrans traffic census data (20) and the City of Corona Traffic Impact Guidelines (21). The vehicle speed is based on the posted speed limits. Soft site conditions were used to analyze the traffic noise impacts within the Project study area which account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. Research conducted by Caltrans has shown that due to the mix of ground types in actual situations, the hard site condition over predicted traffic noise levels and the use of soft site conditions is more appropriate for the application of the FHWA traffic noise prediction model. (22)

TABLE 6-1: ON-SITE TRAFFIC NOISE PREDICTION MODEL PARAMETERS

Roadway	Lanes	Classification[1]	Maximum Daily Traffic Volume[2]	Posted Speed Limit (mph)[3]	Site Conditions
SR-91	10	Freeway	333,000	65	Soft
2nd Street	2	Secondary	23,300	35	Soft
Buena Vista Ave	2	Collector	11,700	30	Soft

[1] Source: City of Corona General Plan.
[2] Source: Caltrans 2021 Traffic Counts.
[3] Posted speed limit.

Table 6-2 presents the time-of-day vehicle splits by vehicle type, and Table 6-3 presents the total traffic flow distributions (vehicle mixes) used for this analysis. The vehicle mix provides the hourly distribution percentages of automobiles, medium trucks, and heavy trucks for input into the FHWA Model based on roadway types. To predict the future noise environment at each building within the Project site, coordinate information was collected to identify the noise transmission path between the noise source and receiver. The coordinate information is based on the Project site plan showing the plotting of each Project building in relationship to surrounding roadways, as shown in Exhibit 1-B and in Appendix 6.1.

TABLE 6-2: TIME OF DAY VEHICLE SPLITS

Vehicle Type	Time of Day Splits[1]			Total of Time of Day Splits
	Daytime	Evening	Nighttime	
Autos	70.18%	11.29%	18.53%	100.00%
Medium Trucks	76.89%	6.44%	16.67%	100.00%
Heavy Trucks	67.09%	7.59%	25.32%	100.00%

[1] Typical Southern California Traffic 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 6-3: ON-SITE TRAFFIC NOISE PREDICTION MODEL VEHICLE MIX

Roadway Classification	Total % Traffic Flow[1]			Total
	Autos	Medium Trucks	Heavy Trucks	
SR-91	94.10%	2.50%	3.40%	100.00%
All Roadways	97.42%	1.84%	0.74%	100.00%

[1] Source: Typical Southern California vehicle mix.

6.2 CADNAA NOISE PREDICTION MODEL

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

Using the ISO 9613 and the TNM protocols, CadnaA will calculate the distance from each noise source to the noise receiver locations, using the ground absorption, distance, and barrier/building attenuation inputs to provide a summary of noise level at each receiver and the partial noise level contributions by noise source. Consistent with the ISO 9613 protocol, the CadnaA noise prediction model relies on the reference sound power level (L_w) to describe individual noise sources. While sound pressure levels (e.g., L_{eq}) quantify in decibels the intensity of given sound sources at a reference distance, sound power levels (L_w) are connected to the sound source and are independent of distance. Sound pressure levels vary substantially with distance from the source and diminish from 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 noise level calculations provided in this noise study account for the distance attenuation provided due to geometric spreading. A default ground attenuation factor of 0.5 was used in the CadnaA noise analysis to account for mixed hard and soft site conditions.

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7 OFF-SITE TRANSPORTATION NOISE IMPACTS

The Project would result in a small increase in regional and local traffic volumes. Based on the *Second Street Housing (DR2023-0026) Trip Generation Assessment*, (23) the Project is anticipated to generate a maximum of 120 trips which would represent an incremental increase to the existing roadway volumes and would not double traffic volumes on local roads. Therefore, the Project is not expected to generate a perceptible noise level increase (i.e., 3 dBA) at nearby sensitive land uses adjacent to study area roadways. Due to the low traffic volumes generated by the Project, the off-site traffic noise levels generated by the Project are considered *less than significant,* and no further analysis is required.

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8 ON-SITE TRANSPORTATION NOISE IMPACTS

An on-site exterior noise impact analysis has been completed to determine the noise exposure in the Project study area. The primary source of transportation noise affecting the Project site is anticipated to be from SR-91 and Second Street. However, the planned residential land use will benefit from the existing topography and barriers separating the noise-sensitive land use from traffic noise on SR-91. The existing barrier along SR-91 and distances separating SR-91 from the planned residential land use will provide substantial exterior noise mitigation. This section analyzes on-site exterior and interior noise levels at the noise-sensitive residential land use.

8.1 NOISE LEVEL AND LAND USE COMPATIBILITY

Using the FHWA traffic noise prediction model and the parameters outlined in Section 6, the expected future exterior noise levels at the noise-sensitive residential units were calculated. Table 8-1 presents a summary of future exterior noise level impacts at the noise-sensitive residential units. The on-site transportation noise level impacts indicate that the unmitigated exterior noise levels will be 57.5 CNEL in the Project's common area/swimming pool area. The on-site traffic noise analysis calculations are provided in Appendix 8.1. Based on Exhibit 3-A, land use for multiple-family residential homes is considered *normally compatible* with unmitigated exterior noise levels of up to 70 dBA CNEL. For *normally compatible* noise levels, *new construction should be undertaken only after detailed analysis of the noise reduction requirements and needed noise insulation features are determined. Conventional Construction with windows closed and fresh air supply or air conditioning, will normally suffice.* Therefore, no exterior noise mitigation is required to satisfy the *Noise Levels and Land Use Compatibility Guidelines*.

TABLE 8-1: UNMITIGATED EXTERIOR TRAFFIC NOISE LEVELS

Receiver Location	Source	Unmitigated Exterior Noise Level (dBA CNEL)	Single-Family Land Use Compatibility[1]
Pool/Common Area	CA-91, 2nd St	57.5	*Clearly Compatible*

[1] Based on the General Plan Noise Element *Noise Levels and Land Use Compatibility Guidelines* as shown in Exhibit 3-A. Normally Compatible: New construction should be undertaken only after detailed analysis of the noise reduction requirements and needed noise insulation features are determined. Conventional Construction with windows closed and fresh air supply or air conditioning, will normally suffice.

8.2 EXTERIOR NOISE ANALYSIS

In addition to demonstrating that the Project land uses are compatible with the *Noise Levels and Land Use Compatibility Guidelines,* the City of Corona General Plan Noise Element specifies the maximum noise levels allowable for new developments impacted by transportation noise sources such as arterial roads, freeways, airports, and railroads. For noise-sensitive residential land uses, the Noise Element indicates that the exterior noise levels shall not exceed 65 dBA CNEL. As shown in Table 8-1, the unmitigated future exterior noise levels at the common area

will be 59.8 dBA CNEL and will satisfy the City of Corona exterior noise standards for *Normally Compatible* land uses.

8.3 INTERIOR NOISE ANALYSIS

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

8.3.1 NOISE REDUCTION METHODOLOGY

The interior noise level is the difference between the predicted exterior noise level at the building façade and the noise reduction of the structure. Typical building construction will provide a Noise Reduction (NR) of approximately 12 dBA with "windows open" and a minimum 25 dBA noise reduction with "windows closed." (7) (3) 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.

8.3.2 INTERIOR NOISE LEVEL ASSESSMENT

Table 8-2 shows that the buildings within the Project will require windows-closed condition and a means of mechanical ventilation (e.g., air conditioning). Table 8-2 shows that the future interior noise levels are expected to reach up to 51.3 dBA CNEL. Based on the interior noise analysis interior noise levels within units facing 2nd Street will exceed the City's interior noise level standard. Therefore, additional analysis was conducted to determine the necessary STC rating for the windows or glass doors associated with habitable rooms. Tables 8-2 through 8-4 provide a summary of the recommended STC ratings for habitable rooms impacted by traffic noise on SR-91 and 2nd Street. With the STC 34-rated windows and/or glass doors, the future interior noise levels are expected to range from 45 CNEL or less. Therefore, the recommended minimum STC rating in windows facing 2nd Street will satisfy the City of Corona 45 dBA CNEL interior noise level standards.

TABLE 8-2: FIRST FLOOR INTERIOR NOISE LEVELS (CNEL)

Receiver Location	Source	Noise Level at Façade[1]	Required Interior Noise Reduction[2]	Estimated Interior Noise Reduction[3]	Interior Noise Level[5]	Are Upgraded Windows Required?	Recommended STC	Final Interior Noise Level[6]
B1 East Façade R1	SR-91, 2nd Street	65.1	20.1	25.0	40.1	No	27.0	40.1

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise limits.
[3] A minimum of 25 dBA noise reduction is assumed with standard building construction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.
[6] Estimated interior noise level with recommended STC rating for all windows.

TABLE 8-3: SECOND FLOOR INTERIOR NOISE LEVELS (CNEL)

Receiver Location	Source	Noise Level at Façade[1]	Required Interior Noise Reduction[2]	Estimated Interior Noise Reduction[3]	Interior Noise Level[5]	Are Upgraded Windows Required?	Recommended STC	Final Interior Noise Level[6]
B1 East Façade R1	SR-91, 2nd Street	65.1	20.1	25.0	40.1	No	27.0	40.1

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise limits.
[3] A minimum of 25 dBA noise reduction is assumed with standard building construction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.
[6] Estimated interior noise level with recommended STC rating for all windows.

TABLE 8-4: THIRD FLOOR INTERIOR NOISE LEVELS (CNEL)

Receiver Location	Source	Noise Level at Façade[1]	Required Interior Noise Reduction[2]	Estimated Interior Noise Reduction[3]	Interior Noise Level[5]	Are Upgraded Windows Required?	Recommended STC	Final Interior Noise Level[6]
B1 East Façade R1	SR-91, 2nd Street	65.1	20.1	25.0	40.1	No	27.0	40.1

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise limits.
[3] A minimum of 25 dBA noise reduction is assumed with standard building construction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.
[6] Estimated interior noise level with recommended STC rating for all windows.

9 SENSITIVE RECEIVER LOCATIONS

To assess the potential for long-term operational and short-term construction noise impacts, the following sensitive receiver locations, as shown in 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, outpatient 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.

To describe the potential off-site Project noise levels, five receiver locations in the vicinity of the Project site were identified. Other sensitive land uses in the Project study area that are located at greater distances than those identified in this noise study will experience lower noise levels than those presented in this report due to the additional attenuation from distance and the shielding of intervening structures. Distance is measured in a straight line from the project boundary to each receiver location.

R1: Location R1 represents the existing noise-sensitive residence within the Citrus Circle Apartment Homes Complex, approximately 192 feet east of the Project site. R1 is placed at the private outdoor living area (playground) nearest the Project site. A 24-hour noise measurement was taken near this location, L2, to describe the existing ambient noise environment.

R2: Location R2 represents the Corona City Hall, approximately 494 feet southeast of the Project site. Since there are no private outdoor living areas (backyards) facing the Project site, receiver R2 is placed at the building façade. A 24-hour noise measurement was taken near this location, L1, to describe the existing ambient noise environment.

R3: Location R3 represents the existing noise-sensitive residence at the Corona-Norco Adult Education School, approximately 209 feet south of the Project site. Since there are no private outdoor living areas (backyards) facing the Project site, receiver R3 is placed at the building façade. A 24-hour noise measurement near this location, L3, is used to describe the existing ambient noise environment.

R4: Location R4 represents the Vista Del Sol Apartments at 923 W 5th Street, approximately 711 feet south of the Project site. R4 is placed at the private outdoor living area (swimming pool) nearest 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 noise-sensitive residence at 1001 W 5th Street, approximately 746 feet southwest of the Project site. R5 is placed in the private outdoor living area (backyard) nearest the Project site. A 24-hour noise measurement near this location, L5, is used to describe the existing ambient noise environment.

EXHIBIT 9-A: SENSITIVE RECEIVER LOCATIONS

10 OPERATIONAL NOISE IMPACTS

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

10.1 OPERATIONAL NOISE SOURCES

This operational noise analysis is intended to describe noise level impacts associated with the expected typical of daytime and nighttime activities at the Project site. The proposed residential development is not expected to include any specific type of operational noise levels beyond the typical noise sources associated with residential land uses in the Project study area. However, to present a conservative approach, on-site Project-only operational noise sources are analyzed in this noise study and are expected to include: air conditioning units, parking lot activity, swimming pool/spa activity, outdoor activities, and trash enclosure activity.

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 in Table 9-1 used to estimate the Project operational noise impacts. It is important to note that the following projected noise levels assume the worst-case noise environment with the air conditioning units, parking lot activity, swimming pool/spa activity, outdoor activities, and trash enclosure activity all operating continuously. These sources of noise activity will likely vary throughout the day.

EXHIBIT 10-A: OPERATIONAL NOISE SOURCE LOCATIONS

TABLE 10-1: REFERENCE NOISE LEVEL MEASUREMENTS

Noise Source[1]	Noise Source Height (Feet)	Min./Hour[2]		Reference Noise Level (dBA L_{eq}) @ 50 Feet	Sound Power Level (dBA)[3]
		Day	Night		
Air Conditioning Units	5'	45	30	44.4	76.0
Parking Lot Vehicle Movements	5'	60	60	31.4	63.0
Outdoor Activity	5'	60	0	59.9	91.5
Trash Enclosure Activity	8'	10	10	57.3	88.9

[1] As measured by Urban Crossroads, Inc.
[2] Anticipated duration (minutes within the hour) of noise activity during typical hourly conditions expected at the Project site. "Daytime" = 7:00 a.m. - 10:00 p.m.; "Nighttime" = 10:0 p.m. - 7:00 a.m.
[3] 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 are 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.
[4] Truck Movements are calculated based on the number of events by time of day (See Table 10-2).

10.2.1 MEASUREMENT PROCEDURES

The reference noise level measurements presented in this section were collected using a Larson Davis LxT Type 1 precision sound level meter (serial number 01146). The LxT sound level meter was calibrated using a Larson-Davis calibrator, Model CAL 200, which 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. (17)

10.2.2 AIR CONDITIONING UNITS

To assess the noise levels created by the air conditioning units, reference noise levels were taken from equipment specifications for a 1- to 3-ton residential ductless mini split outdoor condensing units (Carrier 38MARB). Each unit was modeled as operating 45 minutes per hour during the daytime and 30 minutes during the nighttime. For this noise analysis, the air conditioning units are expected to be ground-mounted adjacent to the proposed buildings. The center of the air conditioning units are anticipated to be located 3 feet above ground level. At a uniform reference distance of 50 feet, each unit would generate a reference noise level of 44.4 dBA (75 dBA L_w).

10.2.3 OUTDOOR ACTIVITY

To assess the noise levels created by the outdoor activities, a reference noise level of 59.9 dBA L_{eq} at 50 feet (91.5 dBA L_w) has been developed to describe dining and drinking activities on outdoor patio areas, with background music playing, people talking, etc. collected by Urban Crossroads, Inc. are used to describe the outdoor activity expected at the site. The outdoor activity noise levels include kids playing, running, parents talking, and other people in the

background on cellular phones. Noise associated with outdoor activities is expected to occur for the entire hour (60 minutes) during daytime hours (7:0 a.m. – 10:00 p.m.).

10.2.4 PARKING LOT VEHICLE MOVEMENTS

Parking activities are based on the number of parking spaces. The Project includes approximately 14 new spaces, which are assumed to have up to 2 movements per hour for a total of 28 events in an hour. Based on studies conducted in Europe and the average parking procedure, which included movement associated with either entering or exiting the parking area, parking the vehicles, and opening and closing doors resulted in a sound power level of approximately 63 dBA L_w per square meter (24) (25)

10.2.5 TRASH ENCLOSURE ACTIVITY

To describe the noise levels associated with a trash enclosure activity, Urban Crossroads collected a reference noise level measurement at an existing trash enclosure containing two dumpster bins. The trash enclosure noise levels describe metal gates opening and closing, metal scraping against concrete floor sounds, dumpster movement on metal wheels, and trash dropping into the metal dumpster. The reference noise levels describe trash enclosure noise activities when the trash is dropped into an empty metal dumpster, as would occur at the Project site. The measured reference noise level at the uniform 50-foot reference distance is 56.8 dBA L_{eq} for the trash enclosure activity. The reference noise level describes the expected noise source activities associated with the trash enclosures for the Project's proposed building. Typical trash enclosure activities are estimated to occur for 10 minutes per hour.

10.3 PROJECT OPERATIONAL NOISE LEVELS

Using the reference noise levels to represent the proposed Project operations that include air conditioning units, parking lot activity, swimming pool/spa activity, outdoor activities, and trash enclosure 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 show 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 34.9 to 39.2 dBA L_{eq}.

TABLE 10-2: DAYTIME PROJECT OPERATIONAL NOISE LEVELS

Noise Source[1]	Operational Noise Levels by Receiver Location (dBA Leq)					
	R1	R2	R3	R4	R5	R6
Air Conditioning Units	24.0	22.2	26.6	24.2	26.0	24.1
Parking Lot Vehicle Movements	11.0	8.9	13.9	10.4	11.2	10.7
Outdoor Activity	36.1	34.5	38.8	36.7	38.7	36.0
Trash Enclosure Activity	22.7	20.3	25.1	21.4	21.9	22.9
Total (All Noise Sources)	**36.6**	**34.9**	**39.2**	**37.1**	**39.0**	**36.5**

[1] See Exhibit 10-A for the noise source locations. CadnaA noise model calculations are included in Appendix 10.1.

Table 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 22.7 to 27.2 dBA L_{eq}. The differences between the daytime and nighttime noise levels are largely related to the duration of noise activity (Table 9-1).

TABLE 10-3: NIGHTTIME PROJECT OPERATIONAL NOISE LEVELS

Noise Source[1]	Operational Noise Levels by Receiver Location (dBA Leq)					
	R1	R2	R3	R4	R5	R6
Air Conditioning Units	21.3	19.5	23.9	21.5	23.3	21.4
Parking Lot Vehicle Movements	11.0	8.9	13.9	10.4	11.2	10.7
Outdoor Activity	0.0	0.0	0.0	0.0	0.0	0.0
Trash Enclosure Activity	21.7	19.4	24.1	20.4	20.9	21.9
Total (All Noise Sources)	**24.7**	**22.7**	**27.2**	**24.2**	**25.5**	**24.9**

[1] See Exhibit 10-A for the noise source locations. CadnaA noise model calculations are included in Appendix 10.1.

10.4 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 Corona exterior noise level standards at the nearest noise-sensitive receiver locations. Table 10-4 shows the operational noise levels associated with the Project will satisfy the City of Corona 55 dBA L_{eq} daytime and 50 dBA L_{eq} nighttime exterior noise level standards at all the nearest receiver locations. Therefore, the operational noise impacts are considered *less than significant* at the nearest 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]		Noise Level Standards Exceeded?[4]	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
R1	36.6	24.7	55	50	No	No
R2	34.9	22.7	55	50	No	No
R3	39.2	27.2	55	50	No	No
R4	37.1	24.2	55	50	No	No
R5	39.0	25.5	55	50	No	No
R6	36.5	24.9	55	50	No	No

[1] See Exhibit 9-A for the receiver locations.
[2] Proposed Project operational noise levels as shown in Tables 10-3 and 10-4.
[3] Exterior noise level standards for source (commercial) land use, as shown in Table 4-1.
[4] Do the estimated Project operational noise source activities exceed the noise level standards?
"Daytime" = 7:00 a.m. - 10:00 p.m.; "Nighttime" = 10:00 p.m. - 7:00 a.m.

10.5 PROJECT OPERATIONAL NOISE LEVEL INCREASES

To describe the Project operational noise level increases, the Project operational noise levels are combined with the existing ambient noise levels measurements for the nearest receiver locations potentially impacted by Project operational noise sources. Since the units used to measure noise, decibels (dB), are logarithmic units, the Project-operational and existing ambient noise levels cannot be combined using standard arithmetic equations. (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 describes the Project noise level increases to the existing ambient noise environment. As indicated in Tables 10-5 and 10-6, the Project will generate operational noise level increases ranging from less than 0.1 to 1.4 dBA at the nearest receiver locations. Project-related operational noise level increases will satisfy the operational noise level increase significance criteria presented in Table 4-1. Therefore, the incremental Project operational noise level increase is considered *less than significant* at all receiver locations.

TABLE 10-5: DAYTIME PROJECT OPERATIONAL NOISE LEVEL INCREASES

Receiver Location[1]	Total Project Operational Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Project Increase[6]	Increase Criteria[7]	Increase Criteria Exceeded?
R1	36.6	L2	63.7	63.7	0.0	3.0	No
R2	34.9	L1	43.3	43.9	0.6	5.0	No
R3	39.2	L3	43.6	45.0	1.4	5.0	No
R4	37.1	L4	50.8	51.0	0.2	5.0	No
R5	39.0	L5	50.6	50.9	0.3	5.0	No
R6	36.5	L6	52.6	52.7	0.1	5.0	No

[1] See Exhibit 9-A for the receiver locations.
[2] Total Project daytime operational noise levels as shown in Table 10-3.
[3] Ambient noise level measurement locations as shown in Exhibit 5-A.
[4] Observed daytime ambient noise levels as shown in Table 5-1.
[5] Represents the combined ambient conditions plus the Project activities.
[6] The noise level increase expected with the addition of the proposed Project activities.
[7] Significance increase criteria as shown in Table 4-1.

TABLE 10-6: NIGHTTIME OPERATIONAL NOISE LEVEL INCREASES

Receiver Location[1]	Total Project Operational Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Project Increase[6]	Increase Criteria[7]	Increase Criteria Exceeded?
R1	24.7	L2	62.2	62.2	0.0	3.0	No
R2	22.7	L1	44.4	44.4	0.0	5.0	No
R3	27.2	L3	44.8	44.9	0.1	5.0	No
R4	24.2	L4	50.6	50.6	0.0	5.0	No
R5	25.5	L5	52.9	52.9	0.0	5.0	No
R6	24.9	L6	52.7	52.7	0.0	5.0	No

[1] See Exhibit 9-A for the receiver locations.
[2] Total Project nighttime operational noise levels as shown in Table 10-4.
[3] Ambient noise level measurement locations as shown in Exhibit 5-A.
[4] Observed nighttime ambient noise levels as shown in Table 5-1.
[5] Represents the combined ambient conditions plus the Project activities.
[6] The noise level increase expected with the addition of the proposed Project activities.
[7] Significance increase criteria as shown in Table 4-1.

11 CONSTRUCTION IMPACTS

This section analyzes potential impacts resulting from the short-term construction activities associated with the development of the Project. Exhibit 11-A shows the construction noise source locations in relation to the nearest sensitive receiver locations previously described in Section 9. To prevent high levels of construction noise from impacting noise-sensitive land uses, the City of Corona Municipal Code, Section 17.84.040[D][2], states that construction noise is prohibited between the hours of 8:00 p.m. to 7:00 a.m., Monday through Saturday and 6:00 p.m. to 10:00 a.m. on Sundays and federal holidays.

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 are expected to occur in the following stages:

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

This construction noise analysis was prepared using reference noise level measurements taken by Urban Crossroads, Inc. to describe the typical construction activity noise levels for each stage of Project construction. The construction reference noise level measurements represent a list of typical construction activity noise levels. Noise levels generated by heavy construction equipment can range from approximately 68 dBA to 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 CONSTRUCTION REFERENCE NOISE LEVELS

To describe the Project's typical construction noise levels, measurements were collected for similar activities at several construction sites. Table 11-1 provides a summary of the construction reference noise level measurements. Since the reference noise levels were collected at varying distances of 30 feet and 50 feet, all construction noise level measurements presented in Table 11-1 have been adjusted for consistency to describe a uniform reference distance of 50 feet. Construction noise generated from concrete crushing activities and nighttime concrete pours are addressed separately below.

EXHIBIT 11-A: TYPICAL CONSTRUCTION NOISE SOURCE AND RECEIVER LOCATIONS

TABLE 11-1: TYPICAL 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 TYPICAL CONSTRUCTION NOISE ANALYSIS

Using the reference construction equipment noise levels and the CadnaA noise prediction model, calculations of the Project construction noise level impacts at the nearby sensitive receiver locations were completed. For construction noise assessment, construction equipment can be considered to operate in two modes: stationary and mobile. As defined, stationary equipment operates in a single location for one or more days at a time, with either fixed-power operation (e.g., pumps, generators, and compressors) or variable-power operation (e.g., pile drivers, rock drills, and pavement breakers). Mobile equipment moves around the construction site with power applied in a cyclic fashion, such as bulldozers, graders, and loaders (FTA 2018). The FTA and FHWA recommend noise impacts from stationary equipment be assessed from the center of the equipment location, while noise impacts from mobile construction equipment should be assessed from the center of the equipment activity area (e.g., construction site). Thus, to assess a more realistic and reasonable worst-case construction scenario while accounting for the dynamic nature of construction activities, this Project construction noise analysis models the equipment combination with the highest reference combined level as a single moving point within the construction area (Project site boundary). Construction impacts are based on the highest noise level calculated at each receiver location. As shown in Table 11-2, the construction

noise levels are expected to range from 43.2 to 57.8 dBA L_{eq}, and the highest construction levels are expected to range from 53.3 to 57.8 dBA L_{eq} at the nearest receiver locations. Appendix 11.1 includes the detailed CadnaA construction noise model inputs.

TABLE 11-2: TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVEL SUMMARY

Receiver Location[1]	Construction Noise Levels (dBA L_{eq})						
	Demolition	Site Preparation	Grading	Building Construction	Paving	Architectural Coating	Highest Levels[2]
R1	51.8	55.2	53.4	51.5	51.1	45.1	55.2
R2	49.9	53.3	51.5	49.6	49.2	43.2	53.3
R3	54.4	57.8	56.0	54.1	53.7	47.7	57.8
R4	51.6	55.0	53.2	51.3	50.9	44.9	55.0
R5	52.8	56.2	54.4	52.5	52.1	46.1	56.2
R6	51.8	55.2	53.4	51.5	51.1	45.1	55.2

[1] Typical construction noise source and receiver locations are shown in Exhibit 11-A.
[2] Construction noise level calculations based on distance from the project site boundaries (construction activity area) to the nearest receiver locations. CadnaA construction noise model inputs are included in Appendix 11.1.

11.4 TYPICAL CONSTRUCTION NOISE LEVEL COMPLIANCE

To evaluate whether the Project will generate potentially significant short-term noise levels at the nearest noise-sensitive receiver locations, a construction-related daytime noise level threshold of 80 dBA L_{eq} is used as a reasonable threshold to assess the daytime construction noise level impacts. The construction noise analysis shows that the nearest receiver locations will satisfy the daytime 80 dBA L_{eq} significance threshold during Project construction activities, as shown in Table 11-3. Therefore, the noise impacts due to Project construction noise is considered *less than significant* at all receiver locations.

TABLE 11-3: TYPICAL CONSTRUCTION NOISE LEVEL COMPLIANCE

Receiver Location[1]	Construction Noise Levels (dBA L_{eq})		
	Highest Construction Noise Levels[2]	Threshold[3]	Threshold Exceeded?[4]
R1	55.2	80	No
R2	53.3	80	No
R3	57.8	80	No
R4	55.0	80	No
R5	56.2	80	No
R6	55.2	80	No

[1] Typical construction noise source and receiver locations are shown in Exhibit 11-A.
[2] Highest construction noise level calculations based on distance from the construction noise source activity to nearby receiver locations, as shown in Table 11-2.
[3] Federal Transit Administration, Transit Noise and Vibration Impact Assessment noise level threshold as shown in Table 4-1.
[4] Do the estimated Project construction noise levels exceed the construction noise level threshold?

11.6 TYPICAL CONSTRUCTION VIBRATION IMPACTS

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures, and soil type. It is expected that ground-borne vibration from Project construction activities would cause only intermittent, localized intrusion. Ground vibration levels associated with various types of construction equipment are summarized in Table 11-4. Based on the representative vibration levels presented for various construction equipment types, it is possible to estimate the potential Project construction vibration levels using the following vibration assessment methods defined by the FTA. To describe the human response (annoyance) associated with vibration impacts, the FTA provides the following equation: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

TABLE 11-4: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

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

Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, 2018.

Table 11-5 presents the expected typical construction equipment vibration levels at the nearest receiver locations. At distances ranging from 502 feet to 936 feet from typical Project construction activities (at the Project site boundary), construction vibration levels are estimated to range from less than 0.001 to 0.001 in/sec RMS at the nearest receiver locations. The Project

construction is not expected to generate vibration levels exceeding the City of Corona maximum acceptable vibration standard of 0.05 in/sec (RMS). Further, impacts at the site of the closest sensitive receiver are unlikely to be sustained during the entire construction period but will occur rather only during the times that heavy construction equipment is operating proximate to the Project site perimeter.

Moreover, 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. On this basis the potential for the Project to result in exposure of persons to, or generation of, excessive ground-borne vibration is determined to be *less than significant*.

TABLE 11-5: TYPICAL CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver Location[1]	Land Use	Distance to Property Line (In Feet)	Receiver PPV Levels (in/sec)[2]					RMS Velocity Levels[3] (in/sec)	Potential Significant Impact?[4]
			Small Bulldozer	Jack-hammer	Loaded Trucks	Large Bulldozer	Peak Vibration		
R1	Residential	748'	0.000	0.000	0.000	0.001	0.001	0.000	No
R2	Residential	936'	0.000	0.000	0.000	0.000	0.000	0.000	No
R3	Residential	502'	0.000	0.000	0.001	0.001	0.001	0.001	No
R4	Residential	767'	0.000	0.000	0.000	0.001	0.001	0.000	No
R5	Residential	664'	0.000	0.000	0.001	0.001	0.001	0.000	No
R6	Residential	689'	0.000	0.000	0.001	0.001	0.001	0.000	No

[1] Typical construction noise source and receiver locations are shown in Exhibit 11-A.
[2] Based on the Vibration Source Levels of Construction Equipment included in Table 11-4.
[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 2020.
[4] Does the Peak Vibration exceed the City of Corona maximum acceptable vibration standard of 0.05 in/sec?

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12 REFERENCES

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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.
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21. **City of Corona.** *City of Corona Traffic Impact Study Guidelines.* July 2006.
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24. **Bayerisches Landesamt fur Umwelt.** *Parking Area Noise, 6. Revised Edition.* 2007. ISBN 3-936385-26-2, ISSN 0723-0028.

25. *Prediction of parking area noise in Australian conditions.* **Johnson, Laurence Nicol and Paul.** Paper Number 39, s.l. : Gold Coast, Australia, 2-4 November 2011, Vol. Proceedings of ACOUSTICS 2011.

13 CERTIFICATIONS

The contents of this noise study report represent an accurate depiction of the noise environment and impacts associated with the proposed Second Street Housing 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 (619) 778-1971.

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URBAN CROSSROADS, INC.
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EDUCATION

Bachelor of Science in Urban and Regional Planning
California Polytechnic State University, Pomona • June 2000

PROFESSIONAL AFFILIATIONS

ASA – Acoustical Society of America
AEP – Association of Environmental Planners
AWMA – Air and Waste Management Association
INCE – Institute of Noise Control Engineers

PROFESSIONAL CERTIFICATIONS

Approved Acoustical Consultant • County of San Diego
FHWA Traffic Noise Model of Training • November 2004
CadnaA Basic and Advanced Training Certificate • October 2008.

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APPENDIX 3.1:

CITY OF CORONA MUNICIPAL CODE

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17.84.040 Noise.

(A) **Purpose and intent**.

(1) The purpose of this section is to regulate noise and vibration in the interest of the public health, safety and general welfare. The city finds that certain noise levels and vibrations are detrimental to the public health, safety and general welfare and that the primary sources of noise in the city are freeways, highways, manufacturing uses, railroads, the airport and construction noise. The noise element of the General Plan contains the city's policies regarding noise and identifies noise contours for existing and future roadways and the Corona Municipal Airport, which are implemented by this chapter. The General Plan noise element shall govern all noise standards and policies.

(2) In order to control unnecessary, excessive and annoying noise and vibration in the city, it is hereby declared to be the policy of the city to prohibit such noise and vibration generated from or by all sources as specified in this chapter. It shall be the policy of the city to maintain quiet in those areas which exhibit low noise levels and to implement programs to reduce noise in those areas within the city where noise levels are above acceptable values. It is the intent of the city to minimize noise impacts to adjacent land uses pursuant to the standards identified herein.

(B) **Definitions**. Terms found in this chapter shall be defined as follows. Additional definitions are found in the noise element of the General Plan.

(1) "**A-weighted sound level**." The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter network is designed to simulate the response of the human ear. The A-weighted sound level is expressed by the symbol dBA.

(2) "**Ambient noise**." The composite of noise from all existing sources near and far. The ambient noise level constitutes the normal or existing level of environmental noise at a given location, excluding any alleged offensive noise.

(3) "**Cumulative period**." An additive period of time composed of individual time segments which may be continuous or interrupted.

(4) "**Community noise equivalent level (CNEL)**." The average equivalent A-weighted sound level during a 24 hour day, obtained after addition of five decibels to sound levels between 7:00 p.m. and 10:00 p.m. and the addition of ten decibels to sound levels between 10:00 p.m. and 7:00 a.m.

(5) "**Decibel (dB)**." A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals.

(6) "**Impulsive noise**." A noise of short duration, usually less than one second, and of high intensity, with an abrupt onset and rapid decay.

(7) "**Noise study**." An acoustical analysis performed by a qualified noise engineer which determines the potential noise impacts of a roadway, land use or operation of equipment. The noise study will generate noise contours and recommend mitigation for noise impacts which exceed the city's noise standards.

(8) "**Sensitive land uses**." Those specific land uses which have associated human activities that may be subject to stress or significant interference from noise. Sensitive land uses include single family residential, multiple family residential, churches, hospitals and similar health care institutions, convalescent homes, libraries and school classroom areas.

(9) "**Simple tone noise**." A noise characterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished. When measured, a simple tone noise shall exist if the one-third octave band sound pressure levels in the band with the tone exceeds the arithmetic average of the sound pressure levels of the two continuous one-third octave bands as follows: 5 dB for frequencies of 500 hertz or above or by 15 dB for frequencies less than or equal to 125 hertz.

(10) "**Sound attenuation device**." An enclosure, blanket, vault, box, wall, fence, panel, baffle, coating, material, silencer, or other appurtenance, mechanism, or device intended to reduce the noise level of mechanical equipment.

(C) **Noise standards**.

(1) The noise ordinance identifies two separate types of noise sources: transportation and stationary. Transportation related noise sources, such as freeways, airports and railroads, are identified within this chapter and are mainly for the planning stages of project development. The noise metrics used for this noise type is the Community Noise Equivalent Level (CNEL) which is a 24 hour time weighted average noise level. The other type of noise standard is for stationary noise sources, such as industrial or construction noise, that may be intrusive to a neighboring private property. The noise metric used for stationary sources is defined as noise levels that cannot be exceeded for certain percentages of time. The noise standards shown in Table 1 are for regulating the impact of stationary noise sources to a neighboring private property. Standards for transportation related noise are found in Table 2.

(2) Stationary noise sources.

TABLE 1

STATIONARY NOISE SOURCE STANDARDS

TYPE OF LAND USE	MAXIMUM ALLOWABLE NOISE LEVELS			
	Exterior Noise Level		Interior Noise Level	
	7 a.m. to 10 p.m.	10 p.m. to 7 a.m.	7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
Single-, Double- and Multi-Family Residential	55 dBA	50 dBA	45 dBA	35 dBA
Other Sensitive Land Uses	55 dBA	50 dBA	45 dBA	35 dBA
Commercial Uses	65 dBA	60 dBA	Not applicable	Not applicable
Industrial, Manufacturing or Agricultural	75 dBA	70 dBA	Not applicable	Not applicable

(a) Each of the noise limits specified here shall be reduced by 5 dBA for impulse or simple tone noises; provided, however, that if the ambient noise level exceeds the resulting standards, the ambient shall be the standard.

(b) If the measurement location is on the boundary between two different zones, the lower noise level standard applicable to the zone shall apply.

(c) If the intruding noise is continuous and cannot be reasonably discontinued or stopped for a time period whereby the ambient noise level can be determined, the measured noise level obtained while the source is in operation shall be compared directly to the allowable noise level standards as specified respective to the measurement location's designated land use and for the time of the day the noise level is measured. The reasonableness of temporarily discontinuing the noise generation by an intruding noise source shall be determined by the Code Enforcement Officer for the purpose of establishing the existing ambient noise level at the measurement location.

(d) Exterior noise:

1. It shall be unlawful for any person, entity or operation at any location within the incorporated area of the city to create any noise, or to 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:

a. The noise standard for a cumulative period of more than 30 minutes in any hour;

b. The noise standard plus 5 dB for a cumulative period of more than 15 minutes in any hour;

c. The noise standard plus 10 dB for a cumulative period of more than five minutes in any hour;

d. The noise standard plus 15 dB for a cumulative period of more than one minute in any hour; or

e. The noise standard plus 20 dB for any period of time.

2. In the event the ambient noise level exceeds any of the first four noise limit categories above, the cumulative period applicable to the category shall be increased to reflect the ambient noise level. In the event the ambient noise level exceeds the fifth noise category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

(e) Interior noise. It shall be unlawful for any person at any location within the incorporated area of the city to create any noise or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such a person which causes the noise level when measured within any other residential dwelling unit or sensitive land use to exceed:

1. The noise standard for a cumulative period of more than five minutes in any hour;

2. The noise standard plus 5 dB for a cumulative period of more than one minute in any hour; or

3. The noise standard plus 10 dB, or the maximum measured ambient, for any period of time.

(3) Transportation noise sources.

TABLE 2

TRANSPORTATION NOISE SOURCE STANDARDS

TYPE OF LAND USE	EXTERIOR NOISE LEVEL	INTERIOR NOISE LEVEL
	(Private Outdoor Living Areas)	
Residential (Roadway)	65 CNEL	45 CNEL
Residential (Airport)	65 CNEL	45 CNEL
Other sensitive land uses (Roadway)	65 CNEL	45 CNEL
Other sensitive land uses (Airport)	65 CNEL	45 CNEL
Hotels/Motels (Roadway)	65 CNEL	45 CNEL
Hotels/Motels (Airport)	65 CNEL	45 CNEL

(a) **Roadway noise**. A noise study shall be performed prior to the construction of new master planned roads, roadway improvements, rail lines and/or prior to the construction of residential or sensitive land uses adjacent to existing or master planned roads or railways. The noise study shall identify the existing and future noise contours for the roadway and propose mitigation measures to reduce the noise impacts to a maximum of 65 dBA CNEL in the private outdoor living area of residences and to a maximum interior noise level of 45 dBA CNEL for residential and sensitive land uses, as shown in Table 2.

(b) **Airport noise**. Sensitive land uses, site-built homes and institutional uses are prohibited in airport noise contours above 65 dBA CNEL. All subdivisions within two miles of the Corona Municipal Airport or within the 65 dBA CNEL contour shall show and record an avigation easement for the benefit of the airport. The avigation easement shall provide notification to potential buyers and occupants of the presence of the easement and the potential for over flights and aircraft noise.

(D) **Special provisions**.

(1) **Mechanical equipment in residential zones.** Upon application for a building permit to install mechanical equipment, such as air conditioner and pool equipment, in a residential zone, the equipment shall be setback at least ten feet from an adjoining property line except where a five foot high block sound wall is maintained extending a distance of two feet on each side of such equipment and situated either between such equipment and the property line or on said property line. Exception: Mechanical equipment in residential zones shall be permitted closer than ten feet from an adjoining property line without a five foot high block sound wall when sound attenuation devices approved by the Building Official are installed. The noise level with sound attenuation devices installed shall comply with the limits and conditions specified in § 17.84.040(C)(2) when measured from any adjoining property. The approved sound attenuation devices shall be maintained and any approvals shall not be construed to permit violations of this code.

(2) **Construction noise**. Construction noise is prohibited between the hours of 8:00 p.m. to 7:00 a.m., Monday through Saturday and 6:00 p.m. to 10:00 a.m. on Sundays and federal holidays. Construction noise is defined as noise which is disturbing, excessive or offensive and constitutes a nuisance involving discomfort or annoyance to persons of normal sensitivity residing in the area, which is generated by the use of any tools, machinery or equipment used in connection with construction operations.

(3) **Noise devices**. In accordance with Chapter 9.24, no loudspeaker, bells, gongs, buzzers, mechanical equipment or other sounds, attention-attracting or communication device associated with any use adjacent to residential or sensitive land uses shall be discernible beyond the boundary line of the parcel, except fire protection devices, burglar alarms and church bells. Noise generated by these sources shall be enforced by the Police Department.

(4) **Noisy animals**. Noise generated by animals shall be regulated by the Police Department in accordance with Chapter 6.11.

(E) **Exemptions**. The following activities shall be exempt from these noise standards:

(1) Special events pursuant to an approved special use permit. Noise impacts shall be evaluated and conditioned as part of the special use permit;

(2) Filming pursuant to a film permit. Noise impacts shall be evaluated and conditioned as part of the film permit;

(3) Activities conducted on public parks, public playgrounds and public or private school grounds, including school athletic and entertainment events that are conducted under the sanction of the school or which a license or permit has been duly issued pursuant to any provision of city code;

(4) Noise sources associated with the maintenance of real property, provided the activities take place between the hours of 7:00 a.m. to 8:00 p.m. on any day except Sunday or between the hours of 9:00 a.m. to 8:00 p.m. on Sunday;

(5) Any activity too the extent regulation thereof has been preempted by state or federal law;

(6) Repairs to and replacement of mechanical equipment in residential zones installed by permit prior to May 20, 1993 shall be exempt from the requirements in division (D) of this section;

(7) Noise variances granted pursuant to subsection (H)(1) below;

(8) Short-term, non-continuous operations associated with government and public utility facilities that are necessary to maintain the delivery of services for the benefit of public health and safety.

(F) **Noise level measurements**. All noise shall be measured in accordance with the following standards. Measurements shall be taken of the ambient noise level and any alleged offensive noise. If the measurement location is on the boundary of two different noise zones, the lower noise level standard shall apply.

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

(2) **Ambient noise**. A measurement of the ambient noise level shall be taken according to the procedures in this chapter. If the ambient noise level exceeds the standard, the ambient level shall be the standard. If an alleged intruding noise source is continuous and cannot be reasonably discontinued or stopped for a time period whereby the ambient noise level can be determined, the measured noise level obtained while the alleged intruding noise source is in operation shall be compared directly to the applicable noise level standard.

(G) **Noise studies required**. As referenced in division (C) of this section, there are essentially two different types of noise sources that have been identified in Corona and each has its own noise metrics as well as its own required noise studies. The noise metrics used for transportation related noise sources is the CNEL which is a 24 hour time weighted average noise level. The noise metrics used for stationary sources are defined as noise levels that cannot be exceeded for certain percentages of time.

(1) **Predevelopment noise studies**. A predevelopment noise study is performed prior to development and is designed to project future noise levels and recommend mitigation measures to be implemented in project development. All noise studies shall be prepared by a registered noise engineer as approved by the city. Noise

studies will be required for the construction of master planned roadways, for development adjacent to master planned roadways, when a noise generating use, such as a factory, is proposed in proximity to residential uses and when residential uses are proposed in proximity to an existing noise source. The need for a noise study will be determined at development plan review. Predevelopment noise studies shall project future noise levels based on proposed uses, traffic volumes and other relevant future conditions. Existing and projected noise shall be evaluated pursuant to the noise standards within this chapter and the noise element of the General Plan. Mitigation measures shall be proposed to bring noise levels into compliance with these standards. Mitigation measures may consist of walls, berms, setbacks, landscaping, building materials, construction methods and any other means whereby noise can be reduced to the maximum amounts within this chapter.

(2) **Studies of existing stationary noise**. At times it will be necessary to study the noise generated by an existing source, either due to alleged violations of the noise ordinance or for monitoring purposes. These noise studies shall be prepared by a registered noise engineer as approved by the city in accordance with the standards in Table 1.

(H) **Noise variance**.

(1) The owner or operator of a noise or vibration source which violates any of the provisions of this chapter may file an application with the Community Development Department for a variance from the provisions thereof wherein said owner or operator shall set forth all actions taken to comply with the provisions, the reasons why immediate compliance cannot be achieved, a proposed method of achieving compliance and a proposed time schedule for its accomplishment. The application shall be accompanied by a fee as determined by City Council resolution. A separate application shall be filed for each noise source; provided, however, that several fixed sources on a single property may be combined into one application. An application for a variance shall remain subject to prosecution under the terms of this chapter until a variance is granted.

(2) The Board of Zoning Adjustment shall evaluate all applications for variance from the requirements of this chapter and may grant the variances with respect to time for compliance, subject to such terms, conditions and requirements as it may deem reasonable to achieve maximum compliance with the provisions of this chapter. The terms, conditions and requirements may include, but shall not be limited to, limitations on noise levels and operating hours. Each such variance shall set forth in detail the approved method of achieving maximum compliance and a time schedule for its accomplishment. In its determinations, the Board shall consider the following:

(a) The magnitude of the nuisance caused by the offensive noise;

(b) The uses of property within the area of impingement by the noise;

(c) The time factors related to study, design, financing and construction of remedial work;

(d) The economic factors related to age and useful life of the equipment;

(e) The general public interest, welfare and safety.

(3) Any variance granted by the Board shall be by resolution and shall be transmitted to the Code Enforcement Officer for enforcement. Any violation of the terms of the variance shall be unlawful and enforced pursuant to division (I) of this section.

(I) **Enforcement**.

(1) It shall be unlawful for any person at any location within the City of Corona to create any exterior noise or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, which causes the noise level when measured according to this chapter to exceed the maximum allowable noise levels in Table 1 of § 17.84.040(C).

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

(3) Any person violating any provision of this chapter shall be deemed guilty of a misdemeanor.

(4) The operation or maintenance of any device, instrument, vehicle or machinery in violation of any noise standard identified in this chapter is declared to be a public nuisance and may be abated pursuant to the nuisance abatement procedure in Chapter 8.32 of this code.

(5) Pursuant to § 1.08.020(A) of this code, each person shall be deemed guilty of a separate offense for each and every day during any portion of which any violation of any provision of this chapter is committed, continued or permitted by such person and shall be punished accordingly.

(`78 Code, § 17.84.040.) (Ord. 3277 §§ 4, 5, 2018; Ord. 3188 § 3, 2015; Ord. 2372 § 2, 1999; Ord. 2161 § 1 (part), 1993.)

APPENDIX 5.1:

NOISE LEVEL MEASUREMENT WORKSHEETS

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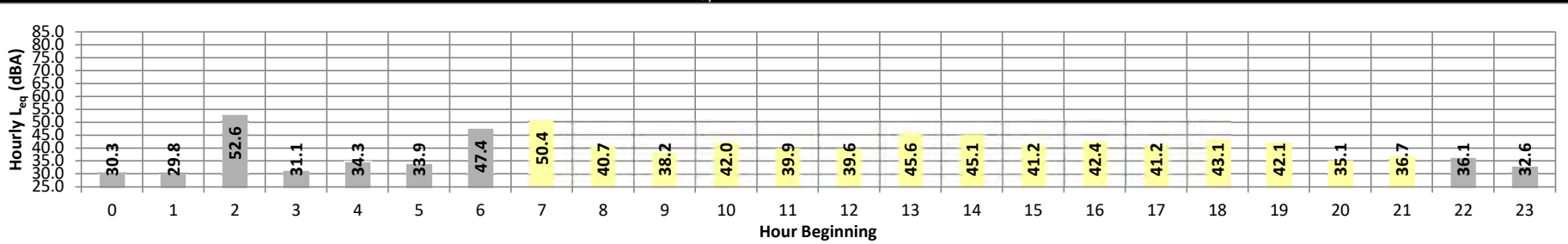
24-Hour Noise Level Measurement Summary

Date: Thursday, October 12, 2023 *Location:* L1 - Located east of the site near the Citrus Circle Apartment *Meter:* Piccolo II *JN:* 15669

Project: Second Street Housing *Source:* Homes Complex *Analyst:* B.Maddux

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	30.3	35.8	29.3	35.1	34.6	33.4	32.8	29.8	29.6	29.5	29.4	29.4	30.3	10.0	40.3
	1	29.8	32.3	29.4	31.7	30.8	30.0	29.9	29.7	29.7	29.6	29.5	29.5	29.8	10.0	39.8
	2	52.6	72.5	29.4	67.9	63.7	55.8	50.8	32.6	29.7	29.5	29.5	29.4	52.6	10.0	62.6
	3	31.1	43.3	29.6	41.2	38.1	31.7	30.5	30.1	30.0	29.8	29.8	29.7	31.1	10.0	41.1
	4	34.3	52.2	29.7	48.2	43.3	34.8	32.8	30.2	30.1	29.9	29.9	29.8	34.3	10.0	44.3
	5	33.9	49.0	29.8	47.4	43.5	36.1	33.3	30.8	30.4	30.1	30.0	29.9	33.9	10.0	43.9
	6	47.4	65.0	34.9	62.1	58.6	50.5	47.9	41.5	39.0	36.4	36.0	35.3	47.4	10.0	57.4
Day	7	50.4	66.7	32.7	63.6	60.6	56.6	54.0	47.1	40.9	34.3	33.7	33.1	50.4	0.0	50.4
	8	40.7	57.1	30.3	55.1	52.4	46.0	41.9	33.7	31.8	30.8	30.6	30.5	40.7	0.0	40.7
	9	38.2	53.6	30.3	51.5	48.4	43.9	41.3	34.8	31.8	30.7	30.6	30.4	38.2	0.0	38.2
	10	42.0	58.1	30.5	56.1	53.1	46.8	43.9	38.3	34.7	31.3	31.0	30.7	42.0	0.0	42.0
	11	39.9	56.2	30.1	53.5	51.1	45.3	41.9	35.2	32.4	30.7	30.5	30.3	39.9	0.0	39.9
	12	39.6	54.9	30.5	52.9	50.8	45.4	42.0	35.4	33.1	31.3	31.0	30.7	39.6	0.0	39.6
	13	45.6	61.3	30.5	59.8	56.7	51.7	49.0	41.0	34.8	31.3	31.0	30.7	45.6	0.0	45.6
	14	45.1	60.1	30.8	58.4	55.7	51.0	48.9	42.6	36.4	31.8	31.4	31.0	45.1	0.0	45.1
	15	41.2	57.1	30.5	55.0	52.1	47.1	44.0	36.4	33.1	31.2	30.9	30.7	41.2	0.0	41.2
	16	42.4	59.0	30.5	56.7	53.6	47.7	44.5	36.4	33.4	31.3	31.1	30.8	42.4	0.0	42.4
	17	41.2	57.9	30.4	55.7	52.8	46.3	42.5	35.5	32.7	31.0	30.8	30.5	41.2	0.0	41.2
	18	43.1	60.3	31.1	57.4	54.2	48.0	44.6	38.4	35.5	32.3	31.9	31.5	43.1	0.0	43.1
	19	42.1	57.5	30.7	55.3	52.9	48.7	44.9	37.9	34.6	31.6	31.3	31.0	42.1	5.0	47.1
	20	35.1	48.1	30.4	46.2	44.4	38.7	36.9	34.1	32.4	31.1	30.9	30.6	35.1	5.0	40.1
	21	36.7	46.9	30.1	45.4	43.8	41.1	40.3	37.8	34.2	30.7	30.5	30.3	36.7	5.0	41.7
Night	22	36.1	51.2	29.8	49.8	47.3	40.2	36.6	32.5	31.2	30.3	30.1	30.0	36.1	10.0	46.1
	23	32.6	48.6	29.7	44.5	41.0	34.4	32.3	30.3	30.1	29.9	29.8	29.8	32.6	10.0	42.6

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	35.1	46.9	30.1	45.4	43.8	38.7	36.9	33.7	31.8	30.7	30.5	30.3
	Max	50.4	66.7	32.7	63.6	60.6	56.6	54.0	47.1	40.9	34.3	33.7	33.1
Energy Average		43.3	Average:		54.8	52.2	46.9	44.1	37.7	34.1	31.4	31.2	30.9
Night	Min	29.8	32.3	29.3	31.7	30.8	30.0	29.9	29.7	29.6	29.5	29.4	29.4
	Max	52.6	72.5	34.9	67.9	63.7	55.8	50.8	41.5	39.0	36.4	36.0	35.3
Energy Average		44.4	Average:		47.6	44.5	38.6	36.3	31.9	31.1	30.5	30.5	30.3

24-Hour CNEL	Leq (dBA) Daytime (7am-10pm)	Leq (dBA) Nighttime (10pm-7am)
50.8	**43.3**	**44.4**

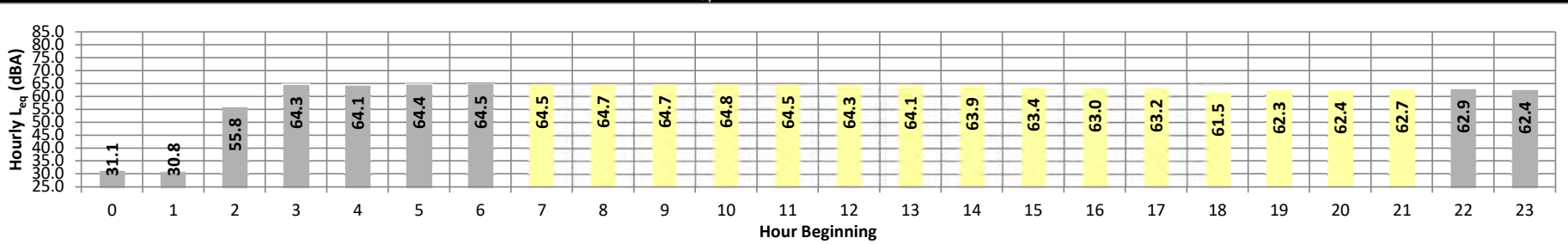
URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Date: Thursday, October 12, 2023 *Location:* L2 - Located southeast of the site near the Corona City Hall *Meter:* Piccolo II *JN:* 15669

Project: Second Street Housing *Source:* *Analyst:* B.Maddux

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	31.1	35.1	30.3	34.5	33.9	33.1	32.6	30.7	30.6	30.5	30.4	30.4	31.1	10.0	41.1
	1	30.8	33.2	30.4	32.3	31.6	30.9	30.9	30.8	30.7	30.6	30.6	30.5	30.8	10.0	40.8
	2	55.8	74.3	49.1	67.3	64.9	60.1	57.0	53.0	51.4	50.9	50.2	49.5	55.8	10.0	65.8
	3	64.3	66.7	63.4	65.5	65.2	64.9	64.7	64.4	64.2	63.9	63.8	63.6	64.3	10.0	74.3
	4	64.1	65.7	63.4	64.6	64.5	64.4	64.3	64.2	64.0	63.8	63.7	63.6	64.1	10.0	74.1
	5	64.4	65.1	63.7	64.8	64.7	64.7	64.6	64.5	64.3	64.1	64.0	63.9	64.4	10.0	74.4
	6	64.5	65.2	63.8	65.0	64.9	64.8	64.8	64.6	64.5	64.2	64.2	64.0	64.5	10.0	74.5
Day	7	64.5	65.3	63.8	65.1	65.0	64.9	64.8	64.6	64.5	64.2	64.2	64.0	64.5	0.0	64.5
	8	64.7	65.5	64.0	65.2	65.1	65.0	65.0	64.8	64.7	64.4	64.3	64.2	64.7	0.0	64.7
	9	64.7	65.4	64.0	65.2	65.1	65.0	65.0	64.8	64.7	64.4	64.3	64.2	64.7	0.0	64.7
	10	64.8	65.6	64.1	65.3	65.2	65.1	65.0	64.9	64.7	64.5	64.4	64.3	64.8	0.0	64.8
	11	64.5	66.1	63.8	65.3	65.0	64.9	64.8	64.7	64.5	64.3	64.2	64.0	64.5	0.0	64.5
	12	64.3	66.4	63.6	65.2	64.9	64.7	64.7	64.5	64.3	64.0	63.9	63.8	64.3	0.0	64.3
	13	64.1	66.0	63.4	64.9	64.8	64.6	64.5	64.3	64.1	63.8	63.7	63.6	64.1	0.0	64.1
	14	63.9	65.0	63.2	64.5	64.4	64.3	64.2	64.1	63.9	63.6	63.5	63.4	63.9	0.0	63.9
	15	63.4	64.4	62.7	63.9	63.9	63.8	63.7	63.5	63.4	63.1	63.0	62.9	63.4	0.0	63.4
	16	63.0	75.1	61.6	69.7	67.5	64.1	63.3	62.6	62.4	62.1	62.0	61.8	63.0	0.0	63.0
	17	63.2	82.5	60.7	70.7	65.3	62.8	62.4	61.9	61.7	61.3	61.2	61.0	63.2	0.0	63.2
	18	61.5	64.4	60.6	62.9	62.4	62.1	61.9	61.7	61.5	61.1	61.0	60.8	61.5	0.0	61.5
	19	62.3	71.7	61.1	65.4	64.0	63.0	62.7	62.3	62.0	61.6	61.5	61.4	62.3	5.0	67.3
	20	62.4	65.4	61.3	64.1	63.7	63.2	63.0	62.5	62.2	61.8	61.7	61.5	62.4	5.0	67.4
	21	62.7	70.6	61.3	66.7	65.7	64.3	63.7	62.7	62.3	61.9	61.8	61.6	62.7	5.0	67.7
Night	22	62.9	73.1	61.5	67.7	66.3	64.7	64.1	62.8	62.4	62.0	61.9	61.7	62.9	10.0	72.9
	23	62.4	65.8	61.5	64.0	63.5	63.1	62.9	62.6	62.3	62.0	61.9	61.7	62.4	10.0	72.4

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	61.5	64.4	60.6	62.9	62.4	62.1	61.9	61.7	61.5	61.1	61.0	60.8
	Max	64.8	82.5	64.1	70.7	67.5	65.1	65.0	64.9	64.7	64.5	64.4	64.3
Energy Average		63.7	Average:		65.6	64.8	64.1	63.9	63.6	63.4	63.1	63.0	62.8
Night	Min	30.8	33.2	30.3	32.3	31.6	30.9	30.9	30.7	30.6	30.5	30.4	30.4
	Max	64.5	74.3	63.8	67.7	66.3	64.9	64.8	64.6	64.5	64.2	64.2	64.0
Energy Average		62.2	Average:		58.4	57.7	56.8	56.2	55.3	54.9	54.7	54.5	54.3

24-Hour CNEL	Leq (dBA) Daytime (7am-10pm)	Leq (dBA) Nighttime (10pm-7am)
69.1	**63.7**	**62.2**

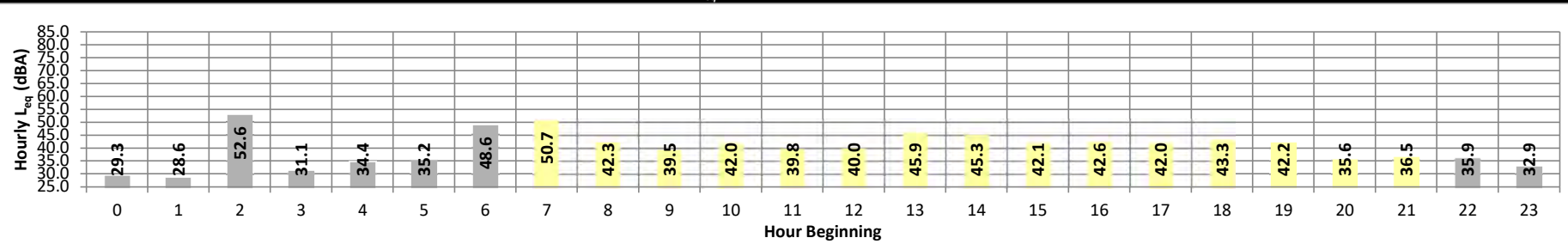
URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Date: Thursday, October 12, 2023 *Location:* L3 - Located south of the site near the Corona-Norco Adult *Meter:* Piccolo II *JN:* 15669

Project: Second Street Housing *Source:* Education School *Analyst:* B.Maddux

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	29.3	33.8	28.3	33.7	33.5	32.7	32.0	28.7	28.4	28.4	28.3	28.3	29.3	10.0	39.3
	1	28.6	30.4	28.4	30.1	29.9	29.1	28.7	28.5	28.5	28.5	28.4	28.4	28.6	10.0	38.6
	2	52.6	68.1	28.4	64.5	63.3	61.0	58.4	44.3	28.5	28.4	28.4	28.4	52.6	10.0	62.6
	3	31.1	42.1	28.6	41.6	40.5	35.8	32.2	28.9	28.7	28.7	28.7	28.7	31.1	10.0	41.1
	4	34.4	48.2	28.7	47.5	46.1	40.6	35.2	29.0	28.8	28.8	28.7	28.7	34.4	10.0	44.4
	5	35.2	48.6	28.9	48.0	46.7	42.0	37.8	30.1	29.3	29.0	28.9	28.9	35.2	10.0	45.2
	6	48.6	62.5	35.3	61.7	60.4	55.6	51.6	44.3	40.3	36.5	36.2	35.4	48.6	10.0	58.6
Day	7	50.7	61.9	33.2	61.3	60.3	57.2	55.3	50.7	45.2	35.2	34.2	33.4	50.7	0.0	50.7
	8	42.3	55.9	29.6	55.2	53.9	50.0	46.9	35.2	31.0	29.7	29.7	29.6	42.3	0.0	42.3
	9	39.5	52.4	29.6	51.7	50.3	46.7	44.0	36.9	31.8	29.9	29.7	29.6	39.5	0.0	39.5
	10	42.0	55.5	29.9	54.8	53.6	49.0	45.5	37.5	33.8	30.4	30.2	29.9	42.0	0.0	42.0
	11	39.8	52.6	29.4	52.0	51.0	47.2	44.1	36.0	31.9	29.8	29.6	29.5	39.8	0.0	39.8
	12	40.0	52.9	29.9	52.2	51.0	47.4	44.8	35.8	32.4	30.4	30.2	29.9	40.0	0.0	40.0
	13	45.9	58.6	29.8	58.0	56.8	53.0	50.6	43.3	37.1	30.6	30.1	29.8	45.9	0.0	45.9
	14	45.3	57.1	30.4	56.6	55.3	51.8	49.9	44.8	38.9	31.3	30.8	30.5	45.3	0.0	45.3
	15	42.1	55.0	29.7	54.3	53.1	49.5	47.1	38.3	33.0	30.3	30.0	29.8	42.1	0.0	42.1
	16	42.6	56.2	29.9	55.6	54.2	49.8	46.3	37.6	32.9	30.6	30.3	30.0	42.6	0.0	42.6
	17	42.0	55.6	29.7	54.8	53.6	49.4	46.2	37.1	32.5	30.1	29.9	29.7	42.0	0.0	42.0
	18	43.3	56.9	30.8	56.2	55.0	51.0	46.9	38.5	35.2	31.7	31.4	30.9	43.3	0.0	43.3
	19	42.2	55.0	30.1	54.4	53.3	49.7	47.1	38.6	34.2	30.6	30.4	30.2	42.2	5.0	47.2
	20	35.6	47.6	29.7	46.8	45.8	41.7	38.8	33.6	31.5	30.2	30.0	29.8	35.6	5.0	40.6
	21	36.5	46.1	29.4	45.4	44.4	41.6	40.0	37.1	34.3	30.0	29.7	29.4	36.5	5.0	41.5
Night	22	35.9	49.2	28.9	48.6	47.3	42.1	38.1	32.0	30.3	29.2	29.1	28.9	35.9	10.0	45.9
	23	32.9	45.6	28.6	45.1	43.5	39.1	35.3	29.1	28.8	28.7	28.7	28.6	32.9	10.0	42.9

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	35.6	46.1	29.4	45.4	44.4	41.6	38.8	33.6	31.0	29.7	29.6	29.4
	Max	50.7	61.9	33.2	61.3	60.3	57.2	55.3	50.7	45.2	35.2	34.2	33.4
Energy Average		43.6	Average:		54.0	52.8	49.0	46.2	38.7	34.4	30.7	30.4	30.1
Night	Min	28.6	30.4	28.3	30.1	29.9	29.1	28.7	28.5	28.4	28.4	28.3	28.3
	Max	52.6	68.1	35.3	64.5	63.3	61.0	58.4	44.3	40.3	36.5	36.2	35.4
Energy Average		44.8	Average:		46.8	45.7	42.0	38.8	32.8	30.2	29.6	29.5	29.4

24-Hour CNEL	Leq (dBA) Daytime (7am-10pm)	Leq (dBA) Nighttime (10pm-7am)
51.1	**43.6**	**44.8**

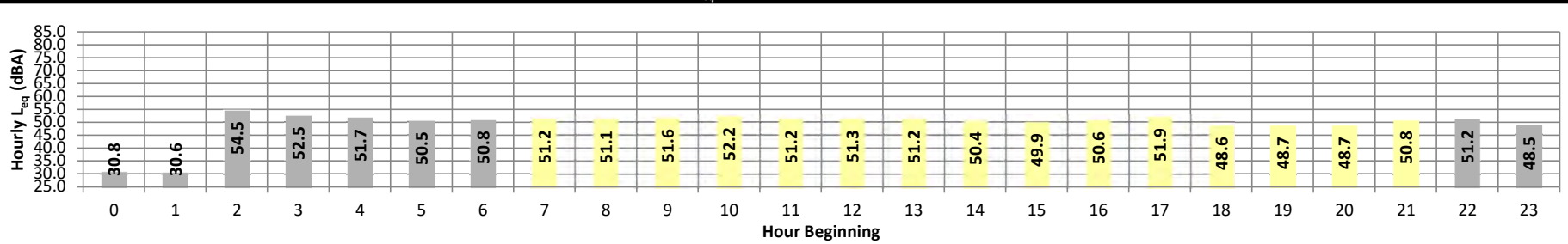
URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Date: Thursday, October 12, 2023 *Location:* L4 - Located south of the site near the Vista Del Sol Apartments *Meter:* Piccolo II *JN:* 15669

Project: Second Street Housing *Source:* at 923 W 5th Street *Analyst:* B.Maddux

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	30.8	34.5	30.2	34.0	33.4	32.6	31.9	30.5	30.4	30.3	30.3	30.2	30.8	10.0	40.8
	1	30.6	32.9	30.3	32.1	31.4	30.8	30.7	30.6	30.5	30.4	30.4	30.3	30.6	10.0	40.6
	2	54.5	76.5	37.3	67.1	64.8	59.6	55.4	48.6	41.2	38.4	38.1	37.6	54.5	10.0	64.5
	3	52.5	61.8	49.7	58.0	56.9	55.5	54.9	53.0	51.5	50.3	50.2	49.9	52.5	10.0	62.5
	4	51.7	62.1	49.6	57.4	55.9	54.0	53.2	51.6	51.0	50.2	50.1	49.9	51.7	10.0	61.7
	5	50.5	53.0	49.7	51.5	51.2	51.0	50.9	50.6	50.4	50.1	50.0	49.9	50.5	10.0	60.5
	6	50.8	55.8	49.9	54.2	53.5	51.6	51.2	50.8	50.6	50.3	50.2	50.1	50.8	10.0	60.8
Day	7	51.2	58.3	49.9	56.8	55.6	52.8	52.0	51.1	50.7	50.4	50.3	50.1	51.2	0.0	51.2
	8	51.1	56.7	50.2	54.1	53.2	51.8	51.5	51.1	51.0	50.7	50.6	50.5	51.1	0.0	51.1
	9	51.6	57.1	50.7	54.6	53.9	51.9	51.8	51.6	51.4	51.1	51.0	50.9	51.6	0.0	51.6
	10	52.2	59.9	50.4	57.5	55.4	54.4	53.9	52.6	51.2	50.8	50.7	50.6	52.2	0.0	52.2
	11	51.2	58.1	50.0	54.7	53.0	52.2	51.9	51.3	51.0	50.5	50.4	50.2	51.2	0.0	51.2
	12	51.3	62.8	49.4	55.8	54.3	53.1	52.5	51.3	50.6	50.0	49.8	49.7	51.3	0.0	51.3
	13	51.2	58.9	49.3	56.3	55.3	53.5	52.9	51.4	50.5	49.8	49.7	49.5	51.2	0.0	51.2
	14	50.4	55.9	49.1	53.8	53.0	51.7	51.4	50.6	50.2	49.6	49.5	49.4	50.4	0.0	50.4
	15	49.9	55.6	48.7	52.5	51.8	51.0	50.7	50.1	49.7	49.2	49.1	48.9	49.9	0.0	49.9
	16	50.6	64.3	48.6	56.9	55.2	52.9	51.9	50.3	49.7	49.1	49.0	48.8	50.6	0.0	50.6
	17	51.9	73.2	46.0	63.5	58.3	52.2	50.5	48.4	47.7	46.9	46.7	46.4	51.9	0.0	51.9
	18	48.6	56.2	46.4	54.2	53.2	50.7	49.9	48.7	48.0	47.2	47.1	46.8	48.6	0.0	48.6
	19	48.7	57.0	46.2	53.5	52.3	51.1	50.4	49.0	48.1	47.1	46.9	46.6	48.7	5.0	53.7
	20	48.7	55.9	46.0	53.3	52.4	51.3	50.7	49.1	48.1	46.9	46.7	46.4	48.7	5.0	53.7
	21	50.8	64.2	46.3	59.5	57.8	55.4	54.0	50.4	48.3	47.1	46.9	46.6	50.8	5.0	55.8
Night	22	51.2	66.4	46.6	60.2	58.4	55.8	54.2	50.3	48.4	47.3	47.2	46.9	51.2	10.0	61.2
	23	48.5	59.1	46.4	54.2	52.9	51.1	50.2	48.4	47.7	47.1	46.9	46.7	48.5	10.0	58.5

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	48.6	55.6	46.0	52.5	51.8	50.7	49.9	48.4	47.7	46.9	46.7	46.4
	Max	52.2	73.2	50.7	63.5	58.3	55.4	54.0	52.6	51.4	51.1	51.0	50.9
Energy Average		50.8	Average:		55.8	54.3	52.4	51.7	50.5	49.7	49.1	49.0	48.8
Night	Min	30.6	32.9	30.2	32.1	31.4	30.8	30.7	30.5	30.4	30.3	30.3	30.2
	Max	54.5	76.5	49.9	67.1	64.8	59.6	55.4	53.0	51.5	50.3	50.2	50.1
Energy Average		50.6	Average:		52.1	50.9	49.1	48.1	46.1	44.6	43.8	43.7	43.5

24-Hour CNEL	Leq (dBA) Daytime (7am-10pm)	Leq (dBA) Nighttime (10pm-7am)
57.3	**50.8**	**50.6**

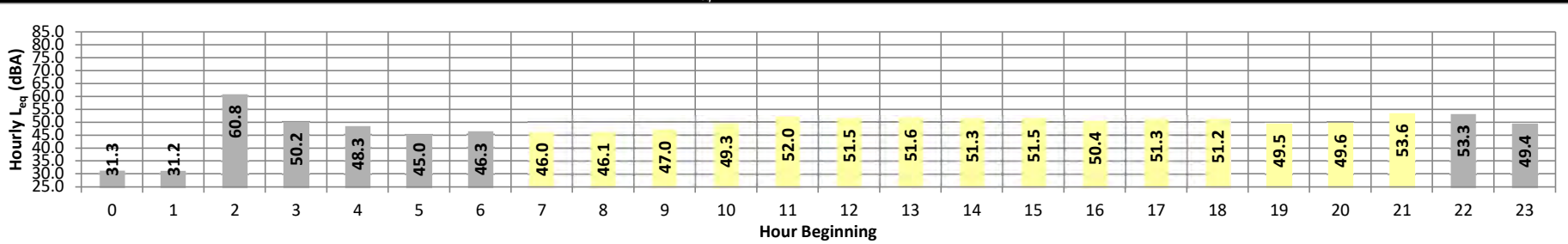
URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Date: Thursday, October 12, 2023 *Location:* L5 - Located West of the site near the residence at 1001 W 5th *Meter:* Piccolo II *JN:* 15669

Project: Second Street Housing *Source:* Street *Analyst:* B.Maddux

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	31.3	34.5	30.8	34.0	33.7	32.7	32.0	31.2	31.1	30.9	30.9	30.9	31.3	10.0	41.3
	1	31.2	33.1	30.9	32.4	31.9	31.4	31.3	31.2	31.1	31.0	31.0	30.9	31.2	10.0	41.2
	2	60.8	81.0	35.6	75.3	71.7	65.9	60.8	49.7	44.7	39.6	38.2	36.8	60.8	10.0	70.8
	3	50.2	63.1	46.6	57.4	54.9	52.3	51.7	50.4	49.2	47.7	47.5	47.1	50.2	10.0	60.2
	4	48.3	54.4	46.4	50.4	49.8	49.3	49.1	48.6	48.1	47.4	47.2	46.9	48.3	10.0	58.3
	5	45.0	46.9	43.2	46.3	46.1	45.9	45.8	45.3	45.0	44.2	44.0	43.7	45.0	10.0	55.0
	6	46.3	52.9	43.6	51.8	50.9	49.0	47.8	46.2	45.7	44.8	44.5	44.1	46.3	10.0	56.3
Day	7	46.0	53.6	43.3	52.3	51.1	49.0	47.6	45.9	45.3	44.4	44.2	43.9	46.0	0.0	46.0
	8	46.1	54.8	44.0	50.0	48.8	47.3	46.9	46.3	45.9	45.1	44.9	44.5	46.1	0.0	46.1
	9	47.0	49.5	45.1	48.6	48.3	48.0	47.8	47.3	46.9	46.2	46.0	45.7	47.0	0.0	47.0
	10	49.3	51.9	47.6	51.2	50.9	50.4	50.1	49.6	49.2	48.6	48.4	48.1	49.3	0.0	49.3
	11	52.0	67.0	49.0	59.5	56.0	53.2	52.6	51.6	51.1	50.1	49.9	49.5	52.0	0.0	52.0
	12	51.5	66.6	46.6	60.6	57.6	54.6	53.4	51.1	49.7	47.9	47.6	47.2	51.5	0.0	51.5
	13	51.6	65.9	47.1	58.3	56.5	54.7	53.8	51.8	50.3	48.5	48.1	47.7	51.6	0.0	51.6
	14	51.3	61.9	48.5	55.4	54.3	53.3	52.8	51.7	50.9	49.7	49.4	49.0	51.3	0.0	51.3
	15	51.5	67.6	47.4	61.1	57.2	53.2	52.3	50.9	50.1	48.6	48.3	47.9	51.5	0.0	51.5
	16	50.4	65.2	46.5	59.1	55.8	52.5	51.6	50.1	49.1	47.8	47.5	47.1	50.4	0.0	50.4
	17	51.3	68.9	47.1	60.7	56.8	52.6	51.4	50.0	49.3	48.3	48.0	47.6	51.3	0.0	51.3
	18	51.2	68.6	46.4	62.7	58.2	52.1	51.0	49.5	48.6	47.6	47.3	46.9	51.2	0.0	51.2
	19	49.5	65.8	44.2	59.0	55.7	52.2	50.9	49.0	47.6	45.8	45.5	44.9	49.5	5.0	54.5
	20	49.6	63.1	44.2	58.0	55.8	52.7	51.9	49.8	48.2	46.0	45.6	45.0	49.6	5.0	54.6
	21	53.6	68.4	43.9	64.1	62.1	59.3	57.7	53.0	49.0	45.5	45.2	44.6	53.6	5.0	58.6
Night	22	53.3	68.3	44.2	63.6	61.7	59.1	57.5	52.7	49.0	45.7	45.4	44.9	53.3	10.0	63.3
	23	49.4	64.4	44.0	59.0	56.5	53.4	52.0	48.6	46.9	45.4	45.1	44.7	49.4	10.0	59.4

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	46.0	49.5	43.3	48.6	48.3	47.3	46.9	45.9	45.3	44.4	44.2	43.9
	Max	53.6	68.9	49.0	64.1	62.1	59.3	57.7	53.0	51.1	50.1	49.9	49.5
Energy Average		50.6	Average:		57.4	55.0	52.3	51.5	49.8	48.7	47.3	47.1	46.6
Night	Min	31.2	33.1	30.8	32.4	31.9	31.4	31.3	31.2	31.1	30.9	30.9	30.9
	Max	60.8	81.0	46.6	75.3	71.7	65.9	60.8	52.7	49.2	47.7	47.5	47.1
Energy Average		52.9	Average:		52.2	50.8	48.8	47.5	44.9	43.4	41.9	41.6	41.1

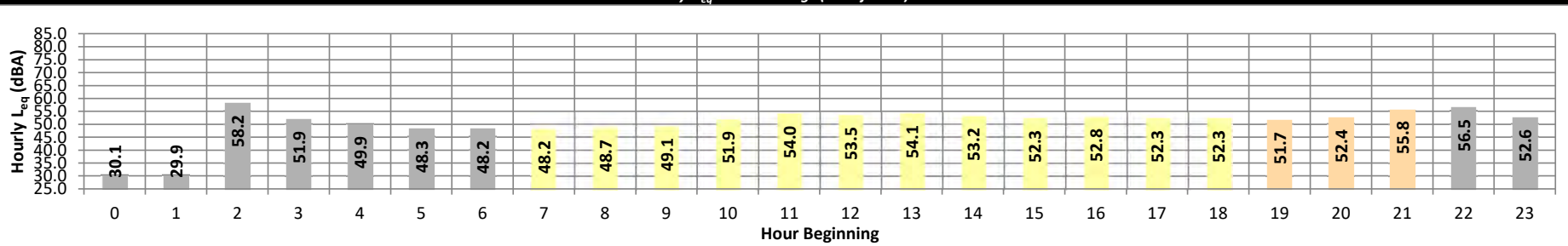
24-Hour CNEL	Leq (dBA) Daytime (7am-10pm)	Leq (dBA) Nighttime (10pm-7am)
59.3	**50.6**	**52.9**

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Date: Thursday, October 12, 2023
Project: Second Street Housing
Location: L5 - Located southwest of the site near the residence at 1001 W 5th Street
Meter: Piccolo II
JN: 15669
Analyst: B.Maddux

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	30.1	31.1	29.6	31.0	30.9	30.8	30.7	30.4	30.0	29.8	29.7	29.6	30.1	10.0	40.1
	1	29.9	30.5	29.6	30.4	30.3	30.3	30.2	29.9	29.8	29.7	29.7	29.6	29.9	10.0	39.9
	2	58.2	72.5	38.0	70.8	69.1	66.0	63.7	54.3	47.9	41.3	40.1	38.6	58.2	10.0	68.2
	3	51.9	59.6	48.3	58.6	57.3	55.1	54.2	52.4	51.1	49.3	49.0	48.6	51.9	10.0	61.9
	4	49.9	54.1	47.7	53.3	52.4	51.5	51.1	50.4	49.8	48.6	48.4	48.0	49.9	10.0	59.9
	5	48.3	49.3	47.1	49.1	49.0	48.9	48.8	48.5	48.2	47.7	47.6	47.4	48.3	10.0	58.3
	6	48.2	50.6	46.8	50.3	50.0	49.3	49.1	48.4	48.0	47.5	47.3	47.1	48.2	10.0	58.2
Day	7	48.2	50.6	46.8	50.3	50.1	49.8	49.4	48.5	48.0	47.4	47.3	47.0	48.2	0.0	48.2
	8	48.7	51.7	47.3	51.1	50.6	49.7	49.4	48.9	48.5	47.9	47.8	47.5	48.7	0.0	48.7
	9	49.1	50.5	47.7	50.3	50.2	50.0	49.8	49.4	49.1	48.4	48.2	48.0	49.1	0.0	49.1
	10	51.9	53.4	50.3	53.2	53.1	52.9	52.7	52.3	51.9	51.0	50.9	50.6	51.9	0.0	51.9
	11	54.0	62.2	51.2	61.0	59.4	56.7	55.5	54.1	53.4	52.1	51.9	51.5	54.0	0.0	54.0
	12	53.5	62.4	48.8	61.6	60.5	58.0	56.5	53.6	52.0	49.9	49.6	49.1	53.5	0.0	53.5
	13	54.1	63.1	49.1	61.9	60.6	58.4	57.2	54.3	52.6	50.4	50.0	49.5	54.1	0.0	54.1
	14	53.2	61.8	50.0	60.7	58.7	55.9	54.9	53.3	52.4	51.1	50.8	50.4	53.2	0.0	53.2
	15	52.3	61.8	48.4	60.6	59.0	55.9	54.4	52.3	51.2	49.7	49.3	48.8	52.3	0.0	52.3
	16	52.8	65.1	47.9	63.7	61.4	57.1	55.2	51.9	50.7	49.1	48.8	48.3	52.8	0.0	52.8
	17	52.3	63.3	48.4	62.0	60.1	55.7	53.7	51.7	50.8	49.5	49.2	48.8	52.3	0.0	52.3
	18	52.3	62.7	48.1	61.9	60.6	57.0	55.0	51.5	50.5	49.2	48.9	48.4	52.3	0.0	52.3
Evening	19	51.7	60.7	47.3	59.8	58.6	55.8	54.4	51.7	50.3	48.6	48.2	47.7	51.7	5.0	56.7
	20	52.4	63.7	47.3	62.4	60.2	56.3	54.9	52.3	50.6	48.5	48.1	47.6	52.4	5.0	57.4
	21	55.8	67.0	47.0	66.0	64.6	61.8	60.3	55.8	51.6	48.0	47.7	47.3	55.8	5.0	60.8
Night	22	56.5	68.6	48.7	67.4	65.8	62.2	60.5	56.0	52.6	49.6	49.3	49.0	56.5	10.0	66.5
	23	52.6	62.4	48.9	61.3	59.6	56.9	55.5	52.4	50.7	49.6	49.4	49.1	52.6	10.0	62.6

Timeframe	Hour	L_{eq}	L_{max}	L_{min}	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day (7am-7pm)	Min	48.2	50.5	46.8	50.3	50.1	49.7	49.4	48.5	48.0	47.4	47.3	47.0
	Max	54.1	65.1	51.2	63.7	61.4	58.4	57.2	54.3	53.4	52.1	51.9	51.5
Energy Average		52.3	Average:		58.2	57.0	54.8	53.7	51.8	50.9	49.7	49.4	49.0
Evening (7pm-10pm)	Min	51.7	60.7	47.0	59.8	58.6	55.8	54.4	51.7	50.3	48.0	47.7	47.3
	Max	55.8	67.0	47.3	66.0	64.6	61.8	60.3	55.8	51.6	48.6	48.2	47.7
Energy Average		53.7	Average:		62.7	61.1	58.0	56.5	53.2	50.9	48.4	48.0	47.5
Night (10pm-7am)	Min	29.9	30.5	29.6	30.4	30.3	30.3	30.2	29.9	29.8	29.7	29.7	29.6
	Max	58.2	72.5	48.9	70.8	69.1	66.0	63.7	56.0	52.6	49.6	49.4	49.1
Energy Average		52.7	Average:		52.5	51.6	50.1	49.3	47.0	45.4	43.7	43.4	43.0

L_{eq} (dBA)		
24-Hour	*Daytime (7am-10pm)*	*Nighttime (10pm-7am)*
52.6	**52.6**	**52.7**

24-Hour CNEL (dBA)

59.4

URBAN CROSSROADS

APPENDIX 8.1:

ON-SITE TRAFFIC NOISE MODEL

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FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Backyard No Wall
Road Name: SR-91
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	150.0	feet
Centerline Dist. to Observer:	349.0	feet
Barrier Distance to Observer:	199.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	276.507
Medium Trucks:	276.469
Heavy Trucks:	276.478

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-11.24	-1.20	*-0.02*	0.000	0.000
Medium Trucks:	81.71	-4.23	-11.24	-1.20	*-0.11*	0.000	0.000
Heavy Trucks:	85.21	-2.90	-11.24	-1.20	*-0.41*	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:	74.6	72.7	71.0	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.5	71.4	66.6	75.2	75.7

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	74.6	72.7	71.0	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.5	71.4	66.6	75.2	75.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Backyard No Wall
Road Name: 2nd Street
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,330 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	12 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	45.0 feet
Centerline Dist. to Observer:	55.0 feet
Barrier Distance to Observer:	10.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	1.0%

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	48.888
Medium Trucks:	48.706
Heavy Trucks:	48.724

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	0.04	-1.20	*-0.91*	0.000	0.000
Medium Trucks:	74.83	-14.42	0.07	-1.20	*-1.15*	0.000	0.000
Heavy Trucks:	80.05	-18.38	0.06	-1.20	*-1.86*	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:	66.8	64.9	63.1	57.0	65.7	66.3
Medium Trucks:	59.3	57.8	51.4	49.9	58.3	58.6
Heavy Trucks:	60.5	59.1	50.1	51.3	59.7	59.8
Vehicle Noise:	68.3	66.5	63.6	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:	66.8	64.9	63.1	57.0	65.7	66.3
Medium Trucks:	59.3	57.8	51.4	49.9	58.3	58.6
Heavy Trucks:	60.5	59.1	50.1	51.3	59.7	59.8
Vehicle Noise:	68.3	66.5	63.6	58.7	67.2	67.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Backyard No Wall
Road Name: SR-91
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	370.0	feet
Centerline Dist. to Observer:	480.0	feet
Barrier Distance to Observer:	110.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	409.909
Medium Trucks:	409.883
Heavy Trucks:	409.889

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-13.81	-1.20	*-0.08*	0.000	0.000
Medium Trucks:	81.71	-4.23	-13.81	-1.20	*-0.12*	0.000	0.000
Heavy Trucks:	85.21	-2.90	-13.81	-1.20	*-0.20*	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:	72.1	70.2	68.4	62.3	71.0	71.6
Medium Trucks:	62.5	61.0	54.6	53.1	61.5	61.8
Heavy Trucks:	67.3	65.9	56.8	58.1	66.5	66.6
Vehicle Noise:	73.7	71.9	68.9	64.1	72.6	73.1

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	72.1	70.2	68.4	62.3	71.0	71.6
Medium Trucks:	62.5	61.0	54.6	53.1	61.5	61.8
Heavy Trucks:	67.3	65.9	56.8	58.1	66.5	66.6
Vehicle Noise:	73.7	71.9	68.9	64.1	72.6	73.1

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Backyard No Wall
Road Name: 2nd Street
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,330 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	12 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	55.0 feet
Centerline Dist. to Observer:	140.0 feet
Barrier Distance to Observer:	85.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	1.0%

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	133.959
Medium Trucks:	133.893
Heavy Trucks:	133.899

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	-6.52	-1.20	*-0.05*	0.000	0.000
Medium Trucks:	74.83	-14.42	-6.52	-1.20	*-0.17*	0.000	0.000
Heavy Trucks:	80.05	-18.38	-6.52	-1.20	*-0.75*	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:	60.2	58.3	56.5	50.5	59.1	59.7
Medium Trucks:	52.7	51.2	44.8	43.3	51.7	52.0
Heavy Trucks:	53.9	52.5	43.5	44.7	53.1	53.2
Vehicle Noise:	61.7	59.9	57.0	52.1	60.7	61.1

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	60.2	58.3	56.5	50.5	59.1	59.7
Medium Trucks:	52.7	51.2	44.8	43.3	51.7	52.0
Heavy Trucks:	53.9	52.5	43.5	44.7	53.1	53.2
Vehicle Noise:	61.7	59.9	57.0	52.1	60.7	61.1

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Backyard With Wall
Road Name: SR-91
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	150.0	feet
Centerline Dist. to Observer:	349.0	feet
Barrier Distance to Observer:	199.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	276.507
Medium Trucks:	276.469
Heavy Trucks:	276.478

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-11.24	-1.20	*-0.02*	0.000	0.000
Medium Trucks:	81.71	-4.23	-11.24	-1.20	*-0.11*	0.000	0.000
Heavy Trucks:	85.21	-2.90	-11.24	-1.20	*-0.41*	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:	74.6	72.7	71.0	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.5	71.4	66.6	75.2	75.7

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	74.6	72.7	71.0	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.5	71.4	66.6	75.2	75.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Backyard With Wall
Road Name: 2nd Street
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	2,330	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	12	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	45.0	feet
Centerline Dist. to Observer:	55.0	feet
Barrier Distance to Observer:	10.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	48.888
Medium Trucks:	48.706
Heavy Trucks:	48.724

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	0.04	-1.20	*-0.91*	0.000	0.000
Medium Trucks:	74.83	-14.42	0.07	-1.20	*-1.15*	0.000	0.000
Heavy Trucks:	80.05	-18.38	0.06	-1.20	*-1.86*	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:	66.8	64.9	63.1	57.0	65.7	66.3
Medium Trucks:	59.3	57.8	51.4	49.9	58.3	58.6
Heavy Trucks:	60.5	59.1	50.1	51.3	59.7	59.8
Vehicle Noise:	68.3	66.5	63.6	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:	66.8	64.9	63.1	57.0	65.7	66.3
Medium Trucks:	59.3	57.8	51.4	49.9	58.3	58.6
Heavy Trucks:	60.5	59.1	50.1	51.3	59.7	59.8
Vehicle Noise:	68.3	66.5	63.6	58.7	67.2	67.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Backyard With Wall
Road Name: SR-91
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**35.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	370.0	feet
Centerline Dist. to Observer:	480.0	feet
Barrier Distance to Observer:	110.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	414.059
Medium Trucks:	413.727
Heavy Trucks:	413.231

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-13.87	-1.20	*5.86*	-15.816	-18.816
Medium Trucks:	81.71	-4.23	-13.87	-1.20	*5.57*	-15.642	-18.642
Heavy Trucks:	85.21	-2.90	-13.86	-1.20	*5.09*	-15.354	-18.354

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	72.0	70.1	68.3	62.3	70.9	71.5
Medium Trucks:	62.4	60.9	54.5	53.0	61.5	61.7
Heavy Trucks:	67.3	65.8	56.8	58.0	66.4	66.5
Vehicle Noise:	73.6	71.8	68.8	64.0	72.6	73.0

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	56.2	54.3	52.5	46.5	55.1	55.7
Medium Trucks:	46.8	45.3	38.9	37.4	45.8	46.0
Heavy Trucks:	51.9	50.5	41.4	42.7	51.0	51.2
Vehicle Noise:	57.9	56.2	53.0	48.3	56.9	57.3

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Backyard With Wall
Road Name: 2nd Street
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	2,330	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	12	feet

Site Data

Barrier Height:	**35.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	55.0	feet
Centerline Dist. to Observer:	140.0	feet
Barrier Distance to Observer:	85.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	150.055
Medium Trucks:	148.743
Heavy Trucks:	145.760

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	-7.26	-1.20	*15.91*	-17.809	-20.809
Medium Trucks:	74.83	-14.42	-7.21	-1.20	*14.70*	-17.664	-20.664
Heavy Trucks:	80.05	-18.38	-7.07	-1.20	*11.79*	-17.315	-20.315

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.5	57.6	55.8	49.7	58.4	59.0
Medium Trucks:	52.0	50.5	44.1	42.6	51.0	51.3
Heavy Trucks:	53.4	52.0	42.9	44.2	52.5	52.7
Vehicle Noise:	61.0	59.2	56.3	51.4	60.0	60.4

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	41.7	39.8	38.0	31.9	40.6	41.2
Medium Trucks:	34.3	32.8	26.5	24.9	33.4	33.6
Heavy Trucks:	36.1	34.7	25.6	26.9	35.2	35.4
Vehicle Noise:	43.3	41.5	38.5	33.7	42.3	42.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: First Floor With Wall
Road Name: SR-91
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	150.0	feet
Centerline Dist. to Observer:	349.0	feet
Barrier Distance to Observer:	199.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	276.507
Medium Trucks:	276.469
Heavy Trucks:	276.478

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-11.24	-1.20	*-0.02*	0.000	0.000
Medium Trucks:	81.71	-4.23	-11.24	-1.20	*-0.11*	0.000	0.000
Heavy Trucks:	85.21	-2.90	-11.24	-1.20	*-0.41*	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:	74.6	72.7	71.0	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.5	71.4	66.6	75.2	75.7

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	74.6	72.7	71.0	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.5	71.4	66.6	75.2	75.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: First Floor With Wall
Road Name: 2nd Street
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,330 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	12 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	45.0 feet
Centerline Dist. to Observer:	55.0 feet
Barrier Distance to Observer:	10.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	1.0%

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	48.888
Medium Trucks:	48.706
Heavy Trucks:	48.724

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	0.04	-1.20	*-0.91*	0.000	0.000
Medium Trucks:	74.83	-14.42	0.07	-1.20	*-1.15*	0.000	0.000
Heavy Trucks:	80.05	-18.38	0.06	-1.20	*-1.86*	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:	66.8	64.9	63.1	57.0	65.7	66.3
Medium Trucks:	59.3	57.8	51.4	49.9	58.3	58.6
Heavy Trucks:	60.5	59.1	50.1	51.3	59.7	59.8
Vehicle Noise:	68.3	66.5	63.6	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:	66.8	64.9	63.1	57.0	65.7	66.3
Medium Trucks:	59.3	57.8	51.4	49.9	58.3	58.6
Heavy Trucks:	60.5	59.1	50.1	51.3	59.7	59.8
Vehicle Noise:	68.3	66.5	63.6	58.7	67.2	67.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: First Floor With Wall
Road Name: SR-91
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**35.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	370.0	feet
Centerline Dist. to Observer:	480.0	feet
Barrier Distance to Observer:	110.0	feet
Observer Height (Above Pad):	5.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	414.059
Medium Trucks:	413.727
Heavy Trucks:	413.231

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-13.87	-1.20	*5.86*	-15.816	-18.816
Medium Trucks:	81.71	-4.23	-13.87	-1.20	*5.57*	-15.642	-18.642
Heavy Trucks:	85.21	-2.90	-13.86	-1.20	*5.09*	-15.354	-18.354

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	72.0	70.1	68.3	62.3	70.9	71.5
Medium Trucks:	62.4	60.9	54.5	53.0	61.5	61.7
Heavy Trucks:	67.3	65.8	56.8	58.0	66.4	66.5
Vehicle Noise:	73.6	71.8	68.8	64.0	72.6	73.0

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	56.2	54.3	52.5	46.5	55.1	55.7
Medium Trucks:	46.8	45.3	38.9	37.4	45.8	46.0
Heavy Trucks:	51.9	50.5	41.4	42.7	51.0	51.2
Vehicle Noise:	57.9	56.2	53.0	48.3	56.9	57.3

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: First Floor With Wall
Road Name: 2nd Street
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,330 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	12 feet

Site Data

Barrier Height:	**35.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	55.0 feet
Centerline Dist. to Observer:	140.0 feet
Barrier Distance to Observer:	85.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	1.0%

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	150.055
Medium Trucks:	148.743
Heavy Trucks:	145.760

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	-7.26	-1.20	*15.91*	-17.809	-20.809
Medium Trucks:	74.83	-14.42	-7.21	-1.20	*14.70*	-17.664	-20.664
Heavy Trucks:	80.05	-18.38	-7.07	-1.20	*11.79*	-17.315	-20.315

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.5	57.6	55.8	49.7	58.4	59.0
Medium Trucks:	52.0	50.5	44.1	42.6	51.0	51.3
Heavy Trucks:	53.4	52.0	42.9	44.2	52.5	52.7
Vehicle Noise:	61.0	59.2	56.3	51.4	60.0	60.4

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	41.7	39.8	38.0	31.9	40.6	41.2
Medium Trucks:	34.3	32.8	26.5	24.9	33.4	33.6
Heavy Trucks:	36.1	34.7	25.6	26.9	35.2	35.4
Vehicle Noise:	43.3	41.5	38.5	33.7	42.3	42.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Second Floor With Wall
Road Name: SR-91
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	150.0	feet
Centerline Dist. to Observer:	349.0	feet
Barrier Distance to Observer:	199.0	feet
Observer Height (Above Pad):	14.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	276.816
Medium Trucks:	276.682
Heavy Trucks:	276.527

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-11.25	-1.20	*-0.14*	0.000	0.000
Medium Trucks:	81.71	-4.23	-11.25	-1.20	*-0.32*	0.000	0.000
Heavy Trucks:	85.21	-2.90	-11.24	-1.20	*-0.79*	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:	74.6	72.7	70.9	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.5	71.4	66.6	75.2	75.7

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	74.6	72.7	70.9	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.5	71.4	66.6	75.2	75.7

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Second Floor With Wall
Road Name: 2nd Street
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,330 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	12 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	45.0 feet
Centerline Dist. to Observer:	55.0 feet
Barrier Distance to Observer:	10.0 feet
Observer Height (Above Pad):	14.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	1.0%

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	50.606
Medium Trucks:	50.020
Heavy Trucks:	48.999

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	-0.18	-1.20	*-5.13*	0.000	0.000
Medium Trucks:	74.83	-14.42	-0.11	-1.20	*-5.77*	0.000	0.000
Heavy Trucks:	80.05	-18.38	0.03	-1.20	*-7.49*	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:	59.1	57.6	51.2	49.7	58.1	58.4
Heavy Trucks:	60.5	59.1	50.0	51.3	59.6	59.8
Vehicle Noise:	68.1	66.3	63.4	58.5	67.1	67.5

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:	59.1	57.6	51.2	49.7	58.1	58.4
Heavy Trucks:	60.5	59.1	50.0	51.3	59.6	59.8
Vehicle Noise:	68.1	66.3	63.4	58.5	67.1	67.5

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Second Floor With Wall
Road Name: SR-91
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**35.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	370.0	feet
Centerline Dist. to Observer:	480.0	feet
Barrier Distance to Observer:	110.0	feet
Observer Height (Above Pad):	14.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	412.028
Medium Trucks:	411.696
Heavy Trucks:	411.200

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-13.84	-1.20	*3.67*	-14.270	-17.270
Medium Trucks:	81.71	-4.23	-13.84	-1.20	*3.44*	-14.040	-17.040
Heavy Trucks:	85.21	-2.90	-13.83	-1.20	*3.07*	-13.670	-16.670

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	72.0	70.1	68.4	62.3	70.9	71.5
Medium Trucks:	62.4	60.9	54.6	53.0	61.5	61.7
Heavy Trucks:	67.3	65.9	56.8	58.1	66.4	66.6
Vehicle Noise:	73.6	71.9	68.8	64.1	72.6	73.1

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	57.8	55.9	54.1	48.0	56.7	57.3
Medium Trucks:	48.4	46.9	40.5	39.0	47.4	47.7
Heavy Trucks:	53.6	52.2	43.2	44.4	52.8	52.9
Vehicle Noise:	59.5	57.8	54.6	50.0	58.5	59.0

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Second Floor With Wall
Road Name: 2nd Street
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	2,330	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	12	feet

Site Data

Barrier Height:	**35.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	55.0	feet
Centerline Dist. to Observer:	140.0	feet
Barrier Distance to Observer:	85.0	feet
Observer Height (Above Pad):	14.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	147.472
Medium Trucks:	146.160
Heavy Trucks:	143.177

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	-7.15	-1.20	*12.76*	-17.431	-20.431
Medium Trucks:	74.83	-14.42	-7.09	-1.20	*11.70*	-17.304	-20.304
Heavy Trucks:	80.05	-18.38	-6.96	-1.20	*9.16*	-16.932	-19.932

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.6	57.7	55.9	49.9	58.5	59.1
Medium Trucks:	52.1	50.6	44.2	42.7	51.2	51.4
Heavy Trucks:	53.5	52.1	43.1	44.3	52.7	52.8
Vehicle Noise:	61.1	59.4	56.4	51.5	60.1	60.6

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	42.1	40.2	38.5	32.4	41.0	41.7
Medium Trucks:	34.8	33.3	26.9	25.4	33.9	34.1
Heavy Trucks:	36.6	35.2	26.1	27.4	35.7	35.9
Vehicle Noise:	43.8	42.0	39.0	34.2	42.8	43.2

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Third Floor With Wall
Road Name: SR-91
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**0.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	150.0	feet
Centerline Dist. to Observer:	349.0	feet
Barrier Distance to Observer:	199.0	feet
Observer Height (Above Pad):	23.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	277.417
Medium Trucks:	277.186
Heavy Trucks:	276.868

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-11.27	-1.20	*-0.39*	0.000	0.000
Medium Trucks:	81.71	-4.23	-11.26	-1.20	*-0.66*	0.000	0.000
Heavy Trucks:	85.21	-2.90	-11.25	-1.20	*-1.28*	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:	74.6	72.7	70.9	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.4	71.4	66.6	75.2	75.6

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	74.6	72.7	70.9	64.9	73.5	74.1
Medium Trucks:	65.0	63.5	57.2	55.6	64.1	64.3
Heavy Trucks:	69.9	68.4	59.4	60.7	69.0	69.1
Vehicle Noise:	76.2	74.4	71.4	66.6	75.2	75.6

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Third Floor With Wall
Road Name: 2nd Street
Lot No: B1 North Façade R2

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	2,330 vehicles
Vehicle Speed:	35 mph
Near/Far Lane Distance:	12 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	45.0 feet
Centerline Dist. to Observer:	55.0 feet
Barrier Distance to Observer:	10.0 feet
Observer Height (Above Pad):	23.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	1.0%

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	53.796
Medium Trucks:	52.855
Heavy Trucks:	50.890

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	-0.58	-1.20	*-9.74*	0.000	0.000
Medium Trucks:	74.83	-14.42	-0.47	-1.20	*-10.72*	0.000	0.000
Heavy Trucks:	80.05	-18.38	-0.22	-1.20	*-13.36*	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	62.5	56.4	65.0	65.7
Medium Trucks:	58.7	57.2	50.9	49.3	57.8	58.0
Heavy Trucks:	60.2	58.8	49.8	51.0	59.4	59.5
Vehicle Noise:	67.7	66.0	63.0	58.1	66.7	67.2

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	66.1	64.2	62.5	56.4	65.0	65.7
Medium Trucks:	58.7	57.2	50.9	49.3	57.8	58.0
Heavy Trucks:	60.2	58.8	49.8	51.0	59.4	59.5
Vehicle Noise:	67.7	66.0	63.0	58.1	66.7	67.2

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Third Floor With Wall
Road Name: SR-91
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	#######	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	33,300	vehicles
Vehicle Speed:	65	mph
Near/Far Lane Distance:	130	feet

Site Data

Barrier Height:	**35.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	370.0	feet
Centerline Dist. to Observer:	480.0	feet
Barrier Distance to Observer:	110.0	feet
Observer Height (Above Pad):	23.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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%	94.10%
Medium Trucks:	84.8%	4.9%	10.3%	2.50%
Heavy Trucks:	86.5%	2.7%	10.8%	3.40%

Noise Source Elevations (in feet)

Autos:	0.00		
Medium Trucks:	2.97		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	410.694
Medium Trucks:	410.362
Heavy Trucks:	409.866

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	75.54	11.53	-13.82	-1.20	*1.97*	-12.240	-15.240
Medium Trucks:	81.71	-4.23	-13.82	-1.20	*1.81*	-11.920	-14.920
Heavy Trucks:	85.21	-2.90	-13.81	-1.20	*1.54*	-11.380	-14.380

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	72.0	70.1	68.4	62.3	70.9	71.6
Medium Trucks:	62.5	61.0	54.6	53.0	61.5	61.7
Heavy Trucks:	67.3	65.9	56.8	58.1	66.5	66.6
Vehicle Noise:	73.6	71.9	68.8	64.1	72.6	73.1

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.8	57.9	56.1	50.1	58.7	59.3
Medium Trucks:	50.5	49.0	42.7	41.1	49.6	49.8
Heavy Trucks:	55.9	54.5	45.5	46.7	55.1	55.2
Vehicle Noise:	61.6	59.9	56.7	52.1	60.6	61.1

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO) - v10/31/19

Scenario: Third Floor With Wall
Road Name: 2nd Street
Lot No: Pool/Common Area

Project Name: Second Street Housing
Job Number: 15670
Analyst: B. Maddux

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	23,300	vehicles
Peak Hour Percentage:	10%	
Peak Hour Volume:	2,330	vehicles
Vehicle Speed:	35	mph
Near/Far Lane Distance:	12	feet

Site Data

Barrier Height:	**35.0**	**feet**
Barrier Type (0-Wall, 1-Berm):	0.0	
Centerline Dist. to Barrier:	55.0	feet
Centerline Dist. to Observer:	140.0	feet
Barrier Distance to Observer:	85.0	feet
Observer Height (Above Pad):	23.0	feet
Pad Elevation:	0.0	feet
Road Elevation:	0.0	feet
Barrier Elevation:	0.0	feet
Road Grade:	1.0%	

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:	0.00		
Medium Trucks:	2.30		
Heavy Trucks:	8.01	*Grade Adjustment:*	0.0

Lane Equivalent Distance (in feet)

Autos:	145.759
Medium Trucks:	144.447
Heavy Trucks:	141.464

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	65.11	2.81	-7.07	-1.20	*9.88*	-17.076	-20.076
Medium Trucks:	74.83	-14.42	-7.01	-1.20	*8.97*	-16.891	-19.891
Heavy Trucks:	80.05	-18.38	-6.88	-1.20	*6.80*	-16.220	-19.220

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.7	57.8	56.0	49.9	58.6	59.2
Medium Trucks:	52.2	50.7	44.3	42.8	51.2	51.5
Heavy Trucks:	53.6	52.2	43.1	44.4	52.7	52.9
Vehicle Noise:	61.2	59.4	56.5	51.6	60.2	60.6

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	42.6	40.7	38.9	32.9	41.5	42.1
Medium Trucks:	35.3	33.8	27.4	25.9	34.3	34.6
Heavy Trucks:	37.4	35.9	26.9	28.2	36.5	36.6
Vehicle Noise:	44.3	42.6	39.5	34.7	43.3	43.7

APPENDIX 10.1:

CADNAA OPERATIONAL NOISE MODEL

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15670 - Second Street Housing LP

CadnaA Noise Prediction Model: 15670-02_Operation.cna
Date: 15.01.24
Analyst: B. Maddux

Calculation Configuration

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

Receiver Noise Levels

Name	M.	ID	Level Lr			Limit. Value			Land Use			Height		Coordinates			
			Day	Night	CNEL	Day	Night	CNEL	Type	Auto	Noise Type			X	Y	Z	
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)				(ft)		(ft)	(ft)	(ft)	
R1		R1	36.5	24.7	35.3	0.0	0.0	0.0		x	Total	5.00	a	6159025.18	2266398.70	5.00	
R2		R2	34.9	22.6	33.5	0.0	0.0	0.0		x	Total	5.00	a	6159059.04	2265926.22	5.00	
R3		R3	39.2	27.2	37.9	0.0	0.0	0.0		x	Total	5.00	a	6158699.66	2266169.28	5.00	
R4		R4	37.0	24.2	35.5	0.0	0.0	0.0		x	Total	5.00	a	6158463.67	2265695.58	5.00	
R5		R5	39.1	25.4	37.3	0.0	0.0	0.0		x	Total	5.00	a	6157883.72	2265824.75	5.00	
R6		R6	36.4	24.8	35.2	0.0	0.0	0.0		x	Total	5.00	a	6158856.07	2267049.31	5.00	

Point Source(s)

Name	M.	ID	Result. PWL			Lw / Li			Operating Time			Height		Coordinates		
			Day	Evening	Night	Type	Value	norm.	Day	Special	Night			X	Y	Z
			(dBA)	(dBA)	(dBA)			dB(A)	(min)	(min)	(min)	(ft)		(ft)	(ft)	(ft)
TRASH1		TRASH1	88.9	88.9	88.9	Lw	88.9		150.00	0.00	90.00	8.00	a	6158281.71	2266566.70	8.00
OUTDOOR1		OUTDOOR1	95.1	95.1	95.1	Lw	95.1		900.00	0.00	0.00	5.00	a	6158133.06	2266480.77	5.00
OUTDOOR2		OUTDOOR2	95.1	95.1	95.1	Lw	95.1		900.00	0.00	0.00	5.00	a	6158024.12	2266501.60	5.00
AC01		AC01	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158074.47	2266480.11	3.00
AC02		AC02	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158077.94	2266480.98	3.00
AC03		AC03	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158081.19	2266482.72	3.00
AC04		AC04	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158087.27	2266484.45	3.00
AC05		AC05	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158090.09	2266485.76	3.00
AC06		AC06	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158093.35	2266486.84	3.00
AC07		AC07	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158121.34	2266495.96	3.00
AC08		AC08	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158125.25	2266497.26	3.00
AC09		AC09	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158128.50	2266498.34	3.00
AC10		AC10	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158144.78	2266504.42	3.00
AC11		AC11	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158147.82	2266505.29	3.00

Name	M.	ID	Result. PWL			Lw / Li			Operating Time			Height		Coordinates		
			Day	Evening	Night	Type	Value	norm.	Day	Special	Night			X	Y	Z
			(dBA)	(dBA)	(dBA)			dB(A)	(min)	(min)	(min)	(ft)		(ft)	(ft)	(ft)
AC12		AC12	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158150.64	2266506.37	3.00
AC13		AC13	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158051.68	2266540.23	3.00
AC14		AC14	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158054.72	2266541.10	3.00
AC15		AC15	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158057.76	2266542.18	3.00
AC16		AC16	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158064.05	2266544.57	3.00
AC17		AC17	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158066.87	2266545.65	3.00
AC18		AC18	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158070.34	2266546.74	3.00
AC19		AC19	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158097.69	2266556.07	3.00
AC20		AC20	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158100.29	2266556.94	3.00
AC21		AC21	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158103.76	2266558.02	3.00
AC22		AC22	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158120.04	2266563.66	3.00
AC23		AC23	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158122.86	2266564.32	3.00
AC24		AC24	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158126.33	2266565.62	3.00
AC25		AC25	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158204.89	2266526.99	3.00
AC26		AC26	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158205.98	2266524.17	3.00
AC27		AC27	75.0	75.0	75.0	Lw	75		675.00	0.00	270.00	3.00	g	6158207.06	2266575.60	3.00

Line Source(s)

Name	M.	ID	Result. PWL			Result. PWL'			Lw / Li			Operating Time			Moving Pt. Src				Height
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Special	Night	Number			Speed	
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	(min)	(min)	(min)	Day	Evening	Night	(mph)	(ft)

Name	ID	Height		Coordinates			
		Begin	End	x	y	z	Ground
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)

Area Source(s)

Name	M.	ID	Result. PWL			Result. PWL''			Lw / Li			Operating Time			Height	
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Special	Night	(ft)	
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	(min)	(min)	(min)		
PARK1		PARK1	72.4	72.4	72.4	44.9	44.9	44.9	Lw	72.4					5	a

Name	ID	Height		Coordinates			
		Begin	End	x	y	z	Ground
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
PARK1	PARK1	5.00	a	6158267.39	2266444.39	5.00	0.00
				6158228.07	2266450.12	5.00	0.00
				6158230.41	2266468.35	5.00	0.00
				6158209.32	2266472.00	5.00	0.00
				6158222.60	2266563.40	5.00	0.00
				6158287.44	2266548.56	5.00	0.00
				6158283.02	2266512.36	5.00	0.00
				6158263.48	2266514.45	5.00	0.00
				6158257.76	2266480.85	5.00	0.00
				6158272.34	2266479.29	5.00	0.00

Barrier(s)

Name	Sel.	M.	ID	Absorption		Z-Ext.	Cantilever		Height		Coordinates			
				left	right		horz.	vert.	Begin	End	x	y	z	Ground
						(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)

Building(s)

Name	Sel.	M.	ID	RB	Residents	Absorption	Height	Coordinates				
							Begin	x	y	z	Ground	
							(ft)	(ft)	(ft)	(ft)	(ft)	

Ground Absorption(s)

Name	Sel.	M.	ID	G	Coordinates	
					x	y
					(ft)	(ft)

Contour(s)

Name	Sel.	M.	ID	OnlyPts	Height		Coordinates		
					Begin	End	x	y	z
					(ft)	(ft)	(ft)	(ft)	(ft)

Vertical Area Source(s)

Name	ID	Height		Coordinates			
		Begin	End	x	y	z	Ground
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)

Rail

Name	Sel.	M.	ID	Lw'		Train Class	Correct.	Vmax
				Day	Night		Track	
				(dBA)	(dBA)		(dB)	(km(mph)

Sound Level Spectra

Name	ID	Type	Oktave Spectrum (dB)											Source
			Weight.	31.5	63	125	250	500	1000	2000	4000	8000	A	lin	

Roads

Name	Sel.	M.	ID	Lme			Count Data		exact Count Data						Speed Limit		SCS	Surface		Gradient	Mult. Reflection		
				Day	Evening	Night	DTV	Str.class.	M			p (%)			Auto	Truck	Dist.	Dstro	Type		Drefl	Hbuild	Dist.
				(dBA)	(dBA)	(dBA)			Day	Evening	Night	Day	Evening	Night	(mph)	(mph)		(dB)		(%)	(dB)	(ft)	(ft)

RoadsGeo

Name	Height				Coordinates				Dist	LSlope
	Begin		End		x	y	z	Ground	(ft)	(%)
	(ft)		(ft)		(ft)	(ft)	(ft)	(ft)		

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APPENDIX 11.1:

CADNAA CONSTRUCTION NOISE MODEL

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15670 - Second Street Housing LP

CadnaA Noise Prediction Model: 15670-02_Construction.cna
Date: 15.01.24
Analyst: B. Maddux

Calculation Configuration

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

Receiver Noise Levels

Name	M.	ID	Level Lr			Limit. Value			Land Use			Height		Coordinates		
			Day	Night	CNEL	Day	Night	CNEL	Type	Auto	Noise Type			X	Y	Z
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)				(ft)		(ft)	(ft)	(ft)
R1		R1	55.2	-44.8	52.2	0.0	0.0	0.0		x	Total	5.00	a	6159025.18	2266398.70	5.00
R2		R2	53.3	-46.7	50.3	0.0	0.0	0.0		x	Total	5.00	a	6159059.04	2265926.22	5.00
R3		R3	57.8	-42.2	54.8	0.0	0.0	0.0		x	Total	5.00	a	6158699.66	2266169.28	5.00
R4		R4	55.0	-45.0	52.0	0.0	0.0	0.0		x	Total	5.00	a	6158463.67	2265695.58	5.00
R5		R5	56.2	-43.8	53.2	0.0	0.0	0.0		x	Total	5.00	a	6157883.72	2265824.75	5.00
R6		R6	55.2	-44.8	52.2	0.0	0.0	0.0		x	Total	5.00	a	6158856.07	2267049.31	5.00

Point Source(s)

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

Line Source(s)

Name	M.	ID	Result. PWL			Result. PWL'			Lw / Li			Operating Time			Moving Pt. Src				Height	
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Special	Night	Number			Speed		
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	(min)	(min)	(min)	Day	Evening	Night	(mph)	(ft)	

Name	ID	Height		Coordinates			
		Begin	End	x	y	z	Ground
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)

Area Source(s)

Name	M.	ID	Result. PWL			Result. PWL''			Lw / Li			Operating Time			Height	
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Special	Night	(ft)	
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	(min)	(min)	(min)		
ConstructionArea		CA1	115.6	15.6	15.6	80.3	-19.7	-19.7	PWL-Pt	115.6					8	a

Name	ID	Height			Coordinates			
		Begin		End	x	y	z	Ground
		(ft)		(ft)	(ft)	(ft)	(ft)	(ft)
ConstructionArea	CA1	8.00	a		6158301.91	2266639.80	8.00	0.00
					6158276.61	2266439.69	8.00	0.00
					6158005.11	2266477.35	8.00	0.00
					6158013.54	2266542.00	8.00	0.00

Barrier(s)

Name	Sel.	M.	ID	Absorption		Z-Ext.	Cantilever		Height		Coordinates			
				left	right		horz.	vert.	Begin	End	x	y	z	Ground
						(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)

Building(s)

Name	Sel.	M.	ID	RB	Residents	Absorption	Height	Coordinates				
							Begin	x	y	z	Ground	
							(ft)	(ft)	(ft)	(ft)	(ft)	

Ground Absorption(s)

Name	Sel.	M.	ID	G	Coordinates	
					x	y
					(ft)	(ft)

Contour(s)

Name	Sel.	M.	ID	OnlyPts	Height		Coordinates		
					Begin	End	x	y	z
					(ft)	(ft)	(ft)	(ft)	(ft)

Vertical Area Source(s)

Name	ID	Height		Coordinates			
		Begin	End	x	y	z	Ground
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)

Rail

Name	Sel.	M.	ID	Lw'		Train Class	Correct.	Vmax
				Day	Night		Track	
				(dBA)	(dBA)		(dB)	(km(mph)

Sound Level Spectra

Name	ID	Type	Oktave Spectrum (dB)											Source
			Weight.	31.5	63	125	250	500	1000	2000	4000	8000	A	lin	

Roads

Name	Sel.	M.	ID	Lme			Count Data		exact Count Data						Speed Limit		SCS	Surface		Gradient	Mult. Reflection		
				Day	Evening	Night	DTV	Str.class.	M			p (%)			Auto	Truck	Dist.	Dstro	Type		Drefl	Hbuild	Dist.
				(dBA)	(dBA)	(dBA)			Day	Evening	Night	Day	Evening	Night	(mph)	(mph)		(dB)		(%)	(dB)	(ft)	(ft)

RoadsGeo

Name	Height			Coordinates				Dist	LSlope
	Begin		End	x	y	z	Ground	(ft)	(%)
	(ft)		(ft)	(ft)	(ft)	(ft)	(ft)		