DAUCHY AVENUE

NOISE IMPACT ANALYSIS

CITY OF RIVERSIDE

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
INCE	Institute of Noise Control Engineering
L_{eq}	Equivalent continuous (average) sound level
L_{max}	Maximum level measured over the time interval
L_{min}	Minimum level measured over the time interval
mph	Miles per hour
NR	Noise Reduction
Project	Dauchy Avenue
REMEL	Reference Energy Mean Emission Level
TNM	Traffic Noise Model
STC	Sound Transmission Class

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise abatement measures for the proposed Dauchy Avenue development ("Project"). The Project site is located south of Ferrari Drive, west of Dauchy Street, in the City of Riverside. The Project consists of the development of 53, detached single-family residential dwelling units in gated community. This noise impact analysis was prepared to satisfy the City of Riverside noise level standards and ensure that adequate noise abatement measures are incorporated into the Project's development. In addition, recommendations for exterior and interior noise abatement are identified based on the latest Project site plans.

EXTERIOR NOISE LEVELS

The on-site traffic noise level analysis indicates that the private outdoor living areas (backyards) for lots nearest to Ferrari Drive and Dauchy Street will experience unmitigated exterior noise levels ranging from 49.1 to 64.1 dBA CNEL. According to City of Riverside General Plan Noise Element *Noise/Land Use Noise Compatibility Criteria* for single-family residential land use, the Dauchy Avenue Project will experience unmitigated exterior noise levels that are considered *conditionally acceptable* at Lots 1, 2, 11 through 14, and 53, and all other lots would be exposed to less than 60 CNEL, which would be considered *normally acceptable*. For *conditionally acceptable* noise/land use compatibility, new construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice. Therefore, no exterior noise mitigation is required to satisfy the City of Riverside General Plan Noise Element *Noise/Land Use Noise Compatibility Criteria*.

INTERIOR NOISE LEVELS

To satisfy the City of Riverside daytime and nighttime interior noise level standards, residential units will require a Noise Reduction (NR) of up to 19.5 dBA and a windows-closed condition requiring a means of mechanical ventilation (e.g. air conditioning). The Project should provide the following or equivalent noise measures on project plans:

- Windows & Glass Doors: All windows and glass doors with well-fitted, well-weather-stripped assemblies and shall have minimum sound transmission class (STC) ratings of 27.
- Exterior Walls: At any penetrations of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar to form an airtight seal.
- Roof: Roof sheathing of wood construction shall be per manufacturer's specification or caulked plywood of at least one-half inch thick. Ceilings shall be per manufacturer's specification or well-sealed gypsum board of at least one-half inch thick. Insulation with at least a rating of R-19 shall be used in the attic space.

- Ventilation: Arrangements for any habitable room shall be such that any exterior door or window can be kept closed when the room is in use and still receive circulated air. A forced air circulation system (e.g. air conditioning) or active ventilation system (e.g. fresh air supply) shall be provided which satisfies the requirements of the Uniform Building Code.

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

OFF SITE TRAFFIC NOISE

Traffic generated by the operation of the proposed Project is not expected to meaningfully influence the traffic noise levels in surrounding off-site areas. The expected Project traffic represents an incremental increase to the existing roadway volumes, which is not expected to generate a barely perceptible noise level increase of 3 dBA CNEL at nearby sensitive land uses adjacent to study area roadways, since a doubling of the existing traffic volumes would be required to generate a 3 dBA CNEL increase. 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.

OPERATIONAL NOISE LEVELS

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. To present the potential worst-case noise conditions, this analysis assumes the Project would be operational 24 hours per day, seven days per week. Consistent with similar residential land uses, the primary noise source would be ground mounted air conditioner condensers.

OFF-SITE LOCATIONS

The Project operational noise levels at the off-site receiver locations are expected to range from 5.5 to 25.0 dBA L_{eq} during the daytime hours (7 a.m. to 10 p.m.) and are expected to range from 2.8 to 22.3 dBA L_{eq} during the nighttime hours (10 p.m. to 7 a.m.). Thus, the operational noise levels associated with the Project will satisfy the City of Riverside 55 dBA L_{eq} daytime and 45 dBA L_{eq} nighttime exterior noise level standards at all the nearby noise sensitive residential receiver locations identified in Chapter 9. Therefore, the operational noise impacts are considered *less than significant* at the nearby off-site noise-sensitive residential receiver locations.

ON-SITE LOCATIONS

The Project operational noise levels at the off-site receiver locations are expected to range from 29.6 to 48.8 dBA L_{eq} during the daytime hours (7 a.m. to 10 p.m.) and 26.9 to 39.0 dBA L_{eq} during nighttime hours (10 p.m. to 7 a.m.). Thus, the operational noise levels associated with the Project will satisfy the City of Riverside 55 dBA L_{eq} daytime and 45 dBA L_{eq} nighttime exterior noise level standards at all the on-site noise sensitive residential properties. Therefore, the incremental Project operational noise impacts are considered *less than significant* at all on-site receiver locations.

CONSTRUCTION NOISE AND VIBRATION IMPACTS

The Project would result in short-term noise level increases at nearest receiver locations, a construction-related daytime noise level threshold of 80 dBA L_{eq} is used as a reasonable threshold to assess the daytime construction noise level impacts. The construction noise analysis shows that construction activities will not exceed the reasonable daytime significance threshold of 80 dBA L_{eq} during Project construction activities at the nearest receiver locations. Therefore, the noise impacts due to Project construction noise is considered *less than significant* under CEQA at all receiver locations.

1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed Dauchy Avenue ("Project"). This noise study briefly describes the proposed Project, provides information regarding noise fundamentals, describes the local regulatory setting, provides the study methods and procedures for traffic noise analysis, and evaluates the future exterior noise environment.

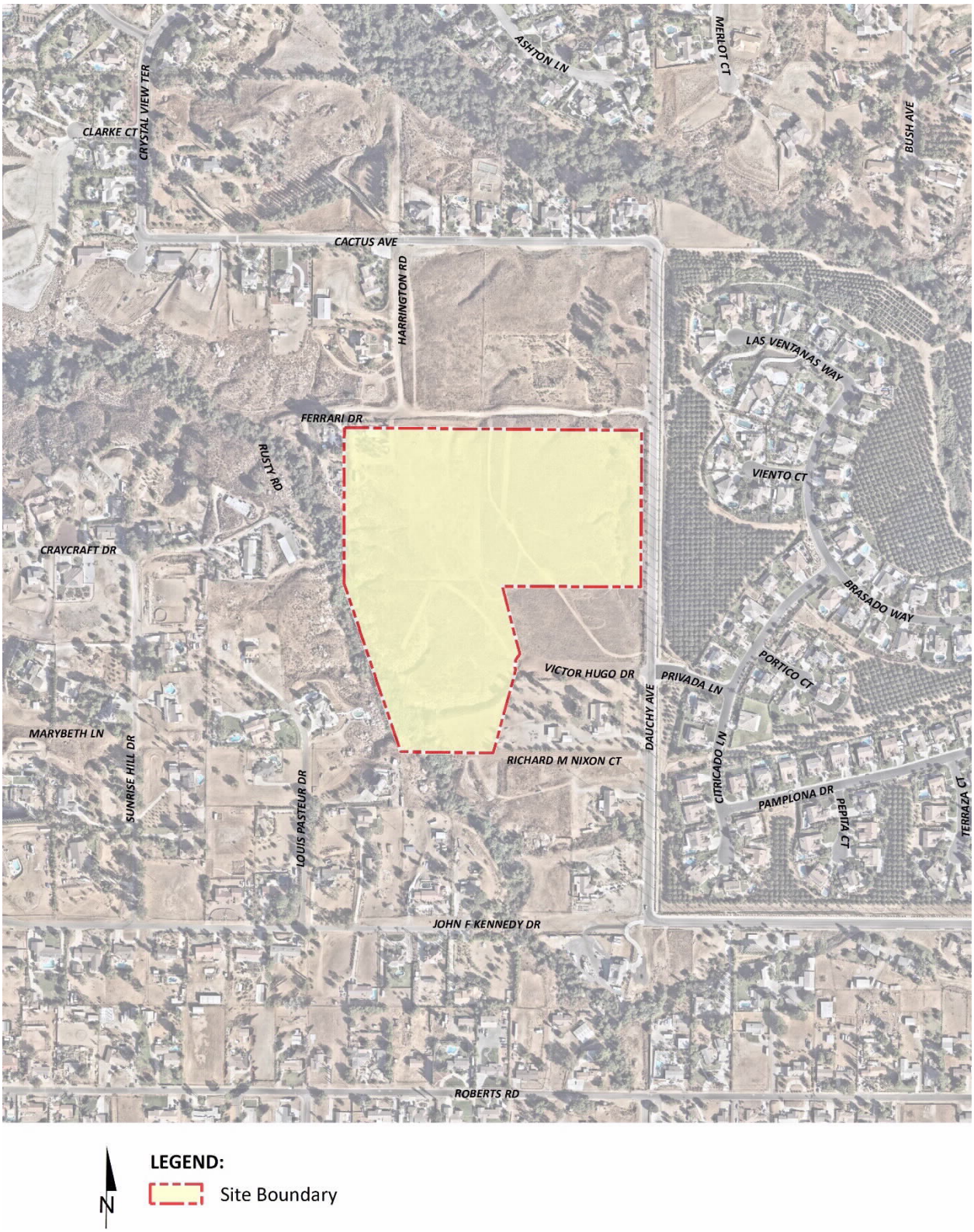
1.1 SITE LOCATION

The proposed Dauchy Avenue site is located south of Ferrari Drive (APN 276-040-011;12), and west of Dauchy Avenue (APN 276-050-029), in the City of Riverside, as shown on Exhibit 1-A. Based on the City of Riverside zoning map, the project site is zoned R-1-1/2-Acre-WC – Single Family Residential and Water Course Overlay Zones (APN 276-040-011 and -012) and the RC-WC – Residential Conservation and Water Course Overlay Zones (APN 276-050-029), which allows for the development of single-family dwellings. The General Plan designates the Project area as VLDR– Very Low Density Residential and OS – Open Space (APN 276-040-011 and 012) and HR – Hillside Residential and OS – Open Space (APN 276-050-029).

1.2 PROJECT DESCRIPTION

The Project consists of the development of 53 residential dwelling units on three parcels (APN:276-050-029,276-040-011 and -012), as shown on Exhibit 1-B. The current acreage of the three parcels involved in the project is 24.45 acres. With the street vacations indicated Lots "A" and "H" on the Tentative Tract Map, the amount of acreage will increase to 24.73 acres. Accordingly, street improvements on the project frontage along Ferrari Drive and Dauchy Avenue will include curbs, gutters, and sidewalks. Ferrari Drive will also include street adjacent landscaping. Victor Hugo Drive will be paved to its full width. Accordingly, curbs and sidewalks will be installed on the north side of Victor Hugo Drive.

EXHIBIT 1-A: LOCATION MAP



LEGEND:

Site Boundary

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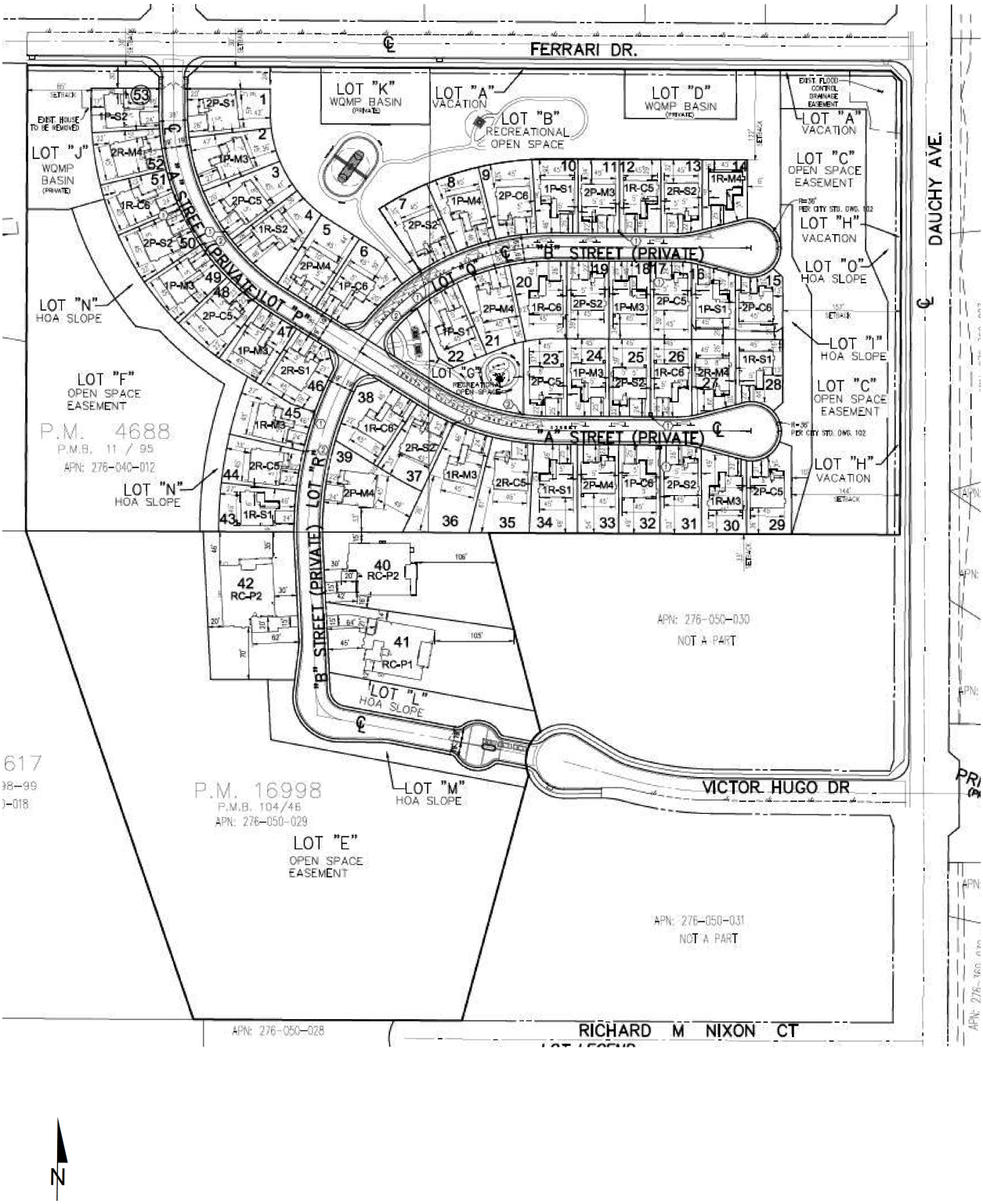
EXHIBIT 1-B: SITE PLAN



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2 FUNDAMENTALS

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

EXHIBIT 2-A: TYPICAL NOISE LEVELS

COMMON OUTDOOR ACTIVITIES	COMMON INDOOR ACTIVITIES	A - WEIGHTED SOUND LEVEL dBA	SUBJECTIVE LOUDNESS	EFFECTS OF NOISE
THRESHOLD OF PAIN		140	INTOLERABLE OR DEAFENING	HEARING LOSS
NEAR JET ENGINE		130		
		120		
JET FLY-OVER AT 300m (1000 ft)	ROCK BAND	110		
LOUD AUTO HORN		100	VERY NOISY	
GAS LAWN MOWER AT 1m (3 ft)		90		
DIESEL TRUCK AT 15m (50 ft), at 80 km/hr (50 mph)	FOOD BLENDER AT 1m (3 ft)	80		SPEECH INTERFERENCE
NOISY URBAN AREA, DAYTIME	VACUUM CLEANER AT 3m (10 ft)	70	LOUD	
HEAVY TRAFFIC AT 90m (300 ft)	NORMAL SPEECH AT 1m (3 ft)	60		
QUIET URBAN DAYTIME	LARGE BUSINESS OFFICE	50	MODERATE	
QUIET URBAN NIGHTTIME	THEATER, LARGE CONFERENCE ROOM (BACKGROUND)	40		SLEEP DISTURBANCE
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. (3) 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. (4) 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.

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

2.3 SOUND PROPAGATION

When sound propagates over a distance, it changes in level and frequency content. The way noise reduces with distance depends on the following factors.

2.3.1 GEOMETRIC SPREADING

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

2.3.2 GROUND ABSORPTION

The propagation path of noise from a highway to a receiver is usually very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually

sufficiently accurate for distances of less than 200 ft. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receiver, such as a parking lot or body of water), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receiver such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance from a line source. (2)

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. (3)

2.3.4 SHIELDING

A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Shielding by trees and other such vegetation typically only has an “out of sight, out of mind” effect. That is, the perception of noise impact tends to decrease when vegetation blocks the line-of-sight to nearby residents. However, for vegetation to provide a substantial, or even noticeable, noise reduction, the vegetation area must be at least 15 feet in height, 100 feet wide and dense enough to completely obstruct the line-of sight between the source and the receiver. This size of vegetation may provide up to 5 dBA of noise reduction. The Federal Highway Administration (FHWA) does not consider the planting of vegetation to be a noise abatement measure (2).

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 (2).

2.6 LAND USE COMPATIBILITY WITH NOISE

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

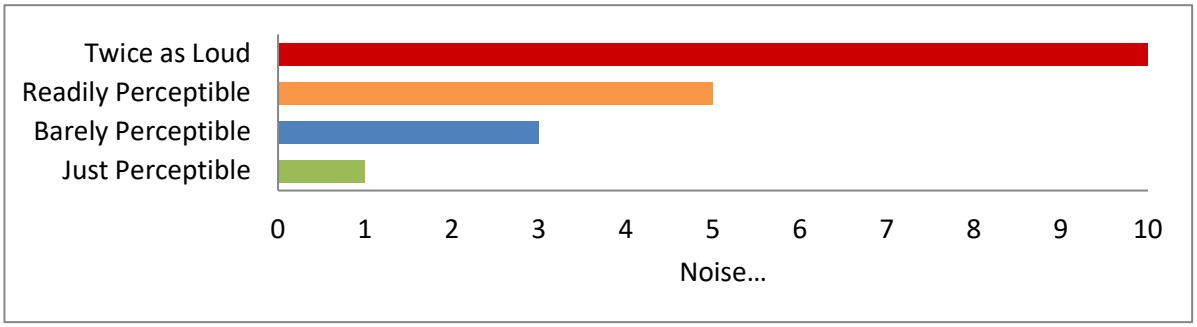
2.7 COMMUNITY RESPONSE TO NOISE

Community responses to noise may range from registering a complaint by telephone or letter, to initiating court action, depending upon everyone's susceptibility to noise and personal attitudes about noise. Several factors are related to the level of community annoyance including:

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

Approximately ten percent of the population has a very low tolerance for noise and will object to any noise not of their making. Consequently, even in the quietest environment, some complaints will occur. Twenty-five percent of the population will not complain even in very severe noise environments. Thus, a variety of reactions can be expected from people exposed to any given noise environment. (6) Surveys have shown that about ten percent of the people exposed to traffic noise of 60 dBA will report being highly annoyed with the noise, and each increase of one dBA is associated with approximately two percent more people being highly annoyed. When traffic noise exceeds 60 dBA or aircraft noise exceeds 55 dBA, people may begin to complain. (6) Despite this variability in behavior on an individual level, the population can be expected to exhibit the following responses to changes in noise levels as shown on Exhibit 2-B. A change of 3 dBA is considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (2)

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



2.8 VIBRATION

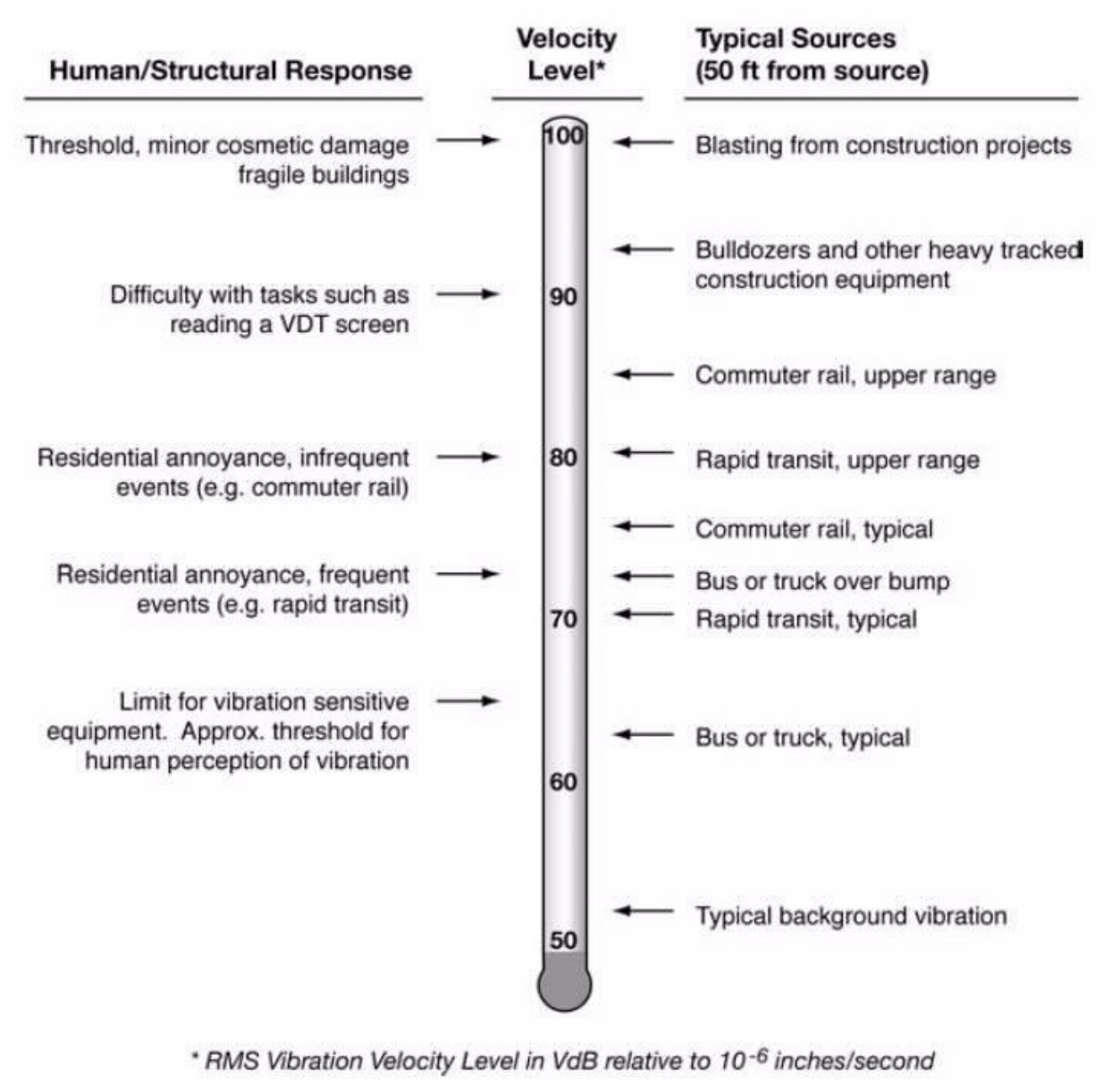
Per the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* (7), vibration is the periodic oscillation of a medium or object. Vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne 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. However, the RMS amplitude and PPV are related mathematically, and the RMS amplitude can be calculated from the PPV. The RMS amplitude is approximately 70% of the PPV (8). Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receivers for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment and/or activities.

While not universally accepted, vibration decibel notation (VdB) is used by the FTA in their guidance manual to describe vibration levels and provide a background of common vibration levels (9). As stated in the FTA guidance manual, 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



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

3 REGULATORY SETTING

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

3.1 STATE OF CALIFORNIA NOISE REQUIREMENTS

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

The State of California's noise insulation standards for all residential units are codified in the California Code of Regulations (CCR), Title 24, Building Standards Administrative Code, Chapter 12, Section 1206. These noise standards are applied to new construction that contains dwelling units or sleeping units, such as residential and hotel or motel uses, in California for controlling interior noise levels resulting from exterior noise sources. For new buildings, the acceptable interior noise limit is 45 dBA CNEL in habitable rooms (11).

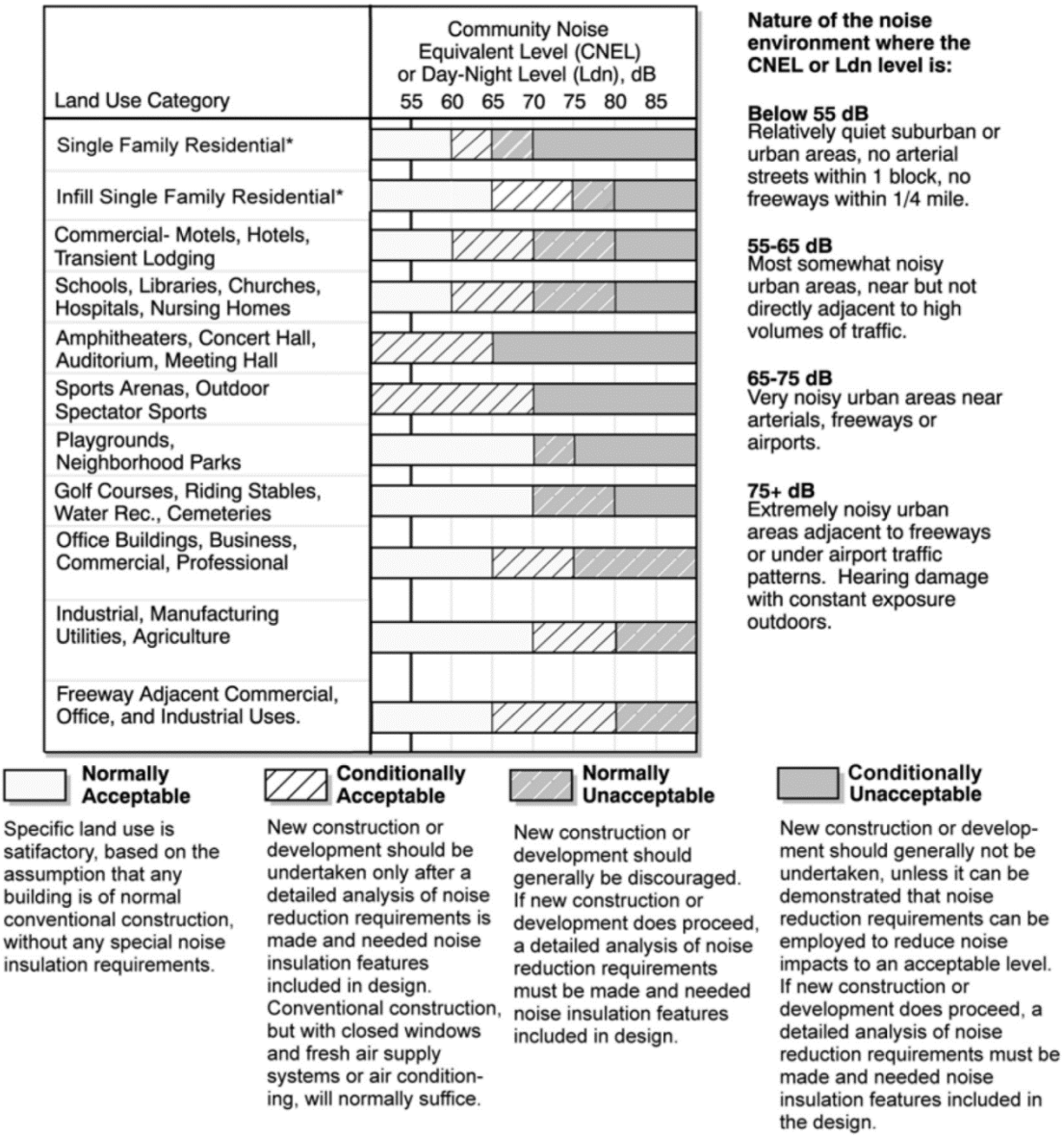
3.2 CITY OF RIVERSID GENERAL PLAN

The City of Riverside has adopted a Noise Element of the General Plan to control and abate environmental noise, and to protect the citizens of the City of Riverside from excessive exposure to noise. In addition, the Noise Element identifies several polices to minimize the impacts of excessive noise levels throughout the community and establishes noise level compatibility criteria for different land uses.

The *Noise/Land Use Noise Compatibility Criteria* (Figure N-10) in the City of Riverside General Plan Noise Element provides guidelines to evaluate the land use compatibility as shown on Exhibit 3-A. Figure N-10 provides the City with a planning tool to gauge the compatibility of land uses relative to existing and future exterior noise levels (9). The *Noise/Land Use Noise Compatibility Criteria* describes categories of compatibility and not specific noise standards. According to the noise/land use categories of compatibility, single-family residential uses are considered *normally acceptable* with unmitigated exterior noise levels below 60 dBA CNEL, *conditionally acceptable*

with noise levels below 65 dBA CNEL, *normally unacceptable* with noise levels below 70 dBA CNEL, and *conditionally unacceptable* with noise levels above 70 dBA CNEL (9).

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



The Community Noise Equivalent Level (CNEL) and Day-Night Noise Level (Ldn) are measures of the 24-hour noise environment. They represent the constant A-weighted noise level that would be measured if all the sound energy received over the day were averaged. In order to account for the greater sensitivity of people to noise at night, the CNEL weighting includes a 5-decibel penalty on noise between 7:00 p.m. and 10:00 p.m. and a 10-decibel penalty on noise between 10:00 p.m. and 7:00 a.m. of the next day. The Ldn includes only the 10-decibel weighting for late-night noise events. For practical purposes, the two measures are equivalent for typical urban noise environments.

* For properties located within airport influence areas, acceptable noise limits for single family residential uses are established by the Riverside County Airport Land Use Compatibility Plan.

SOURCE: STATE DEPARTMENT OF HEALTH, AS MODIFIED BY THE CITY OF RIVERSIDE

3.3 CITY OF RIVERSIDE MUNICIPAL CODE

As shown in Table 5.11-E, Riverside Municipal Code- Title 7 Interior and Exterior Noise Standards, the City of Riverside's Noise Code (Title 7- Ord.6273. 1) sets internal and external noise standards for specific land uses/zoning (Sections 7.25.010 and 7.30.015).

TABLE 3-1: RIVERSIDE MUNICIPAL CODE- TITLE 7 INTERIOR AND EXTERIOR NOISE STANDARDS

Land Use	Time Period	Noise Standards (dBA)	
		Exterior	Interior
Residential	7 a.m. – 10 p.m.	55	45
	10 p.m. – 7 a.m.	45	35
Schools	7 a.m. – 10 p.m.	--	45
Hospitals	Anytime	--	45
Office/Commercial	Anytime	65	--
Industrial	Anytime	70	--
Community Support	Anytime	60	--
Public Recreation Facility	Anytime	65	--
Non-Urban	Anytime	70	--

Section 7.25.010 (A) indicates that it is unlawful for any person to cause or allow the creation of any noise which exceeds the following:

1. The exterior noise standard of the applicable land use category up to 5 dBA for a cumulative period of 30 minutes in any hour (L_{50}); or
2. The exterior noise standard of the applicable land use category, plus 5 dBA, for a cumulative period of more than 15 minutes in any hour (L_{25}); or
3. The exterior noise standard of the applicable land use category, plus 10 dBA, for a cumulative period of more than 5 minutes in any hour (L_8); or
4. The exterior noise standard of the applicable land use category, plus 15 dBA, for a cumulative period of more than 1 minute in any hour (L_2).
5. The exterior noise standard for the applicable land use category, plus twenty decibels or the maximum measured ambient noise level, for any period of time (L_{max}).

In addition, Section 7.25.010 (B) indicates that if the existing ambient noise level already exceeds any of the exterior noise level limit categories, then the standard shall be increased in five decibel increments in each category as appropriate to encompass the ambient noise level. According to Section 7.25.010 (C), if possible, the ambient noise level shall be measured at the same location along the property line with the alleged offending noise source inoperative. If for any reason the alleged offending noise source cannot be shut down, then the ambient noise must be estimated by performing a measurement in the same general area of the source but at a sufficient distance that the offending noise is inaudible. If the measurement location is on the boundary between two different districts, the noise shall be the arithmetic mean of the two districts.

To assess the interior noise levels for noise sensitive residential properties, Table 7.30.015 identifies interior noise standards for the daytime (7:00 a.m. to 10:00 p.m.) hours of 45 dBA L_8 and 35 dBA L_8 during the nighttime (10:00 p.m. to 7:00 a.m.) hours as shown on Table 3-2.

TABLE 3-2: INTERIOR SOUND LEVEL LIMITS

Land Use	Time Period	Interior Noise Level Standards (dBA)[1]		
		L_8 (5 mins)	L_2 (1 min)	L_{max} (0 min)
Residential	Daytime	45	50	55
	Nighttime	35	40	45
School	While in Session	45	50	55
Hospital	Anytime	45	50	55

[1] The percent noise level is the level exceeded "n" percent of the time during the measurement period. L_{50} is the noise level exceeded 50% of the time.
[2] City of Riverside Municipal Code, Title 7 Noise Control, Section 7.30.015 (A) (Appendix 3.1).
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

Section 7.30.015 (A) indicates that no person shall operate or cause to be operated, any source of sound indoors which causes the noise level, when measured inside another dwelling unit, school or hospital, to exceed:

1. The interior noise standard for the applicable land category area, up to five decibels, for a cumulative period of more than five minutes in any (L_8); or
2. The interior noise standard for the applicable land use category, plus five decibels, for a cumulative period of more than one minute in any hour; (L_2); or
3. The interior noise standard for the applicable land use category, plus ten decibels or the maximum measured ambient noise level, for any period of time (L_{max}).

The City of Riverside Municipal Code Title 7 Noise Control section is included in Appendix 3.1.

3.5 CONSTRUCTION NOISE STANDARDS

To control noise impacts associated with the construction of the proposed Project, the City of RiversideCity of Riverside has established limits to the hours of operation. Section 7.35.020 (G) of the General Noise Regulations indicates that *noise sources associated with construction, repair, remodeling, or grading of any real property; provided a permit has been obtained from the City as required; and provided said activities do not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, between the hours of 5:00 p.m. and 8:00 a.m. on Saturdays, or at any time on Sunday or a federal holiday.* Therefore, Project construction noise levels are considered exempt from municipal regulation if activities occur within the hours specified Section 7.35.020 (G); provided a permit has been obtained from the City, as required.

However, neither the City of Riverside General Plan nor Municipal Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers. Therefore, a numerical construction threshold based on Federal Transit Administration (FTA)

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

3.5 CONSTRUCTION VIBRATION CRITERIA

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

To analyze vibration impacts originating from the operation and construction of the Project Dauchy Avenue, vibration-generating activities are appropriately evaluated against standards established under a City's Municipal Code, if such standards exist. However, the City of Riverside does not identify specific vibration level limits. Therefore, for analysis purposes, the Caltrans *Transportation and Construction Vibration Guidance Manual*, (10 p. 38) Table 19, vibration damage are used in this noise study to assess potential temporary construction-related impacts at adjacent building locations.

The construction vibration damage potential criteria include consideration of the building conditions. (4 p. 182) Table 3-2 describes the maximum acceptable transient and continuous vibration building damage potential levels by structure type and condition. The existing buildings adjacent to the Project site can best be described as "older residential structures" with a maximum acceptable continuous vibration threshold of 0.3 PPV (in/sec).

TABLE 3-2: BUILDING DAMAGE VIBRATION CRITERIA

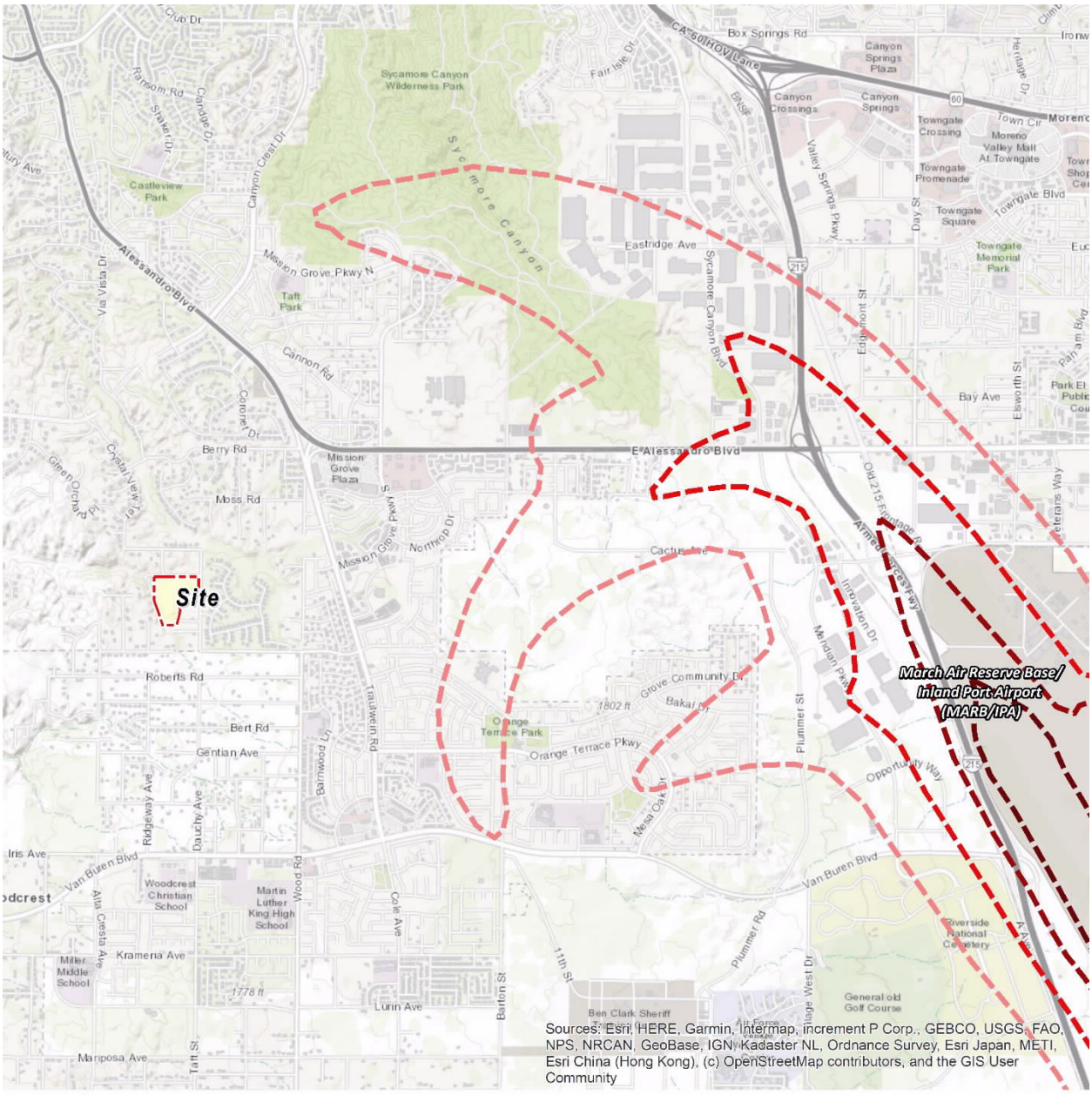
Structure and Condition	Maximum Transient Vibration Levels PPV (in/sec)	Maximum Continuous Vibration Levels PPV (in/sec)
Extremely fragile historic buildings	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 19, p. 38.

3.6 MARCH AIR RESERVE BASE/INLAND PORT AIRPORT LAND USE COMPATIBILITY

The March Air Reserve Base/Inland Port Airport (MARB/IPA) is located approximately 3.6-miles east of the Project site. The *March Air Reserve Base/Inland Port Airport Land Use Compatibility Plan* (MARB/IPA LUCP) includes the policies for determining the land use compatibility of the Project. The MARB/IPA, Map MA-1, indicates that the Project site is located within Compatibility Zone D, which Table MA-1 Compatibility Zone Factors indicates is considered to have a *moderate to low* noise impact. (11) Further, the Project site is located outside of the 60 dBA CNEL noise level contour boundary. The MARB/IPA LUCP does not identify specific noise compatibility standards, and therefore, the City of Riverside *Land Use Compatibility for Community Noise Exposure* matrix, previously discussed in Section 3.3, is used to assess potential aircraft-related noise levels at the Project site. The City of Riverside guidelines indicate that residential uses, such as the Project, are considered *normally acceptable* with exterior noise levels of up to 60 dBA CNEL. (9) The noise contour boundaries of MARB/IPA are presented on Exhibit 3-B of this report and show that the Project is considered *normally acceptable* land use since it is located outside of the 60 dBA CNEL contour boundary.

EXHIBIT 3-B: AIRPORT NOISE LEVEL CONTOURS



N

LEGEND:

60 dBA CNEL | 65 dBA CNEL | 70 dBA CNEL | 75 dBA CNEL

Source: Riverside County Airport Land Use Compatibility Plan, MA-4

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4 SIGNIFICANCE CRITERIA

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

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

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

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

4.1 CEQA GUIDELINES NOT FURTHER ANALYZED

In Section 3.6, the noise contour boundaries of MARB/IPA are presented on Exhibit 3-B of this report and show that the Project is considered *normally acceptable* land use since it is located outside of the 60 dBA CNEL contour. Therefore, impacts are considered *less than significant,* and no further noise analysis is provided under Guideline C.

4.2 SIGNIFICANCE CRITERIA SUMMARY

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

TABLE 4-1: SIGNIFICANCE CRITERIA SUMMARY

Analysis	Condition(s)	Significance Criteria	
		Daytime	Nighttime
On-Site	Exterior Noise Compatibility[1]	See Exhibit 3-A	
	State Interior Noise Level Standard[2]	45 dBA CNEL	
	City Interior Noise Level Standard[3]	45 dBA L_{eq}	35 dBA L_{eq}
Operational	See Table 3-1[3]		
Construction	Exempt from the exterior noise level standards between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, between the hours of 5:00 p.m. and 8:00 a.m. on Saturdays, or at any time on Sunday or a federal holiday.[3]		
	Noise Level Threshold[4]	80 dBA L_{eq}	n/a
	Vibration Level Threshold[5]	0.3 PPV (in/sec)	n/a

[1] City of Riverside General Plan Noise Element, Figure N-10
[2] State of California Building Code standards (Section 3.2)
[3] City of Riverside Municipal Code Title 7`
[4] Federal Transit Authority, 2018.
[5] Caltrans Transportation and Construction Vibration Manual, April 2020 Table 19.
"Daytime" = 7:00 a.m. - 10:00 p.m.; "Nighttime" = 10:00 p.m. - 7:00 a.m.; "PPV" = Peak Particle Velocity

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5 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, 24-hour noise level measurements were taken at nine locations in the Project study area. The receiver locations were selected to describe and document the existing noise environment within the Project study area. Exhibit 5-A provides the boundaries of the Project study area and the noise level measurement locations. To fully describe the existing noise conditions, noise level measurements were collected by Urban Crossroads, Inc. on Wednesday, November 18, 2020. Appendix 5.1 includes study area photos.

5.1 MEASUREMENT PROCEDURE AND CRITERIA

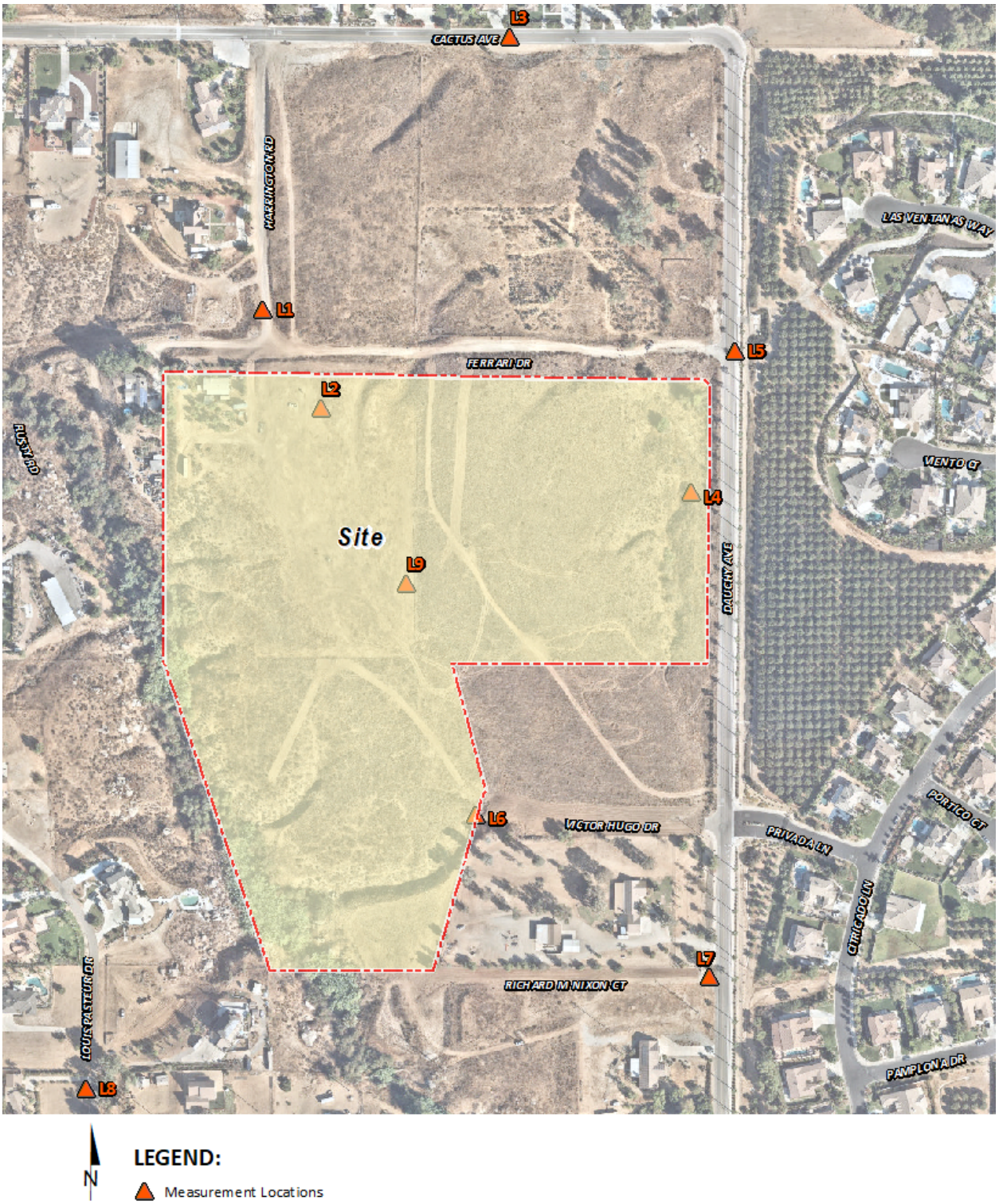
To describe the existing noise environment, the hourly noise levels were measured during typical weekday conditions over a 24-hour period. By collecting individual hourly noise level measurements, it is possible to describe the daytime and nighttime hourly noise levels and calculate the 24-hour CNEL. 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. (12)

5.2 NOISE MEASUREMENT LOCATIONS

The noise level meters 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*. (3) Further, FTA guidance states, t*hat it is not necessary nor recommended that existing noise exposure be determined by measuring at every noise-sensitive location in the project area. Rather, the recommended approach is to characterize the noise environment for clusters of sites based on measurements or estimates at representative locations in the community*. (7)

Based on recommendations of Caltrans and the FTA, it is not necessary to collect measurements at each individual building or residence, because each receiver measurement represents a group of buildings that share acoustical equivalence. (7) 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.

EXHIBIT 5-A: NOISE MEASUREMENT LOCATIONS



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.

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

Location[1]	Description	Energy Average Noise Level (dBA L_{eq})[2]	
		Daytime	Nighttime
L1	Located north of the Project site on Ferrari Drive near existing single-family residential home at 18351 Ferrari Drive.	49.4	46.6
L2	Located north near the northern Project site boundary.	47.1	36.5
L3	Located north of the Project site on Cactus Street near existing single-family residential home at 18386 Cactus Avenue.	63.2	56.2
L4	Located east near the eastern Project site boundary.	49.6	42.9
L5	Located east of the Project site on Dauchy Avenue near existing single family residential homes on Viento Court.	64.7	58.2
L6	Located southeast near the eastern Project site boundary.	45.9	40.8
L7	Located southeast of the Project site on Dauchy Avenue near existing single-family residential home at 14855 Dauchy Avenue.	61.5	54.0
L8	Located south of the Project site on Louis Pasteur Drive near existing single-family residential home at 14855 Louis Pasteur Drive.	49.0	41.5
L9	Located within the Project site.	47.2	36.6

[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.

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6 METHODS AND PROCEDURES

The following section outlines the methods and procedures used to model and analyze the on-site traffic noise levels as well as the Project-related construction noise and vibration levels.

6.1 TRAFFIC NOISE PREDICTION MODEL INPUTS

The expected roadway noise levels from vehicular traffic were calculated by Urban Crossroads, Inc. using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) protocol in CadnaA. To predict the future on-site noise environment at the Project site, parameters including the number of lanes and daily volume thresholds were obtained from the City of Riverside General Plan Transportation Element. (13) According to Figure CCM-4 of the Circulation Element, Ferrari Drive and Dauchy Avenue are considered two-lane collector roadways with estimated average daily traffic volume of 12,500 and vehicle speeds of 40 miles per hour as shown on Table 6-1. The traffic volumes shown on Table 6-1 reflect long-range traffic conditions needed to assess the future on-site traffic noise environment and to identify potential mitigation measures (if any) that address the worst-case future conditions.

TABLE 6-1: ROADWAY PARAMETERS

Roadway Segment	Classification[1]	Future ADT Volume[1]	Speed (mph)
Ferrari Dr.	Collector	12,500	40
Dauchy Av.	Collector	12,500	40

[1] Roadway classification provided in the City of Riverside General Plan Circulation Element (Figure CCM-4).

Table 6-2 presents the time-of-day vehicle distribution representing the total daily percentages of traffic for the daytime, evening, and nighttime periods for input into the CadnaA noise prediction model. The analysis assumes that medium trucks represent two percent of the vehicle mix and that heavy trucks represent one percent of the vehicle mix.

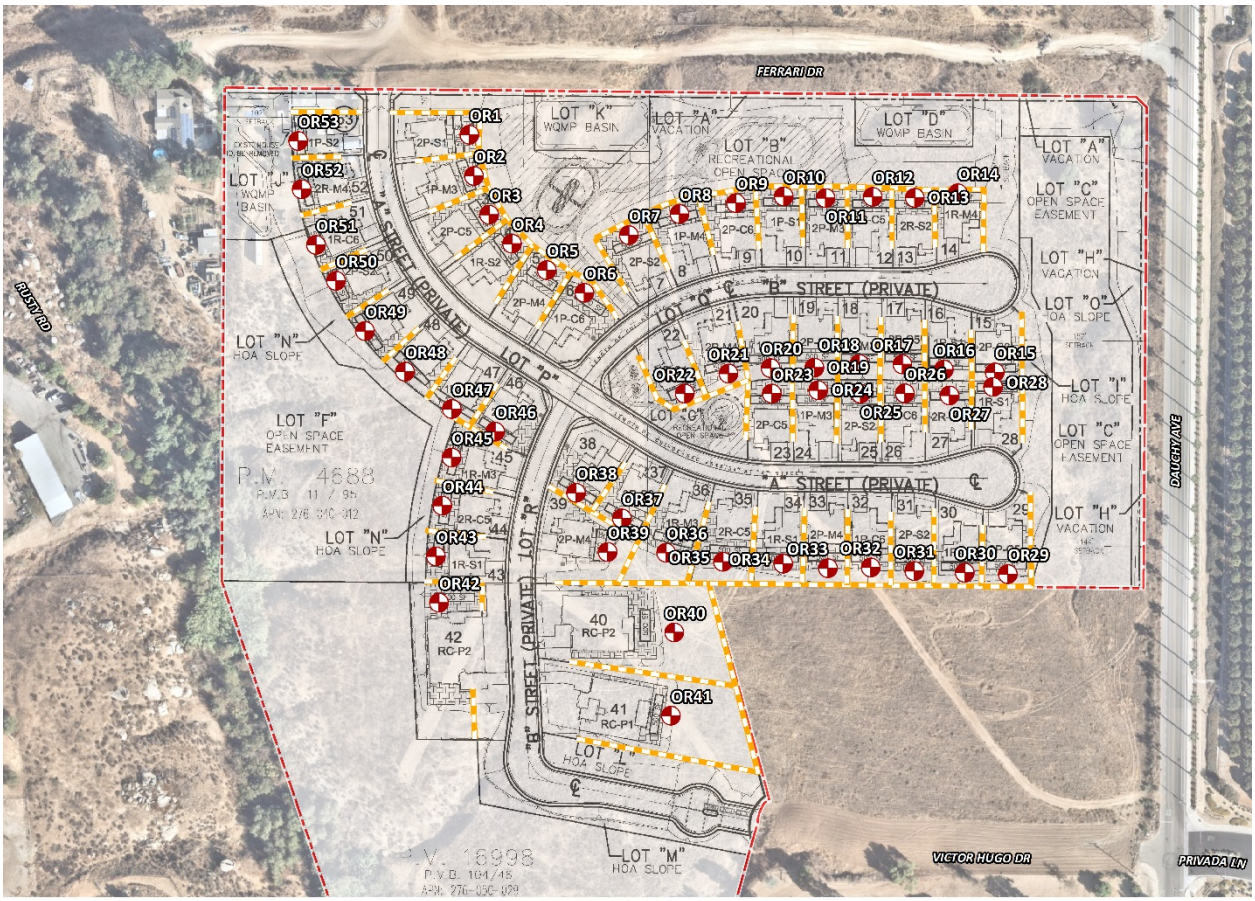
TABLE 6-2: TIME OF DAY VEHICLE DISTRIBUTION

Roadway Classification[1]	Time of Day Vehicle Distribution[2]			
	Daytime	Evening	Nighttime	Total
Collector	74.85%	13.68%	11.47%	100.00%

[1] County of Riverside Office of Industrial Hygiene, 2017.
[2] "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.

The Project site plan is used to identify the relationship between the roadway centerline elevation, the pad elevation and the centerline distance to any intervening noise barriers, and the building façade. To assess the on-site traffic noise levels, exterior receivers were placed on selected lots facing Ferrari Drive and Dauchy Avenue as shown on Exhibit 6-A five feet above the pad elevation at the proposed building façade for first floor.

EXHIBIT 6-A: ON-SITE LOT LOCATIONS



LEGEND:

On-Site Receivers Locations — Proposed 5-6' Barriers — Site Boundary

6.2 CADNAA NOISE PREDICTION MODEL

To fully describe the on-site traffic 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 (Lw) to describe individual noise sources. While sound pressure levels (e.g. Leq) quantify in decibels the intensity of given sound sources at a reference distance, sound power levels (Lw) 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 0.0 was used in the CadnaA noise analysis to account for hard site conditions.

6.3 CONSTRUCTION NOISE SOURCES

Noise generated by the Project construction equipment will include a combination of trucks, power tools, concrete mixers, and portable generators operating simultaneously that when combined can reach high levels. The Project is construction noise sources are expected to include a combination of loaders, cranes, welders, drill rigs, diesel generators, concrete pumps, and mixture of other construction equipment. The Project will not require blasting.

6.4 REFERENCE CONSTRUCTION NOISE LEVELS

The FTA *Transit Noise and Vibration Impact Assessment Manual* recognizes that construction projects are accomplished in several different stages. Each stage has a specific equipment mix, depending on the work to be completed during that stage. As a result of the equipment mix, each stage has its own noise characteristics; some stages have higher continuous noise levels than others, and some have higher impact noise levels than others. The Project construction activities are expected to occur in the following stages:

- 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.

6.5 TYPICAL CONSTRUCTION REFERENCE NOISE LEVELS

To describe the Project typical construction noise levels, measurements were collected for similar activities at several construction sites. Table 6-3 provides a summary of the construction reference noise level measurements. Since the reference noise levels were collected at varying distances, all construction noise level measurements presented on Table 6-3 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.

TABLE 6-3: 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})
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.

6.6 TYPICAL CONSTRUCTION REFERENCE VIBRATION LEVELS

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Ground vibration levels associated with various types of construction equipment are summarized on Table 6-4. Based on the representative vibration levels presented for various construction

equipment types, it is possible to estimate the potential for human response (annoyance) and building damage using the following vibration assessment methods defined by the FTA. To describe the vibration impacts the FTA provides the following equation: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

TABLE 6-4: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

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

Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual

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7 ON-SITE TRAFFIC NOISE

Using FHWA's TNM protocol in CadnaA, and the parameters outlined in Tables 6-1 and 6-2, the expected future exterior noise levels for selected lots were calculated.

7.1 EXTERIOR NOISE/LAND USE COMPATIBILITY

The *Noise/Land Use Noise Compatibility Criteria* (Figure N-10) in the City of Riverside General Plan Noise Element provides guidelines to evaluate the land use compatibility as shown on Exhibit 3-A. A summary of exterior noise/land use compatibility for the single-family residential project use shown on Table 7-1 shows that the unmitigated exterior noise levels will range from 49.1 to 64.1 dBA CNEL. On-Site Receiver locations and walls included in the Project design are shown in Exhibit 7-A. The detailed CadnaA noise prediction model inputs and the exterior noise level calculations are included in Appendix 7.1.

TABLE 7-1: EXTERIOR NOISE/LAND USE COMPATIBILITY

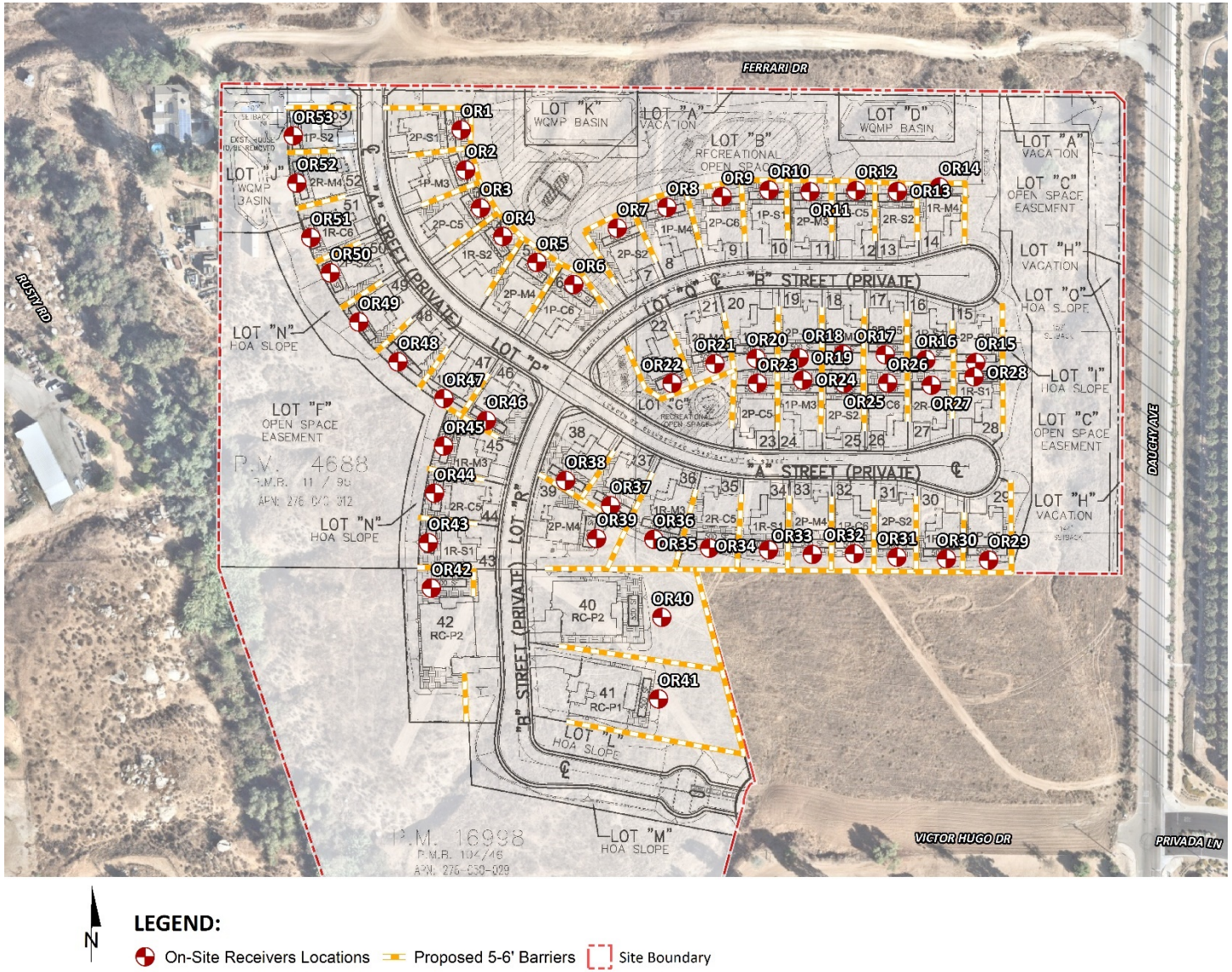
Lot	24-Hr Exterior Noise Levels (dBA CNEL)[2]	Land Use Compatibility[3]
R01	63.2	Conditionally Acceptable
R02	60.5	Conditionally Acceptable
R03	58.9	Normally Acceptable
R04	57.6	Normally Acceptable
R05	55.9	Normally Acceptable
R06	54.2	Normally Acceptable
R07	58.5	Normally Acceptable
R08	59.1	Normally Acceptable
R09	59.0	Normally Acceptable
R10	59.7	Normally Acceptable
R11	60.3	Conditionally Acceptable
R12	60.9	Conditionally Acceptable
R13	60.8	Conditionally Acceptable
R14	61.2	Conditionally Acceptable
R15	59.4	Normally Acceptable
R16	57.7	Normally Acceptable
R17	56.4	Normally Acceptable
R18	55.5	Normally Acceptable
R19	54.8	Normally Acceptable
R20	54.2	Normally Acceptable
R21	55.2	Normally Acceptable

TABLE 7-1: EXTERIOR NOISE/LAND USE COMPATIBILITY

Lot	24-Hr Exterior Noise Levels (dBA CNEL)[2]	Land Use Compatibility[3]
R22	51.7	Normally Acceptable
R23	55.2	Normally Acceptable
R24	55.0	Normally Acceptable
R25	55.9	Normally Acceptable
R26	56.8	Normally Acceptable
R27	58.1	Normally Acceptable
R28	59.4	Normally Acceptable
R29	59.0	Normally Acceptable
R30	57.0	Normally Acceptable
R31	55.4	Normally Acceptable
R32	54.6	Normally Acceptable
R33	54.4	Normally Acceptable
R34	54.1	Normally Acceptable
R35	51.5	Normally Acceptable
R36	51.9	Normally Acceptable
R37	51.3	Normally Acceptable
R38	51.2	Normally Acceptable
R39	50.9	Normally Acceptable
R40	50.8	Normally Acceptable
R41	49.5	Normally Acceptable
R42	49.2	Normally Acceptable
R43	49.7	Normally Acceptable
R44	50.1	Normally Acceptable
R45	50.4	Normally Acceptable
R46	50.7	Normally Acceptable
R47	50.6	Normally Acceptable
R48	51.7	Normally Acceptable
R49	53.2	Normally Acceptable
R50	55.3	Normally Acceptable
R51	56.8	Normally Acceptable
R52	59.0	Normally Acceptable
R53	61.9	Conditionally Acceptable

[1] See Exhibit 7-A for the on-site lot locations.
[2] CadnaA noise model inputs and calculations are included in Appendix 7.1.
[3] Figure N-10 of the City of Riverside General Plan Noise Element (Single Family Residential).

EXHIBIT 7-A: ON-SITE RECEIVERS AND BARRIER LOCATIONS



LEGEND:

On-Site Receivers Locations | Proposed 5-6' Barriers | Site Boundary

According to *Noise/Land Use Noise Compatibility Criteria* for single-family residential land use, the Dauchy Avenue Project will experience unmitigated exterior noise levels that are considered *conditionally acceptable* at Lots 1, 2, 11 through 14, and 53, represented by receivers 1, 2, 11 through 14, and 53. For *conditionally acceptable* noise/land use compatibility, Figure N-10 indicates that *new construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.*

As shown in Table 7-1, the remainder of the lots will experience unmitigated exterior noise levels that are considered *normally acceptable.* For *normally acceptable* noise/land use compatibility, Figure N-10 indicates that *specific land use is satisfactory, based on the assumption that any building is of normal construction without any special noise insulation requirements.* Based on the future unmitigated exterior noise levels at the Project site, additional interior noise analysis is required to satisfy the General Plan Noise Element Figure N-10 noise/land use compatibility requirements for the single-family residential use (Lots 1, 2, 11 through 14, and 53) of the Project site. (9)

7.2 INTERIOR NOISE ANALYSIS

The interior noise level is the difference between the predicted exterior noise level at the building facade and the Noise Reduction (NR) of the structure. Typical building construction will provide a NR of approximately 12 dBA with "windows open" and a minimum 25 dBA noise reduction with "windows closed." (14) 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.

Table 7-2 shows the future exterior first floor daytime noise levels at the building façades are expected to range from 48.1 to 63.5 dBA L_{eq} requiring an interior noise level reduction ranging from 3.1 to 18.5 dBA L_{eq}. Table 7-3 shows the future exterior first floor nighttime noise levels at the building façades are expected to range from 40.8 to 56.2 dBA L_{eq} requiring an interior noise level reduction ranging from 5.8 to 21.2 dBA L_{eq}.

Table 7-3 shows the future exterior first floor daytime noise levels at the building façades are expected to range from 49.2 to 62.8 dBA L_{eq} requiring an interior noise level reduction ranging from 4.2 to 17.8 dBA L_{eq}. Table 7-4 shows the future exterior first floor nighttime noise levels at the building façades are expected to range from 41.9 to 55.5 dBA L_{eq} requiring an interior noise level reduction ranging from 6.9 to 20.5 dBA L_{eq}.

Therefore, a windows-closed condition requiring a means of mechanical ventilation (e.g. air conditioning) is required for all lots. The interior noise level analysis shows that the City of Riverside 45 dBA Leq daytime and 35 dBA Leq nighttime interior noise standards can be satisfied using mechanical ventilation and standard windows with a minimum STC rating of 27. The recommended interior noise abatement measures are outlined in the Executive Summary.

TABLE 7-2: FIRST FLOOR DAYTIME INTERIOR NOISE LEVELS

Lot	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold[6]	Threshold Exceeded?
R01	62.2	17.2	25.0	No	37.2	45	No
R02	63.5	18.5	25.0	No	38.5	45	No
R03	59.5	14.5	25.0	No	34.5	45	No
R04	60.8	15.8	25.0	No	35.8	45	No
R05	58.3	13.3	25.0	No	33.3	45	No
R06	57.6	12.6	25.0	No	32.6	45	No
R07	57.1	12.1	25.0	No	32.1	45	No
R08	58.1	13.1	25.0	No	33.1	45	No
R09	58.0	13.0	25.0	No	33.0	45	No
R10	58.7	13.7	25.0	No	33.7	45	No
R11	59.3	14.3	25.0	No	34.3	45	No
R12	59.9	14.9	25.0	No	34.9	45	No
R13	59.7	14.7	25.0	No	34.7	45	No
R14	60.1	15.1	25.0	No	35.1	45	No
R15	58.4	13.4	25.0	No	33.4	45	No
R16	56.6	11.6	25.0	No	31.6	45	No
R17	55.3	10.3	25.0	No	30.3	45	No
R18	54.4	9.4	25.0	No	29.4	45	No
R19	53.8	8.8	25.0	No	28.8	45	No
R20	53.1	8.1	25.0	No	28.1	45	No
R21	54.2	9.2	25.0	No	29.2	45	No
R22	50.6	5.6	25.0	No	25.6	45	No
R23	54.2	9.2	25.0	No	29.2	45	No
R24	54.0	9.0	25.0	No	29.0	45	No
R25	54.9	9.9	25.0	No	29.9	45	No
R26	55.7	10.7	25.0	No	30.7	45	No
R27	57.1	12.1	25.0	No	32.1	45	No
R28	58.4	13.4	25.0	No	33.4	45	No
R29	58.0	13.0	25.0	No	33.0	45	No
R30	56.0	11.0	25.0	No	31.0	45	No
R31	54.4	9.4	25.0	No	29.4	45	No
R32	53.6	8.6	25.0	No	28.6	45	No
R33	53.4	8.4	25.0	No	28.4	45	No
R34	53.0	8.0	25.0	No	28.0	45	No
R35	50.5	5.5	25.0	No	25.5	45	No
R36	50.8	5.8	25.0	No	25.8	45	No

TABLE 7-2: FIRST FLOOR DAYTIME INTERIOR NOISE LEVELS

Lot	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold[6]	Threshold Exceeded?
R37	50.3	5.3	25.0	No	25.3	45	No
R38	50.2	5.2	25.0	No	25.2	45	No
R39	49.9	4.9	25.0	No	24.9	45	No
R40	49.7	4.7	25.0	No	24.7	45	No
R41	48.5	3.5	25.0	No	23.5	45	No
R42	48.2	3.2	25.0	No	23.2	45	No
R43	48.7	3.7	25.0	No	23.7	45	No
R44	49.1	4.1	25.0	No	24.1	45	No
R45	49.4	4.4	25.0	No	24.4	45	No
R46	49.7	4.7	25.0	No	24.7	45	No
R47	49.5	4.5	25.0	No	24.5	45	No
R48	50.7	5.7	25.0	No	25.7	45	No
R49	52.2	7.2	25.0	No	27.2	45	No
R50	54.3	9.3	25.0	No	29.3	45	No
R51	55.7	10.7	25.0	No	30.7	45	No
R52	57.9	12.9	25.0	No	32.9	45	No
R53	60.9	15.9	25.0	No	35.9	45	No

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise standard.
[3] Estimated minimum interior noise reduction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.
[6] City of Riverside, Municipal Code Section 7.30.015.
"NR" = Noise Reduction

TABLE 7-3: FIRST FLOOR NIGHTTIME INTERIOR NOISE LEVELS

Lot	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold[6]	Threshold Exceeded?
R01	54.9	19.9	25.0	No	29.9	35	No
R02	56.2	21.2	25.0	No	31.2	35	No
R03	52.2	17.2	25.0	No	27.2	35	No
R04	53.5	18.5	25.0	No	28.5	35	No
R05	51.0	16.0	25.0	No	26.0	35	No
R06	50.2	15.2	25.0	No	25.2	35	No
R07	49.7	14.7	25.0	No	24.7	35	No
R08	50.8	15.8	25.0	No	25.8	35	No
R09	50.7	15.7	25.0	No	25.7	35	No
R10	51.4	16.4	25.0	No	26.4	35	No
R11	51.9	16.9	25.0	No	26.9	35	No
R12	52.6	17.6	25.0	No	27.6	35	No
R13	52.4	17.4	25.0	No	27.4	35	No
R14	52.8	17.8	25.0	No	27.8	35	No
R15	51.1	16.1	25.0	No	26.1	35	No
R16	49.3	14.3	25.0	No	24.3	35	No
R17	48.0	13.0	25.0	No	23.0	35	No
R18	47.1	12.1	25.0	No	22.1	35	No
R19	46.5	11.5	25.0	No	21.5	35	No
R20	45.8	10.8	25.0	No	20.8	35	No
R21	46.9	11.9	25.0	No	21.9	35	No
R22	43.3	8.3	25.0	No	18.3	35	No
R23	46.9	11.9	25.0	No	21.9	35	No
R24	46.7	11.7	25.0	No	21.7	35	No
R25	47.5	12.5	25.0	No	22.5	35	No
R26	48.4	13.4	25.0	No	23.4	35	No
R27	49.8	14.8	25.0	No	24.8	35	No
R28	51.1	16.1	25.0	No	26.1	35	No
R29	50.6	15.6	25.0	No	25.6	35	No
R30	48.7	13.7	25.0	No	23.7	35	No
R31	47.1	12.1	25.0	No	22.1	35	No
R32	46.3	11.3	25.0	No	21.3	35	No
R33	46.1	11.1	25.0	No	21.1	35	No
R34	45.7	10.7	25.0	No	20.7	35	No
R35	43.2	8.2	25.0	No	18.2	35	No
R36	43.5	8.5	25.0	No	18.5	35	No

TABLE 7-3: FIRST FLOOR NIGHTTIME INTERIOR NOISE LEVELS

Lot	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold[6]	Threshold Exceeded?
R37	43.0	8.0	25.0	No	18.0	35	No
R38	42.8	7.8	25.0	No	17.8	35	No
R39	42.6	7.6	25.0	No	17.6	35	No
R40	42.4	7.4	25.0	No	17.4	35	No
R41	41.2	6.2	25.0	No	16.2	35	No
R42	40.9	5.9	25.0	No	15.9	35	No
R43	41.3	6.3	25.0	No	16.3	35	No
R44	41.8	6.8	25.0	No	16.8	35	No
R45	42.1	7.1	25.0	No	17.1	35	No
R46	42.4	7.4	25.0	No	17.4	35	No
R47	42.2	7.2	25.0	No	17.2	35	No
R48	43.4	8.4	25.0	No	18.4	35	No
R49	44.9	9.9	25.0	No	19.9	35	No
R50	47.0	12.0	25.0	No	22.0	35	No
R51	48.4	13.4	25.0	No	23.4	35	No
R52	50.6	15.6	25.0	No	25.6	35	No
R53	53.6	18.6	25.0	No	28.6	35	No

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise standard.
[3] Estimated minimum interior noise reduction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.
[6] City of Riverside, Municipal Code Section 7.30.015.
"NR" = Noise Reduction

TABLE 7-3: SECOND FLOOR DAYTIME INTERIOR NOISE LEVELS

Lot	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold[6]	Threshold Exceeded?
R01	62.8	17.8	25.0	No	37.8	45	No
R02	59.9	14.9	25.0	No	34.9	45	No
R03	58.0	13.0	25.0	No	33.0	45	No
R04	57.0	12.0	25.0	No	32.0	45	No
R05	56.1	11.1	25.0	No	31.1	45	No
R06	55.7	10.7	25.0	No	30.7	45	No
R07	57.5	12.5	25.0	No	32.5	45	No
R08	58.3	13.3	25.0	No	33.3	45	No
R09	59.0	14.0	25.0	No	34.0	45	No
R10	59.5	14.5	25.0	No	34.5	45	No
R11	59.4	14.4	25.0	No	34.4	45	No
R12	59.6	14.6	25.0	No	34.6	45	No
R13	59.9	14.9	25.0	No	34.9	45	No
R14	60.4	15.4	25.0	No	35.4	45	No
R15	57.8	12.8	25.0	No	32.8	45	No
R16	56.6	11.6	25.0	No	31.6	45	No
R17	55.8	10.8	25.0	No	30.8	45	No
R18	55.2	10.2	25.0	No	30.2	45	No
R19	54.7	9.7	25.0	No	29.7	45	No
R20	54.3	9.3	25.0	No	29.3	45	No
R21	54.4	9.4	25.0	No	29.4	45	No
R22	53.2	8.2	25.0	No	28.2	45	No
R23	54.2	9.2	25.0	No	29.2	45	No
R24	54.7	9.7	25.0	No	29.7	45	No
R25	55.3	10.3	25.0	No	30.3	45	No
R26	55.9	10.9	25.0	No	30.9	45	No
R27	56.8	11.8	25.0	No	31.8	45	No
R28	57.7	12.7	25.0	No	32.7	45	No
R29	58.2	13.2	25.0	No	33.2	45	No
R30	57.1	12.1	25.0	No	32.1	45	No
R31	55.9	10.9	25.0	No	30.9	45	No
R32	55.3	10.3	25.0	No	30.3	45	No
R33	54.7	9.7	25.0	No	29.7	45	No
R34	54.0	9.0	25.0	No	29.0	45	No
R35	53.3	8.3	25.0	No	28.3	45	No
R36	52.6	7.6	25.0	No	27.6	45	No

TABLE 7-3: SECOND FLOOR DAYTIME INTERIOR NOISE LEVELS

Lot	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold[6]	Threshold Exceeded?
R37	52.0	7.0	25.0	No	27.0	45	No
R38	51.5	6.5	25.0	No	26.5	45	No
R39	51.7	6.7	25.0	No	26.7	45	No
R40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R43	49.8	4.8	25.0	No	24.8	45	No
R44	50.3	5.3	25.0	No	25.3	45	No
R45	50.9	5.9	25.0	No	25.9	45	No
R46	51.5	6.5	25.0	No	26.5	45	No
R47	51.2	6.2	25.0	No	26.2	45	No
R48	51.9	6.9	25.0	No	26.9	45	No
R49	53.3	8.3	25.0	No	28.3	45	No
R50	54.9	9.9	25.0	No	29.9	45	No
R51	55.7	10.7	25.0	No	30.7	45	No
R52	57.7	12.7	25.0	No	32.7	45	No
R53	61.0	16.0	25.0	No	36.0	45	No

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise standard.
[3] Estimated minimum interior noise reduction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.
"NR" = Noise Reduction; N/A = Not applicable to lots due to zoning restrictions.

TABLE 7-4: SECOND FLOOR NIGHTTIME INTERIOR NOISE LEVELS

Lot	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold[6]	Threshold Exceeded?
R01	55.5	20.5	25.0	No	30.5	35	No
R02	52.6	17.6	25.0	No	27.6	35	No
R03	50.7	15.7	25.0	No	25.7	35	No
R04	49.7	14.7	25.0	No	24.7	35	No
R05	48.8	13.8	25.0	No	23.8	35	No
R06	48.4	13.4	25.0	No	23.4	35	No
R07	50.2	15.2	25.0	No	25.2	35	No
R08	51.0	16.0	25.0	No	26.0	35	No
R09	51.7	16.7	25.0	No	26.7	35	No
R10	52.1	17.1	25.0	No	27.1	35	No
R11	52.0	17.0	25.0	No	27.0	35	No
R12	52.3	17.3	25.0	No	27.3	35	No
R13	52.6	17.6	25.0	No	27.6	35	No
R14	53.1	18.1	25.0	No	28.1	35	No
R15	50.5	15.5	25.0	No	25.5	35	No
R16	49.2	14.2	25.0	No	24.2	35	No
R17	48.5	13.5	25.0	No	23.5	35	No
R18	47.9	12.9	25.0	No	22.9	35	No
R19	47.4	12.4	25.0	No	22.4	35	No
R20	47.0	12.0	25.0	No	22.0	35	No
R21	47.1	12.1	25.0	No	22.1	35	No
R22	45.9	10.9	25.0	No	20.9	35	No
R23	46.9	11.9	25.0	No	21.9	35	No
R24	47.3	12.3	25.0	No	22.3	35	No
R25	48.0	13.0	25.0	No	23.0	35	No
R26	48.5	13.5	25.0	No	23.5	35	No
R27	49.4	14.4	25.0	No	24.4	35	No
R28	50.4	15.4	25.0	No	25.4	35	No
R29	50.9	15.9	25.0	No	25.9	35	No
R30	49.8	14.8	25.0	No	24.8	35	No
R31	48.6	13.6	25.0	No	23.6	35	No
R32	48.0	13.0	25.0	No	23.0	35	No
R33	47.4	12.4	25.0	No	22.4	35	No
R34	46.7	11.7	25.0	No	21.7	35	No
R35	46.0	11.0	25.0	No	21.0	35	No
R36	45.3	10.3	25.0	No	20.3	35	No

TABLE 7-4: SECOND FLOOR NIGHTTIME INTERIOR NOISE LEVELS

Lot	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Upgraded Windows[4]	Interior Noise Level[5]	Threshold[6]	Threshold Exceeded?
R37	44.7	9.7	25.0	No	19.7	35	No
R38	44.2	9.2	25.0	No	19.2	35	No
R39	44.4	9.4	25.0	No	19.4	35	No
R40	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R41	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R42	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R43	42.5	7.5	25.0	No	17.5	35	No
R44	43.0	8.0	25.0	No	18.0	35	No
R45	43.6	8.6	25.0	No	18.6	35	No
R46	44.2	9.2	25.0	No	19.2	35	No
R47	43.9	8.9	25.0	No	18.9	35	No
R48	44.5	9.5	25.0	No	19.5	35	No
R49	46.0	11.0	25.0	No	21.0	35	No
R50	47.6	12.6	25.0	No	22.6	35	No
R51	48.3	13.3	25.0	No	23.3	35	No
R52	50.4	15.4	25.0	No	25.4	35	No
R53	53.6	18.6	25.0	No	28.6	35	No

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the 45 dBA CNEL interior noise standard.
[3] Estimated minimum interior noise reduction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.
"NR" = Noise Reduction; N/A = Not applicable to lots due to zoning restrictions.

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8 OFF-SITE TRAFFIC NOISE

Traffic generated by the operation of the proposed Project is not expected to meaningfully influence the traffic noise levels in surrounding off-site areas. The expected Project traffic represents an incremental increase to the existing roadway volumes, which is not expected to generate a barely perceptible noise level increase of 3 dBA CNEL at nearby sensitive land uses adjacent to study area roadways, since a doubling of the existing traffic volumes would be required to generate a 3 dBA CNEL increase. (2) 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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9 OFF-SITE SENSITIVE RECEIVER LOCATIONS

To assess the potential for off-site operational and short-term construction noise impacts, the following receiver locations, as shown on Exhibit 9-A, were identified as representative locations for analysis. Sensitive receiver locations are generally defined as "[a]n area where noise interferes with normal activities associated with its use. Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites (15)." Moderately noise-sensitive land uses typically include multi-family dwellings, hotels, motels, dormitories, out-patient clinics, cemeteries, golf courses, country clubs, athletic/tennis clubs, and equestrian clubs. Land uses that are considered relatively insensitive to noise include business, commercial, and professional developments. Land uses that are typically not affected by noise include: industrial, manufacturing, utilities, agriculture, undeveloped land, parking lots, warehousing, liquid and solid waste facilities, salvage yards, and transit terminals.

To describe the potential off-site Project noise levels, nine receiver locations in the vicinity of the Project site were identified. All distances are measured from the Project site boundary to the outdoor living areas (e.g., private backyards) or at the building façade, whichever is closer to the Project site. 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 property line of the existing residence at 18351 Ferrari Drive, approximately 35 feet northwest of the Project site. A 24-hour noise measurement was taken near this location, L1, to describe the existing ambient noise environment. Location R1 represents a non-residential land use.

R2: Location R2 represents the northern Project site property line. A 24-hour noise measurement was taken near this location, L2, to describe the existing ambient noise environment.

R3: Location R3 represents the property line of the existing noise sensitive residence 18386 Cactus Avenue, approximately 753 feet north of the Project site. A 24-hour noise measurement was taken near this location, L3, to describe the existing ambient noise environment.

R4: Location R4 represents the eastern Project site property line. A 24-hour noise measurement was taken near this location, L4, to describe the existing ambient noise environment.

R5: Location R5 represents the property line of the existing noise sensitive residence on Viento Court, approximately 261 feet east of the Project site. A 24-hour noise measurement was taken near this location, L5, to describe the existing ambient noise environment.

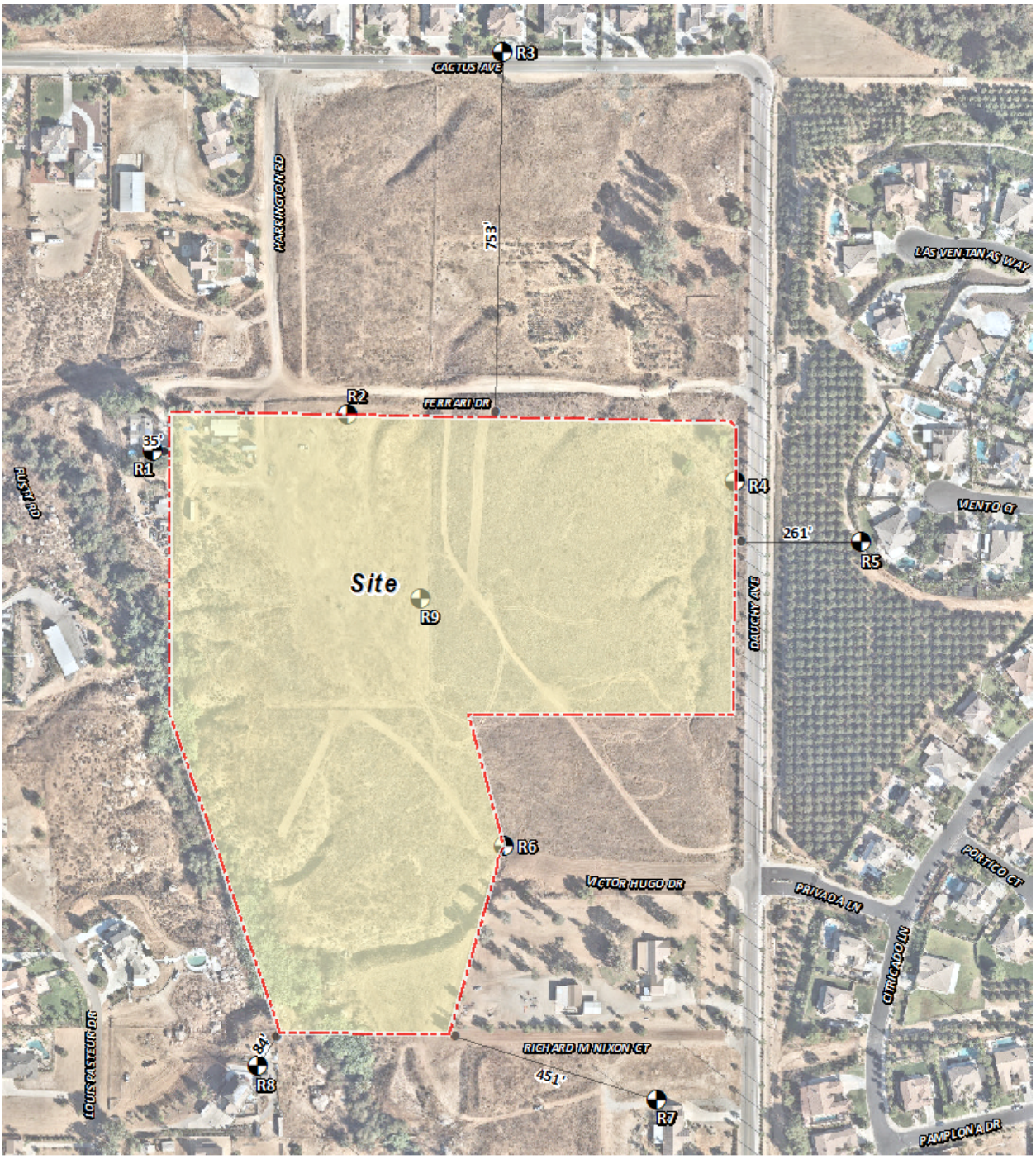
R6: Location R6 represents the southeastern Project site property line. A 24-hour noise measurement was taken near this location, L6, to describe the existing ambient noise environment.

R7: Location R7 represents the property line of the existing noise sensitive residence at 14855 Dauchy Avenue, approximately 451 feet southeast of the Project site. A 24-hour noise measurement was taken near this location, L7, to describe the existing ambient noise environment.

R8: Location R8 represents the property line of the existing noise sensitive residence at 14855 Louis Pasteur Drive, approximately 84 feet southwest of the Project site. A 24-hour noise measurement was taken near this location, L8, to describe the existing ambient noise environment.

R9: Location R9 represents the existing noise within the Project site. A 24-hour noise measurement was taken near this location, L9, to describe the existing ambient noise environment.

EXHIBIT 9-A: RECEIVER LOCATIONS



LEGEND:

N

Site Boundary

Receiver Locations

Distance from receiver to Project site boundary (in feet)

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10 OPERATIONAL NOISE ANALYSIS

This section analyzes the potential stationary-source operational noise impacts at the nearest receiver locations, identified in Section 8, and on-site locations shown on Exhibit 7-A, resulting from the operation of the proposed Dauchy Avenue Project. Exhibit 10-A identifies the representative noise source locations used to assess the operational noise levels.

10.1 OPERATIONAL NOISE SOURCES

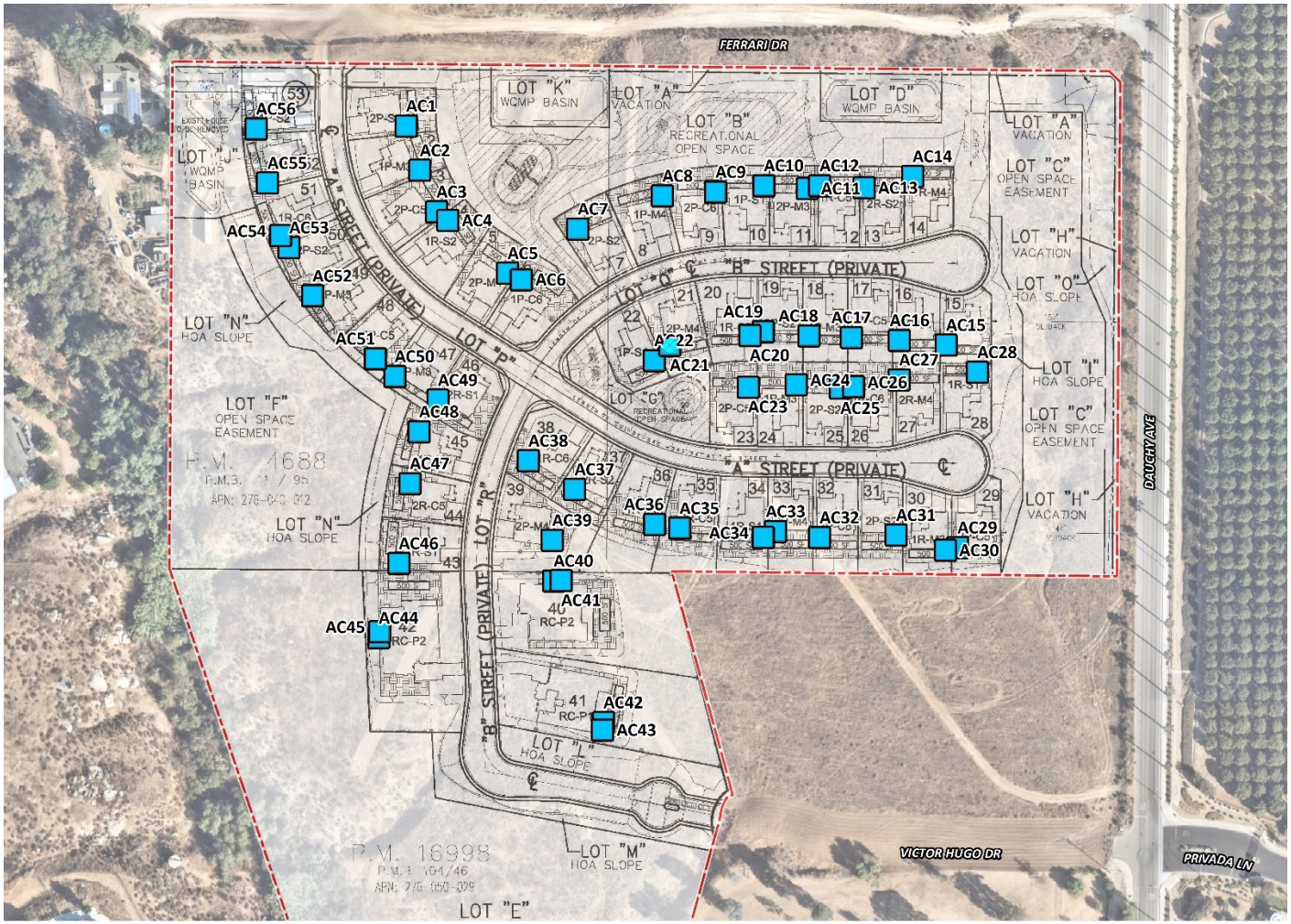
This operational noise analysis is intended to describe noise level impacts associated with the expected typical of daytime and nighttime activities at the Project site. To present the potential worst-case noise conditions, this analysis assumes the Project would be operational 24 hours per day, seven days per week. Consistent with similar residential land uses, the primary noise source would be ground mounted air conditioner condensers.

10.2 REFERENCE NOISE LEVELS

To assess the noise levels created by the ground-mounted air conditioning units, reference noise levels from a Lennox model XC13N used as representative of the air conditioning units that could be used on the Project and have a range of capacity from 1.5 tons to 5 tons. Based on the proposed square footage of each residence, it is estimated each residence would require between 3 to 5 tons of air conditioning. According to the product data sheet a Lennox model XC13N with a capacity ranging from 3 to 5 tons produces a maximum sound power level of 76 dBA, see Appendix 10.1.

While operating at full power air conditioners operate in multiple short cycles up to 30 minutes during the nighttime as compared to the daytime where the units typically operate can operate continuously up to 45 minutes in multiple cycles, depending on the ambient temperature. For purposes of this analysis, it was assumed the air conditioners would operate 45 minutes out of an hour during the daytime (7:00 a.m. to 10:00 p.m.) and 30 minutes out of an hour at nighttime (10:00 p.m. to 7:00 a.m.). The acoustic center of each unit will be located three feet above ground elevation.

EXHIBIT 10-A: OPERATIONAL NOISE SOURCE LOCATIONS



N

LEGEND:

Site Boundary

Air Conditioners

10.3 CADNAA NOISE PREDICTION MODEL

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

Using the ISO 9613-2 protocol, CadnaA will calculate the distance from each noise source to the noise receiver locations, using the ground absorption, distance, and barrier/building attenuation inputs to provide a summary of noise level at each receiver and the partial noise level contributions by noise source. Consistent with the ISO 9613-2 protocol, the CadnaA noise prediction model relies on the reference sound power level (L_w) to describe individual noise sources. While sound pressure levels (e.g., L_{eq}) quantify in decibels the intensity of given sound sources at a reference distance, sound power levels (L_w) are connected to the sound source and are independent of distance. Sound pressure levels vary substantially with distance from the source and diminish because of intervening obstacles and barriers, air absorption, wind, and other factors. Sound power is the acoustical energy emitted by the sound source and is an absolute value that is not affected by the environment.

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

Using the reference noise levels, 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. CadnaA noise model calculations are included in Appendix 10.2.

10.4 PROJECT OPERATIONAL NOISE LEVELS

10.4.1 OFF-SITE RECEIVERS

Table 10-1 shows the Project operational noise levels at the off-site receiver locations are expected to range from 5.5 to 25.0 dBA L_{eq} during the daytime hours.

TABLE 10-1: OFF-SITE PROJECT DAYTIME OPERATIONAL NOISE LEVELS

Noise Source[1]	Operational Noise Levels by Receiver Location (dBA L_{max})								
	R1	R2	R3	R4	R5	R6	R7	R8	R9
Ground Mounted Air Conditioning Units	27.4	17.3	9.2	3.4	7.8	28.2	22.2	17.7	29.3

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

Table 10-2 shows the Project operational noise levels at the off-site receiver locations are expected to range from 2.8 to 22.3 dBA L_{eq} during the nighttime hours.

TABLE 10-2: OFF-SITE PROJECT NIGHTTIME OPERATIONAL NOISE LEVELS

Noise Source[1]	Operational Noise Levels by Receiver Location (dBA L_{max})								
	R1	R2	R3	R4	R5	R6	R7	R8	R9
Ground Mounted Air Conditioning Units	27.4	17.3	9.2	3.4	7.8	28.2	22.2	17.7	29.3

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

10.4.1 ON-SITE RECEIVERS

Table 10-3 shows, the Project operational noise levels at the off-site receiver locations are expected to range from 29.6 to 48.8 dBA L_{eq} during the daytime hours and 26.9 to 39.0 dBA L_{eq}.

TABLE 10-3: ON-SITE PROJECT DAYTIME OPERATIONAL NOISE LEVELS

Receiver/ Lot[1]	Daytime Noise Level (dBA L_{eq})	Nighttime Noise Level (dBA L_{eq})
R01	34.6	31.8
R02	37.5	34.7
R03	39.3	36.6
R04	37.1	34.3
R05	38.2	35.5
R06	37.2	34.5
R07	34.8	32.0
R08	34.8	32.1
R09	35.7	33.0
R10	36.7	34.0
R11	38.5	35.8
R12	38.9	36.1
R13	38.5	35.7
R14	34.3	31.6
R15	41.7	39.0
R16	41.4	38.7
R17	41.4	38.6
R18	41.2	38.4
R19	41.6	38.9
R20	39.6	36.9
R21	46.7	36.8
R22	48.8	35.2
R23	40.6	37.9
R24	41.1	38.4
R25	41.6	38.8
R26	41.8	39.0
R27	40.1	37.3
R28	40.3	37.5
R29	32.5	29.8
R30	36.3	33.6
R31	34.4	31.7
R32	34.7	32.0

TABLE 10-3: ON-SITE PROJECT DAYTIME OPERATIONAL NOISE LEVELS

Receiver/ Lot[1]	Daytime Noise Level (dBA L_{eq})	Nighttime Noise Level (dBA L_{eq})
R33	37.5	34.8
R34	36.2	33.5
R35	34.0	31.3
R36	37.1	34.4
R37	38.2	35.4
R38	38.0	35.2
R39	40.8	38.1
R40	33.8	31.1
R41	29.6	26.9
R42	37.4	34.7
R43	35.5	32.8
R44	35.8	33.1
R45	38.2	35.5
R46	40.0	37.3
R47	40.0	37.3
R48	36.4	33.7
R49	35.3	32.6
R50	39.0	36.3
R51	37.2	34.5
R52	35.7	32.9
R53	33.0	30.3

10.5 PROJECT OPERATIONAL NOISE LEVEL COMPLIANCE

10.5.1 OFF-SITE RECEIVERS

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 Riverside exterior noise level standards at nearby noise-sensitive receiver locations. Table 10-4 shows the operational noise levels associated with the Project will satisfy the City of Riverside 45 dBA L_{eq} daytime and 35 dBA L_{eq} nighttime exterior noise level standards at on-site noise sensitive residential receiver locations. Therefore, the operational noise impacts are considered *less than significant* at the nearby noise-sensitive residential receiver locations.

TABLE 10-4: OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location[1]	Project Operational Noise Levels (dBA L_{max})[2]		Exterior Noise Level Standards (dBA L_{max})[3]		Noise Level Standards Exceeded?[4]	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
R1	27.4	27.4	55	45	No	No
R2	17.3	17.3	55	45	No	No
R3	9.2	9.2	55	45	No	No
R4	3.4	3.4	55	45	No	No
R5	7.8	7.8	55	45	No	No
R6	28.2	28.2	55	45	No	No
R7	22.2	22.2	55	45	No	No
R8	17.7	17.7	55	45	No	No
R9	29.3	29.3	55	45	No	No

[1] See Exhibit 8-A for the receiver locations.
[2] Proposed Project operational noise levels as shown on Tables 9-3 and 9-4.
[3] Exterior noise level standard as shown on Table 3-1.
[4] Do the estimated Project operational noise source activities exceed the noise level standards?
[5] Receiver locations R3 and R4 represent the Val Verde Regional Learning Center and Val Verde High School respectively, and do not include any noise sensitive nighttime receivers.
"Daytime" = 7:01 a.m. to 10:00 p.m.; "Nighttime" = 10:01 p.m. to 7:00 a.m.

10.5.2 ON-SITE RECEIVERS

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 Riverside exterior noise level standards at nearby noise-sensitive receiver locations. Table 10-4 shows the operational noise levels associated with the Project will satisfy the City of Riverside 45 dBA L_{eq} daytime and 35 dBA L_{eq} nighttime exterior noise level standards at all nearby noise sensitive residential receiver locations. Therefore, the operational noise impacts are considered *less than significant* at the nearby noise-sensitive residential receiver locations.

TABLE 10-5: ON-SITE OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver / Lot[1]	Daytime Noise Level (dBA L_{eq})	Nighttime Noise Level (dBA L_{eq})	Daytime Noise Level Limit (dBA L_{eq})[2]	Nighttime Noise Level Limit (dBA L_{eq})[2]	Exceed the daytime threshold?	Exceed the nighttime threshold?
R01	34.6	31.8	55	45	No	No
R02	37.5	34.7	55	45	No	No
R03	39.3	36.6	55	45	No	No
R04	37.1	34.3	55	45	No	No
R05	38.2	35.5	55	45	No	No
R06	37.2	34.5	55	45	No	No
R07	34.8	32.0	55	45	No	No
R08	34.8	32.1	55	45	No	No
R09	35.7	33.0	55	45	No	No
R10	36.7	34.0	55	45	No	No

TABLE 10-5: ON-SITE OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver / Lot[1]	Daytime Noise Level (dBA L_{eq})	Nighttime Noise Level (dBA L_{eq})	Daytime Noise Level Limit (dBA L_{eq})[2]	Nighttime Noise Level Limit (dBA L_{eq})[2]	Exceed the daytime threshold?	Exceed the nighttime threshold?
R11	38.5	35.8	55	45	No	No
R12	38.9	36.1	55	45	No	No
R13	38.5	35.7	55	45	No	No
R14	34.3	31.6	55	45	No	No
R15	41.7	39.0	55	45	No	No
R16	41.4	38.7	55	45	No	No
R17	41.4	38.6	55	45	No	No
R18	41.2	38.4	55	45	No	No
R19	41.6	38.9	55	45	No	No
R20	39.6	36.9	55	45	No	No
R21	46.7	36.8	55	45	No	No
R22	48.8	35.2	55	45	No	No
R23	40.6	37.9	55	45	No	No
R24	41.1	38.4	55	45	No	No
R25	41.6	38.8	55	45	No	No
R26	41.8	39.0	55	45	No	No
R27	40.1	37.3	55	45	No	No
R28	40.3	37.5	55	45	No	No
R29	32.5	29.8	55	45	No	No
R30	36.3	33.6	55	45	No	No
R31	34.4	31.7	55	45	No	No
R32	34.7	32.0	55	45	No	No
R33	37.5	34.8	55	45	No	No
R34	36.2	33.5	55	45	No	No
R35	34.0	31.3	55	45	No	No
R36	37.1	34.4	55	45	No	No
R37	38.2	35.4	55	45	No	No
R38	38.0	35.2	55	45	No	No
R39	40.8	38.1	55	45	No	No
R40	33.8	31.1	55	45	No	No
R41	29.6	26.9	55	45	No	No
R42	37.4	34.7	55	45	No	No
R43	35.5	32.8	55	45	No	No
R44	35.8	33.1	55	45	No	No
R45	38.2	35.5	55	45	No	No
R46	40.0	37.3	55	45	No	No
R47	40.0	37.3	55	45	No	No
R48	36.4	33.7	55	45	No	No
R49	35.3	32.6	55	45	No	No
R50	39.0	36.3	55	45	No	No
R51	37.2	34.5	55	45	No	No

TABLE 10-5: ON-SITE OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver / Lot[1]	Daytime Noise Level (dBA L_{eq})	Nighttime Noise Level (dBA L_{eq})	Daytime Noise Level Limit (dBA L_{eq})[2]	Nighttime Noise Level Limit (dBA L_{eq})[2]	Exceed the daytime threshold?	Exceed the nighttime threshold?
R52	35.7	32.9	55	45	No	No
R53	33.0	30.3	55	45	No	No

[1] On-Site receiver locations shown on Figure 10-A.
[2] Title 7, Ord.6273. 1

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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 8. To prevent high levels of construction noise from impacting noise-sensitive land uses the City of Riverside Municipal Code Section 7.35.020(G) exempts construction noise from its stationary-source noise level limits provided said activities do not take place between the hours of 7:00 p.m. and 7:00 a.m. on weekdays, between the hours of 5:00 p.m. and 8:00 a.m. on Saturdays, or at any time on Sunday or a federal holiday.

11.1 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 nearest sensitive receiver locations were completed. 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 0.0 was used in the CadnaA noise analysis to account for hard site conditions.

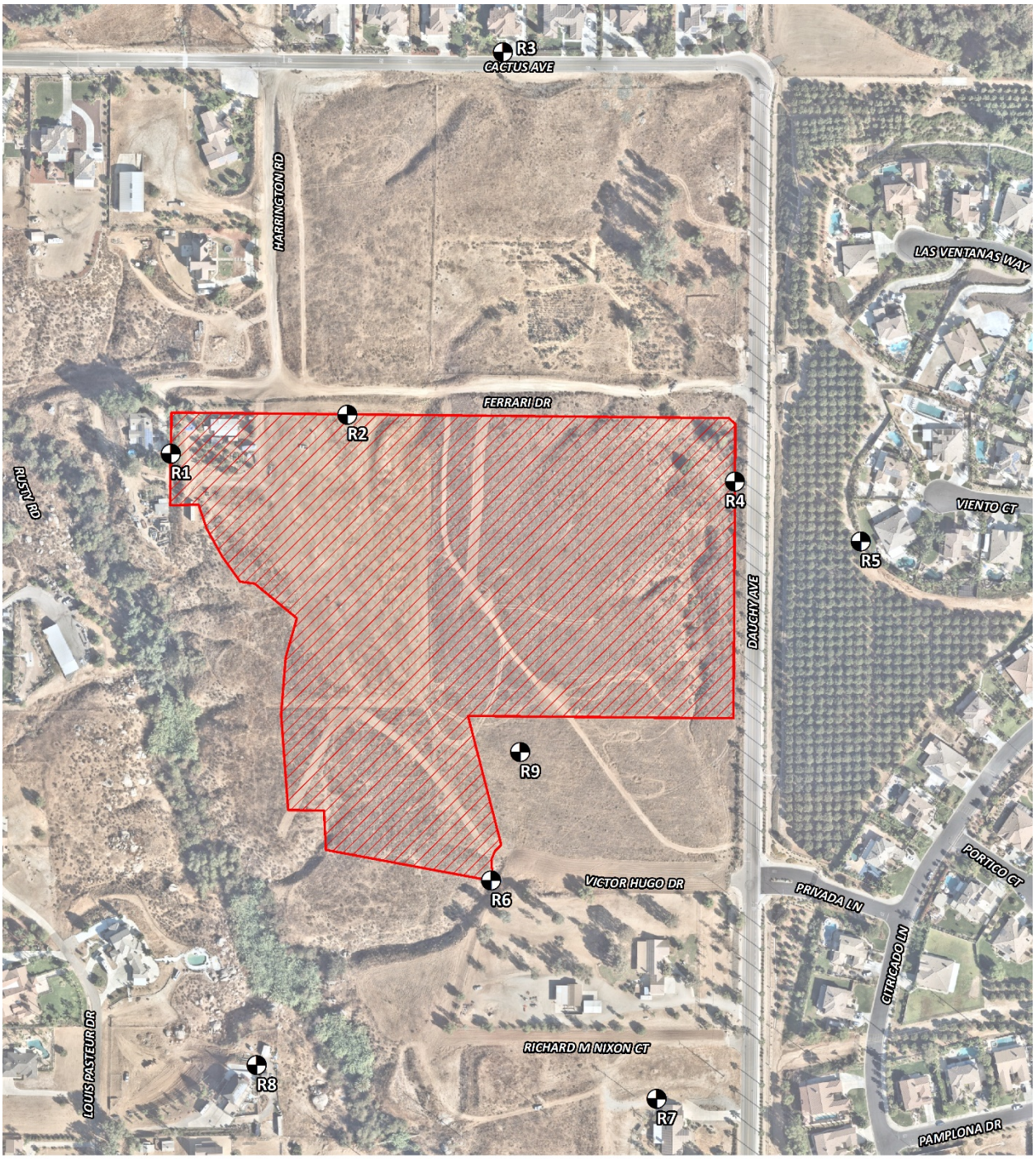
To assess the worst-case construction noise levels, the Project construction noise analysis relies on the highest noise level impacts when the equipment with the highest reference noise level is operating at the closest point from the edge of primary construction activity (Project site boundary) to each receiver location. As shown on Table 11-1, the construction noise levels are expected to range from 48.7 to 75.1 dBA L_{eq}, and the highest construction levels are expected to range from 58.8 to 75.1 dBA L_{eq} at the nearest receiver locations. Appendix 9.1 includes the detailed CadnaA construction noise model inputs.

TABLE 11-1: CONSTRUCTION EQUIPMENT NOISE LEVEL SUMMARY

Receiver Location[1]	Construction Noise Levels (dBA L_{eq})					
	Site Preparation	Grading	Building Construction	Paving	Architectural Coating	Highest Levels[2]
R1	74.6	72.8	70.9	70.5	64.5	74.6
R2	59.9	58.1	56.2	55.8	49.8	59.9
R3	65.6	63.8	61.9	61.5	55.5	65.6
R4	58.8	57.0	55.1	54.7	48.7	58.8
R5	61.0	59.2	57.3	56.9	50.9	61.0
R6	74.7	72.9	71.0	70.6	64.6	74.7
R7	75.1	73.3	71.4	71.0	65.0	75.1
R8	72.4	70.6	68.7	68.3	62.3	72.4
R9	70.1	68.3	66.4	66.0	60.0	70.1

[1] Noise receiver locations are shown on Exhibit 9-A.
[2] Construction noise level calculations based on distance from the project site boundaries (construction activity area) to nearby receiver locations. CadnaA construction noise model inputs are included in Appendix 9.1.

EXHIBIT 11-A: CONSTRUCTION NOISE SOURCE AND RECEIVER LOCATIONS



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LEGEND:

Construction Activity Receiver Locations

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

11.2 CONSTRUCTION NOISE LEVEL COMPLIANCE

To evaluate whether the Project will generate potentially significant short-term noise levels at nearest receiver locations, a construction-related daytime noise level threshold of 80 dBA L_{eq} is used as a reasonable threshold to assess the daytime construction noise level impacts. The construction noise analysis shows that the nearest receiver locations will satisfy the reasonable daytime 80 dBA L_{eq} significance threshold during Project construction activities as shown on Table 11-2. Therefore, the noise impacts due to Project construction noise is considered *less than significant* under CEQA at all receiver locations.

TABLE 11-2: 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	74.6	80	No
R2	59.9	80	No
R3	65.6	80	No
R4	58.8	80	No
R5	61.0	80	No
R6	74.7	80	No
R7	75.1	80	No
R8	72.4	80	No
R9	70.1	80	No

[1] Noise receiver locations are shown on Exhibit 9-A.
[2] Highest construction noise level calculations based on distance from the construction noise source activity to nearby receiver locations as shown on Table 9-1.
[3] Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual.
[4] Do the estimated Project construction noise levels exceed the construction noise level threshold?

11.3 CONSTRUCTION VIBRATION LEVELS

Using the vibration source level of construction equipment provided on Table 6-4 and the construction vibration assessment methodology published by the FTA, it is possible to estimate the Project vibration impacts. Table 9-3 presents the expected Project related vibration levels at the nearby receiver locations. At distances ranging from 37 to 778 feet from Project construction activities, construction vibration velocity levels are estimated to range from 0.00 to 0.05 in/sec PPV. Based on maximum acceptable continuous vibration threshold of 0.3 PPV (in/sec) for older

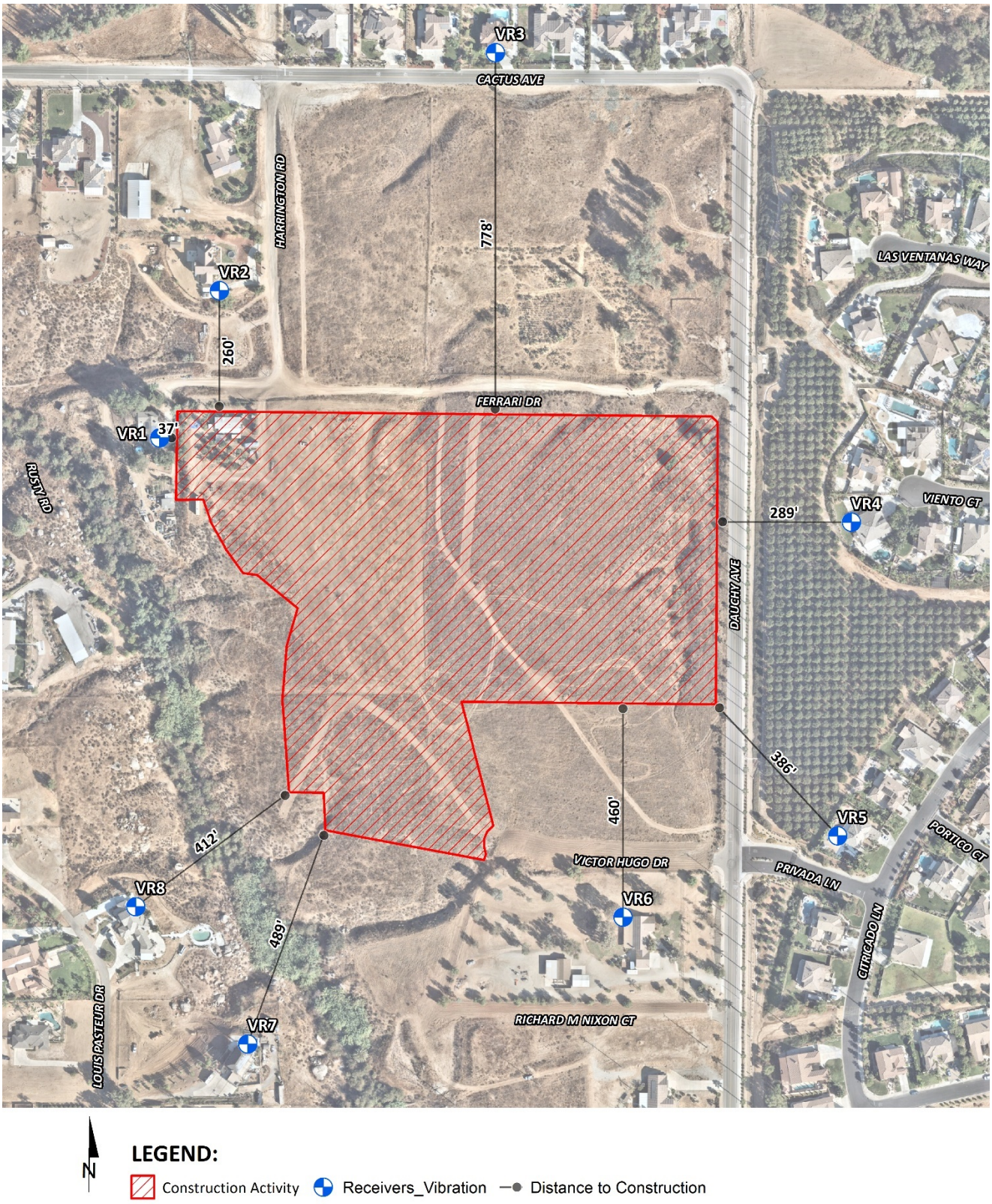
residential buildings, the typical Project construction vibration levels will satisfy the building damage thresholds at all receiver locations. In addition, the typical construction vibration levels at the nearest sensitive receiver locations are unlikely to be sustained during the entire construction period but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site boundaries. Based on the vibration analysis shown in Table 11-3, vibration impacts would be *less than significant* under CEQA.

TABLE 11-3: CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver[1]	Distance to Const. Activity (Feet)[2]	Typical Construction Vibration Levels PPV (in/sec)[3]					Thresholds PPV (in/sec)[4]	Thresholds Exceeded?[5]
		Small bulldozer	Jackhammer	Loaded Trucks	Large bulldozer	Highest Vibration Level		
VR1	37'	0.00	0.02	0.04	0.05	0.05	0.3	No
VR1	260'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR2	778'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR3	289'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR4	386'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR5	460'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR6	489'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR7	412'	0.00	0.00	0.00	0.00	0.00	0.3	No

[1] Receiver locations are shown on Exhibit 9-B.
[2] Distance from receiver location to Project construction boundary.
[3] Based on the Vibration Source Levels of Construction Equipment (Table 6-4).
[4] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 19, p. 38.
[5] Does the peak vibration exceed the acceptable vibration thresholds?
"PPV" = Peak Particle Velocity

EXHIBIT 11-B: VIBRATION RECEIVER LOCATIONS



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Receiver[1]	Distance to Const. Activity (Feet)[2]	Typical Construction Vibration Levels PPV (in/sec)[3]					Thresholds PPV (in/sec)[4]	Thresholds Exceeded?[5]
		Small bulldozer	Jackhammer	Loaded Trucks	Large bulldozer	Highest Vibration Level		
VR1	37'	0.00	0.02	0.04	0.05	0.05	0.3	No
VR1	260'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR2	778'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR3	289'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR4	386'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR5	460'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR6	489'	0.00	0.00	0.00	0.00	0.00	0.3	No
VR7	412'	0.00	0.00	0.00	0.00	0.00	0.3	No

[1] Receiver locations are shown on Exhibit 9-B.
[2] Distance from receiver location to Project construction boundary.
[3] Based on the Vibration Source Levels of Construction Equipment (Table 6-4).
[4] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Tables 19, p. 38.
[5] Does the peak vibration exceed the acceptable vibration thresholds?
"PPV" = Peak Particle Velocity

12 REFERENCES

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13 CERTIFICATION

The contents of this noise study report represent an accurate depiction of the noise environment and impacts associated with the proposed Dauchy Avenue 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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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 5.1:

STUDY AREA PHOTOS

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APPENDIX 5.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

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APPENDIX 7.1:

CADNAA EXTERIOR TRAFFIC NOISE CALCULATIONS

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APPENDIX 10.1:

LENNOX AIR CONDITIONER NOISE LEVEL DATA

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APPENDIX 10.2:

CADNAA OFF-SITE OPERATIONAL NOISE MODEL INPUTS

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APPENDIX 10.3:

CADNAA ON-SITE OPERATIONAL NOISE MODEL INPUTS

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APPENDIX 11.1:

CADNAA CONSTRUCTION NOISE CALCULATIONS

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