



WOODCREST RETAIL CENTER

NOISE AND VIBRATION ANALYSIS

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County of Riverside

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
ANSI	American National Standards Institute
Calveno	California Vehicle Noise
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
INCE	Institute of Noise Control Engineering
Leq	Equivalent continuous (average) sound level
Lmax	Maximum level measured over the time interval
mph	Miles per hour
OPR	Governor's Office of Planning and Research
PPV	Peak Particle Velocity
Project	Woodcrest Retail Center
REMEL	Reference Energy Mean Emission Level
RMS	Root-mean-square
TA	Traffic Analysis
VdB	Vibration Decibels

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise mitigation measures for the proposed Woodcrest Retail Center (Project) in the County of Riverside. This noise study has been prepared to satisfy applicable County of Riverside noise standards and significance criteria based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (1)

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

TABLE ES-1: SUMMARY OF CEQA SIGNIFICANCE FINDINGS

Analysis	Report Section	Significance Findings	
		Unmitigated	Mitigated
Off-Site Traffic Noise	7	<i>Less Than Significant</i>	-
Operational Noise	9	<i>Less Than Significant</i>	-
Project Construction Noise	10	<i>Less Than Significant</i>	-
Construction Vibration	10	<i>Potentially Significant</i>	<i>Less Than Significant</i>

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1 INTRODUCTION

This Noise and Vibration Analysis has been completed to determine the noise impacts associated with the development of the proposed Woodcrest Retail Center (Project). This noise and vibration analysis briefly describes the Project, provides information regarding noise fundamentals, sets out the local regulatory setting, presents the study methods and procedures for noise analysis, evaluates the future exterior noise environment, potential off-site traffic impacts, the Project-related long-term stationary-source operational noise, and Project-related short-term construction noise and vibration impacts.

1.1 SITE LOCATION

The Project site is located on the northwest corner of Washington Street and Van Buren Boulevard in the Lake Matthews-Woodcrest area in the County of Riverside, as shown on Exhibit 1-1. The nearest existing noise-sensitive residential uses are located north of the Project site.

1.2 PROJECT DESCRIPTION

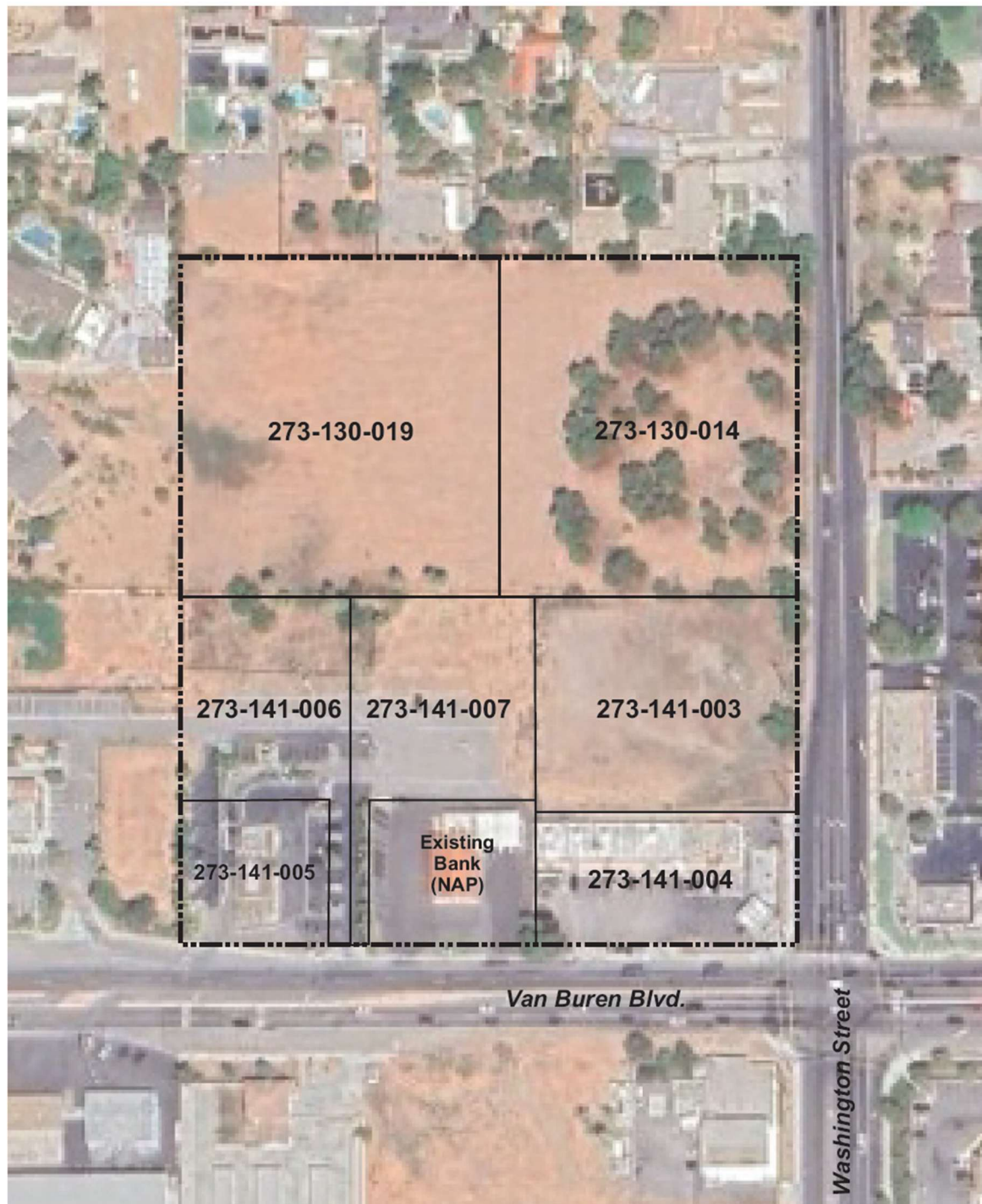
The site is largely undeveloped/vacant, however, there are two parcels developed with existing uses. Assessor's Parcel Number (APN) 273-141-004 is currently developed with in-line shops and a 7-Eleven with Gas Station. The 7-Eleven is approximately 2,400 square feet (with four vehicle fueling positions), the existing bike store is 2,400 square feet, the smoke shop is 1,200 square feet, the nail shop is 1,200 square feet, and the fish taco shop is 1,200 square feet. All existing structures on this parcel will be demolished and redeveloped as part of the Project. APN 273-141-005 is an existing Farmer Boys fast food restaurant that is approximately 2,640 square feet. This pad will be redeveloped as a 3,390 square foot restaurant pad with drive-through window. There is an existing bank (Valley Bank) located on APN 273-141-008) and is not-a-part of this Project and will be redeveloped under a future application. For the purposes of analysis, the assumed Project Opening Year is 2027. For context, location and configuration of existing uses are illustrated on the APN Map provided at Exhibit 1-2.

The Project proposes a Base Development Concept and a "Parcel 1 Option" development concept, presented in Exhibit 1-C. Under the Base Development Concept, Parcel 1 would be developed with a convenience store/retail gas station. Under the Parcel 1 Option, it would be developed with retail/restaurant uses. Under either development concept, the remainder of the Project site (Parcels 2 – 6) would be developed with a supermarket, shops, and restaurant uses as illustrated on Exhibit 1-3. Unless otherwise noted in this analysis, reference to the Project includes both the Base Development Concept and the Parcel 1 Option.

EXHIBIT 1-1: PROJECT LOCATION

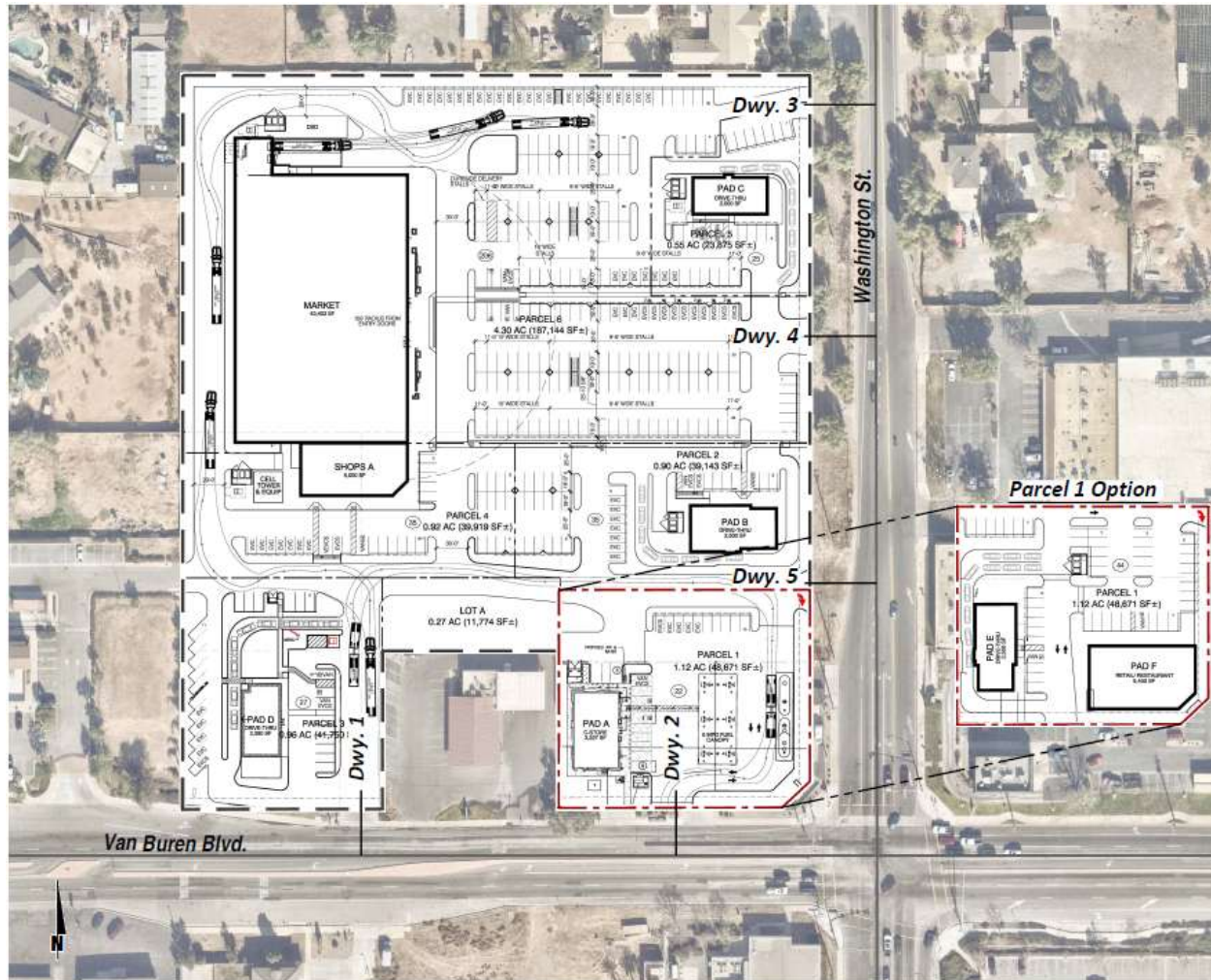


EXHIBIT 1-2: EXISTING USES



NOT TO SCALE
Source: Google Earth; Applied Planning, Inc.

EXHIBIT 1-3: SITE PLAN



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 2-1 presents a summary of the typical noise levels and their subjective loudness and effects that are described in more detail below.

EXHIBIT 2-1: 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		
NOISY URBAN AREA, DAYTIME	VACUUM CLEANER AT 3m (10 ft)	70	LOUD	SPEECH INTERFERENCE
HEAVY TRAFFIC AT 90m (300 ft)	NORMAL SPEECH AT 1m (3 ft)	60		
QUIET URBAN DAYTIME	LARGE BUSINESS OFFICE	50	MODERATE	SLEEP DISTURBANCE
QUIET URBAN NIGHTTIME	THEATER, LARGE CONFERENCE ROOM (BACKGROUND)	40		
QUIET SUBURBAN NIGHTTIME	LIBRARY	30	FAINT	NO EFFECT
QUIET RURAL NIGHTTIME	BEDROOM AT NIGHT, CONCERT HALL (BACKGROUND)	20		
	BROADCAST/RECORDING STUDIO	10	VERY FAINT	
LOWEST THRESHOLD OF HUMAN HEARING	LOWEST THRESHOLD OF HUMAN HEARING	0		

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

2.1 RANGE OF NOISE

Since the range of intensities that the human ear can detect is so large, the scale frequently used to measure intensity is a scale based on multiples of 10, the logarithmic scale. The scale for measuring intensity is the decibel scale. Each interval of 10 decibels indicates a sound energy ten times greater than before, which is perceived by the human ear as being roughly twice as loud. (2) The most common sounds vary between 40 dBA (very quiet) to 100 dBA (very loud). Normal conversation at three feet is roughly at 60 dBA, while loud jet engine noises equate to 110 dBA at approximately 1,000 feet, which can cause serious discomfort. (3) Another important aspect of noise is the duration of the sound and the way it is described and distributed in time.

2.2 NOISE DESCRIPTORS

Environmental noise descriptors are typically based on average noise levels over time, rather than instantaneous measurements. The most commonly used metric is the equivalent continuous sound level (L_{eq}). Rather than being measured directly, L_{eq} is calculated from A-weighted sound pressure levels (dBA) recorded over a specified period. The L_{eq} represents the constant sound level that, over a given time, would contain the same acoustic energy as the actual fluctuating sound levels. As such, it is widely used to describe average environmental noise exposure. Importantly, while sound pressure levels (e.g., L_{eq}) express the intensity of sound at a specific location and are affected by distance and environmental conditions, sound power levels (L_w) are intrinsic properties of the sound source itself. Unlike sound pressure, sound power is independent of distance and unaffected by obstacles, air absorption, or weather conditions. In contrast, sound pressure levels decrease with distance due to factors such as geometric spreading, absorption by air and surfaces, intervening barriers or obstacles, and meteorological conditions (e.g., wind, humidity).

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. 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 noise can become more intrusive. CNEL does not represent the actual sound level heard at any time but rather represents the total sound exposure. The County 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.

(2)

2.3.2 Ground Absorption

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

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

2.3.3 Atmospheric Effects

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

2.3.4 Shielding

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

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 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 block the line-of-sight path of sound from the noise source.

2.6 LAND USE COMPATIBILITY WITH NOISE

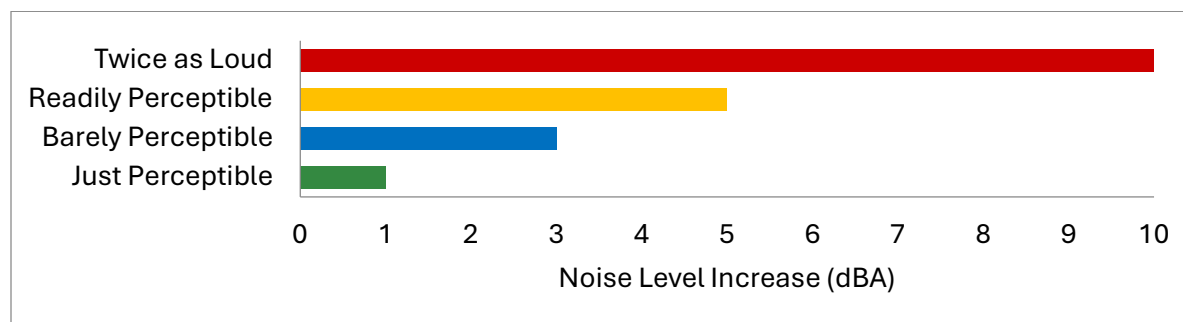
Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches, and residences are more sensitive to noise intrusion than commercial or industrial developments and related activities. As ambient noise levels affect the perceived amenity or livability of a development, 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. (6)

2.7 COMMUNITY RESPONSE TO NOISE

Approximately sixteen 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 may occur. Twenty to thirty percent of the population will not complain even in very severe noise environments. (7 pp. 8-6) Thus, a variety of reactions can be expected from people exposed to any given noise environment.

Surveys have shown that community response to noise varies from no reaction to vigorous action for newly introduced noises averaging from 10 dB below existing to 25 dB above existing. (8) According to research originally published in the Noise Effects Handbook (7), the percentage of high annoyance ranges from approximately 0 percent at 45 dB or less, 10 percent are highly annoyed around 60 dB, and increases rapidly to approximately 70 percent being highly annoyed at approximately 85 dB or greater. 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 2-2. A change of 3 dBA is considered barely perceptible, and changes of 5 dBA are considered readily perceptible. (4)

EXHIBIT 2-2: NOISE LEVEL INCREASE PERCEPTION



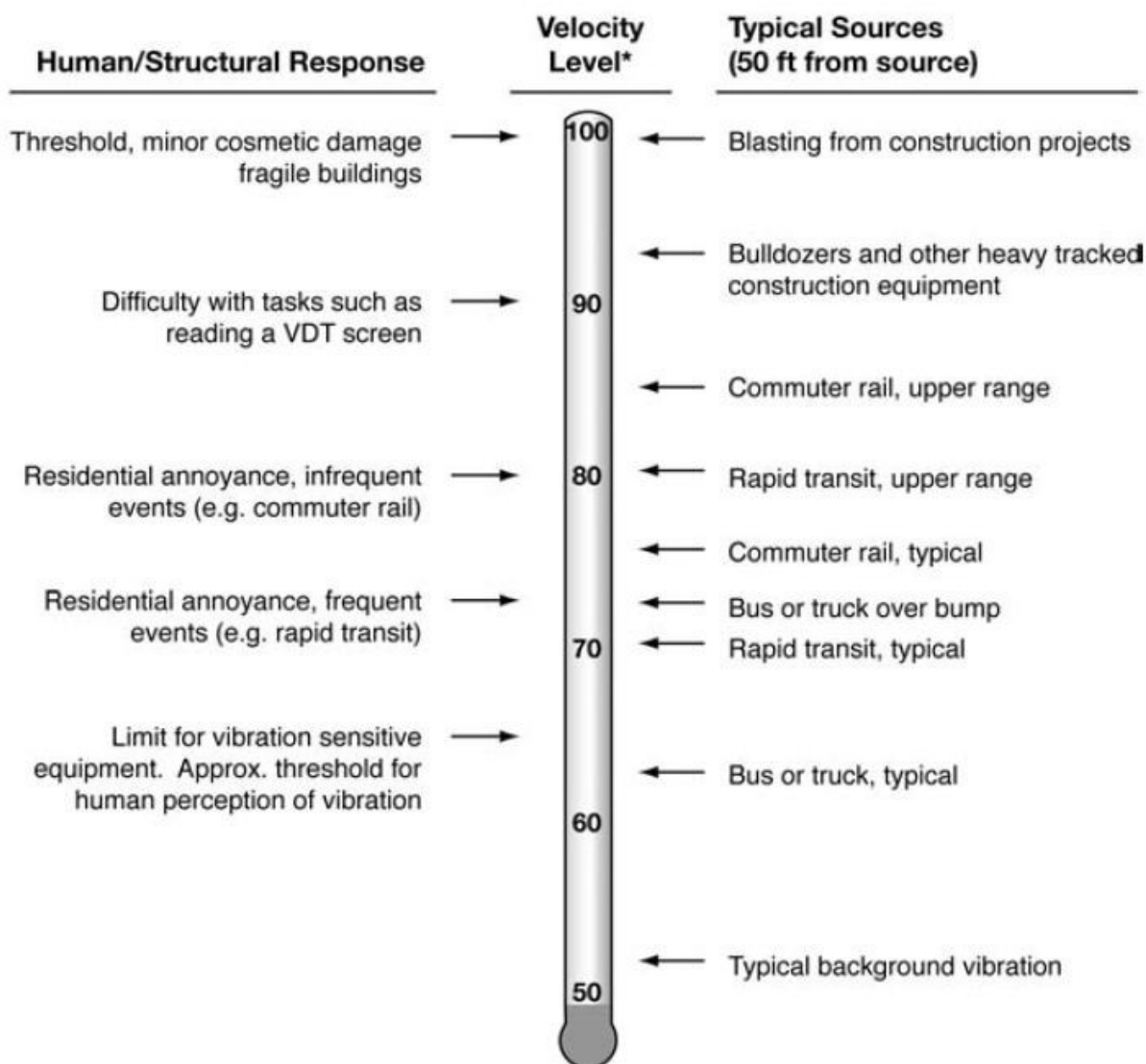
2.8 VIBRATION

Per the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual, 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. Additionally, in contrast to airborne noise, ground-borne vibration outdoors is not a common environmental problem and annoyance from ground-borne vibration is almost exclusively an indoor phenomenon (8). Therefore, the effects of vibrations should only be evaluated at a structure and the effects of the building structure on the vibration should be considered. Wood-frame buildings, such as typical residential structures, are more easily excited by ground vibration than heavier buildings. In contrast, large masonry buildings with spread footings have a low response to ground vibration (8). In general, the heavier a building is, the lower the response will be to the incident vibration energy. However, all structures reduce vibration levels due to the coupling of the building to the soil.

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 (8). 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 (8). However, the RMS amplitude and PPV are related mathematically, and the RMS amplitude of equipment is typically calculated from the PPV reference level. The RMS amplitude is approximately 70% of the PPV (9). Thus, either can be used in the description of vibration impacts.

While not universally accepted, vibration decibel notation (VdB) is another vibration notation developed and used by the FTA in their guidance manual to describe vibration levels and provide a background of common vibration levels and set vibration limits. (8) Decibel notation (VdB) serves to reduce the range of numbers used to describe vibration levels and is used in this report to describe vibration levels. 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 2-3 illustrates common vibration sources and the human and structural response to ground-borne vibration.

EXHIBIT 2-3: TYPICAL LEVELS OF GROUND-BORNE VIBRATION



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

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

3 REGULATORY SETTING

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

3.1 STATE OF CALIFORNIA NOISE REQUIREMENTS

The State of California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards, and provides guidance for local land use compatibility. State law requires that each county and city adopt a General Plan that includes a Noise Element which is to be prepared per guidelines adopted by the Governor's Office of Planning and Research (OPR). (10) The purpose of the Noise Element is to limit the exposure of the community to excessive noise levels. In addition, the California Environmental Quality Act (CEQA) requires that all known environmental effects of a project be analyzed, including environmental noise impacts.

3.2 COUNTY OF RIVERSIDE GENERAL PLAN

The County of Riverside has adopted a Noise Element of the General Plan to control and abate environmental noise, and to protect the citizens of the County of Riverside from excessive exposure to noise. (11) The Noise Element specifies the maximum allowable exterior noise levels for new developments impacted by transportation noise sources such as arterial roads, freeways, airports, and railroads. In addition, the Noise Element identifies several policies to minimize the impacts of excessive noise levels throughout the community and establishes noise level requirements for all land uses. To protect County of Riverside residents from excessive noise, the Noise Element contains the following policies related to the Project:

- N 1.1 Protect noise-sensitive land uses from high levels of noise by restricting noise-producing land uses from these areas. If the noise-producing land use cannot be relocated, then noise buffers such as setbacks, landscaping, or block walls shall be used.*
- N 1.3 Consider the following uses noise-sensitive and discourage these uses in areas in excess of 65 CNEL:*
 - *Schools*
 - *Hospitals*
 - *Rest Homes*
 - *Long Term Care Facilities*
 - *Mental Care Facilities*
 - *Residential Uses*
 - *Libraries*
 - *Passive Recreation Uses*

- *Places of Worship*

- N 1.5 Prevent and mitigate the adverse impacts of excessive noise exposure on the residents, employees, visitors, and noise-sensitive uses of Riverside County.*
- N 4.1 Prohibit facility-related noise, received by any sensitive use, from exceeding the following worst-case noise levels:*
 - a. 45 dBA 9-minute L_{eq} between 10:00 p.m. and 7:00 a.m.;*
 - b. 65 dBA 9-minute L_{eq} between 7:00 a.m. and 10:00 p.m.*
- N 13.1 Minimize the impacts of construction noise on adjacent uses within acceptable standards.*
- N 13.2 Ensure that construction activities are regulated to establish hours of operation in order to prevent and/or mitigate the generation of excessive or adverse impacts on surrounding areas.*
- N 13.3 Condition subdivision approval adjacent to developed/occupied noise-sensitive land uses (see policy N 1.3) by requiring the developer to submit a construction-related noise mitigation plan to the [County] for review and approval prior to issuance of a grading permit. The plan must depict the location of construction equipment and how the noise from this equipment will be mitigated during construction of this project, through the use of such methods as:*
 - i. Temporary noise attenuation fences;*
 - ii. Preferential location and equipment; and*
 - iii. Use of current noise suppression technology and equipment.*
- N 14.1 Enforce the California Building Standards that sets standards for building construction to mitigate interior noise levels to the tolerable 45 CNEL limit. These standards are utilized in conjunction with the Uniform Building Code by the County's Building Department to ensure that noise protection is provided to the public. Some design features may include extra-dense insulation, double-paned windows, and dense construction materials.*
- N 16.3 Prohibit exposure of residential dwellings to perceptible ground vibration from passing trains as perceived at the ground or second floor. Perceptible motion shall be presumed to be a motion velocity of 0.01 inches/second over a range of 1 to 100 Hz.*

To ensure noise-sensitive land uses are protected from high levels of noise (N 1.1), Table N-1 of the Noise Element identifies guidelines to evaluate proposed developments based on exterior and interior noise level limits for land uses and requires a noise analysis to determine needed mitigation measures if necessary. The Noise Element identifies residential use as a noise-sensitive land use (N 1.3) and discourages new development in areas with transportation-related levels of 65 dBA CNEL or greater existing ambient noise levels. To prevent and mitigate noise impacts for its residents (N 1.5), County of Riverside requires exterior noise attenuation measures for sensitive land use exposed to transportation related noise levels higher than 65 dBA CNEL. In addition, the County of Riverside had adopted an interior noise level limit of 45 dBA CNEL (N 14.1).

Policy N 4.1 of the Noise Element sets a stationary-source exterior noise limit to not to be exceeded for a cumulative period of more than ten minutes in any hour of 65 dBA L_{eq} for daytime hours of 7:00 a.m. to 10:00 p.m., and 45 dBA L_{eq} during the noise-sensitive nighttime hours of 10:00 p.m. to 7:00 a.m. To prevent high levels of construction noise from impacting noise-sensitive land uses, policies N 13.1 through 13.3 identify construction noise mitigation requirements for new development located near existing noise-sensitive land uses. (11)

3.2.1 Land Use Compatibility Guidelines

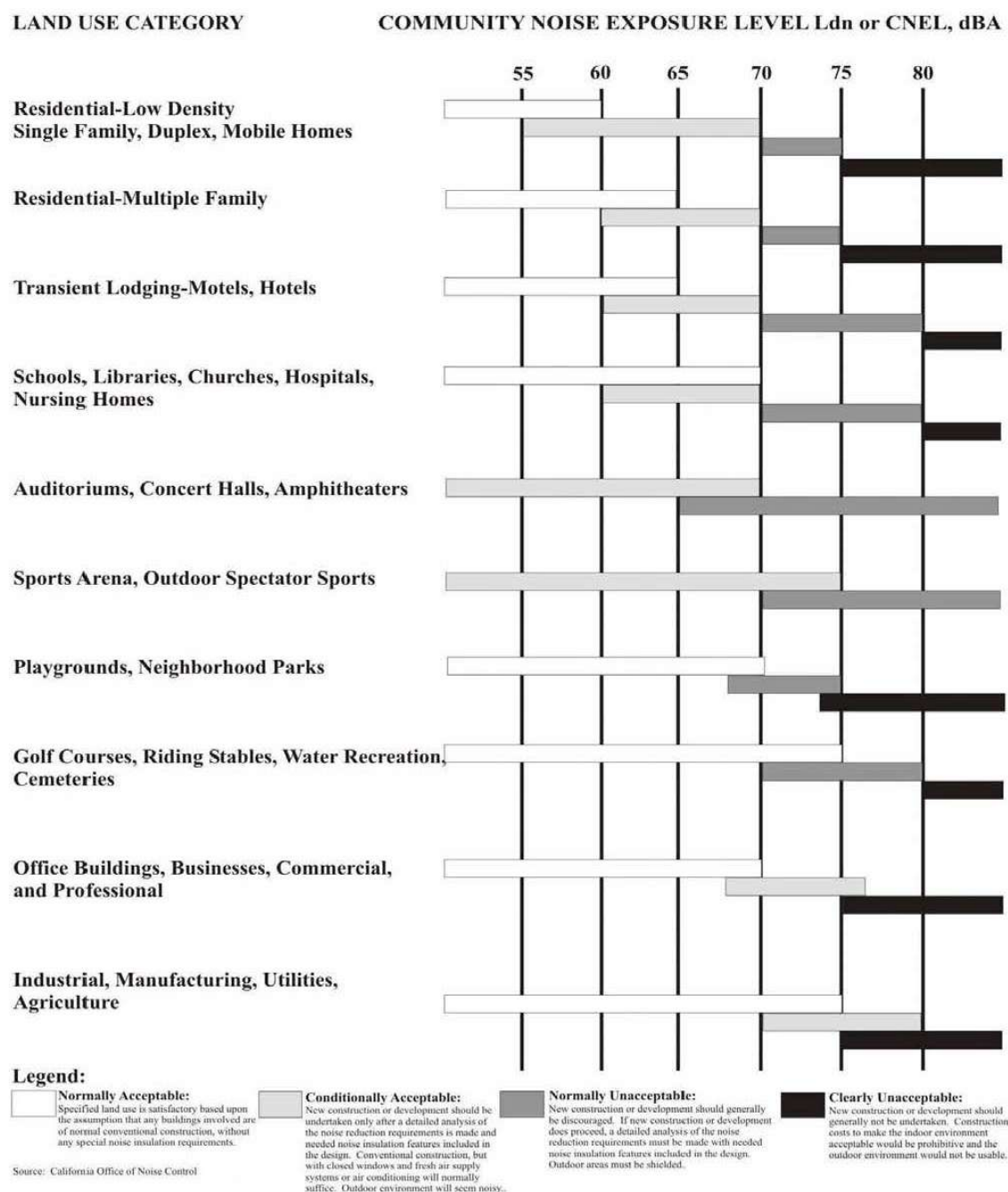
The noise criteria identified in the County of Riverside Noise Element (Table N-1) are guidelines to evaluate the land use compatibility of transportation related noise. The compatibility criteria, shown on Exhibit 3-1, provides the County with a planning tool to gauge the compatibility of land uses relative to existing and future exterior noise levels. The *Land Use Compatibility for Community Noise Exposure* matrix describes categories of compatibility and not specific noise standards. The non-noise sensitive Project maintenance and office buildings are considered *normally acceptable* with unmitigated exterior noise levels of less than 75 dBA CNEL based on the *Industrial, Manufacturing, Utilities, Agriculture* land use compatibility criteria shown on Exhibit 3-A. Noise sensitive residential designated land uses in the Project study area are considered *normally acceptable* with exterior noise levels below 60 dBA CNEL, and *conditionally acceptable* with exterior noise levels of up to 70 dBA CNEL. For *conditionally acceptable* exterior noise levels, of up to 80 dBA CNEL for Project maintenance and office building land uses, *new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and the needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.* (11)

3.3.2 County of Riverside Stationary Noise Standards

The County of Riverside has set stationary-source hourly average L_{eq} exterior noise limits to control loading dock activity, truck movements, trash enclosure activity, roof-top air conditioning units, drive-thru speakerphone, parking lot vehicle movements and gas station activity associated with the development of the proposed Woodcrest Retail Center.

Policy N 4.1 of the County of Riverside General Plan Noise Element sets a stationary-source average L_{eq} exterior noise limit not to be exceeded for a cumulative period of more than ten minutes in any hour of 65 dBA L_{eq} for daytime hours of 7:00 a.m. to 10:00 p.m., and 45 dBA L_{eq} during the noise-sensitive nighttime hours of 10:00 p.m. to 7:00 a.m. (11) The County of Riverside County Code Section 9.52.040 *General sound level standards* (included in Appendix 3.1) summarizing Ordinance No. 847 *Regulating Noise* identify lower, more restrictive exterior noise level standards, which for the purpose of this report, are used to evaluate potential Project-related operational noise level limits instead of the higher General Plan exterior noise level standards previously identified. The County of Riverside County Code identifies residential exterior noise level limits of 55 dBA L_{eq} during the daytime hours of 7:00 a.m. to 10:00 p.m., and 45 dBA L_{eq} during the noise-sensitive nighttime hours of 10:00 p.m. to 7:00 a.m., commercial exterior noise level limits of 65 dBA L_{eq} during the daytime hours, and 55 dBA L_{eq} during the noise-sensitive nighttime hours, and public facility exterior noise level limits of 65 dBA L_{eq} during the daytime hours, and 45 dBA L_{eq} during the noise-sensitive nighttime hours. (12).

EXHIBIT 3-1: LAND USE COMPATIBILITY FOR COMMUNITY NOISE EXPOSURE



Source: County of Riverside General Plan Noise Element, Table N-1.

Based on several discussions with the County of Riverside Department of Environmental Health (DEH), Office of Industrial Hygiene (OIH), it is important to recognize that the County of Riverside County Code noise standards, incorrectly identify maximum noise level (L_{max}) standards that should instead reflect the average L_{eq} noise levels. Moreover, the County of Riverside DEH OIH's April 15th, 2015, *Requirements for determining and mitigating, non-transportation noise source impacts to residential properties* also identifies operational (stationary-source) noise level limits using the L_{eq}

metric, consistent with the direction of the County of Riverside General Plan guidelines and standards provided in the Noise Element. Therefore, this report has been prepared consistent with direction of the County of Riverside DEH OIH guidelines and standards using the average L_{eq} noise level metric for stationary-source (operational) noise level evaluation.

3.3 CONSTRUCTION NOISE STANDARDS

The County of Riverside does not establish quantitative construction noise standards, instead the County has established limits to the hours of construction activities. Riverside County Ordinance No. 847 Regulating Noise Section 2i (Code Section 9.52.020[I]) indicates that noise associated with any private construction activity located within one-quarter of a mile from an inhabited dwelling is considered exempt between the hours of 6:00 a.m. and 6:00 p.m., during the months of June through September, and 7:00 a.m. and 6:00 p.m., during the months of October through May. (12) Neither the County's General Plan nor the County Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers for CEQA analysis purposes.

Previously approved County of Riverside noise impact analysis reports prepared by Urban Crossroads, Inc. relied on a less restrictive 85 dBA L_{eq} construction noise level threshold adopted from the *Criteria for Recommended Standard: Occupational Noise Exposure* prepared by the National Institute for Occupational Safety and Health (NIOSH). (13) A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The NIOSH construction-related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3 dBA increase, the exposure time is cut in half. This results in noise level thresholds of 88 dBA for more than four hours per day, 92 dBA for more than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. (13)

To prevent long periods of exposure to high noise levels, the Occupational Safety and Health Administration (OSHA) requires hearing protection be provided by employers in workplaces where the noise levels may endanger the hearing of their employees, such as construction equipment operators. Standard 29 CFR, Part 1910 indicates the noise levels under which a hearing conservation program is required to be provided to workers exposed to high noise levels. (14) The noise analysis prepared by Urban Crossroads, Inc. does not evaluate the noise exposure of construction workers within the Project site based on CEQA requirements, and instead, evaluates the Project-related construction noise levels at the nearby sensitive receiver locations in the Project study area. Further, periodic exposure to high noise levels in short duration, such as Project construction, is typically considered an annoyance and not impactful to human health. It would take several years of exposure to high noise levels to result in hearing impairment. (15) Therefore, Urban Crossroads, Inc. continues to evaluate other agencies construction noise level limits to find a more appropriate threshold for assessing environmental impacts.

According to Caltrans guidance, which is often cited as reference in CEQA documents, construction noise impacts shall not exceed 86 dBA L_{max} at 50 feet from the job site activities between the hours of 9:00 p.m. to 6:00 a.m. (16) Equipment and operations are usually at or less than that level, except for blasting, pile drivers (impact or vibratory), hoe rams, pavement breakers for crack-and-seat operations, and other impact equipment. (2) The Caltrans guidance also suggests that detailed discussions of typical construction equipment noise levels are probably not necessary unless the

project involves unusually sensitive receptors or nighttime work or if the project is controversial. (2) Since this limitation is only associated with nighttime activities and does not address the noise level at the point of concern, e.g., a residence, Caltrans construction criteria were similarly not considered as the appropriate threshold for environmental review. Further research indicated U.S. Department of Transportation guidance for construction published by the Federal Transit Administration (FTA) is appropriate and based on well documented studies of the effects of construction noise. According to the FTA *Transit Noise and Vibration Impact Assessment Manual*, local noise ordinances are typically not very useful in evaluating construction noise impacts. 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. (8 p. 172)

Due to the lack of standardized construction noise thresholds, the FTA provides guidelines that can be considered reasonable criteria for construction noise assessments. The FTA identifies two types of construction noise assessment criteria, general and detailed. For general construction noise assessments, the analysis is limited to the two noisiest pieces of equipment with an hourly daytime exterior noise level threshold for residential land use of 90 dBA $L_{eq(1hr)}$. (8 p. 179) However, for long-term construction projects that would expose sensitive receivers to noise for extended periods of time, the FTA considers a daytime 8-hour average exterior construction noise level of 80 dBA $L_{eq(8hr)}$. The absolute FTA thresholds are intended to account for reasonable expectations regarding construction noise during the daytime hours and are intended to protect human health. Therefore, to evaluate whether the Project will generate potentially significant short-term noise levels at nearby noise sensitive residential receiver locations, a daytime exterior construction noise level of 80 dBA L_{eq} is used as a reasonable threshold to assess construction noise level impacts based on the FTA detailed analysis construction noise criteria with a nighttime exterior construction noise level of 70 dBA L_{eq} . (8 p. 179)

3.4 CONSTRUCTION VIBRATION STANDARDS

Construction activity can result in varying degrees of ground-borne vibration, depending on the equipment and methods used, distance to the affected structures and soil type. Construction vibration is generally associated with pile driving and rock blasting. Other construction equipment such as air compressors, light trucks, hydraulic loaders, etc., generates little or no ground vibration. (8) To analyze vibration impacts originating from the operation and construction of the Woodcrest Retail Center, vibration-generating activities are appropriately evaluated against standards established under the Municipal Code if such standards exist. However, the County of Riverside does not identify specific construction vibration limits. Therefore, for analysis purposes, the Caltrans *Transportation and Construction Vibration Guidance Manual*, (9 p. 38) Table 19, vibration damage are used in this noise study to assess potential temporary construction-related impacts at adjacent building locations. The nearest noise sensitive 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).

4 SIGNIFICANCE CRITERIA

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

- A. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
- B. Generation of excessive ground-borne vibration or ground-borne noise levels?
- C. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

4.1 NOISE LEVEL INCREASES (THRESHOLD A)

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

4.1.1 Noise Sensitive Receivers (Substantial Permanent Noise Increase)

The Federal Interagency Committee on Noise (FICON) (18) developed guidance to be used for the assessment of project-generated increases in noise levels that consider the ambient noise level. The FICON recommendations are based on studies that relate aircraft noise levels to the percentage of persons highly annoyed by aircraft noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, these recommendations are often used in environmental noise impact assessments involving the use of cumulative noise exposure metrics, such as the average-daily noise level (CNEL) and equivalent continuous noise level (L_{eq}).

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

The FICON guidance provides an established source of criteria to assess the impacts of substantial temporary or permanent increase in baseline ambient noise levels. Based on the FICON criteria, the amount to which a given noise level increase is considered acceptable is reduced when the without Project (baseline) noise levels are already shown to exceed certain land-use specific exterior noise level criteria. The specific levels are based on typical responses to noise level increases of 5 dBA or readily perceptible, 3 dBA or barely perceptible, and 1.5 dBA depending on the underlying without Project noise levels for noise-sensitive uses. These levels of increases and their perceived acceptance are consistent with guidance provided by both the Federal Highway Administration (4 p. 9) and Caltrans (19 p. 2_48).

4.1.2 Non-Noise Sensitive Receivers (Substantial Permanent Noise Increase)

The County of Riverside General Plan Noise Element, Table N-1, *Land Use Compatibility for Community Noise Exposure* was used to establish the satisfactory noise levels of significance for non-noise-sensitive land uses in the Project study area. As previously shown on Exhibit 3-A, the *normally acceptable* exterior noise level for non-noise-sensitive warehouse/industrial land uses are 75 dBA CNEL. Noise levels greater than 75 dBA CNEL are considered *conditionally acceptable* per the *Land Use Compatibility for Community Noise Exposure*. (11) To determine if Project-related traffic noise level increases are significant at off-site non-noise-sensitive land uses, a *barely perceptible* 3 dBA criteria is used. When the without Project noise levels are greater than the *normally acceptable* 75 dBA CNEL land use compatibility criteria, a *barely perceptible* 3 dBA or greater noise level increase is considered a significant impact since the noise level criteria is already exceeded. The noise level increases used to determine significant impacts for non-noise-sensitive land uses is generally consistent with the FICON noise level increase thresholds for noise-sensitive land uses but instead rely on the County of Riverside General Plan Noise Element, Table N-1, *Land Use Compatibility for Community Noise Exposure normally acceptable* 75 dBA CNEL exterior noise level criteria.

4.1.3 Construction Noise (Substantial Temporary Noise Increase)

To control the noise-generating construction activities, the temporary noise level increases over the existing ambient conditions must be considered under CEQA Significance Threshold A. Although noise ordinances vary across jurisdictions, many cities and counties in California, including Los Angeles, San Diego, and San Francisco, set construction noise limits between 75 and 80 dBA L_{eq} and typically restrict construction activities to the daytime hours. In contrast, everyday operational noise regulations are more stringent because they apply to continuous, long-term noise sources that can significantly impact the quality of life. As a result, many jurisdictions establish daytime residential noise limits around 55 dBA L_{eq} (or 55 dBA L_{eq} in the County of San Bernardino). This suggests that 20 to 30 dBA increase over the daytime noise limit can be reasonably tolerated without significant adverse effects. This is also illustrated in the adoption of many CEQA documents statewide that use an 80 dBA L_{eq} limit for assessing construction impacts while using everyday noise level limits of local noise ordinances in assessing on-site operational impacts.

While this analysis relies on the 20 dBA L_{eq} *substantial* noise increase threshold, it is important to recognize that many jurisdictions within the State including the City of Los Angeles no longer maintain any daytime noise increase thresholds. The City of Los Angeles found the 10 dBA daytime construction noise increase thresholds previously employed in the City of Los Angeles to be overly conservative, especially in the context of impacts on public health that often results in significant impact determination, even for routine construction activities that are expected to occur in an urban

environment. (20 p. 7) Based on these findings, the updated City of Los Angeles CEQA Thresholds Guide identifies a 5 dBA nighttime construction noise increase threshold but no longer maintains a numerical threshold above ambient noise levels for daytime construction activities. Therefore, if the Project-related construction noise levels generate a temporary noise level increase over the existing daytime ambient noise levels more than 20 dBA L_{eq} or 5 dBA L_{eq} over the existing nighttime ambient noise levels, then the Project construction noise increases will be considered a *significant* impact.

4.2 VIBRATION (THRESHOLD B)

As described in Section 3.4, vibration impacts originating from the construction of the Woodcrest Retail Center, vibration-generating activities are appropriately evaluated using standards established by the Caltrans *Transportation and Construction Vibration Guidance Manual*, Table 19. Caltrans' vibration thresholds for building damage are used in this noise study to assess potential operational and temporary construction-related impacts at adjacent building locations. A maximum acceptable continuous vibration threshold of 0.3 PPV (in/sec) is used to describe the nearest residential buildings adjacent to the Project site.

4.3 CEQA GUIDELINES NOT FURTHER ANALYZED (THRESHOLD C)

CEQA Noise Threshold C applies when there are nearby public and private airports and/or airstrips and focuses on land use compatibility of the Project to nearby airports and airstrips. The Project site is not located within two miles of an airport or airstrip. The closest major airport is the March Air Reserve Base/Inland Port Airport (MARB/IPA), located over 5.5 miles east of the Project site. As such, the Project site would not be exposed to excessive noise levels from airport operations, and therefore, impacts are considered less than significant, and no further noise analysis is conducted in relation to Appendix G to the CEQA Guidelines, Noise Threshold C.

4.4 SIGNIFICANCE CRITERIA SUMMARY

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

TABLE 4-1: SIGNIFICANCE CRITERIA SUMMARY

Analysis	Receiving Land Use	Condition(s)	Significance Criteria	
			Daytime	Nighttime
Off-Site Traffic	Noise-Sensitive	If ambient is < 60 dBA CNEL ¹ If ambient is 60 - 65 dBA CNEL ¹ If ambient is > 65 dBA CNEL ¹	≥ 5 dBA CNEL Project increase ≥ 3 dBA CNEL Project increase ≥ 1.5 dBA CNEL Project increase	
	Non-Noise-Sensitive	If ambient is > 75 dBA CNEL ²	≥ 3 dBA CNEL Project increase	
Operational	Noise-Sensitive	Residential Exterior Noise Level ³ If ambient is < 60 dBA Leq ¹ If ambient is 60 - 65 dBA Leq ¹ If ambient is > 65 dBA Leq ¹	55 dBA Leq ≥ 5 dBA Leq Project increase ≥ 3 dBA Leq Project increase ≥ 1.5 dBA Leq Project increase	45 dBA Leq
		Exterior Noise Level Threshold ⁴ Exterior Noise Level Increase Vibration Level Threshold ⁷	80 dBA Leq 20 dBA Leq ⁵ 0.3 PPV (in/sec)	70 dBA Leq 5 dBA Leq ⁶

¹ FICON, 1992.

² County of Riverside General Plan Noise Element, Table N-1.

³ County of Riverside General Plan Municipal Code, Section 9.52.040.

⁴ Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual.

⁵ Reasonable daytime increase that can be tolerated without significant adverse effects.

⁶ City of Los Angeles Department of City Planning, Construction Noise and Vibration Updates to Thresholds and Methodology.

⁷ Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Table 19.

"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

5 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, 24-hour noise level measurements were taken at four locations in the Project study area. The receiver locations were selected to describe and document the existing noise environment within the Project study area. Exhibit 5-1 provides the boundaries of the Project study area and the noise level measurement locations. To fully describe the existing noise conditions, long-term noise level measurements were collected by Urban Crossroads, Inc. on Tuesday, March 18, 2025. Appendix 5.1 includes study area photos.

5.1 MEASUREMENT PROCEDURE AND CRITERIA

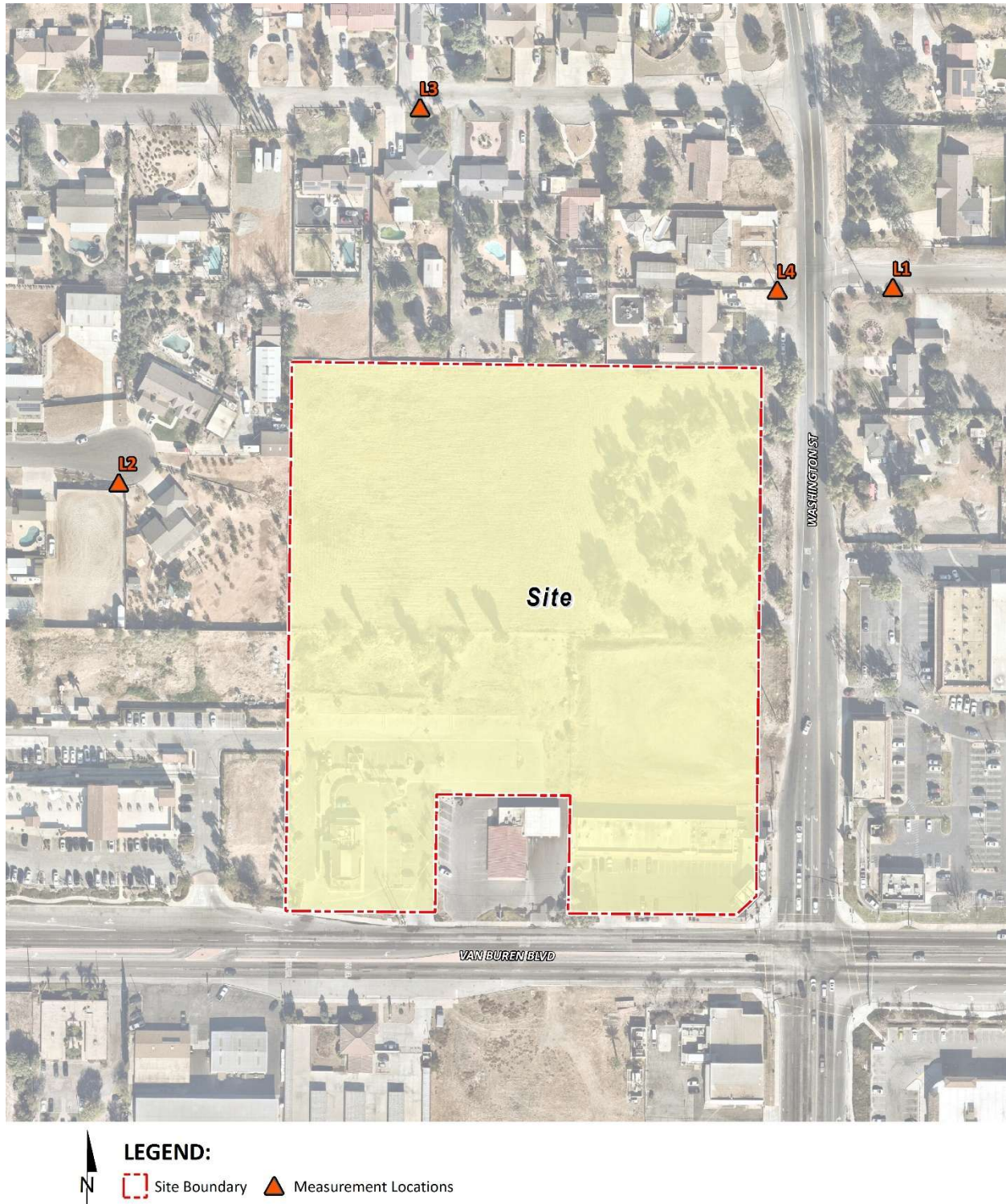
To describe the existing noise environment, the hourly noise levels were measured during typical weekday conditions over a 24-hour period. By collecting individual hourly noise level measurements, it is possible to describe the equivalent daytime and nighttime hourly noise levels. The long-term noise readings were recorded using Piccolo Type 2 integrating sound level meter and dataloggers. The Piccolo sound level meters were calibrated using a Larson-Davis calibrator, Model CAL 150. All noise meters were programmed in "slow" mode to record noise levels in "A" weighted form. The sound level meters and microphones were equipped with a windscreen during all measurements. All noise level measurement equipment satisfies the American National Standards Institute (ANSI) standard specifications for sound level meters ANSI S1.4-2014/IEC 61672-1:2013. (21)

5.2 NOISE MEASUREMENT LOCATIONS

The long-term noise level measurements were positioned as close to the nearest sensitive receiver locations as possible to assess the existing equivalent hourly noise levels surrounding the Project site. Both Caltrans and the FTA recognize that it is not reasonable to collect noise level measurements that can fully represent every part of a private yard, patio, deck, or balcony normally used for human activity when estimating impacts for new development projects. This is demonstrated in the Caltrans general site location guidelines which indicate that sites must be free of noise contamination by sources other than sources of interest. Avoid sites located near sources such as barking dogs, lawnmowers, pool pumps, and air conditioners unless it is the express intent of the analyst to measure these sources. (2) Further, FTA guidance states, that 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. (8)

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. (8) In other words, the area represented by the receiver shares similar shielding, terrain, and geometric relationship to the reference noise source. Receivers represent a location of noise sensitive areas and are used to estimate the future noise level impacts.

EXHIBIT 5-1: NOISE MEASUREMENT LOCATIONS



Collecting 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 increase due to the Project's contribution to the ambient noise levels. This approach is necessary to calculate the temporary or permanent increase in ambient noise levels as required by the CEQA Guidelines Environmental Checklist.

5.3 NOISE MEASUREMENT RESULTS

The noise measurements presented below focus on the equivalent or the hourly energy average sound levels (Leq) to describe the existing ambient conditions. Table 5-1 provides the (energy average) noise levels used to describe 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. The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. The daytime and nighttime equivalent noise levels represent the average of all hourly noise levels observed during these time periods expressed as a single number.

TABLE 5-1: AMBIENT NOISE LEVEL MEASUREMENTS

Location ¹	Description	Energy Average Noise Level (dBA Leq) ²		CNEL
		Daytime	Nighttime	
L1	Located east of the site near the residence at 16180 Washington St.	58.5	50.8	59.9
L2	Located west of the site near the residence at 16851 Palamino Pl.	54.5	44.7	54.7
L3	Located north of the site near the residence at 16961 Tava Ln.	53.6	43.6	53.9
L4	Located north of the site near the Woodcrest Montessori at 16191 Washington St.	63.4	54.9	64.5

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 equivalent noise levels used to describe the daytime and nighttime ambient conditions for each of the measurements. Appendix 5.2 provides summary worksheets of the noise levels for each hour as well as the minimum, maximum, L1, L2, L5, L8, L25, L50, L90, L95, and L99 percentile noise levels observed during the daytime and nighttime periods.

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6 TRAFFIC NOISE METHODS AND PROCEDURES

The following section outlines the methods and procedures used to estimate and analyze the future traffic noise environment. Consistent with the County of Riverside General Plan, *Land Use Compatibility for Community Noise Environments*, all transportation-related noise levels for the outdoor activity areas are presented in terms of the 24-hour CNEL's. Unlike a simple arithmetic average noise level, CNEL represents the logarithmic summation of the equivalent hourly noise levels with evening and nighttime noise penalties recognizing that noise may have different impacts on people depending on when it occurs.

6.1 FHWA TRAFFIC NOISE PREDICTION MODEL

The expected roadway noise level increases from vehicular traffic were calculated by Urban Crossroads, Inc. using a computer program that replicates the Federal Highway Administration (FHWA) Traffic Noise Prediction Model- FHWA-RD-77-108. (22) This methodology is commonly used to describe the off-site traffic noise levels throughout southern California. The FHWA Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL) by vehicle type. REMEL represents the maximum sound level (Lmax) of individual vehicle "pass by" events by vehicle type when measured at a "reference distance" of 50 feet from the center of the travel lane.

In California the national REMELs are substituted with the California Vehicle Noise (Calveno) Emission Levels. (19) Adjustments are then made to the REMEL to account for: the roadway classification (e.g., collector, secondary, major or arterial), the roadway active width (i.e., the distance between the center of the outermost travel lanes on each side of the roadway), the total average daily traffic (ADT), the travel speed, the percentages of automobiles, medium trucks, and heavy trucks in the traffic volume, the roadway grade, the angle of view (e.g., whether the roadway view is blocked), the site conditions ("hard" or "soft" relates to the absorption of the ground, pavement, or landscaping), and the percentage of total ADT which flows each hour throughout a 24-hour period. Research conducted by Caltrans has shown that the use of soft site conditions is appropriate for the application of the FHWA traffic noise prediction model used in this analysis. (23)

6.2 OFF-SITE TRAFFIC NOISE PREDICTION MODEL INPUTS

Table 6-1 presents the roadway parameters used to assess the Project's off-site dBA CNEL transportation noise impacts. Roadway segments were selected for traffic noise impact analysis based on a review of the Project's passenger car and truck trip distributions as presented in the TA. Only segments with assigned Project traffic were included in the analysis, as segments without Project traffic are not expected to experience any increase in off-site traffic noise levels. The ADT volumes used in this study area presented in Table 6-2 are based on the *Woodcrest Retail Center Traffic Analysis* prepared by Urban Crossroads, Inc. for the following traffic scenarios (24):

- Existing without Project (E)
- Existing with Project (EP)
- Existing plus Ambient Growth plus Cumulative (EAC) 2027 without Project
- Existing plus Ambient Growth plus Cumulative (EAC) 2027 with Project
- Horizon Year 2045 without Project

- Horizon Year 2045 with Project

The ADT volumes vary for each roadway segment based on the existing traffic volumes and the combination of project traffic distributions. This analysis relies on a comparative evaluation of the off-site traffic noise impacts at the boundary of the right-of-way of the receiving adjacent land use, without and with project ADT traffic volumes from the Project traffic analysis. Consistent with the *Woodcrest Retail Center Traffic Analysis*, the Base Development Concept is anticipated to generate a net total of 2,910 two-way trips per day and the Parcel 1 Option is anticipated to generate 3,160 two-way trips per day. Since the Parcel 1 Option generates more trips, the Parcel 1 Option trip generation is used to estimate the off-site traffic noise levels. Consistent with *Woodcrest Retail Center Traffic Analysis*, the off-site traffic noise analysis maintains a peak hour to average daily traffic (peak-to-daily) relationship of approximately 12.38%. Table 6-3 provides the time of day (daytime, evening, and nighttime) vehicle splits and the traffic flow by vehicle type (vehicle mix) used for all the Project traffic scenarios.

TABLE 6-1: OFF-SITE ROADWAY PARAMETERS

ID	Roadway	Segment	Receiving Land Use ¹	Classification ²	Distance from Centerline to Receiving Land Use (Feet) ³	Vehicle Speed (mph)
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	Urban Arterial	76'	55
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	Secondary	50'	45
3	Washington St.	n/o Van Buren Blvd.	Sensitive	Arterial	64'	55
4	Washington St.	s/o Van Buren Blvd.	Sensitive	Major	59'	50
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	Arterial	64'	55
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	Secondary	50'	45
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	Urban Arterial	76'	55
8	Van Buren Bl.	w/o King Av.	Sensitive	Urban Arterial	76'	55
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	Urban Arterial	76'	55
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	Urban Arterial	76'	55
11	Van Buren Bl.	w/o Porter Av.	Sensitive	Urban Arterial	76'	55
12	Van Buren Bl.	e/o Porter Av.	Sensitive	Urban Arterial	76'	55
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	Urban Arterial	76'	55
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	Urban Arterial	76'	55
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	Urban Arterial	76'	55
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	Urban Arterial	76'	55

¹ Based on a review of existing aerial imagery.

² Woodcrest Retail Traffic Analysis, Urban Crossroads, Inc.

³ Distance to receiving land use is based upon the right-of-way distances.

TABLE 6-2: AVERAGE DAILY TRAFFIC VOLUMES

ID	Roadway	Segment	Average Daily Traffic Volumes (Actual Vehicles) ¹					
			Existing Without Project	Existing With Project	EAC (2027) Without Project	EAC (2027) With Project	HY (2045) Without Project	HY (2045) With Project
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	38,253	38,569	44,764	45,080	53,417	53,733
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	8,247	8,563	9,057	9,373	10,641	10,957
3	Washington St.	n/o Van Buren Blvd.	18,333	20,387	20,351	22,405	27,717	29,771
4	Washington St.	s/o Van Buren Blvd.	12,049	12,365	14,954	15,270	23,069	23,385
5	Trautwein Rd.	n/o Van Buren Blvd.	22,749	23,065	25,211	25,527	30,286	30,602
6	Trautwein Rd.	s/o Van Buren Blvd.	14,898	15,056	16,743	16,901	17,427	17,585
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	29,659	30,291	36,163	36,795	43,653	44,285
8	Van Buren Bl.	w/o King Av.	32,928	33,876	38,632	39,580	42,057	43,005
9	Van Buren Bl.	w/o Washington St.	32,785	33,733	39,663	40,611	43,133	44,081
10	Van Buren Bl.	e/o Washington St.	38,488	40,068	48,210	49,790	56,287	57,867
11	Van Buren Bl.	w/o Porter Av.	38,427	40,007	47,015	48,595	51,013	52,593
12	Van Buren Bl.	e/o Porter Av.	38,018	39,440	46,156	47,578	46,710	48,132
13	Van Buren Bl.	w/o Dauchy Av.	38,018	39,440	46,156	47,578	46,710	48,132
14	Van Buren Bl.	w/o Wood Rd.	35,591	36,855	45,137	46,401	48,839	50,103
15	Van Buren Bl.	w/o Trautwein Rd.	31,863	32,653	40,365	41,155	41,797	42,587
16	Van Buren Bl.	e/o Trautwein Rd.	37,827	38,143	43,270	43,586	47,568	47,884

¹ Woodcrest Retail Traffic Analysis, Urban Crossroads, Inc.

TABLE 6-3: TIME OF DAY VEHICLE SPLITS

Time of Day	Vehicle Mix ¹			Time of Day Split ¹
	Autos ²	Medium Trucks ³	Heavy Trucks ⁴	
Daytime	73.60%	0.90%	0.35%	74.85%
Evening	13.60%	0.04%	0.04%	13.68%
Nighttime	10.22%	0.90%	0.35%	11.47%
Daily	97.42%	1.84%	0.74%	100.00%

¹County of Riverside Office of Industrial Hygiene. Values rounded to the nearest one-hundredth.

"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.

² All vehicles with two axles and four wheels designed primarily for transportation of nine or fewer passengers (automobiles) or transportation of cargo (light trucks).

³ All vehicles with two axles and six wheels designed for transportation of cargo.

⁴ All vehicles with three or more axles designed for the transportation of cargo.

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7 OFF-SITE TRAFFIC NOISE ANALYSIS

By far, the largest single source of community noise is the flow of traffic on major roadways. Motor vehicle noise is generated by engine vibrations, the interaction between tires and the road, and the exhaust system. To assess the off-site transportation CNEL noise level impacts associated with the development of the proposed Project, noise contours were developed based on the Woodcrest Retail Center Traffic Analysis prepared by Urban Crossroads, Inc. (24) Noise contour boundaries represent the equal levels of noise exposure and are measured in CNEL from the center of the roadway.

7.1 TRAFFIC NOISE CONTOURS

Noise contour boundaries represent equal levels of noise exposure and are measured in CNEL from the center of the roadway. Noise contours were used to assess the Project's incremental 24-hour dBA CNEL traffic-related noise impacts at land uses adjacent to roadways conveying Project traffic. The noise contours represent the distance to noise levels of constant value and are measured from the center of the roadway for the 70, 65, and 60 dBA CNEL noise levels. The noise contours do not consider the effect of any existing noise barriers or topography that may attenuate ambient noise levels. In addition, because the noise contours reflect modeling of vehicular noise on area roadways, they appropriately do not reflect noise contributions from the surrounding stationary noise sources within the Project study area. Tables 7-1 through 7-6 present a summary of the exterior dBA CNEL traffic noise levels for each traffic condition. Appendix 7.1 includes a summary of the dBA CNEL traffic noise level contour worksheets for each of the traffic conditions.

7.2 EXISTING PROJECT TRAFFIC NOISE INCREASES

An analysis of existing traffic noise levels plus traffic noise generated by the proposed Project has been included in this report to fully analyze all the existing traffic scenarios identified in the traffic study. This condition is provided solely for informational purposes and will not occur, since the Project will not be fully developed and occupied under Existing conditions. Table 7-1 shows the Existing without Project conditions CNEL noise levels. The Existing without Project exterior noise levels is expected to range from 68.1 to 74.6 dBA CNEL, without accounting for any noise attenuation features such as noise barriers or topography. Table 7-2 shows the Existing with Project conditions will range from 68.2 to 74.8 dBA CNEL. Table 7-7 shows that the Project off-site traffic noise level impacts will range from 0.0 to 0.4 dBA CNEL. Based on the significance criteria for off-site traffic noise presented in Table 4-1, land uses adjacent to the study area roadway segments would experience *less than significant* noise level impacts due to unmitigated Project-related traffic noise levels.

TABLE 7-1: EXISTING WITHOUT PROJECT CONTOURS

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	74.6	153	331	712
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	68.1	RW	80	172
3	Washington St.	n/o Van Buren Blvd.	Sensitive	72.3	90	195	420
4	Washington St.	s/o Van Buren Blvd.	Sensitive	69.8	RW	124	267
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	73.2	104	225	485
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	70.6	55	119	256
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	73.5	129	279	601
8	Van Buren Bl.	w/o King Av.	Sensitive	73.9	139	299	644
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	73.9	138	298	643
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	74.6	154	332	715
11	Van Buren Bl.	w/o Porter Av.	Sensitive	74.6	154	332	714
12	Van Buren Bl.	e/o Porter Av.	Sensitive	74.6	153	329	709
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	74.6	153	329	709
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	74.3	146	315	679
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	73.8	136	293	631
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	74.5	152	328	707

¹ Based on a review of existing aerial imagery.

² The CNEL is calculated at the boundary of the right-of-way of the receiving adjacent land use.

"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-2: EXISTING WITH PROJECT CONTOURS

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	74.6	154	332	716
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	68.2	RW	82	177
3	Washington St.	n/o Van Buren Blvd.	Sensitive	72.7	97	209	450
4	Washington St.	s/o Van Buren Blvd.	Sensitive	69.9	RW	126	271
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	73.2	105	227	489
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	70.7	55	119	257
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	73.6	131	283	610
8	Van Buren Bl.	w/o King Av.	Sensitive	74.0	142	305	657
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	74.0	141	304	655
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	74.8	158	341	735
11	Van Buren Bl.	w/o Porter Av.	Sensitive	74.8	158	341	734
12	Van Buren Bl.	e/o Porter Av.	Sensitive	74.7	157	337	727
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	74.7	157	337	727
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	74.4	150	322	695
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	73.9	138	297	641
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	74.6	153	330	711

¹ Based on a review of existing aerial imagery.

² The CNEL is calculated at the boundary of the right-of-way of the receiving adjacent land use.

"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-3: EAC (2027) WITHOUT PROJECT CONTOURS

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	75.3	170	367	791
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	68.5	RW	85	183
3	Washington St.	n/o Van Buren Blvd.	Sensitive	72.7	97	209	450
4	Washington St.	s/o Van Buren Blvd.	Sensitive	70.8	66	143	308
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	73.6	112	241	519
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	71.1	60	128	276
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	74.3	148	318	686
8	Van Buren Bl.	w/o King Av.	Sensitive	74.6	154	333	717
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	74.7	157	339	730
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	75.6	179	386	831
11	Van Buren Bl.	w/o Porter Av.	Sensitive	75.5	176	379	817
12	Van Buren Bl.	e/o Porter Av.	Sensitive	75.4	174	375	807
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	75.4	174	375	807
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	75.3	171	369	795
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	74.8	159	343	738
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	75.1	167	359	773

¹ Based on a review of existing aerial imagery.

² The CNEL is calculated at the boundary of the right-of-way of the receiving adjacent land use.

"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-4: EAC (2027) WITH PROJECT CONTOURS

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	75.3	171	369	795
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	68.6	RW	87	188
3	Washington St.	n/o Van Buren Blvd.	Sensitive	73.1	103	223	480
4	Washington St.	s/o Van Buren Blvd.	Sensitive	70.9	67	145	312
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	73.7	113	243	523
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	71.2	60	129	278
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	74.4	150	322	694
8	Van Buren Bl.	w/o King Av.	Sensitive	74.7	157	338	729
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	74.8	160	344	741
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	75.7	183	394	849
11	Van Buren Bl.	w/o Porter Av.	Sensitive	75.6	180	388	835
12	Van Buren Bl.	e/o Porter Av.	Sensitive	75.5	177	382	824
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	75.5	177	382	824
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	75.4	175	376	810
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	74.9	161	347	748
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	75.1	167	361	777

¹ Based on a review of existing aerial imagery.

² The CNEL is calculated at the boundary of the right-of-way of the receiving adjacent land use.

"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-5: HY (2045) WITHOUT PROJECT CONTOURS

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	76.0	192	413	890
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	69.2	RW	95	204
3	Washington St.	n/o Van Buren Blvd.	Sensitive	74.0	119	257	553
4	Washington St.	s/o Van Buren Blvd.	Sensitive	72.6	89	191	411
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	74.4	126	272	587
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	71.3	61	132	284
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	75.2	168	361	778
8	Van Buren Bl.	w/o King Av.	Sensitive	75.0	163	352	759
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	75.1	166	358	772
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	76.3	199	428	921
11	Van Buren Bl.	w/o Porter Av.	Sensitive	75.8	186	401	863
12	Van Buren Bl.	e/o Porter Av.	Sensitive	75.4	175	378	814
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	75.4	175	378	814
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	75.6	181	389	838
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	75.0	163	351	756
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	75.5	177	382	824

¹ Based on a review of existing aerial imagery.

² The CNEL is calculated at the boundary of the right-of-way of the receiving adjacent land use.

"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-6: HY (2045) WITH PROJECT CONTOURS

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²	Distance to Contour from Centerline (Feet)		
					70 dBA CNEL	65 dBA CNEL	60 dBA CNEL
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	76.1	192	415	893
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	69.3	RW	97	208
3	Washington St.	n/o Van Buren Blvd.	Sensitive	74.4	125	269	580
4	Washington St.	s/o Van Buren Blvd.	Sensitive	72.7	89	193	415
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	74.5	127	274	591
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	71.3	62	133	285
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	75.2	169	364	785
8	Van Buren Bl.	w/o King Av.	Sensitive	75.1	166	357	770
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	75.2	169	363	783
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	76.4	202	436	939
11	Van Buren Bl.	w/o Porter Av.	Sensitive	76.0	190	409	881
12	Van Buren Bl.	e/o Porter Av.	Sensitive	75.6	179	385	830
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	75.6	179	385	830
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	75.7	184	396	853
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	75.0	165	355	765
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	75.6	178	384	827

¹ Based on a review of existing aerial imagery.

² The CNEL is calculated at the boundary of the right-of-way of the receiving adjacent land use.

"RW" = Location of the respective noise contour falls within the right-of-way of the road.

TABLE 7-7: EXISTING WITH PROJECT TRAFFIC NOISE INCREASES

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²			Incremental Noise Level Increase Threshold ³	
				No Project	With Project	Project Addition	Limit	Exceeded?
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	74.6	74.6	0.0	1.5	No
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	68.1	68.2	0.1	1.5	No
3	Washington St.	n/o Van Buren Blvd.	Sensitive	72.3	72.7	0.4	1.5	No
4	Washington St.	s/o Van Buren Blvd.	Sensitive	69.8	69.9	0.1	1.5	No
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	73.2	73.2	0.0	1.5	No
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	70.6	70.7	0.1	1.5	No
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	73.5	73.6	0.1	1.5	No
8	Van Buren Bl.	w/o King Av.	Sensitive	73.9	74.0	0.1	1.5	No
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	73.9	74.0	0.1	3.0	No
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	74.6	74.8	0.2	3.0	No
11	Van Buren Bl.	w/o Porter Av.	Sensitive	74.6	74.8	0.2	1.5	No
12	Van Buren Bl.	e/o Porter Av.	Sensitive	74.6	74.7	0.1	1.5	No
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	74.6	74.7	0.1	1.5	No
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	74.3	74.4	0.1	3.0	No
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	73.8	73.9	0.1	1.5	No
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	74.5	74.6	0.1	1.5	No

¹ Based on a review of existing aerial imagery. Noise sensitive uses limited to existing residential land uses.

² The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.

³ Does the Project create an incremental noise level increase exceeding the significance criteria (Table 4-1)?

7.3 EAC (2027) PROJECT TRAFFIC NOISE INCREASES

Table 7-3 presents the Existing plus Ambient Growth plus Cumulative (EAC) 2027 without Project conditions CNEL noise levels. The EAC (2027) without Project exterior noise levels are expected to range from 68.5 to 75.6 dBA CNEL, without accounting for any noise attenuation features such as noise barriers or topography. Table 7-4 shows the EAC (2027) with Project conditions will range from 68.6 to 75.7 dBA CNEL. Table 7-8 shows that the Project off-site traffic noise increases will range from 0.0 to 0.4 dBA CNEL. Based on the significance criteria for off-site traffic noise presented in Table 4-1, land uses adjacent to the study area roadway segments would experience *less than significant* noise level impacts due to unmitigated Project-related traffic noise levels.

7.4 HY (2045) PROJECT TRAFFIC NOISE INCREASES

Table 7-5 presents the Horizon Year (HY) 2045 without Project conditions CNEL noise levels. The HY (2045) without Project exterior noise levels are expected to range from 69.2 to 76.3 dBA CNEL, without accounting for any noise attenuation features such as noise barriers or topography. Table 7-6 shows the HY (2045) with Project conditions will range from 69.3 to 76.4 dBA CNEL. Table 7-9 shows that the Project off-site traffic noise increases will range from 0.0 to 0.4 dBA CNEL. Based on the significance criteria for off-site traffic noise presented in Table 4-1, land uses adjacent to the study area roadway segments would experience *less than significant* noise level impacts due to unmitigated Project-related traffic noise levels.

TABLE 7-8: EAC (2027) WITH PROJECT TRAFFIC NOISE INCREASES

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²			Incremental Noise Level Increase Threshold ³	
				No Project	With Project	Project Addition	Limit	Exceeded?
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	75.3	75.3	0.0	1.5	No
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	68.5	68.6	0.1	1.5	No
3	Washington St.	n/o Van Buren Blvd.	Sensitive	72.7	73.1	0.4	1.5	No
4	Washington St.	s/o Van Buren Blvd.	Sensitive	70.8	70.9	0.1	1.5	No
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	73.6	73.7	0.1	1.5	No
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	71.1	71.2	0.1	1.5	No
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	74.3	74.4	0.1	1.5	No
8	Van Buren Bl.	w/o King Av.	Sensitive	74.6	74.7	0.1	1.5	No
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	74.7	74.8	0.1	3.0	No
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	75.6	75.7	0.1	3.0	No
11	Van Buren Bl.	w/o Porter Av.	Sensitive	75.5	75.6	0.1	1.5	No
12	Van Buren Bl.	e/o Porter Av.	Sensitive	75.4	75.5	0.1	1.5	No
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	75.4	75.5	0.1	1.5	No
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	75.3	75.4	0.1	3.0	No
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	74.8	74.9	0.1	1.5	No
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	75.1	75.1	0.0	1.5	No

¹ Based on a review of existing aerial imagery. Noise sensitive uses limited to existing residential land uses.

² The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.

³ Does the Project create an incremental noise level increase exceeding the significance criteria (Table 4-1)?

TABLE 7-9: HY (2045) WITH PROJECT TRAFFIC NOISE INCREASES

ID	Road	Segment	Receiving Land Use ¹	CNEL at Receiving Land Use (dBA) ²			Incremental Noise Level Increase Threshold ³	
				No Project	With Project	Project Addition	Limit	Exceeded?
1	Van Buren Bl.	n/o Mockingbird Cyn. Rd.	Sensitive	76.0	76.1	0.1	1.5	No
2	Mockingbird Cyn. Rd.	w/o Van Buren Blvd.	Sensitive	69.2	69.3	0.1	1.5	No
3	Washington St.	n/o Van Buren Blvd.	Sensitive	74.0	74.4	0.4	1.5	No
4	Washington St.	s/o Van Buren Blvd.	Sensitive	72.6	72.7	0.1	1.5	No
5	Trautwein Rd.	n/o Van Buren Blvd.	Sensitive	74.4	74.5	0.1	1.5	No
6	Trautwein Rd.	s/o Van Buren Blvd.	Sensitive	71.3	71.3	0.0	1.5	No
7	Van Buren Bl.	s/o Mockingbird Cyn. Rd.	Sensitive	75.2	75.2	0.0	1.5	No
8	Van Buren Bl.	w/o King Av.	Sensitive	75.0	75.1	0.1	1.5	No
9	Van Buren Bl.	w/o Washington St.	Non-Sensitive	75.1	75.2	0.1	3.0	No
10	Van Buren Bl.	e/o Washington St.	Non-Sensitive	76.3	76.4	0.1	3.0	No
11	Van Buren Bl.	w/o Porter Av.	Sensitive	75.8	76.0	0.2	1.5	No
12	Van Buren Bl.	e/o Porter Av.	Sensitive	75.4	75.6	0.2	1.5	No
13	Van Buren Bl.	w/o Dauchy Av.	Sensitive	75.4	75.6	0.2	1.5	No
14	Van Buren Bl.	w/o Wood Rd.	Non-Sensitive	75.6	75.7	0.1	3.0	No
15	Van Buren Bl.	w/o Trautwein Rd.	Sensitive	75.0	75.0	0.0	1.5	No
16	Van Buren Bl.	e/o Trautwein Rd.	Sensitive	75.5	75.6	0.1	1.5	No

¹ Based on a review of existing aerial imagery. Noise sensitive uses limited to existing residential land uses.

² The CNEL is calculated at the boundary of the right-of-way of each roadway and the property line of the receiving land use.

³ Does the Project create an incremental noise level increase exceeding the significance criteria (Table 4-1)?

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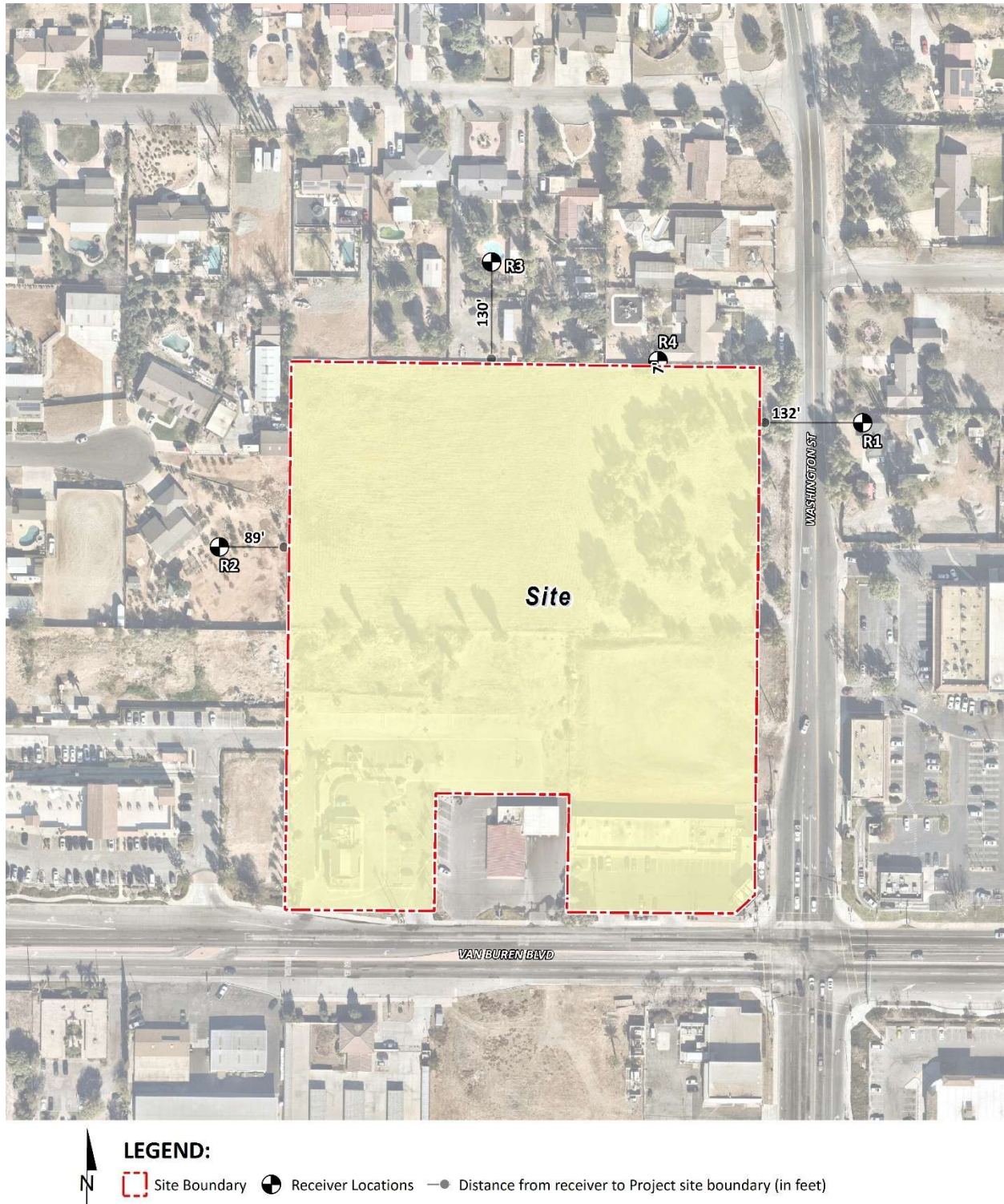
8 RECEIVER LOCATIONS

To assess the potential for long-term operational and short-term construction noise impacts, the following receiver locations, as shown on Exhibit 8-1, were identified as representative locations for analysis. The selection of receiver locations is based on FHWA guidelines and is consistent with additional guidance provided by Caltrans and the FTA, as previously described in Section 5.2. Sensitive receivers are generally defined as locations where people reside or where the presence of unwanted sound could otherwise adversely affect the use of the land. Noise-sensitive land uses are generally considered to include schools, hospitals, single-family dwellings, mobile home parks, churches, libraries, and recreation areas. Moderately noise-sensitive land uses typically include multi-family dwellings, hotels, motels, dormitories, out-patient clinics, cemeteries, golf courses, country clubs, athletic/tennis clubs, and equestrian clubs. Land uses that are considered relatively insensitive to noise include business, commercial, and professional developments. Land uses that are typically not affected by noise include: industrial, manufacturing, utilities, agriculture, undeveloped land, parking lots, warehousing, liquid and solid waste facilities, salvage yards, and transit terminals.

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

- R1: Location R1 represents the existing building at 16200 Washington Street, approximately 132 feet east of the Project site. Receptor R1 is placed at the facade facing the Project site. A 24-hour noise measurement was taken near this location, L1, to describe the existing ambient noise environment
- R2: Location R2 represents the existing residence at 16851 Palamino Place, approximately 89 feet west of the Project site. Receptor R2 is placed at the façade facing the Project site. A 24-hour noise measurement was taken near this location, L2, to describe the existing ambient noise environment
- R3: Location R3 represents the existing residence at 16961 Tava Lane, approximately 130 feet north of the Project site. Receptor R3 is placed at the façade facing 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 existing school, Woodcrest Montessori, at 16191 Washington Street, approximately 7 feet north of the Project site. A 24-hour noise measurement was taken near this location, L4, to describe the existing ambient noise environment

EXHIBIT 8-1: RECEIVER LOCATIONS



9 OPERATIONAL NOISE ANALYSIS

This section analyzes the potential stationary-source operational noise impacts at the nearby receiver locations, identified in Section 8, resulting from the operation of the proposed Woodcrest Retail Center Project. To conservatively describe the potential worst-case noise environment, Exhibit 9-1 presents the 56 individual noise sources including the gas station noise source activities from Parcel Option 1 that are used to assess the operational noise levels. In addition, the operational noise analysis includes the planned 8-foot high screenwall on the northern Project site boundary.

9.1 OPERATIONAL NOISE SOURCES

This operational noise analysis is intended to describe noise level impacts associated with the expected typical of daytime and nighttime activities at the Project site. The on-site Project-related noise sources are expected to include: loading dock activity, truck movements, trash enclosure activity, roof-top air conditioning units, drive-thru speakerphone, parking lot vehicle movements and gas station activity.

9.2 REFERENCE NOISE LEVELS

To estimate the Project operational noise impacts, reference noise level measurements were collected from similar types of activities to represent the noise levels expected with the development of the proposed Project. This section provides a detailed description of the reference noise level measurements shown on Table 9-1 used to estimate the Project operational noise impacts. It is important to note that the following projected noise levels assume the worst-case noise environment with all noise source activity all operating at the same time. These sources of noise activity will likely vary throughout the day.

9.2.1 Measurement Procedures

The reference noise level measurements presented in this section were collected using a Larson Davis LxT Type 1 precision sound level meter (serial number 01146). The LxT sound level meter was calibrated using a Larson-Davis calibrator, Model CAL 200, was programmed in "slow" mode to record noise levels in "A" weighted form and was located at approximately five feet above the ground elevation for each measurement. The sound level meters and microphones were equipped with a windscreen during all measurements. All noise level measurement equipment satisfies the American National Standards Institute (ANSI) standard specifications for sound level meters ANSI S1.4-2014/IEC 61672-1:2013. (21)

EXHIBIT 9-1: OPERATIONAL NOISE SOURCE LOCATIONS

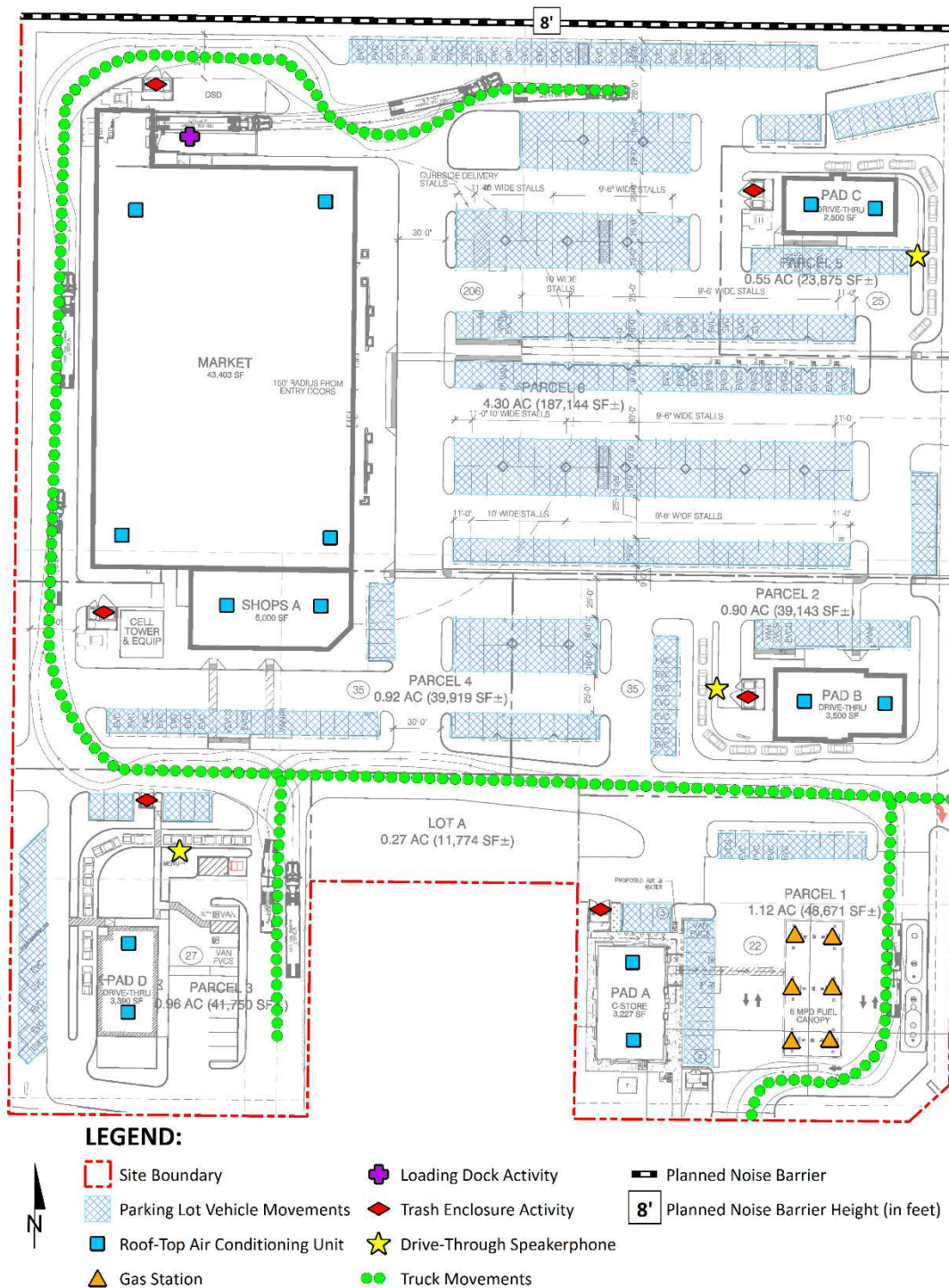


TABLE 9-1: REFERENCE NOISE LEVEL MEASUREMENTS

Reference Noise Source	Noise Source Height (Feet)	Min./ Hour ¹		Reference Noise Level (dBA L _{eq}) @ 50 Feet	Sound Power Level (dBA) ²
		Day	Night		
Loading Dock Activity	8'	60	30	62.8	103.4
Truck Movements	8'	60	30	59.8	93.2
Trash Enclosure Activity	5'	60	30	57.3	89.0
Roof-Top Air Conditioning Units	5'	39	28	57.2	88.9
Drive-Through Speakerphone	3'	60	30	54.8	84.0
Parking Lot Vehicle Movements	5'	60	30	52.6	81.1
Gas Station Activity	5'	60	30	48.2	79.9

¹ Anticipated duration (minutes within the hour) of noise activity during typical hourly conditions expected at the Project site. "Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

² Sound power level represents the total amount of acoustical energy (noise level) produced by a sound source independent of distance or surroundings. Sound power levels calculated using the CadnaA noise model at the reference distance to the noise source. Numbers may vary due to size differences between point and area noise sources.

9.2.2 Loading Dock Activity

The reference dry goods loading dock activities are intended to describe the typical operational noise source levels associated with the Project. This includes truck idling, deliveries, backup alarms, unloading/loading, docking including a combination of tractor trailer semi-trucks, two-axle delivery trucks, and background forklift operations. At a uniform reference distance of 50 feet, Urban Crossroads collected a reference noise level of 62.8 dBA L_{eq}. The loading dock activity noise level measurement was taken over a fifteen-minute period and represents multiple noise sources taken from the center of activity. The reference noise level measurement includes employees unloading a docked truck container included the squeaking of the truck's shocks when weight was removed from the truck, employees playing music over a radio, as well as a forklift horn and backup alarm. In addition, during the noise level measurement a truck entered the loading dock area and proceeded to reverse and dock in a nearby loading bay, adding truck engine, idling, air brakes noise, in addition to on-going idling of an already docked truck. Loading dock activity is estimated during all the daytime, evening, and nighttime hours.

9.2.3 Truck Movements

The truck movements reference noise level measurement was collected over a period of 1 hour and 28 minutes and represent multiple heavy trucks entering and exiting the outdoor loading dock area producing a reference noise level of 59.8 dBA L_{eq} at 50 feet. The noise sources included at this measurement location account for trucks entering and existing the Project driveways and maneuvering in and out of the outdoor loading dock activity area.

9.2.4 Trash Enclosure Activity

To describe the noise levels associated with a trash enclosure activity, Urban Crossroads collected a reference noise level measurement at an existing trash enclosure containing two dumpster bins. The trash enclosure noise levels describe metal gates opening and closing, metal scraping against

concrete floor sounds, dumpster movement on metal wheels, and trash dropping into the metal dumpster. The reference noise levels describe trash enclosure noise activities when trash is dropped into an empty metal dumpster, as would occur at the Project Site. The measured reference noise level at the uniform 50-foot reference distance is 57.3 dBA L_{eq} for the trash enclosure activity. The reference noise level describes the expected noise source activities associated with the trash enclosures for the Project's proposed building.

9.2.5 Roof-Top Air Conditioning Units

The reference noise level represents a Lennox SCA120 series 10-ton model packaged air conditioning unit. At the uniform reference distance of 50 feet, the reference noise level is 57.2 dBA L_{eq} . Based on the typical operating conditions observed over a four-day measurement period, the roof-top air conditioning units are estimated to operate for an average 39 minutes per hour during the daytime hours, and 28 minutes per hour during the nighttime hours. These operating conditions reflect peak summer cooling requirements with measured temperatures approaching 96 degrees Fahrenheit (°F) with average daytime temperatures of 82°F. For this noise analysis, the air conditioning units are expected to be located on the roof of the Project buildings.

9.2.6 Drive-Through Speakerphone Activity

To describe the potential noise level impacts associated with the planned drive-thru speakerphones, this analysis relies on the drive-through intercom system manufactured by HME. This type of system is commonly used by the quick service restaurant (QSR) industry for drive-thru communications. The HME SPP2 speaker post intercom system produces a maximum noise level of 84 dBA at one foot from the speaker post or 54.8 dBA L_{eq} at a distance of 50 feet. The system may also be equipped with an automatic volume control that can automatically reduce the sound levels as the ambient noise level decreases. The reference speakerphone noise level describes continuous drive-through operations and does not include any periods of inactivity.

9.2.7 Parking Lot Vehicle Movements

To describe the on-site parking lot activity, a long-term reference noise level measurement was collected in the center of activity within the staff parking lot of a warehouse distribution center. At 50 feet from the center of activity, the parking lot produced a reference noise level of 52.6 dBA L_{eq} . The parking lot noise levels are mainly due to cars pulling in and out of parking spaces in combination with car doors opening and closing.

9.2.8 Gas Station Activity

To describe the potential noise level impacts created by the gas station of the Project, a reference noise level measurement was collected. The reference noise level measurement includes six cars fueling at once, car doors closing, engines starting, fuel pump public address speaker sounds and background car pass-by events within a 3-minute period. At 50 feet from the gas station, a reference noise level of 48.2 dBA L_{eq} was measured.

9.3 CADNA 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 Nemap 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. This approach ensures a reasonable approximation in environments where both hard and soft surfaces exist, aligning with typical real-world conditions. Appendix 9.1 includes the detailed noise dBA L_{eq} model inputs used to estimate the Project operational noise levels presented in this section.

9.4 PROJECT OPERATIONAL NOISE LEVELS

Using the reference noise levels to represent the Project operations that include loading dock activity, truck movements, trash enclosure activity, roof-top air conditioning units, drive-thru speakerphone, parking lot vehicle movements and gas station activity, Urban Crossroads, Inc. calculated the operational source noise levels that are expected to be generated at the Project site and the Project-related noise level increases that would be experienced at each of the sensitive receiver locations. Table 9-2 shows the Project operational noise levels during the daytime hours from 7:00 a.m. to 10:00 p.m. The daytime hourly noise levels at the off-site receiver locations are expected to range from 45.7 to 48.1 dBA L_{eq} .

TABLE 9-2: DAYTIME PROJECT OPERATIONAL NOISE LEVELS

Noise Source ¹	Operational Noise Levels by Receiver Location (dBA L _{eq})			
	R1	R2	R3	R4
Loading Dock Activity	38.1	31.7	45.7	41.8
Truck Movements	21.2	34.5	25.0	23.6
Trash Enclosure Activity	32.7	42.5	36.2	38.8
Roof-Top Air Conditioning Units	43.7	43.6	43.1	42.9
Drive-Through Speakerphone	31.7	28.9	14.3	19.2
Parking Lot Vehicle Movements	35.9	34.3	32.6	40.8
Gas Station Activity	23.8	16.1	17.0	11.8
Total (All Noise Sources)	45.7	46.9	48.1	47.4

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

Table 9-3 shows the Project operational noise levels during the nighttime hours from 10:00 p.m. to 7:00 a.m. The nighttime hourly noise levels at the existing off-site receiver locations are expected to range from 42.8 to 44.6 dBA L_{eq}. The differences between the daytime and nighttime noise levels are largely related to the estimated duration of noise activity as outlined in Table 9-1. Appendix 9.1 includes the detailed noise model inputs.

TABLE 9-3: NIGHTTIME PROJECT OPERATIONAL NOISE LEVELS

Noise Source ¹	Operational Noise Levels by Receiver Location (dBA L _{eq})			
	R1	R2	R3	R4
Loading Dock Activity	34.1	27.7	41.7	37.8
Truck Movements	14.2	27.5	18.0	16.7
Trash Enclosure Activity	28.8	38.6	32.2	34.8
Roof-Top Air Conditioning Units	41.3	41.2	40.7	40.5
Drive-Through Speakerphone	27.7	24.9	10.4	15.3
Parking Lot Vehicle Movements	31.9	30.4	28.6	36.8
Gas Station Activity	19.8	12.2	13.1	7.8
Total (All Noise Sources)	42.8	43.6	44.6	44.0

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

9.5 PROJECT OPERATIONAL NOISE LEVEL COMPLIANCE

To demonstrate compliance with local noise regulations, the unmitigated Project-only operational noise levels are evaluated against exterior noise level thresholds based on the County of Riverside exterior noise level standards at nearby receiver locations. Table 9-4 shows that the mitigated operational noise levels associated with Project will not exceed the County of Riverside daytime and nighttime exterior noise level standards at the existing nearby noise-sensitive receiver locations. Therefore, the mitigated operational noise impacts are considered *less than significant* at the nearby noise-sensitive receiver locations.

TABLE 9-4: OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location ¹	Project Operational Noise Levels (dBA Leq) ²		Noise Level Standards (dBA Leq) ³		Noise Level Standards Exceeded? ⁴	
	Day	Night	Day	Night	Day	Night
R1	45.7	42.8	55	45	No	No
R2	46.9	43.6	55	45	No	No
R3	48.1	44.6	55	45	No	No
R4	47.4	44.0	55	45	No	No

¹ See Exhibit 8-1 for the receiver locations.

² Proposed Project unmitigated operational noise levels as shown on Tables 9-2, and 9-3.

³ Exterior noise level standards, as shown on Table 4-1.

⁴ Do the estimated Project operational noise source activities exceed the noise level standards?

"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

9.6 PROJECT OPERATIONAL NOISE INCREASES

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

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

where "SPL1," "SPL2," etc. are equal to the sound pressure levels being combined, or in this case, the Project-operational and existing ambient noise levels. The difference between the combined Project and ambient noise levels describes the Project noise level increases to the existing ambient noise environment. Noise levels that would be experienced at receiver locations when Project-source noise is added to the daytime and nighttime ambient conditions are presented on Tables 9-5 and 9-6, respectively. As indicated on Table 9-5, the Project will generate daytime operational noise increases ranging from 0.1 to 1.1 dBA L_{eq} at the nearest receiver locations. Table 9-6 shows that the Project will generate nighttime operational noise increases ranging from 0.3 to 3.6 dBA L_{eq} at the nearest receiver locations. The analysis shows that the Project-related operational noise increases would not exceed the operational noise increase significance criteria presented in Table 4-1. Therefore, Project related operational noise increases at the sensitive receiver locations will be *less than significant*.

TABLE 9-5: DAYTIME PROJECT OPERATIONAL NOISE INCREASES

Receiver Location ¹	Total Project Operational Noise Level ²	Measurement Location ³	Reference Ambient Noise Levels ⁴	Combined Project and Ambient ⁵	Project Increase ⁶	Increase Criteria ⁷	Increase Criteria Exceeded?
R1	45.7	L1	58.5	58.7	0.2	5.0	No
R2	46.9	L2	54.5	55.2	0.7	5.0	No
R3	48.1	L3	53.6	54.7	1.1	5.0	No
R4	47.4	L4	63.4	63.5	0.1	3.0	No

¹ See Exhibit 8-1 for the receiver locations.

² Total Project daytime operational noise levels as shown on Table 9-2.

³ Reference noise level measurement locations as shown on Exhibit 5-A.

⁴ Observed daytime ambient noise levels as shown on Table 5-1.

⁵ Represents the combined ambient conditions plus the Project activities.

⁶ The noise level increase expected with the addition of the proposed Project activities.

⁷ Significance increase criteria as shown on Table 4-1.

TABLE 9-6: NIGHTTIME OPERATIONAL NOISE INCREASES

Receiver Location ¹	Total Project Operational Noise Level ²	Measurement Location ³	Reference Ambient Noise Levels ⁴	Combined Project and Ambient ⁵	Project Increase ⁶	Increase Criteria ⁷	Increase Criteria Exceeded?
R1	42.8	L1	50.8	51.4	0.6	5.0	No
R2	43.6	L2	44.7	47.2	2.5	5.0	No
R3	44.6	L3	43.6	47.2	3.6	5.0	No
R4	44.0	L4	54.9	55.2	0.3	5.0	No

¹ See Exhibit 8-1 for the receiver locations.

² Total Project nighttime operational noise levels as shown on Table 9-3.

³ Reference noise level measurement locations as shown on Exhibit 5-A.

⁴ Observed nighttime ambient noise levels as shown on Table 5-1.

⁵ Represents the combined ambient conditions plus the Project activities.

⁶ The noise level increase expected with the addition of the proposed Project activities.

⁷ Significance increase criteria as shown on Table 4-1.

10 CONSTRUCTION IMPACTS

This section analyzes potential impacts resulting from the short-term construction activities associated with the development of the Project. Exhibit 10-1 shows the on-site construction noise source activity including the off-site roadway and utility improvements in relation to the nearest sensitive receiver locations previously described in Section 8. According to Riverside County Ordinance No. 847 Regulating Noise Section 2i (Code Section 9.52.020[I]), noise associated with any private construction activity located within one-quarter of a mile from an inhabited dwelling is considered exempt between the hours of 6:00 a.m. and 6:00 p.m., during the months of June through September, and 7:00 a.m. and 6:00 p.m., during the months of October through May. (12)

10.1 CONSTRUCTION NOISE LEVELS

The FTA *Transit Noise and Vibration Impact Assessment Manual* recognizes that construction projects are accomplished in several different stages and outlines the procedures for assessing noise impacts during construction. 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:

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

10.2 CONSTRUCTION REFERENCE NOISE LEVELS

To describe construction noise activities, this construction noise analysis was prepared using reference construction equipment noise levels from the Federal Highway Administration (FHWA) published the Roadway Construction Noise Model (RCNM), which includes a national database of construction equipment reference noise emission levels. (25) The RCNM equipment database provides a comprehensive list of the noise-generating characteristics of specific types of construction equipment. In addition, the database provides an acoustical usage factor to estimate the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during a construction operation. According to the EPA, FTA, and FHWA, the overall construction noise level is governed primarily by the noisiest pieces of equipment. The quieter pieces do not affect the overall level, but they do reduce the magnitude of the fluctuations in the noise level. Therefore, a rough estimate of the noise level needs only include the noisiest pieces of equipment expected at the site. (26) (8) (27) Consistent with FHWA and FTA guidance for detailed construction noise assessment, Table 10-1 presents the combined noise levels for the loudest construction activities expected for each stage, assuming all equipment operates simultaneously.

EXHIBIT 10-1: CONSTRUCTION NOISE SOURCE LOCATIONS

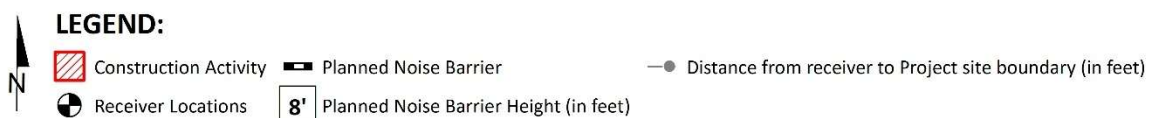
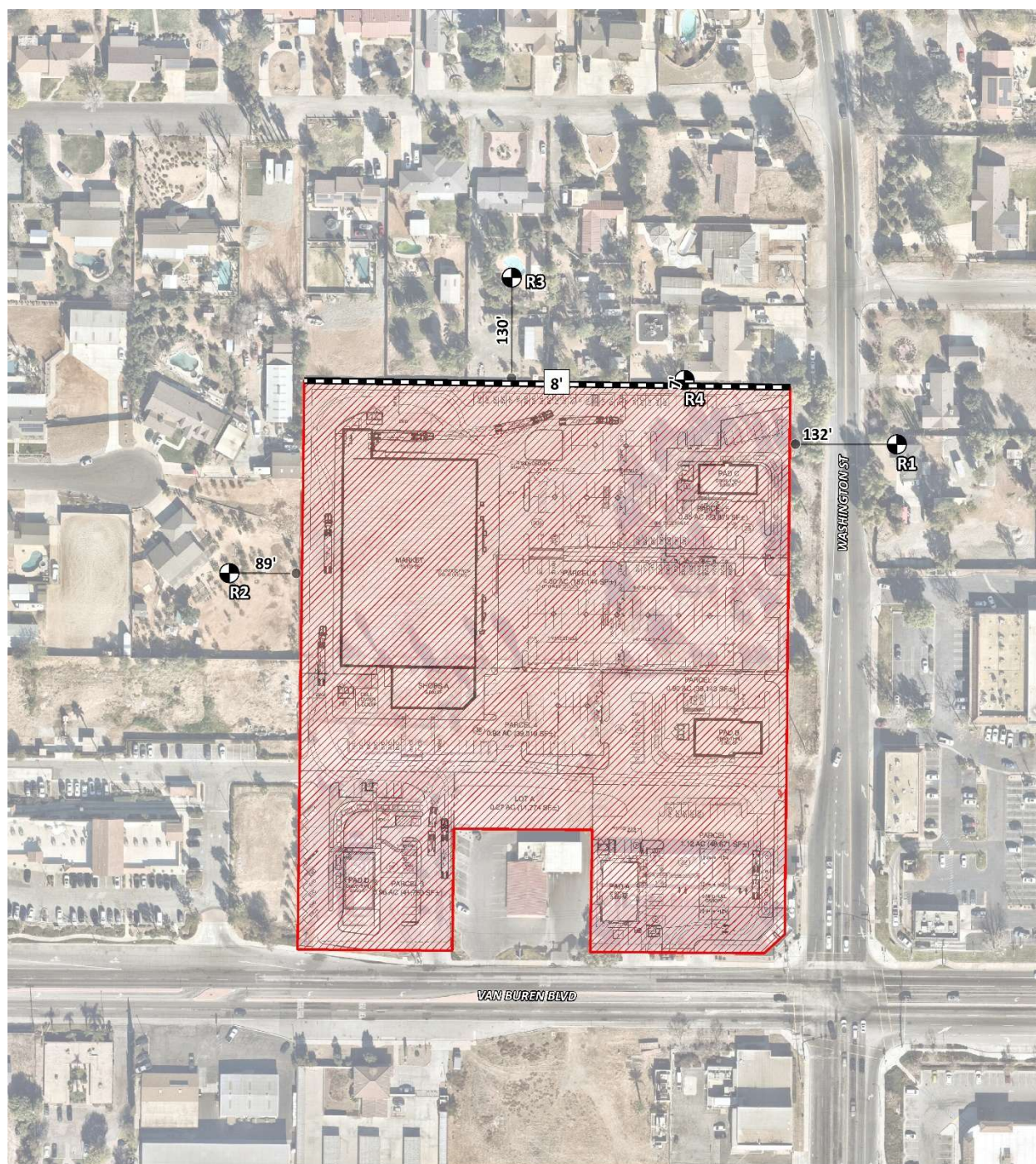


TABLE 10-1: CONSTRUCTION REFERENCE NOISE LEVELS

Construction Stage	Reference Construction Equipmnet ¹	Reference Noise Level @ 50 Feet (dBA L _{eq})	Composite Reference Noise Level (dBA L _{eq}) ²	Reference Power Level (dBA L _w) ³
Demolition	Concrete Saw	83	86.8	118.4
	Grapple (on backhoe)	83		
	Gradall	79		
Site Preparation	Tractor	80	84.0	115.6
	Backhoe	74		
	Grader	81		
Grading	Scraper	80	83.3	114.9
	Excavator	77		
	Dozer	78		
Building Construction	Crane	73	81.1	112.8
	Tractor	80		
	Welder/Torch	70		
Paving	Paver	74	77.8	109.5
	Dump Truck	72		
	Roller	73		
Architectural Coating	Man Lift	68	76.2	107.8
	Compressor (air)	74		
	Generator (<25kVA)	70		

¹ FHWA Road Construction Noise Model.

² Represents the combined noise level for all equipment assuming they operate at the same time.

³ The total amount of acoustical energy produced by a sound source independent of distance or surroundings.

10.3 CONSTRUCTION NOISE ANALYSIS

Construction projects involve various stages, and activities frequently shift from one location to another. For example, during site preparation and grading, noise-generating activities may concentrate in an area for a short period to remove an obstruction, while the majority of the grading involves the equipment moving back and forth in a predictable pattern throughout the site; building construction and foundation work generally concentrate near the building footprint, while paving generally involves a predictable pattern of movement throughout the site. Therefore, construction activities are best evaluated as multiple moving point sources within the construction area since the speed and power of the equipment vary, and the equipment constantly changes position in terms of its distance and direction relative to the receivers. (8) (28) Using the reference construction equipment noise levels and the CadnaA noise prediction model, calculations of the Project construction noise level impacts by phase at the nearby sensitive receiver locations were completed. To account for the dynamic nature of construction activities, the CadnaA construction noise analysis evaluates the noise source activities as multiple moving point sources, or construction crews, within the limits of construction.

Construction impacts are based on the loudest activity and the highest noise level calculated at each receiver location. As shown on Table 10-2, the construction noise levels are expected to range from 64.0 to 71.3 dBA L_{eq} at the nearby receiver locations. Appendix 10.1 includes the detailed CadnaA construction noise model inputs that includes the planned 8-foot high screenwall on the northern Project site boundary.

TABLE 10-2: CONSTRUCTION EQUIPMENT NOISE SUMMARY

Receiver Location ¹	Construction Noise Levels (dBA L_{eq})							
	Demolition	Site Preparation	Grading	Building Construction	Paving	Linear, Utilities	Architectural Coating	Highest Levels ²
R1	64.4	61.6	60.9	58.7	55.4	57.2	53.8	64.4
R2	71.3	68.5	67.8	65.6	62.3	64.1	60.7	71.3
R3	64.0	61.2	60.5	58.3	55.0	56.8	53.4	64.0
R4	69.3	66.5	65.8	63.6	60.3	62.1	58.7	69.3

¹ Construction noise source and receiver locations are shown on Exhibit 10-1.

² Construction noise level calculations based on distance from the construction activity, which is measured from the Project site boundary to the nearest receiver locations. CadnaA construction noise model inputs are included in Appendix 10.1.

10.4 PROJECT SITE CONSTRUCTION NOISE COMPLIANCE

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

TABLE 10-3: CONSTRUCTION NOISE COMPLIANCE

Receiver Location ¹	Construction Noise Levels (dBA L_{eq})		
	Highest Construction Noise Levels ²	Threshold ³	Threshold Exceeded? ⁴
R1	64.4	80	No
R2	71.3	80	No
R3	64.0	80	No
R4	69.3	80	No

¹ Construction noise source and receiver locations are shown on Exhibit 10-1.

² Highest construction noise level calculations based on distance from the construction noise source activity to the nearest receiver locations as shown on Table 10-2.

³ Construction noise level thresholds as shown on Table 4-1.

⁴ Do the estimated Project construction noise levels exceed the construction noise level threshold?

10.5 TEMPORARY CONSTRUCTION NOISE INCREASES

To describe the temporary Project construction noise level contributions to the existing ambient noise environment, the Project construction noise levels were combined with the existing ambient noise levels measurements at the nearest off-site receiver locations. The difference between the combined Project-construction and ambient noise levels is used to describe the construction noise level contributions. Temporary noise level increases that would be experienced at sensitive receiver locations when Project construction-source noise is added to the ambient daytime conditions are presented on Table 10-4. As outlined in Section 4.1.2, a reasonable 20 dBA increase over the daytime noise limit can be tolerated without significant adverse effects.

Table 10-4 shows that the Project will contribute construction noise increases ranging from 6.9 to 16.9 dBA L_{eq} during daytime hours at the nearest receiver locations. The unmitigated construction noise analysis shows that the nearest receiver locations will not exceed the temporary 20 dBA L_{eq} noise increase significance threshold during Project construction activities. Therefore, the temporary construction noise increase analysis shows that the noise impacts due to daytime Project construction noise are considered *less than significant*.

TABLE 10-4: DAYTIME CONSTRUCTION NOISE LEVEL INCREASES

Receiver Location ¹	Typical Project Construction Noise Level ²	Measurement Location ³	Reference Ambient Noise Levels ⁴	Combined Project and Ambient ⁵	Project Increase ⁶	Increase Criteria ⁷	Increase Criteria Exceeded?
R1	64.4	L1	58.5	65.4	6.9	20	No
R2	71.3	L2	54.5	71.4	16.9	20	No
R3	64.0	L3	53.6	64.4	10.8	20	No
R4	69.3	L4	63.4	70.3	6.9	20	No

¹ Construction noise source and receiver locations are shown on Exhibit 10-1.

² Typical Project daytime construction noise levels as shown on Table 10-3.

³ Reference noise level measurement locations as shown on Exhibit 5-A.

⁴ Observed daytime ambient noise levels as shown on Table 5-1.

⁵ Represents the combined ambient conditions plus the Project construction activities.

⁶ The noise level increase expected with the addition of the proposed Project construction activities.

⁷ Reasonable increase that can be tolerated without significant adverse effects.

10.6 CONSTRUCTION VIBRATION ANALYSIS

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 10-5. 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 10-5: 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
Vibratory Roller	0.210

Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual

Using the vibration source level of construction equipment provided in Table 10-5 and the construction vibration assessment methodology published by the FTA, it is possible to estimate the Project vibration impacts. Table 10-6 presents the expected Project related vibration levels at the nearby receiver locations. At distances ranging from 7 to 132 feet from Project construction activities, construction vibration velocity levels are estimated to range from less than 0.017 to 1.417 PPV in/sec. Based on maximum acceptable continuous vibration threshold of 0.3 PPV (in/sec), the typical Project construction vibration levels will exceed the vibration thresholds at receiver R4. Therefore, the Project-related vibration impacts are considered *potentially significant* during typical construction activities at the Project site. It should be noted that vibration levels at the site of the closest sensitive receiver are unlikely to be sustained during the entire construction period but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site perimeter. Moreover, construction at the Project site will be restricted to the daytime hours, consistent with County of Riverside requirements, eliminating potential vibration impacts during the sensitive evening and nighttime hours.

TABLE 10-6: PROJECT CONSTRUCTION VIBRATION LEVELS

Location 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	Jack-hammer	Loaded Trucks	Large bulldozer	Vibratory Roller	Highest Vibration Level		
R1	132'	0.000	0.003	0.006	0.007	0.017	0.017	0.3	No
R2	89'	0.000	0.005	0.011	0.013	0.031	0.031	0.3	No
R3	130'	0.000	0.003	0.006	0.008	0.018	0.018	0.3	No
R4	7'	0.020	0.236	0.513	0.601	1.417	1.417	0.3	Yes

¹ Construction noise source and receiver locations are shown on Exhibit 10-1.

² Distance from receiver building facade to Project construction boundary (Project site boundary).

³ Based on the Vibration Source Levels of Construction Equipment (Table 10-5).

⁴ Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Table 19, p. 38.

⁵ Does the peak vibration exceed the acceptable vibration thresholds?

"PPV" = Peak Particle Velocity

Therefore, a 20-foot buffer setback mitigation measure is required which would restrict the use of large, loaded trucks, heavy mobile equipment greater than 80,000 pounds, jack hammers and vibratory rollers within 20-feet of receiver location R4. Instead, small rubber-tired or alternative equipment, as well as soil compaction equipment shall be used during Project construction to reduce vibration effects on nearby structures and their occupants. Table 10-7 shows that with the 20-foot setback buffer, Project construction vibration levels will not exceed the 0.3 PPV (in/sec) construction vibration threshold.

TABLE 10-7: MITIGATED PROJECT CONSTRUCTION VIBRATION LEVELS

Location 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	Jack- hammer	Loaded Trucks	Large bulldozer	Vibratory Roller	Highest Vibration Level		
R4	20'	0.004	0.049	0.106	0.124	0.293	0.293	0.3	No

¹ Construction noise source and receiver locations are shown on Exhibit 10-1.

² Distance from receiver building facade to Project construction boundary (Project site boundary).

³ Based on the Vibration Source Levels of Construction Equipment (Table 10-5).

⁴ Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, Table 19, p. 38.

⁵ Does the peak vibration exceed the acceptable vibration thresholds?

"PPV" = Peak Particle Velocity

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11 REFERENCES

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12 CERTIFICATION

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

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

Professional Registrations

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

Professional Affiliations

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

Professional Certifications

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

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APPENDIX 3.1:

COUNTY OF RIVERSIDE MUNICIPAL CODE

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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:

OFF-SITE TRAFFIC NOISE ANALYSIS WORKSHEETS

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APPENDIX 9.1:

CADNAA OPERATIONAL NOISE CALCULATIONS

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APPENDIX 10.1:

CONSTRUCTION NOISE CALCULATIONS

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