8978 Haven Ave. Warehouse

NOISE IMPACT ANALYSIS

CITY OF RANCHO CUCAMONGA

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
ALUCP	Airport Land Use Compatibility Plan
ANSI	American National Standards Institute
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
INCE	Institute of Noise Control Engineering
LA/ONT	Los Angeles/Ontario International Airport
L_{eq}	Equivalent continuous (average) sound level
L_{max}	Maximum level measured over the time interval
L_{min}	Minimum level measured over the time interval
mph	Miles per hour
PPV	Peak Particle Velocity
Project	8978 Haven Ave. Warehouse
RMS	Root-mean-square
VdB	Vibration Decibels

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise mitigation measures for the proposed 8978 Haven Ave. Warehouse development ("Project"). The Project site is located west of Haven Avenue at 8th Street in the City of Rancho Cucamonga. It is our understanding that the Project is proposed to include the development of 120,628 square feet of general warehouse use. This study has been prepared consistent with applicable City of Rancho Cucamonga noise standards, and significance criteria based on guidance provided by Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (1)

OFF-SITE TRAFFIC NOISE ANALYSIS

According to the *8978 Haven Ave. Warehouse Trip Generation Evaluation* prepared by Urban Crossroads, Inc., the Project is expected to result in a net reduction in the total trips from the Project site, and generate 97 fewer trip-ends per day (actual vehicles) than the existing use. (2) Therefore, off-site traffic noise levels generated by daily Project trips will be lower than those generated by the existing use at the Project site, and as such, off-site traffic noise level impacts are considered *less than significant*.

ON-SITE RAIL NOISE ANALYSIS

An on-site noise impact analysis has been completed to determine the noise levels from Metrolink and freight train activities on the railroad tracks north of the Project site, and to identify potential abatement measures that would achieve acceptable Project exterior and interior noise levels, if necessary. The results of the on-site railroad noise level analysis indicate that the unmitigated exterior noise level at the northern Project building façade, adjacent to the railroad tracks, will approach 59.2 dBA CNEL. Based on the City of Rancho Cucamonga Public Health and Safety Element, Figure PS-8 land use compatibility criteria, the on-site railroad-related exterior noise level of up to 59.2 dBA CNEL will satisfy the exterior 70 dBA CNEL *normally acceptable* criteria for office and industrial uses of the Project. Further, interior noise levels due to adjacent railroad activities are shown to approach 34.2 dBA CNEL and will satisfy the 50 dBA CNEL interior noise level threshold for non-residential use with standard building construction. Therefore, the railroad noise levels at the Project site represent a *less than significant* impact.

It is important to note that while railroad-related noise levels are shown to satisfy the exterior and interior noise level standards, rail pass-by noise will remain noticeable due to the location of the Project site in relation to the existing rail lines.

ON-SITE RAIL VIBRATION ANALYSIS

Using the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment* reference vibration levels and adjustments based on observations in the Project study area, the vibration levels at the Project building are estimated to approach 74 VdB at approximately 170 feet to the adjacent railroad tracks. Therefore, on-site rail-related vibration levels are shown to

remain below the FTA vibration threshold of 84 VdB for the Project building's interior office uses which are expected to be the most sensitive of the Project's uses to railroad pass-by events.

Further, vibration levels approaching 74 VdB are considered acceptable based on the FTA requirements for more sensitive uses than the Project, such as residential homes, and in terms of perceptibility are described by the FTA as between *not feelable* and *barely feelable*. (3)

OPERATIONAL NOISE ANALYSIS

Using reference noise levels to represent the potential noise sources within 8978 Haven Ave. Warehouse site, this analysis estimates the Project-related operational (stationary-source) noise levels at the nearby receiver locations. The Project-related operational noise sources are expected to include idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, roof-top air conditioning units, and parking lot vehicle movements. The analysis shows that the unmitigated Project-related operational noise levels will satisfy the City of Rancho Cucamonga exterior noise level standards at both the nearby sensitive residential receiver locations, and the adjacent non-noise-sensitive industrial uses. Therefore, Project operational noise levels at the nearby receiver locations are considered a *less than significant* impact.

Further, this analysis demonstrates that the Project-related noise level increases to the existing noise environment at all receiver locations would be less than the Federal Interagency Committee on Noise (FICON) guidance for noise level increases, and thus would be *less than significant* during daytime and nighttime hours. Therefore, the operational noise level impacts associated with the proposed Project activities, such as the idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, roof-top air conditioning units, and parking lot vehicle movements will be *less than significant*.

CONSTRUCTION NOISE ANALYSIS

Construction activities are expected to create temporary and intermittent high-level noise conditions at receivers surrounding the Project site. Using sample reference noise levels to represent the planned construction activities of 8978 Haven Ave. Warehouse site, this analysis estimates the Project-related construction noise levels at nearby sensitive receiver locations. The Project-related short-term construction noise levels are expected to approach 81.4 dBA L_{eq} at the adjacent industrial uses, and 69.9 dBA L_{eq} at the closest noise-sensitive residential home. As such, Project construction noise levels will exceed the City of Rancho Cucamonga 70 dBA L_{eq} industrial construction noise level standard at receiver locations R4 and R6 and will exceed the 65 dBA L_{eq} residential construction noise level standard at receiver location R3.

Therefore, temporary construction noise mitigation measures are required to reduce the impacts at receiver locations R3, R4, and R6 to satisfy the City of Rancho Cucamonga Development Code construction noise level standards. With the temporary construction noise barriers shown on Exhibit ES-A, the mitigated construction noise levels will satisfy the 70 dBA L_{eq} industrial and 65 dBA L_{eq} construction noise level standards, and therefore, the impacts are considered *less than significant* with mitigation.

CONSTRUCTION VIBRATION ANALYSIS

Project construction vibration levels are expected to approach a peak-particle-velocity (PPV) of 0.124 in/sec at the nearby industrial receiver locations. Based on the Caltrans building damage threshold of 0.5 in/sec PPV for industrial uses, Project construction vibration levels of 0.124 in/sec PPV are considered a *less than significant* vibration impact. In addition, Project construction vibration levels at noise-sensitive residential receiver locations will range from 0.001 to 0.017 in/sec PPV and will remain below the Caltrans 0.3 in/sec PPV building damage and 0.04 in/sec PPV annoyance thresholds thereby resulting in *less than significant* vibration impacts at nearby sensitive receiver locations.

Further, 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.

CONSTRUCTION NOISE MITIGATION MEASURES

Though construction noise is temporary, intermittent and of short duration, and will not present any long-term impacts, the following mitigation measures are required to reduce noise levels produced by the construction equipment to the nearby noise-sensitive residential land uses:

- Install the minimum 6 and 10-foot high temporary construction noise barriers at the Project boundaries for sensitive receiver locations R3, R4, and R6, as shown on Exhibit ES-A, for the duration of Project construction. The noise control barriers must have a solid face from top to bottom. The noise control barriers must meet the minimum height and be constructed as follows:
    - The temporary noise barriers shall provide a minimum transmission loss of 20 dBA (Federal Highway Administration, Noise Barrier Design Handbook). The noise barrier shall be constructed using an acoustical blanket (e.g. vinyl acoustic curtains or quilted blankets) attached to the construction site perimeter fence or equivalent temporary fence posts. Example photos are provided in Appendix 11.2.;
    - The noise barrier must be maintained, and any damage promptly repaired. Gaps, holes, or weaknesses in the barrier or openings between the barrier and the ground shall be promptly repaired;
    - The noise control barrier and associated elements shall be completely removed, and the site appropriately restored upon the conclusion of the construction activity.
- Prior to approval of grading plans and/or issuance of building permits, plans shall include a note indicating that Project construction activities shall comply with the City of Rancho Cucamonga municipal code requirements. (4)
- During all Project site construction, the construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards. The construction contractor shall place all stationary construction equipment so that emitted noise is directed away from the noise-sensitive receivers nearest the Project site.

- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receivers nearest the Project site during all Project construction (i.e., to the center or western center).

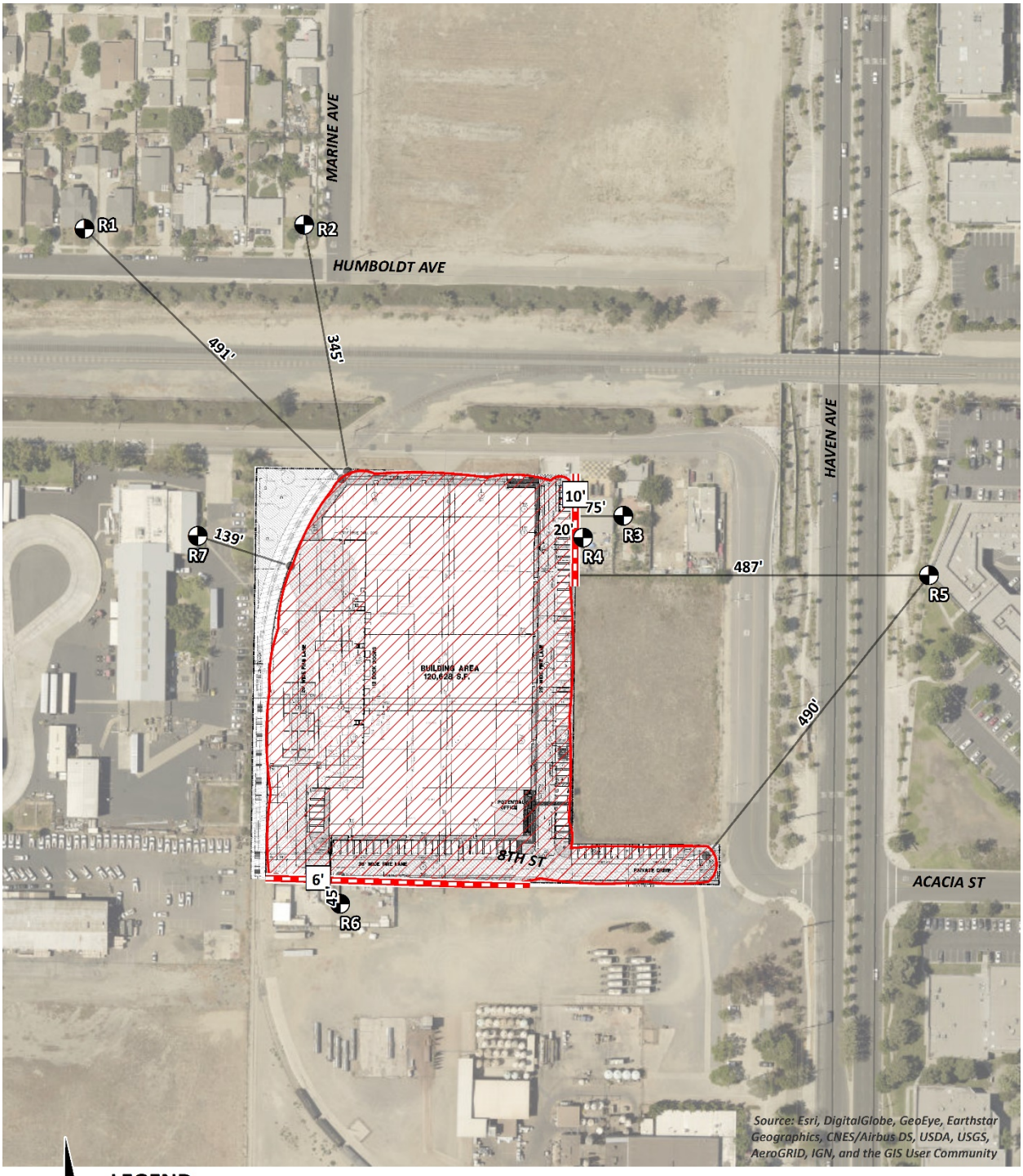
SUMMARY OF CEQA SIGNIFICANCE FINDINGS

The results of this 8978 Haven Ave. Warehouse Noise Impact Analysis are summarized below based on the significance criteria in Section 4 of this report consistent with Appendix G of the California Environmental Quality Act (CEQA) Guidelines. (1). Table ES-1 shows the findings of significance for each potential noise and/or vibration impact under CEQA before and after any required mitigation measures described below.

TABLE ES-1: SUMMARY OF CEQA SIGNIFICANCE FINDINGS

Analysis	Report Section	Significance Findings	
		Unmitigated	Mitigated
Off-Site Traffic Noise Levels	7	*Less Than Significant*	*n/a*
On-Site Rail Noise Levels	8	*Less Than Significant*	*n/a*
On-Site Rail Vibration Levels		*Less Than Significant*	*n/a*
Operational Noise Levels	10	*Less Than Significant*	*n/a*
Construction Noise Levels	11	*Potentially Significant*	*Less Than Significant*
Construction Vibration Levels		*Less Than Significant*	*n/a*

EXHIBIT ES-A: CONSTRUCTION NOISE MITIGATION MEASURES



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1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed 8978 Haven Ave. Warehouse ("Project"). This noise study briefly describes the proposed Project, provides information regarding noise fundamentals, describes the local regulatory setting, describes Project-related off-site traffic noise levels, provides the study methods and procedures for railroad noise and vibration analysis, and evaluates the future exterior noise environment. In addition, this study includes an analysis of the potential Project-related long-term operational and short-term construction noise impacts.

1.1 SITE LOCATION

The proposed 8978 Haven Ave. Warehouse Project is located west of Haven Avenue at 8th Street in the City of Rancho Cucamonga, as shown on Exhibit 1-A. The Project site is located roughly 170 feet south of existing Southern California Regional Rail Authority and Metrolink railroad lines. The Ontario International Airport (ONT) is located approximately 2.15 miles south of the Project site. The Project site is currently occupied by TMT Industries and includes existing industrial and truck activities on-site. Additional existing industrial uses are located west, east, and south of the Project site; with vacant land located east of the Project site, and office uses located east across Haven Avenue. Existing residential uses in the Project study area include one existing residential home east of the Project site on 8th Street, and additional homes located north of the Project site on Humboldt Avenue.

1.2 PROJECT DESCRIPTION

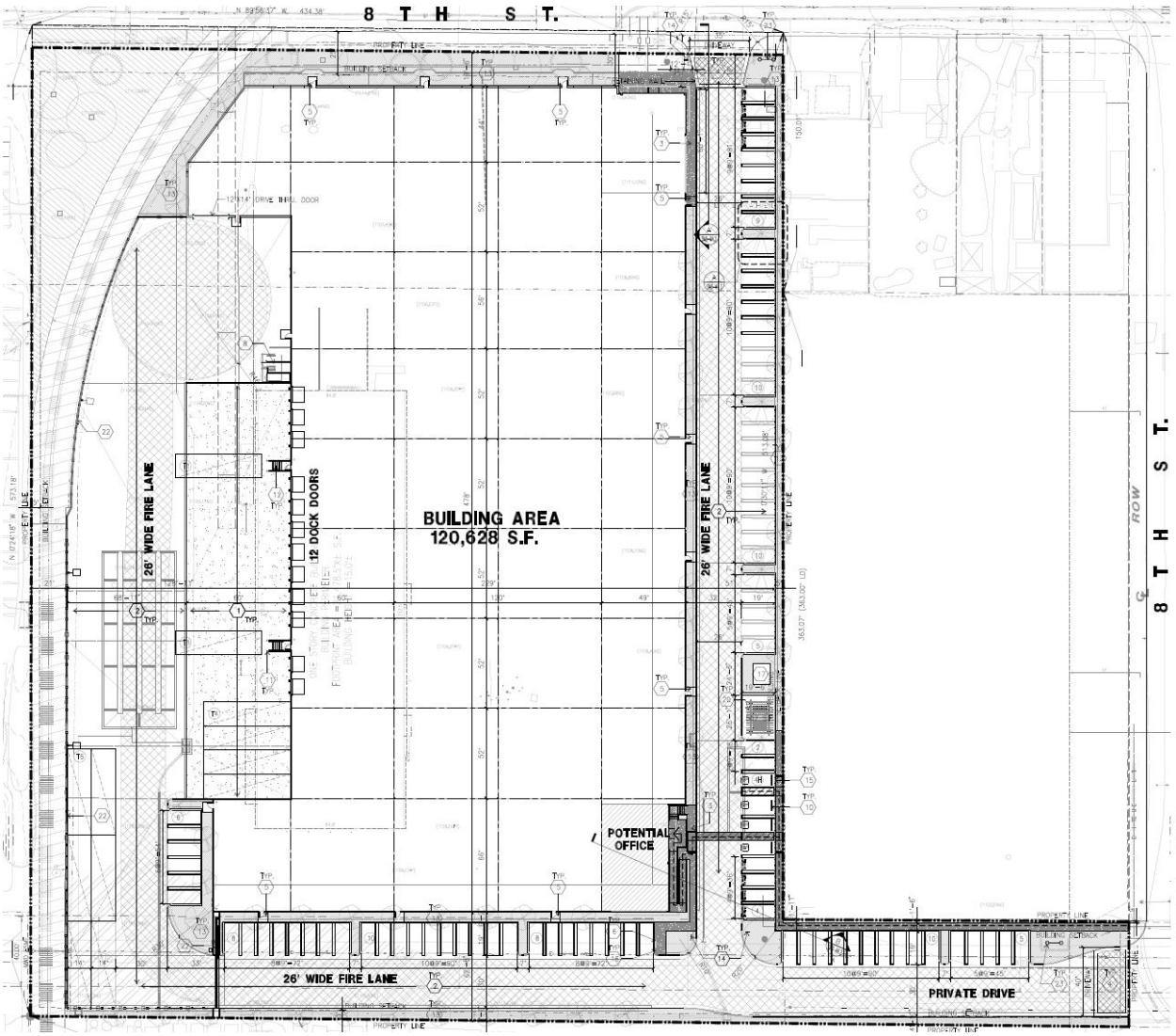
It is our understanding that the Project is proposed to include the development of 120,628 square feet of general warehouse use, as shown on Exhibit 1-B. At the time this noise analysis was prepared, the future tenants of the proposed Project were unknown. The on-site Project-related noise sources are expected to include: idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, roof-top air conditioning units, and parking lot vehicle movements. This noise analysis is intended to describe noise level impacts associated with the expected typical operational activities at the Project site.

1.3 PROJECT TRIP GENERATION

According to the *8978 Haven Ave. Warehouse Trip Generation Evaluation* prepared by Urban Crossroads, Inc., the Project is expected to result in a net reduction in the total trips from the Project site, and generate 97 fewer trip-ends per day (actual vehicles) than the existing use. (2)

EXHIBIT 1-A: LOCATION MAP

EXHIBIT 1-B: SITE PLAN



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2 FUNDAMENTALS

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

EXHIBIT 2-A: TYPICAL NOISE LEVELS

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

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

2.1 RANGE OF NOISE

Since the range of intensities that the human ear can detect is so large, the scale frequently used to measure intensity is a scale based on multiples of 10, the logarithmic scale. The scale for measuring intensity is the decibel scale. Each interval of 10 decibels indicates a sound energy ten times greater than before, which is perceived by the human ear as being roughly twice as loud. (5) The most common sounds vary between 40 dBA (very quiet) to 100 dBA (very loud). Normal conversation at three feet is roughly at 60 dBA, while loud jet engine noises equate to 110 dBA

at approximately 100 feet, which can cause serious discomfort. (6) Another important aspect of noise is the duration of the sound and the way it is described and distributed in time.

2.2 NOISE DESCRIPTORS

Environmental noise descriptors are generally based on averages, rather than instantaneous, noise levels. The most commonly used figure is the equivalent level (L_{eq}). Equivalent sound levels are not measured directly but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (L_{eq}) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period and is commonly used to describe the "average" noise levels within the environment.

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

2.3 SOUND PROPAGATION

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

2.3.1 GEOMETRIC SPREADING

Sound from a localized source (i.e., a stationary point source) propagates uniformly outward in a spherical pattern. The sound level attenuates (or decreases) at a rate of 6 dB for each doubling of distance from a point source. Highways consist of several localized noise sources on a defined path and hence can be treated as a line source, which approximates the effect of several point sources. Noise from a line source propagates outward in a cylindrical pattern, often referred to as cylindrical spreading. Sound levels attenuate at a rate of 3 dB for each doubling of distance from a line source. (5)

2.3.2 GROUND ABSORPTION

The propagation path of noise from a highway to a receptor 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 receptor, 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 receptor such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dB per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dB per doubling of distance from a line source. (7)

2.3.3 ATMOSPHERIC EFFECTS

Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lowered noise levels. Sound levels can be increased at large distances (e.g., more than 500 feet) due to atmospheric temperature inversion (i.e., increasing temperature with elevation). Other factors such as air temperature, humidity, and turbulence can also have significant effects. (5)

2.3.4 SHIELDING

A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Shielding by trees and other such vegetation typically only has an "out of sight, out of mind" effect. That is, the perception of noise impact tends to decrease when vegetation blocks the line-of-sight to nearby resident. However, for vegetation to provide a substantial, or even noticeable, noise reduction, the vegetation area must be at least 15 feet in height, 100 feet wide and dense enough to completely obstruct the line-of sight between the source and the receiver. This size of vegetation may provide up to 5 dBA of noise reduction. The FHWA does not consider the planting of vegetation to be a noise abatement measure. (7)

2.4 NOISE CONTROL

Noise control is the process of obtaining an acceptable noise environment for an observation point or receptor by controlling the noise source, transmission path, receptor, or all three. This concept is known as the source-path-receptor 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 receptor. Noise barriers, however, do have limitations. For a noise barrier to work, it must be high enough and long enough to block the path of the noise source. (7)

2.6 LAND USE COMPATIBILITY WITH NOISE

Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches, and residences are more sensitive to noise intrusion than are commercial or industrial developments and related activities. As ambient noise levels affect the perceived amenity or livability of a development, so too can the mismanagement of noise impacts impair the economic health and growth potential of a community by reducing the area's desirability as a place to live, shop and work. For this reason, land use compatibility with the noise environment is an important consideration in the planning and design process. The FHWA encourages State and Local government to regulate land development in such a way that noise-sensitive land uses are either prohibited from being located adjacent to a highway, or that the developments are planned, designed, and constructed in such a way that noise impacts are minimized. (8)

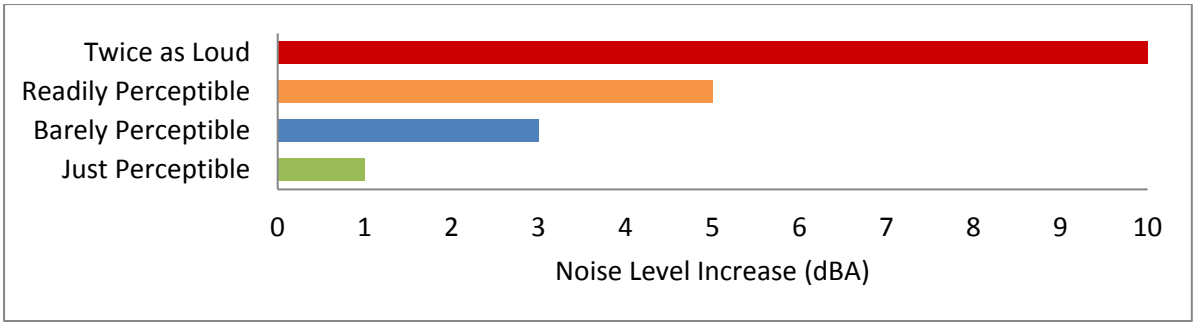
2.7 COMMUNITY RESPONSE TO NOISE

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

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

Approximately ten percent of the population has a very low tolerance for noise and will object to any noise not of their making. Consequently, even in the quietest environment, some complaints will occur. Another 25-percent of the population will not complain even in very severe noise environments. Thus, a variety of reactions can be expected from people exposed to any given noise environment. (9) Surveys have shown that about ten percent of the people exposed to traffic noise of 60 dBA will report being highly annoyed with the noise, and each increase of one dBA is associated with approximately two percent more people being highly annoyed. When traffic noise exceeds 60 dBA or aircraft noise exceeds 55 dBA, people may begin to complain. (9) Despite this variability in behavior on an individual level, the population can be expected to exhibit the following responses to changes in noise levels as shown on Exhibit 2-B. An increase or decrease of 1 dBA cannot be perceived except in carefully controlled laboratory experiments, a change of 3 dBA are considered *barely perceptible*, and changes of 5 dBA are considered *readily perceptible*. (7)

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



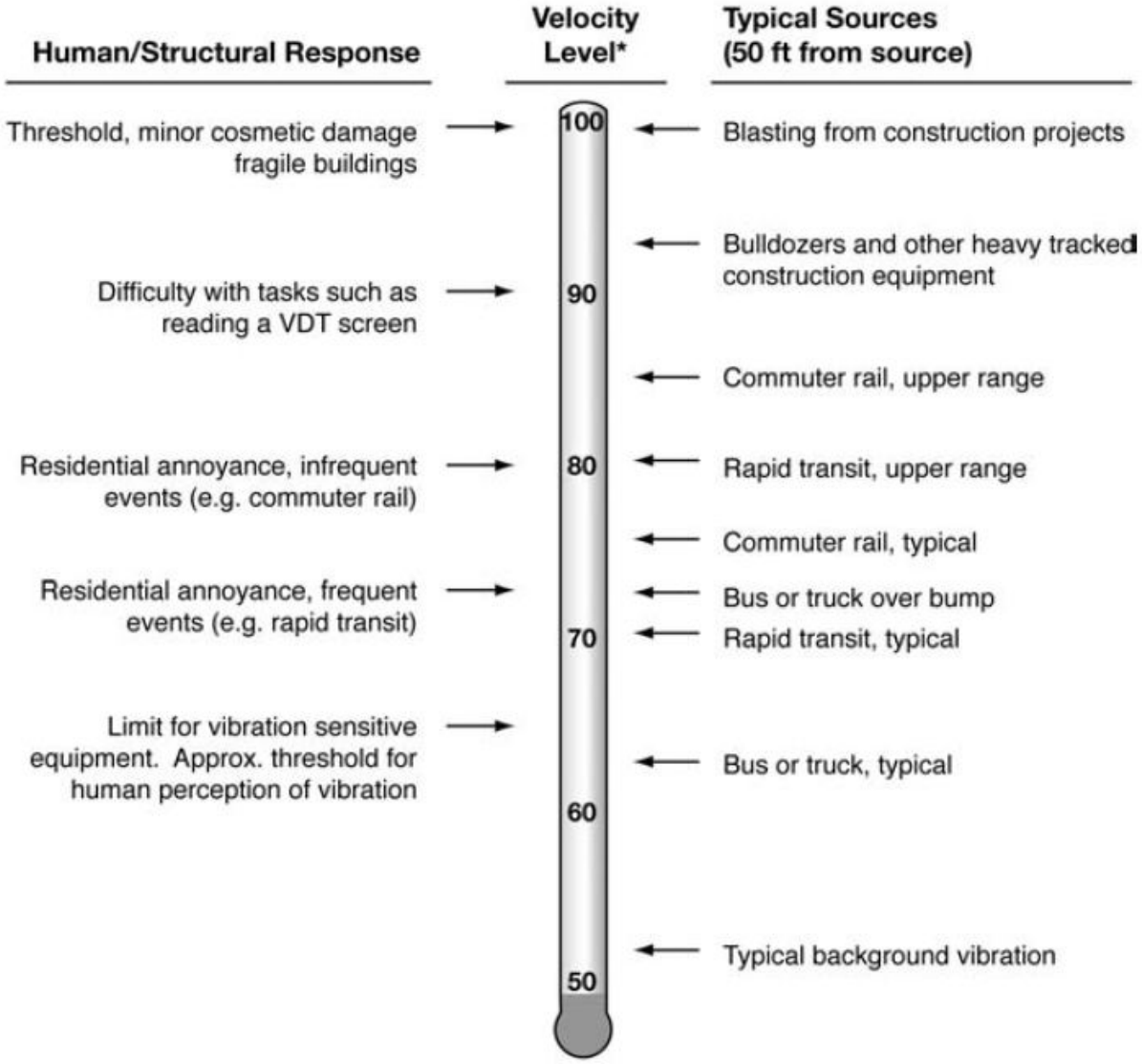
2.8 VIBRATION

Per the Federal Transit Administration (FTA) *Transit Noise Impact and Vibration Assessment* (3), vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) or human-made causes (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, such as factory machinery, or transient, such as explosions. As is the case with airborne sound, ground-borne vibrations may be described by amplitude and frequency.

There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings but is not always suitable for evaluating human response (annoyance) because it takes some time for the human body to respond to vibration signals. Instead, the human body responds to average vibration amplitude often described as the root mean square (RMS). The RMS amplitude is defined as the average of the squared amplitude of the signal and is most frequently used to describe the effect of vibration on the human body. Decibel notation (VdB) is commonly used to measure RMS. Decibel notation (VdB) serves to reduce the range of numbers used to describe human response to vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receivers for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment.

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

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



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

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

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. (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 STATE OF CALIFORNIA BUILDING STANDARDS

The 2016 State of California's Green Building Standards Code contains mandatory measures for non-residential building construction in Section 5.507 on Environmental Comfort. (11) These noise standards are applied to new construction in California for controlling interior noise levels resulting from exterior noise sources. The regulations specify that acoustical studies must be prepared when non-residential structures are developed in areas where the exterior noise levels exceed 65 dBA CNEL, such as within a noise contour of an airport, freeway, railroad, and other areas where noise contours are not readily available. If the development falls within an airport or freeway 65 dBA CNEL noise contour, the combined sound transmission class (STC) rating of the wall and roof-ceiling assemblies must be at least 50. For those developments in areas where noise contours are not readily available, and the noise level exceeds 65 dBA L_{eq} for any hour of operation, a wall and roof-ceiling combined STC rating of 45, and exterior windows with a minimum STC rating of 40 are required (Section 5.507.4.1). Alternatively, if the interior noise levels of non-residential buildings satisfy the performance criteria of 50 dBA L_{eq} (1 hour), then the performance method as defined by the California's Green Building Standards Code can be used. Since no interior noise level standards are identified in the City of Rancho Cucamonga General Plan Noise Element for commercial uses, this noise analysis relies on an interior noise level threshold of 50 dBA CNEL, consistent with the California Green Building Standards Code. The CNEL is used in place of a 1-hour L_{eq} since it represents a more conservative analysis which

applies the previously discussed (Section2.2) CNEL adjustment factors to the evening and nighttime hours.

3.3 CITY OF RANCHO CUCAMONGA PUBLIC HEALTH AND SAFETY ELEMENT

The City of Rancho Cucamonga has adopted a Public Health and Safety Element of the General Plan to minimize noise impacts on the community and to coordinate with surrounding jurisdictions and other entities regarding noise control. (12) The Public Health and Safety Element identifies noise-sensitive land uses and establishes compatibility guidelines for land use and noise. In addition, the Public Health and Safety Element identifies goals and policies to minimize the impacts of excessive noise levels throughout the community. The noise-related Public Health and Safety Element goals are as follows:

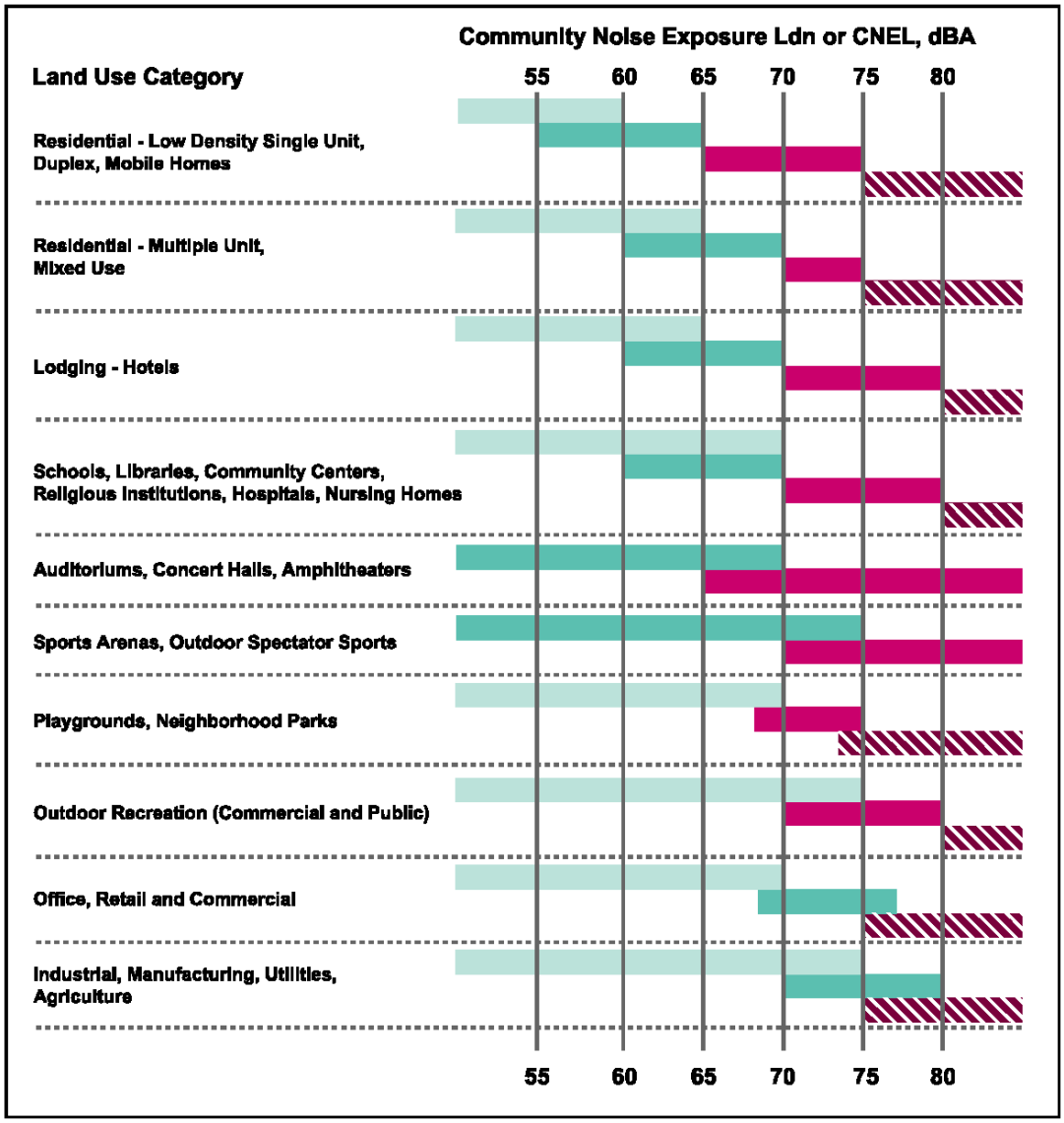
PS-13: Minimize the impacts of excessive noise levels throughout the community, and adopt appropriate noise level requirements for all land uses.

PS-14: Minimize the impacts of transportation-related noise.

The noise criteria identified in the City of Rancho Cucamonga Public Health and Safety Element (Figure PS-8) are guidelines to evaluate the land use compatibility of transportation-related noise. The compatibility criteria, shown on Exhibit 3-A, provides the City with a planning tool to gauge the compatibility of land uses relative to existing and future exterior noise levels.

The *Noise Compatibility Matrix* describes categories of compatibility and not specific noise standards. The Project includes industrial land use which is considered *normally acceptable* with exterior noise levels of up to 70 dBA CNEL, and considered *conditionally acceptable* with exterior noise levels approaching 75 dBA CNEL. For *conditionally acceptable* exterior noise levels, *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.* (12)

EXHIBIT 3-A: NOISE COMPATIBILITY MATRIX



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

Conditionally Acceptable
New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction but with closed windows and fresh air supply systems or air conditioning will normally suffice. Outdoor environment will seem noisy.

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

Clearly Unacceptable
New construction or development should generally not be undertaken. Construction costs to make the indoor environment acceptable would be prohibitive and the outdoor environment would not be usable.

Source: City of Rancho Cucamonga General Plan Public Health and Safety Element, Figure PS-8.

3.4 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from a designated fixed location or private property such as the 8978 Haven Ave. Warehouse Project, operational source noise such as the expected idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, roof-top air conditioning units, and parking lot vehicle movements are typically evaluated against standards established under a City's Municipal Code.

For the City of Rancho Cucamonga, however, the operational noise standards are located in the Development Code. The City of Rancho Cucamonga Development Code, Chapter 17.66 *Performance Standards*, Section 17.66.050 *Noise Standards*, contains the exterior noise level limits for residential (Noise Zone 1) and commercial (Noise Zone 2) land uses, as shown on Table 3-1. Table 17.66.050-1 *Residential Noise Limits* of the Municipal Code identifies a daytime (7:00 a.m. to 10:00 p.m.) base noise level standard of 65 dBA L_{eq}, and a nighttime (10:00 p.m. to 7:00 a.m.) base noise level standard of 60 dBA L_{eq} for residential land uses. (4) For the adjacent industrial uses to the Project site, the Table 17.66.110-1 *Industrial Performance Standards* shall apply to the Project operational noise levels for Class A industrial park land uses. Based on the Class A noise standards, the noise level limit of 70 dBA L_{eq} shall not be exceeded at industrial land uses. (4) Further, Table 17.66.110-1 indicates that the *noise caused by motor vehicles and trains is exempted from this standard*. Therefore, for the purposes of this analysis, the Project operational noise levels are required to satisfy the residential and industrial exterior noise level standards at the nearby receiver locations. The City of Rancho Cucamonga Development Code Performance Standards for noise are shown on Table 3-1 and included in Appendix 3.1.

TABLE 3-1: OPERATIONAL NOISE STANDARDS

City	Land Use	Time Period	Exterior Noise Level Standards (dBA L_{eq})[2]
Rancho Cucamonga[1]	Residential (Noise Zone I)	Daytime	65
		Nighttime	60
	Commercial (Noise Zone II)	Daytime	70
		Nighttime	65
	Industrial	Anytime	70

[1] Sources: City of Rancho Cucamonga Development Code, Table 17.66.050-1, Section 17.66.050 (G), and Table 17.66.110-1 (Appendix 3.1).
[2] L_{eq} represents a steady state sound level containing the same total energy as a time varying signal over a given sample period.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

3.5 CONSTRUCTION NOISE STANDARDS

To control noise impacts associated with the construction of the proposed Project the City of Rancho Cucamonga has established limits to the hours of operation and noise levels. According to Section 17.66.050(D)(4)(a) of the City of Rancho Cucamonga Development Code the following activities are exempt from the provisions of the noise standards: (4) *Noise sources associated with, or vibration created by, construction, repair, remodeling, or grading of any real property or during authorized seismic surveys, provided said activities:*

a. When adjacent to a residential land use, school, church or similar type of use, the noise generating activity does not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a national holiday, and provided that noise levels created do not exceed the base noise level standard of 65 dBA when measured at the adjacent property line.

b. When adjacent to a commercial or industrial use, the noise generating activity does not take place between the hours of 10:00 p.m. and 6:00 a.m. on weekdays, including Saturday and Sunday, and provided noise levels created do not exceed the standards of 70 dBA at the adjacent property line.

The City of Rancho Cucamonga General Plan Land Use Element, Figure LU-2, shows that the Project site is adjacent to industrial land uses. In addition, the noise level standard of 70 dBA L_{eq} shall apply to noise levels generated by Project construction at the nearby land uses. For this noise study, the noise level standard of 65 dBA L_{eq} is also applied to noise levels generated by Project construction at the closest residential uses. If the Project demonstrates compliance with these standards, the construction noise level impacts are considered exempt from the noise standards. The City of Rancho Cucamonga Development Code Noise Standards for construction activities are shown on Table 3-2 and included in Appendix 3.1.

TABLE 3-2: CONSTRUCTION NOISE STANDARDS

City	Adjacent Land Use	Hours of Construction Activity	Construction Noise Level Standard (dBA L_{eq})
Rancho Cucamonga[1]	Residential, School, & Church	7:00 a.m. to 8:00 p.m. Monday to Saturday; no activity on Sundays or national holidays	65
	Commercial & Industrial	6:00 a.m. to 10:00 p.m. Monday to Sunday	70

[1] Source: City of Rancho Cucamonga Development Code, Section 17.66.050(D)(4) Special Exclusions (Appendix 3.1).
[2] Noise level standard when measured at the adjacent property line (Section 17.66.050(D)(4)).

3.6 VIBRATION STANDARDS

The following section outlines the vibration standards for on-site railroad and off-site construction generated vibration levels related to the Project.

3.6.1 ON-SITE RAILROAD VIBRATION STANDARDS

The Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment* identifies vibration criteria for specific land use types. While the industrial use of the Project does not represent sensitive use, the interior office areas are analyzed in this noise study to determine if vibration levels due to railroad activity could affect people working within the Project site.

Table 8-3 of the FTA *Transit Noise and Vibration Impact Assessment* identifies an office use vibration level threshold of 84 VdB, and as such, the 84 VdB threshold is used in this study to assess potential impacts to the Project site from adjacent railroad activities. (13)

3.6.2 OFF-SITE VIBRATION STANDARDS

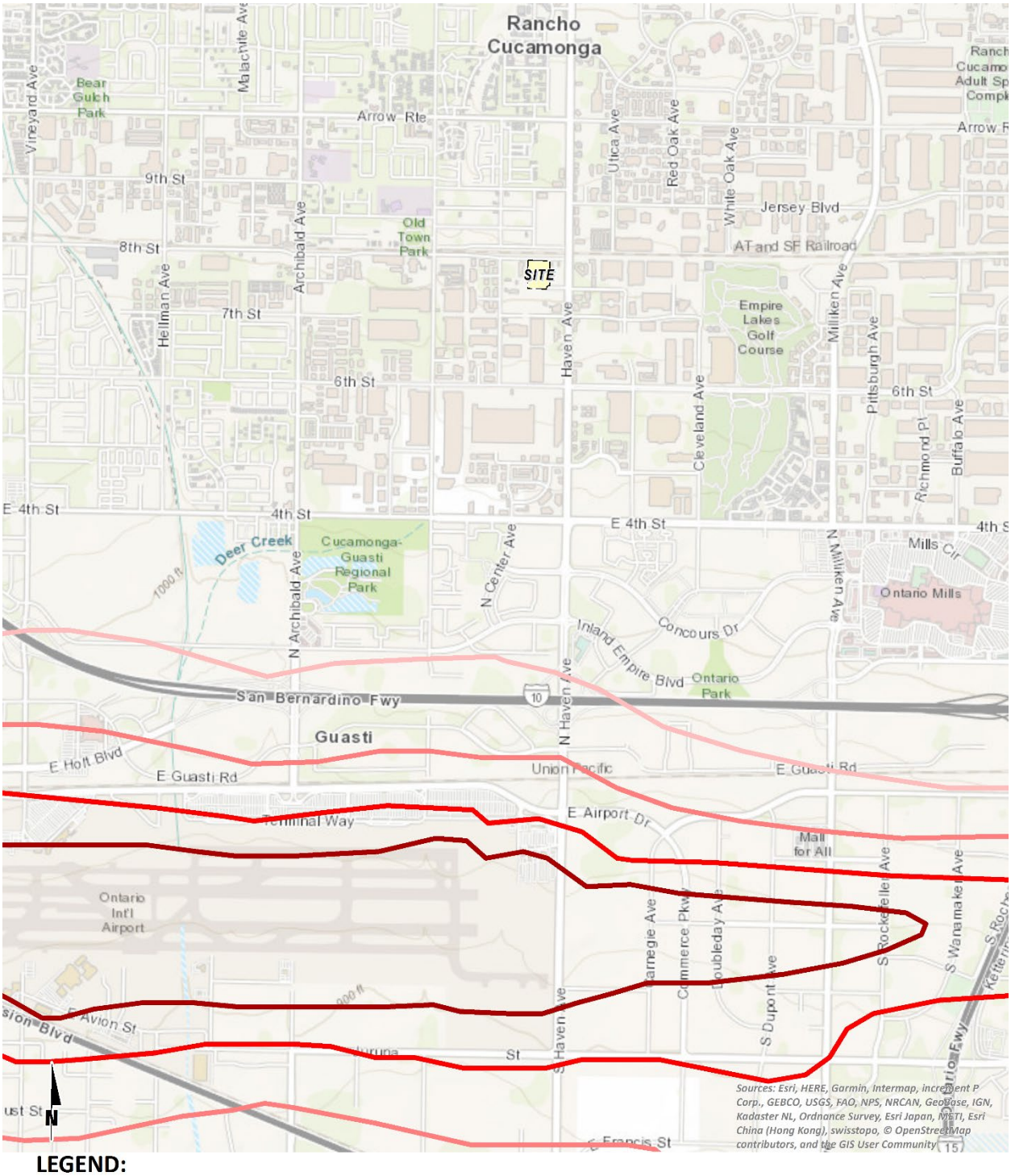
The City of Rancho Cucamonga Development Code, Section 17.66.070, identifies the City's vibration standards. However, Section 17.66.070(D) indicates that *vibrations from temporary construction/demolition and vehicles that leave the subject parcel (e.g., trucks, trains, and aircraft) are exempt from the provisions of this section.* (4) Based on these standards, vibration activity associated with Project truck trips and construction activity is considered exempt from the vibration standards of the City of Rancho Cucamonga.

Therefore, for analysis purposes, the Caltrans *Transportation and Construction Vibration Guidance Manual*, Table 19 and 20, vibration damage and annoyance criteria are used in this noise study to assess potential temporary construction-related impact at adjacent receiver locations. To assess the potential for building damage, the older residential building threshold of 0.3 in/sec PPV and industrial/commercial building threshold of 0.5 in/sec PPV are used in this analysis. For sensitive residential receiver locations, potential annoyance due to construction-related vibration levels is also evaluated based on the Caltrans 0.04 in/sec PPV threshold. (14)

3.7 ONTARIO INTERNATIONAL AIRPORT LAND USE COMPATIBILITY PLAN

The Ontario International Airport (ONT) is located roughly 2.15 miles south of the Project site. According to the LA/Ontario International Airport Land Use Compatibility Plan (LA/ONT ALUCP) the Project is located outside the 60 dBA CNEL noise level contour boundaries, as shown on Exhibit 3-B. Based on the proposed industrial land use for 8978 Haven Ave. Warehouse, the LA/ONT ALUCP identifies noise policies and criteria to minimize the interior noise exposure generated by aircraft activity. The noise criteria on Table 2-3 of the LA/ONT ALUCP indicates that industrial land uses located outside of the 60 dBA CNEL noise level contour boundaries are considered *normally compatible* land use and no further analysis is required. (15)

EXHIBIT 3-B: LA/ONTARIO INTERNATIONAL AIRPORT FUTURE NOISE CONTOURS



LEGEND:

- Unmitigated 60 dBA CNEL Noise Level Contour Boundary
- Unmitigated 65 dBA CNEL Noise Level Contour Boundary
- Unmitigated 70 dBA CNEL Noise Level Contour Boundary
- Unmitigated 75 dBA CNEL Noise Level Contour Boundary

Source: Los Angeles/Ontario International Airport Land Use Compatibility Plan, Map 2-3

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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. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

B. Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels.

C. A substantial permanent increase in ambient noise levels in the Project vicinity above existing levels without the proposed Project; or

D. A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above noise levels existing without the proposed Project.

E. For a project located within 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, expose people residing or working in the Project area to excessive noise levels.

F. For a project within the vicinity of a private airstrip, expose people residing or working in the Project area to excessive noise levels.

While the CEQA Guidelines and the City of Rancho Cucamonga General Plan Guidelines provide direction on noise compatibility and establish noise standards by land use type that are sufficient to assess the significance of noise impacts under CEQA Guideline A, they do not define the levels at which increases are considered substantial for use under Guidelines B, C, and D. CEQA Guidelines E and F apply to nearby public and private airports, if any, and the Project's land use compatibility. As previously indicated in Section 3.7, the Project site is considered *normally acceptable* land use per the LA/ONT ALUCP and is not located within the vicinity of a private airstrip. As such, the Project site would not be exposed to excessive noise levels from airport operations, and therefore, impacts are considered *less than significant,* and no further noise analysis is conducted in relation to Guidelines E and F.

4.1 NOISE-SENSITIVE RECEIVERS

Noise level increases resulting from the Project are evaluated based on the Appendix G CEQA Guidelines described above at the closest sensitive receiver locations. Under CEQA, consideration must be given to the magnitude of the increase, the existing ambient noise levels, and the location of noise-sensitive receivers to determine if a noise increase represents a significant adverse environmental impact. This approach recognizes *that there is no single noise increase that renders the noise impact significant.* (16)

Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise or of the corresponding human reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and differing individual experiences with noise. Thus, an important way of determining a person's subjective reaction to a new noise is the comparison of it to the existing environment to which one has adapted—the so-called *ambient* environment.

In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will typically be judged. The Federal Interagency Committee on Noise (FICON) (17) developed guidance to be used for the assessment of project-generated increases in noise levels that consider the ambient noise level. The FICON recommendations are based on studies that relate aircraft noise levels to the percentage of persons highly annoyed by aircraft noise. Although the FICON recommendations were specifically developed to assess aircraft noise impacts, these recommendations are often used in environmental noise impact assessments involving the use of cumulative noise exposure metrics, such as the average-daily noise level (CNEL) and equivalent continuous noise level (L_{eq}).

As previously stated, the approach used in this noise study recognizes *that there is no single noise increase that renders the noise impact significant*, based on a 2008 California Court of Appeal ruling on Gray v. County of Madera. (16) For example, if the ambient noise environment is quiet (<60 dBA) and the new noise source greatly increases the noise levels, an impact may occur if the noise criteria may be exceeded. Therefore, for this analysis, FICON identifies a *readily perceptible* 5 dBA or greater project-related noise level increase is considered a significant impact when the noise criteria for a given land use is exceeded. Per the FICON, in areas where the without project noise levels range from 60 to 65 dBA, a 3 dBA *barely perceptible* noise level increase appears to be appropriate for most people. When the without project noise levels already exceed 65 dBA, any increase in community noise louder than 1.5 dBA or greater is considered a significant impact if the noise criteria for a given land use is exceeded, since it likely contributes to an existing noise exposure exceedance. Table 4-1 below provides a summary of the potential noise impact significance criteria, based on guidance from FICON.

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

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

Federal Interagency Committee on Noise (FICON), 1992.

4.2 NON-NOISE-SENSITIVE RECEIVERS

The City of Rancho Cucamonga Public Health and Safety Element, Figure PS-8, identifies transportation-related noise level criteria. As previously shown on Exhibit 3-A, non-noise-sensitive land uses such as office, commercial, and industrial uses require exterior noise levels of 70 dBA CNEL to be considered *normally acceptable*. (12)

To determine if Project-related traffic noise level increases are significant at off-site non-noise-sensitive land uses, a *readily perceptible* 5 dBA and *barely perceptible* 3 dBA criteria are used. When the without Project noise levels at the non-noise-sensitive land uses are below the 65 dBA CNEL exterior noise level standard, a *readily perceptible* 5 dBA or greater noise level increase is considered a significant impact. When the without Project noise levels are greater than the 65 dBA CNEL exterior noise level standard, 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 relies on the City of Rancho Cucamonga Public Health and Safety Element, Figure PS-8 exterior noise level criteria.

4.3 SIGNIFICANCE CRITERIA SUMMARY

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

OFF-SITE TRAFFIC NOISE

- When the noise levels at existing and future noise-sensitive land uses (e.g. residential, etc.):
    - are less than 60 dBA CNEL and the Project creates a *readily perceptible* 5 dBA CNEL or greater Project-related noise level increase; or
    - range from 60 to 65 dBA CNEL and the Project creates a *barely perceptible* 3 dBA CNEL or greater Project-related noise level increase; or
    - already exceed 65 dBA CNEL, and the Project creates a community noise level impact of greater than 1.5 dBA CNEL (FICON, 1992).
- When the noise levels at existing and future non-noise-sensitive land uses (e.g. office, commercial, industrial, etc.):
    - are less than the City of Rancho Cucamonga Public Health and Safety Element, Figure PS-8 70 dBA CNEL noise level criteria and the Project creates a *readily perceptible* 5 dBA CNEL or greater Project-related noise level increase; or
    - are greater than the City of Rancho Cucamonga Public Health and Safety Element, Figure PS-8 70 dBA CNEL noise level criteria and the Project creates a *barely perceptible* 3 dBA CNEL or greater Project-related noise level increase.

ON-SITE RAIL NOISE

- If on-site rail-related noise levels exceed:

- the exterior 70 dBA CNEL *normally acceptable* land use compatibility criteria at Project office and industrial uses (City of Rancho Cucamonga Public Health and Safety Element, Figure PS-8); or
- the interior 50 dBA CNEL standard for non-residential uses (Based on the California Green Building Standards Code, Section 5.507.4.2).

ON-SITE RAIL VIBRATION

- If on-site rail-related vibration levels exceed the 84 VdB threshold at Project office uses (FTA, *Transit Noise and Vibration Impact Assessment*).

OPERATIONAL NOISE

- If Project-related operational (stationary-source) noise levels exceed:
  - the 65 dBA L_{eq} daytime or 60 dBA L_{eq} nighttime residential exterior noise level standards at nearby residential receiver locations; or
  - the 70 dBA L_{eq} industrial park exterior noise level standards at adjacent industrial uses (City of Rancho Cucamonga Development Code, Section 17.66).
- If the existing ambient noise levels at the nearby noise-sensitive receivers near the Project site:
  - are less than 60 dBA L_{eq} and the Project creates a *readily perceptible* 5 dBA L_{eq} or greater Project-related noise level increase; or
  - range from 60 to 65 dBA L_{eq} and the Project creates a *barely perceptible* 3 dBA L_{eq} or greater Project-related noise level increase; or
  - already exceed 65 dBA L_{eq}, and the Project creates a community noise level impact of greater than 1.5 dBA L_{eq} (FICON, 1992).

CONSTRUCTION NOISE AND VIBRATION

- If Project-related construction activities:
  - create noise levels which exceed the 65 dBA L_{eq} noise level threshold at the nearby sensitive receiver locations; or
  - create noise levels which exceed the 70 dBA L_{eq} noise level threshold at the nearby industrial uses (City of Rancho Cucamonga Development Code, Section 17.66).
- If short-term Project construction vibration levels exceed the Caltrans building damage vibration thresholds of 0.3 in/sec PPV at residential homes or 0.5 in/sec PPV at industrial uses, or the human annoyance threshold of 0.04 in/sec PPV at sensitive receiver locations (Caltrans, *Transportation and Construction Vibration Guidance Manual*).

TABLE 4-2: SIGNIFICANCE CRITERIA SUMMARY

Analysis	Receiving Land Use	Condition(s)	Significance Criteria	
			Daytime	Nighttime
Off-Site Traffic	Noise-Sensitive[1]	If ambient is < 60 dBA CNEL	≥ 5 dBA CNEL Project increase	
		If ambient is 60 - 65 dBA CNEL	≥ 3 dBA CNEL Project increase	
		If ambient is > 65 dBA CNEL	≥ 1.5 dBA CNEL Project increase	
	Non-Noise-Sensitive[2]	if ambient is < 70 dBA CNEL	≥ 5 dBA CNEL Project increase	
		if ambient is > 70 dBA CNEL	≥ 3 dBA CNEL Project increase	
On-Site Rail	Industrial/ Office	Exterior Noise Level Standards[2]	70 dBA CNEL	
		Interior Noise Level Standards[3]	50 dBA CNEL	
		Exterior Vibration Level Standards[4]	84 VdB	
Operational	Residential	Exterior Noise Level Standards[5]	65 dBA L_{eq}	60 dBA L_{eq}
	Industrial	Exterior Noise Level Standards[5]	70 dBA L_{eq}	
	Noise-Sensitive[1]	if ambient is < 60 dBA L_{eq}	≥ 5 dBA L_{eq} Project increase	
		if ambient is 60 - 65 dBA L_{eq}	≥ 3 dBA L_{eq} Project increase	
		if ambient is > 65 dBA L_{eq}	≥ 1.5 dBA L_{eq} Project increase	
Construction	Residential	Exterior Noise Level Threshold[5]	65 dBA L_{eq}	n/a
	Non-Residential		70 dBA L_{eq}	n/a
	Residential	Building Damage Vibration Level Threshold[6]	0.3 in/sec PPV	n/a
		Annoyance Vibration Level Threshold[6]	0.04 in/sec PPV	n/a
	Industrial/Comm.	Building Damage Vibration Level Threshold[6]	0.5 in/sec PPV	n/a

[1] Source: FICON, 1992.
[2] Source: City of Rancho Cucamonga General Plan Public Health and Safety Element, Figure PS-8.
[3] Source: Based on the California Green Building Standards Code, Section 5.507.4.2.
[4] Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006.
[5] Source: City of Rancho Cucamonga Development Code, Section 17.66 (Appendix 3.1).
[6] Source: Caltrans, Transportation and Construction Vibration Guidance Manual, Tables 19 and 20.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.; "n/a" = construction activities are not planned during the nighttime hours; "PPV" = peak particle velocity.

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5 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, five 24-hour noise level measurements were taken at sensitive receiver locations in the Project study area. The receiver locations were selected to describe and document the existing noise environment within the Project study area. Exhibit 5-A provides the boundaries of the Project study area and the noise level measurement locations. To fully describe the existing noise conditions, noise level measurements were collected by Urban Crossroads, Inc. on Wednesday, March 28th, 2018. Appendix 5.1 includes study area photos.

5.1 MEASUREMENT PROCEDURE AND CRITERIA

To describe the existing noise environment, the hourly noise levels were measured during typical weekday conditions over a 24-hour period. By collecting individual hourly noise level measurements, it is possible to describe the daytime and nighttime hourly noise levels and calculate the 24-hour CNEL. The long-term noise readings were recorded using Piccolo Type 2 integrating sound level meter and dataloggers. The Piccolo sound level meters were calibrated using a Larson-Davis calibrator, Model CAL 150. All noise meters were programmed in "slow" mode to record noise levels in "A" weighted form. The sound level meters and microphones were equipped with a windscreen during all measurements. All noise level measurement equipment satisfies the American National Standards Institute (ANSI) standard specifications for sound level meters ANSI S1.4-2014/IEC 61672-1:2013. (18)

5.2 NOISE MEASUREMENT LOCATIONS

The long-term noise level measurements were positioned as close to the nearest sensitive receiver locations as possible to assess the existing ambient hourly noise levels surrounding the Project site. Both Caltrans and the FTA recognize that it is not reasonable to collect noise level measurements that can fully represent any part of a private yard, patio, deck, or balcony normally used for human activity when estimating impacts for new development projects. This is demonstrated in the Caltrans general site location guidelines which indicate that, *sites must be free of noise contamination by sources other than sources of interest. Avoid sites located near sources such as barking dogs, lawnmowers, pool pumps, and air conditioners unless it is the express intent of the analyst to measure these sources*. (5) Further, FTA guidance states, t*hat it is not necessary nor recommended that existing noise exposure be determined by measuring at every noise-sensitive location in the project area. Rather, the recommended approach is to characterize the noise environment for clusters of sites based on measurements or estimates at representative locations in the community*. (3)

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

sensitive receiver locations allows for a comparison of the before and after Project noise levels and is necessary to assess potential noise impacts due to the Project's contribution to the ambient noise levels.

5.3 NOISE MEASUREMENT RESULTS

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

- Location L1 represents the noise levels west of the Project site on Humboldt Avenue near existing residential homes, north of existing railroad tracks. The noise level measurements collected show an overall 24-hour exterior noise level of 70.2 dBA CNEL. The hourly noise levels measured at location L1 ranged from 50.1 to 69.4 dBA L_{eq} during the daytime hours and from 49.0 to 69.5 dBA L_{eq} during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 65.4 dBA L_{eq} with an average nighttime noise level of 63.1 dBA L_{eq}.
- Location L2 represents the noise levels on Humboldt Avenue, northwest of the Project site, adjacent to existing residential homes. The noise level measurements collected show an overall 24-hour exterior noise level of 65.3 dBA CNEL. The hourly noise levels measured at location L2 ranged from 47.9 to 69.1 dBA L_{eq} during the daytime hours and from 46.1 to 61.9 dBA L_{eq} during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 63.1 dBA L_{eq} with an average nighttime noise level of 56.8 dBA L_{eq}.
- Location L3 represents the noise levels north of the Project site on Humbolt Avenue near existing residential homes and railroad tracks. The 24-hour CNEL indicates that the overall exterior noise level is 61.5 dBA CNEL. At location L3 the background ambient noise levels ranged from 47.6 to 62.6 dBA L_{eq} during the daytime hours to levels of 47.3 to 58.6 dBA L_{eq} during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 56.5 dBA L_{eq} with an average nighttime noise level of 54.4 dBA L_{eq}.
    - This location was selected to represent the existing ambient noise levels at residential uses both north and south of the railroad tracks closest to the Project site, including the residential home east of the Project site on 8th Street. Measurement location L3 includes lower ambient noise levels consistent with the existing residential community to the north on Humboldt, which are expected to be lower than those that would be at the residential home on 8th Street, east of the Project site, since it is adjacent to the existing industrial uses both within the Project site itself and in the immediate study area. This approach is consistent with guidance from Caltrans and the FTA previously discussed in Section 5.2 and presents a conservative approach using lower ambient levels to assess the potential Project-related noise level increases.
- Location L4 represents the noise levels east of the Project site near existing office buildings on Haven Avenue. The noise level measurements collected show an overall 24-hour exterior noise level of 72.6 dBA CNEL. The hourly noise levels measured at location L4 ranged from 63.6 to 73.1 dBA L_{eq} during the daytime hours and from 58.6 to 72.0 dBA L_{eq} during the nighttime hours. The

energy (logarithmic) average daytime noise level was calculated at 67.9 dBA L_{eq} with an average nighttime noise level of 65.6 dBA L_{eq}.

- Location L5 represents the noise levels south of the Project site on Haven Avenue near existing commercial and office uses. The noise level measurements collected show an overall 24-hour exterior noise level of 64.9 dBA CNEL. The hourly noise levels measured at location L5 ranged from 54.6 to 64.6 dBA L_{eq} during the daytime hours and from 52.3 to 64.8 dBA L_{eq} during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 59.3 dBA L_{eq} with an average nighttime noise level of 58.1 dBA L_{eq}.

Table 5-1 provides the (energy average) noise levels used to describe the daytime and nighttime ambient conditions. These daytime and nighttime energy average noise levels represent the average of all hourly noise levels observed during these time periods expressed as a single number. Appendix 5.2 provides summary worksheets of the noise levels for each hour as well as the minimum, maximum, L_1, L_2, L_5, L_8, L_{25}, L_{50}, L_{90}, L_{95}, and L_{99} percentile noise levels observed during the daytime and nighttime periods.

The background ambient noise levels in the Project study area are dominated by the transportation-related noise associated with the arterial roadway network and nearby railroad lines. The 24-hour existing noise level measurements shown on Table 5-1 present the existing ambient noise conditions.

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

Location[1]	Distance to Project Boundary (Feet)	Description	Energy Average Noise Level (dBA L_{eq})[2]		CNEL
			Daytime	Nighttime	
L1	1,800'	Located west of the Project site on Humboldt Avenue near existing residential homes, north of existing railroad tracks.	65.4	63.1	70.2
L2	600'	Located on Humboldt Avenue, northwest of the Project site, adjacent to existing residential homes.	63.1	56.8	65.3
L3	200'	Located north of the Project site on Humbolt Avenue near existing residential homes and railroad tracks.	56.5	54.4	61.5
L4	530'	Located east of the Project site near existing office buildings on Haven Avenue.	67.9	65.6	72.6
L5	1,550'	Located south of the Project site on Haven Avenue near existing commercial and office uses.	59.3	58.1	64.9

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

EXHIBIT 5-A: NOISE MEASUREMENT LOCATIONS

6 METHODS AND PROCEDURES

The following section outlines the methods and procedures used to model and analyze the future noise and vibration levels to and from the Project site.

6.1 ON-SITE RAIL NOISE PREDICTION MODEL

The estimated railroad noise impacts from the Metrolink and freight activity on the rail lines north of the Project site are calculated using the Federal Transit Administration (FTA) General Transit Noise Assessment Model. (19) The FTA model calculates the predicted noise level based on the type of train, distance to receiver, number of trains per hour, speed, number of cars per train, and type of railroad tracks. The train volumes and speeds for Metrolink and freight operations were obtained from the current Metrolink schedule and existing data provided in the U.S. Department of Transportation Crossing Inventory Form (026160N) for Hermosa Avenue, as shown on Table 6-1. (20)

TABLE 6-1: ON-SITE RAILROAD PARAMETERS

Railroad Activities	Modeled Train/ Engine Type	Speed (mph)[1]	Daily Train Volumes/Events[2]	
			Daytime	Nighttime
Metrolink[2]	Diesel	79	29	8
Freight[2]	Diesel	60	3	2

[1] Speed based the maximum passenger train speed from U.S. Department of Transportation Crossing Inventory Form 026160N for Hermosa Avenue and the maximum freight train speed for freight trains per Code of Federal Regulations, Section 49 CFR 213.9.
[2] Based on the U.S. Department of Transportation Crossing Inventory Form 026160N total volume of 42, minus the Metrolink San Bernardino Line scheduled trains (37), to result in approximately 5 freight trains.

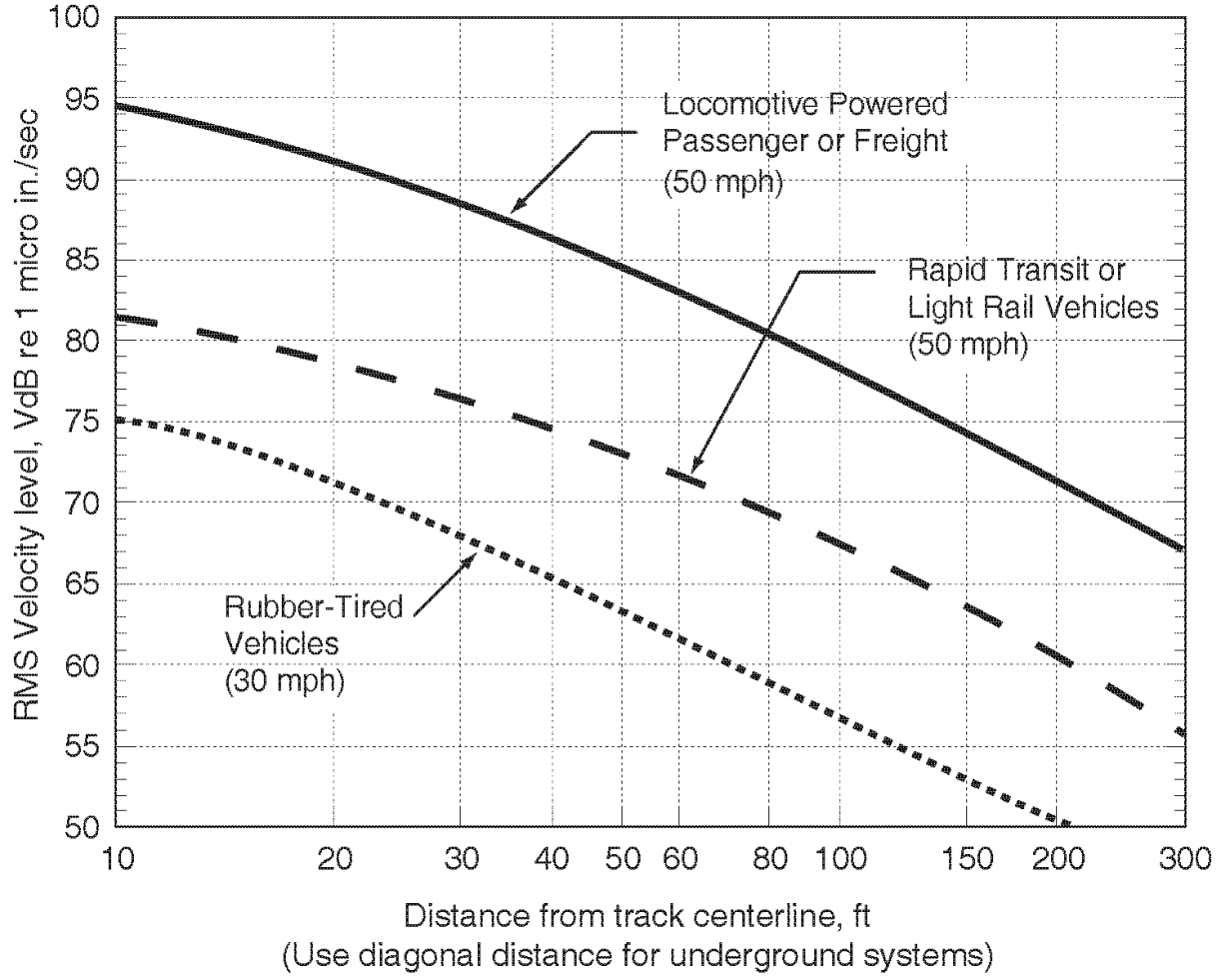
6.2 ON-SITE RAIL VIBRATION ASSESSMENT

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

The estimated railroad vibration impacts from Metrolink and freight trains traveling on the railroad tracks north of the Project site are calculated using the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment* General Vibration Assessment methodology. The FTA General Vibration Assessment calculates the predicted vibration level based on generalized ground surface vibration curves which were developed using actual measurements of representative North American transit systems. (3) Figure 10-1 of the FTA *Transit Noise and Vibration Impact Assessment* shows the generalized ground surface vibration curves for three types of transit sources, as shown on Exhibit 6-A of this report. The generalized reference curves are used to identify the appropriate reference vibration level, before any

adjustments, for the Project based on the type of train, speed, and distance to receiver locations. The FTA reference curves are provided in VdB to describe the human response to vibration levels.

EXHIBIT 6-A: FTA REFERENCE GROUND SURFACE VIBRATION CURVES



Source: FTA Transit Noise and Vibration Impact Assessment, Figure 10-1.

Based on the reference curve for a locomotive powered passenger or freight train traveling at 50 mph, as shown on Exhibit 6-A, the reference vibration level at the Project building is estimated to be 73 VdB at roughly 170 feet. As previously shown on Table 6-1, the passenger trains passing the Project site are expected to travel at a higher speed of up to 79 mph, and therefore, the reference level is adjusted at 170 feet to reflect the change from 50 to 79 mph. In addition, the FTA provides vibration source and propagation adjustments to the reference vibration curve levels based on the characteristics of the trains and rail lines in the study area. Using the adjustments provided by the FTA, provided in Appendix 6.1, the vibration levels at the Project building are estimated in Section 8.

6.3 CONSTRUCTION VIBRATION ASSESSMENT METHODOLOGY

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

However, while vehicular traffic is rarely perceptible, construction has the potential to result in varying degrees of temporary ground vibration, depending on the specific construction activities and equipment used. Ground vibration levels associated with several types of construction equipment are summarized on Table 6-2. Based on the representative vibration levels presented for various construction equipment types, it is possible to estimate the human response (annoyance) using the following vibration assessment methods defined by the FTA. To describe the human response (annoyance) associated with vibration impacts the FTA provides the following equation: $PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$

TABLE 6-2: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

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

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May 2006.

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7 OFF-SITE TRAFFIC NOISE IMPACTS

As previously discussed in Section 1.3, the *8978 Haven Ave. Warehouse Trip Generation Evaluation* prepared by Urban Crossroads, Inc. indicates that the Project is expected to result in a net reduction in the total trips from the Project site. (2) The existing use at the Project site is shown to generate 307 trip-ends per day (actual vehicles) based on two driveway counts taken on 8th Street in the Project study area as a part of the *8978 Haven Ave. Warehouse Trip Generation Evaluation.* Further, the *Trip Generation Evaluation* shows that the proposed Project use is expected to generate a total of 210 trip-ends per day (actual vehicles).

Therefore, the Project is shown to result in 97 fewer trip-ends generated per day (actual vehicles) than the existing use, and as such, the reduced Project trips are expected to result in lower off-site traffic noise levels than those currently generated by the existing operations at the Project site. The Project-related off-site traffic noise level increases are, therefore, not expected to exceed the FICON significance criteria identified in Section 4 and are considered *less than significant* impacts at land uses adjacent to roadways conveying Project traffic.

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8 ON-SITE RAIL NOISE AND VIBRATION IMPACTS

An on-site noise and vibration impact analysis has been completed to determine the noise exposure and vibration levels that would result from off-site railroad tracks, and to identify potential abatement measures that would achieve acceptable Project exterior and interior noise levels, and exterior vibration levels. The primary source of transportation-related noise in the Project study area is anticipated to be from the Metrolink and freight activities on the existing railroad lines north of the Project site, and as such, this analysis focuses on railroad noise levels.

8.1 ON-SITE EXTERIOR NOISE LEVELS

Using the FTA railroad noise prediction model and the parameters outlined in Section 6, the expected future exterior noise level at the Project building façade was calculated. The on-site model results indicate that the unmitigated exterior noise level will approach 59.2 dBA CNEL at the northern building façade, as shown on Table 8-1. Based on the City of Rancho Cucamonga Public Health and Safety Element, Figure PS-8 land use compatibility criteria, the on-site railroad-related exterior noise level of up to 59.2 dBA CNEL will satisfy the exterior 70 dBA CNEL *normally acceptable* criteria for office and industrial uses of the Project, and therefore, represents a *less than significant* impact. The on-site railroad noise analysis calculations are provided in Appendix 8.1.

TABLE 8-1: EXTERIOR RAILROAD NOISE LEVELS

Receiver Location	Noise Source	Unmitigated Noise Levels (dBA CNEL)	Threshold (dBA CNEL)[1]	Threshold Exceeded?
Northern Façade	Railroad	59.2	70	No

[1] Normally compatible land use criteria for industrial use such as the Project (See Significance Criteria on Table 4-2).

8.2 ON-SITE INTERIOR NOISE ANALYSIS

The future noise levels were calculated at the Project building façade to ensure that the interior noise levels comply with 50 dBA CNEL interior noise level standard for non-residential use.

8.2.1 NOISE REDUCTION METHODOLOGY

The interior noise level is the difference between the predicted exterior noise level at the building façade and the noise reduction of the structure. Typical building construction will provide a Noise Reduction (NR) of approximately 25 dBA noise reduction with "windows closed." However, sound leaks, cracks and openings within the window assembly can greatly diminish its effectiveness in reducing noise. Several methods are used to improve interior noise reduction, including: (1) weather-stripped solid core exterior doors; (2) upgraded dual glazed windows; (3) mechanical ventilation/air conditioning; and (4) exterior wall/roof assembles free of cut outs or openings.

8.2.2 INTERIOR NOISE LEVEL ASSESSMENT

Table 8-2 shows that the future exterior noise level at the northern Project building façade is expected to approach 59.2 dBA CNEL, and interior noise levels will approach 34.2 dBA CNEL, which will satisfy the 50 dBA CNEL interior noise level threshold for non-residential use. Therefore, with standard building construction, the Project will satisfy the 50 dBA CNEL interior noise level threshold for non-residential development. It is important to note that while rail-related noise levels are shown to satisfy the interior noise level standards, rail pass-by noise will remain noticeable due to the location of the Project site in relation to the existing rail lines.

TABLE 8-2: UNMITIGATED INTERIOR NOISE LEVELS (CNEL)

Receiver Location	Noise Level at Façade[1]	Required Interior NR[2]	Estimated Interior NR[3]	Interior Noise Level[4]	Threshold	Threshold Exceeded?
Northern Façade	59.2	9.2	25.0	34.2	50	No

[1] Exterior noise level at the facade (Table 8-1).
[2] Noise reduction to satisfy the interior noise standard of 50 dBA CNEL for non-residential use.
[3] A minimum interior noise reduction of 25 dBA is provided by standard building construction.
[4] Estimated interior noise level with standard STC ratings for all windows.
"NR" = Noise Reduction

8.3 ON-SITE RAILROAD VIBRATION ANALYSIS

The following analysis is based on the methodology provided by the FTA *Transit Noise and Vibration Impact Assessment* General Vibration Assessment, previously discussed in Section 6 of this report. Table 8-3 shows the FTA General Assessment reference vibration level and adjustments based on observations in the Project study area and the adjustment factors provided in Appendix 6.1. Based on the FTA vibration analysis, the vibration levels at the Project building are estimated to approach 74 VdB at approximately 170 feet from the Project building to the freight and Metrolink railroad tracks conveying diesel engines and rail cars. Therefore, on-site rail-related vibration levels are shown to remain below the FTA vibration threshold of 84 VdB for office uses. (3)

Vibration levels approaching 74 VdB are acceptable per FTA requirements even for more sensitive uses, such as residential homes, and are considered to be between *not feelable* and *barely feelable* according to the FTA. Ground-borne noise levels generated by on-site rail vibration levels may be audible within quiet rooms. (3) Further, this analysis likely overstates the vibration levels at the Project site from rail activity since the FTA *Transit Noise and Vibration Impact Assessment* states that *although actual levels fluctuate widely, it is rare that ground-borne vibration will exceed the curves in Figure 10-1* (Exhibit 6-A of this report) *by more than one or two decibels unless there are extenuating circumstances, such as wheel or running-surface defects.* (3) In addition, FTA guidance indicates that ground-borne noise levels due to railroad vibration will approach 39 dBA and does not represent an impact on the Project site.

TABLE 8-3: ON-SITE RAILROAD VIBRATION LEVELS

FTA General Adjustment Factors[1]	Site-Specific Adjustments	Vibration Level/ Adjustment (VdB)[1]
Reference Noise Level	Locomotive @ 50 mph @ 170'	73
Speed Adjustment	79 mph	4.0
Vehicle Parameters	Resilient Wheels	0
Track Conditions	Welded Track	0
Track Treatments	n/a	0
Track Configuration	Open Cut	0
Geologic Effects	Normal Propagation	0
Coupling Effects	1-2 Story Masonry	-7
Floor-to-Floor Attenuation	-2 VdB / Floor @ First Floor	-2
Amplification Adjustment	Floors, Walls, Ceilings, etc.	6
	Resulting Vibration Level (VdB):	74 VdB
	Do the on-site vibration levels exceed the FTA Threshold?	No
	Resulting Ground-Borne Noise Level (dBA):	39 dBA

[1] Source: FTA Transit Noise and Vibration Impact Assessment, Figure 10-1 and Table 10-1 (Appendix 6.1).

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9 RECEIVER LOCATIONS

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

Noise-sensitive receivers near the Project site include existing residential homes, while non-noise-sensitive receivers include the adjacent industrial uses in the Project study area, as described below. Consistent with the City of Rancho Cucamonga Development Code operational and construction noise level standards described in Section 3, this noise study analyzes potential Project impacts at both noise-sensitive and non-noise-sensitive receiver locations. 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.

R1: Located approximately 395 feet northwest of the Project site, R1 represents existing residential homes on Humboldt Avenue. A 24-hour noise level measurement was taken near this location, L3, to describe the existing ambient noise environment.

R2: Location R2 represents existing residential homes located approximately 327 feet north of the Project site on Humboldt Avenue. A 24-hour noise level measurement was taken near this location, L3, to describe the existing ambient noise environment.

R3: Location R3 represents the residential home located roughly 60 feet east of the Project site on 8th Street. Measurement location L3 is used to describe the existing ambient conditions at this location, as previously discussed in Section 5.3.

R4: Location R4 represents the existing Speedway Mufflers use at roughly 10 feet east of the Project site on 8th Street. Measurement location L3 is used to describe the existing ambient conditions at this location.

R5: Location R5 represents the existing office use located roughly 477 feet east of the Project site across Haven Avenue. A 24-hour noise level measurement was taken east of this location, L4, to describe the existing ambient noise environment.

R6: Location R6 represents the existing industrial use located roughly 30 feet south of the Project site. Measurement location L4 is used to describe the existing ambient conditions at this location.

R7: Location R7 represents the existing industrial use located roughly 76 feet west of the Project site. Measurement location L3 is used to describe the existing ambient conditions at this location.

EXHIBIT 9-A: RECEIVER LOCATIONS

10 OPERATIONAL IMPACTS

This section analyzes the potential operational noise impacts due to the Project's stationary noise sources on the off-site noise-sensitive and adjacent industrial use receiver locations identified in Section 9. Exhibit 10-A identifies the receiver locations and noise source locations used to assess the Project-related operational noise levels.

10.1 REFERENCE NOISE LEVELS

To estimate the Project operational noise impacts, reference noise level measurements were collected from similar types of activities to represent the noise levels expected with the development of the proposed Project. This section provides a detailed description of the reference noise level measurements shown on Table 10-1 used to estimate the Project operational noise impacts. It is important to note that the following projected noise levels assume the worst-case noise environment with the idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, roof-top air conditioning units, and parking lot vehicle movements all operating continuously. These noise level impacts will likely vary throughout the day.

TABLE 10-1: REFERENCE NOISE LEVEL MEASUREMENTS

Noise Source	Duration (hh:mm:ss)	Ref. Distance (Feet)	Noise Source Height (Feet)	Hourly Activity (Mins)[5]	Reference Noise Level (dBA L_{eq})	
					@ Ref. Dist.	@ 50 Feet
Truck Unloading/Docking Activity[1]	0:15:00	30'	8'	60	67.2	62.8
Roof-Top Air Conditioning Units[4]	96:00:00	5'	5'	39	77.2	57.2
Parking Lot Vehicle Movements[5]	01:00:00	10'	5'	60	52.2	41.7

[1] Reference noise level measurements were collected from the existing operations of the Motivational Fulfillment & Logistics Services distribution facility located at 6810 Bickmore Avenue in the City of Chino on Wednesday, January 7, 2015.
[2] As measured by Urban Crossroads, Inc. on 7/27/2015 at the Santee Walmart located at 170 Town Center Parkway.
[3] As measured by Urban Crossroads, Inc. on 5/17/2017 at the Panasonic Avionics Corporation parking lot in the City of Lake Forest.
[4] Anticipated duration (minutes within the hour) of noise activity during typical hourly conditions expected at the Project site based on the reference noise level measurement activity.

10.1.1 TRUCK IDLING, DELIVERIES, BACKUP ALARMS, AND LOADING/UNLOADING

Short-term reference noise level measurements were collected on Wednesday, January 7th, 2015, by Urban Crossroads, Inc. at the Motivational Fulfillment & Logistics Services distribution facility located at 6810 Bickmore Avenue in the City of Chino. The noise level measurements represent the typical weekday dry goods logistics warehouse operation in a single building, of roughly 285,000 square feet, with a loading dock area on the western side of the building façade. Up to ten trucks were observed in the loading dock area including a combination of track trailer semi-trucks, two-axle delivery trucks, and background forklift operations.

The unloading/docking activity noise level measurement was taken over a fifteen-minute period and represents multiple noise sources taken from the center of loading dock activities generating a reference noise level of 62.8 dBA L_{eq} at a uniform reference distance of 50 feet. At this measurement location, the noise sources associated with 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 and air brakes noise.

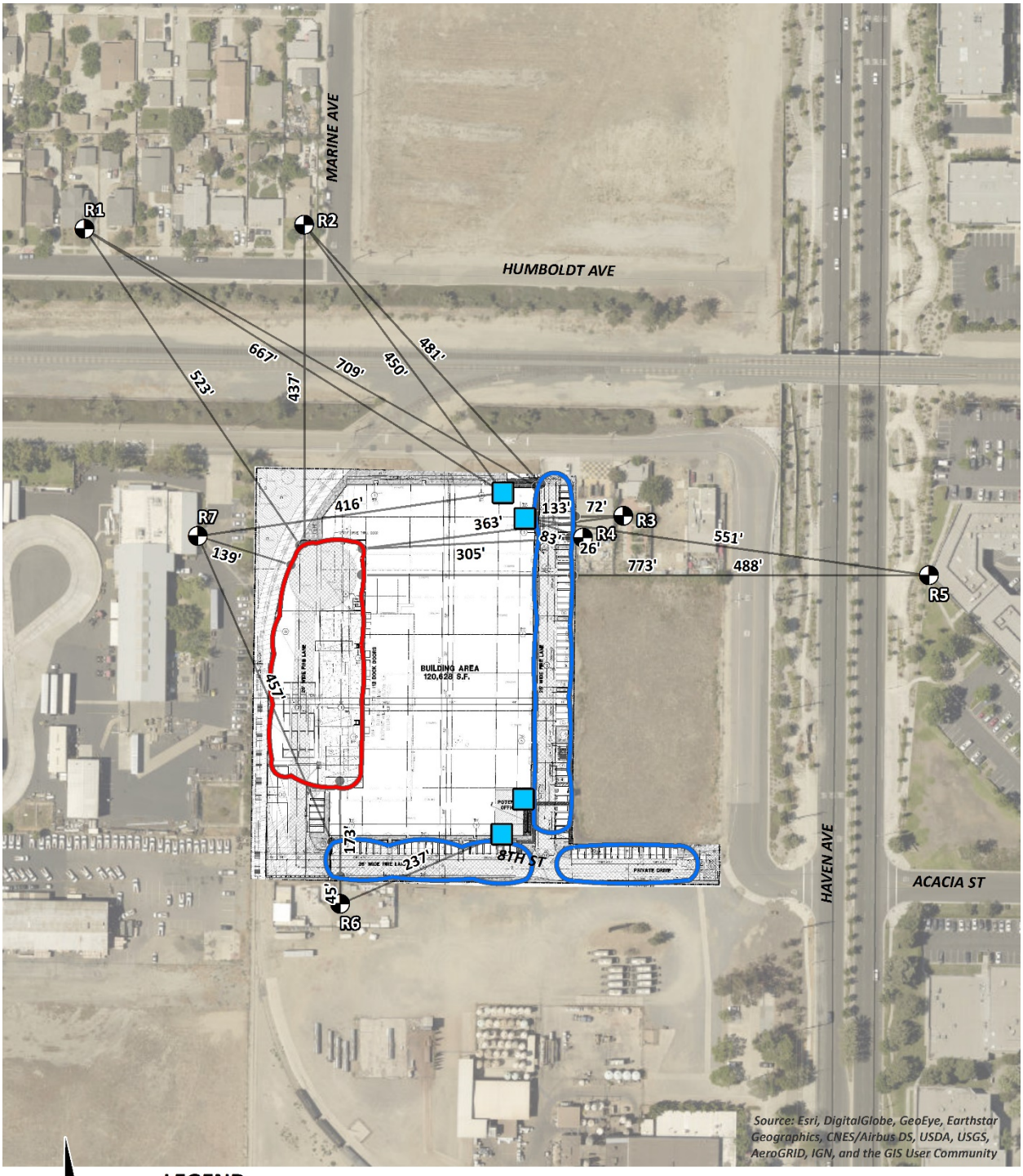
10.1.2 Roof-Top Air Conditioning Units

To assess the impacts created by the roof-top air conditioning units at the Project buildings, reference noise levels measurements were taken at the Santee Walmart on July 27th, 2015. Located at 170 Town Center Parkway in the City of Santee, the noise level measurements describe a single mechanical roof-top air conditioning unit on the roof of an existing Walmart store. The reference noise level represents a Lennox SCA120 series 10-ton model packaged air conditioning unit. At 5 feet from the roof-top air conditioning unit, the exterior noise levels were measured at 77.2 dBA L_{eq}. Using the uniform reference distance of 50 feet, the noise level is 57.2 dBA L_{eq}. The operating conditions of the reference noise level measurement reflect peak summer cooling requirements with measured temperatures approaching 96 degrees Fahrenheit (°F) with average daytime temperatures of 82°F. The roof-top air condition units were observed to operate the most during the daytime hours for a total of 39 minutes per hour. The noise attenuation provided by a parapet wall is not reflected in this reference noise level measurement.

10.1.3 Parking Lot Vehicle Movements (Autos)

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

EXHIBIT 10-A: OPERATIONAL NOISE SOURCE AND RECEIVER LOCATIONS



10.2 OPERATIONAL NOISE LEVELS

Based upon the reference noise levels, it is possible to estimate the Project operational stationary-source noise levels at each receiver location. The operational noise level calculations shown on Table 10-2 account for the distance attenuation provided due to geometric spreading, when sound from a localized stationary source (i.e., a point source) propagates uniformly outward in a spherical pattern. Hard site conditions are used in the operational noise analysis which result in noise levels that attenuate (or decrease) at a rate of 6 dBA for each doubling of distance from a point source. The basic noise attenuation equation shown below is used to calculate the distance attenuation based on a reference noise level (SPL_1):

$$SPL_2 = SPL_1 - 20\log(D_2/D_1)$$

Where SPL_2 is the resulting noise level after attenuation, SPL_1 is the source noise level, D_2 is the distance to the reference sound pressure level (SPL_1), and D_1 is the distance to the receiver location. Table 10-2 indicates that the unmitigated operational noise levels associated with the idling trucks, delivery truck activities, backup alarms, as well as loading and unloading of dry goods, roof-top air conditioning units, and parking lot vehicle movements are expected to range from 35.4 to 54.0 dBA L_{eq} at nearby receiver locations. The unmitigated operational noise level calculation worksheets are included in Appendix 10.1.

TABLE 10-2: UNMITIGATED PROJECT OPERATIONAL NOISE LEVELS

Receiver Location[1]	Noise Levels by Individual Source[2]			Combined Operational Noise Levels (dBA L_{eq})[3]
	Unloading/ Docking Activity	Roof-Top Air Conditioning Unit	Parking Lot Vehicle Movements	
R1	42.4	32.8	24.4	42.9
R2	43.9	36.2	27.0	44.7
R3	27.8	46.8	39.3	47.6
R4	29.4	50.9	46.0	52.1
R5	21.4	34.5	26.9	35.4
R6	34.2	41.8	42.4	45.5
R7	53.9	36.9	27.3	54.0

[1] See Exhibit 10-A for the receiver and noise source locations.
[2] Reference noise sources as shown on Table 10-1.
[3] Calculations for each noise source are provided in Appendix 10.1.

10.3 OPERATIONAL NOISE LEVEL COMPLIANCE

To demonstrate compliance with local noise regulations, the Project-only operational noise levels are evaluated against exterior noise level thresholds based on the City of Rancho Cucamonga exterior noise level standards at nearby noise-sensitive and industrial uses. Table 10-3 shows the operational noise levels associated with 8978 Haven Ave. Warehouse Project will satisfy the exterior noise level standards at all nearby receiver locations. Therefore, operational noise levels are considered *less than significant* noise level impacts.

TABLE 10-3: UNMITIGATED OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location[1]	Land Use	Noise Level at Receiver Locations (dBA L_{eq})[2]	Threshold		Threshold Exceeded?[3]	
			Daytime	Nighttime	Daytime	Nighttime
R1	Residential	42.9	65	60	No	No
R2	Residential	44.7	65	60	No	No
R3	Residential	47.6	65	60	No	No
R4	Industrial Park	52.1	70	70	No	No
R5	Industrial Park	35.4	70	70	No	No
R6	Industrial Park	45.5	70	70	No	No
R7	Industrial Park	54.0	70	70	No	No

[1] See Exhibit 10-A for the receiver and noise source locations.
[2] Estimated Project operational noise levels as shown on Table 10-2.
[3] Do the estimated Project operational noise levels meet the operational noise level thresholds?
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

10.4 PROJECT OPERATIONAL NOISE CONTRIBUTION

To describe the Project operational noise level contributions at nearby noise-sensitive receiver locations, the Project operational noise levels were combined with the existing ambient noise levels measurements for the off-site noise-sensitive receiver locations potentially impacted by Project operational noise sources. Since the units used to measure noise, decibels (dB), are logarithmic units, the Project-operational and existing ambient noise levels cannot be combined using standard arithmetic equations. (5) Instead, they must be logarithmically added using the following base equation:

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

Where "SPL1," "SPL2," etc. are equal to the sound pressure levels being combined, or in this case, the Project-operational and existing ambient noise levels. The difference between the combined Project and ambient noise levels describe the Project noise level contributions. Noise levels that would be experienced at receiver locations when mitigated Project-source noise is added to the ambient daytime and nighttime conditions are presented on Tables 10-4 and 10-5, respectively.

As indicated on Tables 10-4 and 10-5, the Project will contribute an operational noise level increase during the daytime hours of up to 1.9 dBA L_{eq}, and during the nighttime hours of up to 2.8 dBA L_{eq}. Based on the without Project (ambient) noise levels, the Project operational noise level increases will, therefore, remain below the significance criteria discussed in Section 4, and as such, the increases at the sensitive receiver locations will be *less than significant*. On this basis, Project operational stationary-source noise would not result in a substantial temporary/periodic, or permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project.

TABLE 10-4: DAYTIME OPERATIONAL NOISE LEVEL CONTRIBUTIONS

Receiver Location[1]	Total Project Operational Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Project Contribution[6]	Threshold Exceeded?[7]
R1	42.9	L3	56.5	56.7	0.2	No
R2	44.7	L3	56.5	56.8	0.3	No
R3	47.6	L3	56.5	57.0	0.5	No
R4	52.1	L3	56.5	57.9	1.4	No
R5	35.4	L4	67.9	67.9	0.0	No
R6	45.5	L4	67.9	67.9	0.0	No
R7	54.0	L3	56.5	58.4	1.9	No

[1] See Exhibit 10-A for the sensitive receiver locations.
[2] Total Project operational 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 activities.
[6] The noise level increase expected with the addition of the proposed Project activities.
[7] Significance Criteria as defined in Section 4.

TABLE 10-5: NIGHTTIME OPERATIONAL NOISE LEVEL CONTRIBUTIONS

Receiver Location[1]	Total Project Operational Noise Level[2]	Measurement Location[3]	Reference Ambient Noise Levels[4]	Combined Project and Ambient[5]	Project Contribution[6]	Threshold Exceeded?[7]
R1	42.9	L3	54.4	54.7	0.3	No
R2	44.7	L3	54.4	54.8	0.4	No
R3	47.6	L3	54.4	55.2	0.8	No
R4	52.1	L3	54.4	56.4	2.0	No
R5	35.4	L4	65.6	65.6	0.0	No
R6	45.5	L4	65.6	65.6	0.0	No
R7	54.0	L3	54.4	57.2	2.8	No

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

10.5 OPERATIONAL VIBRATION IMPACTS

Truck vibration levels are dependent on vehicle characteristics, load, speed, and pavement conditions. Typical vibration levels for the 8978 Haven Ave. Warehouse heavy truck activity at normal traffic speeds will approach 0.004 in/sec PPV at 25 feet based on the FTA *Transit Noise Impact and Vibration Assessment.* (3) Trucks transiting on site will be travelling at very low speeds so it is expected that delivery truck vibration impacts at nearby receiver locations will satisfy the Caltrans vibration thresholds of 0.3 in/sec PPV for building damage and 0.04 in/sec PPV for annoyance, previously identified for construction vibration, and therefore, will be *less than significant*.

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11 CONSTRUCTION IMPACTS

This section analyzes potential impacts resulting from the short-term construction activities associated with the development of the Project. Exhibit 11-A shows the construction activity boundaries in relation to the nearby sensitive receiver locations.

11.1 CONSTRUCTION NOISE LEVELS

Noise generated by the Project construction equipment will include a combination of trucks, power tools, concrete mixers, and portable generators that when combined can reach high levels. The number and mix of construction equipment is expected to occur in the following stages:

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

This construction noise analysis was prepared using reference noise level measurements taken by Urban Crossroads, Inc. to describe the typical construction activity noise levels for each stage of Project construction. The construction reference noise level measurements represent a list of typical construction activity noise levels. Noise levels generated by heavy construction equipment can range from approximately 68 dBA to in excess of 80 dBA when measured at 50 feet. Hard site conditions are used in the construction noise analysis which result in noise levels that attenuate (or decrease) at a rate of 6 dBA for each doubling of distance from a point source (i.e. construction equipment). For example, a noise level of 80 dBA measured at 50 feet from the noise source to the receiver would be reduced to 74 dBA at 100 feet from the source to the receiver, and would be further reduced to 68 dBA at 200 feet from the source to the receiver. The construction stages used in this analysis are consistent with the data used to support the construction emissions in *8978 Haven Ave. Warehouse Air Quality Impact Analysis* prepared by Urban Crossroads, Inc. (21)

11.2 CONSTRUCTION REFERENCE NOISE LEVELS

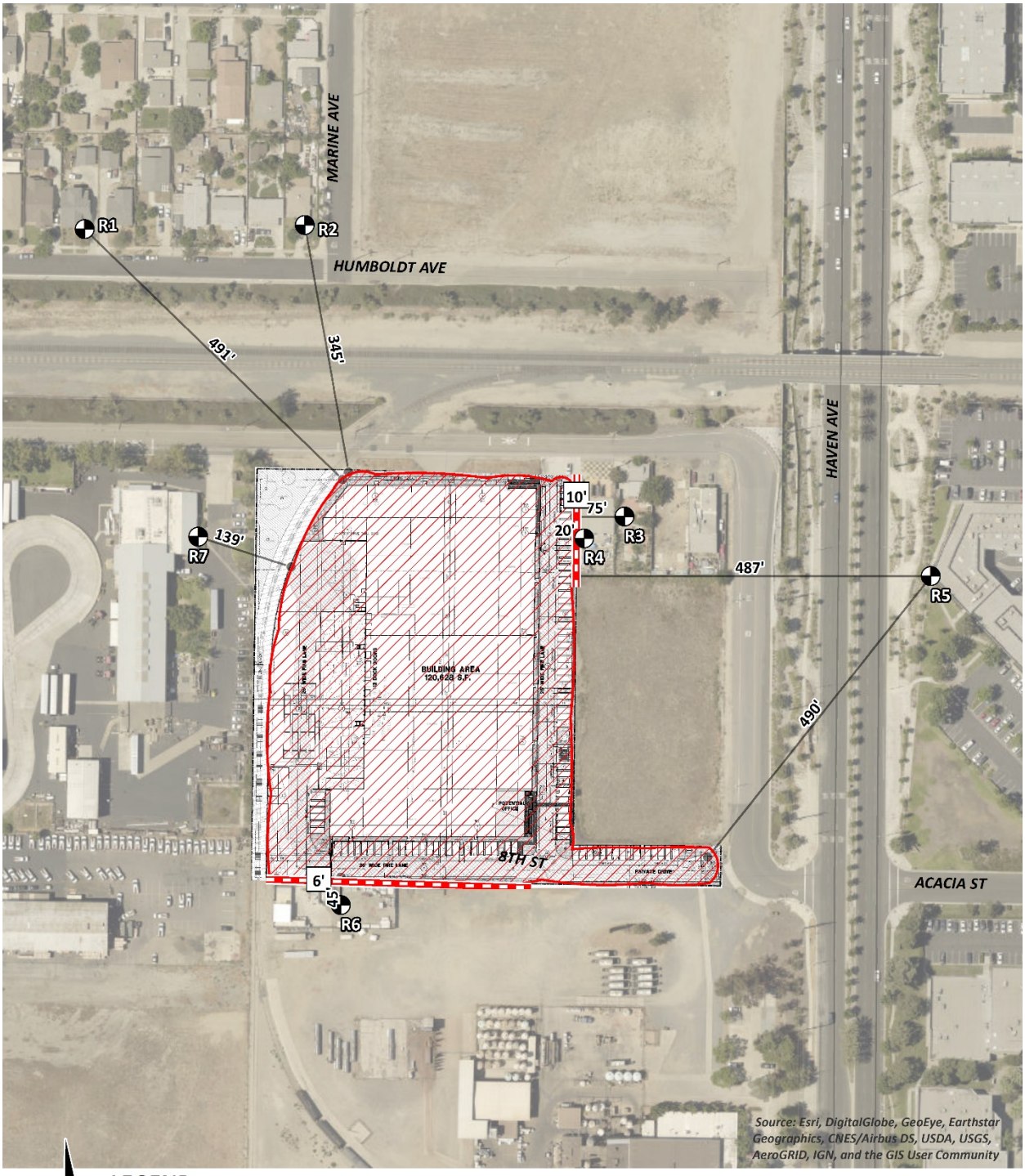
To describe the Project construction noise levels, measurements were collected for similar activities at several construction sites. Table 11-1 provides a summary of the construction reference noise level measurements. Since the reference noise levels were collected at varying distances, all construction noise level measurements presented on Table 10-1 have been adjusted to describe a common reference distance of 50 feet.

TABLE 11-1: CONSTRUCTION REFERENCE NOISE LEVELS

ID	Noise Source	Reference Distance From Source (Feet)	Reference Noise Levels @ Reference Distance (dBA L_{eq})	Reference Noise Levels @ 50 Feet (dBA L_{eq})[6]
1	Truck Pass-Bys & Dozer Activity[1]	30'	63.6	59.2
2	Dozer Activity[1]	30'	68.6	64.2
3	Construction Vehicle Maintenance Activities[2]	30'	71.9	67.5
4	Foundation Trenching[2]	30'	72.6	68.2
5	Rough Grading Activities[2]	30'	77.9	73.5
6	Residential Framing[3]	30'	66.7	62.3
7	Concrete Mixer Truck Movements[4]	50'	71.2	71.2
8	Concrete Paver Activities[4]	30'	70.0	65.6
9	Concrete Mixer Pour & Paving Activities[4]	30'	70.3	65.9
10	Concrete Mixer Backup Alarms & Air Brakes[4]	50'	71.6	71.6
11	Concrete Mixer Pour Activities[4]	50'	67.7	67.7
12	Forklift, Jackhammer, & Metal Truck Bed[5]	50'	67.9	67.9

[1] As measured by Urban Crossroads, Inc. on 10/14/15 at a business park construction site located at the northwest corner of Barranca Parkway and Alton Parkway in the City of Irvine.
[2] As measured by Urban Crossroads, Inc. on 10/20/15 at a construction site located in Rancho Mission Viejo.
[3] As measured by Urban Crossroads, Inc. on 10/20/15 at a residential construction site located in Rancho Mission Viejo.
[4] Reference noise level measurements were collected from a nighttime concrete pour at an industrial construction site, located at 27334 San Bernardino Avenue in the City of Redlands, between 1:00 a.m. to 2:00 a.m. on 7/1/15.
[5] As measured by Urban Crossroads, Inc. on 9/9/16 during the demolition of an existing parking lot at 41 Corporate Park in Irvine.
[6] Reference noise levels are calculated at 50 feet using a drop off rate of 6 dBA per doubling of distance (point source).

EXHIBIT 11-A: CONSTRUCTION ACTIVITY AND RECEIVER LOCATIONS



11.3 CONSTRUCTION NOISE ANALYSIS

Tables 11-2 to 11-7 show the Project construction stages and the reference construction noise levels used for each stage. Table 11-8 provides a summary of the noise levels from each stage of construction at each of the nearby receiver locations. Based on the reference construction noise levels, the Project-related construction noise levels when the highest reference noise level is operating at the edge of primary construction activity nearest each sensitive receiver location will range from 53.6 to 81.4 dBA L_{eq} at the nearby receiver locations, as shown on Table 11-8.

TABLE 11-2: DEMOLITION ACTIVITY NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA L_{eq})
Truck Pass-Bys & Dozer Activity	59.2
Dozer Activity	64.2
Forklift, Jackhammer, & Metal Truck Bed Activities	67.9
Highest Reference Noise Level at 50 Feet (dBA L_{eq}):	67.9

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA L_{eq})[3]	Estimated Noise Barrier Attenuation (dBA L_{eq})[4]	Construction Noise Level (dBA L_{eq})
R1	491'	-19.8	0.0	48.1
R2	345'	-16.8	0.0	51.1
R3	75'	-3.5	0.0	64.4
R4	20'	8.0	0.0	75.9
R5	487'	-19.8	0.0	48.1
R6	45'	0.9	0.0	68.8
R7	139'	-8.9	0.0	59.0

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier attenuation from existing barriers/structures in the Project study area.

TABLE 11-3: SITE PREPARATION ACTIVITY NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA L_{eq})
Truck Pass-Bys & Dozer Activity	59.2
Dozer Activity	64.2
Highest Reference Noise Level at 50 Feet (dBA L_{eq}):	64.2

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA L_{eq})[3]	Estimated Noise Barrier Attenuation (dBA L_{eq})[4]	Construction Noise Level (dBA L_{eq})
R1	491'	-19.8	0.0	44.3
R2	345'	-16.8	0.0	47.4
R3	75'	-3.5	0.0	60.6
R4	20'	8.0	0.0	72.1
R5	487'	-19.8	0.0	44.4
R6	45'	0.9	0.0	65.1
R7	139'	-8.9	0.0	55.3

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier attenuation from existing barriers/structures in the Project study area.

TABLE 11-4: GRADING ACTIVITY NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA L_{eq})
Truck Pass-Bys & Dozer Activity	59.2
Dozer Activity	64.2
Rough Grading Activities	73.5
Highest Reference Noise Level at 50 Feet (dBA L_{eq}):	73.5

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA L_{eq})[3]	Estimated Noise Barrier Attenuation (dBA L_{eq})[4]	Construction Noise Level (dBA L_{eq})
R1	491'	-19.8	0.0	53.6
R2	345'	-16.8	0.0	56.7
R3	75'	-3.5	0.0	69.9
R4	20'	8.0	0.0	81.4
R5	487'	-19.8	0.0	53.7
R6	45'	0.9	0.0	74.4
R7	139'	-8.9	0.0	64.6

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier attenuation from existing barriers/structures in the Project study area.

TABLE 11-5: BUILDING CONSTRUCTION ACTIVITY NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA L_{eq})
Construction Vehicle Maintenance Activities	67.5
Foundation Trenching	68.2
Highest Reference Noise Level at 50 Feet (dBA L_{eq}):	68.2

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA L_{eq})[3]	Estimated Noise Barrier Attenuation (dBA L_{eq})[4]	Construction Noise Level (dBA L_{eq})
R1	491'	-19.8	0.0	48.3
R2	345'	-16.8	0.0	51.4
R3	75'	-3.5	0.0	64.6
R4	20'	8.0	0.0	76.1
R5	487'	-19.8	0.0	48.4
R6	45'	0.9	0.0	69.1
R7	139'	-8.9	0.0	59.3

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier attenuation from existing barriers/structures in the Project study area.

TABLE 11-6: PAVING ACTIVITY NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA L_{eq})
Concrete Mixer Truck Movements	71.2
Concrete Paver Activities	65.6
Concrete Mixer Pour & Paving Activities	65.9
Concrete Mixer Backup Alarms & Air Brakes	71.6
Concrete Mixer Pour Activities	67.7
Highest Reference Noise Level at 50 Feet (dBA L_{eq}):	71.6

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA L_{eq})[3]	Estimated Noise Barrier Attenuation (dBA L_{eq})[4]	Construction Noise Level (dBA L_{eq})
R1	491'	-19.8	0.0	51.8
R2	345'	-16.8	0.0	54.8
R3	75'	-3.5	0.0	68.1
R4	20'	8.0	0.0	79.6
R5	487'	-19.8	0.0	51.8
R6	45'	0.9	0.0	72.5
R7	139'	-8.9	0.0	62.7

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier attenuation from existing barriers/structures in the Project study area.

TABLE 11-7: ARCHITECTURAL COATING ACTIVITY NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA L_{eq})
Construction Vehicle Maintenance Activities	67.5
Framing	62.3
Highest Reference Noise Level at 50 Feet (dBA L_{eq}):	67.5

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA L_{eq})[3]	Estimated Noise Barrier Attenuation (dBA L_{eq})[4]	Construction Noise Level (dBA L_{eq})
R1	491'	-19.8	0.0	47.6
R2	345'	-16.8	0.0	50.7
R3	75'	-3.5	0.0	63.9
R4	20'	8.0	0.0	75.4
R5	487'	-19.8	0.0	47.7
R6	45'	0.9	0.0	68.4
R7	139'	-8.9	0.0	58.6

[1] Reference construction noise level measurements taken by Urban Crossroads, Inc.
[2] Distance from the nearest point of construction activity to the nearest receiver.
[3] Point (stationary) source drop off rate of 6.0 dBA per doubling of distance.
[4] Estimated barrier attenuation from existing barriers/structures in the Project study area.

11.4 CONSTRUCTION NOISE THRESHOLDS OF SIGNIFICANCE

The construction noise analysis shows that the highest construction noise levels will occur when construction activities take place at the closest point from the edge of primary construction activity to each of the nearby receiver locations. As shown on Table 11-8, the unmitigated construction noise levels are expected to range from 53.6 to 81.4 dBA L_{eq} at the nearby receiver locations.

TABLE 11-8: UNMITIGATED CONSTRUCTION EQUIPMENT NOISE LEVEL SUMMARY

Receiver Location[1]	Construction Hourly Noise Level (dBA L_{eq})						
	Demolition	Site Preparation	Grading	Building Construction	Paving	Architectural Coating	Highest Levels[2]
R1	48.1	44.3	53.6	48.3	51.8	47.6	53.6
R2	51.1	47.4	56.7	51.4	54.8	50.7	56.7
R3	64.4	60.6	69.9	64.6	68.1	63.9	69.9
R4	75.9	72.1	81.4	76.1	79.6	75.4	81.4
R5	48.1	44.4	53.7	48.4	51.8	47.7	53.7
R6	68.8	65.1	74.4	69.1	72.5	68.4	74.4
R7	59.0	55.3	64.6	59.3	62.7	58.6	64.6

[1] Noise receiver locations are shown on Exhibit 11-A.
[2] Estimated construction noise levels during peak operating conditions.

Table 11-9 shows the highest construction noise levels at the potentially impacted receiver locations are expected to approach 81.4 dBA L_{eq} and, therefore, will exceed the construction noise level threshold of 70 dBA L_{eq} at two of the adjacent industrial use receiver locations, R4 and R6, and will exceed the 65 dBA L_{eq} threshold at one of the nearby noise-sensitive residential receiver locations, R3. The noise impact due to unmitigated Project construction noise levels is, therefore, considered a *potentially significant* impact at receiver locations R3, R4, and R6.

Therefore, temporary construction noise mitigation measures are required to reduce the impacts at receiver locations R3, R4, and R6 to satisfy the City of Rancho Cucamonga Development Code construction noise level standard of 70 dBA L_{eq} at the adjacent industrial uses (R4 and R6) and 65 dBA L_{eq} at residential uses (R3). This includes mitigation in the form of a minimum 10-foot high temporary noise barrier for receiver locations R3 and R4, and a minimum 6-foot high temporary noise barrier for receiver location R6 where Project construction noise levels could potentially exceed the noise level increase threshold, as shown on Exhibit 11-A. The construction noise analysis presents a conservative approach with the highest noise-level-producing equipment for each stage of Project construction operating at the closest point from primary construction activity to the nearby sensitive receiver locations. This scenario is unlikely to occur during typical construction activities and likely overstates the construction noise levels which will be experienced at each receiver location. With the construction noise mitigation measures identified in this noise study, shown on Exhibit 11-A, the worst-case construction noise levels at the nearby residential receivers would be reduced.

The noise attenuation provided through temporary noise barriers depends on many factors including cost, wind loading, the location of the receiver, and the ability to place barriers such that the line-of-sight of the receiver is blocked to the noise source, among others. This analysis assumes a temporary noise barrier constructed using frame-mounted materials such as vinyl acoustic curtains or quilted blankets attached to the construction site perimeter fence.

As shown on Table 11-9, the temporary construction noise barrier mitigation will reduce the construction noise levels at R3, R4, and R6 to satisfy the 70 dBA L_{eq} industrial and 65 dBA L_{eq} residential construction noise level standards. Therefore, the noise impact due to Project construction is considered a *less than significant* impact with the mitigation measures identified in the Executive Summary for all receiver locations. Appendix 11.1 includes the temporary construction noise barrier attenuation calculations. Sample temporary noise barrier photos are provided in Appendix 11.2 for reference.

TABLE 11-9: CONSTRUCTION EQUIPMENT NOISE LEVEL COMPLIANCE

Receiver Location[1]	Land Use	Unmitigated Construction Noise Levels (dBA L_{eq})			Mitigated Construction Noise Levels (dBA L_{eq})			
		Highest Levels[2]	Threshold[3]	Threshold Exceeded?[4]	Temporary Barrier Height (Feet)	Attenuation	Construction Noise Levels[5]	Threshold Exceeded?[4]
R1	Residential	53.6	65	No	n/a	n/a	n/a	No
R2	Residential	56.7	65	No	n/a	n/a	n/a	No
R3	Residential	69.9	65	Yes	10'	-10.1	59.8	No
R4	Industrial Park	81.4	70	Yes	10'	-12.1	69.3	No
R5	Industrial Park	53.7	70	No	n/a	n/a	n/a	No
R6	Industrial Park	74.4	70	Yes	6'	-4.6	69.8	No
R7	Industrial Park	64.6	70	No	n/a	n/a	n/a	No

[1] Noise receiver locations are shown on Exhibit 11-A.
[2] Estimated construction noise levels during peak operating conditions, as shown on Table 11-8.
[3] Construction noise level threshold as shown on Table 4-2.
[4] Do the estimated Project construction noise levels exceed the construction noise level threshold?
[5] Temporary noise barrier attenuation calculations provided in Appendix 11.1.
"n/a" = Unmitigated construction noise level satisfies the threshold, and therefore, no mitigation is required.

11.5 CONSTRUCTION VIBRATION IMPACTS

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods used, distance to the affected structures and soil type. It is expected that ground-borne vibration from Project construction activities would cause only intermittent, localized intrusion. The proposed Project's construction activities most likely to cause vibration impacts are:

- Heavy Construction Equipment: Although all heavy mobile construction equipment has the potential of causing at least some perceptible vibration while operating close to building, the vibration is usually short-term and is not of sufficient magnitude to cause building damage. It is not expected that heavy equipment such as large bulldozers would operate close enough to any residences to cause a vibration impact.
- Trucks: Trucks hauling building materials to construction sites can be sources of vibration intrusion if the haul routes pass through residential neighborhoods on streets with bumps or potholes. Repairing the bumps and potholes generally eliminates the problem.

Ground-borne vibration levels resulting from construction activities occurring within the Project site were estimated by data published by the Federal Transit Administration (FTA). Construction activities that would have the potential to generate low levels of ground-borne vibration within the Project site include grading. Using the vibration source level of construction equipment provided on Table 6-2 and the construction vibration assessment methodology published by the FTA, it is possible to estimate the Project vibration impacts. Table 11-10 presents the expected Project related vibration levels at each of the sensitive receiver locations based on the vibration thresholds previously identified in Section 3.6.

At distances ranging from 20 to 491 feet from Project construction activity, construction vibration velocity levels are expected to approach 0.124 in/sec PPV, as shown on Table 11-10, at the nearby industrial receiver locations. Based on the Caltrans building damage threshold of 0.5 in/sec PPV for industrial uses, Project construction vibration levels of 0.124 in/sec PPV are considered a *less than significant* vibration impact.

Table 11-10 shows Project construction vibration levels at noise-sensitive residential receiver locations will range from 0.001 to 0.017 in/sec PPV and will remain below the Caltrans 0.3 in/sec PPV building damage and 0.04 in/sec PPV annoyance thresholds, thereby, resulting in *less than significant* vibration impacts at nearby sensitive receiver locations.

Further, 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 simultaneously adjacent to the Project site perimeter.

TABLE 11-10: UNMITIGATED CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver[1]	Land Use	Distance to Const. Activity (Feet)	Receiver PPV Levels (in/sec)[2]					Threshold		Threshold Exceeded?[3]	
			Small Bulldozer	Jack-hammer	Loaded Trucks	Large Bulldozer	Peak Vibration	Building Damage	Annoyance	Building Damage	Annoyance
R1	Residential	491'	0.000	0.000	0.001	0.001	0.001	0.3	0.04	No	No
R2	Residential	345'	0.000	0.001	0.001	0.002	0.002	0.3	0.04	No	No
R3	Residential	75'	0.001	0.007	0.015	0.017	0.017	0.3	0.04	No	No
R4	Industrial Park	20'	0.004	0.049	0.106	0.124	0.124	0.5	n/a	No	No
R5	Industrial Park	487'	0.000	0.000	0.001	0.001	0.001	0.5	n/a	No	No
R6	Industrial Park	45'	0.001	0.014	0.031	0.037	0.037	0.5	n/a	No	No
R7	Industrial Park	139'	0.000	0.003	0.006	0.007	0.007	0.5	n/a	No	No

[1] Receiver locations are shown on Exhibit 11-A.
[2] Based on the Vibration Source Levels of Construction Equipment included on Table 6-2.
[3] Does the peak vibration exceed the vibration thresholds shown on Table 4-2?
"n/a" = Non-sensitive receiver location. Annoyance thresholds are used to assess potential impacts at sensitive receiver locations.

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12 REFERENCES

1. **State of California.** *California Environmental Quality Act, Appendix G.* 2016.
2. **Urban Crossroads, Inc.** *8th St. & Haven Av. Warehouse Trip Generation Evaluation.* March 2018.
3. **U.S. Department of Transportation, Federal Transit Administration.** *Transit Noise and Vibration Impact Assessment.* May 2006. FTA-VA-90-1003-06.
4. **City of Rancho Cucamonga.** *Development Code, 17.66 Performance Standards.*
5. **California Department of Transportation Environmental Program.** *Technical Noise Supplement - A Technical Supplement to the Traffic Noise Analysis Protocol.* Sacramento, CA : s.n., September 2013.
6. **Environmental Protection Agency Office of Noise Abatement and Control.** *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* March 1974. EPA/ONAC 550/9/74-004.
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8. **U.S. Department of Transportation, Federal Highway Administration.** *Highway Traffic Noise in the United States, Problem and Response.* April 2000. p. 3.
9. **U.S. Environmental Protection Agency Office of Noise Abatement and Control.** *Noise Effects Handbook-A Desk Reference to Health and Welfare Effects of Noise.* October 1979 (revised July 1981). EPA 550/9/82/106.
10. **Office of Planning and Research.** *State of California General Plan Guidlines 2003.* October 2003.
11. **State of California.** *California Green Building Standards Code.* 2016.
12. **City of Rancho Cucamonga.** *General Plan Public Health and Safety Element.* May 2010.
13. **U.S. Department of Transportation, Federal Transit Administration.** *Transit Noise and Vibration Impact Assessment.* May 2006. FTA-VA-90-1003-06.
14. **California Department of Transportation.** *Transportation and Construction Vibration Guidance Manual.* September 2013.
15. **City of Ontario.** *LA/Ontario International Airport Land Use Compatibility Plan.* April 2011.
16. **California Court of Appeal.** *Gray v. County of Madera, F053661.* 167 Cal.App.4th 1099; - Cal.Rptr.3d, October 2008.
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18. **American National Standards Institute (ANSI).** *Specification for Sound Level Meters ANSI S1.4-2014/IEC 61672-1:2013.*
19. **U.S. Department of Transportation.** *Federal Transit Administration, Noise Impact Assessment Spreadsheet.* 2007.
20. —. *Crossing Inventory Form, 026160N.* 2014.
21. **Urban Crossroads, Inc.** *8th St. & Haven Av. Warehouse Air Quality Impact Analysis.* April 2018.

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13 CERTIFICATION

The contents of this noise study report represent an accurate depiction of the noise environment and impacts associated with the proposed 8978 Haven Ave. Warehouse Project. The information contained in this noise study report is based on the best available data at the time of preparation. If you have any questions, please contact me directly at (949) 336-5979.

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EDUCATION

Master of Science in Civil and Environmental Engineering
California Polytechnic State University, San Luis Obispo • December, 1993

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

PROFESSIONAL REGISTRATIONS

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

PROFESSIONAL AFFILIATIONS

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

PROFESSIONAL CERTIFICATIONS

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

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APPENDIX 3.1:

CITY OF RANCHO CUCAMONGA DEVELOPMENT CODE

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17.66.050 Noise standards.

A. *Purpose*. In order to control unnecessary, excessive, and annoying noise and vibration in the city, it is hereby declared to be the policy of the city to prohibit such noise generated from or by all sources as specified in this section. The provisions apply within all jurisdictions within all zoning districts. Provisions apply based on the designated noise zones:

Noise Zone I: All single- and multiple-family residential properties.

Noise Zone II: All commercial properties.

B. *Decibel measurement criteria*. Any decibel measurement made pursuant to the provisions of this section shall be based on a reference sound pressure of 20 micropascals as measured with a sound level meter using the A-weighted network (scale) at slow response.

C. *Exterior noise standards*.

1. It shall be unlawful for any person at any location within the city to create any noise or allow the creation of any noise on the property owned, leased, occupied, or otherwise controlled by such person, which causes the noise level when measured on the property line of any other property to exceed the basic noise level as adjusted below:

a. Basic noise level for a cumulative period of not more than 15 minutes in any one hour; or

b. Basic noise level plus five dBA for a cumulative period of not more than ten minutes in any one hour; or

c. Basic noise level plus 14 dBA for a cumulative period of not more than five minutes in any one hour; or

d. Basic noise level plus 15 dBA at any time.

2. If the measurement location is a boundary between two different noise zones, the lower noise level standard shall apply.

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

D. *Special exclusions*. The following activities shall be exempted from the provisions of this section:

1. City- or school-approved activities conducted on public parks, public playgrounds, and public or private school grounds including, but not limited to, athletic and school entertainment events between the hours of 7:00 a.m. and 10:00 p.m.

2. Occasional outdoor gatherings, dances, shows, and sporting and entertainment events, provided said events are conducted pursuant to the approval of a temporary use permit issued by the city.

3. Any mechanical device, apparatus, or equipment used, related to, or connected with emergency machinery, vehicle, work, or warning alarm or bell, provided the sounding of any bell or alarm on any building or motor vehicle shall terminate its operation within 30 minutes in any hour of its being activated.

4. Noise sources associated with, or vibration created by, construction, repair, remodeling, or grading of any real property or during authorized seismic surveys, provided said activities:

a. When adjacent to a residential land use, school, church or similar type of use, the noise generating activity does not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a national holiday, and provided noise levels created do not exceed the noise standard of 65 dBA when measured at the adjacent property line.

b. When adjacent to a commercial or industrial use, the noise generating activity does not take place between the hours of 10:00 p.m. and 6:00 a.m. on weekdays, including Saturday and Sunday, and provided noise levels created do not exceed the noise standards of 70 dBA at the when measured at the adjacent property line.

5. All devices, apparatus, or equipment associated with agricultural operations, provided:

a. Operations do not take place between 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a national holiday.

b. Such operations and equipment are utilized for protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions.

c. Such operations and equipment are associated with agricultural pest control through pesticide application, provided the application is made in accordance with permits issued by, or regulations enforced by, the state department of agriculture.

6. Noise sources associated with the maintenance of real property, provided said activities take place between the hours of 7:00 a.m. and 8:00 p.m. on any day.

7. Any activity to the extent regulation thereof has been preempted by state or federal law.

E. *Schools, churches, libraries, health care institutions*. It shall be unlawful for any person to create any noise which causes the noise level at any school, hospital or similar health care institution, church, or library while the same is in use, to exceed the noise standards specified in this section and prescribed for the assigned noise zone in which the school, hospital, church, or library is located.

F. *Residential noise standards*.

1. Table 17.66.050-1 (Residential Noise Limits) includes the maximum noise limits in residential zones. These are the noise limits when measured at the adjacent residential property line (exterior) or within a neighboring home (interior).

TABLE 17.66.050-1 RESIDENTIAL NOISE LIMITS

Location of Measurement	*Maximum Allowable*	
	10:00 p.m. to 7:00 a.m.	*7:00 a.m. to 10:00 p.m.*
Exterior	60 dBA	65dBA
Interior	45 dBA	50dBA

Additional:

(A) It shall be unlawful for any person at any location within the city to create any noise or to allow the creation of any noise which causes the noise level when measured within any other fully enclosed (windows and doors shut) residential dwelling unit to exceed the interior noise standard in the manner described herein.

(B) If the intruding noise source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient noise level can be determined, each of the noise limits above shall be reduced five dBA for noise consisting of impulse or simple tone noise.

2. *Other residential noise limitations*.

a. *Peddlers; use of loud noise, etc., to advertise goods, etc*. No peddler or mobile vendor or any person in their behalf shall shout, cry out, or use any device or instrument to make sounds for the purpose of advertising in such a manner as to create a noise disturbance.

b. *Animal noises*. No person owning or having the charge, care, custody, or control of any dog or other animal or fowl shall allow or permit the same to habitually howl, bark, yelp, or make other noises, in such a manner as to create a noise disturbance.

c. *Radios, television sets, musical instruments, and similar devices*. No person shall operate or permit the operation or playing of any device which reproduces, produces, or amplifies sound, such as a radio, musical instrument, phonograph, or sound amplifier, in such a manner as to create a noise disturbance.

i. Across any real property boundary or within Noise Zone I, between the hours of 10:00 p.m. and 7:00 a.m. on the following day (except for activities for which a temporary use permit has been issued).

ii. At 50 feet from any such device, if operated on or over any public right-of-way.

G. *Commercial and office noise provisions*. All operations and businesses shall be conducted to comply with the following standards:

1. All commercial and office activities shall not create any noise that would exceed an exterior noise level of 65 dBA during the hours of 10:00 p.m. to 7:00 a.m. and 70 dBA during the hours of 7:00 a.m. to 10:00 p.m. when measured at the adjacent property line.

2. *Loading and unloading*. No person shall cause the loading, unloading, opening, closing, or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects between the hours of 10:00 p.m. and 7:00 a.m., in a manner which would cause a noise disturbance to a residential area.

3. *Vehicle repairs and testing*. No person shall cause or permit the repairing, rebuilding, modifying, or testing of any motor vehicle, motorcycle, or motorboat in such a manner as to increase a noise disturbance between the hours of 10:00 p.m. and 8:00 a.m. adjacent to a residential area.

H. Industrial noise provision included in Table 17.66.110-1 (Industrial Performance Standards). (Code 1980, § 17.66.050; Ord. No. 855 § 4, 2012)

17.66.070 Vibration.

Uses that generate vibrations that may be considered a public nuisance or hazard on any adjacent property shall be cushioned or isolated to prevent generation of vibrations. Uses shall be operated in compliance with the following provisions:

A. No vibration shall be produced that is transmitted through the ground and is discernible without the aid of instruments at the points of measurement specified in section 17.66.030 (Points of Measurement) of this chapter, nor shall any vibration produced exceed 0.002g peak at up to 50 CPS frequency, measured at the point of measurement specified in section 17.66.030 (Points of Measurement) of this chapter using either seismic or electronic vibration measuring equipment. Vibrations occurring at higher than 50 CPS frequency of a periodic vibration shall not induce accelerations exceeding 0.001g. Single-impulse periodic vibrations occurring at an average interval greater than five minutes shall not induce accelerations exceeding 0.01g.

B. Uses, activities, and processes shall not generate vibrations that cause discomfort or annoyance to reasonable persons of normal sensitivity or which endangers the comfort, repose, health, or peace of residents whose property abuts the property line of the parcel.

C. Uses shall not generate ground vibration that interferes with the operations of equipment and facilities of adjoining parcels.

D. Vibrations from temporary construction/demolition and vehicles that leave the subject parcel (e.g., trucks, trains, and aircraft) are exempt from the provisions of this section. (Code 1980, § 17.66.070; Ord. No. 855 § 4, 2012)

17.66.110 Special industrial performance standards.

A. *Purpose*. The performance standards allow industrial uses to operate consistent with the overall characteristics of the land use category to provide for a healthy, safe, and pleasing environment in keeping with the nature and level of surrounding industrial activity. The performance standards contained in Table 17.66.110-1 (Industrial Performance Standards) are applied based on the zoning district as follows:

1. *Industrial Park (IP) Zoning District; Class A performance standards*. The most restrictive of the performance standards to ensure a high quality working environment and available sites for industrial and business firms whose functional and economic needs require protection from the adverse affects of noise, odors, vibration, glare, or high-intensity illumination, and other nuisances.

2. *General Industrial (GI) Zoning District; Class B performance standards*. These standards are intended to provide for the broadest range of industrial activity while assuring a basic level environmental protection. It is the intent of the standards of this section to provide for uses whose operational needs may produce noise, vibration, particulate matter and air contaminants, odors, or humidity, heat, and glare which cannot be mitigated sufficiently to meet the Class A standards. The standards are so designed to protect uses on adjoining sites from effects which could adversely affect their functional and economic viability.

3. *Medium Impact/High Impact (MI/HI) and Heavy Industrial (HI) Zoning Districts; Class C performance standards*. It is the intent of the standards of this section to make allowances for industrial uses whose associated processes produce noise, particulate matter and air contaminants, vibration, odor, humidity, heat, glare, or high-intensity illumination which would adversely affect the functional and economic viability of other uses. The standards, when combined with standards imposed by other governmental agencies, serve to provide basic health and safety protection for persons employed within or visiting the area.

TABLE 17.66.110-1 INDUSTRIAL PERFORMANCE STANDARDS

Class A	Class B	Class C
Noise Maximum		
• 70dB (anywhere on lot) • 65 dB (interior space of neighboring use on same lot) • Noise caused by motor vehicles is exempted from this standard.	• 80 dB (anywhere on lot) • 65dB (at residential property line) • Noise caused by motor vehicles and trains is exempted from this standard.	• 85 dB (lot line) • 65dB (at residential property line) • Where a use occupies a lot abutting or separated by a street from a lot within the designated Class A or B performance standard or residential property, the performance standard of the abutting property shall apply at the common or facing lot line.
Vibration		
All uses shall be so operated as not to generate vibration discernible without instruments by the average person while on or beyond the lot upon which the source is located or within an adjoining enclosed space if more than one establishment occupies a structure. Vibration caused by motor vehicles, trains, and temporary construction or demolition work is exempted from this standard.	All uses shall be operated so as not to generate vibration discernible without instruments by the average persons beyond the lot upon which the source is located. Vibration caused by motor vehicles, trains, and temporary construction or demolition is exempted from this standard.	All uses shall be operated so as not to generate vibration discernible without instruments by the average person beyond 600 feet from where the source is located. Vibration caused by motor vehicles, trains, and temporary construction and demolition is exempted from this standard.
Particulate Matter and Air Contaminants		
In addition to compliance with the Air Quality Maintenance District (AQMD) standards, all uses shall be operated so as not to emit particulate matter or air contaminants that are readily detectable without instruments by the average person while on the lot containing such uses.	In addition to compliance with the AQMD standards, all uses shall be operated so as not to emit particulate matter or air contaminants that are readily detectable without instruments by the average person beyond any lot line of the lot containing such uses.	In addition to compliance with the AQMD standards, all uses shall be operated so as not to emit particulate matter or air contaminants that (a) are injurious to the health of either persons engaged in or related to the use of the lot, or persons residing, working, visiting, or recreating in neighboring areas; (b) substantially and adversely affect the maintenance of property in nearby areas; (c) are disruptive of industrial processes carried on in other parts of the industrial area. Where a use occupies a lot abutting or separated by a street lot with designated Class A or B, the A or B performance standard for particulate matter and air contaminants shall apply at the common or facing lot line.
Odor		
All uses shall be operated so as not to emit matter causing unpleasant odors that are perceptible to the average person while within or beyond the lot containing such uses.	All uses shall be operated so as not to emit matter causing unpleasant odors that are perceptible to the average person beyond any lot line of the lot containing such uses.	All uses shall be operated so as not to emit matter causing unpleasant odors that are perceptible to the average person beyond any lot line of the lot containing such uses.
Humidity, Heat, and Glare		
All uses shall be operated so as not to produce humidity, heat, glare, or high-intensity illumination that is perceptible without instruments by the average person while on or beyond the lot containing such use.	All uses shall be operated so as not to produce humidity, heat, glare, or high-intensity illumination that is perceptible without instruments by the average person beyond the lot line of any lot containing such use.	All uses shall be operated so as not to produce humidity, heat, glare, or high-intensity illumination that is perceptible without instruments by the average person while on any lot zoned for residential purposes or any industrial property with a Class A or B performance standard designation.

(Code 1980, § 17.66.110; Ord. No. 855 § 4, 2012)

APPENDIX 5.1:

STUDY AREA PHOTOS

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L1_E
34, 5' 31.720000", 117, 34' 57.670000"

L1_N
34, 5' 31.730000", 117, 34' 57.670000"

L1_S
34, 5' 31.730000", 117, 34' 57.670000"

L1_W
34, 5' 31.730000", 117, 34' 57.650000"

L2_E
34, 5' 31.800000", 117, 34' 48.500000"

L2_N
34, 5' 31.870000", 117, 34' 48.530000"

L2_S
34, 5' 31.800000", 117, 34' 48.500000"

L2_W
34, 5' 31.760000", 117, 34' 48.530000"

L3_E
34, 5' 31.990000", 117, 34' 40.370000"

L3_N
34, 5' 32.010000", 117, 34' 40.340000"

L3_S
34, 5' 31.990000", 117, 34' 40.370000"

L3_W
34, 5' 32.010000", 117, 34' 40.400000"

L4_E
34, 5' 24.690000", 117, 34' 31.990000"

L4_N
34, 5' 24.700000", 117, 34' 31.990000"

L4_S
34, 5' 24.700000", 117, 34' 31.990000"

L4_W
34, 5' 24.670000", 117, 34' 31.990000"

L5_E
34, 5' 11.460000", 117, 34' 36.640000"

L5_N
34, 5' 11.460000", 117, 34' 36.660000"

L5_S
34, 5' 11.460000", 117, 34' 36.660000"

L5_W
34, 5' 11.460000", 117, 34' 36.640000"

Site_S
34, 5' 30.320000", 117, 34' 39.080000"

APPENDIX 5.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

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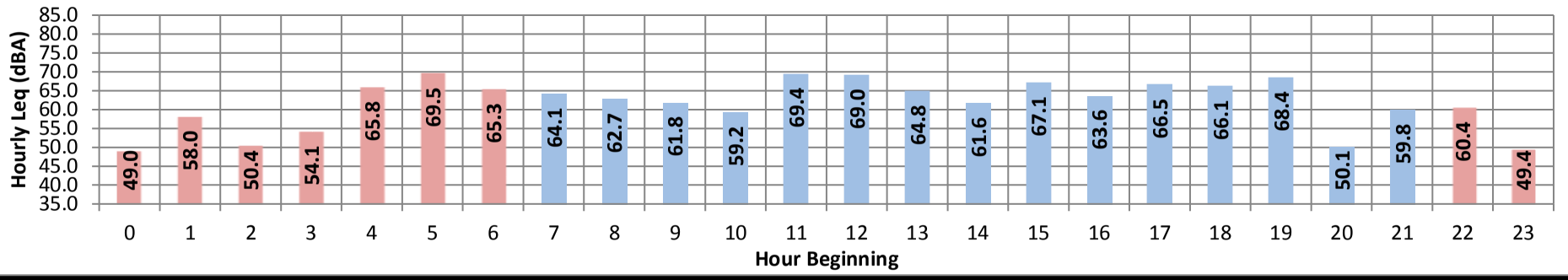
24-Hour Noise Level Measurement Summary

				Energy Average Leq		24-Hour
Project Name:	8978 Haven Avenue	*JN:*	11587	*Day*	*Night*	*CNEL*
Location:	L1 - Located west of the Project site on Humboldt Avenue near existing residential homes, north of existing railroad tracks.	*Analyst:*	A. Wolfe	65.4	63.1	70.2
		Date:	3/28/2018			

Hourly Leq dBA Readings (unadjusted)



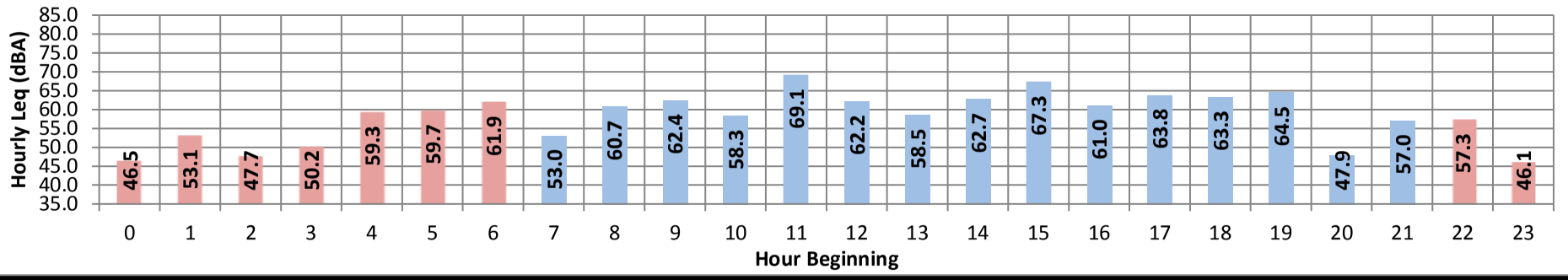
Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	50.1	68.5	41.6	57.0	55.0	52.0	51.0	49.0	47.0	44.0	44.0	42.0
	Max	69.4	101.6	48.0	78.0	70.0	61.0	59.0	54.0	52.0	50.0	50.0	49.0
Energy Average:		65.4	Average:		67.3	62.4	57.3	55.5	51.5	49.5	47.3	46.7	45.7
Night	Min	49.0	61.0	44.4	55.0	54.0	52.0	51.0	48.0	47.0	46.0	45.0	44.0
	Max	69.5	101.3	50.8	75.0	63.0	58.0	57.0	55.0	54.0	52.0	52.0	51.0
Energy Average:		63.1	Average:		62.7	57.6	54.0	53.1	51.1	50.0	48.7	48.2	47.6
Hourly Summary													
Night	0	49.0	61.0	44.4	55.0	54.0	52.0	51.0	49.0	47.0	46.0	45.0	44.0
	1	58.0	80.9	46.8	68.0	60.0	55.0	53.0	50.0	49.0	48.0	48.0	47.0
	2	50.4	64.9	46.6	55.0	54.0	52.0	51.0	50.0	49.0	48.0	48.0	47.0
	3	54.1	78.5	47.0	56.0	54.0	52.0	52.0	51.0	50.0	49.0	48.0	48.0
	4	65.8	94.8	49.4	75.0	63.0	56.0	56.0	54.0	53.0	51.0	50.0	50.0
	5	69.5	101.3	50.8	69.0	60.0	57.0	56.0	54.0	53.0	52.0	51.0	51.0
	6	65.3	94.1	50.3	72.0	63.0	58.0	57.0	55.0	54.0	52.0	52.0	51.0
Day	7	64.1	95.9	46.1	62.0	60.0	59.0	58.0	53.0	51.0	48.0	47.0	46.0
	8	62.7	89.7	42.0	67.0	63.0	58.0	55.0	50.0	48.0	45.0	44.0	43.0
	9	61.8	90.8	42.2	69.0	62.0	57.0	55.0	50.0	47.0	44.0	44.0	43.0
	10	59.2	87.7	41.6	62.0	59.0	55.0	54.0	50.0	47.0	45.0	44.0	42.0
	11	69.4	100.3	43.5	72.0	64.0	58.0	55.0	51.0	49.0	46.0	45.0	44.0
	12	69.0	101.6	43.3	62.0	59.0	55.0	54.0	50.0	48.0	46.0	45.0	44.0
	13	64.8	96.1	44.8	63.0	60.0	57.0	56.0	51.0	49.0	47.0	46.0	45.0
	14	61.6	88.7	45.1	65.0	61.0	57.0	55.0	52.0	50.0	48.0	47.0	46.0
	15	67.1	99.5	47.5	67.0	63.0	60.0	59.0	54.0	52.0	49.0	49.0	48.0
	16	63.6	90.5	48.0	72.0	66.0	59.0	58.0	54.0	52.0	50.0	49.0	48.0
	17	66.5	93.9	47.8	76.0	68.0	60.0	58.0	54.0	52.0	50.0	50.0	49.0
	18	66.1	89.7	48.0	78.0	70.0	61.0	57.0	53.0	51.0	49.0	49.0	48.0
	19	68.4	95.4	46.9	74.0	67.0	58.0	55.0	51.0	50.0	48.0	48.0	47.0
	20	50.1	68.5	45.8	57.0	55.0	52.0	51.0	49.0	48.0	47.0	47.0	46.0
	21	59.8	87.4	47.0	64.0	59.0	54.0	52.0	50.0	49.0	48.0	47.0	47.0
Night	22	60.4	89.2	45.5	59.0	56.0	52.0	51.0	48.0	47.0	46.0	46.0	45.0
	23	49.4	63.3	45.3	55.0	54.0	52.0	51.0	49.0	48.0	46.0	46.0	45.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Project Name:	8978 Haven Avenue	*JN:*	11587	*Energy Average Leq*	*24-Hour*
		Analyst:	A. Wolfe	*Day* / *Night*	*CNEL*
Location:	L2 - Located on Humboldt Avenue, northwest of the Project site, adjacent to existing residential homes.	*Date:*	3/28/2018	63.1 / 56.8	65.3

Hourly Leq dBA Readings (unadjusted)



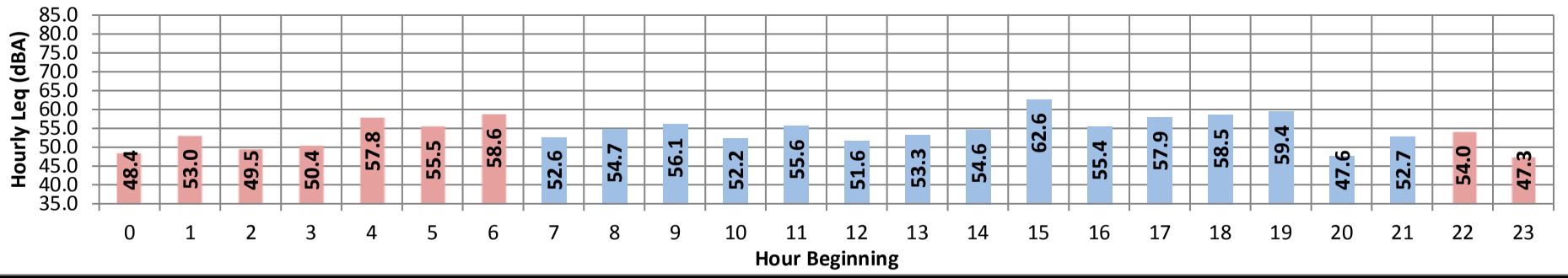
Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	47.9	64.6	40.8	54.0	53.0	51.0	50.0	47.0	46.0	44.0	43.0	42.0
	Max	69.1	100.0	46.2	74.0	68.0	65.0	64.0	55.0	51.0	48.0	48.0	47.0
Energy Average:		63.1	Average:		66.5	61.8	57.1	55.4	51.4	49.1	46.1	45.4	44.5
Night	Min	46.1	57.4	42.3	53.0	51.0	49.0	48.0	45.0	44.0	42.0	42.0	42.0
	Max	61.9	91.2	48.6	67.0	63.0	61.0	59.0	56.0	53.0	50.0	50.0	49.0
Energy Average:		56.8	Average:		59.1	55.7	52.6	51.3	49.0	47.7	45.9	45.8	45.1
Hourly Summary													
Night	0	46.5	57.4	42.6	53.0	51.0	49.0	48.0	46.0	45.0	43.0	43.0	43.0
	1	53.1	74.6	44.7	64.0	58.0	53.0	51.0	48.0	46.0	45.0	45.0	44.0
	2	47.7	57.6	44.3	53.0	52.0	50.0	49.0	48.0	47.0	45.0	45.0	44.0
	3	50.2	73.9	44.8	55.0	53.0	50.0	50.0	48.0	47.0	46.0	46.0	45.0
	4	59.3	89.7	47.7	65.0	59.0	54.0	53.0	51.0	50.0	49.0	49.0	48.0
	5	59.7	91.2	47.9	63.0	59.0	56.0	55.0	53.0	52.0	50.0	49.0	48.0
	6	61.9	90.8	48.6	67.0	63.0	61.0	59.0	56.0	53.0	50.0	50.0	49.0
Day	7	53.0	76.2	43.7	59.0	58.0	56.0	55.0	52.0	50.0	46.0	45.0	44.0
	8	60.7	86.2	40.8	67.0	67.0	65.0	64.0	55.0	49.0	45.0	44.0	42.0
	9	62.4	92.7	40.8	66.0	60.0	57.0	56.0	53.0	50.0	45.0	43.0	42.0
	10	58.3	86.0	42.5	64.0	62.0	58.0	57.0	53.0	51.0	47.0	46.0	43.0
	11	69.1	100.0	42.8	70.0	63.0	57.0	55.0	52.0	49.0	45.0	44.0	43.0
	12	62.2	94.0	43.8	66.0	59.0	56.0	55.0	51.0	49.0	46.0	45.0	44.0
	13	58.5	85.8	44.7	65.0	60.0	56.0	55.0	52.0	49.0	46.0	46.0	45.0
	14	62.7	92.6	44.1	66.0	62.0	58.0	56.0	52.0	50.0	47.0	46.0	45.0
	15	67.3	97.0	46.0	72.0	65.0	59.0	57.0	53.0	51.0	48.0	47.0	47.0
	16	61.0	87.0	46.2	67.0	62.0	58.0	56.0	53.0	51.0	48.0	48.0	47.0
	17	63.8	91.7	45.3	72.0	66.0	60.0	57.0	52.0	50.0	47.0	47.0	46.0
	18	63.3	86.5	44.8	74.0	68.0	59.0	55.0	50.0	48.0	47.0	46.0	46.0
	19	64.5	91.8	44.8	71.0	65.0	56.0	53.0	49.0	47.0	46.0	46.0	45.0
	20	47.9	64.6	43.8	54.0	53.0	51.0	50.0	47.0	46.0	44.0	44.0	44.0
	21	57.0	84.8	44.5	64.0	57.0	51.0	50.0	47.0	46.0	45.0	44.0	44.0
Night	22	57.3	86.2	42.6	59.0	55.0	51.0	49.0	46.0	45.0	43.0	43.0	43.0
	23	46.1	65.8	42.3	53.0	51.0	49.0	48.0	45.0	44.0	42.0	42.0	42.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

					Energy Average Leq	
Project Name:	8978 Haven Avenue	*JN:*	11587	*24-Hour*	*Day*	*Night*
Location:	L3 - Located north of the Project site on Humbolt Avenue near existing residential homes and railroad tracks.	*Analyst:*	A. Wolfe	*CNEL*		
		Date:	3/28/2018	61.5	56.5	54.4

Hourly Leq dBA Readings (unadjusted)



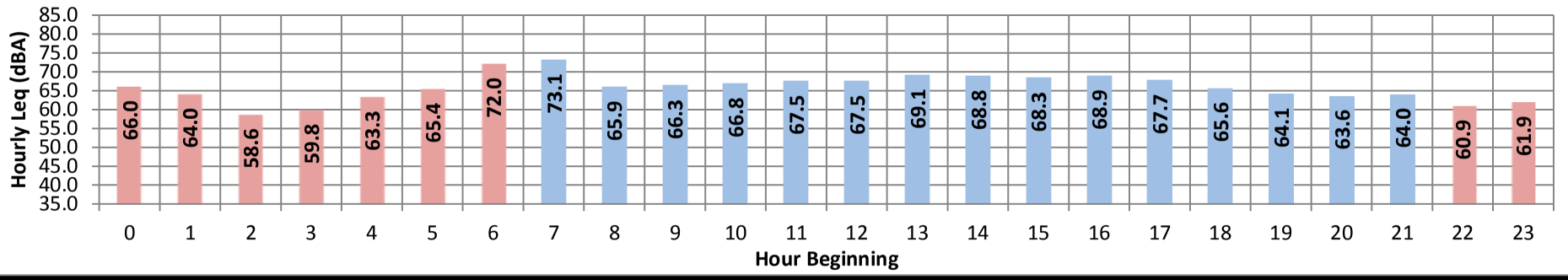
Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	47.6	59.1	40.6	53.0	52.0	50.0	49.0	46.0	44.0	42.0	42.0	41.0
	Max	62.6	91.3	45.1	70.0	65.0	58.0	56.0	52.0	50.0	47.0	46.0	46.0
Energy Average:		56.5	Average:		62.5	58.5	53.9	52.0	48.3	46.4	44.3	44.1	43.2
Night	Min	47.3	58.9	43.1	54.0	53.0	51.0	49.0	46.0	45.0	44.0	44.0	43.0
	Max	58.6	83.2	49.3	66.0	62.0	59.0	58.0	55.0	54.0	51.0	51.0	50.0
Energy Average:		54.4	Average:		58.9	56.2	53.7	52.8	50.2	48.8	47.2	46.9	46.2
Hourly Summary													
Night	0	48.4	62.2	43.5	54.0	53.0	51.0	51.0	48.0	47.0	45.0	45.0	44.0
	1	53.0	73.6	45.6	61.0	57.0	54.0	53.0	50.0	48.0	47.0	46.0	46.0
	2	49.5	58.9	44.8	55.0	54.0	52.0	52.0	50.0	48.0	46.0	46.0	45.0
	3	50.4	71.3	45.5	56.0	54.0	52.0	51.0	49.0	48.0	47.0	46.0	46.0
	4	57.8	83.2	48.0	64.0	59.0	56.0	55.0	53.0	51.0	50.0	49.0	49.0
	5	55.5	77.9	49.1	62.0	59.0	57.0	56.0	54.0	53.0	51.0	51.0	50.0
	6	58.6	82.7	49.3	66.0	62.0	59.0	58.0	55.0	54.0	51.0	51.0	50.0
Day	7	52.6	74.0	45.1	61.0	58.0	55.0	54.0	52.0	50.0	47.0	46.0	46.0
	8	54.7	83.0	41.5	62.0	59.0	55.0	53.0	49.0	47.0	44.0	44.0	42.0
	9	56.1	85.4	40.9	63.0	58.0	53.0	51.0	47.0	45.0	42.0	42.0	41.0
	10	52.2	79.0	40.6	62.0	57.0	53.0	51.0	47.0	45.0	42.0	42.0	41.0
	11	55.6	80.9	40.7	63.0	58.0	53.0	51.0	47.0	45.0	42.0	42.0	41.0
	12	51.6	79.4	41.1	58.0	53.0	50.0	49.0	46.0	44.0	42.0	42.0	41.0
	13	53.3	79.5	41.7	58.0	56.0	53.0	51.0	47.0	45.0	43.0	43.0	42.0
	14	54.6	80.9	42.0	63.0	60.0	54.0	52.0	48.0	46.0	44.0	44.0	43.0
	15	62.6	91.3	44.2	69.0	65.0	56.0	54.0	50.0	48.0	46.0	46.0	45.0
	16	55.4	81.3	44.6	65.0	60.0	55.0	53.0	50.0	48.0	46.0	46.0	45.0
	17	57.9	85.1	44.1	67.0	63.0	58.0	56.0	50.0	48.0	46.0	46.0	45.0
	18	58.5	84.3	43.8	70.0	64.0	57.0	54.0	49.0	47.0	45.0	45.0	44.0
	19	59.4	83.4	43.9	67.0	61.0	55.0	52.0	48.0	46.0	45.0	45.0	44.0
	20	47.6	59.1	43.3	53.0	52.0	50.0	49.0	47.0	46.0	45.0	44.0	44.0
	21	52.7	80.3	43.3	56.0	54.0	51.0	50.0	47.0	46.0	45.0	44.0	44.0
Night	22	54.0	82.6	43.1	58.0	55.0	51.0	49.0	47.0	45.0	44.0	44.0	43.0
	23	47.3	62.0	43.3	54.0	53.0	51.0	50.0	46.0	45.0	44.0	44.0	43.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Project Name:	8978 Haven Avenue	*JN:*	11587	*Energy Average Leq*	*24-Hour*
Location:	L4 - Located east of the Project site near existing office buildings on Haven Avenue.	*Analyst:*	A. Wolfe	*Day* / *Night*	*CNEL*
		Date:	3/28/2018	67.9 / 65.6	72.6

Hourly Leq dBA Readings (unadjusted)



Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	63.6	79.1	36.1	73.0	70.0	68.0	67.0	62.0	56.0	36.0	36.0	36.0
	Max	73.1	99.5	51.2	84.0	80.0	75.0	73.0	68.0	65.0	58.0	56.0	54.0
Energy Average:		67.9	Average:		76.5	74.3	71.1	69.9	66.3	62.0	53.1	51.5	49.1
Night	Min	58.6	77.6	36.1	69.0	67.0	64.0	62.0	55.0	51.0	48.0	36.0	36.0
	Max	72.0	96.8	53.4	81.0	78.0	74.0	72.0	68.0	64.0	57.0	56.0	54.0
Energy Average:		65.6	Average:		73.2	71.1	67.9	65.8	59.4	55.0	50.8	49.0	48.2
Hourly Summary													
Night	0	66.0	91.2	47.5	77.0	77.0	73.0	67.0	57.0	52.0	49.0	48.0	48.0
	1	64.0	95.0	48.4	71.0	68.0	65.0	63.0	56.0	52.0	49.0	49.0	49.0
	2	58.6	80.3	47.8	69.0	67.0	64.0	62.0	55.0	51.0	49.0	49.0	48.0
	3	59.8	80.8	36.1	70.0	68.0	65.0	63.0	57.0	52.0	48.0	36.0	36.0
	4	63.3	85.0	50.8	73.0	71.0	68.0	67.0	62.0	58.0	53.0	52.0	51.0
	5	65.4	88.7	52.1	74.0	73.0	70.0	69.0	64.0	60.0	55.0	54.0	53.0
	6	72.0	96.8	53.4	81.0	78.0	74.0	72.0	68.0	64.0	57.0	56.0	54.0
Day	7	73.1	99.5	47.8	84.0	80.0	75.0	73.0	68.0	64.0	56.0	53.0	49.0
	8	65.9	90.2	36.1	75.0	73.0	70.0	69.0	64.0	58.0	36.0	36.0	36.0
	9	66.3	84.6	46.4	75.0	74.0	71.0	70.0	66.0	62.0	53.0	51.0	48.0
	10	66.8	87.4	46.6	76.0	74.0	71.0	70.0	67.0	63.0	55.0	53.0	49.0
	11	67.5	90.0	48.3	77.0	75.0	72.0	70.0	67.0	63.0	55.0	53.0	50.0
	12	67.5	87.1	48.6	77.0	75.0	72.0	70.0	67.0	64.0	56.0	53.0	50.0
	13	69.1	92.5	49.3	79.0	76.0	72.0	71.0	68.0	64.0	56.0	54.0	51.0
	14	68.8	89.2	50.3	78.0	76.0	72.0	71.0	68.0	64.0	56.0	55.0	52.0
	15	68.3	90.6	50.2	77.0	75.0	72.0	71.0	68.0	65.0	57.0	55.0	52.0
	16	68.9	92.1	51.2	78.0	76.0	72.0	71.0	68.0	65.0	58.0	56.0	54.0
	17	67.7	88.5	48.7	77.0	75.0	72.0	71.0	68.0	64.0	55.0	54.0	51.0
	18	65.6	82.9	47.2	74.0	72.0	70.0	69.0	66.0	61.0	53.0	52.0	50.0
	19	64.1	79.1	48.3	74.0	72.0	69.0	68.0	64.0	59.0	51.0	50.0	49.0
	20	63.6	79.4	47.4	73.0	71.0	69.0	68.0	63.0	58.0	50.0	49.0	48.0
	21	64.0	92.9	47.0	73.0	70.0	68.0	67.0	62.0	56.0	50.0	49.0	48.0
Night	22	60.9	77.6	47.2	71.0	69.0	66.0	65.0	59.0	54.0	49.0	49.0	48.0
	23	61.9	87.4	46.4	73.0	69.0	66.0	64.0	57.0	52.0	48.0	48.0	47.0

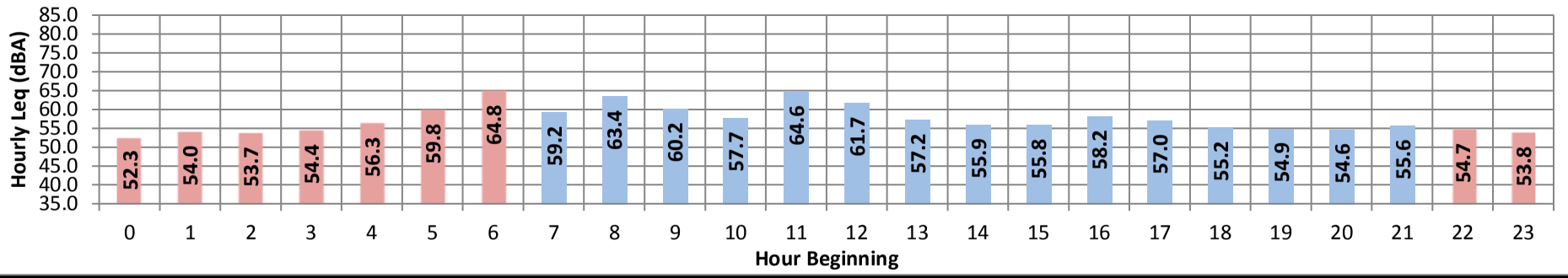
URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

				Energy Average Leq	
Project Name:	8978 Haven Avenue	*JN:*	11587	*Day*	*Night*
Location:	L5 - Located south of the Project site on Haven Avenue near existing commercial and office uses.	*Analyst:*	A. Wolfe	59.3	58.1
		Date:	3/28/2018		

24-Hour CNEL
64.9

Hourly Leq dBA Readings (unadjusted)



Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	54.6	69.3	47.4	61.0	59.0	57.0	56.0	54.0	52.0	50.0	50.0	48.0
	Max	64.6	86.6	51.1	74.0	73.0	70.0	68.0	63.0	59.0	54.0	53.0	52.0
Energy Average:		59.3	Average:		66.7	64.5	61.9	60.1	56.5	54.2	51.4	50.9	50.0
Night	Min	52.3	67.4	47.2	60.0	58.0	55.0	54.0	52.0	50.0	48.0	48.0	47.0
	Max	64.8	85.4	55.3	74.0	71.0	69.0	68.0	63.0	62.0	58.0	57.0	56.0
Energy Average:		58.1	Average:		63.0	61.1	58.9	57.8	55.0	53.7	51.6	51.2	50.6
Hourly Summary													
Night	0	52.3	67.4	47.2	60.0	58.0	55.0	54.0	52.0	50.0	48.0	48.0	47.0
	1	54.0	74.3	48.0	63.0	60.0	57.0	55.0	53.0	51.0	49.0	49.0	49.0
	2	53.7	71.5	49.0	61.0	60.0	57.0	55.0	53.0	52.0	50.0	50.0	49.0
	3	54.4	71.9	49.7	61.0	58.0	56.0	55.0	53.0	52.0	51.0	50.0	50.0
	4	56.3	69.1	51.2	61.0	60.0	59.0	58.0	56.0	55.0	53.0	52.0	52.0
	5	59.8	73.5	54.0	65.0	65.0	64.0	64.0	59.0	57.0	55.0	55.0	54.0
	6	64.8	85.4	55.3	74.0	71.0	69.0	68.0	63.0	62.0	58.0	57.0	56.0
Day	7	59.2	84.7	50.1	66.0	64.0	62.0	61.0	58.0	56.0	53.0	52.0	51.0
	8	63.4	80.3	49.4	71.0	70.0	69.0	67.0	63.0	59.0	54.0	53.0	51.0
	9	60.2	77.8	47.4	71.0	69.0	65.0	63.0	58.0	54.0	50.0	50.0	48.0
	10	57.7	78.3	47.4	67.0	65.0	62.0	60.0	56.0	54.0	50.0	50.0	49.0
	11	64.6	86.6	48.7	74.0	73.0	70.0	68.0	60.0	55.0	51.0	50.0	49.0
	12	61.7	79.0	48.7	74.0	71.0	68.0	65.0	58.0	55.0	51.0	51.0	50.0
	13	57.2	76.3	49.5	68.0	65.0	61.0	59.0	55.0	53.0	51.0	50.0	50.0
	14	55.9	76.5	49.1	63.0	61.0	59.0	57.0	55.0	53.0	51.0	51.0	50.0
	15	55.8	70.6	50.7	63.0	61.0	59.0	58.0	55.0	54.0	52.0	52.0	51.0
	16	58.2	79.2	51.1	67.0	64.0	61.0	59.0	56.0	55.0	53.0	52.0	52.0
	17	57.0	76.8	50.3	66.0	63.0	60.0	58.0	56.0	54.0	52.0	51.0	51.0
	18	55.2	69.3	50.1	63.0	60.0	58.0	57.0	55.0	53.0	51.0	51.0	50.0
	19	54.9	69.6	49.8	62.0	60.0	58.0	57.0	54.2	53.0	51.0	51.0	50.0
	20	54.6	71.6	49.2	61.0	59.0	57.0	56.0	54.0	53.0	51.0	50.0	49.0
	21	55.6	77.7	48.8	64.0	62.0	59.0	57.0	54.0	52.0	50.0	50.0	49.0
Night	22	54.7	73.9	49.2	61.0	59.0	56.0	55.0	53.0	52.0	50.0	50.0	49.0
	23	53.8	72.5	49.2	61.0	59.0	57.0	56.0	53.0	52.0	50.0	50.0	49.0

URBAN CROSSROADS

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APPENDIX 6.1:

FTA RAIL VIBRATION ADJUSTMENT FACTORS

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Table 10-1. Adjustment Factors for Generalized Predictions of Ground-Borne Vibration and Noise

Factors Affecting Vibration Source				
Source Factor	**Adjustment to Propagation Curve**			**Comment**
Speed		Reference Speed		Vibration level is approximately proportional to 20*log(speed/speed$_{ref}$). Sometimes the variation with speed has been observed to be as low as 10 to 15 log(speed/speed$_{ref}$).
	Vehicle Speed	50 mph	30 mph	
	60 mph	+1.6 dB	+6.0 dB	
	50 mph	0.0 dB	+4.4 dB	
	40 mph	-1.9 dB	+2.5 dB	
	30 mph	-4.4 dB	0.0 dB	
	20 mph	-8.0 dB	-3.5 dB	
Vehicle Parameters (not additive, apply greatest value only)				
Vehicle with stiff primary suspension	+8 dB			Transit vehicles with stiff primary suspensions have been shown to create high vibration levels. Include this adjustment when the primary suspension has a vertical resonance frequency greater than 15 Hz.
Resilient Wheels	0 dB			Resilient wheels do not generally affect ground-borne vibration except at frequencies greater than about 80 Hz.
Worn Wheels or Wheels with Flats	+10 dB			Wheel flats or wheels that are unevenly worn can cause high vibration levels. This can be prevented with wheel truing and slip-slide detectors to prevent the wheels from sliding on the track.
Track Conditions (not additive, apply greatest value only)				
Worn or Corrugated Track	+10 dB			If both the wheels and the track are worn, only one adjustment should be used. Corrugated track is a common problem. Mill scale on new rail can cause higher vibration levels until the rail has been in use for some time.
Special Trackwork	+10 dB			Wheel impacts at special trackwork will significantly increase vibration levels. The increase will be less at greater distances from the track.
Jointed Track or Uneven Road Surfaces	+5 dB			Jointed track can cause higher vibration levels than welded track. Rough roads or expansion joints are sources of increased vibration for rubber-tire transit.
Track Treatments (not additive, apply greatest value only)				
Floating Slab Trackbed	-15 dB			The reduction achieved with a floating slab trackbed is strongly dependent on the frequency characteristics of the vibration.
Ballast Mats	-10 dB			Actual reduction is strongly dependent on frequency of vibration.
High-Resilience Fasteners	-5 dB			Slab track with track fasteners that are very compliant in the vertical direction can reduce vibration at frequencies greater than 40 Hz.

Table 10-1. Adjustment Factors for Generalized Predictions of Ground-Borne Vibration and Noise (Continued)

Factors Affecting Vibration Path			
Path Factor	**Adjustment to Propagation Curve**		**Comment**
Resiliently Supported Ties	-10 dB		Resiliently supported tie systems have been found to provide very effective control of low-frequency vibration.
Track Configuration (not additive, apply greatest value only)			
Type of Transit Structure	Relative to at-grade tie & ballast: Elevated structure -10 dB Open cut 0 dB		The general rule is the heavier the structure, the lower the vibration levels. Putting the track in cut may reduce the vibration levels slightly. Rock-based subways generate higher-frequency vibration.
	Relative to bored subway tunnel in soil: Station -5 dB Cut and cover -3 dB Rock-based - 15 dB		
Ground-borne Propagation Effects			
Geologic conditions that promote efficient vibration propagation	Efficient propagation in soil +10 dB		Refer to the text for guidance on identifying areas where efficient propagation is possible.
	Propagation in rock layer	**Dist.** 50 ft 100 ft 150 ft 200 ft	**Adjust.** +2 dB +4 dB +6 dB +9 dB	The positive adjustment accounts for the lower attenuation of vibration in rock compared to soil. It is generally more difficult to excite vibrations in rock than in soil at the source.
Coupling to building foundation	Wood Frame Houses -5 dB 1-2 Story Masonry -7 dB 3-4 Story Masonry -10 dB Large Masonry on Piles -10 dB Large Masonry on Spread Footings -13 dB Foundation in Rock 0 dB		The general rule is the heavier the building construction, the greater the coupling loss.
Factors Affecting Vibration Receiver			
Receiver Factor	**Adjustment to Propagation Curve**		**Comment**
Floor-to-floor attenuation	1 to 5 floors above grade: -2 dB/floor 5 to 10 floors above grade: -1 dB/floor		This factor accounts for dispersion and attenuation of the vibration energy as it propagates through a building.
Amplification due to resonances of floors, walls, and ceilings	+6 dB		The actual amplification will vary greatly depending on the type of construction. The amplification is lower near the wall/floor and wall/ceiling intersections.
Conversion to Ground-borne Noise			
Noise Level in dBA	Peak frequency of ground vibration: Low frequency (<30 Hz): -50 dB Typical (peak 30 to 60 Hz): -35 dB High frequency (>60 Hz): -20 dB		Use these adjustments to estimate the A-weighted sound level given the average vibration velocity level of the room surfaces. See text for guidelines for selecting low, typical or high frequency characteristics. Use the high-frequency adjustment for subway tunnels in rock or if the dominant frequencies of the vibration spectrum are known to be 60 Hz or greater.

APPENDIX 8.1:

ON-SITE RAIL NOISE LEVEL CALCULATIONS

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Federal Transit Administration
Noise Impact Assessment Spreadsheet

version: 7/3/2007

Project:	**11587**

Project Results Summary

Existing CNEL:	62 dBA
Total Project CNEL:	59 dBA
Total Noise Exposure:	64 dBA
Increase:	2 dB

Receiver Parameters	
Receiver:	**Northern Façade**
Land Use Category:	
Existing Noise (Measured or Generic Value):	**62 dBA**

Distance to Impact Contours

Dist to Mod. Impact Contour:	---
Dist to Sev. Impact Contour:	---

Noise Source Parameters	
Number of Noise Sources:	**3**

Noise Source Parameters		**Source 1**
	Source Type:	Fixed Guideway
	Specific Source:	Diesel Electric Locomotive
Daytime hrs	**Avg. Number of Locos/train**	1
	Speed (mph)	60
	Avg. Number of Events/hr	0.2
Nighttime hrs	**Avg. Number of Locos/train**	1
	Speed (mph)	60
	Avg. Number of Events/hr	0.2
Distance	**Distance from Source to Receiver (ft)**	170
	Number of Intervening Rows of Buildings	0
Adjustments		

Source 1 Results

Leq(day):	40.6 dBA
Leq(night):	40.6 dBA
Ldn:	47.1 dBA

Noise Source Parameters		**Source 2**
	Source Type:	Fixed Guideway
	Specific Source:	Rail Car
Daytime hrs	**Avg. Number of Rail Cars/train**	75
	Speed (mph)	60
	Avg. Number of Events/hr	0.2
Nighttime hrs	**Avg. Number of Rail Cars/train**	75
	Speed (mph)	60
	Avg. Number of Events/hr	0.2
Distance	**Distance from Source to Receiver (ft)**	170
	Number of Intervening Rows of Buildings	0
Adjustments	**Noise Barrier?**	No
	Jointed Track?	No
	Embedded Track?	No
	Aerial Structure?	No

Source 2 Results

Leq(day):	51.8 dBA
Leq(night):	51.8 dBA
Ldn:	58.2 dBA
Incremental Ldn (Src 1-2):	58.5 dBA

Noise Source Parameters		**Source 3**
	Source Type:	Fixed Guideway
	Specific Source:	Diesel Multiple Unit (DMU)
Daytime hrs	**Avg. Number of DMU's/train**	2
	Speed	79
	Avg. Number of Events/hr	1.9
Nighttime hrs	**Avg. Number of DMU's/train**	2
	Speed	79
	Avg. Number of Events/hr	0.9
Distance	**Distance from Source to Receiver (ft)**	170
	Number of Intervening Rows of Buildings	0
Adjustments		

Source 3 Results

Leq(day):	47.2 dBA
Leq(night):	44.0 dBA
Ldn:	51.0 dBA
Incremental Ldn (Src 1-3):	59.2 dBA

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APPENDIX 9.1:

OPERATIONAL NOISE LEVEL CALCULATIONS

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STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R1**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	523.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	523.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	523.0	-24.8	-24.8	-24.8	-24.8	-24.8	-24.8
Shielding (Barrier Attenuation)	523.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		42.4	-24.8	-24.8	-24.8	-24.8	-24.8
60 Minute Hourly Adjustment		**42.4**	**-24.8**	**-24.8**	**-24.8**	**-24.8**	**-24.8**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R1**
Source: Roof-Top Air Conditioning Unit
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	667.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	667.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	30.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	667.0	-42.5	-42.5	-42.5	-42.5	-42.5	-42.5
Shielding (Barrier Attenuation)	667.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		34.7	-42.5	-42.5	-42.5	-42.5	-42.5
39 Minute Hourly Adjustment		**32.8**	**-44.4**	**-44.4**	**-44.4**	**-44.4**	**-44.4**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R1**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	709.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	709.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	10.0	52.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	709.0	-27.8	-27.8	-27.8	-27.8	-27.8	-27.8
Shielding (Barrier Attenuation)	709.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		24.4	-27.8	-27.8	-27.8	-27.8	-27.8
60 Minute Hourly Adjustment		**24.4**	**-27.8**	**-27.8**	**-27.8**	**-27.8**	**-27.8**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R2**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	437.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	437.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	437.0	-23.3	-23.3	-23.3	-23.3	-23.3	-23.3
Shielding (Barrier Attenuation)	437.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		43.9	-23.3	-23.3	-23.3	-23.3	-23.3
60 Minute Hourly Adjustment		**43.9**	**-23.3**	**-23.3**	**-23.3**	**-23.3**	**-23.3**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R2**
Source: Roof-Top Air Conditioning Unit
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	450.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	450.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	30.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	450.0	-39.1	-39.1	-39.1	-39.1	-39.1	-39.1
Shielding (Barrier Attenuation)	450.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		38.1	-39.1	-39.1	-39.1	-39.1	-39.1
39 Minute Hourly Adjustment		**36.2**	**-41.0**	**-41.0**	**-41.0**	**-41.0**	**-41.0**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R2**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	481.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	481.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	10.0	52.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	481.0	-25.2	-25.2	-25.2	-25.2	-25.2	-25.2
Shielding (Barrier Attenuation)	481.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		27.0	-25.2	-25.2	-25.2	-25.2	-25.2
60 Minute Hourly Adjustment		**27.0**	**-25.2**	**-25.2**	**-25.2**	**-25.2**	**-25.2**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R3**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	363.0 feet	***Barrier Height:***	**30.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	353.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	363.0	-21.7	-21.7	-21.7	-21.7	-21.7	-21.7
Shielding (Barrier Attenuation)	10.0	-17.7	-17.7	-17.7	-17.7	-17.7	-17.7
Raw (Distance + Barrier)		27.8	-39.4	-39.4	-39.4	-39.4	-39.4
60 Minute Hourly Adjustment		**27.8**	**-39.4**	**-39.4**	**-39.4**	**-39.4**	**-39.4**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R3**
Source: Roof-Top Air Conditioning Unit
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	133.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	133.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	30.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	133.0	-28.5	-28.5	-28.5	-28.5	-28.5	-28.5
Shielding (Barrier Attenuation)	133.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		48.7	-28.5	-28.5	-28.5	-28.5	-28.5
39 Minute Hourly Adjustment		**46.8**	**-30.4**	**-30.4**	**-30.4**	**-30.4**	**-30.4**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R3**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	72.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	72.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	10.0	52.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	72.0	-12.9	-12.9	-12.9	-12.9	-12.9	-12.9
Shielding (Barrier Attenuation)	72.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		39.3	-12.9	-12.9	-12.9	-12.9	-12.9
60 Minute Hourly Adjustment		**39.3**	**-12.9**	**-12.9**	**-12.9**	**-12.9**	**-12.9**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R4**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	305.0 feet	***Barrier Height:***	**30.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	295.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	305.0	-20.1	-20.1	-20.1	-20.1	-20.1	-20.1
Shielding (Barrier Attenuation)	10.0	-17.7	-17.7	-17.7	-17.7	-17.7	-17.7
Raw (Distance + Barrier)		29.4	-37.8	-37.8	-37.8	-37.8	-37.8
60 Minute Hourly Adjustment		**29.4**	**-37.8**	**-37.8**	**-37.8**	**-37.8**	**-37.8**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R4**
Source: Roof-Top Air Conditioning Unit
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	83.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	83.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	30.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	83.0	-24.4	-24.4	-24.4	-24.4	-24.4	-24.4
Shielding (Barrier Attenuation)	83.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		52.8	-24.4	-24.4	-24.4	-24.4	-24.4
39 Minute Hourly Adjustment		**50.9**	**-26.3**	**-26.3**	**-26.3**	**-26.3**	**-26.3**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R4**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	26.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	26.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	10.0	52.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	26.0	-6.2	-6.2	-6.2	-6.2	-6.2	-6.2
Shielding (Barrier Attenuation)	26.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		46.0	-6.2	-6.2	-6.2	-6.2	-6.2
60 Minute Hourly Adjustment		**46.0**	**-6.2**	**-6.2**	**-6.2**	**-6.2**	**-6.2**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R5** *Project Name:* 8th & Haven
Source: Unloading/Docking Activity *Job Number:* 11587
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	773.0 feet	***Barrier Height:***	**30.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	763.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	773.0	-28.2	-28.2	-28.2	-28.2	-28.2	-28.2
Shielding (Barrier Attenuation)	10.0	-17.6	-17.6	-17.6	-17.6	-17.6	-17.6
Raw (Distance + Barrier)		21.4	-45.8	-45.8	-45.8	-45.8	-45.8
60 Minute Hourly Adjustment		**21.4**	**-45.8**	**-45.8**	**-45.8**	**-45.8**	**-45.8**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R5** *Project Name:* 8th & Haven
Source: Roof-Top Air Conditioning Unit *Job Number:* 11587
Condition: Operational *Analyst:* A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	551.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	551.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	30.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	551.0	-40.8	-40.8	-40.8	-40.8	-40.8	-40.8
Shielding (Barrier Attenuation)	551.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		36.4	-40.8	-40.8	-40.8	-40.8	-40.8
39 Minute Hourly Adjustment		**34.5**	**-42.7**	**-42.7**	**-42.7**	**-42.7**	**-42.7**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R5**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	488.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	488.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	10.0	52.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	488.0	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3
Shielding (Barrier Attenuation)	488.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		26.9	-25.3	-25.3	-25.3	-25.3	-25.3
60 Minute Hourly Adjustment		**26.9**	**-25.3**	**-25.3**	**-25.3**	**-25.3**	**-25.3**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R6**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	173.0 feet	***Barrier Height:***	**30.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	163.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	173.0	-15.2	-15.2	-15.2	-15.2	-15.2	-15.2
Shielding (Barrier Attenuation)	10.0	-17.8	-17.8	-17.8	-17.8	-17.8	-17.8
Raw (Distance + Barrier)		34.2	-33.0	-33.0	-33.0	-33.0	-33.0
60 Minute Hourly Adjustment		**34.2**	**-33.0**	**-33.0**	**-33.0**	**-33.0**	**-33.0**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R6**
Source: Roof-Top Air Conditioning Unit
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	237.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	237.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	30.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	237.0	-33.5	-33.5	-33.5	-33.5	-33.5	-33.5
Shielding (Barrier Attenuation)	237.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		43.7	-33.5	-33.5	-33.5	-33.5	-33.5
39 Minute Hourly Adjustment		**41.8**	**-35.4**	**-35.4**	**-35.4**	**-35.4**	**-35.4**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R6**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	45.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	45.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	10.0	52.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	45.0	-9.8	-9.8	-9.8	-9.8	-9.8	-9.8
Shielding (Barrier Attenuation)	45.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		42.4	-9.8	-9.8	-9.8	-9.8	-9.8
60 Minute Hourly Adjustment		**42.4**	**-9.8**	**-9.8**	**-9.8**	**-9.8**	**-9.8**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R7**
Source: Unloading/Docking Activity
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	139.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	139.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	30.0	67.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	139.0	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3
Shielding (Barrier Attenuation)	139.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		53.9	-13.3	-13.3	-13.3	-13.3	-13.3
60 Minute Hourly Adjustment		**53.9**	**-13.3**	**-13.3**	**-13.3**	**-13.3**	**-13.3**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/13/2018

Observer Location: **R7**
Source: Roof-Top Air Conditioning Unit
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	416.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	416.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	30.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	5.0	77.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	416.0	-38.4	-38.4	-38.4	-38.4	-38.4	-38.4
Shielding (Barrier Attenuation)	416.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		38.8	-38.4	-38.4	-38.4	-38.4	-38.4
39 Minute Hourly Adjustment		**36.9**	**-40.3**	**-40.3**	**-40.3**	**-40.3**	**-40.3**

STATIONARY SOURCE NOISE PREDICTION MODEL

4/13/2018

Observer Location: **R7**
Source: Parking Lot Vehicle Movements
Condition: Operational

Project Name: 8th & Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	457.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	457.0 feet	*Noise Source Height:*	5.0 feet
Barrier Distance to Observer:	0.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	0.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	0.0 feet	*Drop Off Coefficient:*	15.0
Barrier Elevation:	0.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	10.0	52.2	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	457.0	-24.9	-24.9	-24.9	-24.9	-24.9	-24.9
Shielding (Barrier Attenuation)	457.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		27.3	-24.9	-24.9	-24.9	-24.9	-24.9
60 Minute Hourly Adjustment		**27.3**	**-24.9**	**-24.9**	**-24.9**	**-24.9**	**-24.9**

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APPENDIX 11.1:

TEMPORARY CONSTRUCTION NOISE BARRIER ATTENUATION CALCULATIONS

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STATIONARY SOURCE NOISE PREDICTION MODEL 4/18/2018

Observer Location: **R3**
Source: Highest Ref. Mobile Equipment
Condition: Construction Mitigation

Project Name: 8th and Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	75.0 feet	***Barrier Height:***	**10.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	65.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	1,105.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	1,103.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	1,105.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	50.0	73.5	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	75.0	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5
Shielding (Barrier Attenuation)	10.0	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1
Raw (Distance + Barrier)		59.9	-13.6	-13.6	-13.6	-13.6	-13.6
60 Minute Hourly Adjustment		**59.9**	**-13.6**	**-13.6**	**-13.6**	**-13.6**	**-13.6**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/18/2018

Observer Location: **R4**
Source: Highest Ref. Mobile Equipment
Condition: Construction Mitigation

Project Name: 8th and Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	20.0 feet	***Barrier Height:***	**10.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	10.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	1,105.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	1,103.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	1,105.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	50.0	73.5	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	20.0	8.0	8.0	8.0	8.0	8.0	8.0
Shielding (Barrier Attenuation)	10.0	-12.1	-12.1	-12.1	-12.1	-12.1	-12.1
Raw (Distance + Barrier)		69.4	-4.1	-4.1	-4.1	-4.1	-4.1
60 Minute Hourly Adjustment		**69.4**	**-4.1**	**-4.1**	**-4.1**	**-4.1**	**-4.1**

STATIONARY SOURCE NOISE PREDICTION MODEL 4/18/2018

Observer Location: **R6**
Source: Highest Ref. Mobile Equipment
Condition: Construction Mitigation

Project Name: 8th and Haven
Job Number: 11587
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	45.0 feet	***Barrier Height:***	**6.0 feet**
Noise Distance to Barrier:	10.0 feet	*Noise Source Height:*	8.0 feet
Barrier Distance to Observer:	35.0 feet	*Observer Height:*	5.0 feet
Observer Elevation:	1,094.0 feet	*Barrier Type (0-Wall, 1-Berm):*	0
Noise Source Elevation:	1,097.0 feet	*Drop Off Coefficient:*	20.0
Barrier Elevation:	1,097.0 feet		

20 = 6 dBA per doubling of distance
15 = 4.5 dBA per doubling of distance

NOISE MODEL PROJECTIONS

Noise Level	*Distance (feet)*	*Leq*	*L50*	*L25*	*L8*	*L2*	*Lmax*
Reference (Sample)	50.0	73.5	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	45.0	0.9	0.9	0.9	0.9	0.9	0.9
Shielding (Barrier Attenuation)	10.0	-4.6	-4.6	-4.6	-4.6	-4.6	-4.6
Raw (Distance + Barrier)		69.8	-3.7	-3.7	-3.7	-3.7	-3.7
60 Minute Hourly Adjustment		**69.8**	**-3.7**	**-3.7**	**-3.7**	**-3.7**	**-3.7**

APPENDIX 11.2:

TEMPORARY CONSTRUCTION NOISE BARRIER SAMPLE PHOTOS

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Temporary Construction Noise Barrier Examples

I-Beam & Acoustic Material 01

I-Beam & Acoustic Material 02

I-Beam & Acoustic Material 03

K-Rail Plywood & Acoustic Material

K-Rail Temporary Fence & Acoustic Material

K-Rail-Mounted Acoustic Material 01

Temporary Construction Noise Barrier Examples

Pillar & Acoustic Material

Straw Bales 01

Straw Bales 02

Temporary Fence & Acoustic Material 01

Temporary Fence & Acoustic Material 02