Harvard Road Project

NOISE IMPACT ANALYSIS

COUNTY OF SAN BERNARDINO

PREPARED BY:

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

Alex Wolfe, INCE
awolfe@urbanxroads.com
(949) 336-5977

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LIST OF ABBREVIATED TERMS

(1)	Reference
ADT	Average Daily Traffic
Calveno	California Vehicle Noise
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dBA	A-weighted decibels
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
Hz	Hertz
I-15	Interstate 15
INCE	Institute of Noise Control Engineering
Leq	Equivalent continuous (average) sound level
Lmax	Maximum level measured over the time interval
Lmin	Minimum level measured over the time interval
mph	Miles per hour
OPR	Office of Planning and Research
PPV	Peak particle velocity
Project	Harvard Road Project
REMEL	Reference Energy Mean Emission Level
RMS	Root-mean-square
VdB	Vibration Decibels

EXECUTIVE SUMMARY

Urban Crossroads, Inc. has prepared this noise study to determine the noise exposure and the necessary noise mitigation measures for the proposed Harvard Road Project development ("Project"). The Project site is located at the southwest corner of Harvard Road and Hacienda Road in unincorporated County of San Bernardino, and is proposed to consist of a truck and gas station with 20 fueling stations, and a convenience store. This noise study has been prepared to satisfy applicable local jurisdiction noise standards consistent with the County of San Bernardino Department of Environmental Health Services Plan Check comments for the Harvard Road Project, provided in Appendix ES.1. (1)

ON-SITE TRAFFIC NOISE ANALYSIS

The on-site traffic noise level analysis indicates that the convenience store building within the Project site will experience unmitigated exterior noise levels approaching 62.2 dBA CNEL. Although the County of San Bernardino Development Code, Table 83-3, does not identify exterior noise level standards for commercial retail uses such as the Project, this noise study calculates the future exterior traffic noise levels at the convenience store building façade to determine if the interior noise levels will satisfy the County of San Bernardino 50 dBA CNEL interior noise level standard. (2)

INTERIOR NOISE ANALYSIS

To provide the necessary interior noise reduction, the Project building will require a windows-closed condition and a means of mechanical ventilation (e.g. air conditioning). The future unmitigated noise levels at the building façade are expected to approach 62.2 dBA CNEL. Based on standard building construction materials providing a noise reduction of 25 dBA CNEL, the interior noise levels within Project convenience store building will approach 37.2 dBA CNEL and will satisfy the 50 dBA CNEL interior noise level criteria of the County of San Bernardino Development Code, Table 83.3 for commercial retail uses. The interior noise analysis shows that with the recommended interior noise abatement measures described below the Project will satisfy the County of San Bernardino interior noise level standards:

- Windows: All windows shall be well fitted, well weather-stripped assemblies and shall have a minimum, standard sound transmission class (STC) ratings of 27 for the classrooms within the Project building.
- Doors: All exterior doors shall be well weather-stripped and have minimum STC ratings of 25. Well-sealed perimeter gaps around the doors are essential to achieve the optimal STC rating. (3)
- Walls: At any penetrations of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts, or conduits shall be caulked or filled with mortar to form an airtight seal.
- Ventilation: Arrangements for any habitable room shall be such that any exterior door or window can be kept closed when the room is in use and still receive circulated air. A forced air circulation system (e.g. air conditioning) or active ventilation system (e.g. fresh air supply) shall be provided which satisfies the requirements of the Uniform Building Code.

OPERATIONAL NOISE ANALYSIS

Using reference noise levels to represent the expected noise sources from the Harvard Road Project site, this analysis estimates the Project-related stationary-source noise levels at nearby sensitive receiver locations. The normal activities associated with the proposed Harvard Road Project are anticipated to include roof-top air conditioning units, parking lot vehicle movements, and gas station fuel pump activities. The operational noise analysis shows that the Project-related stationary-source noise levels of up to 43.3 dBA Leq at the nearby sensitive receiver locations will satisfy the County of San Bernardino Development Code daytime 55 dBA Leq and nighttime 45 dBA Leq exterior noise level standards at all receiver locations. Therefore, the Project-related operational noise level impacts will be *less than significant*.

In addition, Project operational noise levels approaching 43.3 dBA Leq are expected to be largely overshadowed by the existing background traffic noise levels measured in the Project study area which ranged between 50.8 to 74.6 dBA Leq during the daytime hours, and between 50.3 to 74.3 dBA Leq during the nighttime hours.

CONSTRUCTION NOISE AND VIBRATION ANALYSIS

Construction-related noise impacts 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 the Harvard Road Project site, this analysis estimates the Project-related construction noise levels at nearby sensitive receiver locations. Since the County of San Bernardino General Plan and County Code do not identify specific construction noise level limits, the National Institute for Occupational Safety and Health (NIOSH) 85 dBA Leq threshold for construction noise levels is used in this analysis. The Project-related short-term construction noise levels will range from 45.8 to 61.4 dBA Leq at the nearby sensitive receiver locations, and therefore, will satisfy the 85 dBA Leq threshold. Based on the results of this analysis, all nearby sensitive receiver locations will experience *less than significant* impacts due to Project construction noise levels. Further, Project construction noise levels ranging from 45.8 to 61.4 dBA Leq are expected to be largely overshadowed by the existing background traffic noise levels measured in the Project study area which ranged between 50.8 to 74.6 dBA Leq during the daytime hours when construction activities would take place.

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. This analysis shows the highest construction vibration levels are expected to approach a peak particle velocity (PPV) of 0.001 in/sec at the nearby receiver locations which is below the County of San Bernardino Development Code vibration standard of 0.2 in/sec PPV at all receiver locations during Project construction. Therefore, the Project-related vibration impacts are considered *less than significant* during the construction activities at the Project site.

Further, the Project-related construction vibration levels do not represent levels capable of causing building damage to nearby residential homes. The Federal Transit Administration (FTA) identifies construction vibration levels capable of building damage ranging from 0.12 to 0.5 in/sec

PPV. (4) The peak Project-construction vibration levels will approach 0.001 in/sec PPV, and are below the FTA vibration levels for building damage at the residential homes near the Project site. Further, the impacts at the site of the closest sensitive receivers are unlikely to be sustained during the entire construction period, but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site perimeter nearest the closest sensitive receiver. Construction at the Project site will be restricted to daytime hours consistent with City requirements thereby eliminating potential vibration impact during the sensitive nighttime hours.

Construction Noise Abatement Measures

Though construction noise is temporary, intermittent and of short duration, and will not present any long-term impacts, the following practices would reduce noise level increases produced by the construction equipment to the nearby noise-sensitive residential land uses:

- Prior to approval of grading plans and/or issuance of building permits, plans shall include a note indicating that noise-generating Project construction activities shall only occur between the hours of 7:00 a.m. to 7:00 p.m.; with no activity on Sundays and Federal holidays (Section 83.01.080(g)(3) of the County of San Bernardino Development Code).
- 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 receptors 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).
- The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment (between the hours of 7:00 a.m. to 7:00 p.m.; with no activity on Sundays and Federal holidays). The contractor shall design delivery routes to minimize the exposure of sensitive land uses or residential dwellings to delivery truck-related noise, consistent with County of San Bernardino General Plan Noise Element, Policy N 1.5.

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1 INTRODUCTION

This noise analysis has been completed to determine the noise impacts associated with the development of the proposed Harvard Road Project ("Project"). This noise study briefly describes the proposed Project, provides information regarding noise fundamentals, describes the local regulatory setting, provides the study methods and procedures for traffic noise analysis, and evaluates the future exterior noise environment. 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 Harvard Road Project site is located at the southwest corner of Harvard Road and Hacienda Road in an unincorporated community in County of San Bernardino, as shown on Exhibit 1-A. The Project site is currently vacant. It is bound to the north and west by Hacienda Road and undeveloped land, to the east by Harvard Road and undeveloped land, and the Interstate 15 (I-15) Freeway to the south. Existing residential homes are located west, north, and east of the Project site.

1.2 PROJECT DESCRIPTION

The Project is proposed to consist of a truck and gas station with 20 fueling stations, and a convenience store, as shown on Exhibit 1-B. The on-site Project-related noise sources are expected to include: roof-top air conditioning units, parking lot vehicle movements, and gas station fuel pump activities.

EXHIBIT 1-A: LOCATION MAP

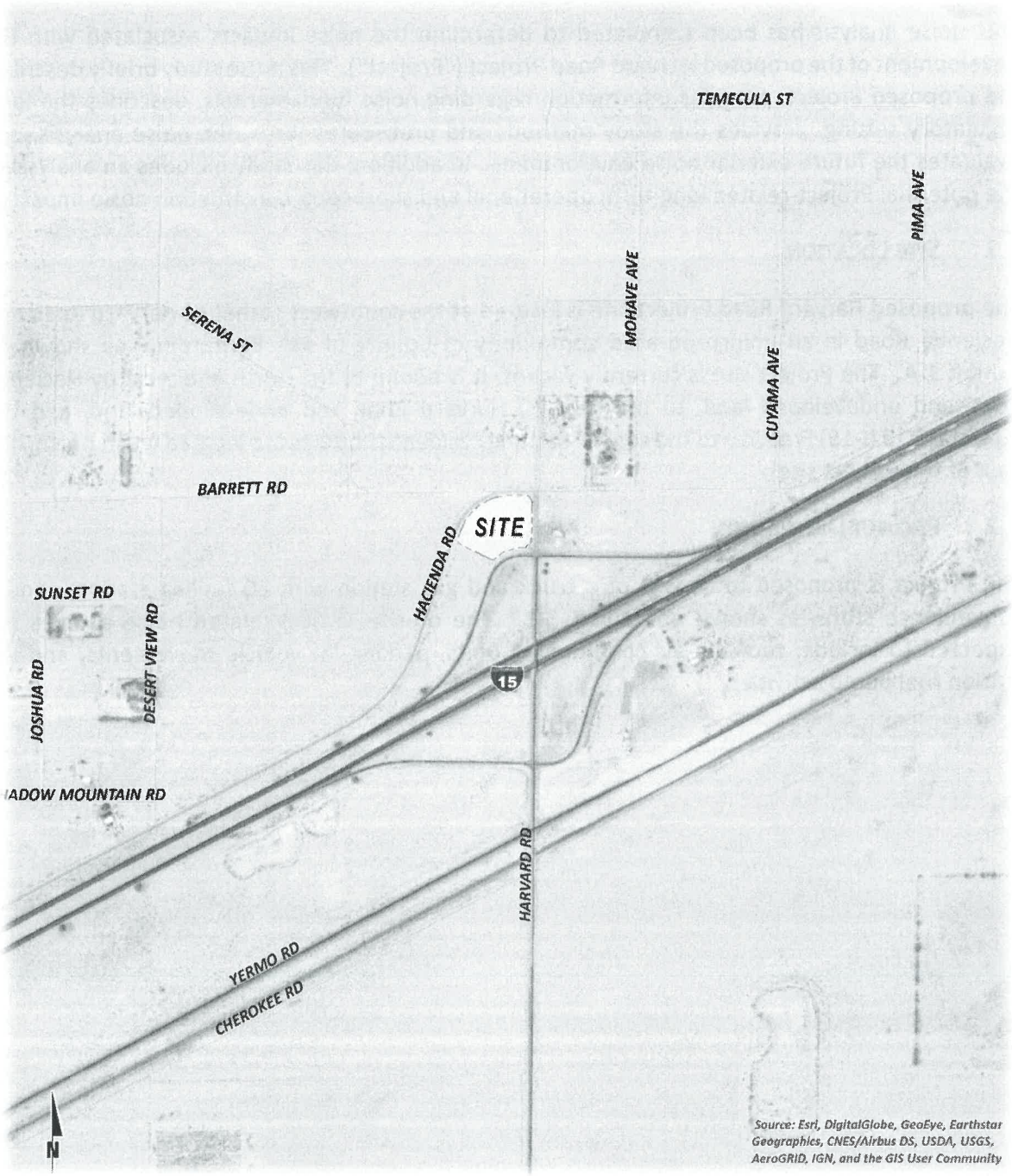
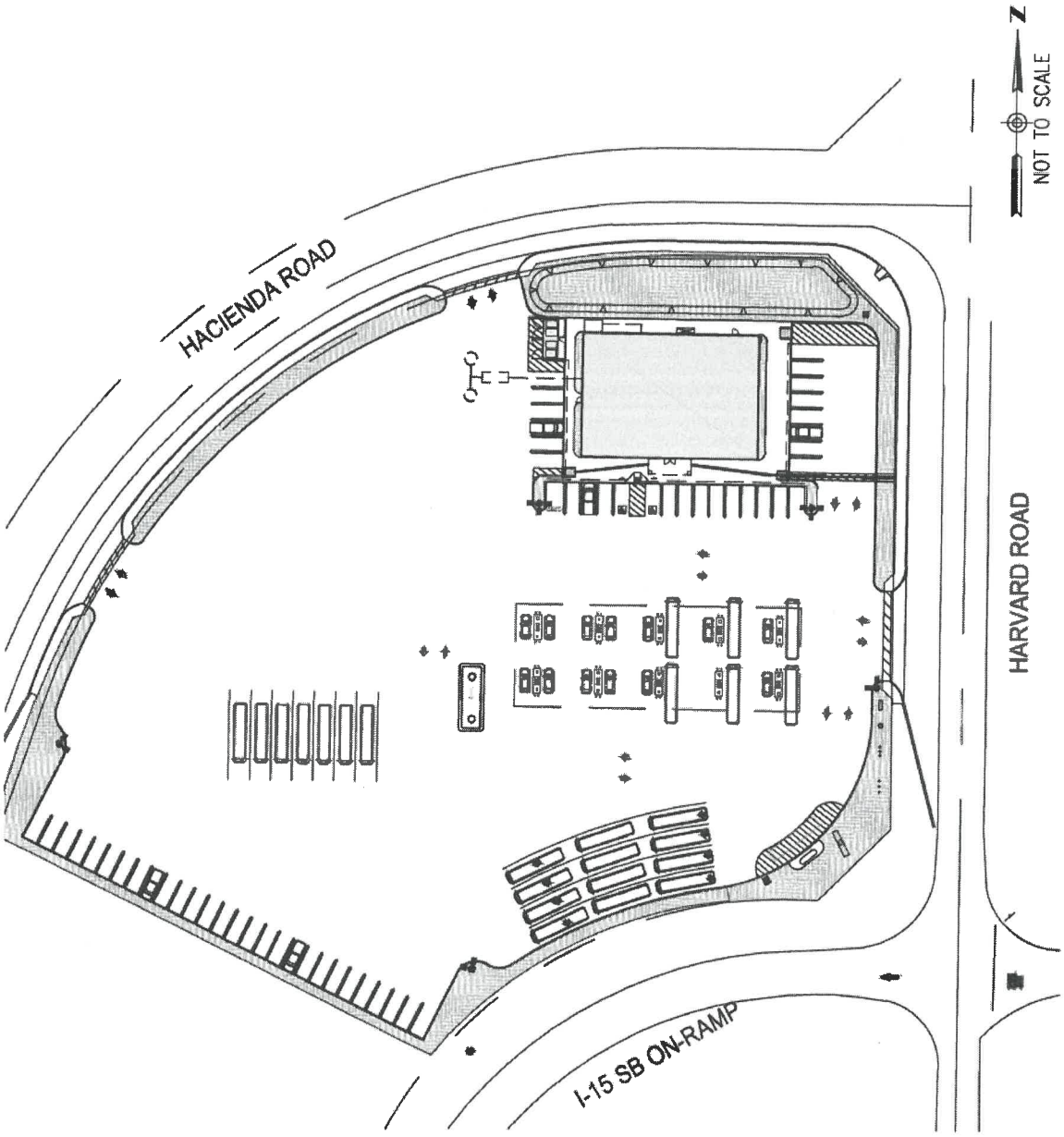


EXHIBIT 1-B: SITE PLAN



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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	
QUIET URBAN NIGHTTIME	THEATER, LARGE CONFERENCE ROOM (BACKGROUND)	40		SLEEP DISTURBANCE
QUIET SUBURBAN NIGHTTIME	LIBRARY	30	FAINT	NO EFFECT
QUIET RURAL NIGHTTIME	BEDROOM AT NIGHT, CONCERT HALL (BACKGROUND)	20		
	BROADCAST/RECORDING STUDIO	10	VERY FAINT	
LOWEST THRESHOLD OF HUMAN HEARING	LOWEST THRESHOLD OF HUMAN HEARING	0		

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

2.1 RANGE OF NOISE

Since the range of intensities that the human ear can detect is so large, the scale frequently used to measure intensity is a scale based on multiples of 10, the logarithmic scale. The scale for measuring intensity is the decibel scale. Each interval of 10 decibels indicates a sound energy ten times greater than before, which is perceived by the human ear as being roughly twice as loud. (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 (Leq). 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 (Leq) 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 Leq sound levels in the evening from 7:00 p.m. to 10:00 p.m., and the addition of 10 decibels to dBA Leq 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 County of San Bernardino 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)

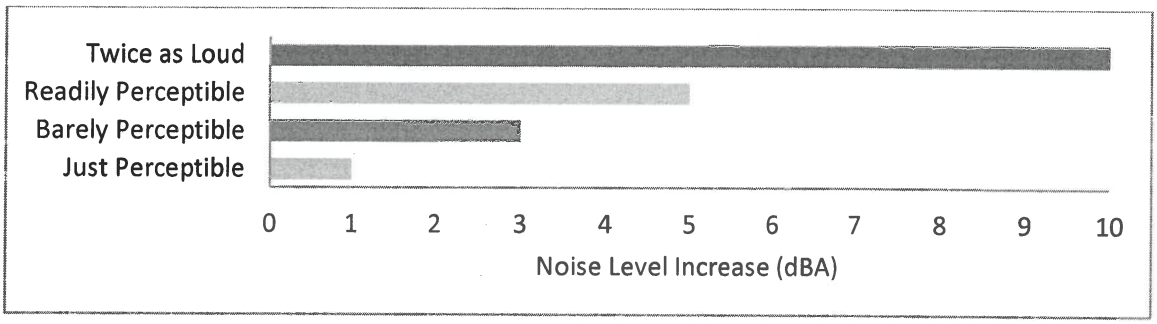
2.7 Community Response to Noise

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

EXHIBIT 2-B: NOISE LEVEL INCREASE PERCEPTION



2.8 EXPOSURE TO HIGH NOISE LEVELS

The Occupational Safety and Health Administration (OSHA) sets legal limits on noise exposure in the workplace. The permissible exposure limit (PEL) for a worker over an eight-hour day is 90 dBA. The OSHA standard uses a 5 dBA exchange rate. This means that when the noise level is increased by 5 dBA, the amount of time a person can be exposed to a certain noise level to receive the same dose is cut in half. The National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise induced hearing loss. NIOSH also recommends a 3 dBA exchange rate so that every increase by 3 dBA doubles the amount of the noise and halves the recommended amount of exposure time. (10)

OSHA has implemented requirements to protect all workers in general industry (e.g. the manufacturing and the service sectors) for employers to implement a Hearing Conservation Program where workers are exposed to a time weighted average noise level of 85 dBA or higher over an eight-hour work shift. Hearing Conservation Programs require employers to measure noise levels, provide free annual hearing exams and free hearing protection, provide training, and conduct evaluations of the adequacy of the hearing protectors in use unless changes to tools, equipment and schedules are made so that they are less noisy and worker exposure to noise is less than the 85 dBA. This noise study does not evaluate the noise exposure of workers within a project or construction site based on CEQA requirements, and instead, evaluates Project-related operational and construction noise levels at the nearby sensitive receiver locations in the Project study area. Further, periodic exposure to high noise levels in short duration, such as Project construction, is typically considered an annoyance and not impactful to human health. It would take several years of exposure to high noise levels to result in hearing impairment. (11)

2.9 VIBRATION

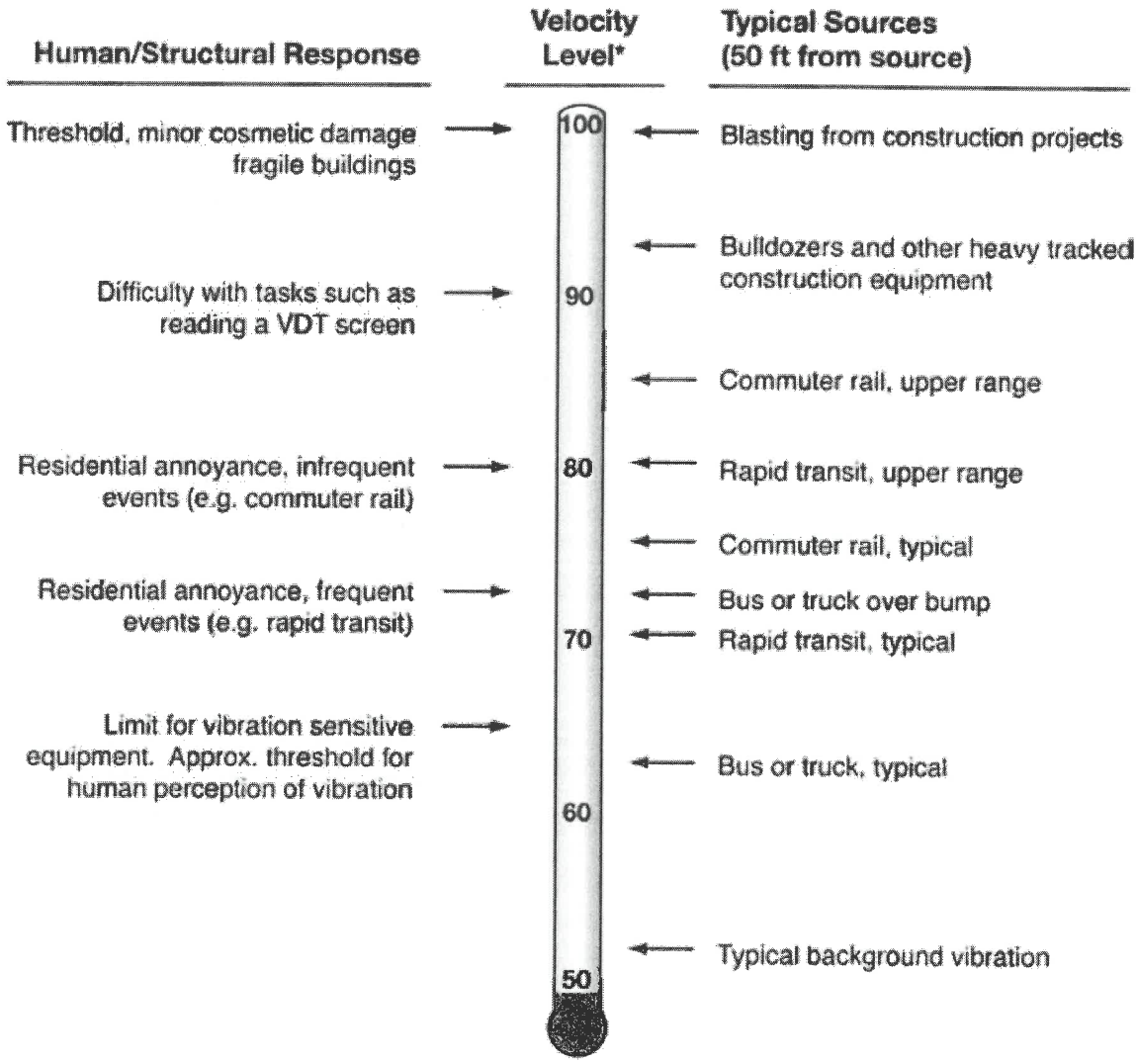
Per the Federal Transit Administration (FTA) *Transit Noise Impact and Vibration Assessment* (4), vibration is the periodic oscillation of a medium or object. The rumbling sound caused by the vibration of room surfaces is called structure-borne noise. Sources of ground-borne vibrations include natural 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.

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3 REGULATORY SETTING

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

3.1 STATE OF CALIFORNIA NOISE REQUIREMENTS

The State of California regulates freeway noise, sets standards for sound transmission, provides occupational noise control criteria, identifies noise standards, and provides guidance for local land use compatibility. State law requires that each county and city adopt a General Plan that includes a Noise Element which is to be prepared per guidelines adopted by the Governor's Office of Planning and Research (OPR). (12) The purpose of the Noise Element is to *limit the exposure of the community to excessive noise levels*.

3.2 STATE OF CALIFORNIA GREEN BUILDING STANDARDS CODE

The 2014 State of California's Green Building Standards Code contains mandatory measures for non-residential building construction in Section 5.507 on Environmental Comfort. (13) 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 Leq 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).

3.3 COUNTY OF SAN BERNARDINO GENERAL PLAN NOISE ELEMENT

The County of San Bernardino has adopted a Noise Element of the General Plan to limit the exposure of the community to excessive noise levels. (14) The most common sources of environmental noise in San Bernardino County are associated with roads, airports, railroad operations, and industrial activities. The facilities are used to transport residents, consumer products and provide basic infrastructure for the community. (14) To address these noise sources found in the County of San Bernardino, the following goals have been identified in the General Plan Noise Element:

N 1 *The County will abate and avoid excessive noise exposures through noise mitigation measures incorporated into the design of new noise-generating and new noise-sensitive land uses, while protecting areas within the County where the present noise environment is within acceptable limits.*

N 1.5 *Limit truck traffic in residential and commercial areas to designated truck routes; limit construction, delivery, and through-truck traffic to designated routes; and distribute maps of approved truck routes to County traffic officers.*

N 2 *The County will strive to preserve and maintain the quiet environment of mountain, desert and other rural areas.*

3.4 COUNTY OF SAN BERNARDINO DEVELOPMENT CODE

While the County of San Bernardino General Plan Noise Element provides guidelines and criteria to assess transportation noise on sensitive land uses, the County Code, Title 8 Development Code contains the noise level limits for mobile, stationary, and construction-related noise sources. (2)

3.4.1 TRANSPORTATION NOISE STANDARDS

Section 83.01.080(d), Table 83-3, contains the County of San Bernardino's mobile noise source-related standards, shown on Exhibit 3-A. Based on the County's mobile noise source standards, there are no exterior noise level standards for the convenience store (commercial retail) building of the Project, however, the interior noise level standard is 50 dBA CNEL.

EXHIBIT 3-A: COUNTY OF SAN BERNARDINO MOBILE NOISE LEVEL STANDARDS

Noise Standards for Adjacent Mobile Noise Sources			
Land Use		***Ldn (or CNEL) dB(A)***	
Categories	***Uses***	***Interior (1)***	***Exterior (2)***
Residential	Single and multi-family, duplex, mobile homes	45	60(3)
Commercial	Hotel, motel, transient housing	45	60(3)
	Commercial retail, bank, restaurant	50	N/A
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, auditorium, movie theater	45	N/A
Institutional/Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	N/A	65

Notes:

(1) The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors.

(2) The outdoor environment shall be limited to:

- Hospital/office building patios
- Hotel and motel recreation areas
- Mobile home parks
- Multi-family private patios or balconies
- Park picnic areas
- Private yard of single-family dwellings
- School playgrounds

(3) An exterior noise level of up to 65 dB(A) (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dB(A) (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

CNEL = (Community Noise Equivalent Level). The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m.

Source: County of San Bernardino County Code, Title 8 Development Code, Table 83-3.

3.4.2 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from a designated fixed location or private property such as the Harvard Road Project, stationary-source (operational) noise such as the expected roof-top air conditioning units, parking lot vehicle movements, and gas station fuel pump activities are typically evaluated against standards established under a jurisdiction's Municipal Code. Therefore, to accurately describe the potential Project-related operational noise levels, this analysis presents the appropriate stationary-source noise level standards from the County of San Bernardino County Code, Title 8 Development Code.

The County of San Bernardino County Code, Title 8 Development Code, Section 83.01.080(c) establishes the noise level standards for stationary noise sources. Since the Project's commercial land use will potentially impact adjacent noise-sensitive uses in the Project study are, this noise study relies on the more conservative residential noise level standards to describe potential operational noise impacts. For residential properties, the exterior noise level shall not exceed 55 dBA Leq during the daytime hours (7:00 a.m. to 10:00 p.m.) and 45 dBA Leq during the nighttime hours (10:00 p.m. to 7:00 a.m.). (2) The County of San Bernardino operational noise level standards are shown on Table 3-1 and included in Appendix 3.1.

TABLE 3-1: OPERATIONAL NOISE STANDARDS

Land Use[1]	Time Period	Exterior Noise Level Standards (dBA Leq)[2]
Residential	Daytime	55
	Nighttime	45
Professional Services	Anytime	55
Other Commercial	Anytime	60
Industrial	Anytime	70

[1] Source: Section 83.01.080(c) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).
[2] Leq 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.

3.4.3 CONSTRUCTION NOISE STANDARDS

To analyze noise impacts originating from the construction of the Harvard Road Project, noise from construction activities are typically limited to the hours of operation established under a jurisdiction's Municipal Code. Section 83.01.080(g)(3) of the County of San Bernardino Development Code, provided in Appendix 3.1, indicates that construction activity is considered exempt from the noise level standards between the hours of 7:00a.m. to 7:00 p.m. except on Sundays and Federal holidays, as shown on Table 3-1. (2) However, neither the County of San Bernardino General Plan or County Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers. Therefore, the following construction noise level threshold is used in this noise study.

To evaluate whether the Project will generate potentially significant construction noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the *Criteria for Recommended Standard: Occupational Noise Exposure* prepared by the National Institute for Occupational Safety and Health (NIOSH). (15) A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The construction related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3 dBA increase, the exposure time is cut in half. This results in noise level thresholds of 88 dBA for more than four hours per day, 92 dBA for more than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. (15) For the purposes of this analysis, the lowest, more conservative construction noise level threshold of 85 dBA Leq is used as an acceptable threshold for construction noise at the nearby sensitive receiver locations. Since this construction-related noise level threshold represents the energy average of the noise source over a given time, they are expressed as Leq noise levels. Therefore, the noise level threshold of 85 dBA Leq over a period of eight hours or more is used to evaluate the potential Project-related construction noise level impacts at the nearby sensitive receiver locations.

The 85 dBA Leq threshold is also consistent with the FTA *Transit Noise and Vibration Impact Assessment* criteria for construction noise which identifies an hourly construction noise level threshold of 90 dBA Leq during daytime hours, and 80 dBA Leq during nighttime hours for

construction for general assessment at residential uses. (4) Detailed assessment, according to the FTA, identifies an 8-hour dBA Leq noise level threshold specific to residential uses of 80 dBA Leq. Therefore, the Noise Study relies on the NIOSH 85 dBA Leq threshold, consistent with FTA general and detailed assessment criteria for residential uses and represents an appropriate threshold for construction noise analysis.

The Occupational Safety and Health Administration (OSHA) requires hearing protection be provided by employers in workplaces where the noise levels may, over long periods of exposure to high noise levels, endanger the hearing of their employees. Standard 29 CFR, Part 1910 indicates the noise levels under which a hearing conservation program is required to be provided to workers exposed to high noise levels. (10) This analysis does not evaluate the noise exposure of construction workers within the Project site based on CEQA requirements, and instead, evaluates the Project-related construction noise levels at the nearby sensitive receiver locations in the Project study area. Further, periodic exposure to high noise levels in short duration, such as Project construction, is typically considered an annoyance and not impactful to human health. It would take several years of exposure to high noise levels to result in hearing impairment. (11)

TABLE 3-2: CONSTRUCTION NOISE STANDARDS

Jurisdiction	Permitted Hours of Construction Activity	Construction Noise Level Standards
County of San Bernardino[1]	Exempt between 7:00 a.m. to 7:00 p.m.; except Sundays and Federal holidays.	85 dBA Leq[2]

[1] Source: Section 83.01.080(g)(3) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).
[2] The County Code does not identify maximum acceptable construction source noise levels. Therefore, construction noise levels are evaluated based on the NIOSH Criteria for Recommended Standard: Occupational Noise Exposure, June 1998.

3.4.4 Construction Vibration Standards

To analyze vibration impacts originating from the operation and construction of the Harvard Road Project, vibration-generating activities are typically evaluated against standards established under a jurisdiction's Municipal Code. Therefore, the County of San Bernardino Development Code vibration level standards are used in this analysis to assess potential impacts at nearby sensitive receiver locations. The vibration standards are summarized on Table 3-3.

The County of San Bernardino Development Code, Section 83.01.090(a) states that vibration shall be no *greater than or equal to two-tenths inches per second measured at or beyond the lot line.* (2) Therefore, to determine if the vibration levels due to the operation and construction of the Project, the peak particle velocity (PPV) vibration level standard of 0.2 inches per second is used.

TABLE 3-3: VIBRATION STANDARDS

Jurisdiction	Peak Particle Velocity (PPV) (inches/second)
County of San Bernardino[1]	0.2 in/sec

[1] Source: Section 83.01.090(a) of the County of San Bernardino County Code, Title 8 Development Code (Appendix 3.1).

4 EXISTING NOISE LEVEL MEASUREMENTS

To assess the existing noise level environment, four 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 4-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 July 1st, 2017. Appendix 4.1 includes study area photos.

4.1 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. (16)

4.2 NOISE MEASUREMENT LOCATIONS

The long-term noise level measurements were positioned as close to the nearest sensitive receiver locations as possible to assess the existing ambient hourly noise levels surrounding the Project site. Both Caltrans and the FTA recognize that it is not reasonable to collect noise level measurements that can fully represent every part of a private yard, patio, deck, or balcony normally used for human activity when estimating impacts for new development projects. This is demonstrated in the Caltrans general site location guidelines which indicate that, *sites must be free of noise contamination by sources other than sources of interest. Avoid sites located near sources such as barking dogs, lawnmowers, pool pumps, and air conditioners unless it is the express intent of the analyst to measure these sources.* (5) Further, FTA guidance states, t*hat it is not necessary nor recommended that existing noise exposure be determined by measuring at every noise-sensitive location in the project area. Rather, the recommended approach is to characterize the noise environment for clusters of sites based on measurements or estimates at representative locations in the community*. (4)

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. (4) 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.

4.3 Noise Measurement Results

The noise measurements presented below focus on the average or equivalent sound levels (Leq). The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. Table 4-1 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 4.2 provides a summary of the existing hourly ambient noise levels described below:

- Location L1 represents the noise levels southwest of the Project site on Desert View Road near existing residential homes, north of I-15. The noise level measurements collected show an overall 24-hour exterior noise level of 63.5 dBA CNEL. The hourly noise levels measured at location L1 ranged from 53.1 to 59.7 dBA Leq during the daytime hours and from 54.7 to 58.9 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 57.4 dBA Leq with an average nighttime noise level of 56.8 dBA Leq.
- Location L2 represents the noise levels north of the Project site near an existing residential home west of Harvard Road. The noise level measurements collected show an overall 24-hour exterior noise level of 57.0 dBA CNEL. The hourly noise levels measured at location L2 ranged from 46.1 to 54.2 dBA Leq during the daytime hours and from 48.5 to 52.1 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 50.8 dBA Leq with an average nighttime noise level of 50.3 dBA Leq.
- Location L3 represents the noise levels east of the Project site on Barret Road adjacent to an existing residential home. The 24-hour CNEL indicates that the overall exterior noise level is 63.0 dBA CNEL. At location L3 the background ambient noise levels ranged from 53.0 to 59.8 dBA Leq during the daytime hours to levels of 53.8 to 58.5 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 56.1 dBA Leq with an average nighttime noise level of 56.3 dBA Leq.
- Located southeast of the Project site, location L4 represents the noise north of Yermo Road near an existing cellular tower and residential home. The noise level measurements collected show an overall 24-hour exterior noise level of 81.1 dBA CNEL. The hourly noise levels measured at location L4 ranged from 70.7 to 77.9 dBA Leq during the daytime hours and from 71.8 to 76.6 dBA Leq during the nighttime hours. The energy (logarithmic) average daytime noise level was calculated at 74.6 dBA Leq with an average nighttime noise level of 74.3 dBA Leq.

Table 4-1 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 4.2 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.

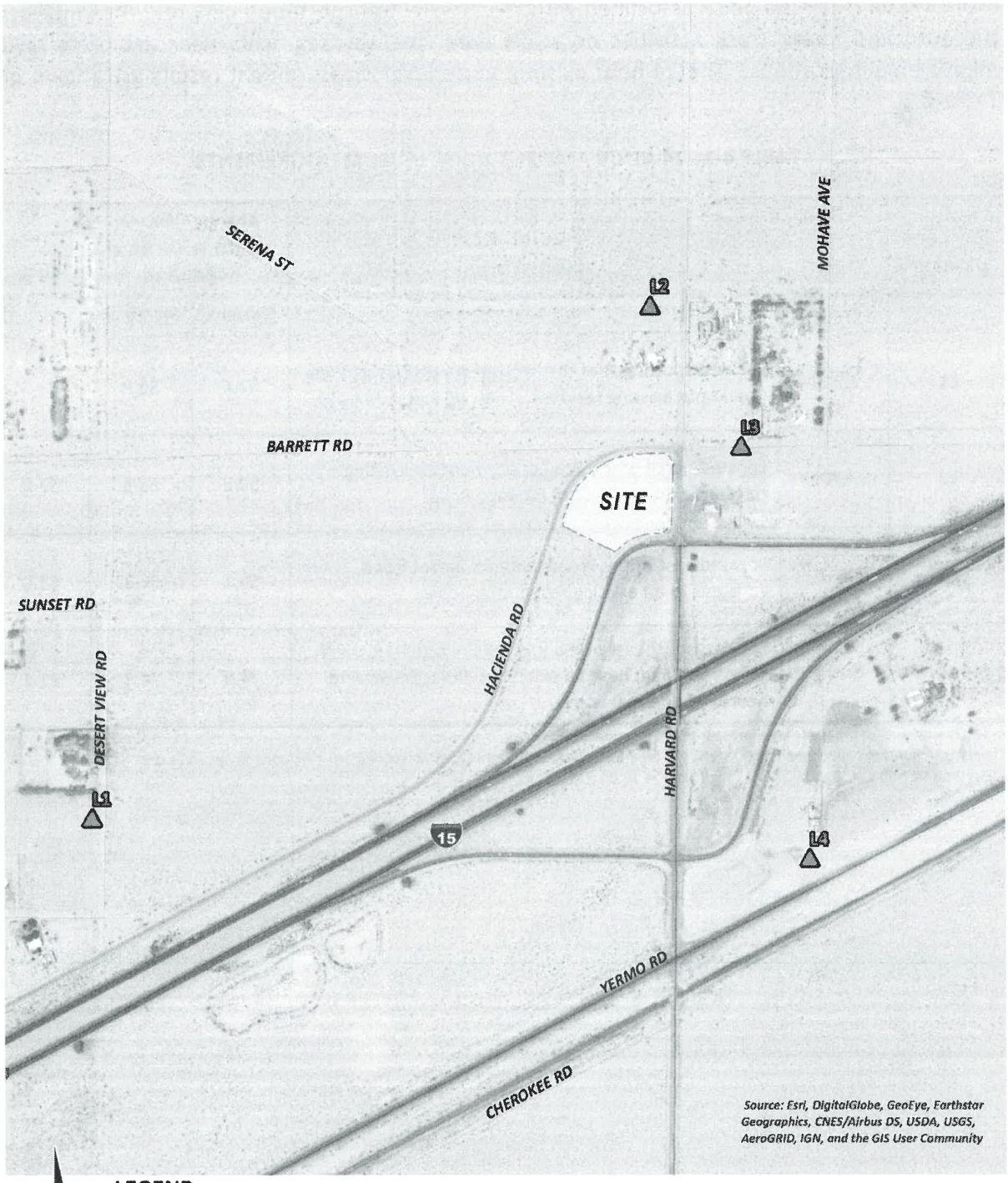
The background ambient noise levels in the Project study area are dominated by the transportation-related noise associated with the arterial transportation network. This includes the auto and heavy truck activities on study area roadway segments near the noise level measurement locations. The 24-hour existing noise level measurement results are shown on Table 4-1.

TABLE 4-1: 24-HOUR AMBIENT NOISE LEVEL MEASUREMENTS

Location[1]	Distance to Project Boundary (Feet)	Description	Energy Average Hourly Noise Level (dBA Leq)[2]		CNEL
			Daytime	Nighttime	
L1	2,510'	Located southwest of the Project site on Desert View Road near existing residential homes, north of I-15.	57.4	56.8	63.5
L2	670'	Located north of the Project site near an existing residential home west of Harvard Road.	50.8	50.3	57.0
L3	320'	Located east of the Project site on Barret Road adjacent to an existing residential home.	56.1	56.3	63.0
L4	1,615'	Located southeast of the Project site and I-15, north of Yermo Road, near an existing cellular tower and nearby residential home.	74.6	74.3	81.1

[1] See Exhibit 4-A for the noise level measurement locations.
[2] Energy (logarithmic) average hourly levels. The long-term 24-hour measurement worksheets are included in Appendix 4.2.
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

EXHIBIT 4-A: NOISE MEASUREMENT LOCATIONS



LEGEND:

Noise Measurement Locations

5 METHODS AND PROCEDURES

The following section outlines the methods and procedures used to model and analyze the future traffic noise environment.

5.1 FHWA TRAFFIC NOISE PREDICTION MODEL

The estimated roadway noise impacts from vehicular traffic were calculated using a computer program that replicates the Federal Highway Administration (FHWA) Traffic Noise Prediction Model- FHWA-RD-77-108. (17) The FHWA Model arrives at a predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). In California the national REMELs are substituted with the California Vehicle Noise (Calveno) Emission Levels. (18) Adjustments are then made to the REMEL to account for: the roadway classification (e.g., collector, secondary, major or arterial), the roadway active width (i.e., the distance between the center of the outermost travel lanes on each side of the roadway), the total average daily traffic (ADT), the travel speed, the percentages of automobiles, medium trucks, and heavy trucks in the traffic volume, the roadway grade, the angle of view (e.g., whether the roadway view is blocked), the site conditions ("hard" or "soft" relates to the absorption of the ground, pavement, or landscaping), and the percentage of total ADT which flows each hour throughout a 24-hour period.

5.2 ON-SITE TRAFFIC NOISE PREDICTION MODEL INPUTS

The on-site roadway parameters including the ADT volumes used for this analysis are presented on Table 5-1. The traffic volumes shown on Table 5-1 reflect the future long-range traffic conditions needed to assess the future on-site traffic noise environment and to identify potential abatement measures (if any) that address the worst-case future conditions. The I-15 traffic volumes are based on an assumed 10-percent growth over existing 2015 conditions provided in the Caltrans Traffic Data Branch *Annual Average Daily Truck Traffic on the California Highways System*. (19) For the purposes of this analysis, soft site conditions were used to analyze the on-site traffic noise impacts for the Project study area. Soft site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. Research conducted by Caltrans has shown that the use of soft site conditions is appropriate for the application of the FHWA traffic noise prediction model used in this analysis. (20)

TABLE 5-1: ON-SITE ROADWAY PARAMETERS

Roadway	Lanes	Classification	Roadway Capacity Volumes[1]	Speed Limits (mph)[2]	Site Conditions
I-15 Fwy.	4	Freeway	51,700	70	Soft

[1] Based on a 10-percent increase in existing volumes obtained from the Caltrans Traffic Data Branch Annual Average Daily Truck Traffic on the California Highways System, 2015.
[2] Posted speed limit.

Table 5-2 presents the time of day vehicle splits by vehicle type, and Table 5-3 presents the total traffic flow distributions (vehicle mixes) used for this analysis. The distribution of traffic flow by vehicle type is based on 2015 count data provided by the Caltrans Traffic Data Branch in the *Annual Average Daily Truck Traffic on the California Highways System*. (19) The vehicle mix provides the hourly distribution percentages of automobile, medium trucks, and heavy trucks for input into the FHWA Model based on roadway types.

TABLE 5-2: TIME OF DAY VEHICLE SPLITS

Time Period	Vehicle Type		
	Autos	Medium Trucks	Heavy Trucks
Daytime (7:00 a.m. - 7:00 p.m.)	77.5%	84.8%	86.5%
Evening (7:00 p.m. - 10:00 p.m.)	12.9%	4.9%	2.7%
Nighttime (10:00 p.m. - 7:00 a.m.)	9.6%	10.3%	10.8%
Total:	100.0%	100.0%	100.0%

Source: Typical Southern California vehicle mix.

TABLE 5-3: DISTRIBUTION OF TRAFFIC FLOW BY VEHICLE TYPE (VEHICLE MIX)

Roadway	Total % Traffic Flow			Total
	Autos	Medium Trucks	Heavy Trucks	
I-15 Fwy.[1]	83.30%	4.32%	12.37%	100.00%

[1] Source: Caltrans Traffic Data Branch Annual Average Daily Truck Traffic on the California Highways System, 2015.

To predict the future noise environment at the convenience store building within the Project site, coordinate information was collected to identify the noise transmission path between the noise source and receiver. The coordinate information is based on Google Earth aerial imagery based on the location of the convenience store building in relationship to I-15. The exterior noise level receiver location was located at the exterior building façade and placed five feet above the pad elevation.

5.3 VIBRATION ASSESSMENT

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 various types of construction equipment are summarized on Table 5-4. 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 5-4: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

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

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

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6 ON-SITE TRAFFIC NOISE IMPACTS

An on-site exterior noise impact analysis has been completed to determine the traffic noise exposure and to identify potential necessary noise abatement measures for the proposed Harvard Road Project. It is expected that the primary source of noise impacts to the Project site will be traffic noise from I-15. The Project will also experience some background traffic noise impacts from Harvard Road, however, due to the low traffic volume/speeds, traffic noise from these roads will not make a significant contribution to the noise environment beyond of the right-of-way of the roadways.

6.1 ON-SITE EXTERIOR NOISE ANALYSIS

Using the FHWA traffic noise prediction model and the parameters outlined in Tables 5-1 to 5-3, the expected future exterior noise levels at the convenience store building façade were calculated. Table 6-1 presents a summary of future exterior noise level impacts at the convenience store building façade. The on-site traffic noise level impacts indicate that the convenience store building will experience unmitigated exterior noise levels approaching 62.2 dBA CNEL. The on-site traffic noise analysis calculations are provided in Appendix 6.1.

Although the County of San Bernardino Development Code, Table 83-3, does not identify exterior noise level standards for commercial retail uses such as the Project, this noise study calculates the future exterior traffic noise levels at the convenience store building façade to determine if the interior noise levels will satisfy the County of San Bernardino 50 dBA CNEL interior noise level standard. (2)

TABLE 6-1: EXTERIOR NOISE LEVELS (CNEL)

Building	Roadway	Unmitigated Noise Level (dBA CNEL)
Convenience Store	I-15 Fwy.	62.2

6.2 ON-SITE INTERIOR NOISE ANALYSIS

To ensure that the interior noise levels comply with the County of San Bernardino interior noise level standards, future noise levels were calculated at the first-floor building façade.

6.2.1 NOISE REDUCTION METHODOLOGY

The interior noise level is the difference between the predicted exterior noise level at the building facade and the noise reduction of the structure. Typical building construction will provide a Noise Reduction (NR) of approximately 12 dBA with "windows open" and a minimum 25 dBA noise reduction with "windows closed." (7; 21) 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.

6.2.2 Interior Noise Level Assessment

To provide the necessary interior noise level reduction, Table 6-2 indicates that the convenience store building will require an interior noise reduction of up to 12.2 dBA CNEL. Table 6-2 shows that the future unmitigated noise levels at the first-floor building façade are expected to approach 62.2 dBA CNEL, and standard windows with a minimum STC rating of 27 will satisfy the County of San Bernardino 50 dBA CNEL interior noise level standards for commercial retail use. The interior noise analysis shows that with the recommended interior noise abatement measures described in the Executive Summary the Project will satisfy the County of San Bernardino 50 dBA CNEL interior noise level standards for commercial retail development.

TABLE 6-2: FIRST FLOOR INTERIOR NOISE IMPACTS (CNEL)

Building	Noise Level at Façade[1]	Required Interior Noise Reduction[2]	Estimated Interior Noise Reduction[3]	Upgraded Windows[4]	Interior Noise Level[5]
Convenience Store	62.2	12.2	25.0	No	37.2

[1] Exterior noise level at the facade with a windows closed condition requiring a means of mechanical ventilation (e.g. air conditioning).
[2] Noise reduction required to satisfy the County of San Bernardino Development Code, Table 83-3 50 dBA CNEL interior noise standard for commercial retail use.
[3] A minimum of 25 dBA noise reduction is assumed with standard building construction.
[4] Does the required interior noise reduction trigger upgraded windows with a minimum STC rating of greater than 27?
[5] Estimated interior noise level with minimum STC rating for all windows.

7 RECEIVER LOCATIONS

To assess the potential for long-term operational and short-term construction noise impacts, the following six receiver locations, as shown on Exhibit 7-A, were identified as representative locations for analysis. Sensitive receivers are generally defined as locations where people reside or where the presence of unwanted sound could otherwise adversely affect the use of the land. Noise-sensitive land uses are generally considered to include: schools, hospitals, single-family dwellings, mobile home parks, churches, libraries, and recreation areas. Moderately noise-sensitive land uses typically include: multi-family dwellings, hotels, motels, dormitories, out-patient clinics, cemeteries, golf courses, country clubs, athletic/tennis clubs, and equestrian clubs. Land uses that are considered relatively insensitive to noise include business, commercial, and professional developments. Land uses that are typically not affected by noise include: industrial, manufacturing, utilities, agriculture, natural open space, undeveloped land, parking lots, warehousing, liquid and solid waste facilities, salvage yards, and transit terminals.

Representative sensitive receivers near the Project site include single-family residential homes at locations R1 to R4. The closest sensitive receiver is represented by location R2 where an existing residential home is located approximately 379 feet north of the Project site. Other sensitive land uses in the Project study area that are located at greater distances than those identified in this noise study will experience lower noise levels than those presented in this report due to the additional attenuation from distance and the shielding of intervening structures.

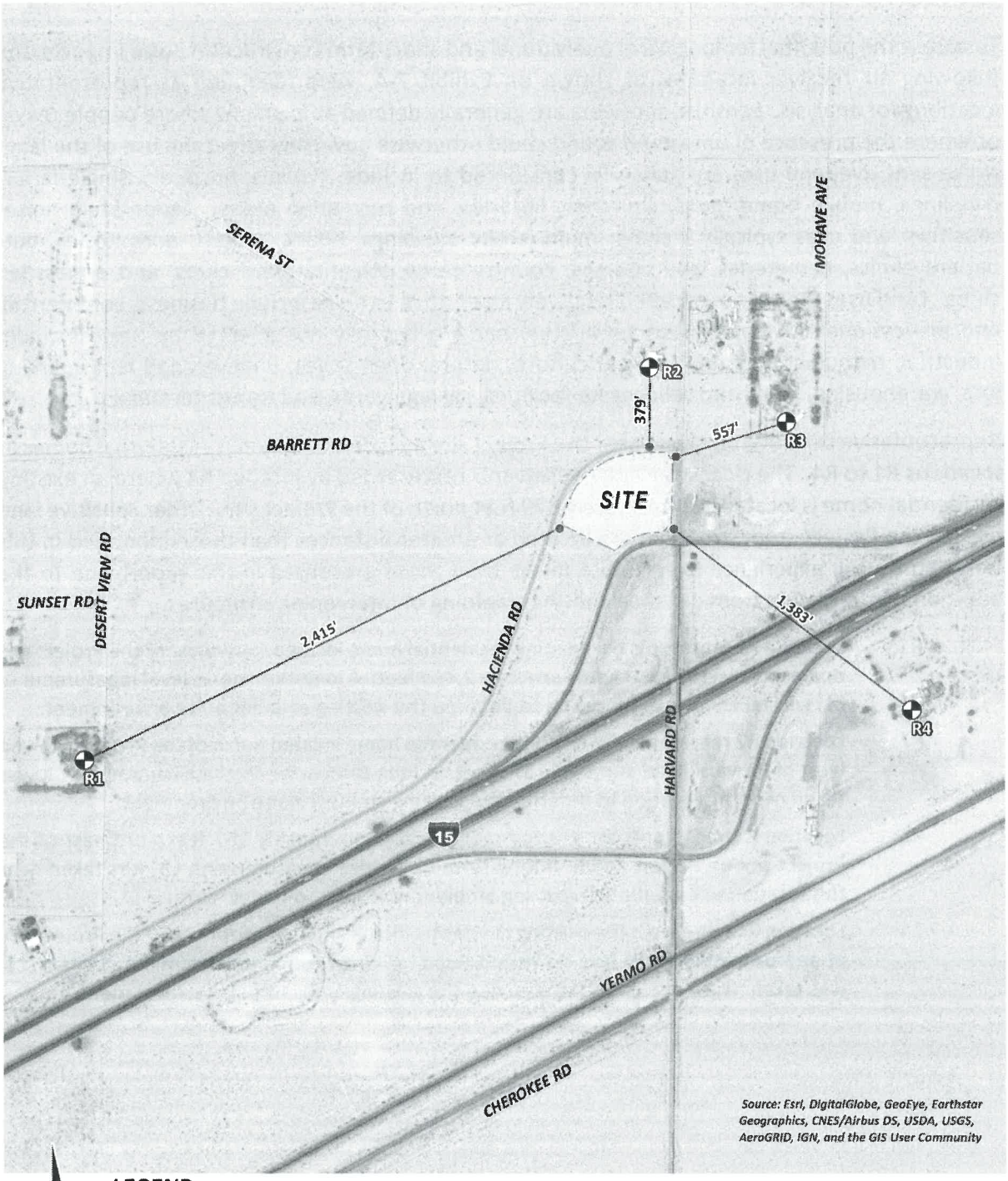
R1: Location R1 represents the existing residential home located southwest of the Project site on Desert View Road at approximately 2,415 feet. A long-term noise level measurement, L1, was taken near this location to describe the existing ambient noise environment.

R2: Location R2 represents the existing residential home located north of the Project site and west of Harvard Road at roughly 379 feet. A long-term noise level measurement, L2, was taken near this location to describe the existing ambient noise environment.

R3: Location R3 represents an existing residential home roughly 557 feet northeast of the Project site on Barrett Road. A long-term noise level measurement, L3, was taken near this location to describe the existing ambient noise environment.

R4: Location R4 represents the existing residential home situated southeast of the Project site at approximately 1,383 feet on Yermo Road. A long-term noise level measurement, L4, was taken near this location to describe the existing ambient noise environment.

EXHIBIT 7-A: RECEIVER LOCATIONS



LEGEND:

Receiver Locations — Distance from receiver to Project site boundary (in feet)

8 OPERATIONAL NOISE IMPACTS

This section analyzes the potential stationary-source operational noise impacts at the nearby receiver locations, identified in Section 7, resulting from operation of the proposed Harvard Road Project. Exhibit 8-A identifies the representative receiver locations and noise source locations used to assess the operational noise levels.

8.1 OPERATIONAL NOISE STANDARDS

To analyze noise impacts originating from a designated fixed location or private property such as the Harvard Road Project, stationary-source (operational) noise such as the expected roof-top air conditioning units, parking lot vehicle movements, and gas station fuel pump activities are typically evaluated against standards established under a jurisdiction's Municipal Code. Therefore, to accurately describe the potential Project-related operational noise levels, this analysis presents the appropriate stationary-source noise level standards from the County of San Bernardino County Code, Title 8 Development Code.

The County of San Bernardino County Code, Title 8 Development Code, Section 83.01.080(c) establishes the noise level standards for stationary noise sources. Since the Project's commercial land use will potentially impact adjacent noise-sensitive uses in the Project study are, this noise study relies on the more conservative residential noise level standards to describe potential operational noise impacts. For residential properties, the exterior noise level shall not exceed 55 dBA Leq during the daytime hours (7:00 a.m. to 10:00 p.m.) and 45 dBA Leq during the nighttime hours (10:00 p.m. to 7:00 a.m.). (2) The County of San Bernardino operational noise level standards are shown on Table 3-1 and included in Appendix 3.1.

8.2 OPERATIONAL NOISE SOURCES

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: roof-top air conditioning units, parking lot vehicle movements, and gas station fuel pump activities. This noise analysis is intended to describe noise level impacts associated with the expected typical operational activities at the Project site.

8.3 REFERENCE NOISE LEVELS

The Project's operational noise levels are estimated based on reference noise level measurements of similar operational activities. The reference noise levels are intended to describe the expected operational noise sources that may include roof-top air conditioning units, parking lot vehicle movements, and gas station fuel pump activities. To estimate the Project off-site operational noise impacts associated with the Harvard Road Project, the following reference noise level measurements were collected from existing operations with similar operational noise sources, as shown on Table 9-1.

8.3.1 Roof-Top Air Conditioning Units

To assess the impacts created by the roof-top air conditioning units at the Project building, 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 Leq. Using the uniform reference distance of 50 feet, the noise level is 57.2 dBA Leq. 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 noise attenuation provided by a parapet wall is not reflected in this reference noise level measurement.

8.3.2 Parking Lot Vehicle Movements

To determine the noise levels associated with parking lot vehicle movements, Urban Crossroads collected reference noise level measurements over a 24-hour period on May 17th, 2017 at the parking lot for the Panasonic Avionics Corporation in the City of Lake Forest. The peak hour of activity measured over the 24-hour noise level measurement period occurred between 12:00 p.m. to 1:00 p.m., or the typical lunch hour for employees working in the area. The measured reference noise level at 50 feet from parking lot vehicle movements was measured at 41.7 dBA Leq. 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).

8.3.3 Gas Station Fuel Pump Activities

To determine the noise levels associated with gas station fuel pump activities, Urban Crossroads collected a reference noise level measurement on July 5th, 2017 at the Ontario Travel Center gas station and truck stop. The measured reference noise level at 50 feet from gas station fuel pump activities was measured at 62.5 dBA Leq. The gas station fuel pump activity noise levels are mainly due to fuel pump use, cars pulling in and out of fueling positions, audio from videos played on televisions screens at the fuel pumps themselves, and people talking. Noise associated with gas station fuel pump activity is expected to operate for the entire hour (60 minutes).

TABLE 8-1: REFERENCE NOISE LEVEL MEASUREMENTS

Noise Source	Duration (hh:mm:ss)	Dist. from Source (Feet)	Noise Source Height (Feet)	Hourly (dBA Leq)	
				Reference Noise Level	@ 50'
Roof-Top Air Conditioning Units[1]	96:00:00	5'	5'	77.2	57.2
Parking Lot Vehicle Movements[2]	01:00:00	10'	5'	52.2	41.7
Gas Station (Fuel Pump) Activity[3]	00:04:18	40'	5'	64.4	62.5

[1] As measured by Urban Crossroads, Inc. on 7/27/2015 at the Santee Walmart located at 170 Town Center Parkway.
[2] As measured by Urban Crossroads, Inc. on 5/17/2017 at the Panasonic Avionics Corporation parking lot in the City of Lake Forest at typical lunch hour (12:00 p.m. to 1:00 p.m.).
[3] As measured by Urban Crossroads, Inc. on 7/5/2017 at the Ontario Travel Center gas station and truck stop.

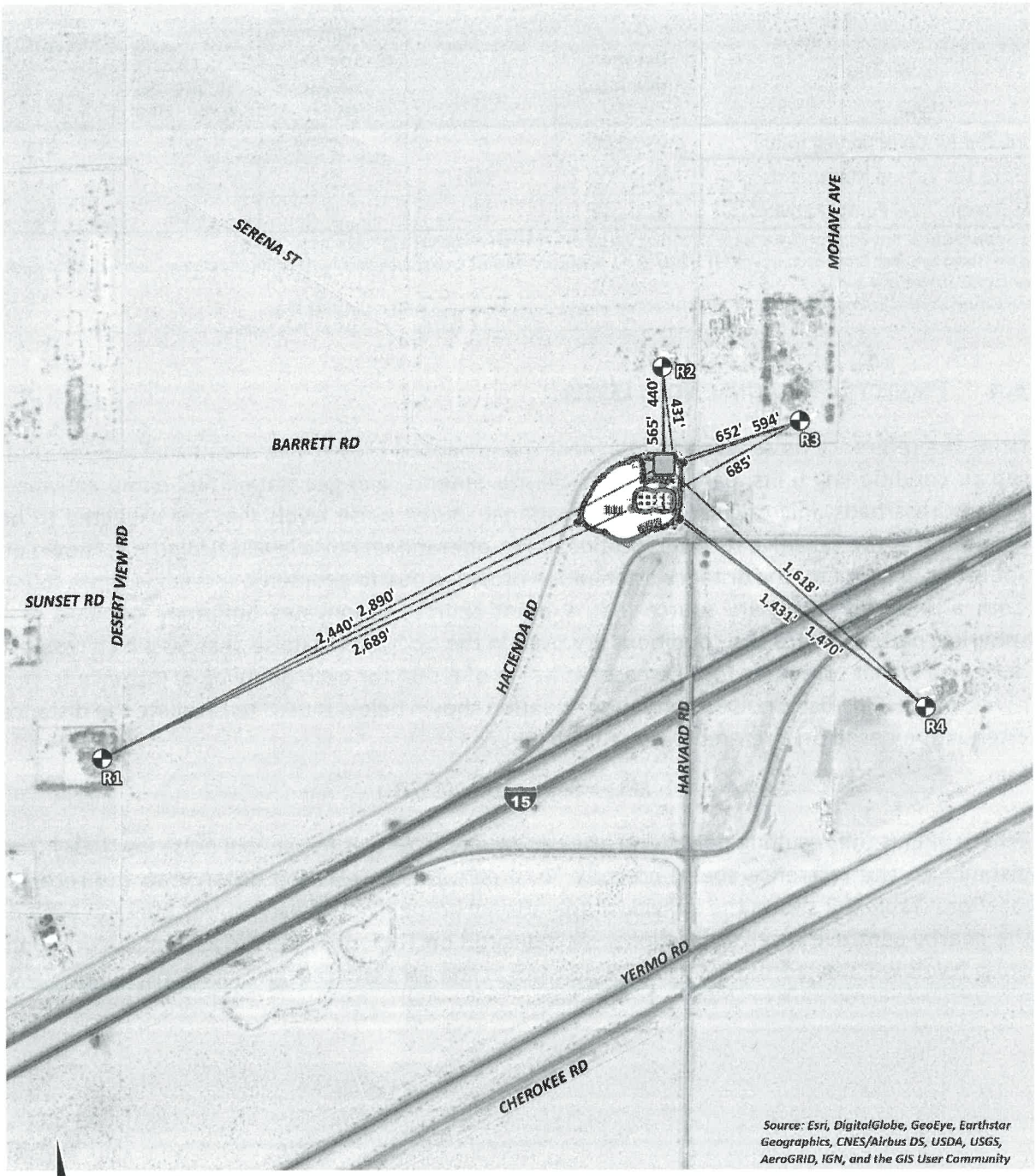
8.4 PROJECT OPERATIONAL NOISE LEVELS

Using the reference noise levels to represent the proposed Project operations that include roof-top air conditioning units, parking lot vehicle movements, and gas station fuel pump activities, Urban Crossroads, Inc. calculated the operational source noise levels that are expected to be generated at the sensitive receiver locations. The operational noise level calculations, shown on Table 8-2, 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 9-2 shows the individual operational noise levels of each noise source at each of the nearby sensitive receiver locations. As indicated on Table 8-2, the Project-only operational noise levels will range from 29.1 to 43.3 dBA Leq at the sensitive receiver locations.

EXHIBIT 8-A: OPERATIONAL NOISE SOURCE LOCATIONS



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LEGEND:

- Receiver Locations
- Roof-Top Air Conditioning Unit
- Parking Lot Vehicle Movements
- Gas Station (Fuel Pump) Activity
- Distance from receiver to center of noise source (in feet)

TABLE 8-2: UNMITIGATED PROJECT-ONLY OPERATIONAL NOISE LEVELS

Receiver Location[1]	Noise Source[2]	Project Operational Noise Levels (dBA Leq)[3]
R1	Roof-Top Air Conditioning Units	22.0
	Parking Lot Vehicle Movements	16.4
	Gas Station (Fuel Pump) Activity	27.8
	Combined Noise Level:	29.1
R2	Roof-Top Air Conditioning Units	38.3
	Parking Lot Vehicle Movements	27.7
	Gas Station (Fuel Pump) Activity	41.4
	Combined Noise Level:	43.3
R3	Roof-Top Air Conditioning Units	34.9
	Parking Lot Vehicle Movements	25.6
	Gas Station (Fuel Pump) Activity	39.7
	Combined Noise Level:	41.1
R4	Roof-Top Air Conditioning Units	27.0
	Parking Lot Vehicle Movements	19.9
	Gas Station (Fuel Pump) Activity	33.1
	Combined Noise Level:	34.2

[1] See Exhibit 8-A for the receiver and noise source locations.
[2] Reference noise sources as shown on Table 8-1.
[3] Operational noise level calculations are provided in Appendix 8.1.

Table 8-3 presents a summary of the combined total Project-only operational noise level projections at the nearby sensitive receiver locations for a comparison with local jurisdiction exterior noise level standards. The Project operational noise levels at the nearby sensitive receiver locations are shown to range from 29.1 to 43.3 dBA Leq. Based on the results of this analysis, the operational noise levels associated with the Harvard Road Project will satisfy the County of San Bernardino Development Code 55 dBA Leq daytime and 45 dBA Leq nighttime exterior noise level standards at all nearby sensitive receiver locations, and no exterior noise mitigation is required. In addition, Project operational noise levels approaching 43.3 dBA Leq will be largely overshadowed by the existing background traffic noise levels measured in the Project study area which ranged between 50.8 to 74.6 dBA Leq during the daytime hours, and between 50.3 to 74.3 dBA Leq during the nighttime hours, as previously shown on Table 4-1.

TABLE 8-3: UNMITIGATED OPERATIONAL NOISE LEVEL COMPLIANCE

Receiver Location[1]	Noise Level at Receiver Locations (dBA Leq)[2]	Threshold Exceeded?[3]	
		Daytime (55 dBA Leq)	Nighttime (45 dBA Leq)
R1	29.1	No	No
R2	43.3	No	No
R3	41.1	No	No
R4	34.2	No	No

[1] See Exhibit 8-A for the receiver and noise source locations.
[2] Estimated Project operational noise levels as shown on Table 8-2.
[3] Do the estimated Project operational noise levels meet the operational noise level standards (Table 3-1)?
"Daytime" = 7:00 a.m. to 10:00 p.m.; "Nighttime" = 10:00 p.m. to 7:00 a.m.

9 CONSTRUCTION IMPACTS

This section analyzes potential impacts resulting from the short-term construction activities associated with the development of the Project. Exhibit 9-A shows the construction noise source locations in relation to the nearby sensitive receiver locations previously described in Section 7.

9.1 CONSTRUCTION NOISE STANDARDS

To analyze noise impacts originating from the construction of the Harvard Road Project, noise from construction activities are typically limited to the hours of operation established under a jurisdiction's Municipal Code. Section 83.01.080(g)(3) of the County of San Bernardino Development Code, provided in Appendix 3.1, indicates that construction activity is considered exempt from the noise level standards between the hours of 7:00a.m. to 7:00 p.m. except on Sundays and Federal holidays, as shown on Table 3-1. (2) However, neither the County of San Bernardino General Plan or County Code establish numeric maximum acceptable construction source noise levels at potentially affected receivers. Therefore, the following construction noise level threshold is used in this noise study.

To evaluate whether the Project will generate potentially significant construction noise levels at off-site sensitive receiver locations, a construction-related noise level threshold is adopted from the *Criteria for Recommended Standard: Occupational Noise Exposure* prepared by the National Institute for Occupational Safety and Health (NIOSH). (15) A division of the U.S. Department of Health and Human Services, NIOSH identifies a noise level threshold based on the duration of exposure to the source. The construction related noise level threshold starts at 85 dBA for more than eight hours per day, and for every 3 dBA increase, the exposure time is cut in half. This results in noise level thresholds of 88 dBA for more than four hours per day, 92 dBA for more than one hour per day, 96 dBA for more than 30 minutes per day, and up to 100 dBA for more than 15 minutes per day. (15) For the purposes of this analysis, the lowest, more conservative construction noise level threshold of 85 dBA Leq is used as an acceptable threshold for construction noise at the nearby sensitive receiver locations. Since this construction-related noise level threshold represents the energy average of the noise source over a given time, they are expressed as Leq noise levels. Therefore, the noise level threshold of 85 dBA Leq over a period of eight hours or more is used to evaluate the potential Project-related construction noise level impacts at the nearby sensitive receiver locations.

The 85 dBA Leq threshold is also consistent with the FTA *Transit Noise and Vibration Impact Assessment* criteria for construction noise which identifies an hourly construction noise level threshold of 90 dBA Leq during daytime hours, and 80 dBA Leq during nighttime hours for construction for general assessment at residential uses. (4) Detailed assessment, according to the FTA, identifies an 8-hour dBA Leq noise level threshold specific to residential uses of 80 dBA Leq. Therefore, the Noise Study relies on the NIOSH 85 dBA Leq threshold, consistent with FTA general and detailed assessment criteria for residential uses and represents an appropriate threshold for construction noise analysis.

9.2 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:

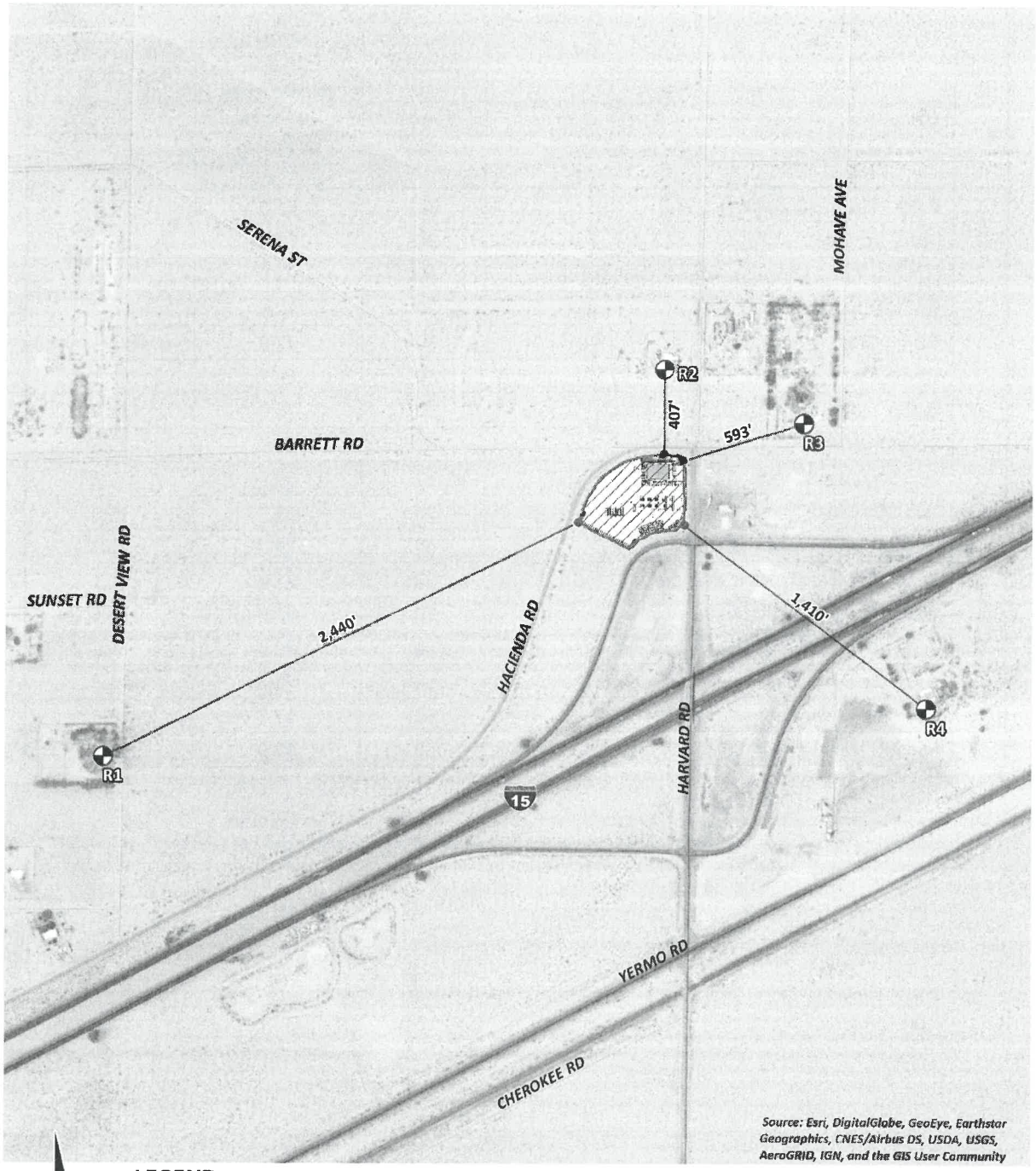
- Site Preparation
- Grading
- Building Construction
- Paving
- Architectural Coating

This construction noise analysis was prepared using reference noise level measurements taken by Urban Crossroads, Inc. to describe the typical construction activity noise levels for each stage of Project construction. The construction reference noise level measurements represent a list of typical construction activity noise levels. Noise levels generated by heavy construction equipment can range from approximately 68 dBA to more than 80 dBA when measured at 50 feet. However, these noise levels diminish with distance from the construction site at a rate of 6 dBA per doubling of distance. For example, a noise level of 80 dBA measured at 50 feet from the noise source to the receiver would be reduced to 74 dBA at 100 feet from the source to the receiver, and would be further reduced to 68 dBA at 200 feet from the source to the receiver. The construction stages used in this analysis are consistent with the *Harvard Road Project Air Quality Impact Analysis* prepared by Urban Crossroads, Inc. (22)

9.3 CONSTRUCTION REFERENCE NOISE LEVELS

To describe the Project construction noise levels, measurements were collected for similar activities at several construction sites. Table 9-1 provides a summary of the 17-construction reference noise level measurements. Since the reference noise levels were collected at varying distances of 30 feet and 50 feet, all construction noise level measurements presented on Table 9-1 have been adjusted for consistency to describe a uniform reference distance of 50 feet.

EXHIBIT 9-A: CONSTRUCTION NOISE SOURCE LOCATIONS



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LEGEND:

Receiver Locations

Distance from receiver to construction activity (in feet)

Construction Activity

TABLE 9-1: CONSTRUCTION REFERENCE NOISE LEVELS

ID	Noise Source	Reference Distance From Source (Feet)	Reference Noise Levels @ Reference Distance (dBA Leq)	Reference Noise Levels @ 50 Feet (dBA Leq)[7]
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	Framing[3]	30'	66.7	62.3
7	Water Truck Pass-By & Backup Alarm[4]	30'	76.3	71.9
8	Dozer Pass-By[4]	30'	84.0	79.6
9	Two Scrapers & Water Truck Pass-By[4]	30'	83.4	79.0
10	Two Scrapers Pass-By[4]	30'	83.7	79.3
11	Scraper, Water Truck, & Dozer Activity[4]	30'	79.7	75.3
12	Concrete Mixer Truck Movements[5]	50'	71.2	71.2
13	Concrete Paver Activities[5]	30'	70.0	65.6
14	Concrete Mixer Pour & Paving Activities[5]	30'	70.3	65.9
15	Concrete Mixer Backup Alarms & Air Brakes[5]	50'	71.6	71.6
16	Concrete Mixer Pour Activities[5]	50'	67.7	67.7
17	Forklift, Jackhammer, & Metal Truck Bed Loading	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] As measured by Urban Crossroads, Inc. on 10/30/15 during grading operations within an industrial construction site located in the City of Ontario.
[5] 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.
[6] As measured by Urban Crossroads, Inc. on 9/9/16 during the demolition of an existing paved parking lot at 41 Corporate Park in Irvine.
[7] Reference noise levels are calculated at 50 feet using a drop off rate of 6 dBA per doubling of distance (point source).

9.4 CONSTRUCTION NOISE ANALYSIS

Using the reference construction equipment noise levels, calculations of the Project construction noise level impacts at the nearby sensitive receiver locations were completed. Tables 9-2 to 9-6 present the short-term construction noise levels for each stage of construction. Table 9-7 provides a summary of the construction noise levels by stage at the nearby noise-sensitive receiver locations which are expected to range from 45.8 to 61.4 dBA Leq. Based on the stages of construction, the noise impacts associated with the proposed Project are expected to create temporarily high noise levels at the nearby receiver locations. To assess the worst-case construction noise levels, this analysis shows the highest noise impacts when the equipment with the highest reference noise level is operating at the closest point from primary construction activity to each receiver location.

TABLE 9-2: SITE PREPARATION EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Truck Pass-Bys & Dozer Activity	59.2
Dozer Activity	64.2
Dozer Pass-By	79.6
Highest Reference Noise Level at 50 Feet (dBA Leq):	79.6

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	2,440'	-33.8	0.0	45.8
R2	407'	-18.2	0.0	61.4
R3	593'	-21.5	0.0	58.1
R4	1,410'	-29.0	0.0	50.6

[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 in the Project study area.

TABLE 9-3: GRADING EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Truck Pass-Bys & Dozer Activity	59.2
Dozer Activity	64.2
Rough Grading Activities	73.5
Dozer Pass-By	79.6
Highest Reference Noise Level at 50 Feet (dBA Leq):	79.6

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	2,440'	-33.8	0.0	45.8
R2	407'	-18.2	0.0	61.4
R3	593'	-21.5	0.0	58.1
R4	1,410'	-29.0	0.0	50.6

[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 in the Project study area.

TABLE 9-4: BUILDING CONSTRUCTION EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
Construction Vehicle Maintenance Activities	67.5
Foundation Trenching	68.2
Framing	62.3
Highest Reference Noise Level at 50 Feet (dBA Leq):	68.2

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	2,440'	-33.8	0.0	34.4
R2	407'	-18.2	0.0	50.0
R3	593'	-21.5	0.0	46.7
R4	1,410'	-29.0	0.0	39.2

[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 in the Project study area.

TABLE 9-5: PAVING EQUIPMENT NOISE LEVELS

Reference Construction Activity[1]	Reference Noise Level @ 50 Feet (dBA Leq)
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 Leq):	71.6

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	2,440'	-33.8	0.0	37.8
R2	407'	-18.2	0.0	53.4
R3	593'	-21.5	0.0	50.1
R4	1,410'	-29.0	0.0	42.6

[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 in the Project study area.

TABLE 9-6: ARCHITECTURAL COATING EQUIPMENT NOISE LEVELS

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

Receiver Location	Distance to Construction Activity (Feet)[2]	Distance Attenuation (dBA Leq)[3]	Estimated Noise Barrier Attenuation (dBA Leq)[4]	Construction Noise Level (dBA Leq)
R1	2,440'	-33.8	0.0	33.7
R2	407'	-18.2	0.0	49.3
R3	593'	-21.5	0.0	46.0
R4	1,410'	-29.0	0.0	38.5

[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 in the Project study area.

TABLE 9-7: UNMITIGATED CONSTRUCTION EQUIPMENT NOISE LEVEL SUMMARY (DBA LEQ)

Receiver Location[1]	Construction Noise Levels by Stage (dBA Leq)					
	Site Preparation	Grading	Building Construction	Paving	Architectural Coating	Highest Construction Noise Level[2]
R1	45.8	45.8	34.4	37.8	33.7	45.8
R2	61.4	61.4	50.0	53.4	49.3	61.4
R3	58.1	58.1	46.7	50.1	46.0	58.1
R4	50.6	50.6	39.2	42.6	38.5	50.6

[1] Noise receiver locations are shown on Exhibit 9-A.
[2] Estimated construction noise levels during peak operating conditions.

9.5 CONSTRUCTION NOISE LEVEL COMPLIANCE

The construction noise analysis shows that the highest construction noise levels will occur when construction activities take place near the edge of the Project site. As shown on Table 9-8, the unmitigated construction noise levels are expected to range from 45.8 to 61.4 dBA Leq at the sensitive receiver locations, which will satisfy the 85 dBA Leq significance threshold during temporary Project construction activities. Further, Project construction noise levels ranging from 45.8 to 61.4 dBA Leq are expected to be largely overshadowed by the existing background traffic noise levels measured in the Project study area which ranged between 50.8 to 74.6 dBA Leq

during the daytime hours when construction activities would take place, as previously shown on Table 4-1.

TABLE 9-8: CONSTRUCTION EQUIPMENT NOISE LEVEL COMPLIANCE (DBA LEQ)

Receiver Location[1]	Construction Noise Levels (dBA Leq)		
	Highest Construction Noise Levels[2]	Threshold[3]	Threshold Exceeded?[4]
R1	45.8	85	No
R2	61.4	85	No
R3	58.1	85	No
R4	50.6	85	No

[1] Noise receiver locations are shown on Exhibit 9-A.
[2] Highest construction noise levels at each receiver location, as shown on Table 9-7.
[3] Construction noise level threshold based on the NIOSH 85 dBA Leq construction noise level limit.
[4] Do the estimated Project construction noise levels exceed the construction noise level threshold?

9.6 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. 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 5-4 and the construction vibration assessment methodology published by the FTA, it is possible to estimate the Project vibration impacts. Table 9-9 presents the expected Project related vibration levels at the nearby receiver locations.

Based on the reference vibration levels provided by the FTA, a large bulldozer represents the peak source of vibration with a reference velocity of 0.089 in/sec PPV at 25 feet. At distances ranging from 407 to 2,440 feet from Project construction activities, construction vibration velocity levels are expected to approach 0.001 in/sec PPV, which is below the County of San

Bernardino Development Code vibration standard of 0.2 in/sec PPV at all receiver locations. (2) Therefore, the Project-related vibration impacts are considered *less than significant* during the construction activities at the Project site.

Further, the Project-related construction vibration levels do not represent levels capable of causing building damage to nearby residential homes. The Federal Transit Administration (FTA) identifies construction vibration levels capable of building damage ranging from 0.12 to 0.5 in/sec PPV. (4) The peak Project-construction vibration levels will approach 0.001 in/sec PPV, and are below the FTA vibration levels for building damage at the residential homes near the Project site. Further, the impacts at the site of the closest sensitive receivers are unlikely to be sustained during the entire construction period, but will occur rather only during the times that heavy construction equipment is operating adjacent to the Project site perimeter nearest the closest sensitive receiver. Construction at the Project site will be restricted to daytime hours consistent with City requirements thereby eliminating potential vibration impact during the sensitive nighttime hours.

TABLE 9-9: CONSTRUCTION EQUIPMENT VIBRATION LEVELS

Receiver[1]	Distance to Const. Activity (Feet)	Receiver PPV Levels (in/sec)[2]					Threshold Exceeded?[3]
		Small Bulldozer	Jack-hammer	Loaded Trucks	Large Bulldozer	Peak Vibration	
R1	2,440'	0.000	0.000	0.000	0.000	0.000	No
R2	407'	0.000	0.001	0.001	0.001	0.001	No
R3	593'	0.000	0.000	0.001	0.001	0.001	No
R4	1,410'	0.000	0.000	0.000	0.000	0.000	No

[1] Receiver locations are shown on Exhibit 9-A.
[2] Based on the Vibration Source Levels of Construction Equipment included on Table 5-4.
[3] Does the peak vibration exceed the County of San Bernardino maximum acceptable vibration threshold shown on Table 3-3?

9.7 Construction Noise Abatement Measures

Though construction noise is temporary, intermittent and of short duration, and will not present any long-term impacts, the following practices would reduce noise level increases produced by the construction equipment to the nearby noise-sensitive residential land uses:

- Prior to approval of grading plans and/or issuance of building permits, plans shall include a note indicating that noise-generating Project construction activities shall only occur between the hours of 7:00 a.m. to 7:00 p.m.; with no activity on Sundays and Federal holidays (Section 83.01.080(g)(3) of the County of San Bernardino Development Code).
- 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 receptors 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).
- The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment (between the hours of 7:00 a.m. to 7:00 p.m.; with no activity on Sundays and Federal holidays). The contractor shall design delivery routes to minimize the exposure of sensitive land uses or residential dwellings to delivery truck-related noise, consistent with County of San Bernardino General Plan Noise Element, Policy N 1.5.

8 REFERENCES

1. **County of San Bernardino Department of Environmental Health Services.** *Harvard Road Plan Check Comments.* 2017.
2. **County of San Bernardino.** *Code of Ordinances, Title 8 Development Code, Chapter 83.01 General Performance Standards.*
3. **Harris, Cyril M.** *Noise Control in Buildings.* s.l. : McGraw-Hill, Inc., 1994.
4. **U.S. Department of Transportation, Federal Transit Administration.** *Transit Noise and Vibration Impact Assessment.* May 2006. FTA-VA-90-1003-06.
5. **California Department of Transportation Environmental Program.** *Technical Noise Supplement - A Technical Supplement to the Traffic Noise Analysis Protocol.* Sacramento, CA : s.n., September 2013.
6. **Environmental Protection Agency Office of Noise Abatement and Control.** *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* March 1974. EPA/ONAC 550/9/74-004.
7. **U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch.** *Highway Traffic Noise Analysis and Abatement Policy and Guidance.* June, 1995.
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. **Occupational Safety and Health Administration.** *Standard 29 CRF, Part 1910.*
11. **Center for Disease Control and Prevention.** About Hearing Loss. [Online] [Cited: 04 15, 2016.] http://www.cdc.gov/healthyschools/noise/signs.htm.
12. **Office of Planning and Research.** *State of California General Plan Guidelines.* October 2003.
13. **State of California.** *2013 California Green Building Standards Code.* January 2014.
14. **County of San Bernardino.** *General Plan Noise Element.* April 2007.
15. **National Institute for Occupational Safety and Health.** *Criteria for Recommended Standard: Occupational Noise Exposure.* June 1998.
16. **American National Standards Institute (ANSI).** *Specification for Sound Level Meters ANSI S1.4-2014/IEC 61672-1:2013.*
17. **U.S. Department of Transportation, Federal Highway Administration.** *FHWA Highway Traffic Noise Prediction Model.* December 1978. FHWA-RD-77-108.
18. **California Department of Transportation Environmental Program, Office of Environmental Engineering.** *Use of California Vehicle Noise Reference Energy Mean Emission Levels (Calveno REMELs) in FHWA Highway Traffic Noise Prediction.* September 1995. TAN 95-03.
19. **California Department of Transportation.** *Traffic Data Branch Annual Average Daily Truck Traffic on the California Highways System.* 2015.
20. —. *Traffic Noise Attenuation as a Function of Ground and Vegetation Final Report.* June 1995. FHWA/CA/TL-95/23.

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

22. **Urban Crossroads, Inc.** *Harvard Road Project Air Quality Impact Analysis.* September 2017.

9 CERTIFICATION

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

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

EDUCATION

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

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

PROFESSIONAL REGISTRATIONS

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

PROFESSIONAL AFFILIATIONS

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

PROFESSIONAL CERTIFICATIONS

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

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APPENDIX ES.1:

COUNTY OF SAN BERNARDINO ENVIRONMENTAL HEALTH SERVICES COMMENTS

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the capacity required for the proposed project. Applicant shall provide documentation outlining methods used in determining function.

5. Written clearance may be required from the designated California Regional Water Quality control Board (listed below) and a copy forwarded to the Division of Environmental Health Services.

   a. Lahontan Region, 15095 Amargosa Road Bldg 2 Suite 210 Victorville, CA 92392

NOISE:

6. Submit preliminary acoustical information demonstrating that the proposed project maintains noise levels at or below San Bernardino County Noise Standard(s), San Bernardino Development Code Section 83.01.080. The purpose is to evaluate potential future on-site and/or adjacent off-site noise sources. If the preliminary information cannot demonstrate compliance to noise standards, a project specific acoustical analysis shall be required. Submit information/analysis to the DEHS for review and approval. For information and acoustical checklist go to: http://www.sbcounty.gov/dehs/Depts/EnvironmentalHealth/FormsPublications/documents/project_acoustical_information.pdf or contact DEHS at 800-442-2283.

FOOD:

7. Plans for food establishments shall be reviewed and approved by DEHS. For information, call DEHS/Plan Check at: 800-442-2283.

VECTOR:

8. All demolition of structures shall have a vector inspection prior to the issuance of any permits pertaining to demolition or destruction of any such premises. For information, contact DEHS Vector Section at 1-800-442-2283.

9. The project area has a high probability of containing vectors. DEHS Vector Control Section will determine the need for vector survey and any required control programs. A vector clearance letter shall be submitted to DEHS/Land Use. For information, contact Vector Control at (800) 442-2283.

The review fee for a CUP is $502.00. There will be additional review fees for a water system permit and septic system review. Please visit our website at http://www.sbcounty.gov/dehs/ for more information.

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APPENDIX 3.1:

COUNTY OF SAN BERNARDINO DEVELOPMENT CODE

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Print

San Bernardino County, CA Code of Ordinances

DIVISION 3: COUNTYWIDE DEVELOPMENT STANDARDS

CHAPTER 83.01: GENERAL PERFORMANCE STANDARDS

Section

83.01.010 Purpose.

83.01.020 Applicability.

83.01.030 Modification of Standards.

83.01.040 Air Quality.

83.01.050 Electrical Disturbances.

83.01.060 Fire Hazards.

83.01.070 Heat.

83.01.080 Noise.

83.01.090 Vibration.

83.01.100 Waste Disposal.

83.01.110 External Commercial or Industrial Activity on Private Property.

§ 83.01.010 Purpose.

The purpose of this Chapter is to establish uniform performance standards for development within the County that promotes compatibility with surrounding areas and land uses.

Performance standards are designed to mitigate the environmental impacts of existing and proposed land uses within a community. Environmental impacts include air quality, glare, heat, noise, runoff control, and waste disposal. These general performance standards are intended to protect the health and safety of businesses, nearby residents, and workers and to prevent damaging effects to surrounding properties.

(Ord. 4011, passed - -2007)

§ 83.01.020 Applicability.

(a) *New and Existing Uses in All Land Use Zoning Districts.* The provisions of this Chapter apply to all new and existing uses in all land use zoning districts. The standards of this Chapter elaborate upon and otherwise augment the development standards specified for individual land use zoning districts in Division 2 (Land Use Zoning Districts and Allowed Land Uses) and in Division 4 (Standards for Specific Land Uses and Activities).

(b) *Compliance of Alterations or Modifications.* Uses of the land that existed on the effective date of this Division shall not be altered or modified so as to conflict with, or further conflict with, these standards.

(c) *Evidence of Compliance with Standards.* If requested by the Director or the Review Authority, applicants shall provide evidence to the Director that the proposed development is in compliance with the standards in this Division and other applicable standards in this Development Code before the issuance of a Building Permit or business license.

(Ord. 4011, passed - -2007)

§ 83.01.030 Modification of Standards.

(a) *Modification by Specific Reference.* The provisions of this Division shall prevail should they conflict with the provisions of a land use zoning district or specific plan, unless the land use zoning district or plan standard specifically overrides or modifies the provisions of this Division by specific reference.

(b) *Modification by Establishment of Overlay or Approval of Planned Development or Variance.* An overlay, approved Planned Development, or approved Variance may modify the provisions of this Division.

(Ord. 4011, passed - -2007)

§ 83.01.040 Air Quality.

(a) *Equipment Permit and Inspection Requirements.* Required permits shall be obtained from either the Mojave Air Pollution Management District or the South Coast Air Quality Management District depending on the location of the subject property and equipment for equipment that may cause air pollution. Before the equipment may be constructed, plans and specifications shall be submitted to the appropriate District for approval

(b) *Permits from Air Quality Management Districts.* Permits shall be obtained from either the Mojave Air Pollution Management District or the South Coast Air Quality Management District depending on the location of the subject property and equipment. If requested by the Director, uses, activities, or processes that require Air Quality Management District approval to operate shall file a copy of the permit with the Department within 30 days of its approval.

(c) *Diesel Exhaust Emissions Control Measures.* The following emissions control measures shall apply to all discretionary land use projects approved by the County on or after January 15, 2009:

(1) *On-Road Diesel Vehicles.* On-road diesel vehicles are regulated by the State of California Air Resources Board.

(2) *Off-Road Diesel Vehicle/Equipment Operations.* All business establishments and contractors that use off-road diesel vehicle/equipment as part of their normal business operations shall adhere to the following measures during their operations in order to reduce diesel particulate matter emissions from diesel-fueled engines:

(A) Off-road vehicles/equipment shall not be left idling on site for periods in excess of five minutes. The idling limit does not apply to:

(I) Idling when queuing;

(II) Idling to verify that the vehicle is in safe operating condition;

(III) Idling for testing, servicing, repairing or diagnostic purposes;

(IV) Idling necessary to accomplish work for which the vehicle was designed (such as operating a crane);

(V) Idling required to bring the machine system to operating temperature; and

(VI) Idling necessary to ensure safe operation of the vehicle.

(B) Use reformulated ultra low-sulfur diesel fuel in equipment and use equipment certified by the U.S. Environmental Protection Agency (EPA) or that pre-dates EPA regulations.

(C) Maintain engines in good working order to reduce emissions.

(D) Signs shall be posted requiring vehicle drivers to turn off engines when parked.

(E) Any requirements or standards subsequently adopted by the South Coast Air Quality Management District, the Mojave Desert Air Quality Management District or the California Air Resources Board.

(F) Provide temporary traffic control during all phases of construction.

(G) On-site electrical power connections shall be provided for electric construction tools to eliminate the need for diesel-powered electric generators, where feasible.

(H) Maintain construction equipment engines in good working order to reduce emissions. The developer shall have each contractor certify that all construction equipment is properly serviced and maintained in good operating condition.

(I) Contractors shall use ultra low sulfur diesel fuel for stationary construction equipment as required by Air Quality Management District (AQMD) Rules 431.1 and 431.2 to reduce the release of undesirable emissions.

(J) Substitute electric and gasoline-powered equipment for diesel-powered equipment, where feasible.

(3) *Project Design.* Distribution centers, warehouses, truck stops and other facilities with loading docks where diesel trucks may reside overnight or for periods in excess of three hours shall be designed to enable any vehicle using these facilities to utilize on-site electrical connections to power the heating and air conditioning of the cabs of such trucks, and any refrigeration unit(s) of any trailer being pulled by the trucks, instead of operating the diesel engines and diesel refrigeration units of such trucks and trailers for these purposes. This requirement shall also apply to Recreational Vehicle Parks (as defined in § 810.01.200(k) of this title) and other development projects where diesel engines may reasonably be expected to operate on other than an occasional basis.

(Ord. 4011, passed - -2007; Am. Ord. 4065, passed - -2008)

§ 83.01.050 Electrical Disturbances.

No activity, land use, or process shall cause electrical disturbance that adversely affects persons or the operation of equipment across lot lines and that does not conform to the regulations of the Federal Communications Commission. Existing or proposed uses that generate electrical disturbances that are be considered hazardous or a public nuisance shall be contained, modified, or shielded to prevent disturbances.

(Ord. 4011, passed - -2007)

§ 83.01.060 Fire Hazards.

This Section establishes standards for storage of solid materials susceptible to fire hazards and flammable liquids and gases where allowed in compliance with Division 2 (Land Use Zoning Districts and Allowed

Land Uses).

(a) *Combustible Solids.* Land uses that include the storage of solid materials susceptible to fire hazards shall be subject to the following storage standards in the indicated land use zoning districts.

(1) *Regional Industrial (IR) Land Use Zoning District.*

(A) *Inside Storage.* A structure utilized for the storage, manufacture, or use of flammable solid materials shall be located no less than 40 feet from any lot line and any other on-site structures or shall adhere to standards specified in Subdivision (2) below.

(B) *Outdoor Storage.* Outdoor storage of flammable solid materials shall be no less than 50 feet from any lot line and any other on-site structures.

(2) *All Other Manufacturing or Industrial Uses Legally Established Within Any Other Land Use Zoning District.* The storage, manufacture, or use of highly flammable solid materials shall take place in enclosed spaces having fire resistance of no less than two hours and protected with an automatic fire extinguishing system.

(b) *Flammable Liquids and Gases.* Land uses that involve the storage of flammable liquids and gases shall be subject to the following standards when established within the land use zoning districts indicated.

(1) *Setbacks.* County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials) shall establish setback requirements for flammable liquids and gases.

(2) *Storage capacity.* The total storage capacity of flammable liquids and gases on a parcel shall not exceed the quantities indicated in Table 83-1 (Storage Standards for Flammable Liquids and Gases).

Table 83-1		
Storage Standards for Flammable Liquids and Gases		
Stored Substance	***Land Use Zoning District***	***Maximum Capacity***
SCF = Standard cubic feet at 60°F and 29.92" Hg (i.e., mercury)		
Liquids	Regional Industrial District (IR)	120,000 gallons
	All other manufacturing or industrial uses legally established within any other land use zoning district	60,000 gallons
Liquefied Petroleum Gas (LPG)	All manufacturing or industrial uses established in any land zoning use district	Per County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials)
	All commercial uses legally established in any land use zoning district	15,000 gal./tank 20,000 gallons maximum aggregate total
	All agricultural uses legally established in any land use zoning district and aggregate total	15,000 gal./tank and aggregate total
Gases other than liquefied petroleum gas	Regional Industrial District (IR)	300,000 SCF above ground 600,000 SCF below ground
	All other manufacturing or industrial uses legally	150,000 SCF above ground 300,000 SCF below ground

	established within any other land use zoning district	

(c) *Liquefied Petroleum Gas (LPG).*

(1) *General Requirements.*

(A) *Agricultural, Commercial, Industrial, or Manufacturing Uses and Land Use Zoning Districts.* Liquefied petroleum gas (LPG) storage and distribution facilities for agricultural, commercial, industrial, or manufacturing uses shall be allowed subject to a Use Permit in compliance with Division 2 (Land Use Zoning Districts and Allowed Land Uses). The location, installation, operation, and maintenance of LPG storage and distribution facilities shall be subject to:

(I) The standards in this Subdivision.

(II) The conditions, requirements, and standards imposed by the Review Authority in compliance with this Chapter.

(B) *Residential Uses and Land Use Zoning Districts.* County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials) shall establish standards for residential uses and residential land use zoning districts for LPG storage.

(C) *Conflict Between Land Use District and Use Permit Requirements.* In the event of a conflict between the provisions of this § 83.01.060(c) (Liquefied Petroleum Gas [LPG]) and the provisions of a land use zoning district, including the requirement for Use Permit, the provisions of this Section shall prevail and control.

(2) *Fire Protection Requirements for All Parcels.*

(A) Setbacks for LPG storage and distribution facilities from structures and property lines shall be those specified by County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(B) LPG storage tanks shall be centrally located on the parcel to the satisfaction of the Fire Department.

(3) *Additional Fire Protection Requirements for Specific Types of Parcels.* For parcels that have no more than one occupied structure less than 5,000 square feet in size and where the water system provides substandard flows per International Standards Organization (ISO) standards for structure protection, additional fire protection requirements shall be as follows:

(A) *Where Parcel Size Is Ten Acres or More.* Fire flow shall be calculated for exposures only in compliance with County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(B) *Where Parcel Size Is at Least Five Acres but less than Ten Acres.*

(I) A one hour approved protective coating shall be applied to the LPG storage tank.

(II) Fire flow shall be calculated for exposures only, in compliance with County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(C) *Where Parcel Size Is at Least Two and One-half Acres, but less than Five Acres.*

(I) A two hour approved protective coating shall be applied to the tank.

(II) Fire flow shall be calculated for exposures only, in compliance with County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(4) *Additional Fire Protection Requirements for Any Parcel with Adequate Fire Flow Available per ISO Standards.*

(A) Fire hydrant(s) shall serve the parcel in compliance with County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(B) Fire flow shall provide for exposure protection (ISO Calculation) and LPG storage tank protection/suppression.

(I) Sprinklers shall use calculations, as adopted by County Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(II) Hose lines shall use the formula: GPM = five times the square root of the tank capacity.

(C) Additional protection.

(I) Where the Fire Chief determines that water can be applied to the tank or exposures by the Fire Department in required amounts in eight minutes or less, no additional protection shall be required.

(II) Where the Fire Chief determines that water cannot be applied to the tank or exposures by the Fire Department in required amounts in eight minutes or less, one of the following protection measures shall be required:

(i) One hour approved protective coating shall be applied to the LPG storage tank; or

(ii) A fixed spray water system shall be installed as approved by the Fire Department.

(5) Additional fire protection requirements for any parcel not included in either Subdivisions (C)(III) or (C)(IV), above:

(A) Either a one-hour or more protective coating shall be applied to the LPG storage tank, as required by the Fire Department, or a fixed spray water system shall be installed instead of coating the tank.

(B) Fire flow shall be calculated for exposure only, in compliance with the San Bernardino Code Title 2, Division 3 (Fire Protection and Explosives and Hazardous Materials).

(Ord. 4011, passed - -2007)

§ 83.01.070 Heat.

Land uses in industrial districts shall not emit heat that would cause a temperature increase on any adjacent property in excess of ten degrees Fahrenheit, whether the change is in the air, on the ground, or in a structure.

(Ord. 4011, passed - -2007)

§ 83.01.080 Noise.

This Section establishes standards concerning acceptable noise levels for both noise-sensitive land uses and for noise-generating land uses.

(a) *Noise Measurement.* Noise shall be measured:

(1) At the property line of the nearest site that is occupied by, and/or zoned or designated to allow the development of noise-sensitive land uses;

(2) With a sound level meter that meets the standards of the American National Standards Institute (ANSI § SI4 1979, Type 1 or Type 2);

(3) Using the "A" weighted sound pressure level scale in decibels (ref. pressure = 20 micronewtons per meter squared). The unit of measure shall be designated as dB(A).

(b) *Noise Impacted Areas.* Areas within the County shall be designated as "noise-impacted" if exposed to existing or projected future exterior noise levels from mobile or stationary sources exceeding the standards listed in Subdivision (d) (Noise Standards for Stationary Noise Sources) and Subdivision (e) (Noise Standards for Adjacent Mobile Noise Sources), below. New development of residential or other noise-sensitive land uses shall not be allowed in noise-impacted areas unless effective mitigation measures are incorporated into the project design to reduce noise levels to these standards. Noise-sensitive land uses shall include residential uses, schools, hospitals, nursing homes, religious institutions, libraries, and similar uses.

(c) *Noise Standards for Stationary Noise Sources.*

(1) *Noise Standards.* Table 83-2 (Noise Standards for Stationary Noise Sources) describes the noise standard for emanations from a stationary noise source, as it affects adjacent properties:

Table 83-2		
Noise Standards for Stationary Noise Sources		
Affected Land Uses (Receiving Noise)	***7:00 a.m. - 10:00 p.m. Leq***	***10:00 p.m. - 7:00 a.m. Leq***
Residential	55 dB(A)	45 dB(A)
Professional Services	55 dB(A)	55 dB(A)
Other Commercial	60 dB(A)	60 dB(A)
Industrial	70 dB(A)	70 dB(A)
Leq = (Equivalent Energy Level). The sound level corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period, typically one, eight or 24 hours.		
dB(A) = (A-weighted Sound Pressure Level). The sound pressure level, in decibels, as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound, placing greater emphasis on those frequencies within the sensitivity range of the human ear.		
Ldn = (Day-Night Noise Level). The average equivalent A-weighted sound level during a 24-hour day obtained by adding 10 decibels to the hourly noise levels measured during the night (from 10:00 p.m. to 7:00 a.m.). In this way Ldn takes into account the lower tolerance of people for noise during nighttime periods.		

(2) *Noise Limit Categories.* No person shall operate or cause to be operated a source of sound at a location or allow the creation of noise on property owned, leased, occupied, or otherwise controlled by the person, which causes the noise level, when measured on another property, either incorporated or unincorporated, to exceed any one of the following:

(A) The noise standard for the receiving land use as specified in Subdivision (b) (Noise-Impacted Areas), above, for a cumulative period of more than 30 minutes in any hour.

(B) The noise standard plus five dB(A) for a cumulative period of more than 15 minutes in any hour.

(C) The noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour.

(D) The noise standard plus 15 dB(A) for a cumulative period of more than one minute in any hour.

(E) The noise standard plus 20 dB(A) for any period of time.

(d) *Noise Standards for Adjacent Mobile Noise Sources.* Noise from mobile sources may affect adjacent properties adversely. When it does, the noise shall be mitigated for any new development to a level that shall not exceed the standards described in the following Table 83-3 (Noise Standards for Adjacent Mobile Noise Sources).

Table 83-3

Noise Standards for Adjacent Mobile Noise Sources

Land Use		***Ldn (or CNEL) dB(A)***	
Categories	***Uses***	***Interior*** (1)	***Exterior*** (2)
Residential	Single and multi-family, duplex, mobile homes	45	60(3)
Commercial	Hotel, motel, transient housing	45	60(3)
	Commercial retail, bank, restaurant	50	N/A
	Office building, research and development, professional offices	45	65
	Amphitheater, concert hall, auditorium, movie theater	45	N/A
Institutional/Public	Hospital, nursing home, school classroom, religious institution, library	45	65
Open Space	Park	N/A	65

Notes:

(1) The indoor environment shall exclude bathrooms, kitchens, toilets, closets and corridors.

(2) The outdoor environment shall be limited to:
- Hospital/office building patios
- Hotel and motel recreation areas
- Mobile home parks
- Multi-family private patios or balconies
- Park picnic areas
- Private yard of single-family dwellings
- School playgrounds

(3) An exterior noise level of up to 65 dB(A) (or CNEL) shall be allowed provided exterior noise levels have been substantially mitigated through a reasonable application of the best available noise reduction technology, and interior noise exposure does not exceed 45 dB(A) (or CNEL) with windows and doors closed. Requiring that windows and doors remain closed to achieve an acceptable interior noise level shall necessitate the use of air conditioning or mechanical ventilation.

CNEL = (Community Noise Equivalent Level). The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of approximately five decibels to sound

levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m.

(e) *Increases in Allowable Noise Levels.* If the measured ambient level exceeds any of the first four noise limit categories in Subdivision (d)(2), above, the allowable noise exposure standard shall be increased to reflect the ambient noise level. If the ambient noise level exceeds the fifth noise limit category in Subdivision (d)(2), above, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.

(f) *Reductions in Allowable Noise Levels.* If the alleged offense consists entirely of impact noise or simple tone noise, each of the noise levels in Table 83-2 (Noise Standards for Stationary Noise Sources) shall be reduced by five dB(A).

(g) *Exempt Noise.* The following sources of noise shall be exempt from the regulations of this Section:

(1) Motor vehicles not under the control of the commercial or industrial use.

(2) Emergency equipment, vehicles, and devices.

(3) Temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and Federal holidays.

(h) *Noise Standards for Other Structures.* All other structures shall be sound attenuated against the combined input of all present and projected exterior noise to not exceed the criteria.

Table 83-4	
Noise Standards for Other Structures	
Typical Uses	***12-Hour Equivalent Sound Level (Interior) in dBA Ldn***
Educational, institutions, libraries, meeting facilities, etc.	45
General office, reception, etc.	50
Retail stores, restaurants, etc.	55
Other areas for manufacturing, assembly, testing, warehousing, etc.	65

In addition, the average of the maximum levels on the loudest of intrusive sounds occurring during a 24-hour period shall not exceed 65 dBA interior.

(Ord. 4011, passed - -2007; Am. Ord. 4245, passed - -2014)

§ 83.01.090 Vibration.

(a) *Vibration Standard.* No ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the lot line, nor shall any vibration be allowed which produces a particle velocity greater than or equal to two-tenths inches per second measured at or beyond the lot line.

(b) *Vibration Measurement.* Vibration velocity shall be measured with a seismograph or other instrument capable of measuring and recording displacement and frequency, particle velocity, or acceleration. Readings shall be made at points of maximum vibration along any lot line next to a parcel within a residential, commercial and industrial land use zoning district.

(c) *Exempt Vibrations.* The following sources of vibration shall be exempt from the regulations of this Section.

(1) Motor vehicles not under the control of the subject use.

(2) Temporary construction, maintenance, repair, or demolition activities between 7:00 a.m. and 7:00 p.m., except Sundays and Federal holidays.

(Ord. 4011, passed - -2007)

§ 83.01.100 Waste Disposal.

(a) *Liquid Waste Disposal and Runoff Control.* No liquids of any kind shall be discharged into a public or private sewage or drainage system, watercourse, body of water, or into the ground, except in compliance with applicable regulations of the County Code, Title 23 (Waters) of the California Code of Regulations, the California Water Code, and related Federal regulations.

(b) *Hazardous Waste.* Refer to Chapter 84.11 (Hazardous Waste Facilities) for regulations relative to hazardous waste facilities.

(c) *Solid Waste Disposal.* Refer to Chapter 84.24 (Solid Waste/Recyclable Materials Storage) for regulations relative to solid waste disposal.

(Ord. 4011, passed - -2007)

§ 83.01.110 External Commercial or Industrial Activity on Private Property.

There shall be no unpermitted external or industrial activity on properties subject to the County's jurisdiction between the hours of 9:00 p.m. and 7:00 a.m. that shall at any time impair the quiet enjoyment of neighboring property owners or residents or in any manner disturb the public peace.

(Ord. 4245, passed - -2014)

APPENDIX 4.1:

STUDY AREA PHOTOS

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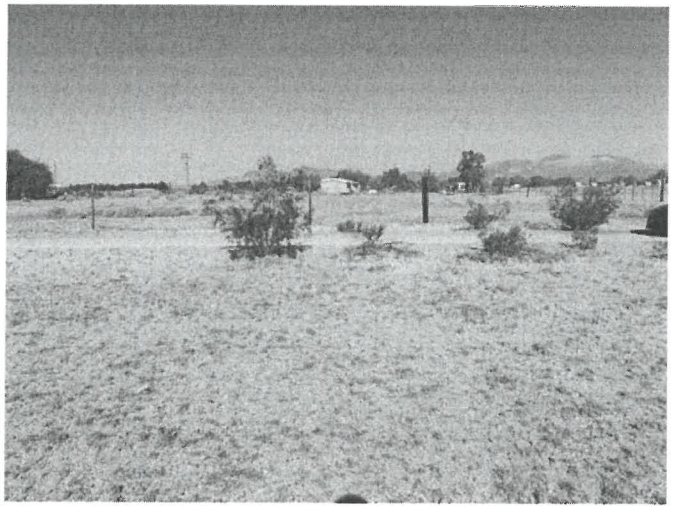
JN:10857 Harvard Road



L1_N
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L1_NE
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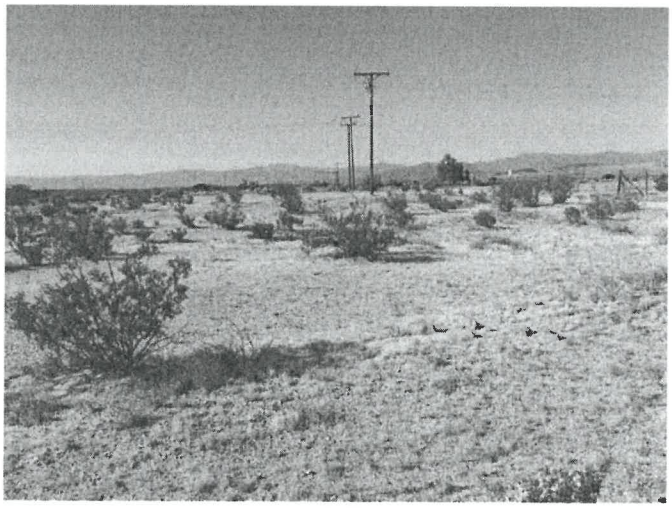

L1_S
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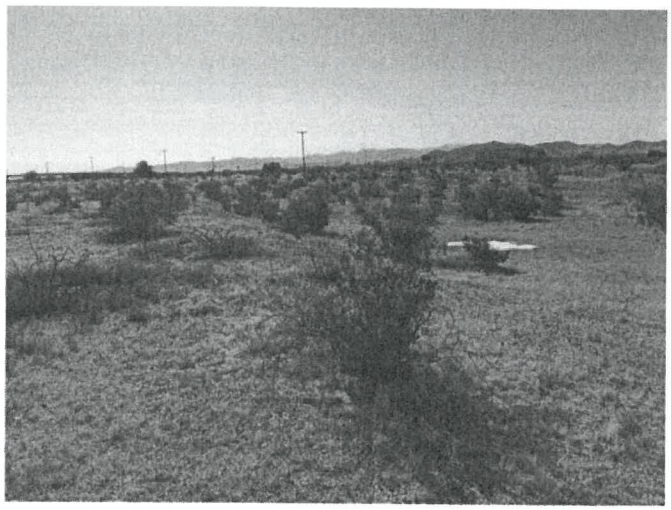

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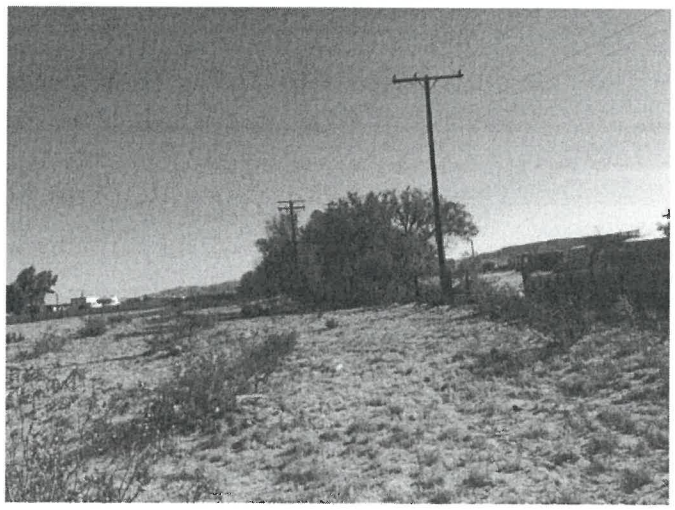

L2_E
34, 58' 1.530000", 116, 38' 37.020000"

L2_N
34, 58' 1.680000", 116, 38' 36.930000"

JN:10857 Harvard Road

L2_S
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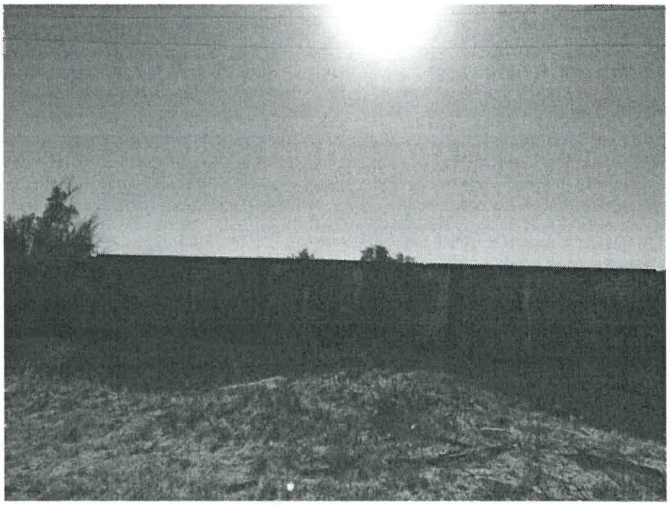

L2_W
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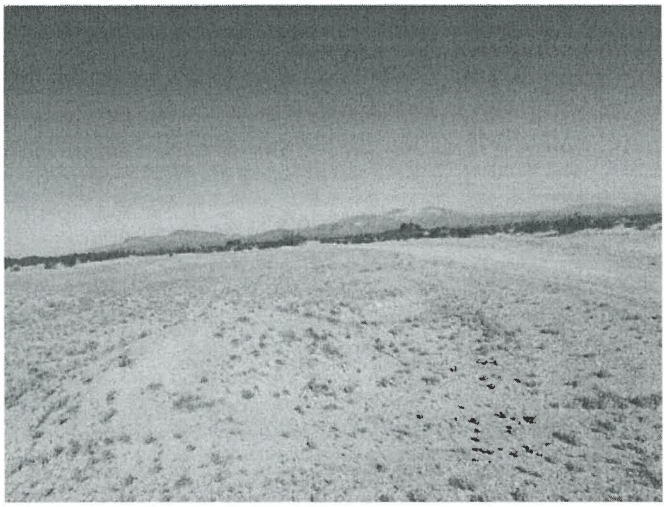

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L3_N
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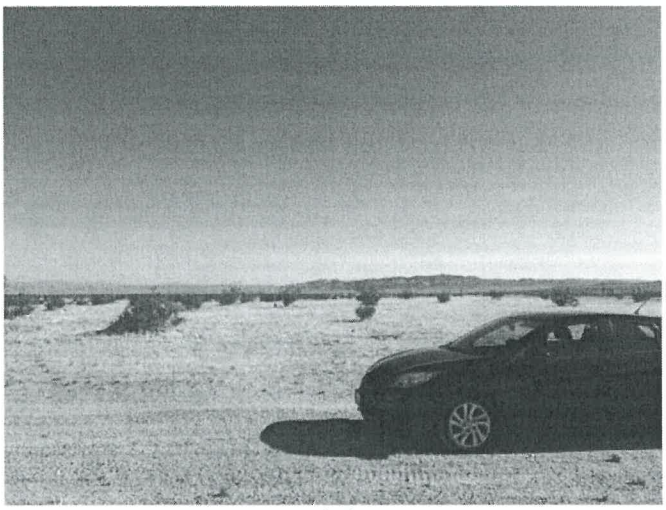

L3_S
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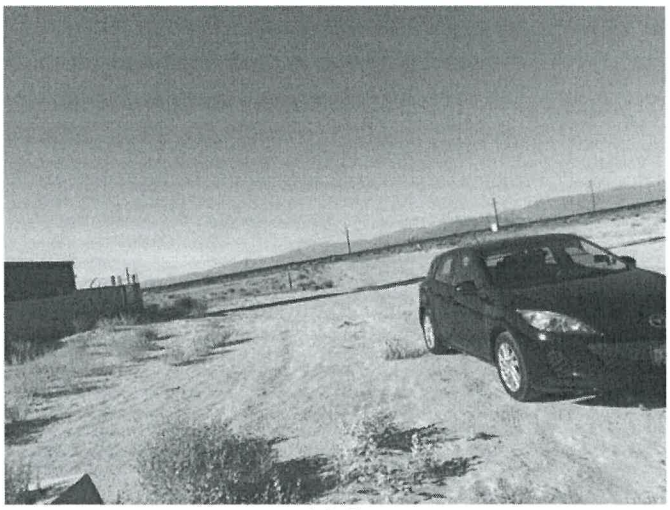

L4_E
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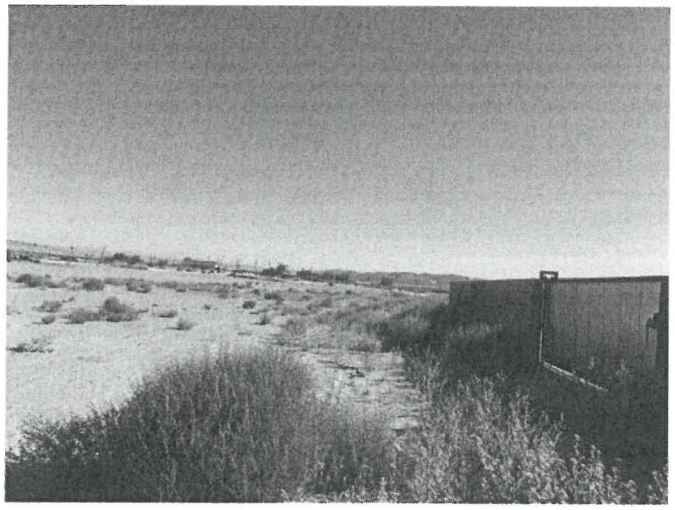
JN:10857 Harvard Road



L4_N
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L4_NE
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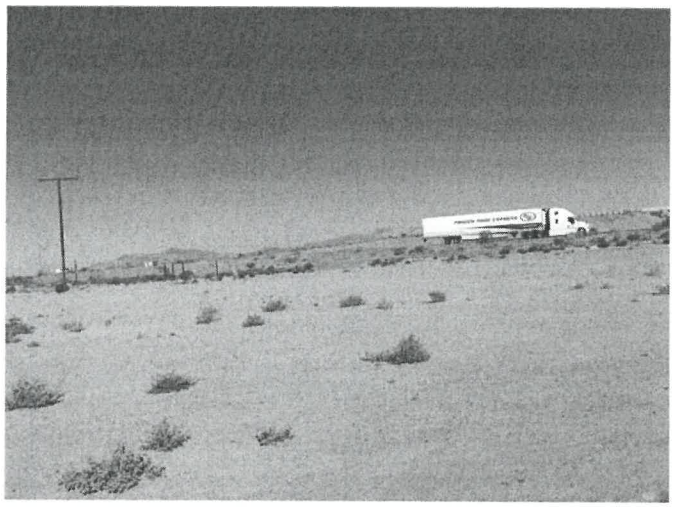

L4_S
34, 57' 43.760000", 116, 38' 34.000000"

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APPENDIX 4.2:

NOISE LEVEL MEASUREMENT WORKSHEETS

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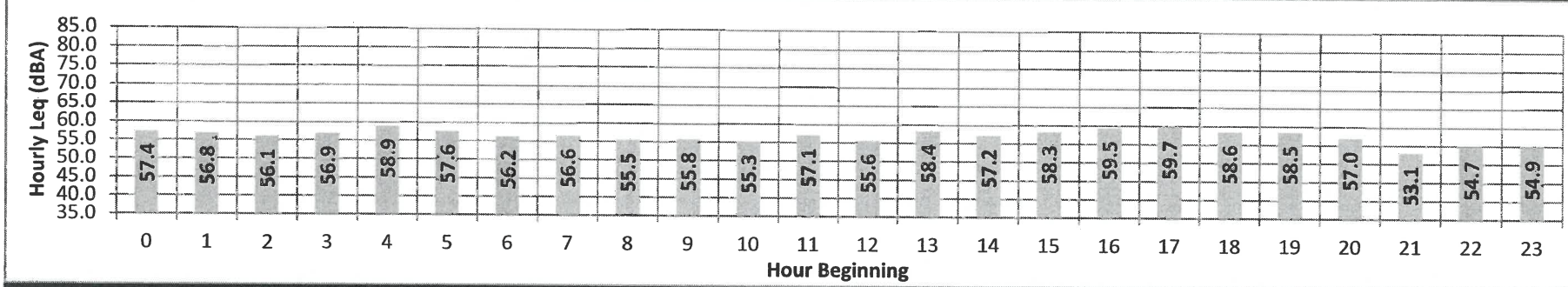
24-Hour Noise Level Measurement Summary

Project Name: Harvard Road		*JN:* 10857	*Energy Average Leq*		*24-Hour*
Location:	L1 - Located southwest of the Project site on Desert View Road near existing residential homes, north of I-15.	*Analyst:* A. Wolfe	*Day*	*Night*	*CNEL*
		Date: 7/1/2017	57.4	56.8	63.5

Hourly Leq dBA Readings (unadjusted)



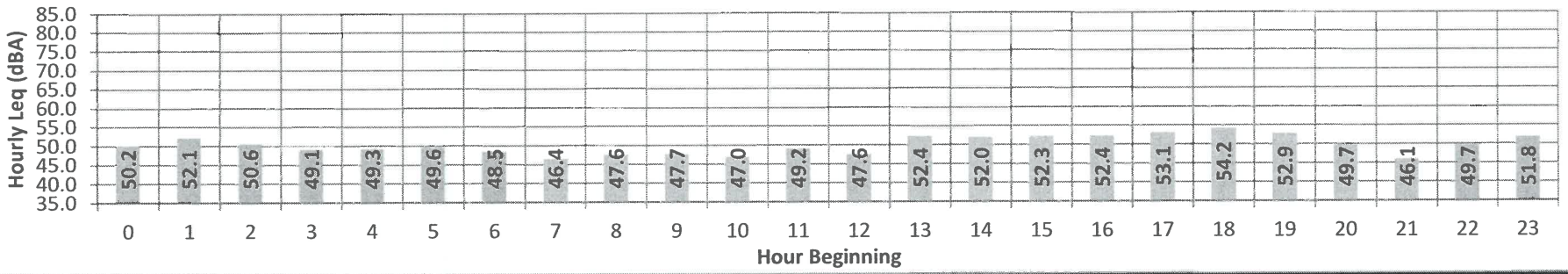
Time Period	Hour	Leq	Lmax	Lmin	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	53.1	67.1	41.9	59.0	58.0	56.0	56.0	53.0	51.0	47.0	47.0	44.0
	Max	59.7	80.1	51.0	66.0	65.0	63.0	62.0	60.0	58.0	54.0	53.0	52.0
Energy Average:		57.4	Average:		63.3	62.1	60.6	59.7	57.4	55.2	51.2	50.3	48.1
Night	Min	54.7	67.2	40.5	61.0	60.0	58.0	57.0	54.0	51.0	47.0	45.0	43.0
	Max	58.9	77.4	46.8	67.0	64.0	62.0	61.0	58.0	56.0	52.0	51.0	49.0
Energy Average:		56.8	Average:		63.3	61.9	60.1	59.3	56.6	54.4	50.1	48.9	46.7
Hourly Summary													
Night	0	57.4	68.9	45.9	64.0	62.0	61.0	60.0	58.0	56.0	52.0	50.0	48.0
	1	56.8	68.5	43.6	63.0	62.0	61.0	60.0	57.0	55.0	50.0	49.0	47.0
	2	56.1	72.0	44.7	64.0	62.0	60.0	59.0	56.0	54.0	49.0	48.0	47.0
	3	56.9	70.1	44.4	64.0	63.0	60.0	60.0	57.0	55.0	51.0	50.0	47.0
	4	58.9	77.4	43.6	67.0	64.0	62.0	61.0	58.0	56.0	51.0	50.0	47.0
	5	57.6	73.0	46.3	63.0	62.0	60.0	60.0	58.0	56.0	52.0	51.0	49.0
	6	56.2	67.2	46.8	62.0	61.0	59.0	59.0	56.0	55.0	51.0	50.0	48.0
Day	7	56.6	71.0	46.8	63.0	61.0	60.0	59.0	57.0	55.0	52.0	51.0	48.0
	8	55.5	67.9	47.4	62.0	61.0	59.0	58.0	56.0	54.0	50.0	50.0	48.0
	9	55.8	67.4	46.9	62.0	61.0	59.0	58.0	56.0	54.0	51.0	50.0	48.0
	10	55.3	70.7	43.0	61.0	60.0	59.0	58.0	56.0	54.0	49.0	47.0	44.0
	11	57.1	69.7	47.2	63.0	62.0	61.0	60.0	57.0	55.0	51.0	50.0	49.0
	12	55.6	67.4	41.9	63.0	62.0	60.0	59.0	56.0	53.0	48.0	47.0	44.0
	13	58.4	76.2	46.0	65.0	64.0	62.0	61.0	59.0	56.0	52.0	50.0	47.0
	14	57.2	80.1	45.8	64.0	63.0	61.0	60.0	57.0	54.0	49.0	48.0	46.0
	15	58.3	69.2	47.9	64.0	63.0	62.0	61.0	59.0	57.0	53.0	52.0	50.0
	16	59.5	70.9	49.9	65.0	64.0	63.0	62.0	60.0	58.0	54.0	53.0	51.0
	17	59.7	76.5	51.0	66.0	65.0	63.0	62.0	60.0	58.0	54.0	53.0	52.0
	18	58.6	72.6	48.4	65.0	63.0	62.0	61.0	59.0	57.0	53.0	53.0	51.0
	19	58.5	75.1	45.3	64.0	63.0	62.0	61.0	59.0	56.0	53.0	52.0	50.0
	20	57.0	67.1	45.8	63.0	61.0	60.0	59.0	57.0	56.0	52.0	51.0	48.0
	21	53.1	67.1	43.7	59.0	58.0	56.0	56.0	53.0	51.0	47.0	47.0	45.0
Night	22	54.7	75.9	40.5	61.0	60.0	58.0	57.0	54.0	51.0	47.0	45.0	43.0
	23	54.9	69.4	41.8	62.0	61.0	60.0	58.0	55.0	52.0	48.0	47.0	44.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Project Name: Harvard Road	*JN:* 10857	*Energy Average Leq*		*24-Hour*
	Analyst: A. Wolfe	*Day*	*Night*	*CNEL*
Location: L2 - Located north of the Project site near an existing residential home west of Harvard Road.	*Date:* 7/1/2017	50.8	50.3	57.0

Hourly Leq dBA Readings (unadjusted)



Time Period	Hour	Leq	Lmax	Lmin	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	46.1	58.2	36.3	53.0	51.0	49.0	48.0	45.0	43.0	41.0	40.0	39.0
	Max	54.2	75.3	45.9	63.0	60.0	57.0	55.0	53.0	51.0	49.0	48.0	47.0
Energy Average:		50.8	Average:		57.4	55.7	53.1	51.9	49.5	47.8	44.9	44.1	42.9
Night	Min	48.5	57.8	39.2	54.0	53.0	52.0	51.0	49.0	46.0	41.0	41.0	39.0
	Max	52.1	74.8	42.2	63.0	59.0	56.0	55.0	51.0	49.0	46.0	45.0	44.0
Energy Average:		50.3	Average:		57.6	56.0	53.6	51.9	49.7	47.4	43.7	42.9	41.4
Hourly Summary													
Night	0	50.2	65.5	42.2	56.0	55.0	53.0	52.0	50.0	49.0	46.0	45.0	44.0
	1	52.1	74.8	40.9	63.0	59.0	56.0	51.0	49.0	47.0	44.0	43.0	42.0
	2	50.6	74.6	40.9	59.0	58.0	53.0	51.0	49.0	47.0	44.0	43.0	42.0
	3	49.1	57.8	41.0	54.0	53.0	52.0	51.0	50.0	48.0	44.0	44.0	42.0
	4	49.3	65.2	39.3	57.0	55.0	52.0	51.0	49.0	47.0	44.0	43.0	41.0
	5	49.6	63.9	39.2	57.0	55.0	53.0	52.0	50.0	48.0	41.0	41.0	39.0
	6	48.5	59.0	39.2	54.0	53.0	52.0	51.0	50.0	47.0	43.0	42.0	41.0
Day	7	46.4	58.2	39.2	54.0	51.0	49.0	48.0	46.0	45.0	42.0	41.0	41.0
	8	47.6	68.7	40.9	53.0	52.0	50.0	49.0	47.0	46.0	43.0	43.0	42.0
	9	47.7	65.3	40.7	56.0	53.0	50.0	49.0	47.0	46.0	43.0	42.0	41.0
	10	47.0	65.3	39.9	54.0	53.0	50.0	49.0	47.0	45.0	43.0	42.0	41.0
	11	49.2	64.1	40.6	59.0	57.0	53.0	51.0	48.0	46.0	43.0	42.0	41.0
	12	47.6	62.7	39.2	55.0	53.0	51.0	50.0	48.0	46.0	43.0	42.0	41.0
	13	52.4	71.7	43.3	60.0	58.0	56.0	55.0	52.0	50.0	47.0	46.0	44.0
	14	52.0	71.7	40.9	61.0	59.0	57.0	55.0	51.0	49.0	44.0	43.0	42.0
	15	52.3	73.0	44.6	57.0	56.0	54.0	53.0	52.0	50.0	48.0	47.0	46.0
	16	52.4	65.5	45.7	59.0	58.0	56.0	55.0	52.0	51.0	48.0	48.0	46.0
	17	53.1	68.5	45.9	60.0	59.0	56.0	55.0	53.0	51.0	49.0	48.0	47.0
	18	54.2	75.3	43.5	63.0	60.0	56.0	55.0	52.0	50.0	47.0	46.0	45.0
	19	52.9	71.4	44.1	61.0	60.0	57.0	55.0	52.0	50.0	47.0	46.0	45.0
	20	49.7	59.8	42.1	55.0	54.0	52.0	52.0	50.0	49.0	45.0	45.0	43.0
	21	46.1	65.3	36.3	54.0	52.0	49.0	48.0	45.0	43.0	41.0	40.0	39.0
Night	22	49.7	64.0	39.2	58.0	57.0	55.0	53.0	49.0	46.0	43.0	42.0	41.0
	23	51.8	67.9	40.1	60.0	59.0	56.0	55.0	51.0	48.0	44.0	43.0	41.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

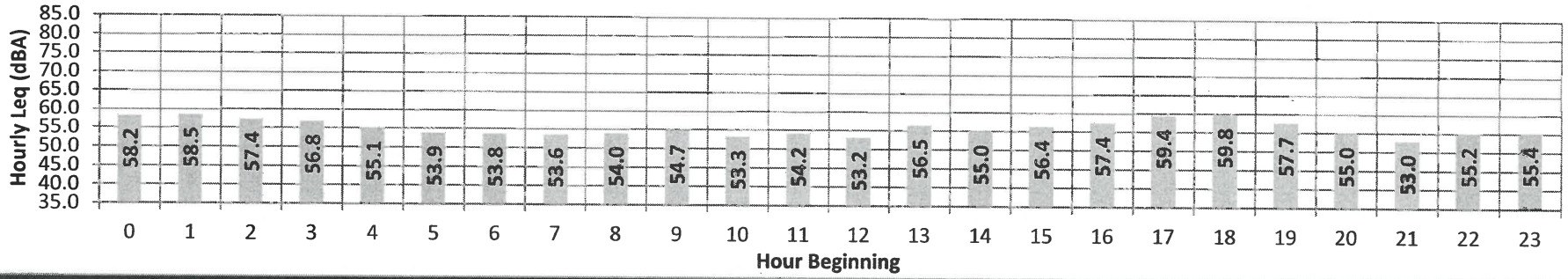
Project Name: Harvard Road

Location: L3 - Located east of the Project site on Barret Road adjacent to an existing residential home.

JN: 10857
Analyst: A. Wolfe
Date: 7/1/2017

Energy Average Leq		24-Hour
Day	Night	CNEL
56.1	56.3	63.0

Hourly Leq dBA Readings (unadjusted)



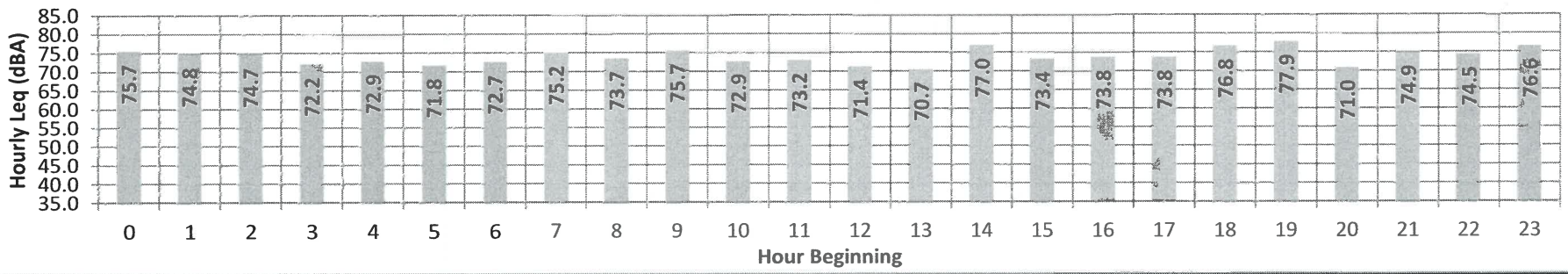
Time Period	Hour	Leq	Lmax	Lmin	L1%	L2%	L5%	L8%	L25%	L50%	L90%	L95%	L99%
Day	Min	53.0	64.2	43.3	59.0	57.0	55.0	54.0	52.0	51.0	47.0	46.0	45.0
	Max	59.8	82.2	51.1	68.0	65.0	63.0	62.0	60.0	57.0	54.0	53.0	52.0
Energy Average:		56.1	Average:		62.3	60.5	58.4	57.6	55.1	53.3	50.2	49.5	48.3
Night	Min	53.8	62.9	43.0	59.0	58.0	57.0	56.0	54.0	52.0	47.0	46.0	44.0
	Max	58.5	79.3	54.3	66.0	63.0	60.0	59.0	58.0	57.0	56.0	56.0	55.0
Energy Average:		56.3	Average:		61.8	60.1	58.2	57.3	55.6	54.3	51.6	51.1	49.9
Hourly Summary													
Night	0	58.2	72.9	54.3	62.0	61.0	60.0	59.0	58.0	57.0	56.0	56.0	55.0
	1	58.5	78.2	53.5	66.0	63.0	60.0	58.0	57.0	56.0	55.0	55.0	54.0
	2	57.4	79.3	51.9	61.0	61.0	58.0	58.0	56.0	56.0	54.0	54.0	53.0
	3	56.8	65.2	53.0	60.0	59.0	58.0	58.0	57.0	56.0	54.0	54.0	54.0
	4	55.1	72.4	44.3	63.0	60.0	57.0	56.0	54.0	53.0	49.0	48.0	46.0
	5	53.9	68.7	43.0	60.0	58.0	57.0	56.0	54.0	52.0	47.0	46.0	44.0
	6	53.8	62.9	44.2	59.0	58.0	57.0	56.0	54.0	53.0	49.0	48.0	46.0
Day	7	53.6	67.7	44.2	60.0	58.0	56.0	56.0	54.0	52.0	48.0	47.0	46.0
	8	54.0	69.1	44.0	60.0	59.0	57.0	56.0	54.0	53.0	49.0	49.0	47.0
	9	54.7	74.0	46.7	63.0	59.0	57.0	56.0	54.0	53.0	50.0	49.0	48.0
	10	53.3	71.2	44.1	59.0	58.0	56.0	55.0	53.0	52.0	48.0	47.0	46.0
	11	54.2	71.5	43.3	60.0	60.0	58.0	57.0	54.0	52.0	49.0	48.0	46.0
	12	53.2	69.7	44.3	61.0	59.0	57.0	56.0	53.0	51.0	48.0	47.0	46.0
	13	56.5	76.1	46.2	65.0	63.0	60.0	59.0	56.0	53.0	49.0	49.0	47.0
	14	55.0	73.5	43.6	64.0	62.0	59.0	58.0	54.0	52.0	47.0	46.0	45.0
	15	56.4	74.2	49.0	63.0	61.0	59.0	59.0	56.0	54.0	52.0	51.0	50.0
	16	57.4	82.2	49.0	62.0	61.0	59.0	58.0	57.0	55.0	53.0	52.0	51.0
	17	59.4	75.7	51.1	65.0	63.0	62.0	62.0	60.0	57.0	54.0	53.0	52.0
	18	59.8	80.1	49.7	68.0	65.0	63.0	62.0	59.0	56.0	53.0	52.0	51.0
	19	57.7	77.9	50.6	65.0	64.0	61.0	59.0	56.0	55.0	53.0	52.0	51.0
	20	55.0	64.2	49.4	59.0	59.0	57.0	57.0	55.0	54.0	51.0	51.0	50.0
	21	53.0	74.4	47.8	60.0	57.0	55.0	54.0	52.0	51.0	49.0	49.0	48.0
Night	22	55.2	74.0	47.2	63.0	60.0	58.0	57.0	55.0	53.0	50.0	49.0	48.0
	23	55.4	70.6	47.2	62.0	61.0	59.0	58.0	55.0	53.0	50.0	50.0	49.0

URBAN CROSSROADS

24-Hour Noise Level Measurement Summary

Project Name:	Harvard Road	*JN:*	10857	*Energy Average Leq*		*24-Hour*
		Analyst:	A. Wolfe	*Day*	*Night*	*CNEL*
Location:	L4 - Located southeast of the Project site and I-15, north of Yermo Road, near an existing cellular tower and nearby residential home.	*Date:*	7/1/2017	74.6	74.3	81.1

Hourly Leq dBA Readings (unadjusted)



Time Period	*Hour*	*Leq*	*Lmax*	*Lmin*	*L1%*	*L2%*	*L5%*	*L8%*	*L25%*	*L50%*	*L90%*	*L95%*	*L99%*
Day	Min	70.7	82.6	58.1	78.0	76.0	74.0	73.0	69.0	67.0	64.0	62.0	61.0
	Max	77.9	99.9	68.9	90.0	88.0	85.0	78.0	74.0	73.0	70.0	70.0	69.0
Energy Average:		74.6	Average:		83.6	82.4	77.7	75.2	71.7	69.9	67.1	66.2	65.0
Night	Min	71.8	83.1	57.9	78.0	77.0	75.0	74.0	70.0	67.0	63.0	62.0	60.0
	Max	76.6	99.6	64.9	89.0	86.0	83.0	79.0	73.0	71.0	68.0	68.0	66.0
Energy Average:		74.3	Average:		83.6	82.0	78.2	75.8	72.0	69.8	66.3	65.9	64.1
Hourly Summary													
Night	0	75.7	95.5	64.2	86.0	85.0	82.0	77.0	73.0	71.0	68.0	67.0	65.0
	1	74.8	93.8	63.5	87.0	86.0	78.0	75.0	72.0	70.0	66.0	66.0	65.0
	2	74.7	91.3	63.6	87.0	86.0	77.0	75.0	72.0	70.0	66.0	66.0	64.0
	3	72.2	83.3	63.6	79.0	78.0	76.0	75.0	72.0	70.0	67.0	67.0	65.0
	4	72.9	86.9	64.9	80.0	79.0	77.0	76.0	73.0	71.0	68.0	67.0	66.0
	5	71.8	83.1	63.5	78.0	77.0	75.0	74.0	72.0	70.0	67.0	67.0	65.0
	6	72.7	87.8	61.1	80.0	78.0	76.0	75.0	73.0	71.0	68.0	68.0	66.0
Day	7	75.2	99.9	63.7	84.0	83.0	79.0	76.0	72.0	70.0	67.0	66.0	65.0
	8	73.7	88.5	63.2	85.0	84.0	77.0	75.0	72.0	70.0	67.0	66.0	65.0
	9	75.7	97.9	62.4	87.0	86.0	78.0	74.0	71.0	69.0	66.0	65.0	64.0
	10	72.9	92.5	62.2	85.0	84.0	76.0	74.0	69.0	67.0	64.0	64.0	63.0
	11	73.2	91.9	58.1	85.0	84.0	76.0	73.0	69.0	67.0	64.0	62.0	61.0
	12	71.4	85.9	61.6	79.0	76.0	74.0	73.0	71.0	70.0	67.0	66.0	63.0
	13	70.7	89.6	63.7	78.0	77.0	74.0	73.0	70.0	68.0	66.0	65.0	65.0
	14	77.0	98.3	63.7	89.0	88.0	85.0	77.0	72.0	70.0	66.0	65.0	65.0
	15	73.4	86.6	67.9	80.0	79.0	76.0	75.0	73.0	72.0	70.0	70.0	69.0
	16	73.8	82.6	68.9	79.0	79.0	78.0	77.0	74.0	72.0	70.0	70.0	69.0
	17	73.8	84.0	67.1	80.0	79.0	77.0	76.0	74.0	72.0	70.0	69.0	68.0
	18	76.8	93.4	65.1	89.0	87.0	80.0	78.0	74.0	73.0	70.0	69.0	67.0
	19	77.9	98.5	64.5	90.0	88.0	82.0	78.0	73.0	71.0	68.0	67.0	66.0
	20	71.0	84.1	61.5	78.0	77.0	75.0	74.0	71.0	69.0	66.0	65.0	63.0
	21	74.9	94.9	60.7	86.0	85.0	78.0	75.0	71.0	69.0	65.0	64.0	62.0
Night	22	74.5	92.3	59.9	86.0	84.0	80.0	76.0	71.0	68.0	64.0	63.0	61.0
	23	76.6	99.6	57.9	89.0	85.0	83.0	79.0	70.0	67.0	63.0	62.0	60.0

URBAN CROSSROADS

APPENDIX 6.1:

ON-SITE TRAFFIC NOISE LEVEL CALCULATIONS

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

Scenario:	Backyard No Wall	*Project Name:*	Harvard Road
Road Name:	I-15 Fwy.	*Job Number:*	10857
Lot No:	Store	*Analyst:*	A. Wolfe

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	51,700 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	5,170 vehicles
Vehicle Speed:	70 mph
Near/Far Lane Distance:	138 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	930.0 feet
Centerline Dist. to Observer:	930.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	0.0%

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	77.5%	12.9%	9.6%	83.30%
Medium Trucks:	84.8%	4.9%	10.3%	4.32%
Heavy Trucks:	86.5%	2.7%	10.8%	12.37%

Noise Source Elevations (in feet)

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

Lane Equivalent Distance (in feet)

Autos:	927.450
Medium Trucks:	927.441
Heavy Trucks:	927.442

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	76.79	2.59	-19.13	-1.20	*-4.88*	0.000	0.000
Medium Trucks:	82.53	-10.27	-19.13	-1.20	*-4.89*	0.000	0.000
Heavy Trucks:	85.83	-5.70	-19.13	-1.20	*-4.92*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.0	57.1	55.4	49.3	57.9	58.6
Medium Trucks:	51.9	50.4	44.1	42.5	51.0	51.2
Heavy Trucks:	59.8	58.4	49.3	50.6	58.9	59.1
Vehicle Noise:	62.8	61.2	56.6	53.4	61.9	62.2

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.0	57.1	55.4	49.3	57.9	58.6
Medium Trucks:	51.9	50.4	44.1	42.5	51.0	51.2
Heavy Trucks:	59.8	58.4	49.3	50.6	58.9	59.1
Vehicle Noise:	62.8	61.2	56.6	53.4	61.9	62.2

Centerline Distance to Noise Contour (in feet)	*70 dBA*	*65 dBA*	*60 dBA*	*55 dBA*
CNEL:	281	605	1,302	2,806

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

Scenario:	First Floor With Wall	*Project Name:*	Harvard Road
Road Name:	I-15 Fwy.	*Job Number:*	10857
Lot No:	Store	*Analyst:*	A. Wolfe

SITE SPECIFIC INPUT DATA

Highway Data

Average Daily Traffic (Adt):	51,700 vehicles
Peak Hour Percentage:	10%
Peak Hour Volume:	5,170 vehicles
Vehicle Speed:	70 mph
Near/Far Lane Distance:	138 feet

Site Data

Barrier Height:	**0.0 feet**
Barrier Type (0-Wall, 1-Berm):	0.0
Centerline Dist. to Barrier:	930.0 feet
Centerline Dist. to Observer:	930.0 feet
Barrier Distance to Observer:	0.0 feet
Observer Height (Above Pad):	5.0 feet
Pad Elevation:	0.0 feet
Road Elevation:	0.0 feet
Barrier Elevation:	0.0 feet
Road Grade:	0.0%

NOISE MODEL INPUTS

Site Conditions (Hard = 10, Soft = 15)

Autos:	15
Medium Trucks (2 Axles):	15
Heavy Trucks (3+ Axles):	15

Vehicle Mix

VehicleType	*Day*	*Evening*	*Night*	*Daily*
Autos:	77.5%	12.9%	9.6%	83.30%
Medium Trucks:	84.8%	4.9%	10.3%	4.32%
Heavy Trucks:	86.5%	2.7%	10.8%	12.37%

Noise Source Elevations (in feet)

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

Lane Equivalent Distance (in feet)

Autos:	927.450
Medium Trucks:	927.441
Heavy Trucks:	927.442

FHWA Noise Model Calculations

VehicleType	*REMEL*	*Traffic Flow*	*Distance*	*Finite Road*	*Fresnel*	*Barrier Atten*	*Berm Atten*
Autos:	76.79	2.59	-19.13	-1.20	*-4.88*	0.000	0.000
Medium Trucks:	82.53	-10.27	-19.13	-1.20	*-4.89*	0.000	0.000
Heavy Trucks:	85.83	-5.70	-19.13	-1.20	*-4.92*	0.000	0.000

Unmitigated Noise Levels (without Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.0	57.1	55.4	49.3	57.9	58.6
Medium Trucks:	51.9	50.4	44.1	42.5	51.0	51.2
Heavy Trucks:	59.8	58.4	49.3	50.6	58.9	59.1
Vehicle Noise:	62.8	61.2	56.6	53.4	61.9	62.2

Mitigated Noise Levels (with Topo and barrier attenuation)

VehicleType	*Leq Peak Hour*	*Leq Day*	*Leq Evening*	*Leq Night*	*Ldn*	*CNEL*
Autos:	59.0	57.1	55.4	49.3	57.9	58.6
Medium Trucks:	51.9	50.4	44.1	42.5	51.0	51.2
Heavy Trucks:	59.8	58.4	49.3	50.6	58.9	59.1
Vehicle Noise:	62.8	61.2	56.6	53.4	61.9	62.2

APPENDIX 8.1:

OPERATIONAL STATIONARY-SOURCE NOISE CALCULATIONS

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STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

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

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	2,890.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	2,890.0 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:	20.0 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	2,890.0	-55.2	-55.2	-55.2	-55.2	-55.2	-55.2
Shielding (Barrier Attenuation)	2,890.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		22.0	-55.2	-55.2	-55.2	-55.2	-55.2
60 Minute Hourly Adjustment		**22.0**	**-55.2**	**-55.2**	**-55.2**	**-55.2**	**-55.2**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

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

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	2,440.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	2,440.0 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	2,440.0	-35.8	-35.8	-35.8	-35.8	-35.8	-35.8
Shielding (Barrier Attenuation)	2,440.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		16.4	-35.8	-35.8	-35.8	-35.8	-35.8
60 Minute Hourly Adjustment		**16.4**	**-35.8**	**-35.8**	**-35.8**	**-35.8**	**-35.8**

STATIONARY SOURCE NOISE PREDICTION MODEL 9/19/2017

Observer Location: **R1**
Source: Gas Station Activity
Condition: Operational

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	2,689.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	2,689.0 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:*	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)	40.0	64.4	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	2,689.0	-36.6	-36.6	-36.6	-36.6	-36.6	-36.6
Shielding (Barrier Attenuation)	2,689.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		27.8	-36.6	-36.6	-36.6	-36.6	-36.6
60 Minute Hourly Adjustment		**27.8**	**-36.6**	**-36.6**	**-36.6**	**-36.6**	**-36.6**

STATIONARY SOURCE NOISE PREDICTION MODEL 9/19/2017

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

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	440.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	440.0 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:	20.0 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	440.0	-38.9	-38.9	-38.9	-38.9	-38.9	-38.9
Shielding (Barrier Attenuation)	440.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		38.3	-38.9	-38.9	-38.9	-38.9	-38.9
60 Minute Hourly Adjustment		**38.3**	**-38.9**	**-38.9**	**-38.9**	**-38.9**	**-38.9**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

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

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	431.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	431.0 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	431.0	-24.5	-24.5	-24.5	-24.5	-24.5	-24.5
Shielding (Barrier Attenuation)	431.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		27.7	-24.5	-24.5	-24.5	-24.5	-24.5
60 Minute Hourly Adjustment		**27.7**	**-24.5**	**-24.5**	**-24.5**	**-24.5**	**-24.5**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

Observer Location: R2
Source: Gas Station Activity
Condition: Operational

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	565.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	565.0 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:*	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)	40.0	64.4	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	565.0	-23.0	-23.0	-23.0	-23.0	-23.0	-23.0
Shielding (Barrier Attenuation)	565.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		41.4	-23.0	-23.0	-23.0	-23.0	-23.0
60 Minute Hourly Adjustment		**41.4**	**-23.0**	**-23.0**	**-23.0**	**-23.0**	**-23.0**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

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

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	652.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	652.0 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:	20.0 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	652.0	-42.3	-42.3	-42.3	-42.3	-42.3	-42.3
Shielding (Barrier Attenuation)	652.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		34.9	-42.3	-42.3	-42.3	-42.3	-42.3
60 Minute Hourly Adjustment		**34.9**	**-42.3**	**-42.3**	**-42.3**	**-42.3**	**-42.3**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

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

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	594.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	594.0 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	594.0	-26.6	-26.6	-26.6	-26.6	-26.6	-26.6
Shielding (Barrier Attenuation)	594.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		25.6	-26.6	-26.6	-26.6	-26.6	-26.6
60 Minute Hourly Adjustment		**25.6**	**-26.6**	**-26.6**	**-26.6**	**-26.6**	**-26.6**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

Observer Location: R3
Source: Gas Station Activity
Condition: Operational

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	685.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	685.0 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:*	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)	40.0	64.4	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	685.0	-24.7	-24.7	-24.7	-24.7	-24.7	-24.7
Shielding (Barrier Attenuation)	685.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		39.7	-24.7	-24.7	-24.7	-24.7	-24.7
60 Minute Hourly Adjustment		**39.7**	**-24.7**	**-24.7**	**-24.7**	**-24.7**	**-24.7**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

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

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,618.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	1,618.0 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:	20.0 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	1,618.0	-50.2	-50.2	-50.2	-50.2	-50.2	-50.2
Shielding (Barrier Attenuation)	1,618.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		27.0	-50.2	-50.2	-50.2	-50.2	-50.2
60 Minute Hourly Adjustment		**27.0**	**-50.2**	**-50.2**	**-50.2**	**-50.2**	**-50.2**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

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

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,431.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	1,431.0 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	1,431.0	-32.3	-32.3	-32.3	-32.3	-32.3	-32.3
Shielding (Barrier Attenuation)	1,431.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		19.9	-32.3	-32.3	-32.3	-32.3	-32.3
60 Minute Hourly Adjustment		**19.9**	**-32.3**	**-32.3**	**-32.3**	**-32.3**	**-32.3**

STATIONARY SOURCE NOISE PREDICTION MODEL

9/19/2017

Observer Location: R4
Source: Gas Station Activity
Condition: Operational

Project Name: Harvard Road
Job Number: 10857
Analyst: A. Wolfe

NOISE MODEL INPUTS

Noise Distance to Observer	1,470.0 feet	***Barrier Height:***	**0.0 feet**
Noise Distance to Barrier:	1,470.0 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:*	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)	40.0	64.4	0.0	0.0	0.0	0.0	0.0
Distance Attenuation	1,470.0	-31.3	-31.3	-31.3	-31.3	-31.3	-31.3
Shielding (Barrier Attenuation)	1,470.0	0.0	0.0	0.0	0.0	0.0	0.0
Raw (Distance + Barrier)		33.1	-31.3	-31.3	-31.3	-31.3	-31.3
60 Minute Hourly Adjustment		**33.1**	**-31.3**	**-31.3**	**-31.3**	**-31.3**	**-31.3**