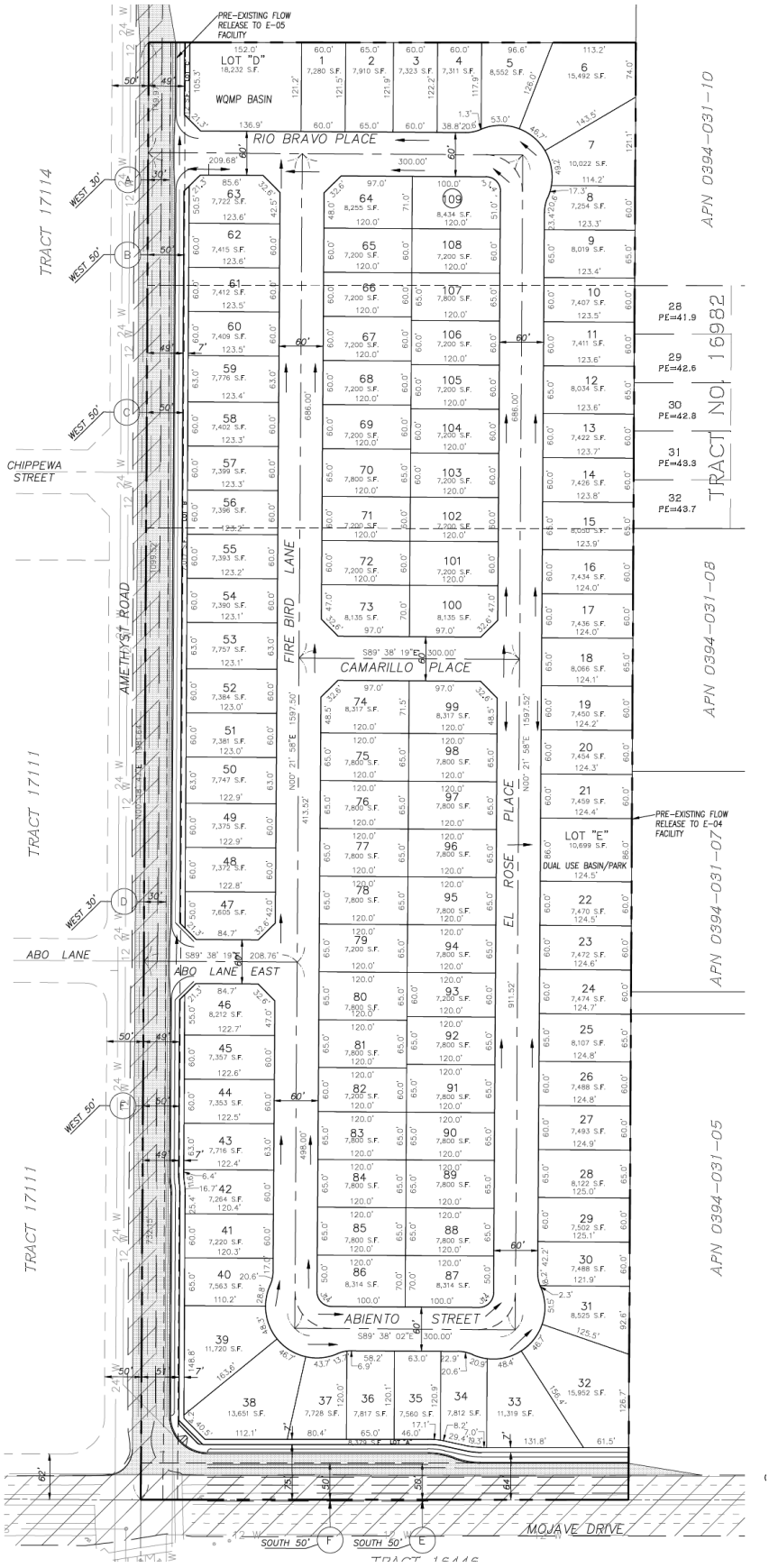
TTM 20525 SINGLE FAMILY RESIDENTIAL
NOISE IMPACT STUDY
City of Victorville, California



TTM 20525 SINGLE FAMILY RESIDENTIAL NOISE IMPACT STUDY
City of Victorville, California

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

The purpose of this report is to evaluate the potential noise impacts from the proposed TTM 20525 Single Family Residential (project) and provide recommendations, if necessary, to minimize any project noise impacts.

The assessment was conducted within the context of the California Environmental Quality Act (CEQA, California Public Resources Code Sections 21000, et seq.) and the standards and methodology follow the City of Victorville Municipal Code and General Plan requirements.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- Identification of the regulatory setting and applicable noise standards
- Analysis of the project's operational noise impact to adjacent receptors
- Analysis of the project's construction noise and vibration impact to adjacent sensitive receptors
- Summary of recommended project design features to reduce noise level impacts.

1.2 Site Location

The proposed project site is located near the northeast corner of Amethyst Road and Mojave Drive, in the City of Victorville. The project site is located approximately 2,955 feet above sea level and the topography is generally flat. The project site is currently vacant.

The primary sources of existing ambient noise at the project site includes roadway noise from Mojave Drive and Amethyst Road, as well as typical residential neighborhood noise from the existing residential homes to the east the project site.

The nearest noise sensitive receptors are the existing adjacent residential properties located along Valley High Lane to the east of the project site and the residential homes located south of Mojave Road, south of the site.

The project site location map is provided in Exhibit A.

1.3 Project Description

The proposed project consists of constructing and operating 112 single family residential dwelling units on approximately 30.1 gross acres. As part of the project design, six (6) foot noise barrier walls will be constructed along the property lines facing Mojave Drive and Amethyst Road, shielding the backyards of the residential uses. The site plan used for this analysis, provided by LUDWIG ENGINEERING ASSOCIATES, INC., is illustrated in Exhibit B.

This report analyzes short-term and long-term noise impacts associated with the day-to-day operation of the project. The primary source of short-term noise is from construction activities. The primary sources of long-term noise impacts include typical residential activity noise including HVAC units and vehicular traffic activity.

1.4 Summary of Analysis Results

Table 1 provides a summary of the noise analysis results, per the CEQA impact criteria checklist. With the implementation of the recommended mitigation measures, the project is not expected to result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Table 1
CEQA Noise Impact Criteria

Noise Impact Criteria	Potentially Significant	Potentially Significant Unless Mitigated	Less Than Significant Impact	No Impact
Would the project result in?				
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			X	
b) Generation of excessive groundborne vibration or groundborne noise levels?			X	
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X

1.5 Recommended Project Design Features

The following recommended project design features include standard rules and requirements, best practices and recognized design guidelines for reducing noise levels. Design features are assumed to be part of the conditions of the project and integrated into its design.

Operational Design Features

DF-1 A six (6) foot noise barrier wall will be provided to shield all habitable backyard areas facing exterior roadways and adjacent properties. The designed noise screening will only be accomplished if the barrier's weight is at least 3.5 pounds per square foot of face area without decorative cutouts or line-of-site openings between the shielded areas and the project site. All gaps (except for weep holes) should be filled with grout or caulking to avoid flanking.

Noise control barrier may be constructed using one, or any combination of the following materials:

- Masonry block;
- Stucco veneer over wood framing (or foam core), or 1-inch thick tongue and groove wood of sufficient weight per square foot;
- Transparent glass (1/2-inch-thick), acrylic, polycarbonate, or other transparent material with sufficient weight per square foot.

DF-2 The project should incorporate building construction techniques and insulation that is consistent with California Title 24 Building Standards to achieve the minimum interior noise standard of 45 dBA CNEL for all residential units.

DF-3 A "windows closed" condition is expected to be required for all residential units within the project site to meet the interior noise standard. To accommodate a windows closed conditions, all units shall be equipped with adequate fresh air ventilation, per the requirements of the California Building Standards Code.

DF-4 Based on the results of this analysis, the project should provide upgraded windows and sliding glass doors per the recommendations described in Table 10 of this report.

DF-5 For proper acoustical performance, all exterior windows, doors, and sliding glass doors should have a positive seal and leaks/cracks must be kept to a minimum.

Construction Design Features

DF-7 All construction equipment shall be equipped with muffles and other suitable noise attenuation devices (e.g., engine shields).

DF-8 Establish an electric connection to the site to avoid the use of diesel and gas powered generators, if feasible.

DF-9 Locate staging area, generators and stationary construction equipment as far from the adjacent residential homes as feasible.

DF-10 Construction-related equipment, including heavy-duty equipment, motor vehicles, and portable equipment, shall be turned off when not in use for more than 5 minutes.

DF-11 No impact pile driving or blasting activities should be permitted on the project site during construction.

2.0 Fundamentals of Noise

This section of the report provides basic information about noise and presents some of the terms used within the report.

2.1 Sound, Noise and Acoustics

Sound is a disturbance created by a moving or vibrating source and is capable of being detected by the hearing organs. Sound may be thought of as mechanical energy of a moving object transmitted by pressure waves through a medium to a human ear. For traffic, or stationary noise, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or unwanted.

2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch (bass sounding) and high-frequency sounds are high in pitch (squeak). These oscillations per second (cycles) are commonly referred to as Hertz (Hz). The human ear can hear from the bass pitch starting out at 20 Hz all the way to the high pitch of 20,000 Hz.

2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines it loudness. The loudness of sound increases or decreases, as the amplitude increases or decreases. Sound pressure amplitude is measured in units of micro-Newton per square inch meter (N/m2), also called micro-Pascal (μPa). One μPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels and abbreviated dB.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two (2) sounds of equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3 dB increase.

If two (2) sounds differ by approximately 10 dB the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels

In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, (A-weighted scale) and it perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. For purposes of this report as well as with most environmental documents, the A-scale weighting is typically reported in terms of A-weighted decibel (dBA). Typically, the human ear can barely perceive the change in noise level of 3 dB. A change in 5 dB is readily perceptible, and a change in 10 dB is perceived as being twice or half as loud[1]. As previously discussed, a doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g. doubling the volume of traffic on a highway), would result in a barely perceptible change in sound level.

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels are constant, while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels. Following are the most commonly used noise descriptors along with brief definitions.

A-Weighted Sound Level

The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear. A numerical method of rating human judgment of loudness.

Ambient Noise Level

The composite of noise from all sources, near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

[1] Source: U.S. DOT Federal Highway Administration. Dec. 2011. Highway Traffic Noise: Analysis and Abatement Guidance.

Community Noise Equivalent Level (CNEL)

The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB)

A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro-pascals.

dB(A)

A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ)

The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time varying noise level. The energy average noise level during the sample period.

Habitable Room

Any room meeting the requirements of the Uniform Building Code or other applicable regulations which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms, and similar spaces.

L(n)

The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 is the sound level exceeded 10 percent of the sample time. Similarly L50, L90 and L99, etc.

Noise

Any unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Outdoor Living Area

Outdoor spaces that are associated with residential land uses typically used for passive recreational activities or other noise-sensitive uses. Such spaces include patio areas, barbecue areas, jacuzzi areas, etc. associated with residential uses; outdoor patient recovery or resting areas associated with hospitals, convalescent hospitals, or rest homes; outdoor areas associated with places of worship which have a significant role in services or other noise-sensitive activities; and outdoor school facilities routinely used for educational purposes which may be adversely impacted by noise. Outdoor areas usually not included in this definition are: front yard areas, driveways, greenbelts, maintenance areas and storage areas associated with residential land uses; exterior areas at hospitals that are not used for patient activities; outdoor areas associated with places of worship and principally used for short-term social gatherings; and, outdoor areas associated with school facilities that are not typically associated with educational uses prone to adverse noise impacts (for example, school play yard areas).

Percent Noise Levels

See L(n).

Sound Level (Noise Level)

The weighted sound pressure level obtained by use of a sound level meter having a standard frequency-filter for attenuating part of the sound spectrum.

Sound Level Meter

An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL)

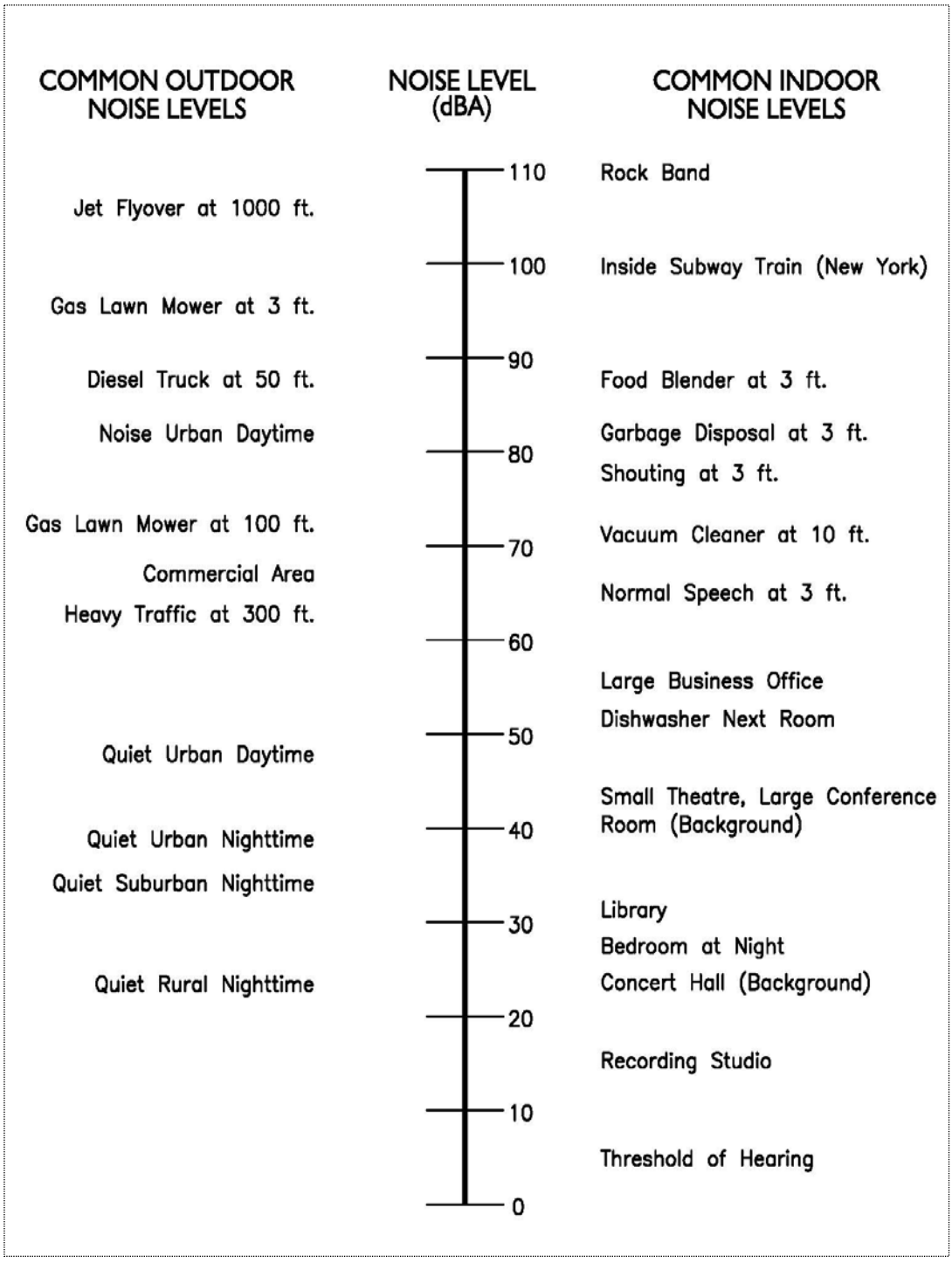
The dBA level which, if it lasted for one (1) second, would produce the same A-weighted sound energy as the actual event.

2.7 Sound Propagation

As sound propagates from a source it spreads geometrically. Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of 6 dB per doubling of distance. The movement of vehicles down a roadway makes the source of the sound appear to propagate from a line (i.e., line source) rather than a point source. This line source results in the noise propagating from a roadway in a cylindrical spreading versus a spherical spreading that results from a point source. The sound level attenuates for a line source at a rate of 3 dB per doubling of distance.

As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground absorption between the noise source and the receiver. Soft site conditions such as grass, soft dirt or landscaping attenuate noise at an additional rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 3 dB per doubling of distance for a line source and 6.0 dB per doubling of distance for a point source.

Figure 1
Typical Sound Levels from Indoor and Outdoor Noise Sources[2]



[2] Source: AASHSTO. 1993. Guide on Evaluation and Abatement of Traffic Noise

2.8 Vibration Descriptors

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude.

PPV

Known as the peak particle velocity (PPV) which is the maximum instantaneous peak in vibration velocity, typically given in inches per second.

RMS

Known as the root mean squared (RMS) can be used to denote vibration amplitude.

VdB

A commonly used abbreviation to describe the vibration level (VdB) for a vibration source.

2.9 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts. According to the FTA, fragile buildings can be exposed to ground-borne vibration levels of 0.3 inches per second without experiencing structural damage.

2.10 Vibration Propagation

There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wavefront, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wavefront. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wavefront. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

2.11 Construction Related Vibration Level Prediction[3]

Operational activities are separated into two different categories. The vibration can be transient or continuous in nature. Each category can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of the project area site respond to these vibrations with varying results ranging from no perceptible effects at the low levels to slight damage at the highest levels. The thresholds from Caltrans Transportation and Construction Vibration Guidance Manual, April 2020, in the table below provide general guidelines as to the maximum vibration limits for when vibration becomes potentially annoying.

[3] Caltrans Transportation and Construction Vibration Guidance Manual, April 2020

Table 2
Vibration Annoyance Potential Criteria

Human Response	PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.90	0.10
Severe	2.00	0.40

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

The Caltrans Transportation and Construction Vibration Guidance Manual, April 2020 provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts. The table below provides general vibration damage potential thresholds:

Table 3
Vibration Damage Potential Threshold Criteria

Structure and Condition	PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings ruin ancient monuments	0.12	0.08
Fragile buildings	0.20	0.10
Historic and some old buildings	0.50	0.25
Older residential structures	0.50	0.30
New residential structures	1.00	0.50
Modern industrial/commercial buildings	2.00	0.50

Soil conditions have an impact on how vibration propagates through the ground. The Caltrans Transportation and Construction Vibration Guidance Manual, April 2020 provides suggested "n" values based on soil class. The table below outlines the manual's suggested values and description.

Table 4
Suggested "n" Values Based on Soil Classes

Soil Class	Description of Soil Material	Suggested Value of "n"
I	Weak or soft soils: loose soils, dry or partially saturated peat and muck, mud, loose beach sand, and dune sand.	1.4
II	Most sands, sandy clays, silty clays, gravel, silts, weathered rock.	1.3
III	Hard soils: densely compacted sand, dry consolidated clay, consolidated glacial till, some exposed rock.	1.1
IV	Hard, component rock: bedrock, freshly exposed hard rock.	1.0

3.0 Regulatory Setting

3.1 State of California Noise Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the "Land Use Compatibility for Community Noise Environments Matrix." The matrix allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

The State of California has also established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the legislative body of each county and city adopt a noise element as a part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

Noise insulation design standards for residences have been established by the State of California Building Standards Code. The City is required by the State Housing Law to adopt these State codes as minimum performance standards. The City may enact stricter noise standards throughout the city or on a case-by-case basis if deemed necessary. In brief, the Title 24 noise standards require the following for allowable interior noise levels:

- Interior noise levels due to exterior sources must not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.

3.2 City of Victorville Noise Regulations

The City of Victorville outlines their noise regulations and standards within the General Plan, Noise Element and the Municipal Code, Chapter 13.01, Noise Control. The Victorville General Plan Noise Element and Municipal Code Noise Control are provided in Appendix A.

3.2.1 General Plan Noise – Compatible Land Use Objectives

The City of Victorville's noise element is used to evaluate the project's noise/land use compatibility and ensure the project is consistent with the established plans, policies and programs for noise control within the City.

Table 5 summarizes the Noise/Land Use Compatibility standards for land uses applicable to this project:

Table 5
Noise/Land Use Compatibility Standards

Land Use	Noise Limit (dBA CNEL)			
	Normally Acceptable[1]	Conditionally Acceptable[2]	Normally Unacceptable[3]	Clearly Unacceptable[4]
Residential - Single Family	50 - 65	65 - 75	75 - 80	>80

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

[2] Conditionally Acceptable: New construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.

[3] Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

[4] Clearly Unacceptable: New construction or development should generally not be undertaken.

3.2.2 Municipal Code – Noise Control

Table 6 shows the City of Victorville's Residential Noise Standards, as established in the City of Victorville Municipal Code Section 13.01.040 – Base Ambient Noise Levels. The noise standards shown in Table 6 shall apply to residential properties, unless otherwise specifically identified by the Municipal Code.

Table 6
City of Victorville Base Ambient Noise Levels

Land Use	Daytime (7:00 AM to 10:00 PM)	Nighttime (10:00 PM to 7:00 AM)
Residential	65 dBA	55 dBA

Noise levels shall not exceed the ambient noise levels shown in Table 2 by the following dB(A) levels for the cumulative period of time specified:

1) Less than 5dB(A) for a cumulative period of more than thirty minutes in any hour;

2) Less than 10 dB(A) for a cumulative period of more than fifteen minutes in any hour;

3) Less than 15 dB(A) for a cumulative period of more than five minutes in any hour;

4) Less than 20 dB(A) for a cumulative period of more than one minute in any hour;

5) 20 dB(A) or more for any period of time.

Construction Noise Standards

The City of Victorville Municipal Code Noise Ordinance Section 13.01.060 – Noise Source Exemption (9) exempts noise levels associated with construction activities provided:

- *Construction activity on private properties that are determined by the director of building and safety to be essential to the completion of a project.*

4.0 Study Method and Procedures

The following section describes the noise modeling procedures and assumptions used in the noise analysis.

4.1 Traffic Noise Modeling

Traffic noise from vehicular traffic was projected using a version of the FHWA Traffic Noise Prediction Model (FHWA-RD-77-108). The FHWA model arrives at the predicted noise level through a series of adjustments to the key input parameters. The following outlines the key adjustments made to the computer model for the roadway inputs:

- Roadway classification – (e.g. freeway, major arterial, arterial, secondary, collector, etc.),
- Roadway Active Width – (distance between the center of the outer most travel lanes on each side of the roadway)
- Average Daily Traffic (ADT) Volumes, Travel Speeds, Percentages of automobiles, medium trucks, and heavy trucks
- Roadway grade and angle of view
- Site Conditions (e.g. soft vs. hard)
- Percentage of total ADT which flows each hour throughout a 24-hour period

The following outlines key adjustments to the computer model for the project site parameter inputs:

- Vertical and horizontal distances (Sensitive receptor distance from noise source)
- Noise barrier vertical and horizontal distances (Noise barrier distance from sound source and receptor).
- Traffic noise source spectra
- Topography

Table 7 indicates the roadway parameters utilized for this study.

The City of Victorville General Plan Circulation Map designates Amethyst Road as an Arterial (4 Lane Divided). Currently, Amethyst Road north of Mojave Drive is undeveloped and the project is expecting to develop it as a part of the project. Mojave Drive is designated as Super Arterial (6 Lane) in the City of Victorville General Plan Circulation Map, and the project is expected to complete the remaining half-width improvements along Mojave Drive as part of the project.

The City of Victorville General Plan do not contain existing roadway volumes along Amethyst Road and Mojave Drive. Therefore, in order to conservatively estimate the future roadway noise impacting the project, roadway capacity volumes of Los C have been used.

Table 7
Roadway Parameters[1]

Roadway	Classification	Segment	Roadway Capacity[2]	Speed (MPH)	Site Conditions
Mojave Drive	Super Arterial	East of Amethyst Road	37,500	60	Hard
Amethyst Road	Arterial	South of Mojave Drive	30,000	50	Hard

[1] Source: City of Victorville General Plan Circulation Element, Figure CIRC-2: Roadway Network.
[2] City of Victorville Los C Thresholds, Civic Center Community Sustainability Plan Traffic Study, January 2014.

Table 8 indicates the vehicle distribution and truck mix utilized for all roadways in this study area.

Table 8
Vehicle Distribution (Truck Mix) for Arterial Roadways[1,2]

Motor-Vehicle Type	Daytime % (7 AM - 7 PM)	Evening % (7 PM - 10 PM)	Night % (10 PM - 7 AM)	Total % of Traffic Flow
Automobiles	69.5	12.9	9.6	92.00
Medium Trucks	1.44	0.06	1.5	3.00
Heavy Trucks	2.4	0.1	2.5	5.00

[1] Vehicle percentages specified are based on typical mix for Arterial roadways.

4.2 Interior Noise Modeling

The interior noise level is the difference between the projected exterior noise level at the structure's façade and the noise reduction provided by the structure itself. Typical building construction will provide a conservative 12 dBA noise level reduction with a "windows open" condition and a very conservative 20 dBA noise level reduction with "windows closed". RK estimated the interior noise level by subtracting the building shell design from the estimated exterior noise level.

The interior noise analysis is based on industry standards for building noise reduction established by the Federal Highway Administration (FHWA), the 2013 Caltrans Technical Noise Supplement to the Traffic Noise Analysis Protocol (TeNS), the California Office of

Noise Control Catalog of STC and IIC Ratings for Wall and Floor/Ceiling Assemblies, and the California Building Standards Code, Title 24.

The TeNS manual shows that the noise reduction due to building exteriors with ordinary sash windows (windows closed) is at least 20 decibels. By providing upgraded STC rated windows, the project design is considered adequate to meet interior noise standards. The building's exterior walls will be constructed per the latest building code insulation requirements and provide occupants with the most protection from exterior noise. Insulated exterior walls, designed per the latest California Building Standards, would provide a minimum of STC 35-40. Windows, on the other hand, are one of the acoustically weakest parts of the structure. Therefore, for a conservative estimate of preliminary interior noise, the building's noise reduction potential is limited to the STC of the windows.

4.3 Construction Noise Modeling

The construction noise analysis utilizes the Federal Highway Administration (FHWA) Roadway Construction Noise Model, together with several key construction parameters. Key inputs include distance to the sensitive receiver, equipment usage, and baseline parameters for the project site. This study evaluates the potential exterior noise impacts during each phase of construction. Noise levels were projected at an average distance of 50 feet for equipment operating over an 8-hour period from to the nearest sensitive receptor property line. While some construction noise activity may occur closer than 50 feet from the property line, noise levels are averaged over an 8-hour period for purposes of assessing impacts.

4.4 Construction Vibration Modeling

The construction vibration assessment is based on the methodology set-forth within the Caltrans Transportation and Construction Induced Vibration Guidance Manual. The vibration impacts from vibratory rollers and compactors, heavy truck loading and bulldozer activity is analyzed. All vibratory activity is analyzed as a continuous and/or frequent event and is required to comply with the applicable guidance thresholds criteria. It is expected that vibration levels will be highest during paving phase. No impact pile driving is expected as part of this project.

Vibratory impacts were calculated from the site area property line to the closest sensitive receptors and structures using the reference vibration levels, soil conditions and the reference equation *PPV= PPV ref (25/D) ^ n (in/sec)* (from Caltrans Manual) where:

PPV = reference measurement at 25 feet from vibration source
D = distance from equipment to property line
n= vibration attenuation rate through ground (n=1.1 was utilized for this study)

5.0 Operational Noise Impacts

A noise analysis has been performed to determine whether the proposed project would result in a substantial increase in ambient noise levels in the vicinity of the site. Additionally, the noise analysis examines whether the project can meet the City of Victorville and State of California requirements for residential exterior and interior noise exposure.

The State of California and City of Victorville require that interior noise levels due to exterior sources must not exceed a community noise equivalent level (CNEL) or a day-night level (LDN) of 45 dBA, in any habitable room.

5.1 Project Operational Noise Impacts

The project is consistent with the General Plan Land Use Designation and consists of single-family residential housing. The project is not expected to consist of significant sources of stationary noise. The main sources of potential stationary noise impacts from the project would mainly include on-site noise would include typical neighborhood noise, such as motor vehicle traffic, HVAC equipment and general human activities.

These types of on-site noise from the project are typically considered compatible with other adjacent residential uses and would not typically be categorized as loud, unnecessary, or unusual noise that disturbs the peace or quiet of any neighborhood, or that causes discomfort or annoyance to any person of normal sensitiveness. In particular, social activities and vehicular related noise are generally substantially less during the noise sensitive nighttime hours.

The project noise sources will be screened behind the proposed six-foot property line walls that will shield backyard areas of the site. Thus, most of the typical on-site outdoor residential activity and HVAC equipment will be screened from the neighboring property's line of sight behind a minimum 6-foot high noise barrier wall. As a result, the project is not expected to generate on-site stationary noise that would adversely affect the existing ambient conditions in the vicinity of the site.

5.2 Noise/Land Use Compatibility

Traffic noise impacts from Mojave Drive and Amethyst Road are analyzed at the project site and are compared to the City's Noise Standards for determining the project's noise/land use compatibility.

Traffic noise along Mojave Drive and Amethyst Road will be the main sources of noise impacting the project site. The nearest first row of residential lot will be set back approximately 71.0 feet from the centerline of Mojave Drive and approximately 59 feet from the Amethyst Road. As previously mentioned, the project is proposing to build a six (6) foot CMU block wall along the property lines facing the external roadways to help reduce noise impacts.

Table 9 indicates the noise level projections to the backyard habitable areas of the residential units nearest the subject roadways. Future exterior noise levels at the nearest first row residential lots facing Mojave Drive will be approximately 65.7 dBA CNEL and future exterior noise levels at the first-row residential lots facing Amethyst Road will be approximately 62.9 dBA CNEL.

Table 9
Future Exterior Roadway Noise Levels (dBA CNEL)[1]

Roadway	Exterior Façade Study Locations	Exterior Noise Level at Facade	City of Victorville Land Use Compatibility
Mojave Drive	Backyard/Patio	65.7	Conditionally Acceptable
Amethyst Road	Backyard/Patio	62.9	Normally Acceptable

[1] Exterior noise levels calculated 5-feet above pad elevation, perpendicular to subject roadway and includes attenuation from 6-foot wall.

Based on the City of Victorville General Plan Noise-Compatibility Land Use Objectives, the future exterior noise levels at the habitable backyard areas of the project site ranges from conditionally acceptable for residential lots facing Mojave Drive to normally acceptable for residential lots facing Amethyst Road.

As a result, based on City of Victorville General Plan Noise/Land Use Compatibility, new construction or development should be undertaken only after detailed analysis of the noise reduction requirements are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.

The roadway calculation sheets are provided in Appendix B.

5.3 Future Interior Noise

A preliminary interior noise analysis has been performed for the first row of habitable dwellings facing adjacent roadways using a typical "windows open" and "windows closed" condition. A "windows open" condition assumes 12 dBA of noise attenuation from the exterior noise level. A "windows closed" condition" assumes 20 dBA of noise attenuation from the exterior noise level.

Table 10 indicates the future interior noise levels along the adjacent roadways.

Table 10
Future Interior Noise Levels (dBA CNEL)[1]

Roadway	Exterior Façade Study Location	Exterior Noise Level at Façade	Required Interior Noise Reduction	Interior Noise Level w/Standard Windows (STC ~ 25)		STC Rating
				"Windows Open" [1]	"Windows Closed" [2]	
Mojave Drive	1st Floor (All lots along Mojave Drive)	65.3	20.3	53.3	45.3	25
	2nd Floor (All lots along Mojave Drive)	73.9	28.9	61.9	53.9	32
Amethyst Road	1st Floor (All lots along Amethyst Road)	62.4	17.9	50.9	42.9	25
	2nd Floor (All lots along Amethyst Road)	71.1	26.4	59.4	51.4	30

[1] A minimum of 12 dBA noise reduction is assumed with the "windows open" condition.
[2] A minimum of 20 dBA noise reduction is assumed with the "windows closed" condition.

California standard building shell and residential windows are expected to provide adequate attenuation to meet interior noise standards with a window open and windows closed condition for first floor residential homes and upgraded windows and sliding glass doors per the recommendations described in Table 10 for the second floor.

5.4 Project Design Features

The following recommendations are provided to help ensure the proposed project meets the City of Victorville and State of California requirements for residential interior noise exposure:

DF-1 A six (6) foot noise barrier wall will be provided to shield all habitable backyard areas facing exterior roadways and adjacent properties. The

designed noise screening will only be accomplished if the barrier's weight is at least 3.5 pounds per square foot of face area without decorative cutouts or line-of-site openings between the shielded areas and the project site. All gaps (except for weep holes) should be filled with grout or caulking to avoid flanking.

Noise control barrier may be constructed using one, or any combination of the following materials:

- Masonry block;
- Stucco veneer over wood framing (or foam core), or 1-inch thick tongue and groove wood of sufficient weight per square foot;
- Transparent glass (1/2-inch-thick), acrylic, polycarbonate, or other transparent material with sufficient weight per square foot.

DF-2 The project should incorporate building construction techniques and insulation that is consistent with California Title 24 Building Standards to achieve the minimum interior noise standard of 45 dBA CNEL for all residential units.

DF-3 A "windows closed" condition is expected to be required for all residential units within the project site to meet the interior noise standard. To accommodate a windows closed conditions, all units shall be equipped with adequate fresh air ventilation, per the requirements of the California Building Standards Code.

DF-4 Based on the results of this analysis, the project should provide upgraded windows and sliding glass doors per the recommendations described in Table 10 of this report.

DF-5 For proper acoustical performance, all exterior windows, doors, and sliding glass doors should have a positive seal and leaks/cracks must be kept to a minimum.

6.0 Construction Noise and Vibration Impacts

Temporary construction noise and vibration impacts have been assessed from the project site to the surrounding existing noise sensitive land uses.

As previously mentioned, the City of Victorville General Plan and Municipal Code do not identify specific construction noise level thresholds.

This section provides an analysis of estimated construction noise levels at 50 feet, at the adjacent residential properties. Although construction activity is exempt from the noise standards in the City's Municipal Code, CEQA requires that potential noise impacts still be disclosed for informational purposes.

6.1 Typical Construction Noise Levels

Table 11 shows typical construction noise levels compiled by the Environmental Protection Agency (EPA) for common type construction equipment. Typical construction noise levels are used to estimate potential project construction noise levels at the adjacent sensitive receptors.

Table 11
Typical Construction Noise Levels[1]

Type	Noise Levels (dBA) at 50 Feet
Earth Moving	
Compactors (Rollers)	73 - 76
Front Loaders	73 - 84
Backhoes	73 - 92
Tractors	75 - 95
Scrapers, Graders	78 - 92
Pavers	85 - 87
Trucks	81 - 94
Materials Handling	
Concrete Mixers	72 - 87
Concrete Pumps	81 - 83
Cranes (Movable)	72 - 86
Cranes (Derrick)	85 - 87
Stationary	
Pumps	68 - 71
Generators	71 - 83
Compressors	75 - 86
Impact Equipment	
Pneumatic Wrenches	82 - 87
Jack Hammers, Rock Drills	80 - 99
Pile Drivers (Peak)	95-105
Other	
Vibrators	68 - 82
Saws	71 - 82

[1] Referenced Noise Levels from the Environmental Protection Agency (EPA)

6.2 Construction Noise Impact Analysis

This assessment analyzes potential noise impacts during all expected phases of construction, including; site preparation, grading, building construction, paving, and architectural coating. Noise levels are calculated based on an average distance of 50 feet over an 8-hour period. The project's estimated construction noise levels have been calculated using the Federal Highway Administration Roadway Construction Noise Model Version 1.1.

Tables 12 show the worst-case noise level impacts at 50 feet. However, the degree of construction noise will vary depending on the type of construction activity taking place and the location of the activity relative to the surrounding properties. Construction noise calculation worksheets are provided in Appendix C.

Table 12
Project Construction Noise Levels – at 50 Feet

Phase	Equipment	Quantity	Equipment Noise Level at 50ft (dBA Leq)	Combined Noise Level (dBA Leq)
Site Preparation	Rubber Tired Dozers	3	77.7	87.6
	Tractors/Loaders/Backhoes	4	80.0	
Grading	Excavators	1	76.7	87.3
	Graders	1	81.0	
	Rubber Tired Dozers	1	77.7	
	Tractors/Loaders/Backhoes	3	80.0	
Building Construction	Cranes	1	72.6	86.3
	Forklifts	3	71.0	
	Generator Sets	1	77.6	
	Tractors/Loaders/Backhoes	3	80.0	
	Welders	1	70.0	
Paving	Cement and Mortar Mixers	2	74.8	84.3
	Pavers	1	74.2	
	Paving Equipment	2	73.0	
	Rollers	2	73.0	
	Tractors/Loaders/Backhoes	1	80.0	
Architectural Coating	Air Compressors	1	73.7	73.7
Worst Case Construction Phase Noise Level - Leq (dBA)				87.6

The project is expected to generate noise levels which range from 73.7 dBA to 87.6 dBA at 50 feet. Construction noise calculation worksheets are provided in Appendix C.

6.3 Construction Vibration

To determine the vibratory impacts during construction, reference construction equipment vibration levels were utilized and then extrapolated to the façade of the nearest adjacent structures. The nearest sensitive receptors are the adjacent residential uses to the east of the project site. All structures surrounding the project site are "new structures". No historical or fragile buildings are known to be located within the vicinity of the site.

The construction of the proposed project is not expected to require the use of substantial vibration inducing equipment or activities, such as pile drivers or blasting. The main sources of vibration impacts during construction of the project would be the operation of equipment such as bulldozer activity during site preparation, loading trucks during grading and excavation and vibratory rollers during paving.

The construction vibration assessment utilizes the referenced vibration levels and methodology set-forth within the Transit Noise and Vibration Impact Assessment Manual, Federal Transit Administration, September 2018.

Table 13 shows the FTA referenced vibration levels.

Table 13
Typical Construction Vibration Levels[1]

Equipment	Peak Particle Velocity (PPV) (inches/second) at 25 feet	Approximate Vibration Level (LV) at 25 feet
Piledriver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Piledriver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill	0.008 in soil	66
(slurry wall)	0.017 in rock	75
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

[1] Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

Table 14 shows the project's construction-related vibration analysis at the nearest structures to the project construction area. Construction impacts are assessed at 25 feet from the nearest adjacent structure.

Table 14
Construction Vibration Impact Analysis

Construction Activity	Distance to Nearest Structure (ft)	Duration	Calculated Vibration Level - PPV (in/sec)	Damage Potential Level	Annoyance Criteria Level
Large Bulldozer	25	Continuous/Frequent	0.089	Extremely fragile historic buildings, ruins, ancient monuments	Distinctly Perceptible
Vibratory Roller	25	Continuous/Frequent	0.210	Historic and old buildings	Strongly Perceptible
Loaded Trucks	25	Continuous/Frequent	0.076	No Impact	Distinctly Perceptible

Project related construction activity is not expected to cause any potential damage to the nearest structures.

Construction vibration calculation worksheets are shown in Appendix C.

6.4 Construction Project Design Features

The following recommended project design features include standard rules and requirements, best practices and recognized design guidelines for reducing noise levels. Design features are assumed to be part of the conditions of the project and integrated into the site design and construction management plan.

Construction Design Features

DF-12 All construction equipment should be equipped with muffles and other suitable noise attenuation devices (e.g., engine shields).

DF-13 Establish an electric connection to the site to avoid the use of diesel and gas powered generators, if feasible.

DF-14 Locate staging area, generators and stationary construction equipment as far from the adjacent residential homes as feasible.

DF-15 Construction-related equipment, including heavy-duty equipment, motor vehicles, and portable equipment, shall be turned off when not in use for more than 5 minutes.

DF-16 No impact pile driving or blasting activities should be permitted on the project site during construction.

Exhibits

Exhibit A

Location Map

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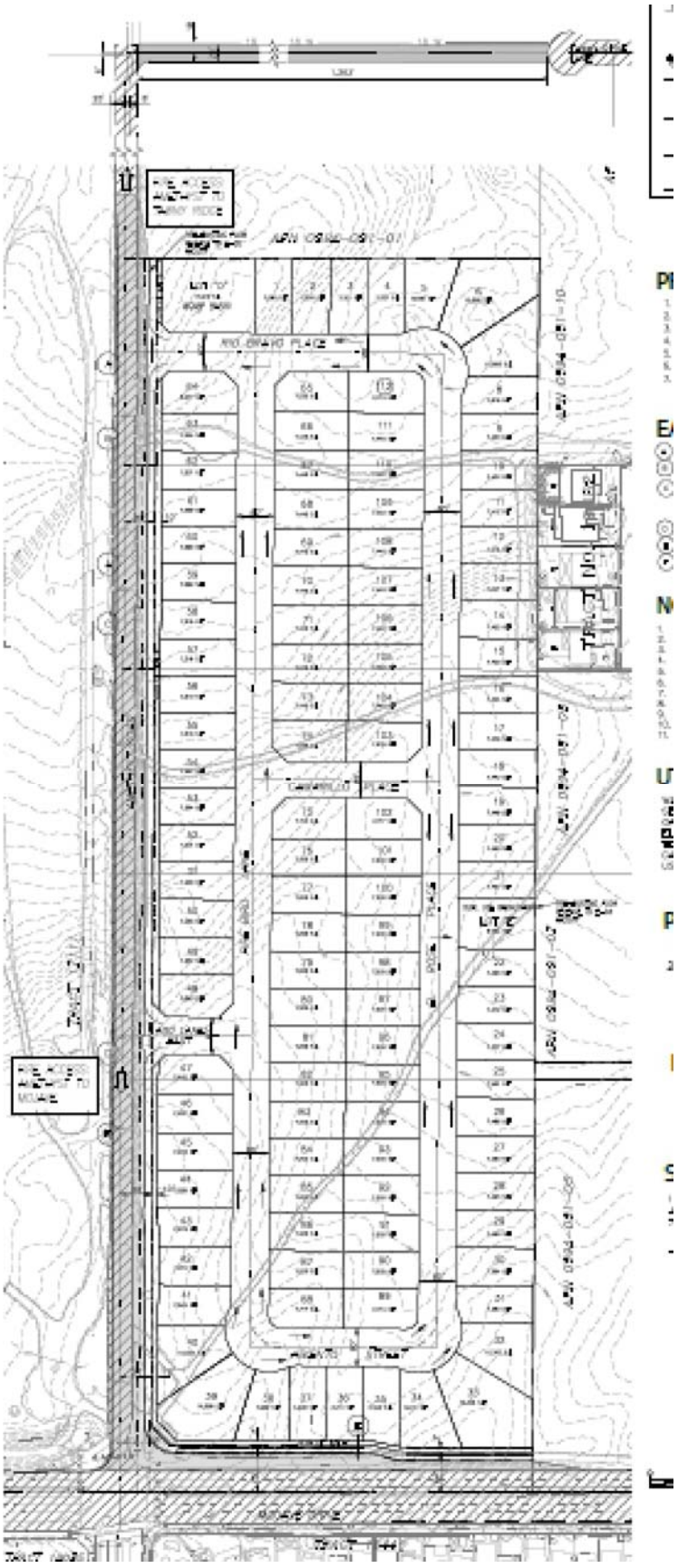
Exhibit B

Site Plan



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Appendices

Appendix A

City of Victorville
General Plan Noise Element and
Municipal Code Noise Control

Chapter 13.01 - NOISE CONTROL

Sections:

(a) The purpose of this chapter is to establish criteria and standards for the regulation of noise levels within the city of Victorville.

(b) The city council declares and finds that excessive noise levels are detrimental to the public health, welfare and safety and contrary to the public interest. It is the intent of this chapter to protect persons from excessive levels of noise from sources including, but not limited to; persons, animals, or fowl; automobiles, motorcycles, engines, machines, or other mechanical devices; loudspeakers, musical instruments, radios, televisions, phonographs, or other amplifying devices.

(c) This chapter includes standards for the measurement of noise levels to ensure that noise levels do not disturb and interfere with the peace, comfort or repose of the residents of the neighborhood from which the noise is emitted.

(Ord. 1962 § 2 (part), 2002)

The following words, phrases, and terms as used in this chapter shall have the following meanings:

(1) "A-weighted sound level" means the sound pressure level in decibels as measured on a sound level meter using A-weighting network. The level to read is designated db(A) or dB(A).

(2) "Ambient noise level" means the all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding any intrusive noise.

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

(4) "Decibel" means a unit of measure of sound level noise.

(5) "Noise level" means the same as "sound level" and the terms may be used interchangeably herein.

(6) "Sound level" (noise level) in decibels is the quantity measured using the frequency weighting of A of a sound level meter as defined herein.

(7) "Sound level meter" means an instrument meeting American National Standard Institute's Standard S1.4-1971 for type 1 or type 2 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

(Ord. 1962 § 2 (part), 2002)

13.01.030 - Noise measurement criteria.

Any noise level measurements made pursuant to the provisions of this chapter shall be performed using a sound level meter as defined in this chapter. The location selected for measuring exterior noise levels shall be at any point on the property line of the offender or anywhere on the affected property.

(Ord. 1962 § 2 (part), 2002)

13.01.040 - Base ambient noise levels.

All ambient noise measurements shall commence in decibels within the respective zones and times as follows:

Zone	Time	Sound Level Decibels
All residential zones	10:00pm to 7:00am	55 dB(A)
	7:00am to 10:00pm	65 dB(A)
All commercial zones	Anytime	70 dB(A)
All industrial zones	Anytime	75 dB(A)

If the ambient noise level exceeds the applicable limit as noted in the above table, the ambient noise level shall be the standard.

(Ord. 1962 § 2 (part), 2002)

13.01.050 - Noise levels prohibited.

Noise levels shall not exceed the ambient noise levels in Section 13.01.040 by the following dB(A) levels for the cumulative period of time specified:

(1) Less than 5dB(A) for a cumulative period of more than thirty minutes in any hour;

(2) Less than 10 dB(A) for a cumulative period of more than fifteen minutes in any hour;

(3) Less than 15 dB(A) for a cumulative period of more than five minutes in any hour;

(4) Less than 20 dB(A) for a cumulative period of more than one minute in any hour;

(5) 20 dB(A) or more for any period of time.

(Ord. 1962 § 2 (part), 2002)

13.01.060 - Noise source exemptions.

The following activities shall be exempted from the provisions of this chapter:

(1) All mechanical devices, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work.

(2) The provisions of this regulation shall not preclude the construction, operation, maintenance and repairs of equipment, apparatus or facilities of park and recreation projects, public works projects or essential public works services and facilities, including those utilities subject to the regulatory jurisdiction of the California Public Utilities Commission.

(3) Activities conducted on the grounds of any elementary, intermediate or secondary school or college.

(4) Outdoor gatherings, public dances and shows, provided said events are conducted pursuant to a permit as required by this code.

(5) Activities conducted in public parks and public playgrounds, provided said events are conducted pursuant to a permit as required by this code.

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

(7) Traffic on any roadway or railroad right-of-way.

(8) The operation of the Southern California Logistics Airport.

(9) Construction activity on private properties that are determined by the director of building and safety to be essential to the completion of a project.

(Ord. 1962 § 2 (part), 2002)

13.01.070 - Notice and penalties.

Any person violating any of the provisions, or failing to comply with the requirements of this chapter, is guilty of a civil penalty, punishable in accordance with Chapter 1.05. In addition, in the discretion of the city attorney and based upon the specific facts and circumstances presented to him or her, any such violation may be charged as an infraction subject to the penalties contained in Section 1.04.010.

(Ord. 1962 § 2 (part), 2002)

13.01.080 - Severability.

If any provision of the ordinance codified in this chapter or the application thereof to any person or circumstance is held invalid, the remainder of the ordinance, and the application of such provision to other persons or circumstances, shall not be affected thereby.

(Ord. 1962 § 2 (part), 2002)

Noise Element

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Noise Element

PURPOSE

The Noise Element is intended to limit exposure of the community to excessive noise levels. Noise is generally defined as unwanted or unpleasant sound. Excessive noise is associated with an interference with speech and other communication, a distraction at home and at work, the disturbance of rest and sleep, and the disruption of various recreational pursuits.

To ensure that noise does not affect the health and serenity of Victorville residents, this element provides a systematic approach to identifying and appraising excessive noise in the Planning Area, quantifying noise levels, and addressing excessive noise exposure, and community planning for the regulation of noise. This element includes policies, standards, criteria, programs, diagrams, a reference to action items, and maps related to protecting public health and welfare from noise.

Section 65302(f) of the Government Code requires that a General Plan include a Noise Element to guide decisions concerning land use and the location of excessive noise sources. Issues to be addressed in the Noise Element include:

- Major noise sources, both mobile and stationary
- Existing and projected levels of noise and noise contours for major noise sources
- Existing and projected land uses and locational relationship to existing and projected noise sources
- Existing and proposed sensitive receptors, including:
    - Hospitals
    - Convalescent homes
    - Schools
    - Churches
    - Sensitive wildlife habitat, including the habitat of rare, threatened, or endangered species.

Major noise sources in a community include the following:

- Highways and freeways
- Primary arterials and major local streets
- Passenger and freight on-line railroad operations and ground rapid transit systems
- Commercial, general aviation, heliport, helistop and military airport operations, aircraft over-flights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation
- Local industrial plants, including, but not limited to railroad classification yards
- Other ground stationary sources identified by local agencies as contributing to the community noise environment.

RELATIONSHIP TO OTHER ELEMENTS

The Noise Element has a direct relationship with other General Plan elements, most notably the Land Use Element. Through the Land Use Map and Land Use Element policies, land uses that will be occupied by sensitive receptors are located away from excessive noise sources. These policies that focus on placing residential uses away from major noise sources also are reflected in the Housing Element. The Noise Element also relates to the Circulation Element, because the location and design of new roads and transit could impact existing and planned land uses. Finally, the Noise Element also relates to the Resource Ele-

ment because excessive noise may have a detrimental effect on sensitive habitats and the community's enjoyment of open spaces.

VISION – NOISE

The Noise Element of the City of Victorville's General Plan lays the foundation for balancing the placement of noise sensitive land uses with the need for infrastructure and activities that generate excessive noise. The goals, objectives, policies, and implementation measures of this element envision a Victorville that minimizes noise-land use incompatibilities and supports the health and serenity of its citizens.

EXISTING CONDITIONS

Definition of Noise

Noise is usually defined as unwanted or excessive sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a wave, resulting in the tone's range from high to low. Loudness is the strength of a sound and describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves, combined with the reception characteristics of the human ear. In an urban environment, sound that becomes noise is typically a byproduct of transportation systems, certain land uses and on-going human activity.

Definitions of acoustical terms are provided in Table N-1.

Noise Measurement

The common unit for measuring sound (or noise) to the faintest level detectable by a person with good hearing is called a decibel (dB).

Because sound or noise can vary in intensity by over one million times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, noise levels at maximum human sensitivity are factored more heavily into sound descriptions in a process called A-weighting, written as dBA. References to noise levels in this Section are in dBA. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud).

Because community receptors (e.g. residents, the infirm, convalescents, children) are more sensitive to unwanted noise during the evening and night, state law requires that nighttime noise be more heavily weighted than noise occurring during the day. To measure this noise variation during different times of the day, an artificial dB increment is added to quiet time noise levels for planning purposes in a 24-hour noise descriptor called the Community Noise Equivalency Level (CNEL). The CNEL takes average sound levels at an observation point and adds a weighting penalty to those sounds that occur during the evening and night hours. A penalty of 5 dBA is added between 7 PM and 10 PM, and a 10 dBA penalty is added between 10 PM and 7 AM. CNEL noise levels are often reported as 65 dB CNEL or 65 CNEL.

When evaluating changes in 24-hour community noise levels, a 3 dBA increase is

barely perceptible to most people. While a 5 dBA increase is readily noticeable, a 10 dBA increase would be perceived as a doubling of loudness (US DOT 1980).

Effects of Noise

Noise measurements are meaningless without an understanding of the relationship to human sensitivity. The human response to noise is varied and extremely complex. Noise effects have been divided and described in terms of physiological effects, behavioral effects, and subjective effects. Physiological effects include both temporary effects such as startle reactions and temporary hearing threshold shifts, along with enduring effects such as those from prolonged sleep loss or permanent hearing damage. Behavioral effects involve interference with ongoing activities such as speech, learning, listening, or distraction from the performance of various tasks. Subjective effects are a combined result of behavioral and physiological effects and are described in such terms as "annoyance," "nuisance," "disturbance," or "dissatisfaction."

Table N-2, Common Noise Sources and Sound Levels, provides examples of some common sound levels and their noise sources.

Demolition of a portion of City Hall

Table N-1

Definitions of Acoustical Terms

Term	Definition
Decibel (dB)	A unit of level that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency (Hz)	Of a function periodic in time, the number of times that the quantity repeats itself in one second (i.e., number of cycles per second).
A-Weighted Sound Level (dBA)	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{02}, L_{08}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 2 percent, 8 percent, 50 percent, and 90 percent of a stated time period, respectively.
Equivalent Continuous Noise Level (L_{eq})	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level (CNEL)	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 decibels to sound levels occurring in the evening from 7:00 PM to 10:00 PM and after the addition of 10 decibels to sound levels occurring in the night between 10:00 PM and 7:00 AM
Day/Night Noise Level (L_{dn})	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 decibels to sound levels occurring in the night between 10:00 PM and 7:00 AM
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time, usually a composite of sound from many sources at many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.
Source: *Handbook of Acoustical Measurement and Noise Control, 1991*.	

Table N-2
Common Noise Sources and Sound Levels

Noise Source	A-Weighted Sound Level (dB)	Noise Effect
Near jet engine	140	Deafening
Civil defense siren	130	Threshold of pain
Hard rock band	120	Threshold of feeling
Accelerating motorcycle at a few feet away	110	Very loud
Pile driver; noisy urban street/ heavy city traffic	100	Very loud
Ambulance siren; food blender	95	Very loud
Garbage disposal	90	Very loud
Freight cars; living room music	85	Loud
Pneumatic drill; vacuum cleaner	80	Loud
Busy restaurant	75	Moderately loud
Near freeway auto traffic	70	Moderately loud
Average office	60	Quiet
Suburban street	55	Quiet
Light traffic; soft radio music in apartment	50	Quiet
Large transformer	45	Quiet
Average residence without stereo playing	40	Faint
Soft whisper	30	Faint
Rustling leaves	20	Very faint
Human breathing	10	Very faint

Standards for Land Use Compatibility

Activity, or land use, also is a factor in sensitivity to noise. Excessive noise could prevent sleep. As sleep is a primary activity in residences and hospitals, these land uses are also sensitive to noise. Noise can distract from activities that require quiet and human concentration, such as reading, studying, and listening, making schools and libraries vulnerable to noise intrusion. Noise is tolerated to a much greater extent in commercial and industrial areas, where it does not interfere with quiet human activities as much. Table N-3 illustrates acceptable and unacceptable noise levels for various land uses as established by the U.S. Department of Housing and Urban Development and State of California Guidelines.

Table N-3
Victorville Land Use Compatibility Standards

	Community Noise Exposure Ldn or CNEL, dB						
Land Use Categories	55	60	65	70	75	80 +	
Residential - Low Density, Single Family, Duplex, Multi-family, Mobile Home	1	1	2	2	3	4	4
Transient Lodging - Motels, Hotels	1	1	2	2	3	3	4
Schools, Libraries, Churches, Hospitals, Nursing Homes	1	1	2	3	3	4	4
Auditoriums, Concert Halls, Amphitheaters	2	2	3	3	4	4	4
Sports Arena, Outdoor Spectator Sports	2	2	2	2	3	3	3
Playgrounds, Neighborhood Parks	1	1	1	2	3	3	3
Golf Courses, Riding Stables, Water Recreation, Cemeteries	1	1	1	2	2	4	4
Office Buildings, Business Commercial, Retail Commercial and Professional	1	1	1	2	2	3	3
Industrial, Manufacturing, Utilities	1	1	1	1	2	2	2
Agriculture	1	1	1	1	1	1	1

Legend:

1. NORMALLY ACCEPTABLE: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
2. CONDITIONALLY ACCEPTABLE: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and Schools, Libraries, Churches, Hospitals, Nursing Homes 1 needed noise insulation features included in the design. Conventional construction, with closed windows and fresh air supply systems or air conditioning will normally suffice.
3. NORMALLY UNACCEPTABLE: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
4. CLEARLY UNACCEPTABLE: New construction or development should generally not be undertaken.

Noise exposure is "normally acceptable" if the level of exposure does not require any special noise insulation or special construction techniques to reduce interior noise levels. The maximum exterior noise level considered to be normally acceptable for residential development is 65 dBA.

The State also provides additional standards through the implementation of the State Noise Insulation Standards. These standards apply to new multiple-family residential development located in areas exposed to ambient noise levels that exceed 65 dB (CNEL or Ldn). New multiple-family development in these areas must reduce exterior to interior noise levels through insulation, construction, or design.

Noise Environment

The primary sources of noise in the Victorville Planning Area are freeways and roadways, railroad traffic, SCLA aircraft operations, and stationary sources, as described below.

Freeways and Roadways: The dominant sources of noise throughout the Planning Area are transportation-related. Motor vehicle noise commonly causes sustained noise levels, often in close proximity to sensitive land uses. The major sources of traffic noise in the Planning Area are the I-15, US-395, SR-18, Route 66, Bear Valley Road, Palmdale Road, Mojave Drive, 7th Street, Amethyst Road, El Evado Road, Green Tree Boulevard, Hesperia Road, and La Mesa Road.

Vehicular noise along these routes comes from both cars and trucks. The following roadways are designated truck routes, and are expected to have notably higher levels of truck related Noise: Air Expressway; National Trails Highway / D Street; Hesperia Road from Bear Valley Road to D Street; Green Tree Boulevard from 7th Street to Hesperia Road; Mariposa Road from Bear Valley Road to Green Tree Boulevard; Bear Valley Road within the City limits; Amargosa Road from Bear Valley Road to Dos Palmas Road; Nisqualli Road from Hesperia Road to I-15.

Railroad Traffic: The Burlington Northern Santa Fe Company (BNSF) operates freight rail services through the City of Victorville, with a double main line and lead tracks for industrial uses. Union Pacific Railroad also operates on the double main line and Victorville is within its service area. The rail lines bisect the eastern portion of the City. In the future, with the expansion of the SCLA, Victorville plans to function as a major hub for cargo transfer and distribution. The City has begun construction of the first phase of rail lines leading to a new inter-modal/multi-modal rail yard. This facility will be located in the northwestern portion of the City, allowing transfer of freight from rail-to-truck and rail-to-rail.

SCLA Airport Noise: The SCLA site encompasses approximately 2,762 acres in the northwestern part of Victorville. It is bordered by the Mojave River to the east, a federal correctional facility to the south, and the City of Adelanto to the west. Aircraft noise is an important component of determining land use compatibility with airport operations. Aircraft activity noise contours have been calculated based upon long range SCLA utilization projections.

The existing aircraft noise contours presented in the “Comprehensive Land Use Plan for Southern California Logistics Airport” (Draft December 2007) are depicted in Figure N-1 . Future Noise Contours are presented in Figure N-2. For existing activity levels, the 70 and 75 CNEL contours remain entirely on airport property. The 65 CNEL noise contour extends off airport property to the south. This area is presently

undeveloped. The 60 CNEL noise contour extends off airport property to the north, south, and southwest. The 55 CNEL noise contour extends off airport property to the north, south, northeast, and southwest.[1]

SCLA is proposing to update its master plan and increase aircraft flight operations. As proposed, SCLA's long-term forecast activity, expected in year 2025, would extend its noise contours (75, 70, 65, 60, 55 CNEL) beyond airport property. As shown in Figure N-2, the contours that are considered to have a significant noise effect are the 75, 70, and 65 CNEL contours. The 75 CNEL noise contour extends a short distance beyond the airport property line to the north and south. To the east and west this contour does not go beyond the airport property line. The 70 CNEL noise contour extends north and south of airport property approximately one mile. This contour does not extend beyond the property line to the east or west. The 65 CNEL noise contour extends south of the airport property line approximately three miles to Mojave Drive. It extends north of airport property approximately 2.5 miles. Additionally, this contour extends beyond airport property west of Adelanto Road.

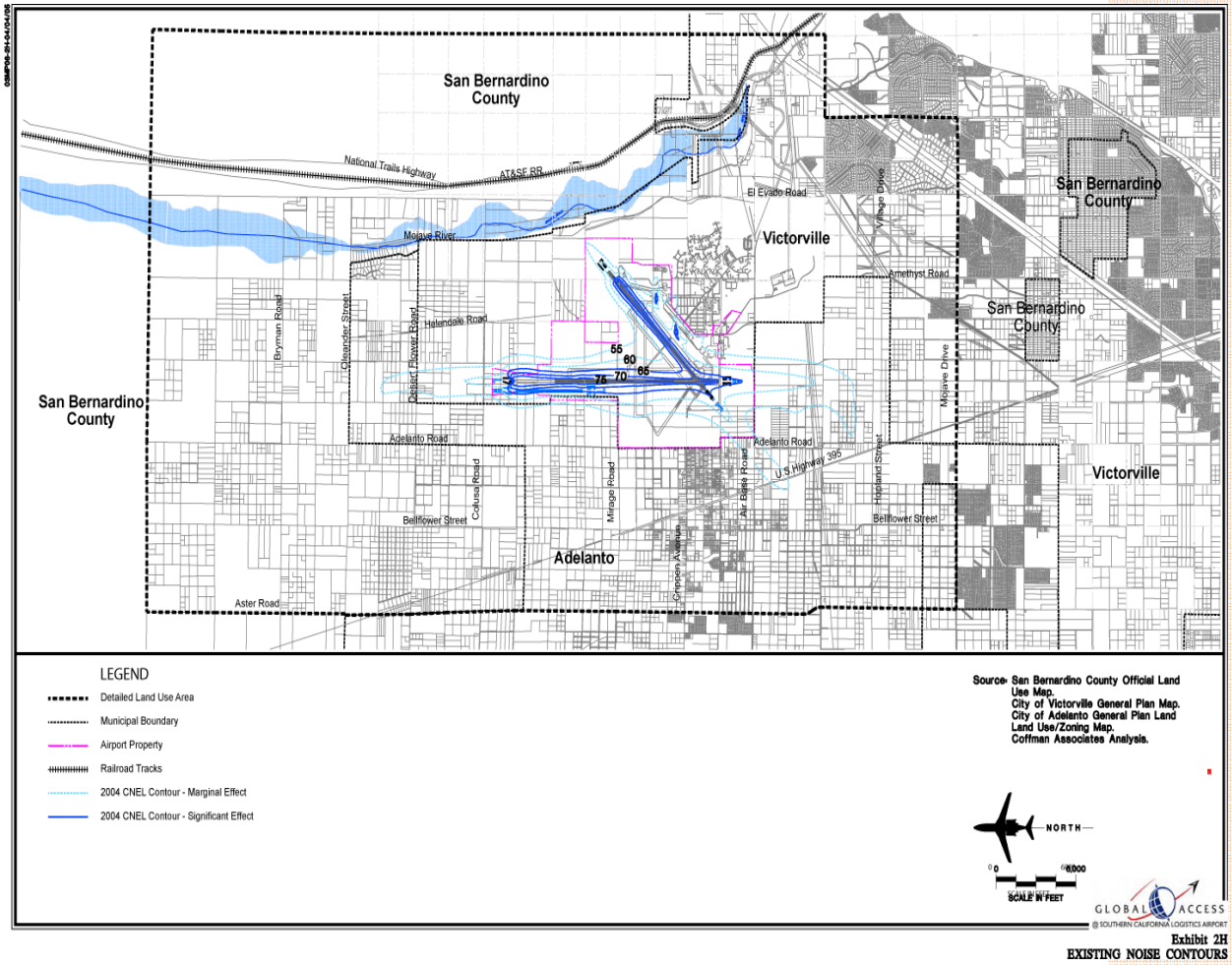

Figure N-1. SCLA Existing Airport Noise Contours

[1]Comprehensive Land Use Plan for Southern California Logistics Airport, Draft December 2007, Coffman Associates.

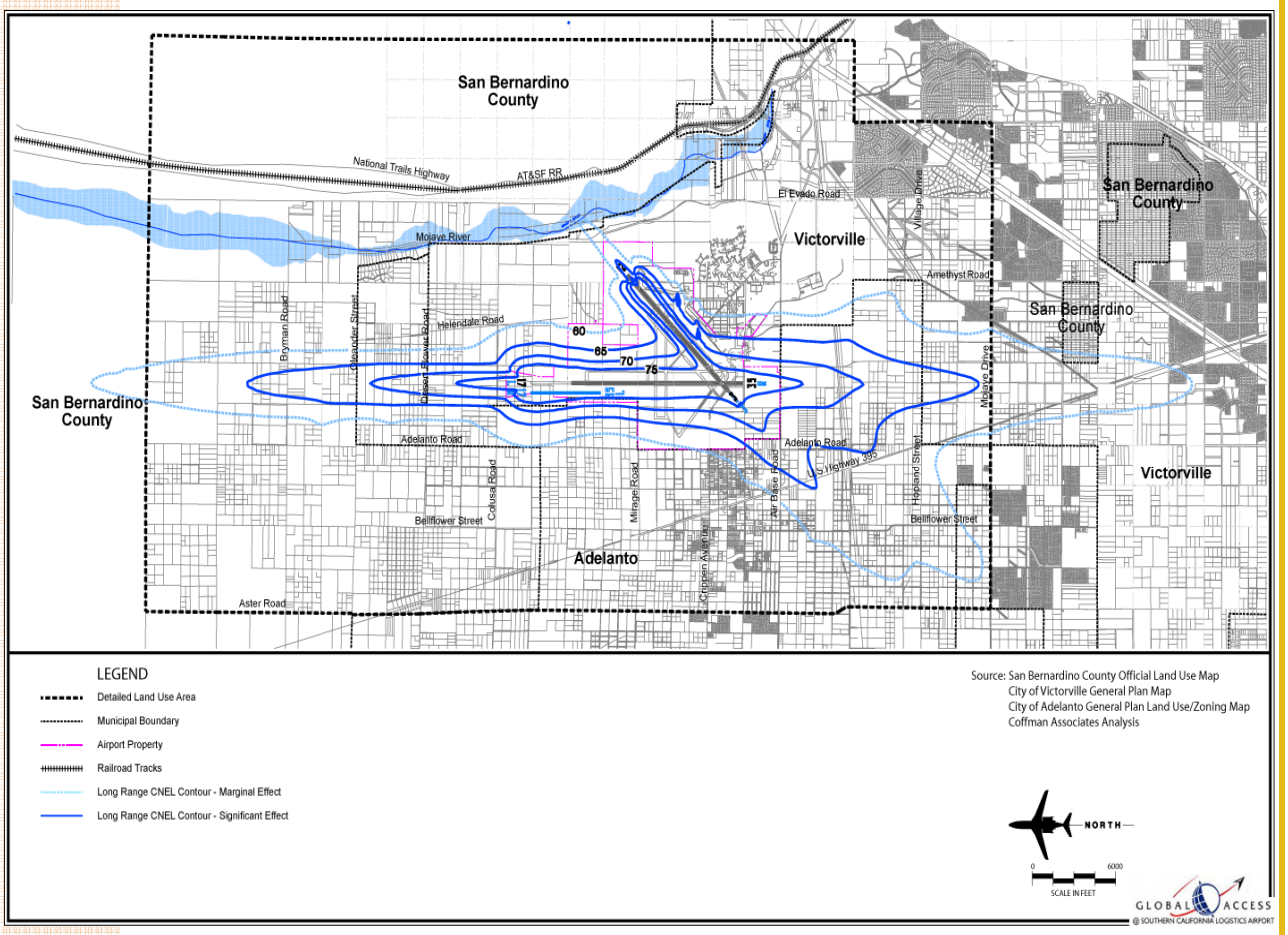

Figure N-2 (5.11-2. SCLA Proposed Future (2025) Airport Noise Contours)

Stationary Noise Sources: Manufacturing operations are the major stationary noise sources in the Planning Area. Of the existing manufacturing operations in the Planning Area, cement manufacturers are expected to generate the most noise. There are currently two cement manufacturers in the Planning Area, both which have outdoor rock crushing operations. Both are located within Heavy Industrial land use designated areas where 75 decibels is "conditionally acceptable" for permitted uses.

GOALS, OBJECTIVES, POLICIES AND IMPLEMENTATION

The following goals, objectives, policies and implementation measures are intended to achieve the Vision of this Noise Element and to guide the City's efforts to minimize noise-land use incompatibilities and support the health and serenity of its citizens.

GOAL #1: Noise Sensitivity – Identify significant noise sources that could adversely affect community.

GOAL #2: Noise Control – Manage the affects of noise emissions to help ensure reduction of adverse affects on the community.

GOAL #1: NOISE SENSITIVITY
IDENTIFY SIGNIFICANT NOISE SOURCES THAT COULD ADVERSELY AFFECT COMMUNITY.

Objective 1.1: Locate noise sensitive land uses away from existing excessive noise sources, and locate new excessive noise generators away from existing sensitive land uses

Policy 1.1.1: *Implement Table N-3 regarding placement of new land uses.*

Implementation Measure 1.1.1.1: Continue to assess projects through the subdivision, site plan, conditional use permit, and other development review processes and incorporate conditions of approval which ensure noise compatibility where appropriate.

Implementation Measure 1.1.1.2: Prohibit new single family residential land uses in areas with a CNEL of 65 dB or greater.

Implementation Measure 1.1.1.3: Require a noise study to be performed and appropriate noise attenuation to be incorporated prior to approving any multifamily or mixed-use residential development in an area with a CNEL of 65 dB or greater.

Policy 1.1.2: *Continue to ensure that there is no conflict or inconsistency between the operation of the Southern California Logistics Airport and future land uses within the Planning Area.*

Implementation Measure 1.1.2.1: Continue to monitor Southern California Logistics Airport operations to ensure there is no conflict or inconsistency between the operation of the Southern California Logistics Airport and future land uses within the Planning Area.

Implementation Measure 1.1.2.2: Work closely with Southern California Logistics Airport planners to ensure that future master plan expansions do not impact sensitive Victorville land uses.

Implementation Measure 1.1.2.3: Require Southern California Logistics Airport to update its Specific Plan as directed by the City to accommodate changes in its master plan.

Objective 1.2: Design new transportation facilities to minimize noise impacts on nearby sensitive sources

Policy 1.2.1: *Include noise mitigation measures in the design and use of new roadway projects.*

Implementation Measure 1.2.1.1: Continue to use special paving materials that will buffer roadway noise.

Implementation Measure 1.2.1.2: Incorporate adequate setbacks in roadway design to maximize the distance from sensitive land uses.

Implementation Measure 1.2.1.3: Restrict new truck routes to roadways that are located away from sensitive land uses.

Policy 1.2.2*: Promote noise mitigation measures in the design and use of new rail projects.*

Implementation Measure 1.2.2.1: Continue to coordinate with regional agencies and rail providers to incorporate adequate setbacks in rail line to maximize the distance from sensitive land uses.

GOAL #2 NOISE CONTROL
MANAGE THE AFFECTS OF NOISE EMISSIONS TO HELP ENSURE REDUCTION OF ADVERSE AFFECTS ON THE COMMUNITY

Objective 2.1: Ensure existing and future noise sources are properly attenuated

Policy 2.1.1: *Continue to implement acceptable standards for noise for various land uses throughout the City.*

Implementation Measure 2.1.1.1: Require a noise study to be performed and appropriate noise attenuation to be incorporated prior to approving any multifamily or mixed-use residential development in an area with a CNEL of 65 dB or greater.

Implementation Measure 2.1.1.2: Monitor noise complaints and enforce provisions of the City noise ordinance.

Implementation Measure 2.1.1.3: Discourage location of new educational facilities in areas with noise levels greater than 65 dB CNEL.

Implementation Measure 2.1.1.5: Continue to restrict noise and require mitigation measures for any noise-emitting construction equipment or activity.

Implementation Measure 2.1.1.6: Reduce speed limits on arterial streets if necessary to lower sound to appropriate levels for adjacent and surrounding land uses.

Objective 2.2: Ensure the community is properly informed regarding potential noise from SCLA operations

Policy 2.2.1: *Incorporate current information regarding SCLA operations into the land use planning process.*

Implementation Measure 2.2.1.1: Place the following condition on all new residential projects within the Planning Area: *The applicant/developer shall record an Airport Location Notice, which discloses the direction and distance from Southern California Logistics Airport. This notice shall record with the final map, including legal descriptions for all lots, and shall be subject to staff review and approval.*

Implementation Measure 2.2.1.2: Place the following condition on all development within the airport influence area, roughly north of Mojave Drive and west of Amargosa Road: *The applicant/developer shall record an Avigation Easement, which allows for the continued operation of overhead flights from Southern California Logistics Airport. The Avigation Easement shall be recorded prior to the issuance of any building permits, and shall be subject to staff review and approval.*

Appendix B

Roadway Noise Calculation Results

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO)

PROJECT:	112 Lots Single Family Residential	JOB #:	3018-2021-02
ROADWAY:	Mojave Drive	DATE:	18-Feb-22
LOCATION:	Nearest Residential Building Property Line.	ENGINEER:	D. Shivaiah

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	37,500
SPEED =	60
PK HR % =	10
NEAR LANE/FAR LANE DIST	80
ROAD ELEVATION =	0.0
GRADE =	0.0 %
PK HR VOL =	3,750

RECEIVER INPUT DATA

RECEIVER DISTANCE =		81
DIST C/L TO WALL =		71
RECEIVER HEIGHT =		5.0
WALL DISTANCE FROM RECEIVER =		10
PAD ELEVATION =		0.0
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	10	(10 = HARD SITE, 15 = SOFT SITE)
MEDIUM TRUCKS =	10	
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL=	6.0	
AMBIENT=	0.0	
BARRIER =	1	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCKS	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	68.85	- -
MEDIUM TRUCKS	4.0	68.74	- -
HEAVY TRUCKS	8.0	68.74	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	75.0	72.7	71.4	65.3	73.7	74.4
MEDIUM TRUCKS	66.8	47.6	39.8	49.0	55.2	55.2
HEAVY TRUCKS	72.7	55.7	48.0	57.2	63.3	63.4
NOISE LEVELS (dBA)	77.4	72.8	71.4	66.0	74.2	74.7

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	66.0	63.7	62.4	56.3	64.7	65.4
MEDIUM TRUCKS	58.1	38.9	31.1	40.3	46.5	46.5
HEAVY TRUCKS	64.5	47.5	39.8	49.0	55.1	55.2
NOISE LEVELS (dBA)	68.5	63.8	62.4	57.1	65.2	65.8

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	242	764	2417	7643
LDN	212	669	2116	6691

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO)

PROJECT:	112 Lots Single Family Residential	JOB #:	3018-2021-02
ROADWAY:	Mojave Drive	DATE:	18-Feb-22
LOCATION:	Nearest Residential Building 1st Floor Façade.	ENGINEER:	D. Shivaiah

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	37,500	
SPEED =	60	
PK HR % =	10	
NEAR LANE/FAR LANE DIST	75	
ROAD ELEVATION =	0.0	
GRADE =	0.0	%
PK HR VOL =	3,750	

RECEIVER INPUT DATA

RECEIVER DISTANCE =		91
DIST C/L TO WALL =		71
RECEIVER HEIGHT =		5.0
WALL DISTANCE FROM RECEIVER =		20
PAD ELEVATION =		0.0
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	10	(10 = HARD SITE, 15 = SOFT SITE)
MEDIUM TRUCKS =	10	
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL=	6.0	
AMBIENT=	0.0	
BARRIER =	1	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCKS	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	80.45	- -
MEDIUM TRUCKS	4.0	80.35	- -
HEAVY TRUCKS	8.0	80.35	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	74.3	72.0	70.7	64.6	73.1	73.7
MEDIUM TRUCKS	66.1	46.9	39.1	48.3	54.5	54.5
HEAVY TRUCKS	72.1	55.1	47.3	56.5	62.6	62.7
NOISE LEVELS (dBA)	76.8	72.1	70.7	65.3	73.5	74.1

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	65.5	63.2	61.9	55.8	64.3	64.9
MEDIUM TRUCKS	57.7	38.5	30.7	39.9	46.1	46.1
HEAVY TRUCKS	64.1	47.1	39.3	48.5	54.7	54.7
NOISE LEVELS (dBA)	68.0	63.3	62.0	56.6	64.8	65.3

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	232	735	2324	7348
LDN	203	643	2034	6433

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO)

PROJECT:	112 Lots Single Family Residential	JOB #:	3018-2021-02
ROADWAY:	Mojave Drive	DATE:	18-Feb-22
LOCATION:	Nearest Residential Building 2nd Floor Façade.	ENGINEER:	D. Shivaiah

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	37,500	
SPEED =	60	
PK HR % =	10	
NEAR LANE/FAR LANE DIST	75	
ROAD ELEVATION =	0.0	
GRADE =	0.0	%
PK HR VOL =	3,750	

RECEIVER INPUT DATA

RECEIVER DISTANCE =		91
DIST C/L TO WALL =		71
RECEIVER HEIGHT =		15.0
WALL DISTANCE FROM RECEIVER =		20
PAD ELEVATION =		0.0
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	10	(10 = HARD SITE, 15 = SOFT SITE)
MEDIUM TRUCKS =	10	
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL=	6.0	
AMBIENT=	0.0	
BARRIER =	1	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCKS	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	83.93	- -
MEDIUM TRUCKS	4.0	83.64	- -
HEAVY TRUCKS	8.0	83.21	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	74.2	71.8	70.5	64.4	72.9	73.5
MEDIUM TRUCKS	65.9	46.7	39.0	48.2	54.3	54.3
HEAVY TRUCKS	71.9	54.9	47.1	56.3	62.5	62.5
NOISE LEVELS (dBA)	76.6	71.9	70.5	65.2	73.3	73.9

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	74.2	71.8	70.5	64.4	72.9	73.5
MEDIUM TRUCKS	65.9	46.7	39.0	48.2	54.3	54.3
HEAVY TRUCKS	71.9	54.9	47.1	56.3	62.5	62.5
NOISE LEVELS (dBA)	76.6	71.9	70.5	65.2	73.3	73.9

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	223	705	2229	7048
LDN	195	617	1951	6170

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO)

PROJECT:	112 Lots Single Family Residential	JOB #:	3018-2021-02
ROADWAY:	Amethyst Road	DATE:	18-Feb-22
LOCATION:	Nearest Residential Building Property Line.	ENGINEER:	D. Shivaiah

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	30,000	
SPEED =	50	
PK HR % =	10	
NEAR LANE/FAR LANE DIST	75	
ROAD ELEVATION =	0.0	
GRADE =	0.0	%
PK HR VOL =	3,000	

RECEIVER INPUT DATA

RECEIVER DISTANCE =	71	
DIST C/L TO WALL =	61	
RECEIVER HEIGHT =	5.0	
WALL DISTANCE FROM RECEIVER =	10	
PAD ELEVATION =	0.0	
ROADWAY VIEW: LF ANGLE=	-90	
RT ANGLE=	90	
DF ANGLE=	180	

SITE CONDITIONS

AUTOMOBILES =	10	(10 = HARD SITE, 15 = SOFT SITE)
MEDIUM TRUCKS =	10	
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL=	6.0	
AMBIENT=	0.0	
BARRIER =	1	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCKS	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	58.33	- -
MEDIUM TRUCKS	4.0	58.20	- -
HEAVY TRUCKS	8.0	58.20	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	72.5	70.1	68.8	62.8	71.2	71.8
MEDIUM TRUCKS	65.3	46.1	38.3	47.5	53.7	53.7
HEAVY TRUCKS	71.8	54.8	47.0	56.2	62.3	62.4
NOISE LEVELS (dBA)	75.6	70.3	68.9	63.7	71.8	72.4

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	63.4	61.0	59.7	53.7	62.1	62.7
MEDIUM TRUCKS	56.6	37.4	29.6	38.8	45.0	45.0
HEAVY TRUCKS	63.7	46.7	38.9	48.1	54.3	54.3
NOISE LEVELS (dBA)	66.6	61.3	59.9	54.8	62.8	63.4

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	122	387	1224	3870
LDN	108	340	1076	3403

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO)

PROJECT:	112 Lots Single Family Residential	JOB #:	3018-2021-02
ROADWAY:	Amethyst Road	DATE:	18-Feb-22
LOCATION:	Nearest Residential Building 1st Floor Façade.	ENGINEER:	D. Shivaiah

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	30,000	
SPEED =	50	
PK HR % =	10	
NEAR LANE/FAR LANE DIST	75	
ROAD ELEVATION =	0.0	
GRADE =	0.0	%
PK HR VOL =	3,000	

RECEIVER INPUT DATA

RECEIVER DISTANCE =		81
DIST C/L TO WALL =		61
RECEIVER HEIGHT =		5.0
WALL DISTANCE FROM RECEIVER =		20
PAD ELEVATION =		0.0
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL=	6.0	
AMBIENT=	0.0	
BARRIER =	1	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCKS	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	68.30	- -
MEDIUM TRUCKS	4.0	68.18	- -
HEAVY TRUCKS	8.0	68.18	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.8	69.4	68.1	62.1	70.5	71.2
MEDIUM TRUCKS	64.6	45.4	37.6	46.8	53.0	53.0
HEAVY TRUCKS	71.1	54.1	46.3	55.5	61.7	61.7
NOISE LEVELS (dBA)	74.9	69.6	68.2	63.1	71.1	71.7

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	62.9	60.5	59.2	53.2	61.6	62.3
MEDIUM TRUCKS	56.1	36.9	29.1	38.3	44.5	44.5
HEAVY TRUCKS	63.1	46.1	38.3	47.5	53.7	53.7
NOISE LEVELS (dBA)	66.1	60.8	59.4	54.3	62.3	62.9

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	119	377	1192	3770
LDN	105	332	1048	3315

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL (CALVENO)

PROJECT:	112 Lots Single Family Residential	JOB #:	3018-2021-02
ROADWAY:	Amethyst Road	DATE:	18-Feb-22
LOCATION:	Nearest Residential Building 2nd Floor Façade.	ENGINEER:	D. Shivaiah

NOISE INPUT DATA

ROADWAY CONDITIONS

ADT =	30,000	
SPEED =	50	
PK HR % =	10	
NEAR LANE/FAR LANE DIST	75	
ROAD ELEVATION =	0.0	
GRADE =	0.0	%
PK HR VOL =	3,000	

RECEIVER INPUT DATA

RECEIVER DISTANCE =		81
DIST C/L TO WALL =		61
RECEIVER HEIGHT =		15.0
WALL DISTANCE FROM RECEIVER =		20
PAD ELEVATION =		0.0
ROADWAY VIEW:	LF ANGLE=	-90
	RT ANGLE=	90
	DF ANGLE=	180

SITE CONDITIONS

AUTOMOBILES =	10	
MEDIUM TRUCKS =	10	(10 = HARD SITE, 15 = SOFT SITE)
HEAVY TRUCKS =	10	

WALL INFORMATION

HTH WALL=	6.0	
AMBIENT=	0.0	
BARRIER =	1	(0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.695	0.129	0.096	0.9200
MEDIUM TRUCKS	0.014	0.001	0.015	0.0300
HEAVY TRUCKS	0.024	0.001	0.025	0.0500

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	72.96	- -
MEDIUM TRUCKS	4.0	72.63	- -
HEAVY TRUCKS	8.0	72.14	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.5	69.2	67.9	61.8	70.2	70.9
MEDIUM TRUCKS	64.4	45.1	37.4	46.6	52.7	52.8
HEAVY TRUCKS	70.8	53.8	46.1	55.3	61.4	61.5
NOISE LEVELS (dBA)	74.6	69.3	67.9	62.8	70.8	71.4

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	71.5	69.2	67.9	61.8	70.2	70.9
MEDIUM TRUCKS	64.4	45.1	37.4	46.6	52.7	52.8
HEAVY TRUCKS	70.8	53.8	46.1	55.3	61.4	61.5
NOISE LEVELS (dBA)	74.6	69.3	67.9	62.8	70.8	71.4

NOISE CONTOUR (FT)				
NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	112	353	1117	3533
LDN	98	311	983	3107

Appendix C

Construction Noise and
Vibration Results

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/17/2022
Case Description: TTM 20525 Residential Lots

				---- Receptor #1 ----
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Site Preparation	Residential	80	65	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50	0
Tractor	No	40	84		50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Tractor	No	40	84		50	0
Tractor	No	40	84		50	0
Tractor	No	40	84		50	0

Results

		Calculated (dBA)	
Equipment		*Lmax	Leq
Dozer		81.7	77.7
Tractor		84	80
Dozer		81.7	77.7
Dozer		81.7	77.7
Tractor		84	80
Tractor		84	80
Tractor		84	80
	Total	84	87.6

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/17/2022
Case Description: TTM 20525 Residential Lots

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Grading	Residential	80	65	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Excavator	No	40		80.7	50	0
Grader	No	40	85		50	0
Dozer	No	40		81.7	50	0
Tractor	No	40	84		50	0
Tractor	No	40	84		50	0
Tractor	No	40	84		50	0

Results

	Calculated (dBA)	
Equipment	*Lmax	Leq
Excavator	80.7	76.7
Grader	85	81
Dozer	81.7	77.7
Tractor	84	80
Tractor	84	80
Tractor	84	80
Total	85	87.3

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/17/2022
Case Description: TTM 20525 Residential Lots

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Building Construction	Residential	80	65	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	50	0
Pickup Truck	No	40		75	50	0
Generator	No	50		80.6	50	0
Tractor	No	40	84		50	0
Welder / Torch	No	40		74	50	0
Pickup Truck	No	40		75	50	0
Pickup Truck	No	40		75	50	0
Tractor	No	40	84		50	0
Tractor	No	40	84		50	0

Calculated (dBA)

Equipment		*Lmax	Leq
Crane		80.6	72.6
Pickup Truck		75	71
Generator		80.6	77.6
Tractor		84	80
Welder / Torch		74	70
Pickup Truck		75	71
Pickup Truck		75	71
Tractor		84	80
Tractor		84	80
	Total	84	86.3

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/17/2022
Case Description: TTM 20525 Residential Lots

		Baselines (dBA)			---- Receptor #1 ----			
Description	Land Use	Daytime	Evening	Night				
Paving	Residential	80	65	45				

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	50	0
Paver	No	50		77.2	50	0
Roller	No	20		80	50	0
Roller	No	20		80	50	0
Tractor	No	40	84		50	0
Concrete Mixer Truck	No	40		78.8	50	0
Roller	No	20		80	50	0
Roller	No	20		80	50	0

		Calculated (dBA)	
Equipment		*Lmax	Leq
Concrete Mixer Truck		78.8	74.8
Paver		77.2	74.2
Roller		80	73
Roller		80	73
Tractor		84	80
Concrete Mixer Truck		78.8	74.8
Roller		80	73
Roller		80	73
	Total	84	84.3

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/17/2022
Case Description: TTM 20525 Residential Lots

				---- Receptor #1 ----			
		Baselines (dBA)					
Description	Land Use	Daytime	Evening	Night			
Architectural Coating	Residential	80	65	45			

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Compressor (air)	No	40		77.7	50	0

Results

		Calculated (dBA)	
Equipment		*Lmax	Leq
Compressor (air)		77.7	73.7
	Total	77.7	73.7

*Calculated Lmax is the Loudest value.

VIBRATION IMPACTS FROM CONSTRUCTION AND OPERATIONS

PROJECT:	TTM 20525 Residential Lots	JOB #:	3018-2021-02
ACTIVITY:	Construction Vibration	DATE:	18-Feb-22
LOCATION:	Receptors at 25 Feet	ENGINEER:	Darshan Shivaiah

VIBRATION INPUT/OUTPUT DATA

OTHER CONSTRUCTION EQUIPMENT

$$PPV = PPV_{ref}(25/D)^{n} \text{ (in/sec)}$$

PPV =	**0.089 in/sec**

Equipment Type =	2	Large Bulldozer
PPV_{ref} =	0.089	Reference PPV at 25 ft.
D =	25.00	Distance from Equipment to receiver in ft.
n =	1.10	Vibration attenuation rate through the ground

EQUIPMENT PPV REFERENCE LEVELS

Type	Equipment	Reference PPV
1	Vibratory Roller	0.210
2	Large Bulldozer	0.089
3	Caisson Drilling	0.089
4	Loaded Trucks	0.076
5	Jackhammer	0.035
6	Small Bulldozer	0.003
7	Crack and Seat	2.400

VIBRATION IMPACTS FROM CONSTRUCTION AND OPERATIONS

PROJECT:	TTM 20525 Residential Lots	JOB #:	3018-2021-02
ACTIVITY:	Construction Vibration	DATE:	18-Feb-22
LOCATION:	Receptors at 25 Feet	ENGINEER:	Darshan Shivaiah

VIBRATION INPUT/OUTPUT DATA

OTHER CONSTRUCTION EQUIPMENT

$$PPV = PPV_{ref}(25/D)^{n} \text{ (in/sec)}$$

PPV =	**0.210 in/sec**

Equipment Type =	1	Vibratory Roller
PPV_{ref} =	0.210	Reference PPV at 25 ft.
D =	25.00	Distance from Equipment to receiver in ft.
n =	1.10	Vibration attenuation rate through the ground

EQUIPMENT PPV REFERENCE LEVELS

Type	Equipment	Reference PPV
1	Vibratory Roller	0.210
2	Large Bulldozer	0.089
3	Caisson Drilling	0.089
4	Loaded Trucks	0.076
5	Jackhammer	0.035
6	Small Bulldozer	0.003
7	Crack and Seat	2.400

VIBRATION IMPACTS FROM CONSTRUCTION AND OPERATIONS

PROJECT:	TTM 20525 Residential Lots	JOB #:	3018-2021-02
ACTIVITY:	Construction Vibration	DATE:	18-Feb-22
LOCATION:	Receptors at 25 Feet	ENGINEER:	Darshan Shivaiah

VIBRATION INPUT/OUTPUT DATA

OTHER CONSTRUCTION EQUIPMENT

$$PPV = PPV_{ref}(25/D)^{n} \text{ (in/sec)}$$

PPV =	**0.076 in/sec**

Equipment Type =	4	Loaded Trucks
PPV_{ref} =	0.076	Reference PPV at 25 ft.
D =	25.00	Distance from Equipment to receiver in ft.
n =	1.10	Vibration attenuation rate through the ground

EQUIPMENT PPV REFERENCE LEVELS

Type	Equipment	Reference PPV
1	Vibratory Roller	0.210
2	Large Bulldozer	0.089
3	Caisson Drilling	0.089
4	Loaded Trucks	0.076
5	Jackhammer	0.035
6	Small Bulldozer	0.003
7	Crack and Seat	2.400