Noise Study Report

Dry Creek Estates Project

City of Sacramento, California

January 2022

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List of Abbreviated Terms

CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibels
FHWA	Federal Highway Administration
Hz	Hertz
kHz	Kilohertz
L_{dn}	Day-Night Level
L_{eq}	Equivalent Sound Level
$L_{eq(h)}$	Equivalent Sound Level over one hour
L_{max}	Maximum Sound Level
LOS	Level of Service
L_{xx}	Percentile-Exceeded Sound Level
mPa	micro-Pascals
mph	miles per hour
NSR	Noise Study Report
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
SPL	sound pressure level
TNM 2.5	FHWA Traffic Noise Model Version 2.5

Chapter 1. Introduction

1.1 Purpose of the Noise Study Report

The purpose of this Noise Study Report is to evaluate noise impacts under the California Environmental Quality Act (CEQA). Pursuant to the CEQA Guidelines (Title 14, Sections 15000 et seq. of the California Code of Regulations) and the City of Sacramento Local Environmental Regulations (Resolution 91-892), this Noise Study Report shall analyze the following questions related to noise:

Would the project:

a) Result in exterior noise levels in the project area that are above the upper value of the normally acceptable category for various land uses due to the project's noise level increases?

b) Result in residential interior noise levels of 45 dBA Ldn or greater caused by noise level increases due to the project?

c) Result in construction noise levels that exceed the standards in the City of Sacramento General Plan or Noise Ordinance?

d) Permit existing and/or planned residential and commercial areas to be exposed to vibration-peak-particle velocities greater than 0.5 inches per second due to project construction?

e) Permit adjacent residential and commercial areas to be exposed to vibration peak particle velocities greater than 0.5 inches per second due to highway traffic and rail operations?

f) Permit historic buildings and archaeological sites to be exposed to vibration-peak-particle velocities greater than 0.2 inches per second due to project construction and highway traffic?

This report provides the technical background for answering questions above and evaluating noise impacts in general.

Chapter 2. Project Description

The project is located in the Robla Neighborhood of North Sacramento on two vacant parcels totaling 28.78 acres in size (APN 237-0051-012 & 237-0051-013). The parcels are located on the east side of Rio Linda Boulevard south of the Main Avenue intersection and bordered by Futures High School to the south and Sunset Lawn Funeral Home to the east. The City of Sacramento is the California Environmental Quality Act (CEQA) lead agency.

2.1. Project Description

The City of Sacramento is evaluating the environmental impact of rezoning the project area and allowing for residential development. The proposed project would include construction of approximately 147 single family homes, associated utilities service connections, and 13 local roadways on the undeveloped site. In addition, as part of the development project, a maintenance district may be formed to maintain a segment of the Sacramento Northern Bike Trail. A discussion of the project components, including residential units, site access and circulation, utility infrastructure, open space preservation, and the maintenance district are discussed in greater detail below.

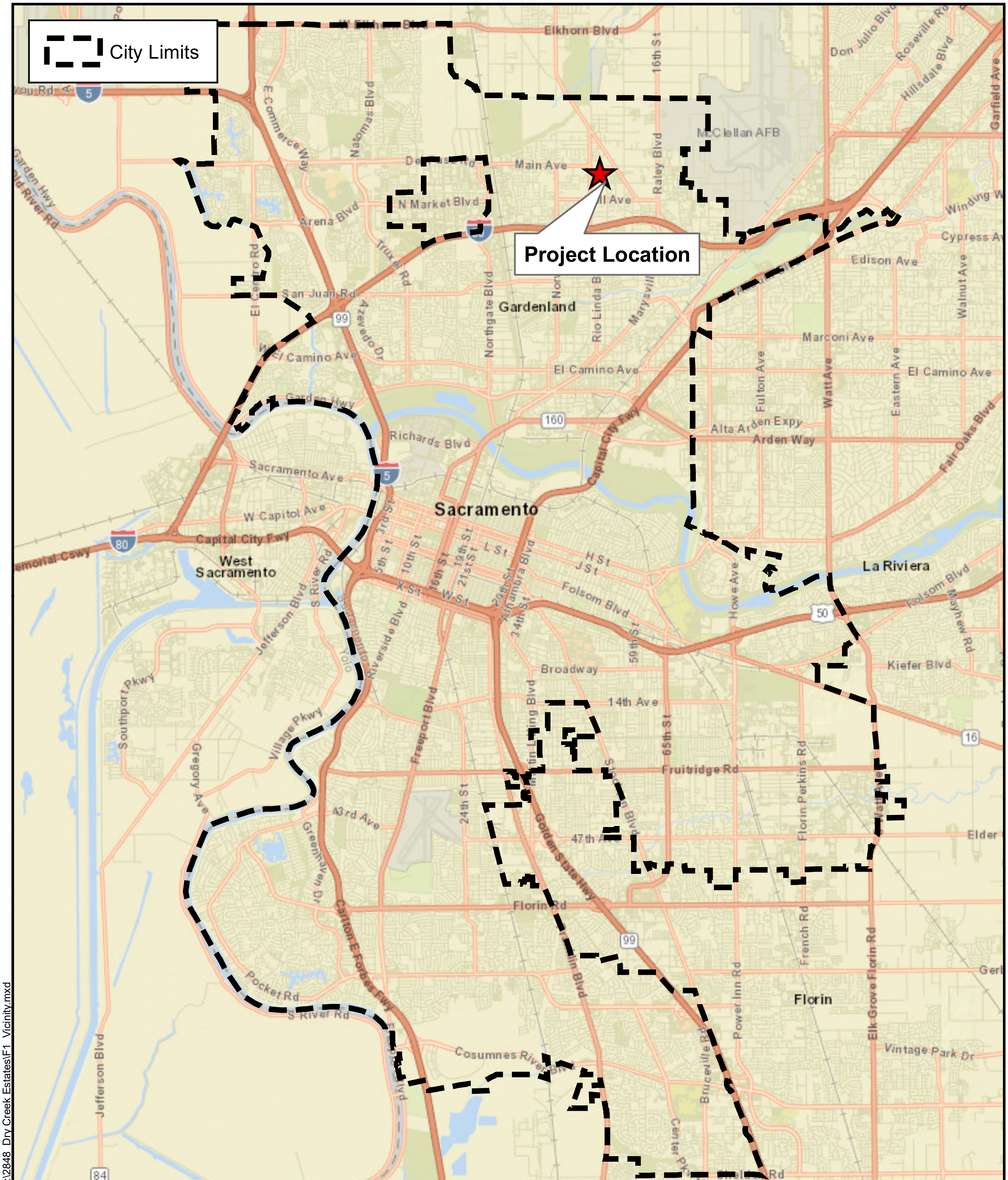
Residential Units

The proposed project would build approximately 147 single family homes on the property. Lot sizes range between 5,900 ft2 and 3,800 ft2 with a total density of 5.11 dwelling units per acre. Homes will be built in two clusters on either side of the wetland open space corridor with 80 homes on the north side of the open space and 67 on the south side of the open space.

Site Access and Circulation

The project area is bordered by Rio Linda Boulevard on the west side and Grace Avenue on the South Side. As a component of this project, Main Avenue will be extended by approximately 1,100 feet along the north side of the project area from its current terminus at Rio Linda Boulevard at the northwestern corner of the project area to the existing section of Main Avenue at the northeastern corner of the project area. This roadway gap closure would involve building a bridge over Magpie Creek just east of Rio Linda Boulevard, reconfiguring the existing intersection, and paving approximately 1,100 linear feet of two-lane roadway.

Roadway access to individual properties within the development will be provided by a network of 13 new local streets. Right-of-way for these streets will be 30 feet wide, accommodating two travel lanes, curb, gutter, sidewalk, and limited on street parking in designated parking locations.



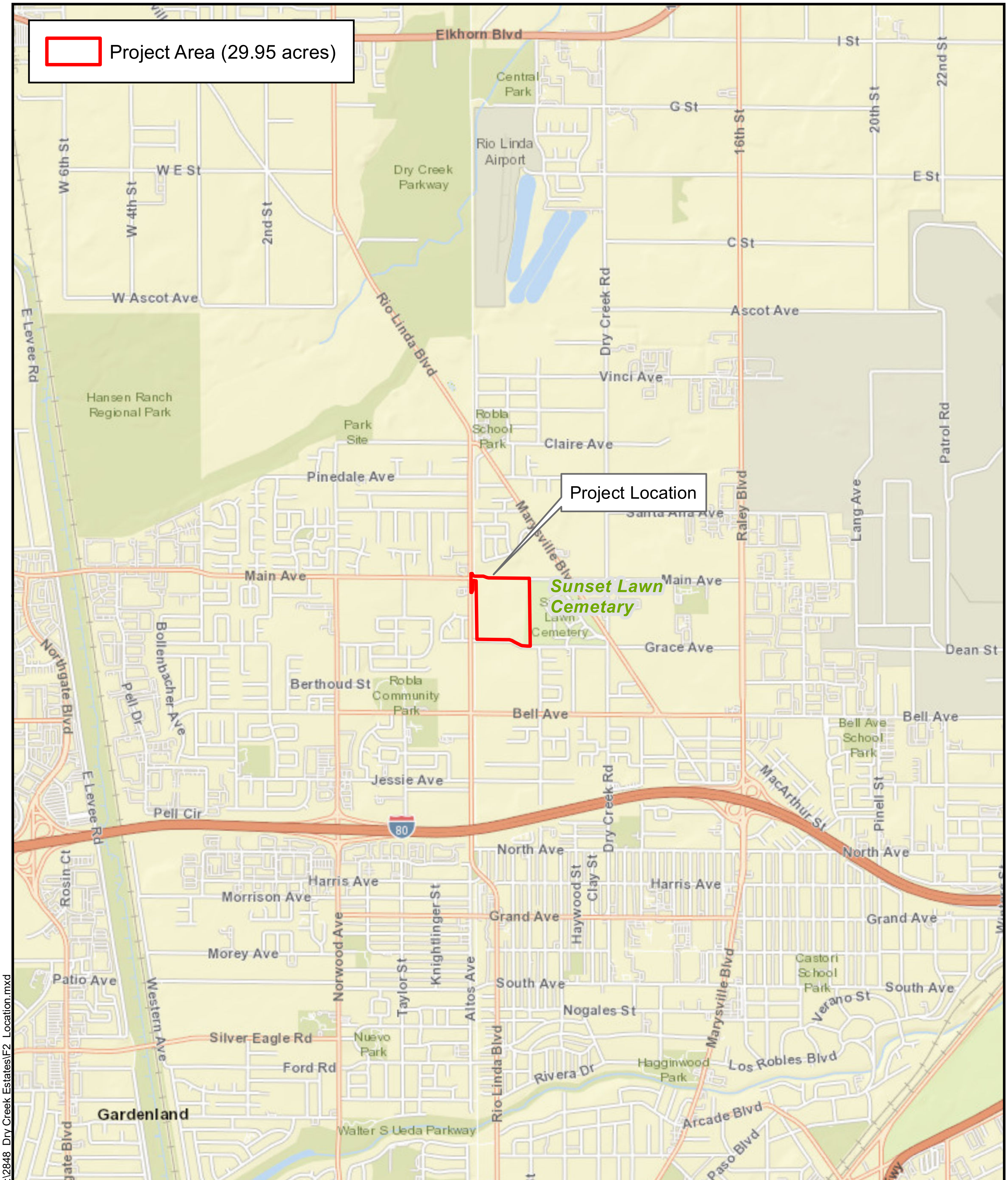
Source: ESRI 2008; Dokken Engineering11/30/2021; Created By: vchevreuil

V:\2848 Dry Creek Estates\F1 Vicinity.mxd

0 1 2 3 Miles

FIGURE 1
Project Vicinity

Dry Creek Estates Project
Sacramento County, California



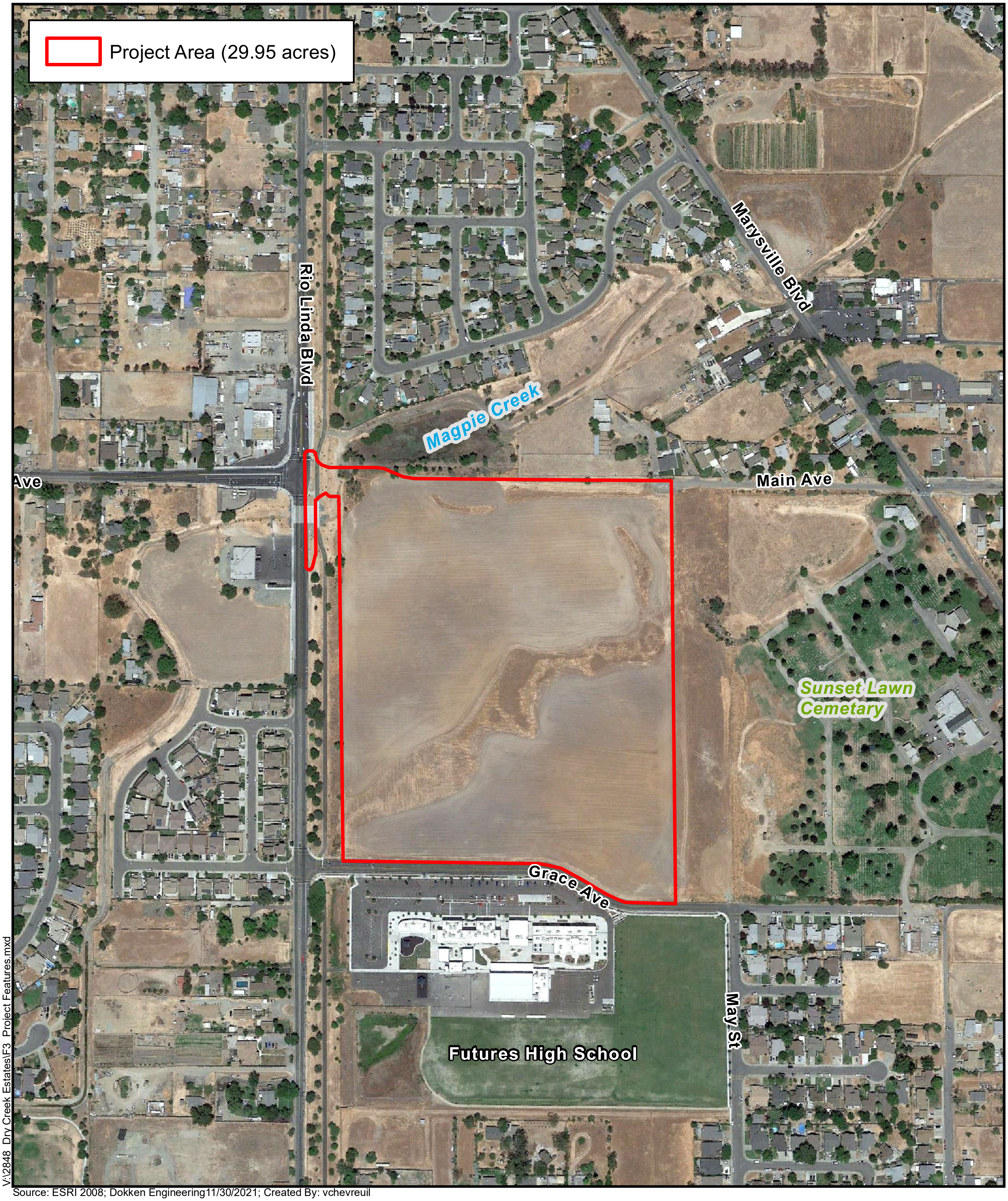
Source: ESRI 2008; Dokken Engineering11/30/2021; Created By: vchevreuil

V:\2848 Dry Creek Estates\F2 Location.mxd

0 0.5 1 Miles

FIGURE 2
ProjectLocation

Dry Creek Estates Project
Sacramento County, California



V:\2848_Dry Creek Estates\F3_Project Features.mxd

Source: ESRI 2008; Dokken Engineering11/30/2021; Created By: vchevreuil

1 in = 400 ft

0 500 1,000 1,500 Feet

FIGURE 3
Project Location

Dry Creek Estates Project
Sacramento County, California

Chapter 3. Fundamentals of Traffic Noise

The following is a brief discussion of fundamental traffic noise concepts.

3.1. Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receptor, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receptor determine the sound level and characteristics of the noise perceived by the receptor. The field of acoustics deals primarily with the propagation and control of sound.

3.1. Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

3.2. Sound Pressure Levels and Decibels

The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.00000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this huge range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of decibels (dB). The threshold of hearing for young people is about 0 dB, which corresponds to 20 mPa.

3.3. Addition of Decibels

Because decibels are logarithmic units, SPL cannot be added or subtracted through ordinary arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB—rather, they would combine to produce 73 dB. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dB louder than one source.

3.4. A-Weighted Decibels

The decibel scale alone does not adequately characterize how humans perceive noise. The dominant frequencies of a sound have a substantial effect on the human response to that sound. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human hearing is limited in the range of audible frequencies as well as in the way it perceives the SPL in that range. In general, people are most sensitive to the frequency range of 1,000–8,000 Hz, and perceive sounds within that range better than sounds of the same amplitude in higher or lower frequencies. To approximate the response of the human ear, sound levels of individual frequency bands are weighted, depending on the human sensitivity to those frequencies. Then, an “A-weighted” sound level (expressed in units of dBA) can be computed based on this information.

The A-weighting network approximates the frequency response of the average young ear when listening to most ordinary sounds. When people make judgments of the relative loudness or annoyance of a sound, their judgements correlate well with the A-scale sound levels of those sounds. Other weighting networks have been devised to address high noise levels or other special problems (e.g., B-, C-, and D-scales), but these scales are rarely used in conjunction with highway-traffic noise. Noise levels for traffic noise reports are typically reported in terms of A-weighted decibels or dBA. Table 1 describes typical A-weighted noise levels for various noise sources.

Table 1. Typical A-Weighted Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 1000 feet		
	— 100 —	
Gas lawn mower at 3 feet		
	— 90 —	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	— 80 —	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	— 70 —	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 2013.

3.5. Human Response to Changes in Noise Levels

As discussed above, doubling sound energy results in a 3-dB increase in sound. However, given a sound level change measured with precise instrumentation, the subjective human perception of a doubling of loudness will usually be different than what is measured.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1-dB changes in sound levels, when exposed to steady, single-frequency (“pure-tone”) signals in the midfrequency (1,000 Hz–8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dB are generally not perceptible. However, it is widely accepted that people are able to begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5-dB increase is generally perceived as a distinctly noticeable increase, and a 10-dB increase is generally perceived as a doubling of loudness. Therefore, a doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dB increase in sound, would generally be perceived as barely detectable.

3.6. Noise Descriptors

Noise in our daily environment fluctuates over time. Some fluctuations are minor, but some are substantial. Some noise levels occur in regular patterns, but others are random. Some noise levels fluctuate rapidly, but others slowly. Some noise levels vary widely, but others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used in traffic noise analysis.

- **Equivalent Sound Level (L_{eq}):** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level (L_{eq}[h]) is the energy average of A-weighted sound levels occurring during a one-hour period, and is the basis for noise abatement criteria (NAC) used by Caltrans and FHWA.

- **Percentile-Exceeded Sound Level (L_{xx}):** L_{xx} represents the sound level exceeded for a given percentage of a specified period (e.g., L_{10} is the sound level exceeded 10% of the time, and L_{90} is the sound level exceeded 90% of the time).

- **Maximum Sound Level (L_{max}):** L_{max} is the highest instantaneous sound level measured during a specified period.

- **Day-Night Level (L_{dn}):** L_{dn} is the energy average of A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during nighttime hours between 10 p.m. and 7 a.m.

- **Community Noise Equivalent Level (CNEL):** Similar to L_{dn}, CNEL is the energy average of the A-weighted sound levels occurring over a 24-hour period, with a 10-dB penalty applied to A-weighted sound levels occurring during the nighttime hours between 10 p.m. and 7 a.m., and a 5-dB penalty applied to the A-weighted sound levels occurring during evening hours between 7 p.m. and 10 p.m.

3.7. Sound Propagation

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

3.7.1. Geometric Spreading

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

3.7.2. Ground Absorption

The propagation path of noise from a highway to a receptor is usually very close to the ground. Noise attenuation from ground absorption and reflective-wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is usually sufficiently accurate for distances of less than 200 feet. For acoustically hard sites (i.e., sites with a reflective surface between the source and the receptor, such as a parking lot or body of water,), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (i.e., those sites with an absorptive ground surface between the source and the receptor, such as soft dirt, grass, or scattered bushes and trees), an excess ground-attenuation value of 1.5 decibels per doubling of distance is normally assumed. When added to the cylindrical spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 decibels per doubling of distance.

3.7.3. Atmospheric Effects

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

3.7.4. Shielding by Natural or Human-Made Features

A large object or barrier in the path between a noise source and a receptor can substantially attenuate noise levels at the receptor. The amount of attenuation provided by shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (e.g., hills and dense woods) and human-made features (e.g., buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receptor specifically to reduce noise. A barrier that breaks the line of sight between a source and a receptor will typically result in at least 5 dB of noise reduction. Taller barriers provide increased noise reduction. Vegetation between the highway and receptor is rarely effective in reducing noise because it does not create a solid barrier.

Chapter 4. Fundamentals of Vibration

4.1. Vibration Descriptors

Vibration is an oscillatory motion which can be described in terms of the displacement, velocity, or acceleration. The peak particle velocity (PPV) is defined as the maximum instantaneous positive or negative peak of the vibration signal. PPV is often used in monitoring of blasting vibration since it is related to the stresses that are experienced by buildings. The PPV is normally described in inches per second in the USA (Federal Transit Administration, May 2006).

4.2. Human Response to Vibration

Ground vibration can be annoying to people. The primary effect of perceptible vibration is often a concern. The vibration of floors and walls may cause perceptible vibration, rattling of items such as windows or dishes on shelves, or a rumble noise. The rumble is the noise radiated from the motion of surfaces, also known as ground-borne noise (Federal Transit Administration, May 2006). However, secondary effects, such as the rattling of a china cabinet, can also occur, even when vibration levels are well below perception. Any effect (primary perceptible vibration, secondary effects, or a combination of the two) can lead to annoyance.

4.3. Vehicle Operation Vibration

Vehicles traveling on a smooth roadway are rarely, if ever, the source of perceptible ground vibration. However, discontinuities in roadway pavement often develop as the result of settling of pavement sections, cracking, and faulting. When this occurs, vehicles passing over the pavement discontinuities impart energy into the ground, generating vibration. In most cases, only heavy trucks, not automobiles, are the source of perceptible vibration. Trucks traveling over pavement discontinuities also often rattle and make noise, which tends to make the event more noticeable when the ground vibration generated may only be barely noticeable.

Because vibration from the vehicle operations is almost always the result of pavement discontinuities, the solution is to smooth the pavement to eliminate the discontinuities. This step will eliminate perceptible vibration from vehicle operations in virtually all cases.

4.4. Construction Vibration

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings founded on the soil in the vicinity of the construction site respond to these vibrations, with varying results ranging from no perceptible effects at the lowest levels, low rumbling sounds and perceptible vibrations at moderate levels, and slight damage at the highest levels.

Vibration generated by construction activity has the potential to damage structures. This damage could be structural damage, such as cracking of floor slabs, foundations, columns, beams, or wells, or cosmetic architectural damage, such as cracked plaster, stucco, or tile. However, ground vibrations from construction activities do not often reach the levels that can damage structures, but they can achieve the audible and feelable ranges in buildings very close to the site. A possible exception is the case of fragile buildings, many of them old, where special care must be taken to avoid damage. The construction criteria include special consideration for such buildings. The construction activities that typically generate the most severe vibrations are blasting and impact pile driving.

In most cases, vibration induced by typical construction equipment does not result in adverse effects on people or structures. Noise from the equipment typically overshadows any meaningful ground vibration effects on people. Some equipment, however, including vibratory rollers and crack-and-seat equipment, can create high vibration levels. In cases where prolonged annoyance or damage from construction vibrations is not expected, a qualitative assessment is appropriate. Such an assessment should include a description of the duration and the type of equipment to be used during the construction, with an explanation of how the ground-borne vibration will be maintained at an acceptable level.

Chapter 5. Federal Regulations and State Policies

This report focuses on City CEQA requirements as discussed below. In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where there are no exterior activity areas, or where the exterior activities occur far from the roadway or physically shielded in a manner that prevents an impact on exterior activities, the interior criterion is used as the basis for determining a noise impact.

5.1. State Regulations and Policies

5.1.1. California Environmental Quality Act (CEQA)

This report is in conformance with the California Environmental Quality Act (CEQA) (Public Resources Code 21000-21177) and the CEQA Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387). Under CEQA, the baseline noise level is compared to the build noise level. The assessment entails looking at the setting of the noise impact and then how large or perceptible any noise increase would be in the given area. Key considerations include: the uniqueness of the setting, the sensitive nature of the noise receptors, the magnitude of the noise increase, the number of residences affected, and the absolute noise level

The significance of noise impacts under CEQA are addressed in the environmental document rather than the NSR. Even though the NSR does not specifically evaluate the significance of noise impacts under CEQA, it must contain the technical information that is needed to make that determination in the environmental document.

5.1.2. Section 216 of the California Streets and Highways Code

The proposed project is subject to Section 216 of the California Streets and Highways Code. Section 216 of the California Streets and Highways Code relates to the noise effects of a proposed freeway project on public and private elementary and secondary schools. Under Section 216(c), a noise impact occurs if, as a result of a proposed freeway project, noise levels exceed 52 dBA-L_{eq}(h) in the interior of public or private elementary or secondary classrooms, libraries, multipurpose rooms, or spaces.

If a project results in a noise impact under this code, noise abatement must be provided to reduce classroom noise to a level that is at or below 52 dBA-L_{eq}(h). Under Section 216(d), if the noise levels generated from freeway and roadway sources exceed 52 dBA-

L_{eq}(h) prior to the construction of the proposed freeway project, then noise abatement must be provided to reduce the noise to the level that existed prior to construction of the project.

5.2. Local Regulations and Standards

5.2.1. City of Sacramento 2035 General Plan

The City of Sacramento has the following noise and vibration goals and policies in the Environmental Constraints chapter of the City of Sacramento 2035 General Plan:

EC 3.1.1 **Exterior Noise Standards.** The City shall require noise mitigation for all development where the projected exterior noise levels exceed those shown below to the extent feasible.

Table 2. Exterior Noise Compatibility Standards for Various Land Uses

Land Use Type	Highest Level of Noise Exposure That is Regarded as "Normally Acceptable"[a] (L_{dn}[b] or CNEL[c])
Residential – Low Density Single Family, Duplex, Mobile Homes	60 dBA[d,e]
Residential – Multi-family	65 dBA
Urban Residential Infill and Mixed-Use Projects	70 dBA
Transient Lodging – Motels, Hotels	65 dBA
Schools, Libraries, Churches, Hospitals, Nursing Homes	70 dBA
Auditoriums, Concert Halls, Amphitheaters	Mitigation based on site-specific study
Sports Arena, Outdoor Spectator Sports	Mitigation based on site-specific study
Playgrounds, Neighborhood Parks	70 dBA
Golf Courses, Riding Stables, Water Recreation, Cemeteries	75 dBA
Office Buildings – Business, Commercial and Professional	70 dBA
Industrial, Manufacturing, Utilities, Agri	75 dBA

a. As defined in the Guidelines, "Normally Acceptable" means that the "specified land use is satisfactory, based upon the assumption that any building involved is of normal conventional construction, without any special noise insulation requirements."
b. Ldn or Day Night Average Level is an average 24-hour noise measurement that factors in day and night noise levels.
c. CNEL or Community Noise Equivalent Level measurements are a weighted average of sound levels gathered throughout a 24-hour period.
d. Applies to the primary open space area of a detached single-family home, duplex, or mobile home, which is typically the backyard or fenced side yard, as measured from the center of the primary open space area (not the property line). This standard does not apply to secondary open space areas, such as front yards, balconies, stoops, and porches.
e. dBA or A-weighted decibel scale is a measurement of noise levels.
f. The exterior noise standard for the residential area west of McClellan Airport known as McClellan Heights/Parker Homes is 65 dBA.
g. Applies to the primary open space areas of townhomes and multi-family apartments or condominiums (private year yards for townhomes; common courtyards, roof gardens, or gathering spaces for multi-family developments).These standards shall not apply to balconies or small attached patios in multistoried multi-family structures.
h. With land use designations of Central Business District, Urban Neighborhood (Low, Medium, or High) Urban Center (Low or High), Urban Corridor (Low or High).
i. All mixed-use projects located anywhere in the City of Sacramento
j. See notes d and g above for definition of primary open space areas for single-family and multi-family developments.

EC 3.1.2 **Exterior Incremental Noise Standards.** The City shall require noise mitigation for all development that increases existing noise levels by more than the allowable increment shown below to the extent feasible.

Table 3. Exterior Incremental Noise Impact Standards for Noise-Sensitive Uses (dBA)

Residences and buildings where people normally sleep[a]		Institutional land uses with primarily daytime and evening uses[b]	
Existing L_{dn}	Allowable Noise Increment	Existing Peak Hour L_{eq}	Allowable Noise Increment
45	8	45	12
50	5	50	9
55	3	55	6
60	2	60	5
65	1	65	3
70	1	70	3
75	0	75	1
80	0	80	0

a. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
b. This category includes schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material.

EC 3.1.3 **Interior Noise Standards.** The City shall require new development to include noise mitigation to assure acceptable interior noise levels appropriate to the land use type: 45 dBA Ldn (with windows closed) for residential, transient lodgings, hospitals, nursing homes and other uses where people normally sleep; and 45 dBA Leq (peak hour with windows closed) for office buildings and similar uses.

EC 3.1.5 **Interior Vibration Standards.** The City shall require construction projects anticipated to generate a significant amount of vibration to ensure acceptable interior vibration levels at nearby residential and commercial uses based on the current City or Federal Transit Administration (FTA) criteria.

EC 3.1.6 **Effects of Vibration.** The City shall consider potential effects of vibration when reviewing new residential and commercial projects that are proposed in the vicinity of rail lines or light rail lines.

EC 3.1.7 **Vibration.** The City shall require an assessment of the damage potential of vibration-induced construction activities, highways, and rail lines in close proximity to historic buildings and archaeological sites and require all feasible measures be implemented to ensure no damage would occur.

EC 3.1.10 **Construction Noise.** The City shall require development projects subject to discretionary approval to assess potential construction noise impacts on nearby sensitive uses and to minimize impacts on these uses, to the extent feasible.

5.2.2. City of Sacramento Municipal Code (Noise Ordinance)

The Sacramento Municipal Code includes noise regulations in Title 8 – Health and Safety, Chapter 8.68 – Noise Control (referred to generally as the Noise Ordinance). Of the regulations in Chapter 8.68, not all are applicable to the Proposed Project. The following regulations would apply to the Proposed Project:

"Section 8.68.080 exempts certain activities from Chapter 8.68, including "noise sources due to the erection (including excavation), demolition, alteration or repair of any building or structure" as long as these activities are limited to between the hours of 7 a.m. and 6 p.m. Monday through Saturday, and between the hours of 9 a.m. and 6 p.m. on Sunday. Section 8.68.080 also requires the use of exhaust and intake silencers for internal combustion engines, and provides for construction work to occur outside of the designated hours if the work is of urgent necessity and in the interest of public health and welfare for a period not to exceed three days."

Chapter 6. Study Methods and Procedures

6.1. Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receiver Locations

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Although all land uses are evaluated in this analysis, the focus is on locations of frequent human use that would benefit from a lowered noise level. Accordingly, this impact analysis focuses on locations with defined outdoor activity areas, such as residential backyards.

6.2. Field Measurement Procedures

Short-term noise measurements were taken at outdoor frequent human use areas at sensitive receivers within the proposed project area. Field measurements were taken at these locations to help determine proper shielding and background noise levels. All field measurements were 15 minutes in duration and noise levels are in terms of A-weighted decibel equivalent sound level. The following is a brief description of the measurement procedures utilized during field monitoring.

- Microphones were placed 5 feet above the ground elevation for all locations.
- Sound level meters were calibrated before and after each measurement.
- Following the calibration of equipment, a windscreen was placed over the microphone.
- Frequency weighting was set on “A” and slow response.
- Results of the noise measurements were recorded on field data sheets.
- During the noise measurements, any excessive noise contamination such as barking dogs, lawn mowers, and/or aircraft fly-overs were noted.
- Wind speed, temperature, humidity, and weather conditions were observed and documented.
- The following instruments were used for field noise measurements:

- Sound Level Meter – A Larson Davis (LD) 824 System sound level meter was used to measure existing noise levels. This sound level meter and its microphone conform to the Institute of Electronic and Electric Engineers and the American National Standards Institute standards for Type 1 instruments.

- Microphone System – LD Model 2560 1.27-centimeter (0.5-inch) pressure microphone; LD Model 900 microphone preamplifier.

- Acoustic Field Calibrator – LD Model CAL250 Precision Acoustic Calibrator.

6.2.1. Short-Term Measurements

Short-term monitoring was conducted at two locations on Thursday, January 6, 2022 using a Larson Davis Model 824 Precision Type 1 sound level meters (serial number 824A3562). The calibration of the meter was checked before and after the measurement using a Larson Davis CAL200 (serial number 8534). Measurements were taken over a 15-minute period at each site. The short-term measurement locations are identified in Figure 4.

During the short-term measurements, field staff attended each meter. Minute-to-minute Leq values collected during the measurement period (typically 15 minutes in duration) were logged by the sound level meter. Dominant noise sources that were not traffic-based were observed and noted during the measurements.

Temperature, wind speed, and humidity were noted during the short-term monitoring. During the short-term measurements, winds were gentle and speeds typically ranged from 7 to 8 miles per hour (mph). Temperatures ranged from 53°F to 55°F, with relative humidity ranging from 87% to 92%. Field note data sheets are attached to this memorandum.

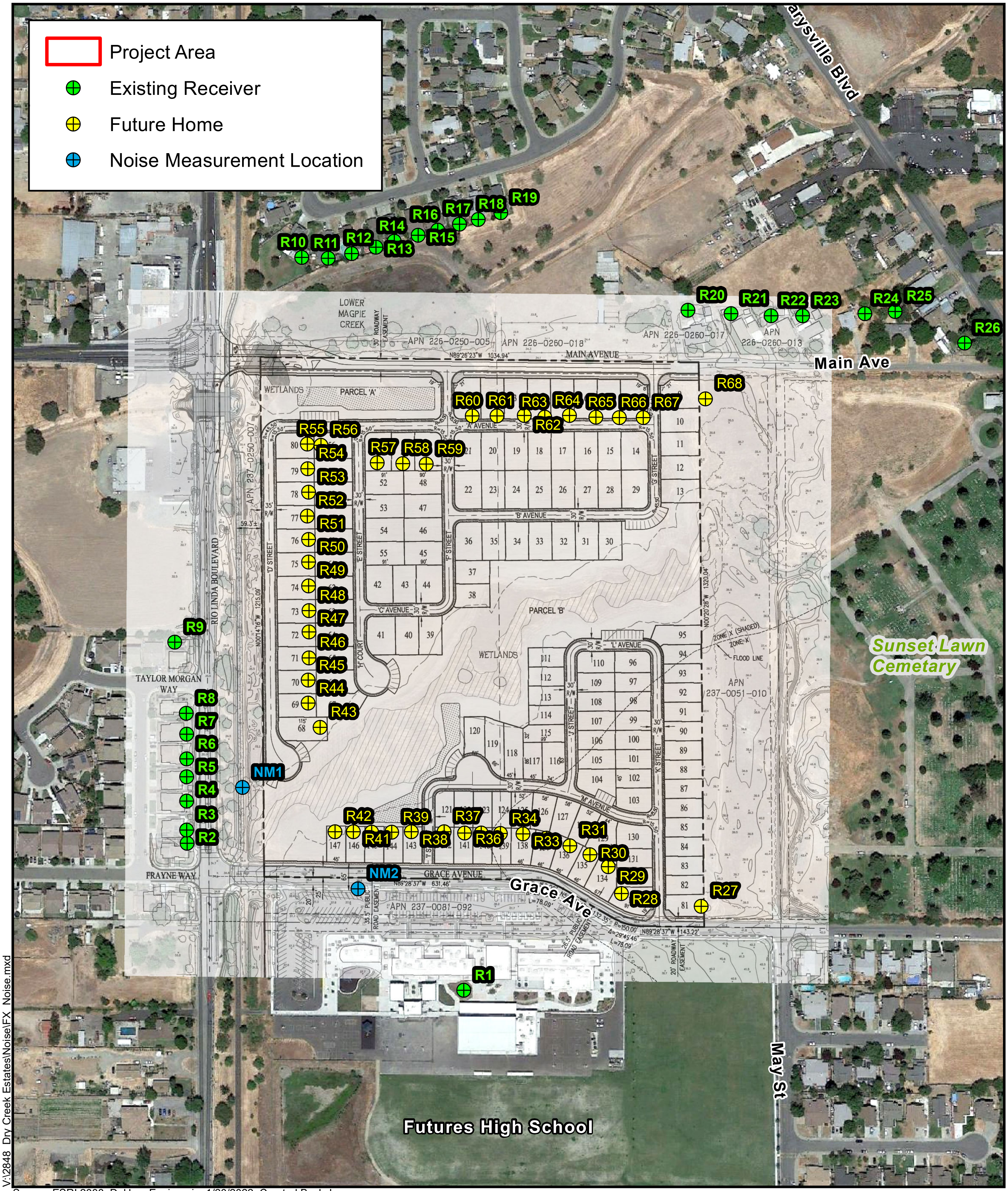
Traffic on Rio Linda Boulevard and Grace Avenue was classified and counted during short-term noise measurements. Vehicles were classified as automobiles, medium-duty trucks, or heavy-duty trucks. An automobile was defined as a vehicle with two axles and four tires that are designed primarily to carry passengers. Small vans and light trucks were included in this category. Medium-duty trucks included all cargo vehicles with two axles and six tires. Heavy-duty trucks included all vehicles with three or more axles. Posted speeds on Rio Linda Boulevard was 45 mph and 25 mph on Grace Avenue.

6.3. Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model Version 2.5 (TNM 2.5). Key inputs to the traffic noise model were the locations of roadways, traffic mix and speed, shielding features (e.g., topography and buildings), noise barriers, ground type, and receptors. Three-dimensional representations of these inputs were developed using field data, CAD drawings, aerials, and topographic contours provided by the project engineer.

Traffic noise was evaluated under existing conditions, future no-project conditions, and future conditions with the project alternative. Average daily traffic volumes were taken from the City of Sacramento 2035 General Plan for input into the traffic noise model. Tables A-1 to A-3 in Appendix A summarize the traffic volumes and assumptions used for modeling existing and design-year conditions with and without the project.

To validate the accuracy of the model calculations, TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations. For each receptor, traffic volumes counted during the short-term measurement periods were normalized to 1-hour volumes. These normalized volumes were assigned to the corresponding project area roadways to simulate the noise source strength at the roadways during the actual measurement period. Modeled and measured sound levels were then compared to determine the accuracy of the model and if additional adjustment of the model was necessary.



V:\2848 Dry Creek Estates\Noise\FX Noise.mxd

Source: ESRI 2008; Dokken Engineering1/20/2022; Created By: kchen

1 in = 300 ft

0 500 1,000 1,500 Feet

FIGURE 4
Noise Measurement and Receiver Locations

Dry Creek Estates Project
Sacramento County, California

Chapter 7. Existing Noise Environment

7.1. Existing Land Uses

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. The noise study area, which encompasses approximately 500 feet from the project footprint, includes primarily residential uses, a high school, and a cemetery. A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Single-family residences were identified as the predominant sensitive land use in the project area.

7.2. Noise Measurement Results

The existing noise environment of the project area was characterized by conducting short-term noise level measurements at representative noise-sensitive receiver locations.

7.2.1. Short-Term Measurements

The primary source of noise in the project area is traffic on Rio Linda Boulevard. Short-term (15-minute) noise measurements were conducted to document existing noise levels at two representative sensitive receiver locations along Rio Linda Boulevard and Grace Avenue. The noise level measurements were performed using a Larson Davis Model 824 Type 1 sound level meter. Table 4 describes the physical location of the noise monitoring and the results of these measurements. Noise measurement field monitoring forms are located in Appendix C.

Table 4. Short-Term Measurement Results

Position	Location	Land Uses	Start Time	Duration (minutes)	Measured L_{eq}	Direction	Autos	Medium Trucks	Heavy Trucks	Bus	Moto	Observed Speed (mph)
NM-1	Sacramento Northern Bike Trail facing west toward Rio Linda Boulevard	Residential	4:42 pm	15	63.7	Northbound	82	1	0	0	0	45 mph
						Southbound	80	0	0	0	1	
NM-2	Futures High School facing north toward Grace Avenue	Residential	5:01 pm	15	55.8	Eastbound	4	0	0	0	0	25 mph
						Westbound	4	0	0	0	0	

During the measurement period (15 minutes in duration), dominant noise sources were identified and logged. The calibration of the meter was checked before and after the measurement using Larson-Davis Model CAL250 calibrator. Temperature, wind speed, and humidity were recorded manually during the short-term monitoring session.

During the short-term measurements, wind speeds typically ranged from 15 to 21 miles per hour (mph). Temperatures ranged from 63 to 66°F, with relative humidity typically 15 to 19 percent.

7.2.2. Model Calibration

Noise measurements for the calibration were conducted with simultaneous traffic counts at two (2) locations on January 6, 2022. These measurements were conducted to calibrate the TNM 2.5 model. Concurrent with the measurements, traffic volumes were recorded through the use of a video camera. Traffic speeds were recorded by driving on the roadways immediately after a calibration measurement. The traffic counts were tabulated according to three vehicles types, including automobiles, medium trucks (2-axle with 6-wheels but not including pick-up trucks) and heavy trucks (3 or more axles). As a general rule, the noise model is considered to be calibrated if the field measured noise levels versus the modeled noise levels (using field collected traffic data) agree within 3 dB of each other. If differences are more than 3 dB, refinement of the noise model is performed until there is agreement between the two values. If after thorough reevaluation calibration still cannot be achieved due to complex topography or other unusual circumstances, then a calibration constant is added such that the measured versus modeled values agree before any predictions can be made with the model.

Table 5 shows the representative modeled receiver locations, measured existing ambient noise level, and the modeled existing noise levels using traffic counts during noise monitoring.

Table 5. Model Calibration

Receiver ID	Measured Leq, dBA	Modeled Leq, dBA	Difference
NM-1	63.7	62.5	-1.2
NM-2	55.8	53.0	-2.8

Source: Dokken Engineering, January 2022

The predicted sound levels are within 3 dB of the measured sound levels and considered to be in reasonable agreement with the measured sound levels. Therefore, the noise model is considered to be calibrated and accurate.

7.2.3. Existing Noise Levels

The primary existing noise sources in the project area are transportation facilities. Traffic traveling on Rio Linda Boulevard is the main source of traffic noise in the project vicinity. The FHWA TNM 2.5 was used to evaluate traffic-related noise conditions in the vicinity of the project site. Since City of Sacramento noise standards are expressed in Ldn/CNEL, TNM 2.5 was used to estimate noise levels expressed in dBA Lden, the level of noise expressed as a 24-hour average (also known as CNEL).

Average Daily Traffic (ADT) volumes for Rio Linda Bouelvard were taken from the City of Sacramento 2035 General Plan and extrapolated to the existing year of 2022 using population growth rates for North Sacramento from the City of Sacramento 2035 General Plan Housing Element. Traffic volumes for Grace Avenue were extrapolated from traffic counts taken during the noise measurements. The ADT counts were then used as inputs in TNM 2.5 to estimate noise levels in the existing condition in dBA CNEL. The modelled existing noise results are provided in Appendix B.

Table 5 shows the existing noise levels in the project area. Table 5 also lists the location and type of development for each modeled receiver location. The ambient noise levels measured were used to establish the existing noise level at many locations within the project area. As shown in Table 5, existing residences at R1 through R8 (west of Rio Linda Boulevard, along Debralee Way) may be exposed to exterior noise levels exceeding the City of Sacramento noise threshold of 60 dBA CNEL without the project.

Table 6. Existing Exterior Noise Levels

Receiver No.	Location	Type of Land Use	Number of Dwelling Units	Modeled Exterior Noise Level (CNEL)
R1	Futures High School	School	-	52.2
R2	4600 Debralee Way	Single-Family Residence	1	**60.5**
R3	4610 Debralee Way	Single-Family Residence	1	**61.4**
R4	4620 Debralee Way	Single-Family Residence	1	**61.9**
R5	4630 Debralee Way	Single-Family Residence	1	**62.2**
R6	4640 Debralee Way	Single-Family Residence	1	**62.2**
R7	4650 Debralee Way	Single-Family Residence	1	**62.2**
R8	4660 Debralee Way	Single-Family Residence	1	**62.3**
R9	771 Taylor Morgan Way	Single-Family Residence	1	58.7
R10	4915 Wind Creek Drive	Single-Family Residence	1	52.5
R11	4911 Wind Creek Drive	Single-Family Residence	1	51.7
R12	4907 Wind Creek Drive	Single-Family Residence	1	50.5
R13	4903 Wind Creek Drive	Single-Family Residence	1	49.5
R14	4899 Wind Creek Drive	Single-Family Residence	1	48.8
R15	4895 Wind Creek Drive	Single-Family Residence	1	48.1

Table 6. Existing Exterior Noise Levels

Receiver No.	Location	Type of Land Use	Number of Dwelling Units	Modeled Exterior Noise Level (CNEL)
R16	4891 Wind Creek Drive	Single-Family Residence	1	47.5
R17	4887 Wind Creek Drive	Single-Family Residence	1	47.0
R18	4883 Wind Creek Drive	Single-Family Residence	1	46.5
R19	4879 Wind Creek Drive	Single-Family Residence	1	46.1
R20	933 Main Avenue	Single-Family Residence	1	49.4
R21	935 Main Avenue	Single-Family Residence	1	46.7
R22	1005 Main Avenue	Single-Family Residence	1	35.6
R23	1009 Main Avenue	Single-Family Residence	1	36.6
R24	1013 Main Avenue	Single-Family Residence	1	44.2
R25	1015 Main Avenue	Single-Family Residence	1	43.7
R26	4805 Marysville Boulevard	Single-Family Residence	1	51.3

Bold indicates noise levels exceeding City of Sacramento noise threshold

Chapter 8. Future Noise Environment and Impacts

This section discusses the predicted traffic noise level under future conditions (with and without the project), identifies traffic noise impacts, and considers noise mitigation. The results of this analysis are provided Table B-1 contained in the appendix to the NSR.

8.1. Future Noise Environment and Impacts

Table B-1 in Appendix B summarizes the traffic noise modeling results for future 2035 conditions with and without the project.

The proposed project would build approximately 147 single family homes on the property. Homes will be built in two clusters with 80 homes on the north side (represented by R43 through R68) and 67 on the south side of the project site (represented by R27 through R42). These receivers represent future homes along the project site boundary adjacent to Main Avenue, Rio Linda Boulevard, and Grace Avenue that would be most exposed to traffic noise along these roadways. Furthermore, as receivers R27 through R68 would only be developed as a part of the proposed project, they were only analyzed in the Future Build scenario.

Future Average Daily Traffic (ADT) volumes on Rio Linda Boulevard were taken from the City of Sacramento 2035 General Plan. For the new Main Avenue connection that would be built as part of the project, future traffic volumes were predicted based on trips generated by the 80 new homes on the north side that would be accessed by Main Avenue. For Grace Avenue, traffic volumes were predicted based on trips generated by the 67 new homes on the south side of the property that would be accessed Grace Avenue, as well as the adjacent Futures High School.

8.1.1. Future Exterior Noise Levels

a) Would the project result in exterior noise levels in the project area that are above the upper value of the normally acceptable category for various land uses due to the project's noise level increases?

The future traffic noise modeling results in Table B-1, and summarized in Table 7 below, indicate that exterior noise levels without the proposed project would range between 36.2 dBA CNEL and 63.1 dBA CNEL. Exterior noise levels at R2 through R8 would continue to be exposed to noise levels exceeding the City of Sacramento 60 dBA acceptable noise threshold.

Table 7. Comparison of Estimated Future Exterior Noise Levels in 2035

Receiver No.	Location	Predicted Noise Level for No-Build (2035) (dBA CNEL)	Predicted Noise Level for Build (2035) (dBA CNEL)	Noise Difference 2035 No-Build to 2035 Build (dBA CNEL)
R1	Futures High School	52.9	50.6	-2.3
R2	4600 Debralee Way	**61.3**	**61.7**	0.4
R3	4610 Debralee Way	**62.2**	**62.6**	0.4
R4	4620 Debralee Way	**62.7**	**63.1**	0.4
R5	4630 Debralee Way	**63.0**	**63.4**	0.4
R6	4640 Debralee Way	**63.0**	**63.4**	0.4
R7	4650 Debralee Way	**63.0**	**63.4**	0.4
R8	4660 Debralee Way	**63.1**	**63.5**	0.4
R9	771 Taylor Morgan Way	59.5	59.9	0.4
R10	4915 Wind Creek Drive	53.3	53.7	0.4
R11	4911 Wind Creek Drive	52.5	52.8	0.3
R12	4907 Wind Creek Drive	51.3	51.4	0.1
R13	4903 Wind Creek Drive	50.3	50.3	0.0
R14	4899 Wind Creek Drive	49.6	49.5	-0.1
R15	4895 Wind Creek Drive	48.9	48.7	-0.2
R16	4891 Wind Creek Drive	48.3	48.0	-0.3
R17	4887 Wind Creek Drive	47.7	47.4	-0.3
R18	4883 Wind Creek Drive	47.3	46.9	-0.4
R19	4879 Wind Creek Drive	46.8	46.3	-0.5
R20	933 Main Avenue	50.2	48.8	-1.4
R21	935 Main Avenue	47.2	47.5	0.3
R22	1005 Main Avenue	36.2	38.1	1.9
R23	1009 Main Avenue	37.2	38.7	1.5
R24	1013 Main Avenue	44.3	44.5	0.2
R25	1015 Main Avenue	44.3	40.7	-3.6
R26	4805 Marysville Boulevard	51.4	50.9	-0.5
R27	Lot 81	-	50.7	-
R28	Lot 133	-	47.0	-
R29	Lot 134	-	40.4	-
R30	Lot 135	-	42.0	-
R31	Lot 136	-	44.8	-
R32	Lot 137	-	46.8	-
R33	Lot 138	-	50.0	-
R34	Lot 139	-	50.7	-

Table 7. Comparison of Estimated Future Exterior Noise Levels in 2035

Receiver No.	Location	Predicted Noise Level for No-Build (2035) (dBA CNEL)	Predicted Noise Level for Build (2035) (dBA CNEL)	Noise Difference 2035 No-Build to 2035 Build (dBA CNEL)
R35	Lot 140	-	51.4	-
R36	Lot 141	-	51.9	-
R37	Lot 142	-	52.8	-
R38	Lot 143	-	54.3	-
R39	Lot 144	-	55.2	-
R40	Lot 145	-	56.5	-
R41	Lot 146	-	57.7	-
R42	Lot 147	-	58.9	-
R43	Lot 68	-	42.7	-
R44	Lot 69	-	40.8	-
R45	Lot 70	-	40.9	-
R46	Lot 71	-	41.3	-
R47	Lot 72	-	42.3	-
R48	Lot 73	-	41.7	-
R49	Lot 74	-	42.0	-
R50	Lot 75	-	42.2	-
R51	Lot 76	-	42.7	-
R52	Lot 77	-	41.5	-
R53	Lot 78	-	43.0	-
R54	Lot 79	-	42.8	-
R55	Lot 80	-	47.8	-
R56	Lot 56	-	56.8	-
R57	Lot 51	-	43.6	-
R58	Lot 50	-	43.8	-
R59	Lot 49	-	43.5	-
R60	Lot 1	-	50.0	-
R61	Lot 2	-	47.9	-
R62	Lot 3	-	46.8	-
R63	Lot 4	-	46.2	-
R64	Lot 5	-	45.4	-
R65	Lot 6	-	44.8	-
R66	Lot 7	-	44.2	-
R67	Lot 8	-	43.7	-
R68	Lot 9	-	47.6	-

Bold indicates noise levels exceeding City of Sacramento noise threshold
Source: FHWA Traffic Noise Model 2.5

With construction of the proposed project, future exterior noise levels would range between 38.1 dBA and 63.5 dBA CNEL in 2035. Exterior noise levels at receivers R2 through R8 would continue to be exposed to noise levels exceeding the City of Sacramento 60 dBA acceptable noise threshold. However, the project would result in a 0.4 dBA increase in noise at these receivers. Under the City of Sacramento's Exterior Incremental Noise Impact Standards for Noise-Sensitive Uses (shown above in Table 3), this is not considered a significant increase in noise that would require mitigation. No other existing receivers would be exposed to unacceptable noise levels in 2035 with the project. Therefore, the proposed project would not result in noise level increases that would cause an exceedance of the normally acceptable category for land uses in the project area.

Receivers R27 through R68 represent new homes that would be constructed as part of the proposed project along the project site boundary adjacent to Main Avenue, Rio Linda Boulevard, and Grace Avenue. These receivers would be most exposed to traffic noise along these roadways. As shown in Table 7, no receivers would be exposed to exterior noise levels above the upper value of the normally acceptable category for single family homes. Therefore, impacts are **Less than Significant**.

8.1.2. Future Interior Noise Levels

b) Would the project result in residential interior noise levels of 45 dBA Ldn or greater caused by noise level increases due to the project?

Standard residential design (with windows closed) will provide approximately 20 dBA of attenuation. Table 8 shows the estimated interior noise levels at each noise receiver location representing a residence with exterior-to-interior noise attenuation.

Table 8. Comparison of Estimated Future Interior Noise Levels in 2035

Receiver No.	Location	Predicted Noise Level for No-Build (2035) (dBA CNEL)	Predicted Noise Level for Build (2035) (dBA CNEL)	Noise Difference 2035 No-Build to 2035 Build (dBA CNEL)
R1	Futures High School	32.9	30.6	-2.1
R2	4600 Debralee Way	41.3	41.7	0.4
R3	4610 Debralee Way	42.2	42.6	0.4
R4	4620 Debralee Way	42.7	43.1	0.4
R5	4630 Debralee Way	43.0	43.4	0.4
R6	4640 Debralee Way	43.0	43.4	0.4
R7	4650 Debralee Way	43.0	43.4	0.4
R8	4660 Debralee Way	43.1	43.5	0.4
R9	771 Taylor Morgan Way	39.5	39.9	0.4
R10	4915 Wind Creek Drive	33.3	33.7	0.4
R11	4911 Wind Creek Drive	32.5	32.8	0.3
R12	4907 Wind Creek Drive	31.3	31.4	0.1
R13	4903 Wind Creek Drive	30.3	30.3	0
R14	4899 Wind Creek Drive	29.6	29.5	-0.1
R15	4895 Wind Creek Drive	28.9	28.7	-0.2
R16	4891 Wind Creek Drive	28.3	28.0	-0.3
R17	4887 Wind Creek Drive	27.7	27.4	-0.3
R18	4883 Wind Creek Drive	27.3	26.9	-0.4
R19	4879 Wind Creek Drive	26.8	26.3	-0.5
R20	933 Main Avenue	30.2	28.8	-1.4
R21	935 Main Avenue	27.2	27.5	0.3
R22	1005 Main Avenue	16.2	18.1	1.9
R23	1009 Main Avenue	17.2	18.7	1.5
R24	1013 Main Avenue	24.3	24.5	0.2
R25	1015 Main Avenue	24.3	20.7	-3.6
R26	4805 Marysville Boulevard	31.4	30.9	-0.5
R27	Lot 81	-	30.7	-
R28	Lot 133	-	27.0	-

Table 8. Comparison of Estimated Future Interior Noise Levels in 2035

Receiver No.	Location	Predicted Noise Level for No-Build (2035) (dBA CNEL)	Predicted Noise Level for Build (2035) (dBA CNEL)	Noise Difference 2035 No-Build to 2035 Build (dBA CNEL)
R29	Lot 134	-	20.4	-
R30	Lot 135	-	22.0	-
R31	Lot 136	-	24.8	-
R32	Lot 137	-	26.8	-
R33	Lot 138	-	30.0	-
R34	Lot 139	-	30.7	-
R35	Lot 140	-	31.4	-
R36	Lot 141	-	31.9	-
R37	Lot 142	-	32.8	-
R38	Lot 143	-	34.3	-
R39	Lot 144	-	35.2	-
R40	Lot 145	-	36.5	-
R41	Lot 146	-	37.7	-
R42	Lot 147	-	38.9	-
R43	Lot 68	-	22.7	-
R44	Lot 69	-	20.8	-
R45	Lot 70	-	20.9	-
R46	Lot 71	-	21.3	-
R47	Lot 72	-	22.3	-
R48	Lot 73	-	21.7	-
R49	Lot 74	-	22.0	-
R50	Lot 75	-	22.2	-
R51	Lot 76	-	22.7	-
R52	Lot 77	-	21.5	-
R53	Lot 78	-	23.0	-
R54	Lot 79	-	22.8	-
R55	Lot 80	-	27.8	-
R56	Lot 56	-	36.8	-
R57	Lot 51	-	23.6	-
R58	Lot 50	-	23.8	-
R59	Lot 49	-	23.5	-
R60	Lot 1	-	30.0	-
R61	Lot 2	-	27.9	-
R62	Lot 3	-	26.8	-
R63	Lot 4	-	26.2	-
R64	Lot 5	-	25.4	-
R65	Lot 6	-	24.8	-

Table 8. Comparison of Estimated Future Interior Noise Levels in 2035

Receiver No.	Location	Predicted Noise Level for No-Build (2035) (dBA CNEL)	Predicted Noise Level for Build (2035) (dBA CNEL)	Noise Difference 2035 No-Build to 2035 Build (dBA CNEL)
R66	Lot 7	-	24.2	-
R67	Lot 8	-	23.7	-
R68	Lot 9	-	27.6	-

The future interior results summarized in Table 8 indicate that the future interior noise levels would range between 20.7 dBA CNEL and 43.5 dBA CNEL with the proposed project. No analyzed receivers would be exposed to residential interior noise levels of 45 dBA Ldn or greater caused by noise level increases due to the project. Impacts would be **Less than Significant.**

Chapter 9. Construction Noise

c) Would the project result in construction noise levels that exceed the standards in the City of Sacramento General Plan or Noise Ordinance?

During construction of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction.

Table 9 summarizes noise levels produced by construction equipment that is commonly used on roadway construction projects. Construction equipment is expected to generate noise levels ranging from 80 to 89 dB at a distance of 50 feet, and noise produced by construction equipment would be reduced over distance at a rate of about 6 dB per doubling of distance.

Table 9. Construction Equipment Noise

Equipment	Maximum Noise Level (dBA at 50 feet)
Scrapers	89
Bulldozers	85
Heavy Trucks	88
Backhoe	80
Pneumatic Tools	85
Concrete Pump	82

Source: Federal Transit Administration, 2006. See also:
http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

In accordance with Section 8.68.080 of the City of Sacramento Noise Ordinance, Measure **NOI-1** will be required to be implemented by the contractor during construction of the proposed project:

NOI — 1: The following measures are required to minimize potential noise impacts during construction:

- Do not exceed 86 dBA Lmax at 50 feet from the job site activities from 7 a.m. and 6 p.m. Monday through Saturday, and between the hours of 9 a.m. and 6 p.m. on Sunday.

- Equip an internal combustion engine with the manufacturer recommended exhaust and intake silencers.

- Do not operate an internal combustion engine on the job site without the appropriate muffler or exhaust and intake silencer.

Adherence to standard construction Best Management Practices and measure **NOI-1** would ensure construction noise levels are in compliance with the City of Sacramento General Plan and Noise Ordinance. Impacts would be **Less than Significant with Mitigation Incorporated**.

Chapter 10. Vibratory Impacts

d) Would the project permit existing and/or planned residential and commercial areas to be exposed to vibration-peak-particle velocities greater than 0.5 inches per second due to project construction?

The proposed project would result in the construction of 147 new homes. Operation of the proposed project would not perceptibly increase groundborne vibration or groundborne noise on the proposed project because operation of the proposed project would not involve vibration creating activities.

Construction of the proposed project could temporarily increase groundborne vibration or noise in the project area. Table 10 provides an estimate of vibration levels associated with construction activities for each piece of equipment. These are based on a wide range of soil conditions.

Table 10. Vibration Source Levels for Construction Equipment

Equipment	PPV at 25 ft (in/sec)
Pile Driver (impact)	1.518
Pile Drive (sonic)	0.734
Vibratory Roller	0.210
Hoe Ram	0.089
Large Bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003

Source: Federal Transit Administration, 2006. See also: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

During construction, the equipment with the greatest potential for vibration impacts would be generated by vibratory rollers, which would compact soil over the project site. Based on the information shown in Table 10, vibratory rollers could cause continuous vibration levels up to 0.210 PPV to buildings within 25 feet of the project site during construction. Therefore, construction of the proposed project would not result in exposure to vibration-peak-particle velocities greater than 0.5 inches per second. Impacts would be **Less than Significant**.

e) Would the project permit adjacent residential and commercial areas to be exposed to vibration peak particle velocities greater than 0.5 inches per second due to highway traffic and rail operations?

There are no new highway or railway operations associated with the construction of the proposed project. In addition, the new residences that would be constructed as part of the proposed project would not be in the vicinity of adjacent highways or rail lines that would cause significant vibratory impacts. The nearest highway is U.S. 80 approximately 0.6 miles to the south, and the nearest railroad is approximately 1.4 miles to the west. There would be **No Impact**.

f) Would the project permit historic buildings and archaeological sites to be exposed to vibration-peak-particle velocities greater than 0.2 inches per second due to project construction and highway traffic?

No historic buildings or archaeological sites have been identified within the project area. The majority of buildings in the project vicinity that would be impacted by construction are residential structures, none of which are considered extremely fragile, fragile, or historic buildings. None of the buildings occur within 25 feet of where soil compaction would occur. Therefore, no historic buildings or archaeological sites would be exposed to vibration-peak-particle velocities greater than 0.2 inches per second due to project construction and highway traffic. There would be **No Impact**.

Chapter 11. Aircraft Noise

The proposed project is not located within two miles of a public or private airport or airstrip. The nearest airport is Sacramento McClellan Airport, located approximately 2.3 miles east of the proposed project site. The proposed project would result in **Less than Significant Impacts** to sensitive receptors from public or public use airports or private airstrips.

Chapter 12. References

City of Sacramento, 2035 General Plan. March 3, 2015.

Federal Highway Administration, 2004. FHWA Traffic Noise Model, Version 2.5

Appendix A Traffic Data

This appendix contains tables presenting the traffic data for existing conditions, design-year conditions without the project, and design-year conditions with the project for each alternative.

Table A-1. Existing Average Daily Traffic Volumes

	Segment	Number of Lanes	Total Average Daily Traffic	Auto %	MT %	HT %	Speed (A/MT/HT)
Rio Linda Boulevard	Northbound	1	4,060	98	1	1	45/45/45
Rio Linda Boulevard	Southbound	1	4,060	98	1	1	45/45/45
Grace Avenue	Eastbound	1	320	98	1	1	25/25/25
Grace Avenue	Westbound	1	320	98	1	1	25/25/25

A = Auto, MT = medium truck, HT = heavy truck

Table A-2. Future 2035 No-Project Average Daily Traffic Volumes

	Segment	Number of Lanes	Total Average Daily Traffic	Auto %	MT %	HT %	Speed (A/MT/HT)
Rio Linda Boulevard	Northbound	1	4,850	98	1	1	45/45/45
Rio Linda Boulevard	Southbound	1	4,850	98	1	1	45/45/45
Grace Avenue	Eastbound	1	354	98	1	1	25/25/25
Grace Avenue	Westbound	1	354	98	1	1	25/25/25

A = Auto, MT = medium truck, HT = heavy truck

Table A-3. Future 2035 With Project Average Daily Traffic Volumes

	Segment	Number of Lanes	Total Average Daily Traffic	Auto %	MT %	HT %	Speed (A/MT/HT)
Rio Linda Boulevard	Northbound	1	5,350	98	1	1	45/45/45
Rio Linda Boulevard	Southbound	1	5,350	98	1	1	45/45/45
Grace Avenue	Eastbound	1	484	98	1	1	25/25/25
Grace Avenue	Westbound	1	484	98	1	1	25/25/25
Main Avenue (new extension)	Eastbound	1	320	98	1	1	25/25/25
Main Avenue (new extension)	Westbound	1	320	98	1	1	25/25/25

A = Auto, MT = medium truck, HT = heavy truck

Appendix B Predicted Future Noise Levels

This appendix contains a table that summarizes the traffic noise modeling results for existing and future conditions with and without the project.

Table B-1. Predicted Future Noise

Receiver No.	Location	Predicted Exterior Noise Level for Existing (dBA CNEL)	Predicted Interior Noise Level for Existing (dBA CNEL)	Predicted Exterior Noise Level for No-Build (2035) (dBA CNEL)	Predicted Interior Noise Level for No-Build (2035) (dBA CNEL)	Predicted Exterior Noise Level for Build (2035) (dBA CNEL)	Predicted Interior Noise Level for Build (2035) (dBA CNEL)	Noise Difference Existing to 2035 No-Build (dBA CNEL)	Noise Difference Existing to 2035 Build (dBA CNEL)	Noise Difference 2035 No-Build to 2035 Build (dBA CNEL)
R1	Futures High School	52.2	32.2	52.9	32.9	50.6	30.6	0.7	-1.6	-2.3
R2	4600 Debralee Way	60.5	40.5	**61.3**	41.3	**61.7**	41.7	0.8	1.2	0.4
R3	4610 Debralee Way	61.4	41.4	**62.2**	42.2	**62.6**	42.6	0.8	1.2	0.4
R4	4620 Debralee Way	61.9	41.9	**62.7**	42.7	**63.1**	43.1	0.8	1.2	0.4
R5	4630 Debralee Way	62.2	42.2	**63.0**	43.0	**63.4**	43.4	0.8	1.2	0.4
R6	4640 Debralee Way	62.2	42.2	**63.0**	43.0	**63.4**	43.4	0.8	1.2	0.4
R7	4650 Debralee Way	62.2	42.2	**63.0**	43.0	**63.4**	43.4	0.8	1.2	0.4
R8	4660 Debralee Way	62.3	42.3	**63.1**	43.1	**63.5**	43.5	0.8	1.2	0.4
R9	771 Taylor Morgan Way	58.7	38.7	59.5	39.5	59.9	39.9	0.8	1.2	0.4
R10	4915 Wind Creek Drive	52.5	32.5	53.3	33.3	53.7	33.7	0.8	1.2	0.4
R11	4911 Wind Creek Drive	51.7	31.7	52.5	32.5	52.8	32.8	0.8	1.1	0.3
R12	4907 Wind Creek Drive	50.5	30.5	51.3	31.3	51.4	31.4	0.8	0.9	0.1
R13	4903 Wind Creek Drive	49.5	29.5	50.3	30.3	50.3	30.3	0.8	0.8	0.0
R14	4899 Wind Creek Drive	48.8	28.8	49.6	29.6	49.5	29.5	0.8	0.7	-0.1
R15	4895 Wind Creek Drive	48.1	28.1	48.9	28.9	48.7	28.7	0.8	0.6	-0.2
R16	4891 Wind Creek Drive	47.5	27.5	48.3	28.3	48.0	28.0	0.8	0.5	-0.3
R17	4887 Wind Creek Drive	47.0	27.0	47.7	27.7	47.4	27.4	0.7	0.4	-0.3
R18	4883 Wind Creek Drive	46.5	26.5	47.3	27.3	46.9	26.9	0.8	0.4	-0.4
R19	4879 Wind Creek Drive	46.1	26.1	46.8	26.8	46.3	26.3	0.7	0.2	-0.5
R20	933 Main Avenue	49.4	29.4	50.2	30.2	48.8	28.8	0.8	-0.6	-1.4
R21	935 Main Avenue	46.7	26.7	47.2	27.2	47.5	27.5	0.5	0.8	0.3
R22	1005 Main Avenue	35.6	15.6	36.2	16.2	38.1	18.1	0.6	2.5	1.9
R23	1009 Main Avenue	36.6	16.6	37.2	17.2	38.7	18.7	0.6	2.1	1.5
R24	1013 Main Avenue	44.2	24.2	44.3	24.3	44.5	24.5	0.1	0.3	0.2
R25	1015 Main Avenue	43.7	23.7	44.3	24.3	40.7	20.7	0.6	-3.0	-3.6
R26	4805 Marysville Boulevard	51.3	31.3	51.4	31.4	50.9	30.9	0.1	-0.4	-0.5
R27	Lot 81	-	-	-	-	50.7	30.7	-	-	50.7
R28	Lot 133	-	-	-	-	47.0	27.0	-	-	47.0
R29	Lot 134	-	-	-	-	40.4	20.4	-	-	40.4
R30	Lot 135	-	-	-	-	42.0	22.0	-	-	42.0
R31	Lot 136	-	-	-	-	44.8	24.8	-	-	44.8
R32	Lot 137	-	-	-	-	46.8	26.8	-	-	46.8
R33	Lot 138	-	-	-	-	50.0	30.0	-	-	50.0
R34	Lot 139	-	-	-	-	50.7	30.7	-	-	50.7
R35	Lot 140	-	-	-	-	51.4	31.4	-	-	51.4
R36	Lot 141	-	-	-	-	51.9	31.9	-	-	51.9
R37	Lot 142	-	-	-	-	52.8	32.8	-	-	52.8

Table B-1. Predicted Future Noise

Receiver No.	Location	Predicted Exterior Noise Level for Existing (dBA CNEL)	Predicted Interior Noise Level for Existing (dBA CNEL)	Predicted Exterior Noise Level for No-Build (2035) (dBA CNEL)	Predicted Interior Noise Level for No-Build (2035) (dBA CNEL)	Predicted Exterior Noise Level for Build (2035) (dBA CNEL)	Predicted Interior Noise Level for Build (2035) (dBA CNEL)	Noise Difference Existing to 2035 No-Build (dBA CNEL)	Noise Difference Existing to 2035 Build (dBA CNEL)	Noise Difference 2035 No-Build to 2035 Build (dBA CNEL)
R38	Lot 143	-	-	-	-	54.3	34.3	-	-	54.3
R39	Lot 144	-	-	-	-	55.2	35.2	-	-	55.2
R40	Lot 145	-	-	-	-	56.5	36.5	-	-	56.5
R41	Lot 146	-	-	-	-	57.7	37.7	-	-	57.7
R42	Lot 147	-	-	-	-	58.9	38.9	-	-	58.9
R43	Lot 68	-	-	-	-	42.7	22.7	-	-	42.7
R44	Lot 69	-	-	-	-	40.8	20.8	-	-	40.8
R45	Lot 70	-	-	-	-	40.9	20.9	-	-	40.9
R46	Lot 71	-	-	-	-	41.3	21.3	-	-	41.3
R47	Lot 72	-	-	-	-	42.3	22.3	-	-	42.3
R48	Lot 73	-	-	-	-	41.7	21.7	-	-	41.7
R49	Lot 74	-	-	-	-	42.0	22.0	-	-	42.0
R50	Lot 75	-	-	-	-	42.2	22.2	-	-	42.2
R51	Lot 76	-	-	-	-	42.7	22.7	-	-	42.7
R52	Lot 77	-	-	-	-	41.5	21.5	-	-	41.5
R53	Lot 78	-	-	-	-	43.0	23.0	-	-	43.0
R54	Lot 79	-	-	-	-	42.8	22.8	-	-	42.8
R55	Lot 80	-	-	-	-	47.8	27.8	-	-	47.8
R56	Lot 56	-	-	-	-	56.8	36.8	-	-	56.8
R57	Lot 51	-	-	-	-	43.6	23.6	-	-	43.6
R58	Lot 50	-	-	-	-	43.8	23.8	-	-	43.8
R59	Lot 49	-	-	-	-	43.5	23.5	-	-	43.5
R60	Lot 1	-	-	-	-	50.0	30.0	-	-	50.0
R61	Lot 2	-	-	-	-	47.9	27.9	-	-	47.9
R62	Lot 3	-	-	-	-	46.8	26.8	-	-	46.8
R63	Lot 4	-	-	-	-	46.2	26.2	-	-	46.2
R64	Lot 5	-	-	-	-	45.4	25.4	-	-	45.4
R65	Lot 6	-	-	-	-	44.8	24.8	-	-	44.8
R66	Lot 7	-	-	-	-	44.2	24.2	-	-	44.2
R67	Lot 8	-	-	-	-	43.7	23.7	-	-	43.7
R68	Lot 9	-	-	-	-	47.6	27.6	-	-	47.6

Bold indicates noise levels exceeding City of Sacramento noise threshold
Source: FHWA Traffic Noise Model 2.5

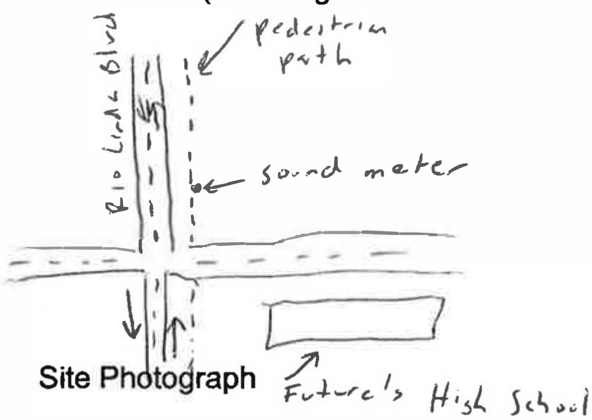
Appendix C Field Data

Supplemental data such as field notes, photographs, and other data from the field investigation should be provided here.

Noise Field Data Sheet

Project Name and Number	2848 / Dry Creek Estates
Receptor Site	Pedestrian Path near NE corner of Rio Linda Blvd
Latitude/Longitude/Description	38° 39' 7.34" N , -121° 26' 50.48" W
Start Date & Time	1/5/21 4:42 pm
End Date & Time	1/5/21 4:47 pm
Relative Humidity (%),Temperature (degrees F), Wind Speed/Direction	87% Humidity 55° F 8 mph NNW
Vehicle Speeds	
Notes	63.7 dBA Data # 8

Site Sketch (including landmarks—building corners, trees, street signs, curbs, fences)



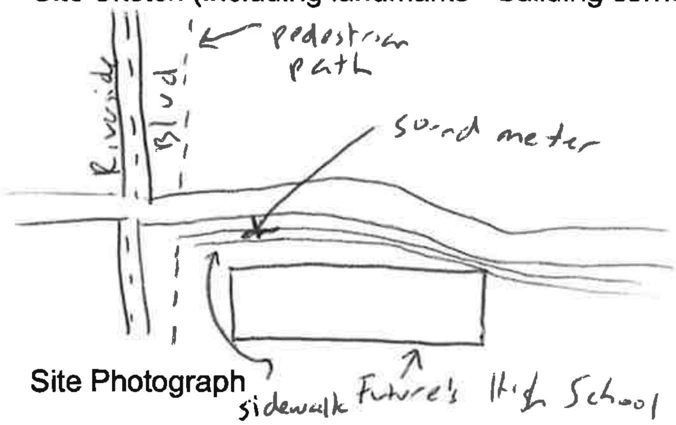
Site Photograph

Equipment	Meter Type:	Larson Davis 824
	Calibrator:	Larson Davis Cal 200
Company meter #		
Staff	Roberto R., Ken C.	

Noise Field Data Sheet

Project Name and Number	2848 / Dry Creek Estates
Receptor Site	Parking lot of Future's High School
Latitude/Longitude/Description	38°39' 5.03" N , -121° 26' 47.86
Start Date & Time	1/5/21 5:01 pm
End Date & Time	1/5/21 5:16 pm
Relative Humidity (%),Temperature (degrees F), Wind Speed/Direction	92% Humidity 53° F 7 mph NNW
Vehicle Speeds	
Notes	55.8 dBA Data # 9

Site Sketch (including landmarks—building corners, trees, street signs, curbs, fences)



Site Photograph

Equipment	Meter Type:	Larson Davis 824
	Calibrator:	Larson Davis Cal 200
Company meter #		
Staff		Roberto R. , Ken C.