Construction Noise Technical Memorandum

E

APPENDIX

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TECHNICAL MEMORANDUM

Date: October 29, 2024

To: EMC Planning Group

From: Kurt Legleiter, Principal

Subject: **Construction Noise Technical Memorandum – Santa Maria River Levee Trail Project**

INTRODUCTION

The County of Santa Barbara (County), in accordance with the California Environmental Quality Act (CEQA), proposes to expand and improve public access to the existing trail and provide an alternative east-west active transportation corridor through the implementation of the proposed Santa Maria River Levee Trail Project (Project). This technical memorandum presents an analysis of construction-related noise and groundborne vibration impacts associated with the proposed Project.

PROPOSED PROJECT

The proposed Project consists of a series of to-be-determined design improvements to an existing 6.7-mile-long segment of the south bank of the Santa Maria River Levee that stretches from the eastern terminus of the Tom Urbanske Multi-Purpose Trail in the City of Santa Maria to the western terminus in the City of Guadalupe at Peralta Street. An alternative connection under consideration at the Guadalupe access point would extend the trail under the railroad crossing connecting to 12th Street near State Route (SR) 1. Figure 1 depicts the Projects' regional location.

The Project will consider a crossing at Bonita School Road and a connection point to a new bridge with bicycle and pedestrian facilities to be constructed across the river, better connecting to nearby cities in southern San Luis Obispo County. It would serve to enhance regional connectivity by providing a safe separate route to the Pacific Coast Highway (SR 1), a popular route used by recreational cyclists traveling throughout California.

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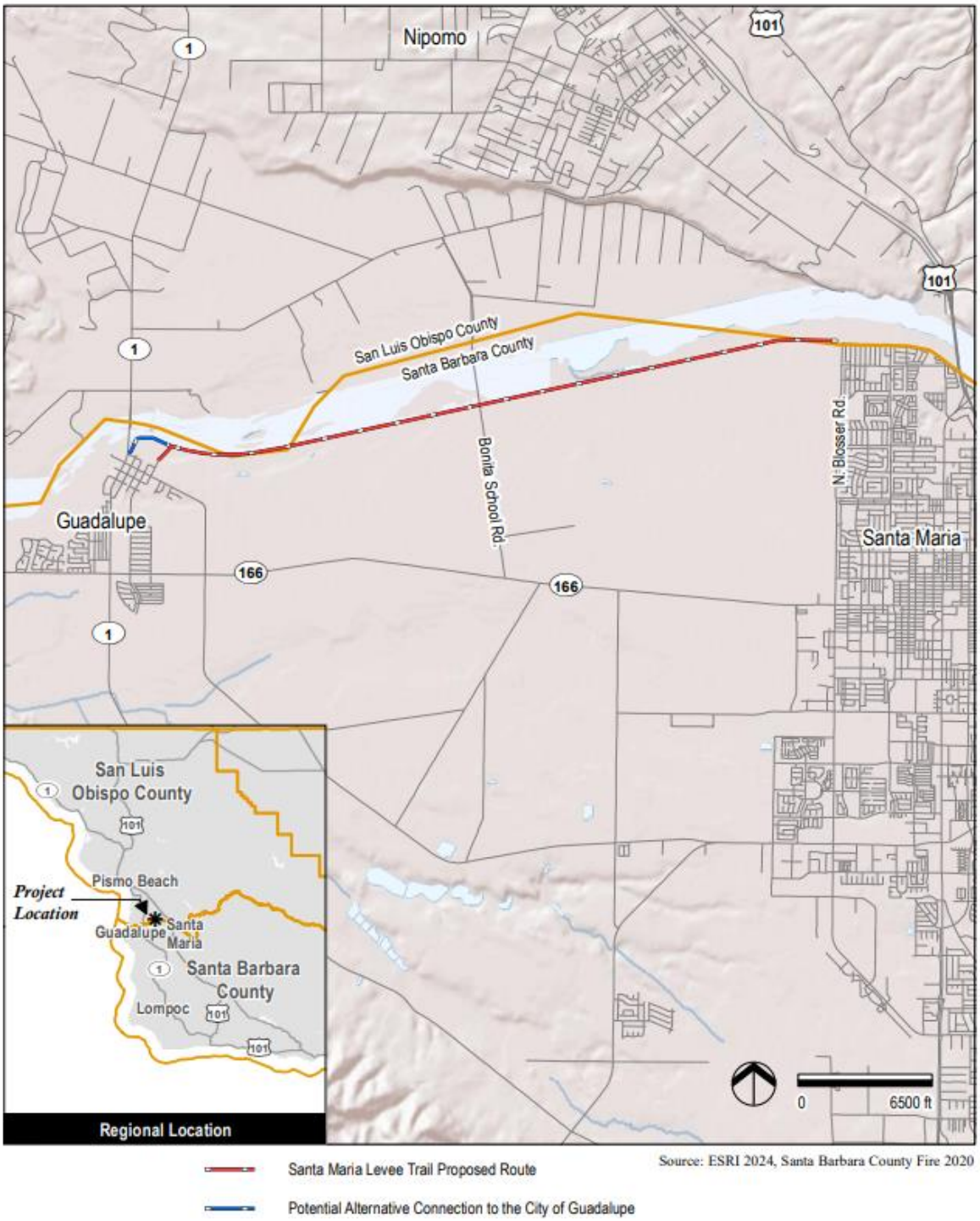
Figure 1. Project Location



REGULATORY FRAMEWORK

Construction Noise

City of Santa Maria General Plan

The City of Santa Maria has established policies in the Noise Element of the General Plan to guide the development of new land uses with respect to noise exposure. The City's Noise element requires the following measures when feasible to manage construction noise (City of Santa Maria 2009):

- Limit the hours of construction activity in residential areas in order to reduce intrusion of noise early in the morning and late evening hours, and on weekends and holidays.
- Control noise at all construction sites through the provision of mufflers and the physical separation of machinery maintenance areas from adjacent residential and noise-sensitive land uses.

City of Santa Maria Municipal Code

The City of Santa Maria Code of Ordinances, Chapter 5-5 (Noise Regulations) includes provisions to prohibit unnecessary, excessive, and annoying noises from all sources. Applicable policies include but are not limited to the following (City of Santa Maria 2024):

Section 5-5.06 Unmeasurable Nuisance Noise

Noises or noise sources which because of the time when they are emitted or their quality, intensity, frequency or uniqueness, are not amenable to measurement as other noise sources described in this chapter, but which nevertheless are offensive or detrimental to the health, safety or welfare of other persons, or which substantially interfere with the reasonable quiet enjoyment of property by other persons, are found and determined to be nuisances. Emitting or causing the emission of such noises is a violation of this chapter. Such sources include but are not necessarily limited to:

- *Noise of construction caused by hand tools, power tools or equipment, when the noise occurs at a time other than:*

  (1) between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday; or

  (2) between the hours of 8:00 a.m. and 5:00 p.m., Saturday through Sunday; or

  (3) allowed by permit issued by the Noise Control Officer.

Section 5-5.09 Residential Zones: Construction-noise Permits

Persons operating equipment or performing any outside construction or repair work on buildings, structures or projects within a residential zone, or within a radius of 500 feet therefrom, shall be required to obtain a permit from the Noise Control Officer only if they exceed the noise standards set forth in Sections 5-5.03 and 5-5.05. This permit would cover short-term or occasional, non-routine operations.

Santa Barbara County Environmental Thresholds and Guidelines Manual

The Santa Barbra County Environmental Thresholds and Guidelines Manual serves to assist the public, applicants, environmental consulting firms, and County decision-makers in understanding the use and

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application of various environmental impact thresholds as they relate to project proposals (County of Santa Barbara 2021). As per the county's guidelines, noise from grading and construction activity proposed within 1,600 feet of noise-sensitive land uses, including schools, residential development, commercial lodging facilities, hospitals, or care facilities, would generally result in a potentially significant impact.

To mitigate this impact the county requires, construction within 1,600 feet of noise-sensitive land uses shall be limited to weekdays between the hours of 8 AM to 5 PM only. Noise attenuation barriers and muffling of grading equipment may also be required. Construction equipment generating noise levels above 95 dB(A) may require additional mitigation.

City of Guadalupe General Plan

The City of Guadalupe's General Plan Noise Element contains goals and policies to control and abate environmental noise and to protect residents from excessive exposure (City of Guadalupe 2022). The Noise Element requires Construction activities at new development sites to be managed to reduce noise generation. Construction contractors shall implement the following construction noise reduction measures, or equivalent measures that achieve the same noise reduction:

- Restrict noise-generating activities at construction sites or in areas adjacent to construction sites to the hours between 7:00 a.m. and 6:00 p.m., Monday through Saturday. Construction shall be prohibited on Sundays and Federal holidays unless prior written approval is granted by the building official.
- Where feasible, construct temporary noise barriers between the noise source and receiver, where feasible.
- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers.
- Prohibit unnecessary engine idling.
- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from receivers as possible. Adequate muffling (with enclosures where feasible and appropriate) shall be used to reduce noise levels.
- Utilize "quiet" air compressors and other stationary noise sources where technology exists.
- Route all construction traffic via designated truck routes where possible. Prohibit construction-related heavy truck traffic in residential areas where feasible.
- Signs shall be posted at the construction site and near adjacent sensitive receptors displaying hours of construction activities and providing the contact phone number of a designated noise disturbance coordinator to whom complaints can be directed and issues resolved.

Construction Vibration

There are no federal, state, or local regulatory standards for construction-generated groundborne vibration. However, Caltrans has developed vibration criteria based on potential structural damage risks and human annoyance. Caltrans-recommended criteria for the evaluation of groundborne vibration levels, with regard to structural damage and human annoyance, are summarized in Table 1. The criteria apply to continuous

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vibration sources, which include vehicle traffic and most construction activities. All damage criteria for buildings are in terms of ground motion at the buildings' foundation. No allowance is included for the amplifying effects of structural components (Caltrans 2020).

Table 1. Summary of Groundborne Vibration Levels and Potential Effects Associated with Typical Construction Activities

Potential Impact	Maximum Groundborne Vibration Level (in/sec ppv)
Structural Damage Risk	
Extremely fragile historic buildings, ruins, ancient monuments	0.08
Fragile buildings	0.1
Historic and some old buildings	0.25
Older residential structures	0.3
New residential structures	0.5
Modern industrial/commercial buildings	0.5
Human Response	
Barely perceptible	0.01
Distinctly perceptible	0.04
Strongly perceptible Level may begin to annoy people in outdoor areas	0.1
Level may begin to annoy people in buildings	0.2
Severe	0.4
Note: The vibration levels are based on peak particle velocity in the vertical direction for continuous vibration sources, which includes most construction activities. *Source: Caltrans 2020*	

EXISTING SETTING

Existing Land Uses

The Project site is surrounded by the Santa Maria River to the north, which forms the boundary of San Luis Obispo and Santa Barbara counties; active agricultural operations and fields to the south; State Route 1 and the City of Guadalupe to the west; and the City of Santa Maria to the east. Figure 2 depicts existing land uses, as well as, city and county limits. The nearest existing noise-sensitive land uses are residential dwellings located adjacent to the Project's western boundary, within the City of Guadalupe, a rural residential dwelling located south of the Project site within Santa Barbara County, and residential dwellings located near the eastern boundary of the Project site in the City of Santa Maria. Nearby noise-sensitive land uses are depicted in Figures 3, 4, and 5.

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Existing Noise Environment

Short-term noise measurements were conducted on July 31, 2024, for the purposes of documenting the ambient noise environment in the Project area. Noise measurements were conducted using a Larson Davis Laboratories LxT Type I sound-level meter. Five noise measurements were conducted along the existing levee trail and proposed extensions. Noise-measurement survey data is summarized in Table 2. Noise measurement locations are depicted in Figures 3, 4, and 5.

Table 2. Summary of Measured Short-Term Ambient Noise Levels

Monitoring Location	Monitoring Date/Period	Monitoring Location	Primary Noise Source	Measured Noise Level (dBA)	
				Average-Hourly (L_{eq})	Instantaneous (L_{max})
STM1	7/31/24 10:05-10:15	Dirt road at the end of the alternative connection, near existing residence in Guadalupe	Traffic	53.7	64.4
STM2	7/31/24 10:23-10:33	East of nearby packaging facility, end of road	Background plant noise, traffic	48.5	73.8
STM3	7/31/24 9:34-9:44	Sidewalk beside nearest residence in Santa Maria, across the street from the existing trail entrance	Background talking, distant tractor, traffic, dog barking	57.4	77.4

Noise measurement surveys were conducted on July 31, 2024, using a Larson Davis Laboratories, Type I, Model LxT integrating sound-level meter positioned at a height of approximately 5 feet above ground level. Refer to Figures 3, 4, and 5 for noise measurement locations.

Based on the measurements conducted, ambient noise levels in the Project area are primarily influenced by vehicular traffic on area roadways. Measured average-hourly daytime noise levels in the project area generally ranged from approximately 49 to 57 dBA L_{eq}. Ambient evening and nighttime noise levels are typically 5 to 10 dBA lower than daytime noise levels.

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Figure 2. Project Site and Surrounding Land Uses

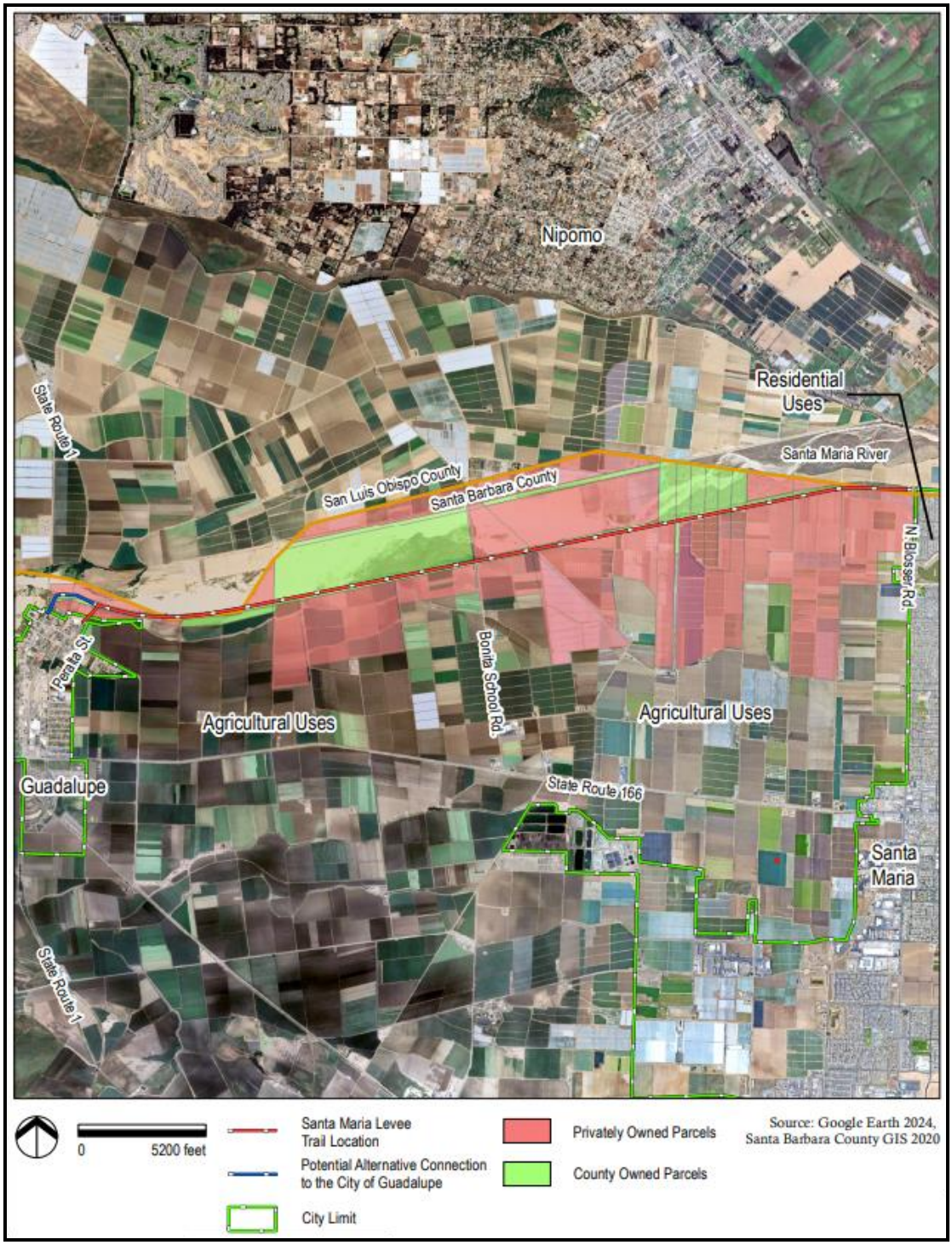

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Figure 3. Noise Monitoring Locations and Nearest Noise-Sensitive Land Uses (1 of 3)

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Figure 4. Noise Monitoring Locations and Nearest Noise-Sensitive Land Uses (2 of 3)

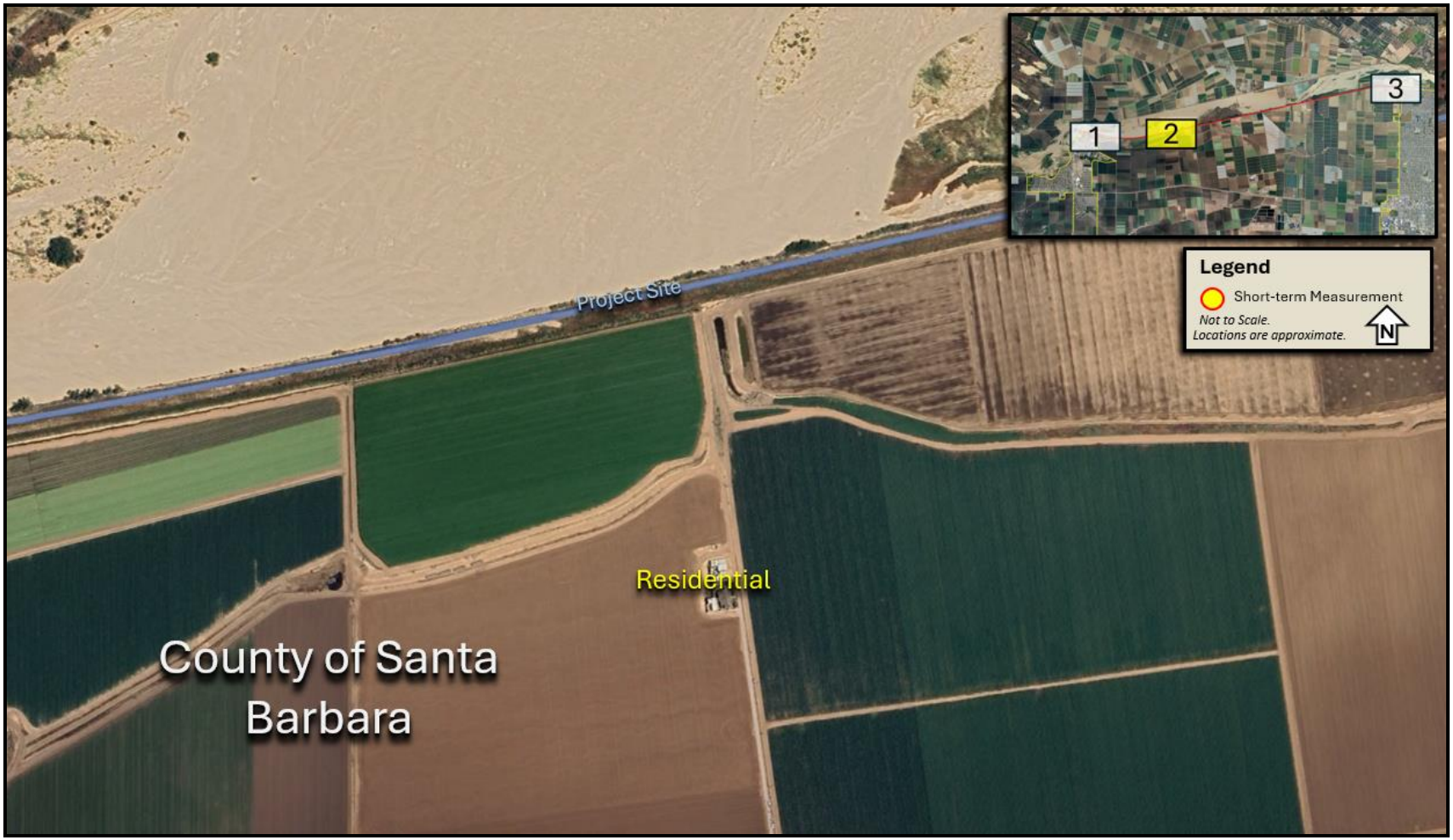

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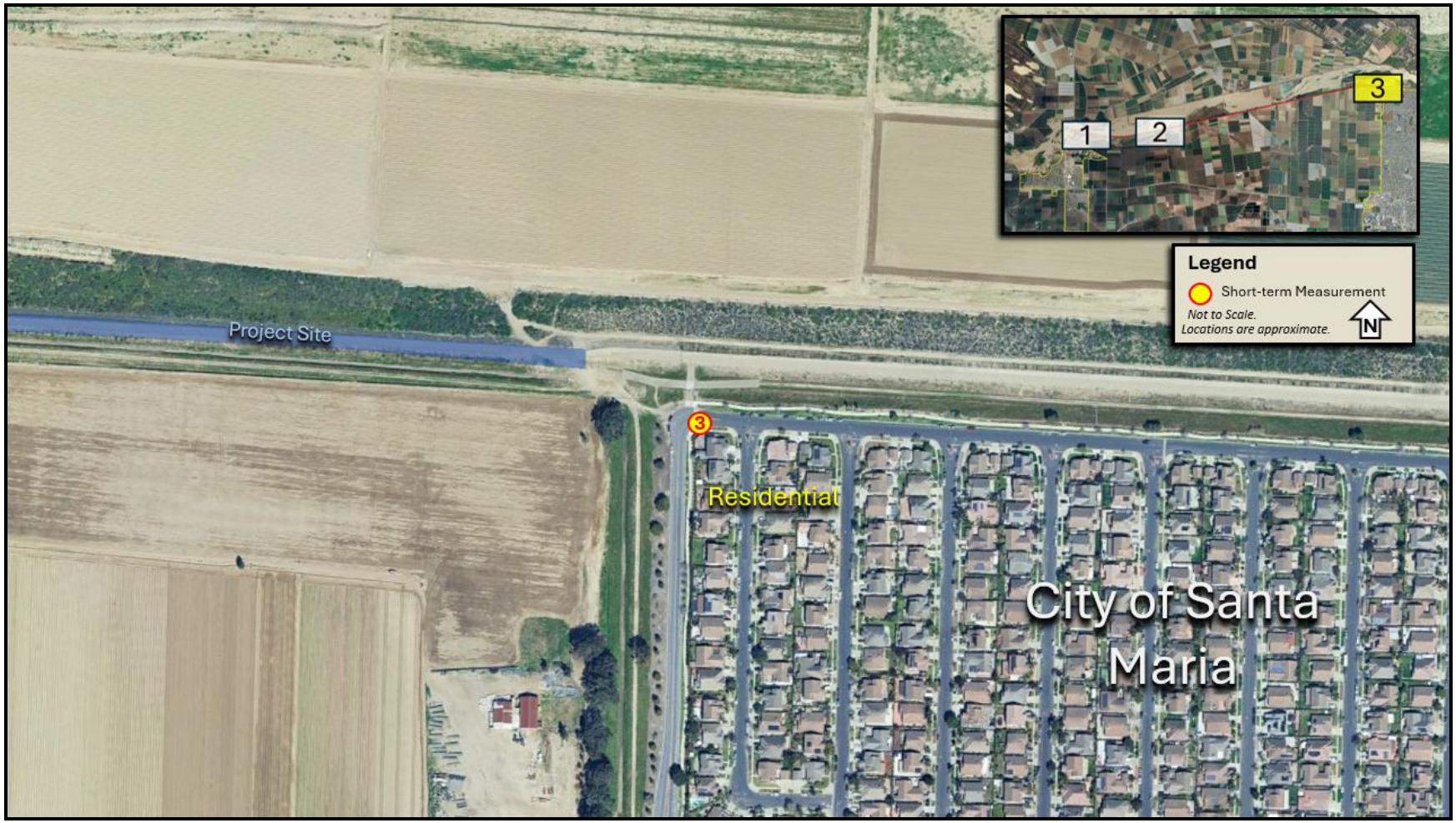
Figure 5. Noise Monitoring Locations and Nearest Noise-Sensitive Land Uses (3 of 3)



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CONSTRUCTION NOISE & GROUNDBORNE VIBRATION IMPACT ANALYSIS

Thresholds of Significance

It is important to note that no standardized criteria have been developed by the State of California, County of Santa Barbara, City of Guadalupe, or City of Santa Maria for assessing construction noise impacts. However, the Federal Transit Administration (FTA) has identified criteria for the assessment of construction-generated noise levels. For noise-sensitive land uses, the FTA detailed analysis construction noise criteria identify daytime and nighttime noise standards of 80 and 70 respectively (FTA 2018). These thresholds are based on an 8-hour average. To be conservative, these daytime and nighttime standards have been applied on an average hourly basis. For the purpose of this analysis, construction-generated noise levels at nearby noise-sensitive land uses that exceed the daytime and nighttime thresholds of 80 and 70 dBA L_{eq} respectively, would be considered to have a potentially significant impact.

Methodology

Construction-generated noise levels were calculated based on typical noise levels associated with construction equipment derived from the Federal Highway Administration (FHWA) Road Construction Noise Model (FHWA 2008) Predicted construction noise levels were calculated assuming the two loudest pieces of equipment operating simultaneously.

Groundborne vibration would be largely associated with the operation of off-road equipment (e.g., vibratory rollers, bulldozers, trucks, and jackhammers). The use of pile drivers is not anticipated to be required for this Project. Groundborne vibration levels were quantified using typical vibration levels associated with the proposed Project derived from the Transportation and Construction Vibration Guidance Manual (Caltrans 2020). Predicted construction vibration levels at nearby structures were calculated based on the most intensive equipment anticipated to be used.

Construction Noise

Noise levels typically associated with construction equipment anticipated to be used during the construction of the proposed Project are summarized in Table 3. As noted in Table 3, average noise levels associated with individual construction equipment typically range from 76 to 80 dBA L_{eq}. Instantaneous noise levels generated by individual pieces of off-road equipment typically range from approximately 80 to 85 dBA L_{max} at 50 feet (FHWA 2008). Typical operating cycles may involve 2 minutes of full power, followed by 3 or 4 minutes at lower settings. Assuming that multiple pieces of equipment could be operating simultaneously, predicted average-hourly noise levels could reach levels of approximately 83 dBA L_{eq} at 50 feet.

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Table 3. Typical Construction Equipment Noise Levels

Equipment	Noise Level (dBA at 50 feet)	
	Instantaneous (L_{max})	Average Hourly (L_{eq})
Flat Bed Truck	84.0	80.0
Dump Truck	84.0	80.0
Front End Loader	80.0	76.0
Backhoe	80.0	76.0
Roller	85.0	78.0

Based on measured instantaneous noise levels (L_{max}), average equipment usage rates, and calculated average-hourly (L_{eq}) noise levels derived from the FHWA Road Construction Noise Model (FHWA 2008).

The proposed Project spans over 6.7 miles and across several jurisdictions, including the City of Guadalupe, the County of Santa Barbara, and the City of Santa Maria. The nearest existing noise-sensitive land uses are residential dwellings located adjacent to the Project's western boundary within the City of Guadalupe, a rural residential dwelling within the County of Santa Barbara, and residential homes located near the eastern boundary in the City of Santa Maria. Nearby noise-sensitive land uses are depicted in Figures 3, 4, and 5. A discussion of predicted construction noise levels associated with the Project at the nearest noise-sensitive land uses located within the City of Guadalupe, County of Santa Barbara, and City of Santa Maria is provided below:

City of Guadalupe

The western terminus of the proposed Project is located within the City of Guadalupe at Peralta Street. At this terminus location, the nearest noise-sensitive receptor is a residential land use located approximately 304 feet from the Project terminus. Based on this distance and assuming a maximum construction noise level of 83 dBA L_{eq} at 50 feet, predicted construction-generated noise levels at this nearest residential land use would be 67 dBA L_{eq} or less. Noise levels at other nearby noise-sensitive land uses would be less.

Implementation of the proposed Project would not result in construction-generated noise levels that would exceed the commonly applied daytime or nighttime noise standard of 80 and 70 dBA L_{eq}. However, with regard to residential dwellings, activities occurring during the more noise-sensitive nighttime hours would be of particular concern given the potential for increased levels of annoyance and sleep disruption to building occupants. As a result, this impact would be considered ***potentially significant.***

<u>12th Street Terminus Alternative</u>

An alternative connection is under consideration for the Guadalupe access point, which would extend the trail under the railroad crossing connecting to 12th Street near State Route (SR) 1. At this location, the nearest noise-sensitive land use is a residential dwelling located approximately 90 feet from the Project terminus. . based on this distance and assuming a maximum construction noise level of 83 dBA L_{eq} at 50 feet predicted noise levels at this nearest residence would be 78 dBA L_{eq} or less. Noise levels at other nearby noise-sensitive land uses would be less.

Implementation of the proposed Project, including the alternative terminus location, would not result in construction-generated noise levels that would exceed the commonly applied daytime noise standard of 80 dBA L_{eq}. However, construction-generated noise levels at the nearest residence would exceed the commonly

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applied nighttime noise standard of 70 dBA L_{eq}. With regard to residential dwellings, activities occurring during the more noise-sensitive nighttime hours would be of particular concern given the potential for increased levels of annoyance and sleep disruption to building occupants. As a result, this impact would be considered ***potentially significant.***

County of Santa Barbara

The central portion of the project site is located within Santa Barbara County. The nearest noise-sensitive receptor within the County is a rural residential dwelling located approximately 825 feet from the proposed areas of construction. Based on this distance and assuming a maximum noise level of 83 dBA L_{eq} at 50 feet, predicted construction-generated noise levels at this nearest residence would be 59 dBA L_{eq} or less. Predicted construction-generated noise levels at other nearby noise-sensitive land uses in Santa Barbara County would be less. Refer to Appendix B for noise prediction modeling assumptions and results.

Implementation of the proposed Project would not result in construction-generated noise levels that would exceed the commonly applied daytime or nighttime noise standard of 80 dBA L_{eq} and 70 dBA L_{eq} at nearby sensitive land uses within the County. However as previously noted, with regard to residential dwellings, activities occurring during the more noise-sensitive nighttime hours would be of particular concern given the potential for increased levels of annoyance and sleep disruption to building occupants. As a result, this impact would be considered ***potentially significant.***

City of Santa Maria

The eastern terminus of the proposed Project would occur within Santa Maria City limits. At this terminus location, the nearest noise-sensitive land use is a residential dwelling located approximately 300 feet from the eastern terminus. Based on this distance and assuming a maximum noise level of 83 dBA L_{eq} at 50 feet, predicted construction-generated noise levels at this nearest residence would be 68 dBA L_{eq} or less. Predicted construction noise levels at other nearby noise-sensitive land uses in the City of Santa Maria would be less. Refer to Appendix B for noise prediction modeling assumptions and results.

Implementation of the proposed Project would not result in construction-generated noise levels that would exceed the commonly applied daytime or nighttime noise standard of 80 dBA L_{eq} and 70 dBA L_{eq}. However as previously noted, with regard to residential dwellings, activities occurring during the more noise-sensitive nighttime hours would be of particular concern given the potential for increased levels of annoyance and sleep disruption to building occupants. As a result, this impact would be considered ***potentially significant.***

Construction Noise Mitigation Measures

The following Mitigation Measures shall be implemented:

- Construction activities shall be restricted to between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday. Construction shall be prohibited on Saturdays, Sundays, and Federal holidays unless prior written approval is granted by the building official.
- Equip all internal combustion engine-driven equipment with intake and exhaust mufflers.

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- Prohibit unnecessary engine idling.
- Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from receivers as possible. Adequate muffling (with enclosures where feasible and appropriate) shall be used to reduce noise levels.
- Utilize "quiet" air compressors and other stationary noise sources where technology exists.
- Route all construction traffic via designated truck routes where possible. Prohibit construction-related heavy truck traffic in residential areas where feasible.
- Signs shall be posted at the construction site displaying hours of construction activities and providing the contact phone number of a designated noise disturbance coordinator to whom complaints can be directed and issues resolved.

Significance after Mitigation

Implementation of the above mitigation measures would limit construction activities to between the hours of 8:00 a.m. to 5:00 p.m., Monday through Friday. Construction would be be prohibited on Saturdays, Sundays, and federal holidays. The use of mufflers would further reduce equipment noise levels by as much as approximately 10 dBA (US EPA 1971). Other noise-reduction measures, such as idling limitations for construction equipment, would further reduce overall construction noise levels. With the implementation of the above construction noise mitigation measures, noise impacts associated with short-term construction activities would not be anticipated to result in a significant impact to occupants of nearby residential dwellings. With mitigation, this impact would be considered ***less than significant.***

Construction Vibration

There are no federal, state, or local regulatory standards for groundborne vibration. However, Caltrans has developed vibration criteria based on potential structural damage risks and human annoyance. Caltrans-recommended criteria for the evaluation of groundborne vibration levels, with regard to structural damage and human annoyance, are summarized in Table 1. The criteria apply to continuous vibration sources, which include vehicle traffic and most construction activities. All damage criteria for buildings are in terms of ground motion at the buildings' foundations. No allowance is included for the amplifying effects of structural components (Caltrans 2020). As shown in Table 1 the criteria for structural damage commonly applied to construction activities is a peak particle velocity (ppv) of 0.25 inches/sec (in/sec) for historic structures, 0.3 in/sec ppv for older residential structures, and 0.5 in/sec ppv for newer structures. Groundborne vibration levels of 0.2 in/sec ppv may result in increased levels of annoyance for people in buildings (Caltrans 2020).

Construction-related groundborne vibration levels associated with the proposed Project would be largely associated with the operation of off-road equipment (e.g., vibratory rollers, bulldozers, trucks, and jackhammers). The use of pile drivers is not anticipated to be required for this Project. Groundborne vibration levels commonly associated with off-road equipment used on roadway projects are summarized in Table 4. As

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indicated, groundborne vibration levels associated with construction equipment generally range from approximately 0.003 to 0.21 in/sec ppv at 25 feet.

Table 4 Representative Vibration Levels for Construction Equipment

Equipment	Peak Particle Velocity at 25 Feet (in/sec)
Vibratory Roller	0.210
Caisson Drilling	0.089
Loaded Trucks	0.076
Jackhammer	0.035
Small Bulldozers	0.003
Source: Caltrans 2020	

No existing fragile or historic structures were identified within the Project area. The nearest existing structure would be located approximately 30 feet, or more, from areas of construction under both Project. Based on this distance and assuming a maximum groundborne vibration level of 0.21 in/sec ppv, vibration levels at the nearest unoccupied structure could reach up to approximately 0.17 in/sec ppv. Predicted vibration levels at this nearest structure would not exceed the recommended criteria for the threshold for human annoyance or potential structural damage of 0.2 and 0.5 in/sec ppv respectively. Predicted vibration levels at other nearby structures would be less and subsequently not exceed applicable thresholds. As a result, this impact would be considered ***less than significant.***

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APPENDIX A
Acoustic Fundamentals

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ACOUSTIC FUNDAMENTALS

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 receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

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.

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.

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.

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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 dB or 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.

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 judgments correlate well with the A-scale sound levels of those sounds. Common A-weighted noise levels are depicted in Figure A-1.

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.

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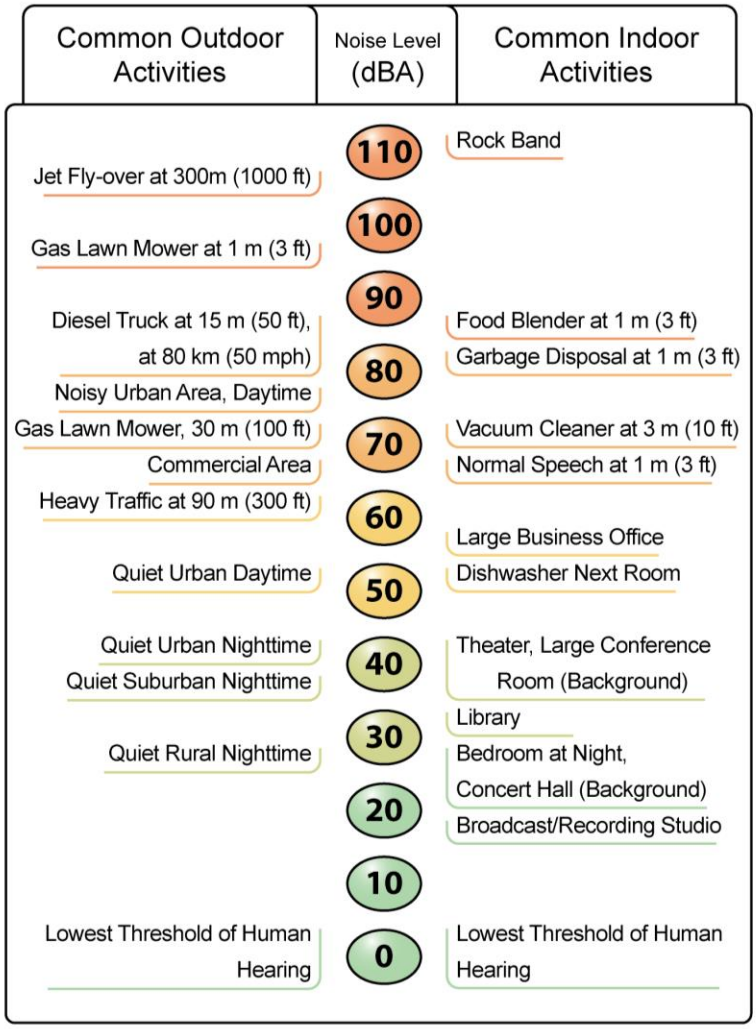
Table A-1. Common A-Weighted Noise Levels



Source: Caltrans 2019

Common Noise Descriptors

Various noise descriptors have been developed to describe time-varying noise levels. The following are the noise descriptors most commonly used for the analysis of construction-generated noise:

- **Equivalent Sound Level (L_{eq}):** L_{eq} represents an average of the sound energy occurring over a specified 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.
- **Maximum Sound Level (L_{max}):** L_{max} is the highest instantaneous sound level measured.

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APPENDIX B
Construction Noise Modeling & Support Documentation

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Predicted Exterior Construction Noise Levels at the Nearest Sensitive Receptors
City of Guadalupe

Receptor ID: 1

Distance: 304 feet

Results

Receptor #1: Guadelupe (Peralta Street Connection)

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
	Equipment	Lmax*	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
	Total	68.3	67.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	Flat Bed Truck	68.3	64.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Dump Truck	68.3	64.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3															
4															
5															

*Total Lmax is the value for the loudest piece of equipment.

Receptor ID: 2

Distance: 90 feet

Results

Receptor #1: Guadelupe (12th Street Connection)

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
	Equipment	Lmax*	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
	Total	78.9	77.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	Flat Bed Truck	78.9	74.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Dump Truck	78.9	74.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3															
4															
5															

*Total Lmax is the value for the loudest piece of equipment.

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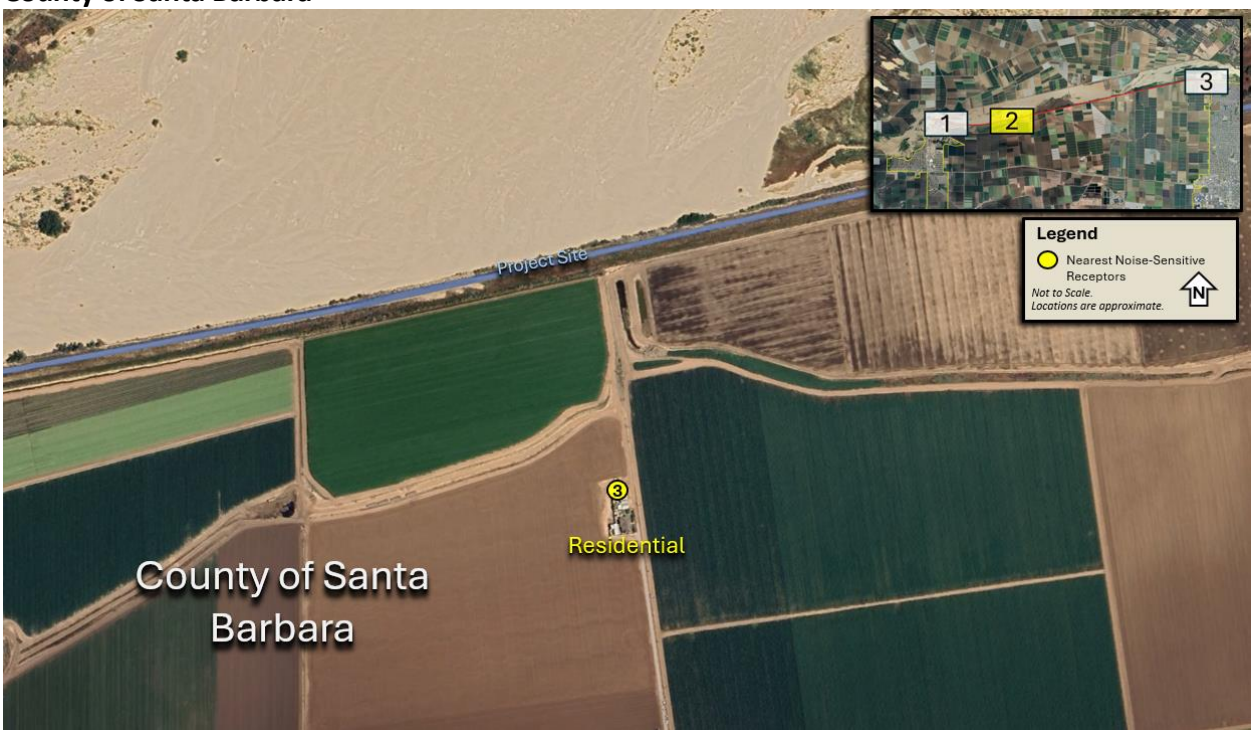
County of Santa Barbara



Receptor ID: 3

Distance: 825 feet

esults

Receptor #1: Santa Barbara County

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
	Equipment	Lmax*	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
	Total	59.7	58.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	Flat Bed Truck	59.7	55.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Dump Truck	59.7	55.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3															
4															
5															

*Total Lmax is the value for the loudest piece of equipment.

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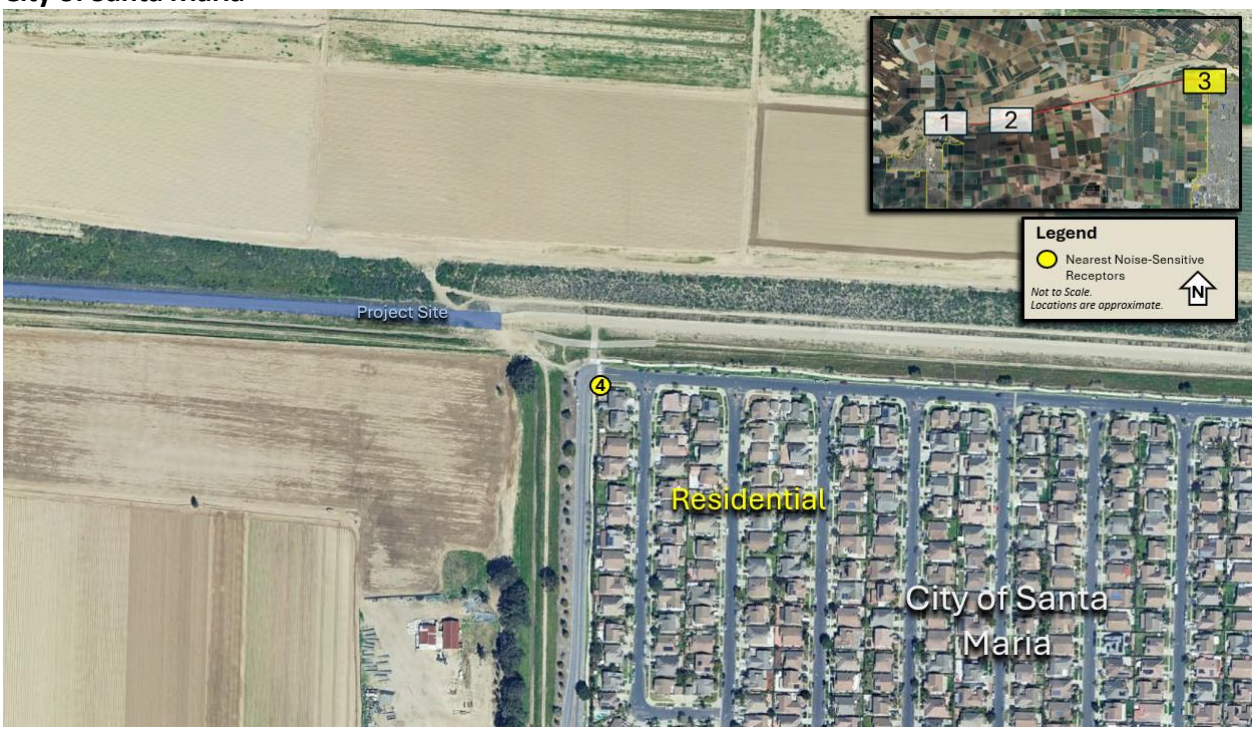
City of Santa Maria



Receptor ID: 4

Distance: 300 feet

Results

Receptor #1: City of Santa Maria

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
	Equipment	Lmax*	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
	Total	68.4	67.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	Flat Bed Truck	68.4	64.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Dump Truck	68.4	64.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3															
4															
5															

*Total Lmax is the value for the loudest piece of equipment.

Predicted Construction Vibration Levell at the Nearest Structure

SOURCE:	Paving
REFERENCE LEVEL:	0.21
ATTENUATION RATE*:	1.3
DISTANCE	30
PREDICTED GROUND-BORNE VIBRATION LEVEL:	0.166

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NOISE MEASUREMENT SURVEY FORM

SHEET 1 OF 1

DATE:	7/31/2024
PROJECT:	SANTA MARIA LEVEE TRAIL
MONITORING STAFF:	KURT LEGLEITER

NOISE MEASUREMENT CONDITIONS & EQUIPMENT

MET CONDITIONS & MONITORING EQUIPMENT:	TEMP: 60 F.	HUMIDITY: 90 %	WIND SPEED: 3 MPH	GROUND: DRY	
	COVER BY CLASS (OC-OVERCAST):	OC	(1. HEAVY OC, 2. LIGHT OC, 3. SUNNY, 4. CLEAR NIGHT, 5. OC NIGHT)		
	MET. METER:	KESTREL 2500			
NOISE MONITORING EQUIPMENT:	LARSON DAVIS SLM MODEL:	LD LXT TYPE 1			
	CALIBRATOR:	REED R8090 Sound Level Calibrator			
NOISE MONITORING SETUP:	WITHIN 10 FT OF REFLECTIVE SURFACE?:	NO	MICROPHONE HEIGHT AGL (FT):	5	
	CALIBRATED PRIOR TO AND UPON COMPLETION OF MEASUREMENTS:	YES	METER SETTINGS:	A-WHT	SLOW

NOISE & TRAFFIC MEASUREMENTS

MEASUREMENT LOCATION	DATE/TIME	DURATION	MEASUREMENT LOCATION	PRIMARY NOISE SOURCES NOTED	LEVELS Leq	LEVELS Lmax	
STM1	7/31/24 10:05am	10	1	Traffic	53.7	64.4	
STM2	7/31/24 10:23am	10	2	Background plant noise, traffic	48.5	73.8	
STM3	7/31/24 9:34am	10	3	People talkingin the distance, distant tractor, traffic, dog barking	57.4	77.4	