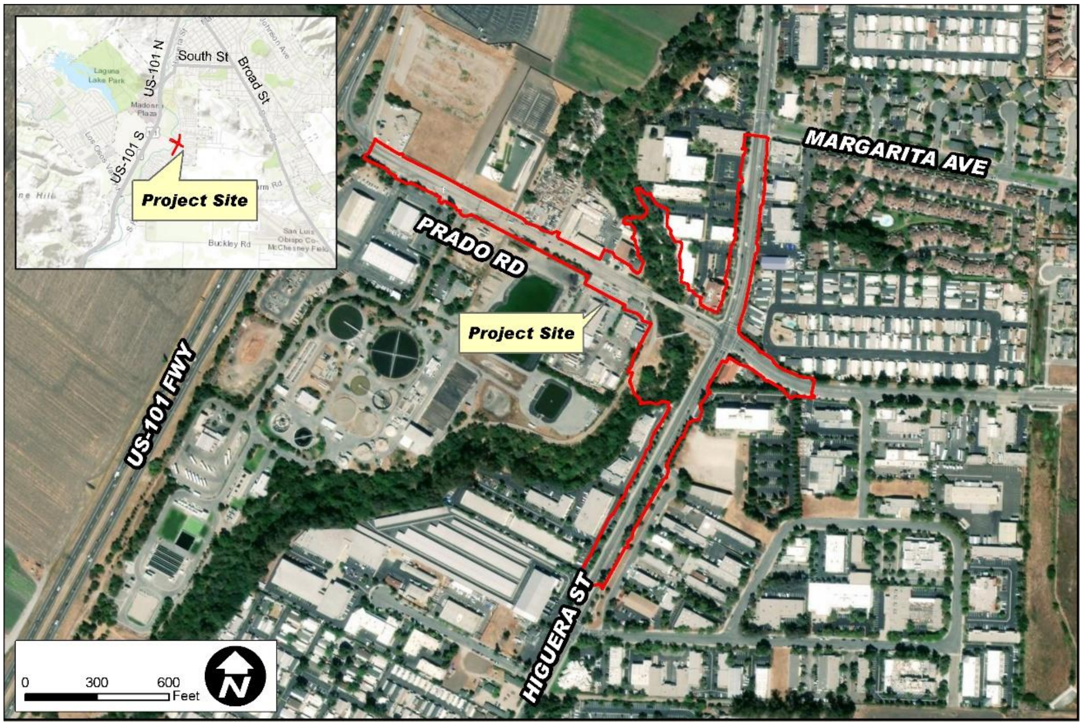

Noise Study Report

Prado Road Bridge Replacement Project

San Luis Obispo County

District 5-0-SLO

BRLS-5016(056)

June 2020

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BRLS-5016(056)

June 16, 2020

Prepared By: ______________________ Date: 07-21-2020

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Summary

This Noise Study Report (NSR) discusses potential noise impacts and related noise abatement measures associated with the construction and operation of the proposed Prado Road Bride Replacement Project (project) in San Luis Obispo County. This report has been prepared to comply with 23 Code of Federal Regulations (CFR) 772, "Procedures for Abatement of Highway Traffic Noise," and California Department of Transportation (Caltrans) noise analysis policy as described in the *Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction, Retrofit Barrier Projects* (Protocol).

The existing Prado Road Bridge over San Luis Obispo Creek has been classified as structurally deficient. The bridge has also previously been deemed functionally obsolete, as the existing two-lane bridge lacks any pedestrian or bicycle facilities and has insufficient width to accommodate existing and future multimodal traffic demands. The City of San Luis Obispo and Caltrans have concurred that bridge replacement is an appropriate action to address these deficiencies. The primary purpose of the proposed project is to replace the structurally deficient bridge, with secondary consideration for addressing the functional obsolescence of this facility. Additional goals of the project are to provide bicycle and pedestrian facilities across the bridge, improve multimodal operations at the Prado Road/South Higuera Street intersection, and improve connectivity to the adjacent Bob Jones Bike Trail, with the option to include a north-south extension of that trail under Prado Road. The need of the project is to provide a structurally adequate bridge, that safely accommodates expected multi-modal traffic.

The City proposes to increase the total bridge width from 26.5 feet to 114 feet through installation of a replacement structure that would widen the existing bridge location on both the north and south ends. Replacing the existing bridge with a new simple span precast concrete I girder bridge (Alternative 3) is the recommended preferred alternative. The project also includes widening to the north and south along Prado Road between the bridge at the Prado Road/South Higuera intersection to conform with the replacement bridge section and widening along the west side of South Higuera at the Prado Road/South Higuera intersection to accommodate a second northbound-to-westbound left-turn lane and improve bicycle/pedestrian facilities.

The project area consists of residential uses, commercial properties, industrial uses, open space, several music schools, and civic uses. The surrounding area is primarily flat. Noise monitoring was conducted to describe and document existing conditions within the project area. Single- and multi-family residences were identified as Activity Category B

land uses. Parks were identified as Activity Category C land uses. The music schools were identified as Activity Category D land uses. Commercial, retail, and civic uses were categorized as Activity Category E and Industrial uses were categorized as Activity Category F.

Short-term (15-minute) noise measurements were completed near the proposed improvements. Short-term monitoring was performed at 5 locations in two sets and results ranged from 57.1A-weighted equivalent sound level over one-hour (dBA) L_{eq}(h) to 70.9 dBA L_{eq}(h).

The Federal Highway Administration (FHWA) Traffic Noise Prediction Model Version 2.5 was used in this analysis to evaluate existing conditions, design-year (2035) without project conditions, design-year (2035) with project conditions. Modeling results indicate that predicted traffic noise levels under opening-year and design-year conditions would approach or exceed the noise abatement criterion (NAC) of 67 dBA-L_{eq}(h) for Activity Category B land uses. Predicted noise levels in design-year (2035) conditions would range from 48 to 72 dBA-L_{eq}(h).

In accordance with Caltrans Protocol, noise abatement was not considered at Activity Category E land uses because the commercial and office land uses identified in the project area do not include areas of frequent outdoor human use. Similarly, noise abatement was also not considered at Activity Category F uses.

Noise barriers were evaluated for areas where noise impacts were identified. Areas A and G were the only areas evaluated for a noise barrier (see Figure 7-1 for areas and noise barrier locations). Additional considerations include the ability of a given barrier and height to meet the design goal of 7 decibels (dB) and if the barrier breaks the line-of-sight between a 11.5-foot truck stack and the first row of receptors. The line-of-sight break is important to reduce visual and noise intrusiveness of truck exhaust stacks at first row receivers.

Noise Barrier NB-1 was found to be feasible starting at a barrier height of 8-feet. The design goal of 7 dB for was not met for any barrier height. A 12-foot noise barrier would break the line-of-sight between a 11.5-foot truck stack and first row receptors. The total reasonable allowance for an 8-foot barrier would be $107,000, which would benefit one receptor. Noise Barrier NB-2 was found to be feasible and meet the design goal of 7 dB for Area G for all barrier heights. A 12-foot noise barrier would break the line-of-sight between a 11.5-foot truck stack and first row receptors. The total reasonable allowance for a 12-foot barrier would be $1.2 Million, which would benefit 12 receptors. A 6-foot barrier would benefit nine receptors and all four impacted receivers (7 impacted receptors) would be reduced below the exterior NAC of 67 dBA-L_{eq}(h). The total reasonable allowance for a 6-foot barrier would be $963,000.

Construction equipment that is anticipated to be used would include equipment typical to roadway construction such as backhoes and pavers. Construction equipment noise levels are anticipated to range between 66.7 dBA L_{eq} and 81.9 dBA L_{eq} at 50 feet. The worst-case combined construction noise level would likely occur during the grading and site preparation phases, which would generate a combined noise level of 89 dBA L_{eq} at 50 feet (USEPA, 1971). Construction noise at off-site receptor locations would be dependent on the loudest piece of equipment operating.

The City of San Luis Obispo includes exterior noise standards for residential and business properties where technically economical and feasible. The ordinance also requires that all mobile or stationary internal combustion engine powered equipment or machinery be equipped with suitable exhaust and air intake silencers in proper working order. No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans Standard Specifications Section 14.8-02. Construction noise would be short-term, intermittent, and overshadowed by local traffic noise.

Table of Contents

List of Figures

List of Tables

List of Abbreviated Terms

Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibels
dBA	A-Weighted 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
LT	LongTerm
L_{xx}	Percentile-Exceeded Sound Level
mPa	Micro-Pascals
mph	Miles Per Hour
NAC	Noise Abatement Criteria
NADR	Noise Abatement Decision Report
NEPA	National Environmental Policy Act
NSR	Noise Study Report
Project	Prado Road Bridge Widening Project
Protocol	Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects
SPL	Sound Pressure Level
ST	Short-Term
TeNS	Caltrans' Technical Noise Supplement
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 NSR is to evaluate noise impacts and abatement under the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "Procedures for Abatement of Highway Traffic Noise." 23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and Federal-aid highway projects. According to 23 CFR 772.3, all highway projects that are developed in conformance with this regulation are deemed to be in conformance with Federal Highway Administration (FHWA) noise standards. Compliance with 23 CFR 772 provides compliance with the noise impact assessment requirements of the National Environmental Policy Act (NEPA).

The Caltrans Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects (Protocol) (Caltrans 2011) provides Caltrans policy for implementing 23 CFR 772 in California. The Protocol outlines the requirements for preparing noise study reports (NSR). Noise impacts associated with this project under the California Environmental Quality Act (CEQA) are evaluated separately in the project's environmental document.

1.1. Project Purpose and Need

The existing Prado Road Bridge over San Luis Obispo Creek has been classified as structurally deficient. The bridge has also previously been deemed functionally obsolete, as the existing two-lane bridge lacks any pedestrian or bicycle facilities and has insufficient width to accommodate existing and future multimodal traffic demands. The City and Caltrans have concurred that bridge replacement is an appropriate action to address these deficiencies. The primary purpose of the proposed project is to replace the structurally deficient bridge, with secondary consideration for addressing the functional obsolescence of this facility. Additional goals of the project are to provide bicycle and pedestrian facilities across the bridge, improve multimodal operations at the Prado Road/South Higuera Street intersection, and improve connectivity to the adjacent Bob Jones Bike Trail, with the option to include a north-south extension of that trail under Prado Road. The need of the project is to provide a structurally adequate bridge, that safely accommodates expected multi-modal traffic.

Chapter 2. Project Description

2.1. No-Build

Under the No-Build Alternative, no changes would be made to Prado Road or Higuera Street in the project area.

2.2. Build Alternative—Bridge Replacement

The City proposes to increase the total bridge width from 26.5 feet to 114 feet through installation of a replacement structure that would widen the existing bridge location on both the north and south ends. Replacing the existing bridge with a new simple span precast concrete I girder bridge (Alternative 3) is the recommended preferred alternative. The project also includes widening to the north and south along Prado Road between the bridge at the Prado Road/South Higuera intersection to conform with the replacement bridge section and widening along the west side of South Higuera at the Prado Road/South Higuera intersection to accommodate a second northbound-to-westbound left-turn lane and improve bicycle/pedestrian facilities.

Chapter 3. Fundamentals of Traffic Noise

The following is a brief discussion of fundamental traffic noise concepts. For a detailed discussion, please refer to Caltrans' Technical Noise Supplement (TeNS) (Caltrans 2013), a technical supplement to the Protocol that is available on Caltrans Web site (http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf).

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 judgments 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 3-1 describes typical A-weighted noise levels for various noise sources.

Table 3-1. 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. Federal Regulations and State Policies

This report focuses on the requirements of 23 CFR 772, as discussed below.

4.1. Federal Regulations

4.1.1. 23 CFR 772

23 CFR 772 provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and Federal-aid highway projects. Under 23 CFR 772.7, projects are categorized as Type I, Type II, or Type III projects.

- FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment of the highway. The following projects are also considered to be Type I projects:

- The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a high-occupancy vehicle (HOV) lane, high-occupancy toll (HOT) lane, bus lane, or truck climbing lane,

- The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane,

- The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange,

- Restriping existing pavement for the purpose of adding a through traffic lane or an auxiliary lane,

- The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza.

If a project is determined to be a Type I project under this definition, the entire project area as defined in the environmental document is a Type I project.

A Type II project is a noise barrier retrofit project that involves no changes to highway capacity or alignment. A Type III project is a project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Under 23 CFR 772.11, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR 772 requires that the project sponsor “consider” noise abatement before adoption of the final NEPA document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the predicted noise level in the design-year approaches or exceeds the NAC specified in 23 CFR 772, or a predicted noise level substantially exceeds the existing noise level (a “substantial” noise increase). 23 CFR 772 does not specifically define the terms “substantial increase” or “approach”; these criteria are defined in the Protocol, as described below.

Table 4-1 summarizes NAC corresponding to various land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual or permitted land use in a given area.

4.1.2. Traffic Noise Analysis Protocol for New Highway Construction and Reconstruction Projects

The Protocol specifies the policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or Federal-aid highway projects. The Protocol defines a noise increase as substantial when the predicted noise levels with project implementation exceed existing noise levels by 12 dBA or more. The Protocol also states that a sound level is considered to approach an NAC level when the sound level is within 1 dB of the NAC identified in 23 CFR 772 (e.g., 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA is not).

The Technical Noise Supplement to the Protocol provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

Table 4-1. Activity Categories and Noise Abatement Criteria (23 CFR 772)

Activity Category	Activity $L_{eq}[h]$[1]	Evaluation Location	Description of Activities
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential.
C[2]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F.
F			Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G			Undeveloped lands that are not permitted.

[1] The $L_{eq}(h)$ activity criteria values are for impact determination only and are not design standards for noise abatement measures. All values are A-weighted decibels (dBA).

[2] Includes undeveloped lands permitted for this activity category.

4.2. State Regulations and Policies

4.2.1. California Environmental Quality Act (CEQA)

Noise analysis under the California Environmental Quality Act (CEQA) may be required regardless of whether or not the project is a Type I project. The CEQA noise analysis is completely independent of the 23 CFR 772 analysis done for NEPA. 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 (or noise technical memorandum) 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.

4.2.2. 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 this code, 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. This requirement does not replace the “approach or exceed” NAC criterion for FHWA Activity Category E for classroom interiors, but it is a requirement that must be addressed in addition to the requirements of 23 CFR 772.

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). 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.

Chapter 5. Study Methods and Procedures

5.1. 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. Existing land uses in the project area were categorized by land use type and Activity Category as defined in Table 4-1, and the extent of frequent human use. As stated in the Protocol, noise abatement is only considered where frequent human use occurs and where a lowered noise level would be of benefit. 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 and common use areas at multi-family residences. The geometry of the project relative to nearby existing and planned land uses was also identified.

Short-term measurement locations were selected to represent each major developed area within the project area. Short-term measurement locations were selected to serve as representative modeling locations. Several other non-measurement locations were selected as modeling locations.

5.2. Field Measurement Procedures

A field noise study was conducted in accordance with recommended procedures in TeNS. The following is a summary of the procedures used to collect short-term and long term sound level data.

5.2.1. Short-Term Measurements

Short-term monitoring was conducted at five locations on Monday May 4, 2015 using a Quest Soundpro SE/DL Type 2 sound level meter (serial number BGS100001). The calibration of the meter was checked before and after the measurement using a Quest Model AC-300 calibrator (serial number AC300011274). Measurements were taken over a 15-minute period at each site. Short-term monitoring was conducted for each analysis area. The short-term measurement locations are identified in Figure 5-1.

During the short-term measurements, field staff attended each meter. Minute-to-minute L_{eq} values collected during the measurement period (typically 15 minutes in duration) were logged manually, and dominant noise sources observed were also identified and logged. Two sets of noise measurements were taken at each site for a total of 10 noise measurements at five sites.

Temperature, wind speed, and humidity were recorded manually during the short-term monitoring session using weather information provided by weather.com. During the short-term measurements, wind speeds typically ranged from 1 to 8 miles per hour (mph). Temperatures ranged from (54–62°F), with relative humidity typically 60–70%. Traffic 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. The posted speed on Prado Road and Higuera Street was 35 mph.

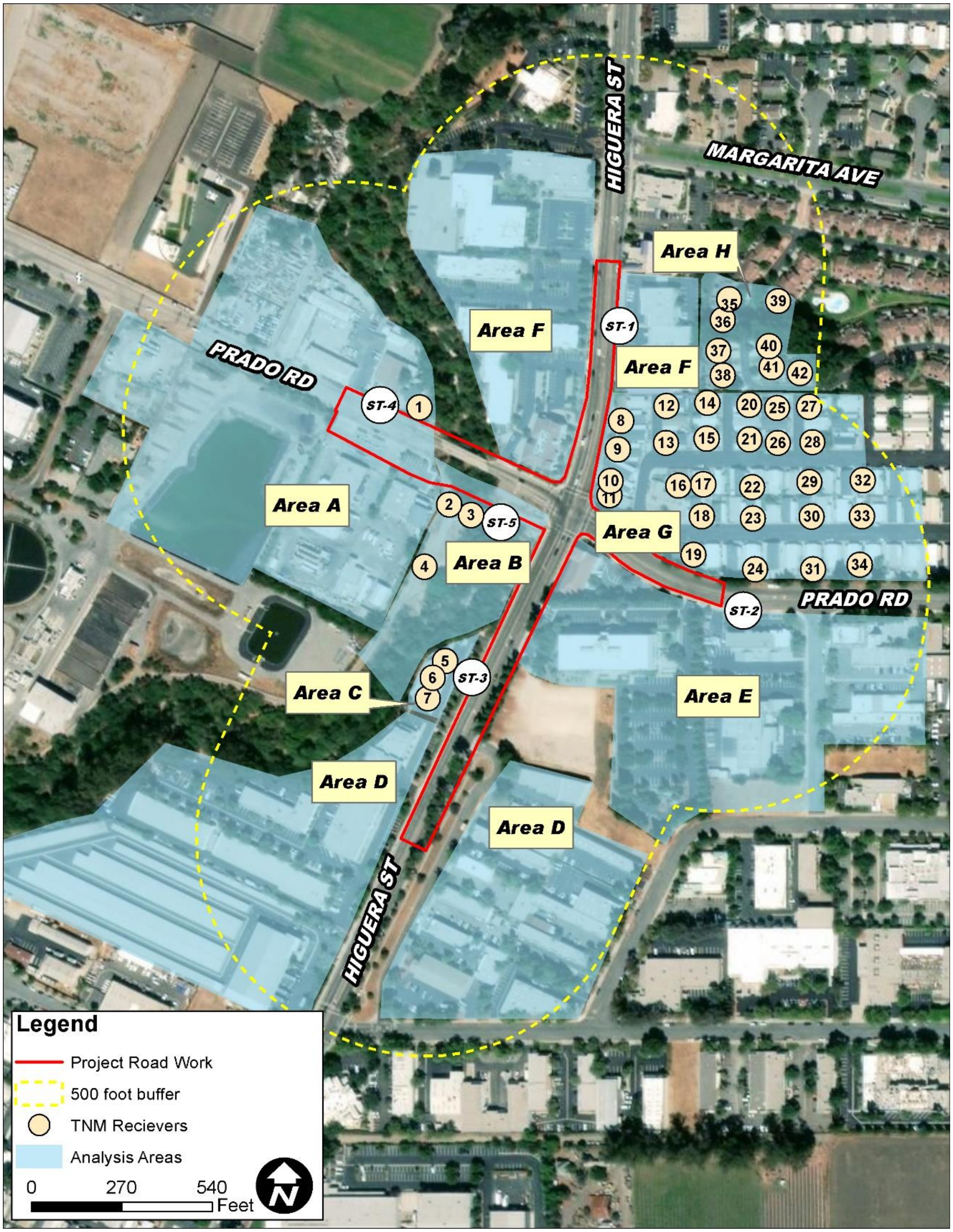
5.3. Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model Version 2.5 (TNM 2.5). TNM 2.5 is a computer model based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a, 1998b). 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 CAD drawings and aerials.

Traffic noise was evaluated under existing conditions, design-year no-project conditions, and design-year conditions with the project alternative. Loudest-hour traffic volumes, vehicle classification percentages, and traffic speeds under existing and design-year (2035) conditions were provided by Central Coast Transportation Consulting for input into the traffic noise model. The highest traffic volume under the AM and PM peak hour was selected for each roadway segment and was utilized in the 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 alternative.

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. Measured ambient noise levels were used to compare with modeled noise levels during the peak hour. Modeled and measured sound levels were compared to determine the accuracy of the model and if additional adjustment of the model was necessary.

Figure 5-1. Analysis Areas, Noise Monitoring Positions, and Modeled Receivers



Source: TAHA, 2020

5.4. Methods for Identifying Traffic Noise Impacts and Consideration of Abatement

Traffic noise impacts are considered to occur at receptor locations where predicted design-year noise levels are 12 dB or more greater than existing noise levels, or where predicted design-year noise levels approach or exceed the NAC for the applicable activity category. Where traffic noise impacts are identified, noise abatement must be considered for reasonableness and feasibility as required by 23 CFR 772 and the Protocol.

According to the Protocol, abatement measures are considered acoustically feasible if a minimum noise reduction of 5 dB at impacted receptor locations is predicted with implementation of the abatement measures. In addition, barriers should be designed to intercept the line-of-sight from the exhaust stack of a truck to the first tier of receptors, as required by the Highway Design Manual, Chapter 1100. Other factors that affect feasibility include topography, access requirements for driveways and ramps, presence of local cross streets, utility conflicts, other noise sources in the area, and safety considerations.

The overall reasonableness of noise abatement is determined by the following three factors:

- The noise reduction design goal.
- The cost of noise abatement.
- The viewpoints of benefited receptors (including property owners and residents of the benefited receptors).

The Caltrans' acoustical design goal is that a barrier must be predicted to provide at least 7 dB of noise reduction at one benefited receptor. This design goal applies to any receptor and is not limited to impacted receptors.

The Protocol defines the procedure for assessing reasonableness of noise barriers from a cost perspective. Based on 2019 construction costs an allowance of $107,000 is provided for each benefited receptor (i.e., receptors that receive at least 5 dB of noise reduction from a noise barrier). The total allowance for each barrier is calculated by multiplying the number of benefited receptors by $107,000. If the estimated construction cost of a barrier is less than the total calculated allowance for the barrier, the barrier is considered reasonable from a cost perspective. The viewpoints of benefits receptors are determined by a survey that is typically conducted after completion of the noise study report. The process for conducting the survey is described in detail in the Protocol.

The noise study report identifies traffic noise impacts and evaluates noise abatement for acoustical feasibility. It also reports information that will be used in the reasonableness analysis including if the 7 dB design goal reduction in noise can be achieved and the abatement allowances. The noise study report does not make any conclusions regarding reasonableness. The feasibility and reasonableness of noise abatement is reported in the Noise Abatement Decision Report.

Chapter 6. Existing Noise Environment

6.1. 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 following land uses were identified in the project area:

- Single-family residences and multi-family residences: Activity Category B
- Music Motive and teVelde Conservatory of Music: Activity Category D (interior)
- Bob Jones Trail: Activity Category C (exterior)
- Commercial, retail, and civic uses: Activity Category E
- Industrial uses: Activity Category F

Although all developed land uses are evaluated in this analysis, noise abatement is only considered for areas 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 and common use areas at multi-family residences.

Land uses in the project area have been grouped into a series of lettered analysis areas that are identified in Figure 5-1. Each of these analysis areas is considered to be acoustically equivalent.

- **Area A:** Area A is located on the west side of the Prado Road Bridge. Industrial uses (Activity Category F) and one residential building (Activity Category B) are located in this area. This area is generally flat. As stated in TeNs, Activity Category F uses need not be considered for further analysis.(Refer to Figure 5-1)

- **Area B:** Area B is located on the south side of Prado Road Bridge west of Higuera Street. The Bob Jones Trail and Bob Jones Bike Trail (Activity Category C) are located in this area. The trail and bike trial are generally level with Prado Road. The area steeply slopes from the trail down into the San Luis Obispo Creek channel. No sound barriers or topographical shielding occur between the roadway and the outdoor uses. (Refer to Figure 5-1)

- **Area C:** Area C is located south of Prado Road west of Higuera Street. Music Motive and teVelde Conservatory of Music (Activity Category D) are located in this area. No outdoor uses have been identified, so Area C has been classified solely as Activity Category D. A dense tree zone is located between Prado Road and this area. (Refer to Figure 5-1)

- **Area D:** Area D is located south of Prado Road and south of Area C. Commercial and retail uses (Activity Category E) are located in this area. No sound barrier or topographical shielding occurs between the roadways and this area. All of the outdoor uses areas are parking lots. Therefore, no exterior areas of frequent human use occur in this area and Area D is not considered for further analysis. (Refer to Figure 5-1)

- **Area E:** Area E is located south of Prado road. Commercial and civic uses (Activity Category E) are located in this area. No sound barrier or topographical shielding occurs between the roadways and this area. All of the outdoor uses areas are parking lots. Therefore, no exterior areas of frequent human use occur in this area and Area E is not considered for further analysis. (Refer to Figure 5-1)

- **Area F:** Area F is located north of Prado road. Commercial, civic, and retail uses (Activity Category E) are located in this area. No sound barrier or topographical shielding occurs between the roadways and this area. All of the outdoor uses areas are parking lots. Therefore, no exterior areas of frequent human use occur in this area and Area F is not considered for further analysis. (Refer to Figure 5-1)

- **Area G:** Area G is located north of Prado road east of Higuera Street. Residential uses (Activity Category B) are located in this area. No sound barrier or topographical shielding occurs between the roadways and this area. (Refer to Figure 5-1)

- **Area H:** Area H is located north of Prado road east of Higuera Street. Residential uses (Activity Category B) are located in this area. No sound barrier or topographical shielding occurs between the roadways and this area. (Refer to Figure 5-1)

6.2. Noise Measurement Results

The existing noise environment in the project area is characterized below based on short-noise monitoring that was conducted.

6.2.1. Short-Term Monitoring

Table 6-1 summarizes the results of the short-term noise monitoring conducted in the project area.

Table 6-1. Summary of Short-Term Measurements

Position	Address	Area	Land Uses	Start Time	Duration (minutes)	Measured L_{eq}	Observed Speed (mph)
ST-1	3281 South Higuera St.	F/G/H	Residential/ Commercial /Industrial	9:24 a.m.	15	68.5	35
				10:50 a.m.	15	68.3	35
ST-2	183 Prado Rd.	E/G	Residential/ Commercial	7:51 a.m.	15	62.6	40
				8:41 a.m.	15	60.5	40
ST-3	3440 South Higuera St.	C/D	Music School	8:47 a.m.	15	70.9	35
				10:00 a.m.	15	70.6	35
ST-4	70 Prado Rd.	A	Industrial	9:09 a.m.	15	67.8	40
				10:32 a.m.	15	64.6	40
ST-5	Bob Jones Trail Bridge	B	Bob Jones Trail	8:30 a.m.	15	57.1	-
				10:19 a.m.	15	57.1	-

Note: Refer to Figure 5-1 for measurement locations and boundaries of each area.
Source: TAHA, 2020

TNM 2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations. Table 6-2 compares measured and modeled noise levels at each measurement location (see Figure 5-1). The predicted sound levels for measurement positions ST-1, ST-2, ST-3, and ST-4 are within 3 dB of the measured sound levels and are, therefore, considered to be in reasonable agreement with the measured sound levels. Receivers represented by ST-5 were calibrated using the values below in Table 6-2 and calibrated noise levels are shown in Table 6-3. The calibration process involves adjusting the predicted noise level calculated by TNM for receivers represented by a measurement position that has not been validated by the model. The calibration constant is added or subtracted from the predicted noise level to account for variations in noise levels in the real world that are not reflected by noise levels solely calculated from traffic data.

Table B-1 in Appendix B presents existing noise levels at each receptor

6.2.2. Long-Term Monitoring

A long-term monitoring location was not identified.

Table 6-2. Comparison of Measured to Predicted Sound Levels in the TNM Model

Measurement Position	Measured Sound Level (dBA)	Predicted Sound Level (dBA)	Measured minus Predicted -Calibration Constant (dB)
ST-1	68.5	70.8	- 2.3
ST-2	62.6	65.6	- 3.0
ST-3	70.9	71.4	- 0.5
ST-4	67.8	67.7	-0.1
ST-5	57.1	62.8	- 5.7

Source: TAHA, 2020

Table 6-3. Model Calibration

Receiver	Representative Short-Term Monitoring Location	Calculated Noise Level	Calibration Constant	Calibrated Noise Level
Existing				
2	ST-5	61.9	-5.7	56.2
3	ST-5	63.2	-5.7	57.5
4	ST-5	60.5	-5.7	54.8
Design Year without Project				
2	ST-5	64.7	-5.7	59.0
3	ST-5	65.8	-5.7	60.1
4	ST-5	62.5	-5.7	56.8
Design Year with Project				
2	ST-5	66.4	-5.7	60.7
3	ST-5	67.1	-5.7	61.4
4	ST-5	63.1	-5.7	57.4

Source: TAHA, 2020

Chapter 7. Future Noise Environment, Impacts, and Considered Abatement

7.1. Future Noise Environment and Impacts

Table B-1 in Appendix B summarizes the traffic noise modeling results for existing conditions and design-year conditions with and without the project. Predicted design-year traffic noise levels with the project are compared to existing conditions and to design-year no-project conditions. The comparison to existing conditions is included in the analysis to identify traffic noise impacts as defined under 23 CFR 772. The comparison to no-project conditions indicates the direct effect of the project.

As stated in the TeNS, modeling results are rounded to the nearest decibel before comparisons are made. In some cases, this can result in relative changes that may not appear intuitive. An example would be a comparison between calculated sound levels of 64.4 and 64.5 dBA. The difference between these two values is 0.1 dB. However, after rounding, the difference is reported as 1 dB.

Traffic noise impacts and proposed noise barriers are shown in Figure 7-1. Areas D, E, and F were not modeled as no sensitive uses were identified. Modeling results in Table B-1 indicate the following:

Area A

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at the residence in Area A are predicted to be in the range of 67 dBA L_{eq}(h) in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is predicted to be 3 dB. Because the predicted noise level in the design-year exceeds 67 dBA L_{eq} (h), traffic noise impacts are predicted at residences in this area, and noise abatement must be considered in this area.

Area B

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at residences in Area B are predicted to be in the range of 57 to 61 dBA L_{eq}(h) in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is predicted to be 3 dB. Because the predicted noise levels in the design-year are not predicted to approach or exceed the noise abatement criterion (67 dBA L_{eq}[h]) or result in a substantial increase in noise, no traffic noise impacts are predicted in Area B.

Area C

The traffic noise modeling results indicate exterior traffic noise levels at music schools in Area C are predicted to be approximately 69 dBA L_{eq}(h) in the design-year, and that the increase in noise will be 1 dB in the design-year. The music schools in Area C do not have outdoor uses or classes that would be affected by exterior traffic noise. Therefore, Receivers 5, 6, and 7 have been assessed against the interior noise abatement criterion of 52 dBA L_{eq}(h). From Table 6 in the FHWA Highway Traffic Noise Analysis and Abatement Guidance document, the building noise reduction factor for standard construction with ordinary windows closed is 20 dB. As shown in Table B-1, the interior noise level in the music schools in the design-year is therefore predicted to be 49 dBA L_{eq}(h). Because this predicted design-year noise level does not exceed the interior NAC of 52 dBA L_{eq}(h), no interior traffic noise impacts are predicted at the music schools. Therefore, noise abatement does not need to be considered in this area.

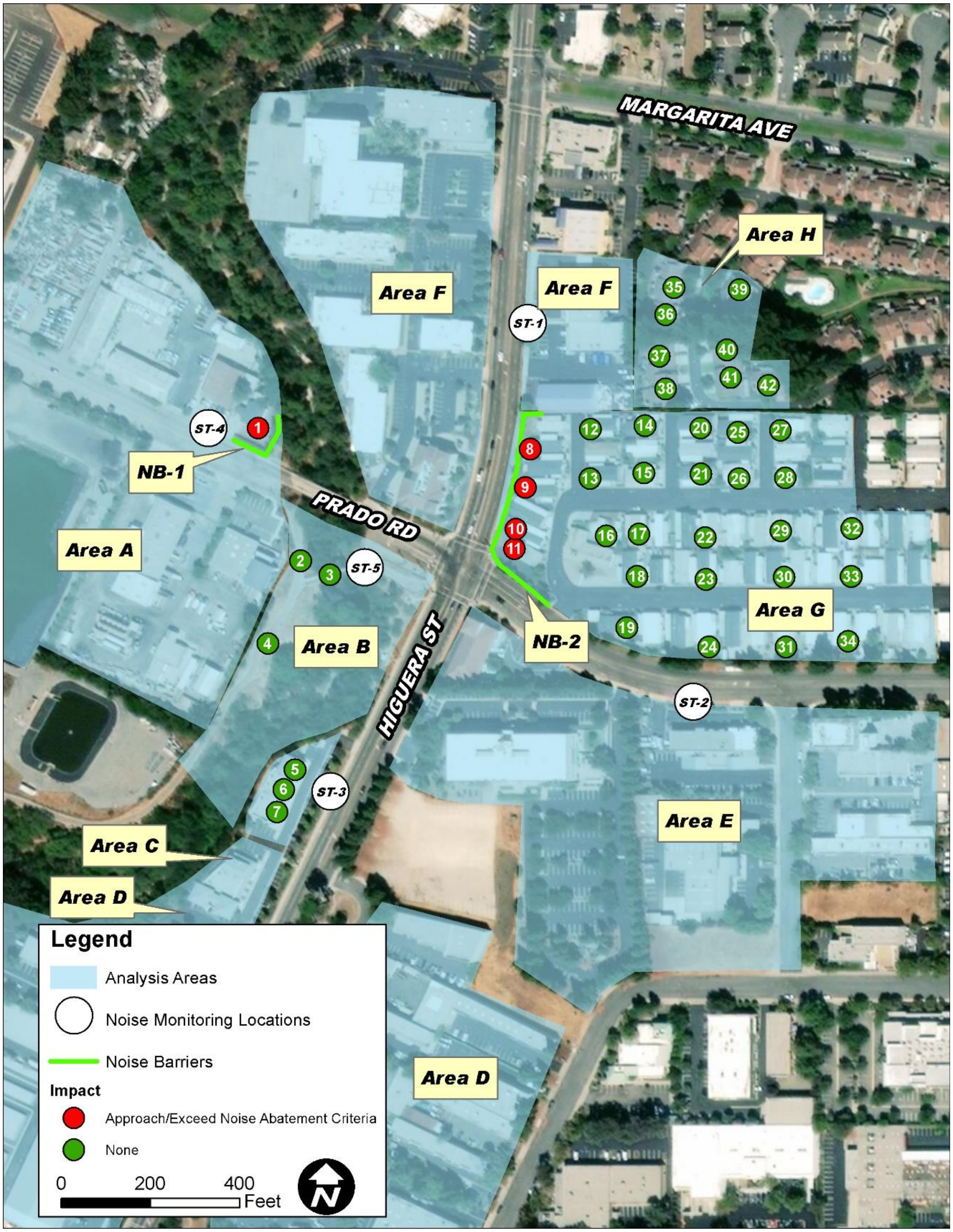
Area G

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at residences in Area G are predicted to be in the range of 53 to 72 dBA L_{eq}(h) in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is predicted to be 4 dB. Because the predicted noise level in the design-year exceeds 67 dBA L_{eq} (h), traffic noise impacts are predicted at residences in this area, and noise abatement must be considered in this area.

Area H

The traffic noise modeling results in Table B-1 indicate that traffic noise levels at residences in Area H are predicted to be in the range of 55 to 61 dBA L_{eq}(h) in the design-year. The results also indicate that the increase in noise between existing conditions and the design-year is predicted to be 3 dB. Because the predicted noise levels in the design-year are not predicted to approach or exceed the noise abatement criterion (67 dBA L_{eq}[h]) or result in a substantial increase in noise, no traffic noise impacts are predicted in Area H.

Figure 7-1. Analysis Areas, Noise Monitoring Positions, Modeled Recievers and Location of Evaluated Noise Barrier



Source: TAHA, 2020

7.2. Preliminary Noise Abatement Analysis

Noise abatement is considered where noise impacts are predicted in areas of frequent human use that would benefit from a lowered noise level. According to 23 CFR 772(13)(c) and 772(15)(c), federal funding may be used for the following abatement measures:

- Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way.
- Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.
- Alteration of horizontal and vertical alignments.
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise.
- Noise insulation of Activity Category D land use facilities listed in Table 1. Post-installation maintenance and operational costs for noise insulation are not eligible for Federal-aid funding.

Noise barriers are the only form of noise abatement considered for this project. Each noise barrier evaluated has been evaluated for feasibility based on achievable noise reduction. For each noise barrier found to be acoustically feasible, reasonable cost allowances were calculated by multiplying the number of benefited receptors by $107,000. Table B-1 in Appendix B summarizes results at receptor locations for the barriers NB-1 and NB-2 that have been evaluated in detail for this project.

For any noise barrier to be considered reasonable from a cost perspective the estimated cost of the noise barrier should be equal to or less than the total cost allowance calculated for the barrier. The cost calculations of the noise barrier must include all items appropriate and necessary for construction of the barrier, such as traffic control, drainage modification, retaining walls, landscaping for graffiti abatement, and right-of-way costs. Construction cost estimates are not provided in this NSR, but are presented in the Noise Abatement Decision Report (NADR). The NADR is a design responsibility and is prepared to compile information from the NSR, other relevant environmental studies, and design considerations into a single, comprehensive document before public review of the project. The NADR is prepared by the project engineer after completion of the NSR and prior to publication of the draft environmental document. The NADR includes noise abatement construction cost estimates that have been prepared and signed by the project engineer based on site-specific conditions. Construction cost estimates are compared to reasonableness allowances in the NADR to identify which wall configurations are reasonable from a cost perspective.

The design of noise barriers presented in this report is preliminary and has been conducted at a level appropriate for environmental review and not for final design of the project. Preliminary information on the physical location and height of noise barriers is provided in this report. If pertinent parameters change substantially during the final project design, preliminary noise barrier designs may be modified or eliminated from the final project. A final decision on the construction of the noise abatement will be made upon completion of the project design.

The following is a discussion of noise abatement considered for each evaluation area where traffic noise impacts are predicted.

7.2.1. Area A

Traffic noise impacts are predicted at the residence in this area, and noise abatement must be considered. Receptor 1 represents one residence in Area A. Detailed modeling analysis was conducted for a barrier located at the edge of the shoulder. The barrier evaluated is identified as Barrier NB-1 in Figure 7-1. Barrier heights in the range of 6 to 16 feet were evaluated in 2-foot increments. Table 7-1 summarizes the calculated noise reductions and reasonable allowances for each barrier height.

Table 7-1. Summary of Reasonableness Allowances —Barrier NB-1

Barrier I.D.: NB-1 in Area A						
Critical Receptor: 1						
Design Year Noise Level, dBA L_{eq}(h): 67						
Design Year Noise Level Minus Existing Noise Level: 3						
Design Year with Barrier	**6-Foot Barrier**	**8-Foot Barrier**	**10-Foot Barrier[1]**	**12-Foot Barrier[1]**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	4	5	5	5	6	6
Number of Benefited Receptors	0	1	1	1	1	1
Reasonable Allowance Per Benefited Receptor	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$0	$107,000	$107,000	$107,000	$107,000	$107,000

Note: The 7 DB noise reduction design goal was not achieved.
1. Minimum height needed to break the line of sight between 11.5 foot truck stack and first row receptor.

7.2.2. Area B

No traffic noise impacts are predicted for Area B. Accordingly, noise abatement does not need to be considered in this area.

7.2.3. Area C

No traffic noise impacts are predicted for Area C. Accordingly, noise abatement does not need to be considered in this area.

7.2.4. Area G

Traffic noise impacts are predicted at residences in this area, and noise abatement must be considered. Receptors 7 through 33 represent a total of 61 residences and one outdoor pool in Area G. Detailed modeling analysis was conducted for a barrier located at the edge of the shoulder. The barrier evaluated is identified as Barrier NB-1 in Figure 5-1. Barrier heights in the range of 6 to 16 feet were evaluated in 2-foot increments. Table 7-2 summarizes the calculated noise reductions and reasonable allowances for each barrier height.

Table 7-2. Summary of Reasonableness Allowances —Barrier NB-2

Barrier I.D.: NB-2 in Area G						
Critical Receptor: 8						
Design Year Noise Level, dBA L_{eq}(h): 70						
Design Year Noise Level Minus Existing Noise Level: 1						
Design Year with Barrier	**6-Foot Barrier[2]**	**8-Foot Barrier**	**10-Foot Barrier**	**12-Foot Barrier[1]**	**14-Foot Barrier**	**16-Foot Barrier**
Barrier Noise Reduction, dB	7	9	11	12	13	14
Number of Benefited Receptors	9	9	9	12	15	15
Reasonable Allowance Per Benefited Receptor	$107,000	$107,000	$107,000	$107,000	$107,000	$107,000
Total Reasonable Allowance	$963,000	$963,000	$963,000	$1.2 Million	$1.6 Million	$1.6 Million

1. Minimum height needed to break the line of sight between 11.5 foot truck stack and first row receptor.
2. Minimum height need to achieve 7 dB noise reduction design goal.

7.2.5. Area H

No traffic noise impacts are predicted for Area H. Accordingly, noise abatement does not need to be considered in this area.

Chapter 8. Construction Noise

During construction of the project, noise from construction activities may intermittently dominate the noise environment in the immediate area of construction. Noise associated with construction is controlled by Caltrans Standard Specification Section 14-8.02, "Noise Control," which states the following:

> Do not exceed 86 dBA L_{max} at 50 feet from the job site activities from 9 p.m. to 6 a.m.
>
> Equip an internal combustion engine with the manufacturer-recommended muffler. Do not operate an internal combustion engine on the job site without the appropriate muffler.

Construction activities would be temporary and would mostly occur during normal daytime hours. The City of San Luis Obispo includes exterior noise standards for residential and business properties where technically economical and feasible. The Standards are outlined in Table 8-1 below and apply for stationary equipment, which are repetitively scheduled for ten days or more. The ordinance also requires that all mobile or stationary internal combustion engine powered equipment or machinery be equipped with suitable exhaust and air intake silencers in proper working order.

Table 8-1. San Luis Obispo Construction Noise Standards

Time	**Stationary Equipment (More than Ten Days) Maximum Noise Level (dBA)**		
	Single-Family Residential	Multi-Family Residential	Mixed Residential/Commercial
Daily, except Sundays and legal holidays 7:00 a.m. to 7:00 p.m.	60	65	70
Daily, 7:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	50	55	60
	Business		
Daily, including Sunday and legal holidays	75		

Source: San Luis Obispo, 2019.

Table 8-2 summarizes noise levels produced by construction equipment that is commonly used on roadway construction projects. Construction equipment that is anticipated to be used would include equipment typical to roadway construction such as backhoes and pavers. Construction equipment noise levels are anticipated to range between 66.7 dBA L_{eq} and 81.9 dBA L_{eq} at 50 feet. The worst-case combined construction noise level would likely occur during the grading and site preparation phases, which would generate a combined noise level of 89 dBA L_{eq} at 50 feet (USEPA, 1971). Construction noise at off-site receptor locations would be dependent on the loudest piece of equipment operating.

Table 8-2. Construction Equipment Noise

Equipment	Maximum Noise Level (dBA, L_{eq} at 50 feet)
Auger Drill	77.4
Backhoe	73.6
Compressor (air)	73.7
Concrete Mixer Truck	74.8
Concrete Pump Truck	74.4
Concrete Saw	82.6
Crane	72.6
Dump Truck	72.5
Excavator	76.7
Front End Loader	75.1
Generator	77.6
Gradall	79.4
Grader	81
Jackhammer	81.9
Man Lift	67.7
Mounted Impact Hammer (hoe ram)	83.3
Paver	74.2
Pneumatic Tools	82.2
Roller	73
Scraper	79.6
Tractor	80
Vacuum Street Sweeper	71.6

Source: Federal Highway Administration, 2008.

No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with Caltrans Standard Specifications Section 14.8-02. Construction noise would be short-term, intermittent, and overshadowed by local traffic noise.

Chapter 9. References

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Appendix A Traffic Data

This appendix contains tables presenting the traffic data. **Table A-**1 presents traffic data for existing conditions, **Table A-2** for design-year conditions without the project, and **Table A-3** for design-year conditions with the project.

Table A-1. Traffic Data for Existing (2016) Conditions

	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto		Medium Trucks		Heavy Trucks		Speed (A/MT/HT)
				%	Volume	%	Volume	%	Volume	
Prado Road EB	West of Higuera St	1	220	98.0	216	1.5	3	0.5	1	35/35/35
Prado Road WB	West of Higuera St	1	689	98.0	676	1.5	10	0.5	3	35/35/35
Prado Road EB through	West of Higuera St.	1	84	98.0	83	1.5	1	0.5	0	35/35/35
Prado Road EB Left Turn	West of Higuera St.	1	58	98.0	57	1.5	1	0.5	0	35/35/35
Prado Road EB Right Turn	West of Higuera St.	1	85	98.0	84	1.5	1	0.5	0	35/35/35
Prado Road WB	East of Higuera St	1	391	98.0	383	1.5	6	0.5	2	35/35/35
Prado Road EB	East of Higuera St	1	341	98.0	334	1.5	5	0.5	2	35/35/35
Prado Road WB through	East of Higuera St.	1	183	98.0	179	1.5	3	0.5	1	35/35/35
Prado Road WB Left Turn	East of Higuera St.	1	104	98.0	101	1.5	2	0.5	1	35/35/35
Prado Road WB Right Turn	East of Higuera St.	1	104	98.0	101	1.5	2	0.5	1	35/35/35
Higuera St. NB	South of Prado Rd.	2	1,194	98.0	1,170	1.5	18	0.5	6	40/40/40
Higuera St. SB	South of Prado Rd.	2	815	98.0	799	1.5	12	0.5	4	40/40/40
Higuera St. NB through	South of Prado Rd.	1	688	98.0	675	1.5	10	0.5	3	40/40/40
Higuera St. Left Turn NB	South of Prado Rd.	1	451	98.0	442	1.5	7	0.5	2	40/40/40
Higuera St. Right Turn NB	South of Prado Rd.	1	55	98.0	54	1.5	1	0.5	0	40/40/40
Higuera St. NB	North of Prado Rd.	2	841	98.0	824	1.5	13	0.5	4	40/40/40
Higuera St. SB	North of Prado Rd.	2	793	98.0	777	1.5	12	0.5	4	40/40/40
Higuera St. SB through	North of Prado Rd.	1	626	98.0	614	1.5	9	0.5	3	40/40/40
Higuera St. Left Turn SB	North of Prado Rd.	1	229	98.0	225	1.5	3	0.5	1	40/40/40
Higuera St. Right Turn SB	North of Prado Rd.	1	55	98.0	54	1.5	1	0.5	0	40/40/40

Table A-2. Traffic Data for Design year (2035) without Project Conditions

	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto		Medium Trucks		Heavy Trucks		Speed (A/MT/HT)
				%	Volume	%	Volume	%	Volume	
Prado Road EB	West of Higuera St	1	951	98.0	932	1.5	14	0.5	5	35/35/35
Prado Road WB	West of Higuera St	1	1,176	98.0	1,152	1.5	18	0.5	6	35/35/35
Prado Road EB through	West of Higuera St.	1	726	98.0	711	1.5	11	0.5	4	35/35/35
Prado Road EB Left Turn	West of Higuera St.	1	91	98.0	90	1.5	1	0.5	0	35/35/35
Prado Road EB Right Turn	West of Higuera St.	1	189	98.0	185	1.5	3	0.5	1	35/35/35
Prado Road WB	East of Higuera St	1	1,448	98.0	1,419	1.5	22	0.5	2	35/35/35
Prado Road EB	East of Higuera St	1	1,346	98.0	1,319	1.5	20	0.5	2	35/35/35
Prado Road WB through	East of Higuera St.	1	808	98.0	792	1.5	12	0.5	1	35/35/35
Prado Road WB Left Turn	East of Higuera St.	1	200	98.0	196	1.5	3	0.5	1	35/35/35
Prado Road WB Right Turn	East of Higuera St.	1	440	98.0	431	1.5	7	0.5	1	35/35/35
Higuera St. NB	South of Prado Rd.	2	1,108	98.0	1,085	1.5	17	0.5	6	40/40/40
Higuera St. SB	South of Prado Rd.	2	1,049	98.0	1,028	1.5	16	0.5	5	40/40/40
Higuera St. NB through	South of Prado Rd.	1	690	98.0	677	1.5	10	0.5	3	40/40/40
Higuera St. Left Turn NB	South of Prado Rd.	1	308	98.0	301	1.5	5	0.5	2	40/40/40
Higuera St. Right Turn NB	South of Prado Rd.	1	160	98.0	157	1.5	2	0.5	1	40/40/40
Higuera St. NB	North of Prado Rd.	2	1,221	98.0	1,197	1.5	18	0.5	6	40/40/40
Higuera St. SB	North of Prado Rd.	2	1,064	98.0	1,043	1.5	16	0.5	5	40/40/40
Higuera St. SB through	North of Prado Rd.	1	660	98.0	647	1.5	10	0.5	3	40/40/40
Higuera St. Left Turn SB	North of Prado Rd.	1	460	98.0	451	1.5	7	0.5	2	40/40/40
Higuera St. Right Turn SB	North of Prado Rd.	1	74	98.0	73	1.5	1	0.5	0	40/40/40

Table A-3. Traffic Data for Design year (2035) with Project Conditions

	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto		Medium Trucks		Heavy Trucks		Speed (A/MT/HT)
				%	Volume	%	Volume	%	Volume	
Surface Streets										
Prado Road EB	West of Higuera St	2	951	98.0	932	1.5%	14	0.5	5	35/35/35
Prado Road WB	West of Higuera St	2	1,176	98.0	1,152	1.5%	18	0.5	6	35/35/35
Prado Road EB through	West of Higuera St.	1	726	98.0	711	1.5%	11	0.5	4	35/35/35
Prado Road EB Left Turn	West of Higuera St.	1	91	98.0	90	1.5%	1	0.5	0	35/35/35
Prado Road EB Right Turn	West of Higuera St.	1	189	98.0	185	1.5%	3	0.5	1	35/35/35
Prado Road WB	East of Higuera St	1	1,448	98.0	1,419	1.5%	22	0.5	7	35/35/35
Prado Road EB	East of Higuera St	1	1,346	98.0	1,319	1.5%	20	0.5	7	35/35/35
Prado Road WB through	East of Higuera St.	1	808	98.0	792	1.5%	12	0.5	4	35/35/35
Prado Road WB Left Turn	East of Higuera St.	1	200	98.0	196	1.5%	3	0.5	1	35/35/35
Prado Road WB Right Turn	East of Higuera St.	1	440	98.0	431	1.5%	7	0.5	2	35/35/35
Higuera St. NB	South of Prado Rd.	2	1,108	98.0	1,085	1.5%	17	0.5	6	40/40/40
Higuera St. SB	South of Prado Rd.	2	1,049	98.0	1,028	1.5%	16	0.5	5	40/40/40
Higuera St. NB through	South of Prado Rd.	1	690	98.0	677	1.5%	10	0.5	3	40/40/40
Higuera St. Left Turn NB	South of Prado Rd.	2	308	98.0	301	1.5%	5	0.5	2	40/40/40
Higuera St. Right Turn NB	South of Prado Rd.	1	160	98.0	157	1.5%	2	0.5	1	40/40/40
Higuera St. NB	North of Prado Rd.	2	1,221	98.0	1,197	1.5%	18	0.5	6	40/40/40
Higuera St. SB	North of Prado Rd.	2	1,064	98.0	1,043	1.5%	16	0.5	5	40/40/40
Higuera St. SB through	North of Prado Rd.	1	660	98.0	647	1.5%	10	0.5	3	40/40/40
Higuera St. Left Turn SB	North of Prado Rd.	1	460	98.0	451	1.5%	7	0.5	2	40/40/40
Higuera St. Right Turn SB	North of Prado Rd.	1	74	98.0	73	1.5%	1	0.5	0	40/40/40

Appendix B Predicted Future Noise Levels and Noise Barrier Analysis

This appendix summarizes the traffic noise modeling results for existing and design-year conditions with and without the project. This table also compares the predicted noise reductions by barrier height for each noise barrier analyzed. Existing, design-year without project, and design-year with project noise levels are shown in **Table B-1**.

Table B-1. Predicted Future Noise and Barrier Analysis

Receptor I.D.	Area	Barrier I.D.	Land Use	Number of Dwelling Units	Address	Existing Noise Level L_{eq}(h), dBA	Prado Road Bridge Replacement Future Worst Hour Noise Levels - L_{eq}(h), dBA																								
							Design Year Noise Level without Project L_{eq}(h), dBA	Design Year Noise Level with Project L_{eq}(h), dBA	Design Year Noise Level without Project minus Existing Conditions L_{eq}(h), dBA	Design Year Noise Level with Project Minus No Project Conditions L_{eq}(h), dBA	Activity Category (NAC)	Impact Type	Noise Prediction with Barrier, Barrier Insertion Loss (I.L.), and Number of Benefited Receptors (NBR)																	
													6 feet			8 feet			10 feet			12 feet			14 feet			16 feet		
													L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR	L_{eq}(h)	I.L.	NBR
1	A	NB-1	Residence	1	70 Prado Rd.	65	68	67	3	-1	B (67)	A/E	63	4	0	62	5	1	62	5	1	62[a]	5	1	61	6	1	61	6	1
2	B	-	Bob Jones Trail	1	Bob Jones Trail	56	59	61	3	2	C (67)	None	61	0	0	61	0	0	61	0	0	61	0	0	61	0	0	61	0	0
3	B	-	Bob Jones Trail	1	Bob Jones Trail	58	60	61	2	1	C (67)	None	61	0	0	61	0	0	61	0	0	61	0	0	61	0	0	61	0	0
4	B	-	Bob Jones Trail	1	Bob Jones Trail	55	57	57	2	0	C (67)	None	57	0	0	57	0	0	57	0	0	57	0	0	57	0	0	57	0	0
5	C	-	The TeVelde Conservatory of Music	0	3440 S Higuera St.	47[b]	48[b]	49[b]	1	1	D (52)	None	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0
6	C	-	The TeVelde Conservatory of Music	0	3440 S Higuera St.	47[b]	48[b]	49[b]	1	1	D (52)	None	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0
7	C	-	Music Motive	0	3440 S Higuera St.	47[b]	48[b]	49[b]	1	1	D (52)	None	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0	49[b]	0	0
8	G	NB-2	Residence	2	3395 S Higuera St.	69	70	70	1	0	B (67)	A/E	63	7	2	61	9	2	59	11	2	58[a]	12	2	57	13	2	56	14	2
9	G	NB-2	Residence	2	3395 S Higuera St.	68	70	70	2	0	B (67)	A/E	63	7	2	61	9	2	60	10	2	59[a]	11	2	58	12	2	57	13	2
10	G	NB-2	Residence	2	3395 S Higuera St.	69	71	71	2	0	B (67)	A/E	64	7	2	63	8	2	61	10	2	60[a]	11	2	59	12	2	59	12	2
11	G	NB-2	Residence	1	3395 S Higuera St.	69	72	72	3	0	B (67)	A/E	65	7	1	63	9	1	62	10	1	61[a]	11	1	60	12	1	59	13	1
12	G	NB-2	Residence	1	3395 S	63	65	65	2	0	B (67)	None	62	3	0	61	4	0	61	4	0	61[a]	4	0	61	4	0	61	4	0

					Higuera St.																									
13	G	NB-2	Residence	2	3395 S Higuera St.	63	65	65	2	0	B (67)	None	60	5	2	60	5	2	59	6	2	58[a]	7	2	58	7	2	58	7	2
14	G	NB-2	Residence	1	3395 S Higuera St.	57	59	59	2	0	B (67)	None	57	2	0	57	2	0	57	2	0	57[a]	2	0	57	2	0	56	3	0
15	G	NB-2	Residence	2	3395 S Higuera St.	58	60	60	2	0	B (67)	None	57	3	0	56	4	0	56	4	0	55[a]	5	2	55	5	2	55	5	2
16	G	NB-2	Pool	1	3395 S Higuera St.	59	61	61	2	0	C (67)	None	58	3	0	57	4	0	57	4	0	56[a]	5	1	56	5	1	56	5	1
17	G	NB-2	Residence	3	3395 S Higuera St.	59	61	61	2	0	B (67)	None	58	3	0	57	4	0	57	4	0	57[a]	4	0	56	5	3	56	5	3
18	G	NB-2	Residence	3	3395 S Higuera St.	61	63	63	2	0	B (67)	None	60	3	0	60	3	0	60	3	0	59[a]	4	0	59	4	0	59	4	0
19	G	NB-2	Residence	3	3395 S Higuera St.	59	63	63	4	0	B (67)	None	62	1	0	61	2	0	61	2	0	61[a]	2	0	61	2	0	61	2	0
20	G	NB-2	Residence	1	3395 S Higuera St.	56	58	58	2	0	B (67)	None	56	2	0	56	2	0	55	3	0	55[a]	3	0	55	3	0	55	3	0
21	G	NB-2	Residence	2	3395 S Higuera St.	57	59	59	2	0	B (67)	None	57	2	0	56	3	0	56	3	0	56[a]	3	0	56	3	0	56	3	0
22	G	NB-2	Residence	3	3395 S Higuera St.	57	59	59	2	0	B (67)	None	56	3	0	56	3	0	55	4	0	55[a]	4	0	55	4	0	55	4	0
23	G	NB-2	Residence	3	3395 S Higuera St.	58	60	60	2	0	B (67)	None	58	2	0	57	3	0	57	3	0	57[a]	3	0	56	4	0	56	4	0
24	G	NB-2	Residence	3	3395 S Higuera St.	57	61	61	4	0	B (67)	None	60	1	0	60	1	0	60	1	0	59[a]	2	0	59	2	0	59	2	0
25	G	NB-2	Residence	1	3395 S Higuera St.	51	53	53	2	0	C(67)	None	52	1	0	51	2	0	51	2	0	51[a]	2	0	51	2	0	51	2	0
26	G	NB-2	Residence	2	3395 S Higuera St.	54	56	56	2	0	B (67)	None	54	2	0	54	2	0	54	2	0	53[a]	3	0	53	3	0	53	3	0
27	G	NB-2	Residence	2	3395 S Higuera St.	53	55	55	2	0	B (67)	None	53	2	0	52	3	0	52	3	0	52[a]	3	0	52	3	0	52	3	0
28	G	NB-2	Residence	4	3395 S Higuera St.	54	57	57	3	0	B (67)	None	54	3	0	54	3	0	54	3	0	53[a]	4	0	53	4	0	53	4	0
29	G	NB-2	Residence	3	3395 S Higuera St.	55	57	57	2	0	B (67)	None	55	2	0	54	3	0	54	3	0	54[a]	3	0	54	3	0	53	4	0
30	G	NB-2	Residence	3	3395 S Higuera St.	55	58	58	3	0	B (67)	None	56	2	0	56	2	0	55	3	0	55[a]	3	0	55	3	0	55	3	0
31	G	NB-2	Residence	2	3395 S Higuera St.	56	60	60	4	0	B (67)	None	59	1	0	59	1	0	59	1	0	58[a]	2	0	58	2	0	58	2	0
32	G	NB-2	Residence	3	3395 S Higuera St.	53	56	56	3	0	B (67)	None	53	3	0	53	3	0	52	4	0	52[a]	4	0	52	4	0	52	4	0
33	G	NB-2	Residence	3	3395 S Higuera St.	53	56	56	3	0	B (67)	None	54	2	0	54	2	0	54	2	0	54[a]	2	0	54	2	0	54	2	0
34	G	NB-2	Residence	4	3395 S Higuera St.	54	58	58	4	0	B (67)	None	57	1	0	57	1	0	57	1	0	57[a]	1	0	57	1	0	57	1	0
35	H	-	Residence	2	3235 Via Ensenada St.	58	59	59	1	0	B (67)	None	59	0	0	59	0	0	59	0	0	59	0	0	59	0	0	59	0	0
36	H	-	Residence	2	3251 Via	58	60	60	2	0	B (67)	None	60	0	0	60	0	0	60	0	0	60	0	0	60	0	0	60	0	0

					Ensenada St.																									
37	H	-	Residence	2	3267 Via Ensenada St.	59	61	61	2	0	B (67)	None	61	0	0	61	0	0	61	0	0	61	0	0	61	0	0	61	0	0
38	H	-	Residence	2	3275 Via Ensenada St.	59	61	60	2	-1	B (67)	None	60	0	0	60	0	0	60	0	0	60	0	0	60	0	0	60	0	0
39	H	-	Residence	2	3240 Via Ensenada St.	53	55	55	2	0	B (67)	None	55	0	0	55	0	0	55	0	0	55	0	0	55	0	0	55	0	0
40	H	-	Residence	2	3268 Via Ensenada St.	53	56	56	3	0	B (67)	None	56	0	0	56	0	0	56	0	0	56	0	0	56	0	0	56	0	0
41	H	-	Residence	2	3276 Via Ensenada St.	54	56	56	2	0	B (67)	None	56	0	0	56	0	0	56	0	0	56	0	0	56	0	0	56	0	0
42	H	-	Residence	2	204 Via La Paz	53	55	55	2	0	B (67)	None	55	0	0	55	0	0	55	0	0	55	0	0	55	0	0	55	0	0

Note: All NAC are exterior unless note. A/E= Future noise conditions approach or exceed the Noise Abatement Criteria; SI = Substantial Increase

[a] Minimum height needed to break the line of sight between 11.5 foot truck stack and first row receptors.

[a] Noise level includes a building noise reduction factor of 20 dB from the calculated exterior noise level.

Appendix C TNM Results

This appendix contains model result outputs and the line-of-sight noise barrier analysis.

<Organization?>							8 June 2020						
<Analysis By?>							TNM 2.5						
							Calculated with TNM 2.5						
RESULTS: SOUND LEVELS													
PROJECT/CONTRACT:		<Project Name?>											
RUN:		<Run Title?>											
BARRIER DESIGN:		INPUT HEIGHTS						Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.					
ATMOSPHERICS:		68 deg F, 50% RH											
Receiver													
Name	No.	#DUs	Existing	No Barrier					With Barrier				
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction			
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal	
							Sub'l Inc						
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB	
2	30	1	0.0	61.9	66	61.9	10	----	61.9	0.0	8	-8.0	
3	31	1	0.0	63.2	66	63.2	10	----	63.2	0.0	8	-8.0	
4	32	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0	
5	33	1	0.0	67.1	66	67.1	10	Snd Lvl	67.1	0.0	8	-8.0	
6	34	1	0.0	67.2	66	67.2	10	Snd Lvl	67.2	0.0	8	-8.0	
7	35	1	0.0	67.4	66	67.4	10	Snd Lvl	67.4	0.0	8	-8.0	
8	36	1	0.0	68.5	66	68.5	10	Snd Lvl	68.5	0.0	8	-8.0	
9	37	1	0.0	68.4	66	68.4	10	Snd Lvl	68.4	0.0	8	-8.0	
10	38	1	0.0	69.2	66	69.2	10	Snd Lvl	69.2	0.0	8	-8.0	
11	39	1	0.0	69.3	66	69.3	10	Snd Lvl	69.3	0.0	8	-8.0	
12	40	1	0.0	62.9	66	62.9	10	----	62.9	0.0	8	-8.0	
13	41	1	0.0	63.0	66	63.0	10	----	63.0	0.0	8	-8.0	
14	42	1	0.0	57.2	66	57.2	10	----	57.2	0.0	8	-8.0	
15	43	1	0.0	57.7	66	57.7	10	----	57.7	0.0	8	-8.0	
16	44	1	0.0	59.4	66	59.4	10	----	59.4	0.0	8	-8.0	
17	45	1	0.0	59.2	66	59.2	10	----	59.2	0.0	8	-8.0	
18	46	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0	
19	47	1	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0	
20	48	1	0.0	56.0	66	56.0	10	----	56.0	0.0	8	-8.0	
21	49	1	0.0	56.9	66	56.9	10	----	56.9	0.0	8	-8.0	
22	50	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0	
23	51	1	0.0	57.5	66	57.5	10	----	57.5	0.0	8	-8.0	
24	52	1	0.0	57.3	66	57.3	10	----	57.3	0.0	8	-8.0	
25	53	1	0.0	51.1	66	51.1	10	----	51.1	0.0	8	-8.0	

26	54	1	0.0	53.6	66	53.6	10	----	53.6	0.0	8	-8.0
27	55	1	0.0	52.9	66	52.9	10	----	52.9	0.0	8	-8.0
28	56	1	0.0	54.4	66	54.4	10	----	54.4	0.0	8	-8.0
29	57	1	0.0	55.0	66	55.0	10	----	55.0	0.0	8	-8.0
30	58	1	0.0	55.0	66	55.0	10	----	55.0	0.0	8	-8.0
31	59	1	0.0	55.6	66	55.6	10	----	55.6	0.0	8	-8.0
32	60	1	0.0	53.0	66	53.0	10	----	53.0	0.0	8	-8.0
33	61	1	0.0	53.4	66	53.4	10	----	53.4	0.0	8	-8.0
34	62	1	0.0	54.3	66	54.3	10	----	54.3	0.0	8	-8.0
35	63	1	0.0	57.5	66	57.5	10	----	57.5	0.0	8	-8.0
36	64	1	0.0	58.2	66	58.2	10	----	58.2	0.0	8	-8.0
37	65	1	0.0	59.0	66	59.0	10	----	59.0	0.0	8	-8.0
38	66	1	0.0	58.6	66	58.6	10	----	58.6	0.0	8	-8.0
39	67	1	0.0	53.1	66	53.1	10	----	53.1	0.0	8	-8.0
40	69	1	0.0	53.3	66	53.3	10	----	53.3	0.0	8	-8.0
41	70	1	0.0	53.7	66	53.7	10	----	53.7	0.0	8	-8.0
42	71	1	0.0	53.3	66	53.3	10	----	53.3	0.0	8	-8.0
1	73	1	0.0	64.5	66	64.5	10	----	64.5	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	42	0.0	0.0	0.0
All Impacted	7	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

<Organization?>
<Analysis By?>

8 June 2020
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: <Project Name?>
RUN: <Run Title?>
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
2	30	1	0.0	64.7	66	64.7	10	----	64.7	0.0	8	-8.0
3	31	1	0.0	65.8	66	65.8	10	----	65.8	0.0	8	-8.0
4	32	1	0.0	62.5	66	62.5	10	----	62.5	0.0	8	-8.0
5	33	1	0.0	68.0	66	68.0	10	Snd Lvl	68.0	0.0	8	-8.0
6	34	1	0.0	68.1	66	68.1	10	Snd Lvl	68.1	0.0	8	-8.0
7	35	1	0.0	68.3	66	68.3	10	Snd Lvl	68.3	0.0	8	-8.0
8	36	1	0.0	70.2	66	70.2	10	Snd Lvl	70.2	0.0	8	-8.0
9	37	1	0.0	70.1	66	70.1	10	Snd Lvl	70.1	0.0	8	-8.0
10	38	1	0.0	71.2	66	71.2	10	Snd Lvl	71.2	0.0	8	-8.0
11	39	1	0.0	71.7	66	71.7	10	Snd Lvl	71.7	0.0	8	-8.0
12	40	1	0.0	64.7	66	64.7	10	----	64.7	0.0	8	-8.0
13	41	1	0.0	64.9	66	64.9	10	----	64.9	0.0	8	-8.0
14	42	1	0.0	59.2	66	59.2	10	----	59.2	0.0	8	-8.0
15	43	1	0.0	59.9	66	59.9	10	----	59.9	0.0	8	-8.0
16	44	1	0.0	61.4	66	61.4	10	----	61.4	0.0	8	-8.0
17	45	1	0.0	61.3	66	61.3	10	----	61.3	0.0	8	-8.0
18	46	1	0.0	63.2	66	63.2	10	----	63.2	0.0	8	-8.0
19	47	1	0.0	63.0	66	63.0	10	----	63.0	0.0	8	-8.0
20	48	1	0.0	58.1	66	58.1	10	----	58.1	0.0	8	-8.0
21	49	1	0.0	59.1	66	59.1	10	----	59.1	0.0	8	-8.0
22	50	1	0.0	59.4	66	59.4	10	----	59.4	0.0	8	-8.0
23	51	1	0.0	60.2	66	60.2	10	----	60.2	0.0	8	-8.0
24	52	1	0.0	61.0	66	61.0	10	----	61.0	0.0	8	-8.0
25	53	1	0.0	53.3	66	53.3	10	----	53.3	0.0	8	-8.0

26	54	1	0.0	55.8	66	55.8	10	----	55.8	0.0	8	-8.0
27	55	1	0.0	55.1	66	55.1	10	----	55.1	0.0	8	-8.0
28	56	1	0.0	56.7	66	56.7	10	----	56.7	0.0	8	-8.0
29	57	1	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0
30	58	1	0.0	57.9	66	57.9	10	----	57.9	0.0	8	-8.0
31	59	1	0.0	59.6	66	59.6	10	----	59.6	0.0	8	-8.0
32	60	1	0.0	55.5	66	55.5	10	----	55.5	0.0	8	-8.0
33	61	1	0.0	56.3	66	56.3	10	----	56.3	0.0	8	-8.0
34	62	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
35	63	1	0.0	59.2	66	59.2	10	----	59.2	0.0	8	-8.0
36	64	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0
37	65	1	0.0	60.8	66	60.8	10	----	60.8	0.0	8	-8.0
38	66	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0
39	67	1	0.0	55.1	66	55.1	10	----	55.1	0.0	8	-8.0
40	69	1	0.0	55.5	66	55.5	10	----	55.5	0.0	8	-8.0
41	70	1	0.0	55.8	66	55.8	10	----	55.8	0.0	8	-8.0
42	71	1	0.0	55.3	66	55.3	10	----	55.3	0.0	8	-8.0
1	73	1	0.0	67.7	66	67.7	10	Snd Lvl	67.7	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	42	0.0	0.0	0.0
All Impacted	8	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

<Organization?> 8 June 2020
<Analysis By?> TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: <Project Name?>
RUN: <Run Title?>
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
2	30	1	0.0	66.4	66	66.4	10	Snd Lvl	66.4	0.0	8	-8.0
3	31	1	0.0	67.1	66	67.1	10	Snd Lvl	67.1	0.0	8	-8.0
4	32	1	0.0	63.1	66	63.1	10	----	63.1	0.0	8	-8.0
5	33	1	0.0	68.8	66	68.8	10	Snd Lvl	68.8	0.0	8	-8.0
6	34	1	0.0	68.7	66	68.7	10	Snd Lvl	68.7	0.0	8	-8.0
7	35	1	0.0	68.8	66	68.8	10	Snd Lvl	68.8	0.0	8	-8.0
8	36	1	0.0	69.9	66	69.9	10	Snd Lvl	69.9	0.0	8	-8.0
9	37	1	0.0	69.9	66	69.9	10	Snd Lvl	69.9	0.0	8	-8.0
10	38	1	0.0	71.0	66	71.0	10	Snd Lvl	71.0	0.0	8	-8.0
11	39	1	0.0	71.5	66	71.5	10	Snd Lvl	71.5	0.0	8	-8.0
12	40	1	0.0	64.7	66	64.7	10	----	64.7	0.0	8	-8.0
13	41	1	0.0	64.8	66	64.8	10	----	64.8	0.0	8	-8.0
14	42	1	0.0	59.1	66	59.1	10	----	59.1	0.0	8	-8.0
15	43	1	0.0	59.8	66	59.8	10	----	59.8	0.0	8	-8.0
16	44	1	0.0	61.3	66	61.3	10	----	61.3	0.0	8	-8.0
17	45	1	0.0	61.2	66	61.2	10	----	61.2	0.0	8	-8.0
18	46	1	0.0	63.2	66	63.2	10	----	63.2	0.0	8	-8.0
19	47	1	0.0	63.0	66	63.0	10	----	63.0	0.0	8	-8.0
20	48	1	0.0	58.1	66	58.1	10	----	58.1	0.0	8	-8.0
21	49	1	0.0	59.1	66	59.1	10	----	59.1	0.0	8	-8.0
22	50	1	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0
23	51	1	0.0	60.3	66	60.3	10	----	60.3	0.0	8	-8.0
24	52	1	0.0	61.0	66	61.0	10	----	61.0	0.0	8	-8.0
25	53	1	0.0	53.3	66	53.3	10	----	53.3	0.0	8	-8.0

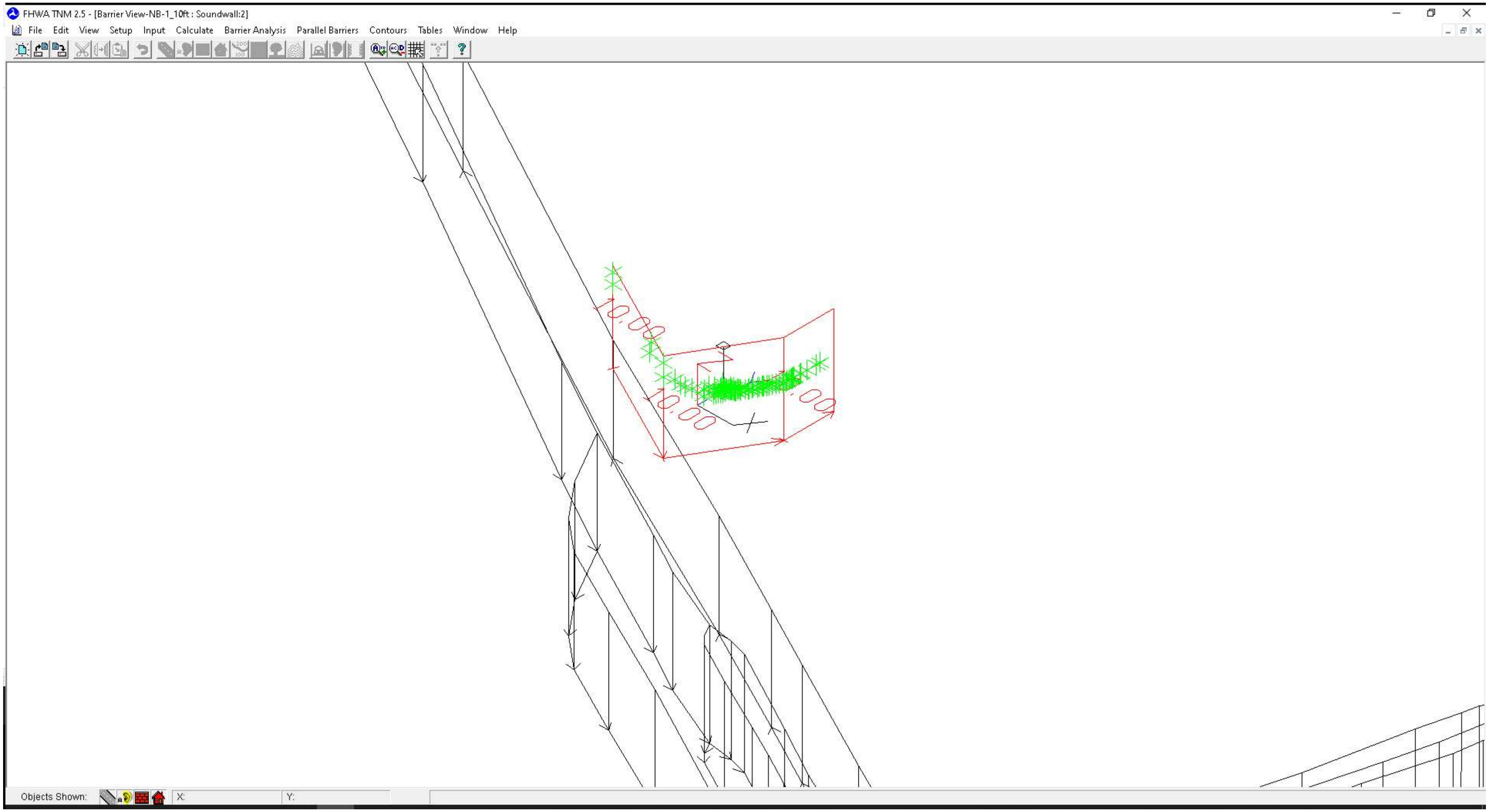
26	54	1	0.0	56.1	66	56.1	10	----	56.1	0.0	8	-8.0
27	55	1	0.0	55.1	66	55.1	10	----	55.1	0.0	8	-8.0
28	56	1	0.0	56.8	66	56.8	10	----	56.8	0.0	8	-8.0
29	57	1	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0
30	58	1	0.0	57.9	66	57.9	10	----	57.9	0.0	8	-8.0
31	59	1	0.0	59.6	66	59.6	10	----	59.6	0.0	8	-8.0
32	60	1	0.0	55.5	66	55.5	10	----	55.5	0.0	8	-8.0
33	61	1	0.0	56.3	66	56.3	10	----	56.3	0.0	8	-8.0
34	62	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
35	63	1	0.0	59.2	66	59.2	10	----	59.2	0.0	8	-8.0
36	64	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0
37	65	1	0.0	60.7	66	60.7	10	----	60.7	0.0	8	-8.0
38	66	1	0.0	60.4	66	60.4	10	----	60.4	0.0	8	-8.0
39	67	1	0.0	55.1	66	55.1	10	----	55.1	0.0	8	-8.0
40	69	1	0.0	55.5	66	55.5	10	----	55.5	0.0	8	-8.0
41	70	1	0.0	55.8	66	55.8	10	----	55.8	0.0	8	-8.0
42	71	1	0.0	55.3	66	55.3	10	----	55.3	0.0	8	-8.0
1	73	1	0.0	67.2	66	67.2	10	Snd Lvl	67.2	0.0	8	-8.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		42	0.0	0.0	0.0
All Impacted		10	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

Noise Barrier 1

Receiver

Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
NB-1_6 Foot												
1	73	1	0	67.5	66	67.5	10	Snd Lvl	63.1	4.4	8	-3.6
NB-1_8 Foot												
1	73	1	0	67.5	66	67.5	10	Snd Lvl	62.4	5.1	8	-2.9
NB-1_10 Foot												
1	73	1	0	67.5	66	67.5	10	Snd Lvl	61.8	5.7	8	-2.3
NB-1_12 Foot												
1	73	1	0	67.5	66	67.5	10	Snd Lvl	61.5	6	8	-2
NB-1_14 Foot												
1	73	1	0	67.5	66	67.5	10	Snd Lvl	61.3	6.2	8	-1.8
NB-1_16 Foot												
1	73	1	0	67.5	66	67.5	10	Snd Lvl	61.2	6.3	8	-1.7


FHWA TNM 2.5 - [Barrier View-NB-1_10ft : Soundwall:2]
File Edit View Setup Input Calculate Barrier Analysis Parallel Barriers Contours Tables Window Help
10.00
10.00
Objects Shown:
X:
Y:

NB-2_6 Foot

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
8	36	1	0	70.2	66	70.2	10	Snd Lvl	63	7.2	8	-0.8
9	37	1	0	70.2	66	70.2	10	Snd Lvl	63.2	7	8	-1
10	38	1	0	71.3	66	71.3	10	Snd Lvl	64.4	6.9	8	-1.1
11	39	1	0	71.7	66	71.7	10	Snd Lvl	65.1	6.6	8	-1.4
12	40	1	0	64.8	66	64.8	10	----	61.8	3	8	-5
13	41	1	0	65	66	65	10	----	60.3	4.7	8	-3.3
14	42	1	0	59.2	66	59.2	10	----	57.3	1.9	8	-6.1
15	43	1	0	59.9	66	59.9	10	----	56.7	3.2	8	-4.8
16	44	1	0	61.3	66	61.3	10	----	57.6	3.7	8	-4.3
17	45	1	0	61.3	66	61.3	10	----	57.9	3.4	8	-4.6
18	46	1	0	63.4	66	63.4	10	----	60.4	3	8	-5
19	47	1	0	63.1	66	63.1	10	----	61.6	1.5	8	-6.5
20	48	1	0	58.1	66	58.1	10	----	55.8	2.3	8	-5.7
21	49	1	0	59.2	66	59.2	10	----	56.6	2.6	8	-5.4
22	50	1	0	59.4	66	59.4	10	----	56.1	3.3	8	-4.7
23	51	1	0	60.4	66	60.4	10	----	57.7	2.7	8	-5.3
24	52	1	0	61	66	61	10	----	59.8	1.2	8	-6.8
25	53	1	0	53.4	66	53.4	10	----	51.7	1.7	8	-6.3
26	54	1	0	56.1	66	56.1	10	----	54.2	1.9	8	-6.1
27	55	1	0	55.2	66	55.2	10	----	52.5	2.7	8	-5.3
28	56	1	0	56.9	66	56.9	10	----	54.2	2.7	8	-5.3
29	57	1	0	57.6	66	57.6	10	----	54.8	2.8	8	-5.2
30	58	1	0	58	66	58	10	----	55.8	2.2	8	-5.8
31	59	1	0	59.6	66	59.6	10	----	58.7	0.9	8	-7.1
32	60	1	0	55.7	66	55.7	10	----	53.1	2.6	8	-5.4
33	61	1	0	56.4	66	56.4	10	----	54.5	1.9	8	-6.1
34	62	1	0	58.4	66	58.4	10	----	57.5	0.9	8	-7.1

NB-2_8 Foot

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
8	36	1	0	70.2	66	70.2	10	Snd Lvl	61.1	9.1	8	1.1
9	37	1	0	70.2	66	70.2	10	Snd Lvl	61.4	8.8	8	0.8
10	38	1	0	71.3	66	71.3	10	Snd Lvl	62.7	8.6	8	0.6
11	39	1	0	71.7	66	71.7	10	Snd Lvl	63.4	8.3	8	0.3
12	40	1	0	64.8	66	64.8	10	----	61.4	3.4	8	-4.6
13	41	1	0	65	66	65	10	----	59.7	5.3	8	-2.7
14	42	1	0	59.2	66	59.2	10	----	57.1	2.1	8	-5.9
15	43	1	0	59.9	66	59.9	10	----	56.2	3.7	8	-4.3
16	44	1	0	61.3	66	61.3	10	----	57.1	4.2	8	-3.8
17	45	1	0	61.3	66	61.3	10	----	57.5	3.8	8	-4.2
18	46	1	0	63.4	66	63.4	10	----	60	3.4	8	-4.6
19	47	1	0	63.1	66	63.1	10	----	61.4	1.7	8	-6.3
20	48	1	0	58.1	66	58.1	10	----	55.6	2.5	8	-5.5
21	49	1	0	59.2	66	59.2	10	----	56.3	2.9	8	-5.1
22	50	1	0	59.4	66	59.4	10	----	55.7	3.7	8	-4.3
23	51	1	0	60.4	66	60.4	10	----	57.3	3.1	8	-4.9
24	52	1	0	61	66	61	10	----	59.7	1.3	8	-6.7
25	53	1	0	53.4	66	53.4	10	----	51.4	2	8	-6
26	54	1	0	56.1	66	56.1	10	----	53.9	2.2	8	-5.8
27	55	1	0	55.2	66	55.2	10	----	52.3	2.9	8	-5.1
28	56	1	0	56.9	66	56.9	10	----	53.9	3	8	-5
29	57	1	0	57.6	66	57.6	10	----	54.4	3.2	8	-4.8
30	58	1	0	58	66	58	10	----	55.5	2.5	8	-5.5
31	59	1	0	59.6	66	59.6	10	----	58.6	1	8	-7
32	60	1	0	55.7	66	55.7	10	----	52.7	3	8	-5
33	61	1	0	56.4	66	56.4	10	----	54.2	2.2	8	-5.8
34	62	1	0	58.4	66	58.4	10	----	57.4	1	8	-7

NB-2_10 Foot

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
8	36	1	0	70.2	66	70.2	10	Snd Lvl	59.2	11	8	3
9	37	1	0	70.2	66	70.2	10	Snd Lvl	59.7	10.5	8	2.5
10	38	1	0	71.3	66	71.3	10	Snd Lvl	61	10.3	8	2.3
11	39	1	0	71.7	66	71.7	10	Snd Lvl	61.7	10	8	2
12	40	1	0	64.8	66	64.8	10	----	61.1	3.7	8	-4.3
13	41	1	0	65	66	65	10	----	59	6	8	-2
14	42	1	0	59.2	66	59.2	10	----	56.9	2.3	8	-5.7
15	43	1	0	59.9	66	59.9	10	----	55.8	4.1	8	-3.9
16	44	1	0	61.3	66	61.3	10	----	56.7	4.6	8	-3.4
17	45	1	0	61.3	66	61.3	10	----	57.1	4.2	8	-3.8
18	46	1	0	63.4	66	63.4	10	----	59.6	3.8	8	-4.2
19	47	1	0	63.1	66	63.1	10	----	61.2	1.9	8	-6.1
20	48	1	0	58.1	66	58.1	10	----	55.4	2.7	8	-5.3
21	49	1	0	59.2	66	59.2	10	----	56.1	3.1	8	-4.9
22	50	1	0	59.4	66	59.4	10	----	55.4	4	8	-4
23	51	1	0	60.4	66	60.4	10	----	57	3.4	8	-4.6
24	52	1	0	61	66	61	10	----	59.5	1.5	8	-6.5
25	53	1	0	53.4	66	53.4	10	----	51.2	2.2	8	-5.8
26	54	1	0	56.1	66	56.1	10	----	53.7	2.4	8	-5.6
27	55	1	0	55.2	66	55.2	10	----	52.1	3.1	8	-4.9
28	56	1	0	56.9	66	56.9	10	----	53.7	3.2	8	-4.8
29	57	1	0	57.6	66	57.6	10	----	54.1	3.5	8	-4.5
30	58	1	0	58	66	58	10	----	55.3	2.7	8	-5.3
31	59	1	0	59.6	66	59.6	10	----	58.5	1.1	8	-6.9
32	60	1	0	55.7	66	55.7	10	----	52.4	3.3	8	-4.7
33	61	1	0	56.4	66	56.4	10	----	54	2.4	8	-5.6
34	62	1	0	58.4	66	58.4	10	----	57.3	1.1	8	-6.9

NB-2_12 Foot

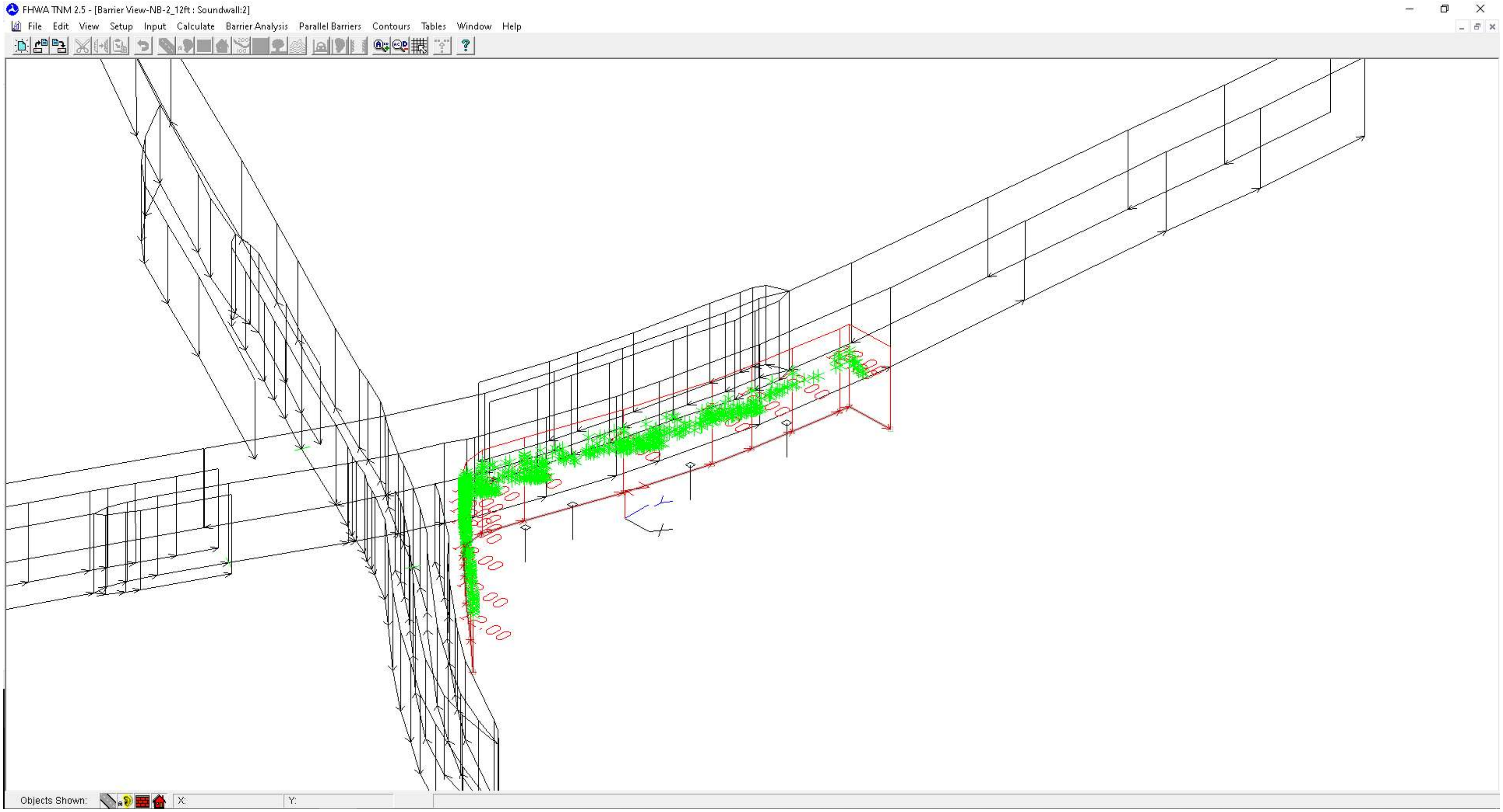
Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
8	36	1	0	70.2	66	70.2	10	Snd Lvl	57.9	12.3	8	4.3
9	37	1	0	70.2	66	70.2	10	Snd Lvl	58.6	11.6	8	3.6
10	38	1	0	71.3	66	71.3	10	Snd Lvl	60.1	11.2	8	3.2
11	39	1	0	71.7	66	71.7	10	Snd Lvl	60.6	11.1	8	3.1
12	40	1	0	64.8	66	64.8	10	----	60.9	3.9	8	-4.1
13	41	1	0	65	66	65	10	----	58.4	6.6	8	-1.4
14	42	1	0	59.2	66	59.2	10	----	56.6	2.6	8	-5.4
15	43	1	0	59.9	66	59.9	10	----	55.2	4.7	8	-3.3
16	44	1	0	61.3	66	61.3	10	----	56.1	5.2	8	-2.8
17	45	1	0	61.3	66	61.3	10	----	56.5	4.8	8	-3.2
18	46	1	0	63.4	66	63.4	10	----	59.2	4.2	8	-3.8
19	47	1	0	63.1	66	63.1	10	----	61.1	2	8	-6
20	48	1	0	58.1	66	58.1	10	----	55.2	2.9	8	-5.1
21	49	1	0	59.2	66	59.2	10	----	55.7	3.5	8	-4.5
22	50	1	0	59.4	66	59.4	10	----	54.9	4.5	8	-3.5
23	51	1	0	60.4	66	60.4	10	----	56.6	3.8	8	-4.2
24	52	1	0	61	66	61	10	----	59.4	1.6	8	-6.4
25	53	1	0	53.4	66	53.4	10	----	50.8	2.6	8	-5.4
26	54	1	0	56.1	66	56.1	10	----	53.4	2.7	8	-5.3
27	55	1	0	55.2	66	55.2	10	----	51.8	3.4	8	-4.6
28	56	1	0	56.9	66	56.9	10	----	53.3	3.6	8	-4.4
29	57	1	0	57.6	66	57.6	10	----	53.7	3.9	8	-4.1
30	58	1	0	58	66	58	10	----	54.9	3.1	8	-4.9
31	59	1	0	59.6	66	59.6	10	----	58.4	1.2	8	-6.8
32	60	1	0	55.7	66	55.7	10	----	52	3.7	8	-4.3
33	61	1	0	56.4	66	56.4	10	----	53.7	2.7	8	-5.3
34	62	1	0	58.4	66	58.4	10	----	57.2	1.2	8	-6.8

NB-2_14 Foot

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
8	36	1	0	70.2	66	70.2	10	Snd Lvl	56.9	13.3	8	5.3
9	37	1	0	70.2	66	70.2	10	Snd Lvl	57.7	12.5	8	4.5
10	38	1	0	71.3	66	71.3	10	Snd Lvl	59.3	12	8	4
11	39	1	0	71.7	66	71.7	10	Snd Lvl	60	11.7	8	3.7
12	40	1	0	64.8	66	64.8	10	----	60.8	4	8	-4
13	41	1	0	65	66	65	10	----	58.2	6.8	8	-1.2
14	42	1	0	59.2	66	59.2	10	----	56.5	2.7	8	-5.3
15	43	1	0	59.9	66	59.9	10	----	55	4.9	8	-3.1
16	44	1	0	61.3	66	61.3	10	----	55.9	5.4	8	-2.6
17	45	1	0	61.3	66	61.3	10	----	56.3	5	8	-3
18	46	1	0	63.4	66	63.4	10	----	59.1	4.3	8	-3.7
19	47	1	0	63.1	66	63.1	10	----	61	2.1	8	-5.9
20	48	1	0	58.1	66	58.1	10	----	55.1	3	8	-5
21	49	1	0	59.2	66	59.2	10	----	55.6	3.6	8	-4.4
22	50	1	0	59.4	66	59.4	10	----	54.7	4.7	8	-3.3
23	51	1	0	60.4	66	60.4	10	----	56.4	4	8	-4
24	52	1	0	61	66	61	10	----	59.4	1.6	8	-6.4
25	53	1	0	53.4	66	53.4	10	----	50.7	2.7	8	-5.3
26	54	1	0	56.1	66	56.1	10	----	53.3	2.8	8	-5.2
27	55	1	0	55.2	66	55.2	10	----	51.7	3.5	8	-4.5
28	56	1	0	56.9	66	56.9	10	----	53.2	3.7	8	-4.3
29	57	1	0	57.6	66	57.6	10	----	53.6	4	8	-4
30	58	1	0	58	66	58	10	----	54.8	3.2	8	-4.8
31	59	1	0	59.6	66	59.6	10	----	58.3	1.3	8	-6.7
32	60	1	0	55.7	66	55.7	10	----	51.8	3.9	8	-4.1
33	61	1	0	56.4	66	56.4	10	----	53.6	2.8	8	-5.2
34	62	1	0	58.4	66	58.4	10	----	57.1	1.3	8	-6.7

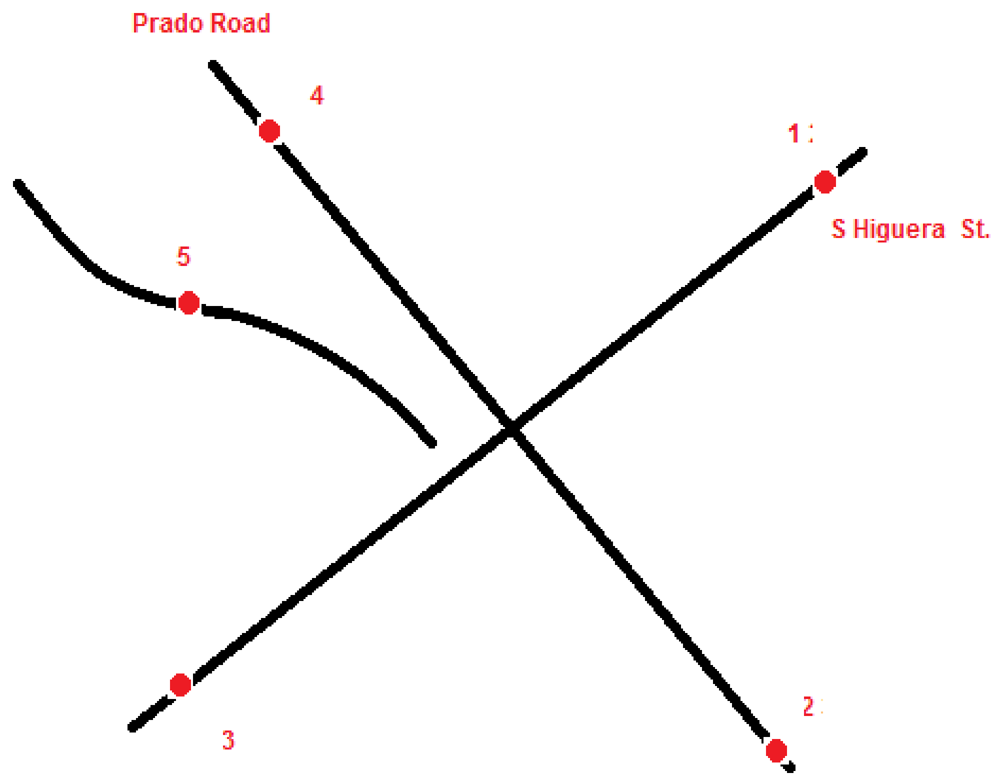
NB-2_16 Foot

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
8	36	1	0	70.2	66	70.2	10	Snd Lvl	56	14.2	8	6.2
9	37	1	0	70.2	66	70.2	10	Snd Lvl	57.1	13.1	8	5.1
10	38	1	0	71.3	66	71.3	10	Snd Lvl	58.6	12.7	8	4.7
11	39	1	0	71.7	66	71.7	10	Snd Lvl	59.2	12.5	8	4.5
12	40	1	0	64.8	66	64.8	10	----	60.7	4.1	8	-3.9
13	41	1	0	65	66	65	10	----	58	7	8	-1
14	42	1	0	59.2	66	59.2	10	----	56.4	2.8	8	-5.2
15	43	1	0	59.9	66	59.9	10	----	54.8	5.1	8	-2.9
16	44	1	0	61.3	66	61.3	10	----	55.8	5.5	8	-2.5
17	45	1	0	61.3	66	61.3	10	----	56.2	5.1	8	-2.9
18	46	1	0	63.4	66	63.4	10	----	59	4.4	8	-3.6
19	47	1	0	63.1	66	63.1	10	----	61	2.1	8	-5.9
20	48	1	0	58.1	66	58.1	10	----	55	3.1	8	-4.9
21	49	1	0	59.2	66	59.2	10	----	55.5	3.7	8	-4.3
22	50	1	0	59.4	66	59.4	10	----	54.6	4.8	8	-3.2
23	51	1	0	60.4	66	60.4	10	----	56.3	4.1	8	-3.9
24	52	1	0	61	66	61	10	----	59.3	1.7	8	-6.3
25	53	1	0	53.4	66	53.4	10	----	50.6	2.8	8	-5.2
26	54	1	0	56.1	66	56.1	10	----	53.2	2.9	8	-5.1
27	55	1	0	55.2	66	55.2	10	----	51.6	3.6	8	-4.4
28	56	1	0	56.9	66	56.9	10	----	53.1	3.8	8	-4.2
29	57	1	0	57.6	66	57.6	10	----	53.5	4.1	8	-3.9
30	58	1	0	58	66	58	10	----	54.7	3.3	8	-4.7
31	59	1	0	59.6	66	59.6	10	----	58.3	1.3	8	-6.7
32	60	1	0	55.7	66	55.7	10	----	51.7	4	8	-4
33	61	1	0	56.4	66	56.4	10	----	53.5	2.9	8	-5.1
34	62	1	0	58.4	66	58.4	10	----	57.1	1.3	8	-6.7


FHWA TNM 2.5 - [Barrier View-NB-2_12ft : Soundwall:2]
File Edit View Setup Input Calculate Barrier Analysis Parallel Barriers Contours Tables Window Help
Objects Shown:
X:
Y:

Appendix D Supplemental Data

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



Location ID	1	2	3	4	5
Start Time	9:24 a.m.	7:51 a.m.	8:47 a.m.	9:09 a.m.	8:30 a.m.
Calibration Time	9:24 a.m.	7:51 a.m.	8:45 a.m.	9:08 a.m.	8:29 a.m.
Temperature	60.4	54.5	57.2	60.4	55.4
Wind Speed	5.8	2.2	4.7	5.8	6.3
Wind Direction	NNW	WSW	WSW	WSW	WSW
Sky Condition	S40%	C85%	C65%	S40%	C60%
Traffic Counts	49A/110	65A/26	90A/78	45A/35	-

Location ID	1	2	3	4	5
Start Time	10:50 a.m.	9:41 a.m.	10:00 a.m.	10:33 a.m.	10:19 a.m.
Calibration Time	10:48 a.m.	9:41 a.m.	10:00 a.m.	10:32 a.m.	10:18 a.m.
Temperature	63.9	57.6	61.2	61.5	60.4
Wind Speed	1.6	6.3	7.4	1.6	4.7
Wind Direction	SW	NW	NW	WNW	W
Sky Condition	S30%	S40%	S40%	S15%	S30%
Traffic Counts	91A/108	23A/19	92A/80	55A/24	-

Note: S: Sunny, C: Cloudy, % Area covered with Clouds

ST-1 (3281 South Higuera Street)

ST-2 (183 Prado Road)

ST-3 (3440 South Higuera Street)

ST-4 (70 Prado Road)

ST-5 (Bob Jones Trail Bridge)