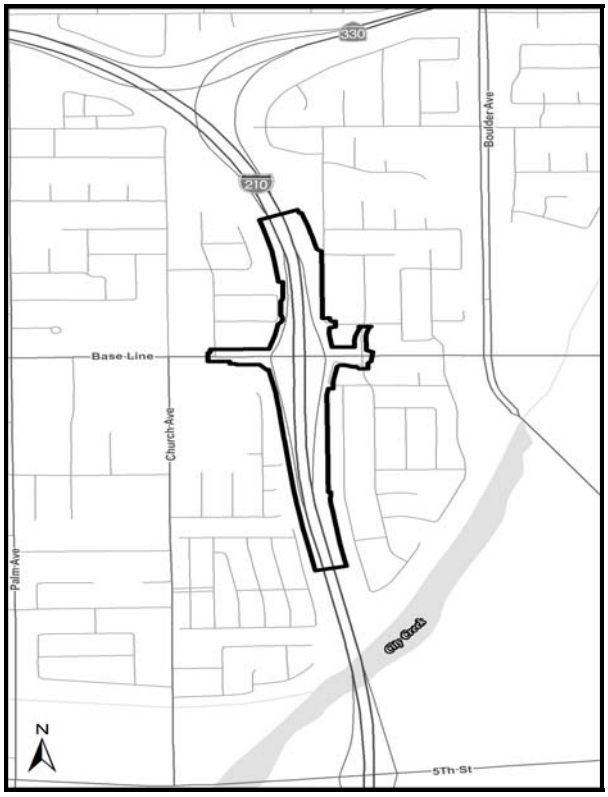


Noise Study Report

State Route 210/Base Line Interchange Improvement Project
City of Highland, County of San Bernardino, California

DISTRICT 8–SBD–210 (PM R28.3/R30.3)

EA 1C970

PN 0813000105

March 2016

This page intentionally left blank.

Noise Study Report

State Route 210/Base Line Interchange Improvement Project
City of Highland, County of San Bernardino, California

DISTRICT 8–SBD–210

EA 1C970

PN 0813000105

March 2016

Prepared by: _____ Date: March 17, 2016

Peter Hardie
Senior Acoustical Analyst
ICF International
949-333-6650

QA/QC Reviewed by: _____ Date: March 17, 2016

Jason Volk
Senior Acoustical Analyst
ICF International
206-801-2800

Approved by: _____ Date: March 17, 2016

Dave Buehler, P.E.
Senior Acoustical Engineer
ICF International
916-737-3000

Concurred by: Olufemi Odufalu Date: 03/24/16

Olufemi Odufalu, P.E.
Office Chief
Environmental Engineering
Oversight and Local Assistance
Caltrans, District 8
909-388-1095

This page intentionally left blank.

Summary

The San Bernardino Associated Governments, in cooperation with the California Department of Transportation (Caltrans), District 8, and the City of Highland, proposes to improve the State Route 210 (SR-210)/Base Line interchange in the City of Highland, San Bernardino County, California. Specifically, the project would widen Base Line from Buckeye Street to Seine Avenue, including the Base Line overcrossing on SR-210 between post mile (PM) R28.3 and PM R30.3, The Project also includes widening three of the four existing SR-210 interchange ramps (including widening the westbound on- and off-ramps from two to three lanes and the eastbound on-ramp from two to three lanes) and improvements at the ramp terminal intersections. The purpose of the project is to reduce congestion and improve operational efficiency at the interchange and throughout the Base Line corridor.

The purpose of this noise study report is to evaluate noise impacts and, if necessary, abatement related to construction and operation of the SR-210/Base Line Interchange Improvement Project under the requirements of the Code of Federal Regulations, Title 23, Part 772, Procedures for Abatement of Highway Traffic Noise. A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts resulting from the proposed project. Single-family residences were identified as Activity Category B land uses in the project area. Outdoor use areas associated with a place of worship or a park were identified as Activity Category C land uses. Commercial (Activity Category F) and undeveloped (Activity Category G) land uses in the project area would not be subject to noise impacts.

Traffic noise levels were predicted using the Federal Highway Administration (FHWA) Traffic Noise Model, version 2.5. Existing worst-hour traffic noise levels were found to range from 52 to 67 A-weighted decibels, hourly equivalent sound level (dBA L_{eq}[h]).

For the design year, traffic noise levels under the No Build and Build conditions are predicted to range from 54 to 68 dBA L_{eq}(h) under the No Build condition and 54 to 69 dBA L_{eq}(h) under the Build condition. The modeled receivers that are predicted to be 66–69 L_{eq}(h) during the design year No Build and Build conditions are at Activity Category F (M-21 and M-28) or Activity Category G (M-6 and M-11) land uses. Therefore, no impact would occur because there are no noise abatement criteria (NAC) for Activity Category F or G land uses. Traffic noise levels would not approach or exceed the NAC at any of the receivers identified in this analysis. Therefore, traffic noise impacts would not occur.

Pursuant to Caltrans and FHWA regulations and guidance, noise abatement must be considered for land uses where traffic noise impacts are predicted to occur. Because traffic noise impacts are not predicted to occur at any areas of frequent human use in the project area, noise abatement was not considered for this project.

During construction of the proposed project, noise from construction activities would intermittently dominate the noise environment in the immediate area of construction. Conventional construction equipment is expected to generate maximum noise levels that would range from 75 to 96 decibels (dB) at a distance of 50 feet. Noise from pile driving would generate a maximum noise level of approximately 96 dBA at a distance of 50 feet. Noise produced by construction equipment would diminish at a rate of about 6 dB per doubling of distance. No adverse noise impacts from construction are anticipated because construction activities would be conducted in accordance with the provisions in Caltrans Standard Specifications, Section 14-8.02, Noise Control, and applicable local noise standards. Furthermore, implementing the measures specified in Chapter 8 of this report would minimize temporary noise impacts from construction.

Table of Contents

Page

Summary ..... **S-i**

Chapter 1. **Introduction** **1**
1.1. Purpose of the Noise Study Report 1

Chapter 2. **Project Description** **3**
2.1. Purpose and Need 3
2.2. Existing Conditions 4
2.3. Project Description 4
2.3.1. No Build Alternative 13
2.3.2. Build Alternative 13

Chapter 3. **Fundamentals of Traffic Noise** **15**
3.1. Sound, Noise, and Acoustics 15
3.2. Frequency 15
3.3. Sound Pressure Levels and Decibels 15
3.4. Addition of Decibels 16
3.5. A-Weighted Decibels 16
3.6. Human Response to Changes in Noise Levels 17
3.7. Noise Descriptors 18
3.8. Sound Propagation 18
3.8.1. Geometric Spreading 18
3.8.2. Ground Absorption 19
3.8.3. Atmospheric Effects 19
3.8.4. Shielding by Natural or Human-Made Features 19

Chapter 4. **Federal Regulations and State Policies** **21**
4.1. Federal Regulations 21
4.1.1. 23 CFR 772 21
4.2. State Regulations and Policies 23
4.2.1. California Environmental Quality Act (CEQA) 23
4.2.2. Section 216 of the California Streets and Highways Code 23

Chapter 5. **Study Methods and Procedures** **25**
5.1. Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receptor Locations 25
5.2. Field Measurement Procedures 25
5.2.1. Short-Term Measurements 25
5.2.2. Long-Term Measurements 26
5.3. Traffic Noise Levels Prediction Methods 26
5.4. Methods for Identifying Traffic Noise Impacts and Consideration of Abatement 30

Chapter 6. **Existing Noise Environment** **33**
6.1. Existing Land Uses 33
6.2. Noise Measurement Results 33
6.2.1. Short-Term Monitoring 33

6.2.2. Long-Term Monitoring 33
6.2.3. Traffic Noise Model Calibration 40
6.2.4. Existing Modeled Noise Levels 41

Chapter 7. **Future Noise Environment, Impacts, and Considered Abatement 43**
7.1. Future Noise Environment and Impacts 43

Chapter 8. **Construction Noise 45**

Chapter 9. **References 49**

Appendices

Appendix A Traffic Data

Appendix B Predicted Future Noise Levels and Noise Barrier Analysis

Appendix C Supplemental Data

C-1 List of Field Instrumentation and Calibration Records

C-2 Field Data Sheets

C-3 Field Photos

C-4 TNM® Files: Input/Output Sheets and Model Files

Appendix D Traffic Impact Analysis

List of Figures

Figure **Page**

2-1 Regional Vicinity Map 5
2-2 Project Location Map 7
2-3 Sheet 1, Project Layout Map 9
2-3 Sheet 2, Project Layout Map 11
5-1 Noise Monitoring and Prediction Modeling Locations 27
6-1 Long-Term Monitoring at Location LT-3, December 4 to 5, 2012 39

List of Tables

Table **Page**

3-1 Typical A-Weighted Noise Levels 17
4-1 Activity Categories and Noise Abatement Criteria 22
6-1 Summary of Short-Term Measurements 35
6-2 Summary of Long-Term Monitoring at Location LT-3 40
6-3 Comparison of Measured and Modeled Worst-Noise-Hour Sound Levels 41
8-1 Typical Construction Equipment Noise Levels 46

List of Abbreviated Terms

°F	degrees Fahrenheit
CAD	computer-aided design
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	community noise equivalent level
dB	decibel
dBA	A-weighted decibels
FHWA	Federal Highway Administration
FTIP	Federal Transportation Improvement Program
HOT	high-occupancy toll
HOV	high-occupancy vehicle
Hz	Hertz
I-10	Interstate 10
I-15	Interstate 15
I-215	Interstate 215
K-factors	calibration factors
kHz	Kilohertz
L_{dn}	day-night level
L_{eq}	equivalent sound level
$L_{eq}(h)$	hourly equivalent sound level
L_{max}	maximum sound level
L_{xx}	percentile-exceeded sound level
MFLA Project	State Route 210 Mixed-Flow Lane Addition Project
µPa	micropascals
mph	miles per hour
NAC	noise abatement criteria
NEPA	National Environmental Policy Act
NSR	noise study report
PM	post mile
Protocol	*Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects*
RTP	Regional Transportation Plan
SANBAG	San Bernardino Associated Governments
SCAG	Southern California Association of Governments
SPL	sound pressure level
SR-210	State Route 210
TCE	temporary construction easement
TeNS	Technical Noise Supplement
TNM	Traffic Noise Model

Chapter 1. Introduction

1.1. Purpose of the Noise Study Report

The San Bernardino Associated Governments (SANBAG), in cooperation with the California Department of Transportation (Caltrans), District 8, and the City of Highland (City), proposes to improve the State Route 210 (SR-210)/Base Line interchange in the City of Highland, San Bernardino County, California. Specifically, the project would widen Base Line from Buckeye Street to Seine Avenue, including widening the Base Line overcrossing, located on SR-210 between post mile (PM) R28.3 and PM R30.3. The project also includes widening three of the four existing interchange ramps and improvements at the ramp terminal intersections. The purpose of the proposed project is to reduce congestion and improve operational efficiency at the interchange and throughout the Base Line corridor.

The purpose of this noise study report (NSR) is to evaluate noise impacts and, if necessary, abatement related to construction and operation of the SR-210/Base Line Interchange Improvement Project under the requirements of the Code of Federal Regulations (CFR), Title 23, Part 772, Procedures for Abatement of Highway Traffic Noise. Specifically, 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.

The Caltrans *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (Protocol), dated May 2011, provides Caltrans policy for implementing 23 CFR 772 in California. The Protocol also outlines the requirements for preparing NSRs. Noise impacts associated with this project under the California Environmental Quality Act (CEQA) are evaluated separately in the project's environmental document [insert name of environmental document and provide reference.

This page intentionally left blank.

Chapter 2. Project Description

SANBAG, in cooperation with Caltrans, District 8 and the City of Highland, proposes to widen three of the four existing on- and off-ramps at the SR-210/Base Line interchange and add or reconfigure lanes on the Base Line overpass and at nearby intersections. The widening would occur on Base Line between Buckeye Street and Seine Avenue and on SR-210 between PM R28.3 and PM R30.3. All work would occur within the existing Caltrans right of way and temporary construction easements. Figures 2-1 and 2-2 provide the regional vicinity map and the project location map, respectively.

The proposed project is included in the Southern California Association of Governments (SCAG) 2012 Regional Transportation Plan (RTP), Amendment #1, which was adopted by SCAG on June 12, 2013, and approved by FHWA on July 15, 2013, and the 2013 Federal Transportation Improvement Program (FTIP), Amendment #13-19, adopted by SCAG on June 16, 2014, and approved by FHWA on July 17, 2014. Both SCAG 2012 RTP Amendment #1 and SCAG 2013 FTIP Amendment #13-19 include the proposed project as 2012 RTP project number REG0701 and 2013 FTIP project number 201186. In addition, the project is included in the SCAG 2012 RTP Amendment #2 approved by SCAG on September 11, 2014 and SCAG's 2015 FTIP (RTP ID #REG0701 and FTIP ID #201186). The 2015 FTIP was adopted by SCAG on September 11, 2014 and approved for air quality conformity by FHWA on December 15, 2014. It includes all federally funded and regionally significant projects.

2.1. Purpose and Need

The purpose of the proposed project is to improve operations and reduce congestion at an existing interchange in the City. This area of southwestern San Bernardino County has grown significantly over the past 10 years and is experiencing continued population and employment growth. In particular, commercial and residential development is occurring along Base Line near SR-210, and new retail centers are planned for vacant land northwest and northeast of the interchange. The SR-210/Base Line interchange is an important component of the City's traffic circulation system. By 2040, traffic volumes on Base Line and at the interchange ramps will increase substantially. The increasing demand for freeway access at Base Line is causing, and will continue to cause, congestion at ramp terminal intersections and along the segment of Base Line at the interchange. Delays will increase at both of the ramp terminal intersections at Base Line under future-year conditions.

The purpose of the proposed project is to:

- Reduce congestion and improve operational efficiency at the SR-210/Base Line interchange and along the Base Line corridor.

2.2. Existing Conditions

The SR-210/Base Line interchange serves growing residential and commercial development in the City. SR-210 is an east/west freeway, and it travels in a generally northwest/southeast direction, diagonally through the western portion of the City. To the north and west, SR-210 continues through San Bernardino County and is the link to the Interstate 215 (I-215) and Interstate 15 (I-15) freeways and State Routes 18 and 57, and the greater Los Angeles area. To the south, SR-210 continues through San Bernardino County and connects to the Interstate 10 (I-10) freeway. Adjacent interchanges exist on SR-210 at State Route 330 to the north and at 5th Street–Greenspot Road to the south.

SR-210 in San Bernardino County is included in the National Highway System, the California Freeway and Expressway System, and the "12 foot Wide Arterial System." SR-210, within the project limits, is classified as a Principal Arterial highway.

The City of Highland General Plan Circulation Element designates Base Line within the limits of the project as a Primary Arterial. Within the study area, Base Line is designated as a Truck Route with a Class II Bike Lane (on-street) in the City of Highland General Plan. The existing Base Line overcrossing consists of two lanes in each direction plus westbound and eastbound double left-turn lanes.

2.3. Project Description

This section describes the proposed action and the design alternative that was developed by a multi-disciplinary team to achieve the project purpose and need while avoiding or minimizing environmental impacts. For the proposed project, one Build Alternative and a No Build Alternative are being considered.

The proposed project would widen Base Line from Buckeye Street to Seine Avenue and also widen the existing SR-210 interchange ramps; refer to Figure 2-3, *Project Layout Map*. Within the limits of the proposed project, Base Line is generally a four-lane arterial with turn lanes at intersections.

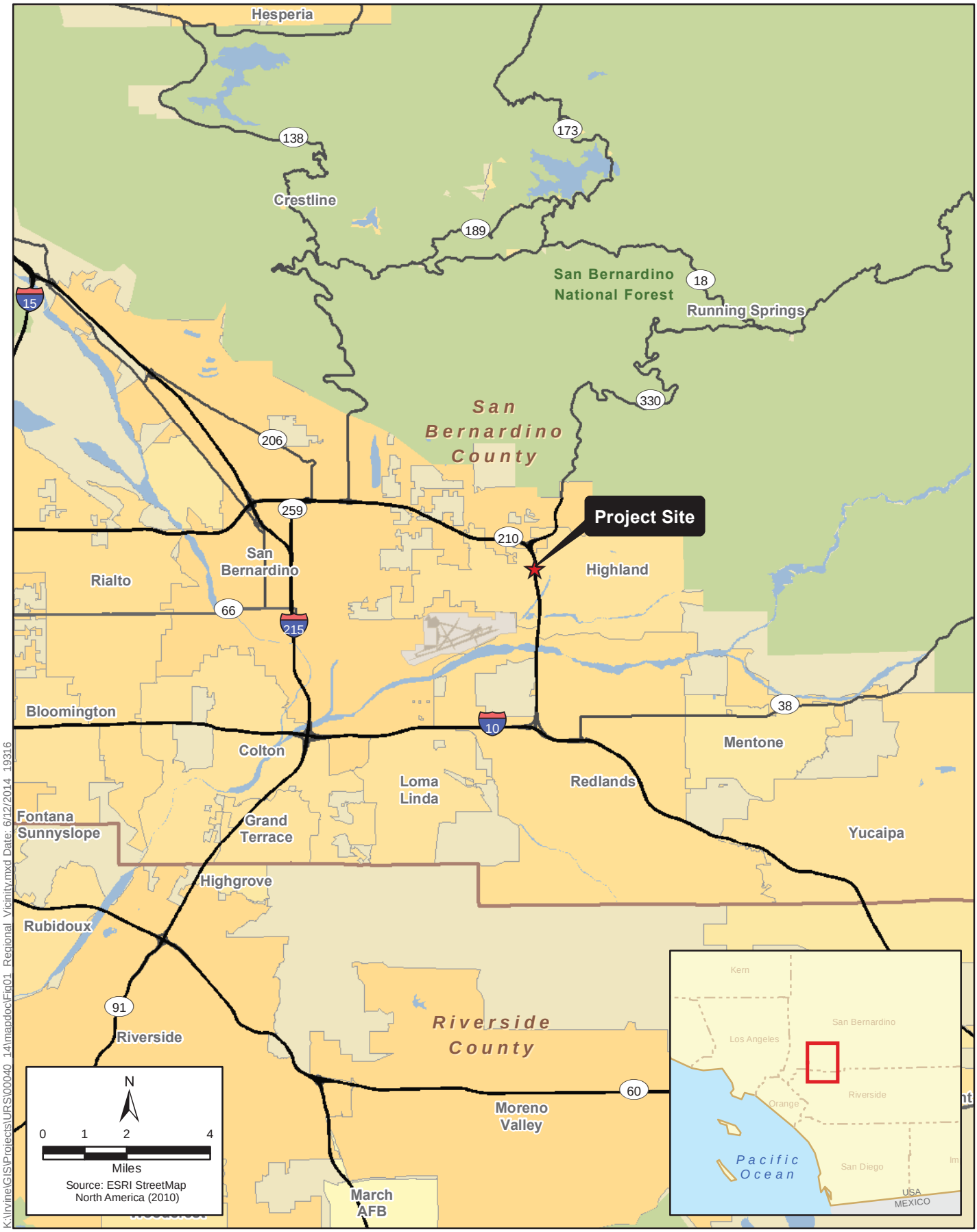


Figure 2-1
Regional Vicinity Map
SR-210/Base Line Interchange Project

This page intentionally left blank.

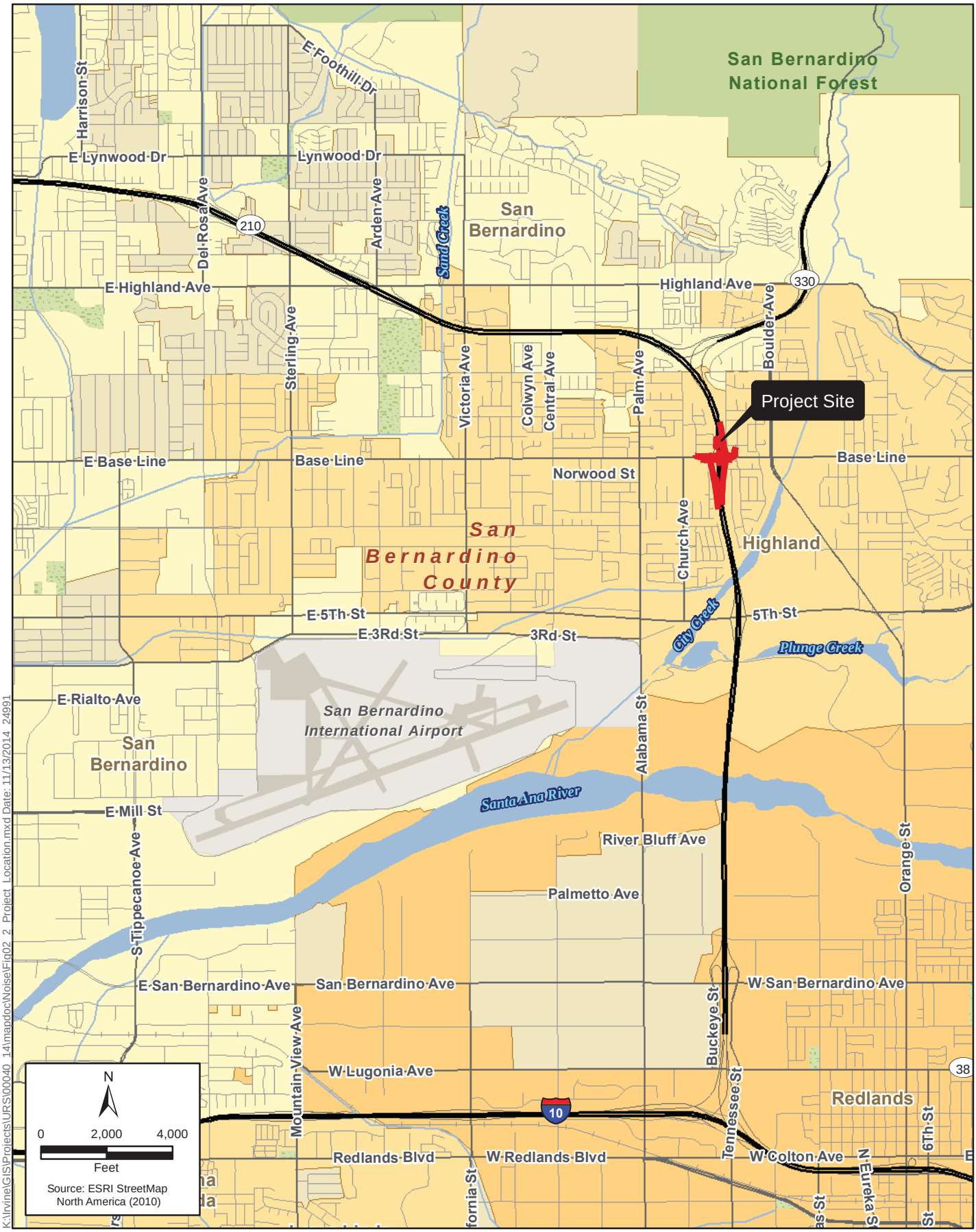
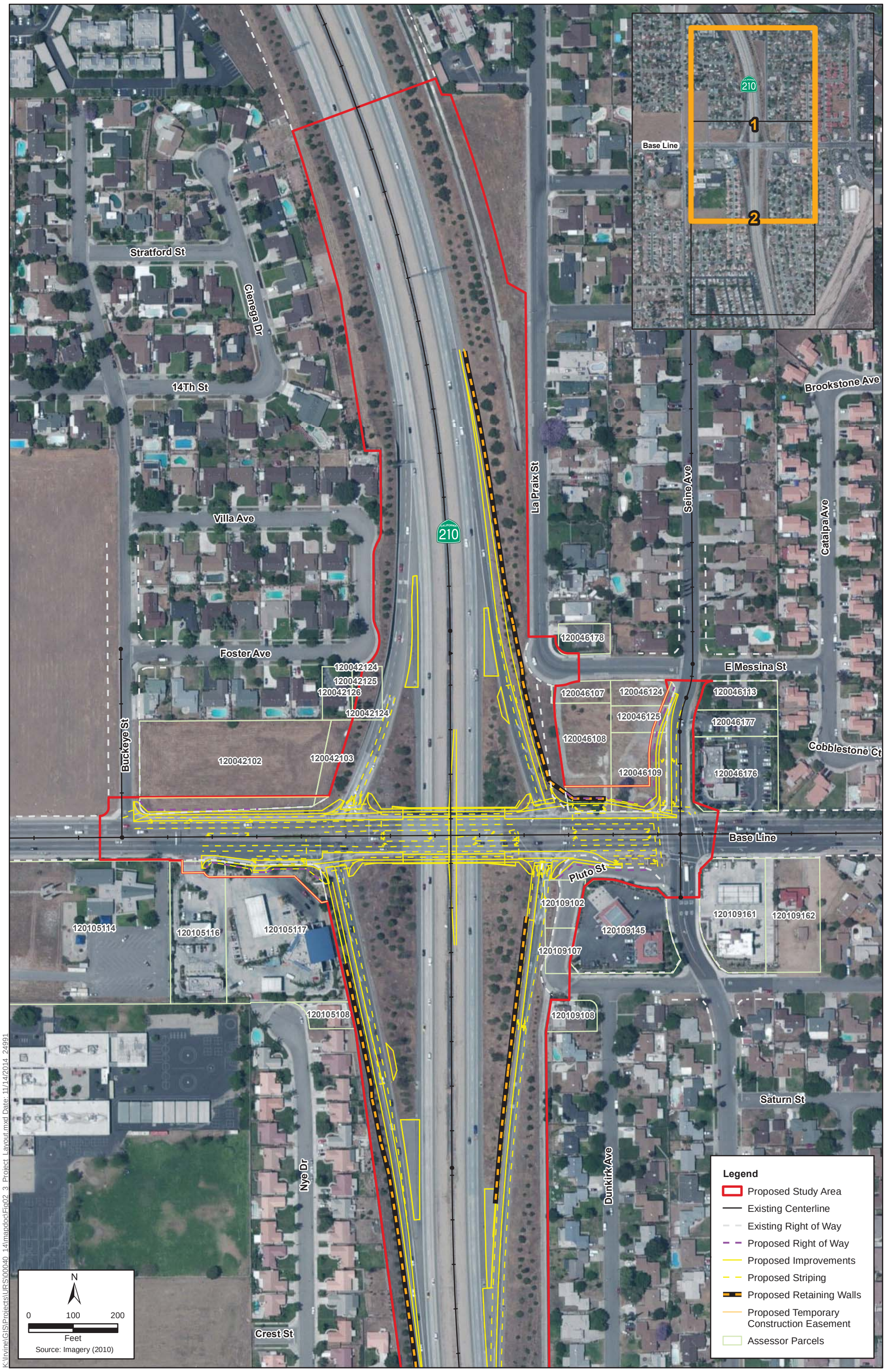


Figure 2-2
Project Location Map
SR-210/Base Line Interchange Project

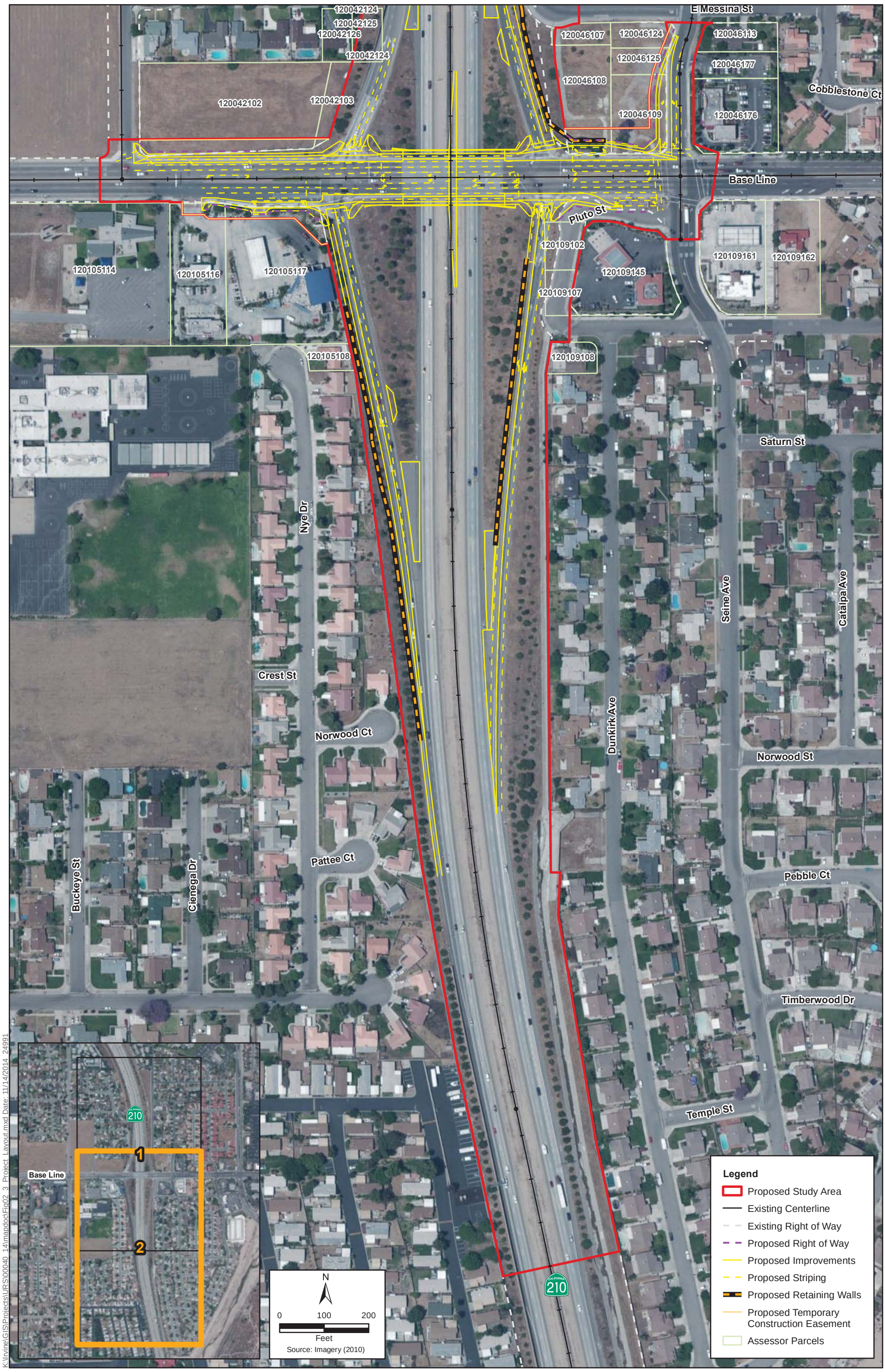
This page intentionally left blank.



K:\Irvine\GIS\Projects\URS00040_14\mapdoc\Fig02_3_Project_Layout.mxd Date: 11/14/2014 24991

Figure 2-3 - Sheet 1
Project Layout Map
SR-210/Base Line Interchange Project

This page intentionally left blank.



K:\Irvine\GIS\Projects\URS\00040_14\mapdoc\Fig02_3_Project_Layout.mxd Date: 11/14/2014 24991

Figure 2-3 - Sheet 2
Project Layout Map
SR-210/Base Line Interchange Project

This page intentionally left blank.

2.3.1. No Build Alternative

Under the No Build Alternative, Base Line would not be widened through the interchange, and improvements to the existing ramps would not occur. Segments of Base Line west (Church Avenue to Buckeye Street) and east (Seine Avenue to Boulder Highway) of the interchange project limits could still be widened by the City.

2.3.2. Build Alternative

The proposed Build Alternative would reconstruct and improve the existing diamond interchange by widening Base Line as well as three of the four interchange ramps within the limits of the project. These three ramps may be reconstructed or rehabilitated depending on the condition of the existing pavement at the time of construction.

The proposed Build Alternative includes the following design features and elements.

- Base Line between Buckeye Street and Seine Avenue and the interchange ramps would be widened to add through lanes, turn lanes, and storage for vehicle queues.
- Existing pavement adjacent to pavement widening would be rehabilitated or reconstructed, as needed.
- A two-lane exit would be created at the westbound exit ramp.
- The entrance ramps would be widened to accommodate high-occupancy vehicle preferential lanes.
- The existing Base Line overcrossing would be widened to accommodate the new lanes.
- Retaining walls would be constructed, as needed, in areas of widening.
- The proposed project would require the acquisition of new permanent right of way, and temporary construction easements (TCEs) would be needed during the construction period to facilitate access to the construction work areas.
- Drainage system improvements would be constructed to handle stormwater runoff.
- Ramp metering would be installed on the entrance ramps at the interchange.
- Utilities would be relocated, as needed, to accommodate the improved facility.
- TCEs would be needed along Base Line during the construction period.

This page intentionally left blank.

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, which is available on the 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.

3.2. 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.

3.3. 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 micropascals (μPa). One μPa 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 μPa. Because of this huge range of values, sound is rarely expressed in terms of μPa. 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 μPa.

3.4. 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.

3.5. 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 1,000 feet		
	— 100 —	
Gas lawnmower 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 lawnmower at 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
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: Caltrans 2013.

3.6. 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 from 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.

3.7. 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.

3.8. 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 factors listed below.

3.8.1. 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.

3.8.2. 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.

3.8.3. 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.

3.8.4. 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.

This page intentionally left blank.

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 that 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 National Environmental Policy

Act (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.

Table 4-1. Activity Categories and Noise Abatement Criteria

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.

This page intentionally left blank.

Chapter 5. Study Methods and Procedures

5.1. Methods for Identifying Land Uses and Selecting Noise Measurement and Modeling Receptor Locations

A field investigation was conducted to identify land uses that could be subject to traffic and construction noise impacts from the proposed project. Land uses in the project area were categorized by land use type; Activity Category, as defined in Table 4-1; and the extent of frequent human use. Although all developed land uses are evaluated in this analysis, as stated in the Protocol, the focus of this impact analysis is on locations of frequent human use that would benefit from a lowered noise level, such as locations with defined outdoor activity areas. For this project, the potentially affected noise-sensitive uses with defined outdoor activity areas consist of the backyards of residential land uses. The noise monitoring and modeling locations are shown in Figure 5-1.

Short-term measurement locations were selected to represent frequent outdoor use areas along the project alignment. Additionally, a long-term measurement was conducted to capture the day/night traffic noise level patterns in the project area. Short-term and long-term measurement locations were also used as noise prediction model locations. Additional locations were selected as prediction sites to characterize the noise environment at frequent outdoor use areas along the project alignment.

5.2. Field Measurement Procedures

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

5.2.1. Short-Term Measurements

Short-term monitoring was conducted at nine locations along the project alignment on December 4 and 5, 2012; January 31, 2013; and November 6, 2013, using a Larson Davis Type 1 (precision grade) sound-level meter. The measurements were conducted at Activity Category B and F land uses. The short-term measurement locations are identified in Figure 5-1. Short-term measurements were attended by field staff to count traffic and record observations concurrent with the measurements. Traffic speeds were obtained by driving the alignments during and after when measurements were being taken to gauge the flow of traffic, as is consistent with the TeNS. Traffic speeds are presented in table 6-1 below and generally shows that heavy trucks exceeded the 55 mph speed limit. During the time when field measurements were being taken, all efforts were made to take short-term measurements at areas of frequent human use. In some

cases, these areas could not be accessed because of access constraints such as homeowners not being home or not allowing access. In this case, short-term measurements were taken at acoustically equivalent locations, as is consistent with the TeNS. The L_{eq} values collected during each measurement period (10 minutes in duration) were automatically recorded with digital integrating sound-level meters and subsequently logged manually on field data sheets for each measurement location. Dominant noise sources observed and other relevant measurement conditions were identified and logged manually on the field data sheets. The calibration of the meter was checked before and after the measurement using a Larson-Davis Model CAL 200 calibrator.

Temperature, wind speed, and humidity were recorded manually during the short-term monitoring sessions using a Kestrel 3000 portable weather station. During the short-term measurements, wind speeds typically ranged from 0 to 3 miles per hour (mph). Temperatures ranged from 64 degrees Fahrenheit (°F) to 75°F, with relative humidity ranging from 38 to 64 percent.

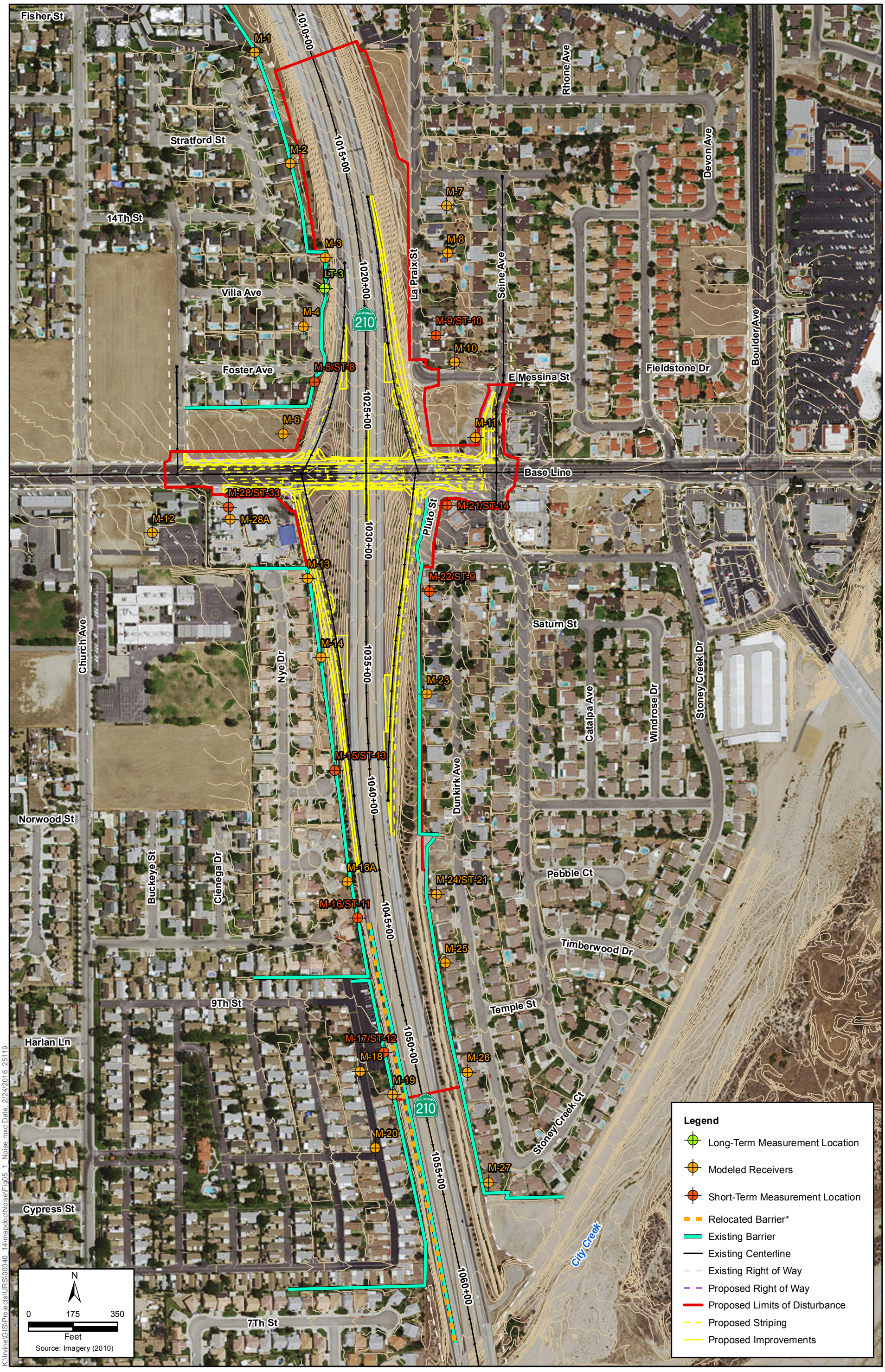
5.2.2. Long-Term Measurements

Long-term monitoring was conducted at one location (LT-3) using a Rion Model NL-22 sound-level meter. The purpose of the measurement was to identify the traffic noise pattern throughout a typical day/night cycle. Sound level data at site LT-3 were collected over a time period of 24 hours, beginning December 4, 2012, and ending December 5, 2012.

Long-term noise monitoring location LT-3 is shown in Figure 5-1. LT-3 was located on Villa Avenue, off of Buckeye Street. The sound-level meter was located approximately 50 feet from the edge of the eastbound SR-210 off-ramp shoulder. The SR-210 alignment was below grade relative to the site. Ambient noise at the site was dominated by traffic noise on SR-210.

5.3. Traffic Noise Levels Prediction Methods

Traffic noise levels were predicted using the FHWA Traffic Noise Model (TNM), version 2.5. The TNM computer model is based on two FHWA reports: FHWA-PD-96-009 and FHWA-PD-96-010 (FHWA 1998a; FHWA 1998b). Key inputs to the traffic noise model were the locations of roadways, shielding features (e.g., topography and buildings), noise barriers, and receivers as well as ground type. Three-dimensional representations of these inputs were developed using computer-aided design (CAD) drawings, aerials, and topographic contours provided by the project engineer.



* Relocated barrier only relocated by other Project under the no build and build conditions.

Figure 5-1
Noise Monitoring and Modeling Locations SR-210/ Base Line Interchange Project

This page intentionally left blank.

Traffic volume data for the project were gathered from the *Traffic Operations Analysis Report, State Route 210 (SR-210) at Base Line (PM R28.3/R30.3) in the City of Highland* (URS 2014a). The traffic report includes traffic volume data for local roads and ramps under existing (2013) and design-year (2040) No Build and Build conditions. The SR-210/Base Line Interchange Improvement Project includes a segment of SR-210 from the State Route 210 Mixed-Flow Lane Addition Project (MFLA Project). Therefore, the noise analysis uses traffic volumes from the *Traffic Operations Analysis Report for SR-210 Mixed Flow Lane Addition from Highland Avenue (PM R25.0) to San Bernardino Avenue (PM R33.2) in the County of San Bernardino* (URS 2014b). One local roadway volume was not included in either traffic study (La Praix Street). This traffic volume was obtained from the *MFLA Noise Study Report Traffic Volume Memo*. The traffic volume memo is included on the CD attached to this document. The tables in Appendix A (Traffic Data) summarize the traffic volumes used for modeling and design-year No Build and Build conditions. Speed limits included in the TNM modeling were modeled at the posted speed limit of 65 mph for automobiles and medium trucks and 55 mph for heavy trucks.

The loudest hour is generally characterized by high-volume but free-flowing traffic that travels at the highway design speed (i.e., LOS C/D or better). An additional general-purpose lane in each direction, associated with the SR-210 MFLA Project, would improve to an LOS great than LOS C/D. Therefore, for the purposes of this analysis, the actual volumes from the *Traffic Operations Analysis Report for SR-210 Mixed-Flow Lane Addition from Highland Avenue* were used in the TNM modeling, as described below. For this analysis, it was assumed that all on-ramps along the SR-210 facility will be metered in the future. Because all future on-ramps within the modeled area will be metered and reduced to one lane, any traffic volume along any on-ramp that exceeded 900 vehicles was capped at 900 vehicles.

Traffic noise was evaluated under existing conditions, design-year (2040) No Build conditions, and design-year Build conditions. Traffic volumes from the project traffic study during the PM peak hour were used to model design-year No Build and Build traffic volumes for ramps and local streets because PM peak-hour traffic volumes were generally higher than AM volumes. The volumes taken from the traffic report are included in Appendices A1–A3 of this document, and both Traffic Operations Analysis Reports are included on the CD appended to this document.

For volumes along the eastbound mainline, the mainline volume to the north of the project alignment (included in the Traffic Operations Analysis Report for the MFLA Project) was modeled up to the divergence of the eastbound off-ramp to Base Line. From that point, the traffic volumes included in the Traffic Operations Analysis Report for SR-210 at Base Line were subtracted from the mainline volume and modeled on the mainline and ramps, respectively. At the convergence of the eastbound on-ramp from Base Line, the on-ramp volumes were added to

the mainline volumes to obtain the mainline volume south of the ramps. The same methodology was used for the westbound lanes to obtain the respective volumes. The existing vehicle mix (i.e., percent autos, percent medium trucks, percent heavy trucks) for the mainline is consistent with that of the MFLA Project. The vehicle mix for Base Line and other local roadways was obtained from the *MFLA Noise Study Report Traffic Volume Memo*, which is included in the CD attached to this document. The mainline vehicle mix was used for SR-210 off-ramps, and the Base Line vehicle mix was used for on-ramps.

The ultimate corridor for SR-210 within the project limits is an eight-lane freeway facility (six mixed-flow lanes and two HOV lanes); this project is programmed for construction prior to 2040. However, the TNM modeling, under the design-year 2040 condition, does not include the HOV lanes.

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

Traffic noise impacts occur at receiver locations where predicted design-year noise levels approach or exceed the NAC for the applicable activity category or where substantial noise increases above existing noise levels under the Build or No Build condition would occur. 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 is predicted for at least one affected receiver with implementation of the abatement measures. Any receiver that is predicted to receive 5 dB or more of noise reduction from an abatement measure is identified as a “benefited” receiver. In addition, barriers should be designed to intercept the line of sight from the exhaust stack of a truck to the first tier of receivers, as stated in the Caltrans *Highway Design Manual*, Chapter 1100 (Caltrans 2012). Other factors that affect feasibility include topography, access requirements for driveways and ramps, the 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 three factors:

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

To meet the noise reduction design goal, a barrier must provide at least 7 dB of noise reduction at one or more benefited receivers. This design goal applies to any receiver and is not limited to affected receivers.

The Protocol defines the procedure for assessing the reasonableness of noise barriers from a cost perspective. A cost-per-residence allowance is calculated for each benefited receptor (i.e., residences that receive at least 5 dB of noise reduction from a noise barrier). The allowance currently is $80,000 per benefited residence. Total allowances are calculated by multiplying the cost per residence by the number of benefited residences.

This page intentionally left blank.

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 SR-210/Base Line Interchange Improvement Project alignment includes residential (Activity Category B), park and place-of-worship (Activity Category C), commercial (Activity Category F), and undeveloped (Activity Category G) land uses. Noise abatement is 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 backyard areas, parks, and facilities such as places of worship with associated outdoor use areas.

6.2. Noise Measurement Results

The existing noise environment, characterized below, is based on the short- and long-term noise monitoring that was conducted along SR-210 in the project area.

6.2.1. Short-Term Monitoring

Table 6-1 summarizes the results of short-term noise monitoring. Table 6-1 lists the receptor name; address; land use/activity category; measurement start time, date, and duration; and measured L_{eq} value. The naming convention for short-term measurement sites is consistent with that of the MFLA Project. The short-term monitoring locations are shown in Figure 5-1.

Short-term noise measurements and respective traffic counts were conducted to characterize the noise environment adjacent to SR-210 and calibrate the TNM model calculations, using traffic that was counted concurrently with the measurements. Traffic on SR-210 was observed to be the dominant source of noise at all short-term measurement sites. Traffic speeds were obtained in the field by driving the alignment as discussed above.

6.2.2. Long-Term Monitoring

Long-term monitoring was conducted at one location (LT-3). The purpose of the long-term noise measurement was to determine the changes in noise levels within the project area throughout a typical day. Long-term sound-level data were collected from Wednesday, December 4, 2012, to Thursday, December 5, 2012.

Long-term monitoring site LT-3 is located at 27640 Villa Avenue, in a single-family residential neighborhood adjacent to the southbound SR-210 right of way. The loudest-hour noise level measured, between 8 and 9 a.m., was 63 dBA L_{eq}(h).

This page intentionally left blank.

Table 6-1. Summary of Short-Term Measurements

Receptor	Address	Land Uses/ Activity Category	Start Date/Time	Duration	L_{eq}	Direction	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles
ST-8	27631 Foster Avenue, Highland	Single-Family Residential/B	12/4/2012 11:55 a.m.	10:00	59.7	—	—	—	—	—	—
			12/4/2012 12:05 p.m.	10:00	58.8	EB SR-210 Ln1	735 (65 mph)	12 (65 mph)	42 (60 mph)	—	3 (65 mph)
						EB SR-210 Ln2	735 (65 mph)	12 (65 mph)	42 (60 mph)	—	3 (65 mph)
						WB SR-210 Ln1	927 (65 mph)	24 (65 mph)	42 (60 mph)	—	—
						WB SR-210 Ln2	927 (65 mph)	24 (65 mph)	42 (60 mph)	—	—
						EB off-ramp	162 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	—	6 (mainline speed down to 10 mph)
						EB on-ramp	222 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	—	—
						WB on-ramp	204 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	—	—
						WB off-ramp	260 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	—	—
ST-9[1]	7374 Dunkirk Avenue, Highland	Single-Family Residential/B	12/4/2012 12:05 p.m.	10:00	57.7	EB SR-210 Ln1	735 (65 mph)	12 (65 mph)	42 (60 mph)	—	3 (65 mph)
						EB SR-210 Ln2	735 (65 mph)	12 (65 mph)	42 (60 mph)	—	3 (65 mph)
						WB SR-210 Ln1	927 (65 mph)	24 (65 mph)	42 (60 mph)	—	—
						WB SR-210 Ln2	927 (65 mph)	24 (65 mph)	42 (60 mph)	—	—
						EB off-ramp	162 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	—	6 (mainline speed down to 10 mph)
						EB on-ramp	222 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	—	—
						WB on-ramp	204 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	—	—
						WB off-ramp	260 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	—	—
			12/4/2012 12:15 p.m.	5:00	58.1	—	—	—	—	—	—

[1] Measurements at locations ST-8 and ST-9 were conducted at the same time by two different analysts during field measurements. Because of external noise contamination (barking dogs), Run 1 of ST-9 was excluded from the analysis, and a third run was conducted at 12:15. Therefore, Run 2 for ST-8 and ST-9 was used for model calibration purposes and shows generally good agreement. The times for Run 2 at both measurement sites are the same as shown above, but the alternate measurement times are different.

Receptor	Address	Land Uses/ Activity Category	Start Date/Time	Duration	L_{eq}	Direction	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles
ST-10	7215 La Praix, Highland	Single-Family Residential/B	12/4/2012 2:35 p.m.	10:00	62	EB SR-210 Ln1	1,356 (65 mph)	12 (65 mph)	57 (60 mph)	15 (65 mph)	—
						EB SR-210 Ln2	1,356 (65 mph)	12 (65 mph)	57 (60 mph)	15 (65 mph)	—
						WB SR-210 Ln1	1,548 (65 mph)	18 (65 mph)	36 (60 mph)	6 (65 mph)	9 (65 mph)
						WB SR-210 Ln2	1,548 (65 mph)	18 (65 mph)	36 (60 mph)	6 (65 mph)	9 (65 mph)
						EB off-ramp	372 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	18 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	—
						WB on-ramp	492 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	—	6 (10 mph up to mainline speed)
						WB off-ramp	456 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)
						EB on-ramp	372 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	18 (10 mph up to mainline speed)	—	—
			12/4/2012 2:45 p.m.	10:00	62.3	—	—	—	—	—	—
ST-11	27650 Temple Street, Highland	Single-Family Residential/B	12/4/2012 2:35 p.m.	10:00	64.4	EB SR-210 Ln1	1,356 (65 mph)	12 (65 mph)	57 (60 mph)	15 (65 mph)	—
						EB SR-210 Ln2	1,356 (65 mph)	12 (65 mph)	57 (60 mph)	15 (65 mph)	—
						WB SR-210 Ln1	1,548 (65 mph)	18 (65 mph)	36 (60 mph)	6 (65 mph)	9 (65 mph)
						WB SR-210 Ln2	1,548 (65 mph)	18 (65 mph)	36 (60 mph)	6 (65 mph)	9 (65 mph)
						EB off-ramp	372 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	18 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	—
						WB on-ramp	492 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	—	6 (10 mph up to mainline speed)
						WB off-ramp	456 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)
						EB on-ramp	372 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	18 (10 mph up to mainline speed)	—	—
			12/4/2012 2:45 p.m.	10:00	64.2	—	—	—	—	—	—

Receptor	Address	Land Uses/ Activity Category	Start Date/Time	Duration	L_{eq}	Direction	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles
ST-12	Playground along Thoroughbred Lane, Highland	Recreational/C	12/4/2012 3:40 p.m.	10:00	62.0	EB SR-210 Ln1	1,446 (65 mph)	21 (65 mph)	30 (60 mph)	—	3 (65 mph)
						EB SR-210 Ln2	1,446 (65 mph)	21 (65 mph)	30 (60 mph)	—	3 (65 mph)
						WB SR-210 Ln1	1,473 (65 mph)	18 (65 mph)	54 (60 mph)	—	—
						WB SR-210 Ln1	1,473 (65 mph)	18 (65 mph)	54 (60 mph)	—	—
						EB on-ramp	420 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)
						WB off-ramp	414 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	18 (mainline speed down to 10 mph)	—	—
			12/4/2012 3:50 p.m.	10:00	62.8	—	—	—	—	—	—
ST-13	27644 Norwood Court, Highland	Single-Family Residential/B	12/4/2012 3:40 p.m.	10:00	64.5	EB SR-210 Ln1	1,446 (65 mph)	21 (65 mph)	30 (60 mph)	—	3 (65 mph)
						EB SR-210 Ln2	1,446 (65 mph)	21 (65 mph)	30 (60 mph)	—	3 (65 mph)
						WB SR-210 Ln1	1,473 (65 mph)	18 (65 mph)	54 (60 mph)	—	—
						WB SR-210 Ln1	1,473 (65 mph)	18 (65 mph)	54 (60 mph)	—	—
						EB on-ramp	420 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)
						WB off-ramp	414 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	18 (mainline speed down to 10 mph)	—	—
			12/4/2012 3:50 p.m.	10:00	64.6	—	—	—	—	—	—
ST-14	Arco station on the corner of Base Line and SR-210, Highland	Commercial/F	12/5/2012 9:40 a.m.	10:00	65.1	EB SR-210 Ln1	780 (65 mph)	15 (65 mph)	48 (60 mph)	—	—
						EB SR-210 Ln2	780 (65 mph)	15 (65 mph)	48 (60 mph)	—	—
						WB SR-210 Ln1	1,473 (65 mph)	18 (65 mph)	54 (60 mph)	—	3 (65 mph)
						WB SR-210 Ln2	1,473 (65 mph)	18 (65 mph)	54 (60 mph)	—	3 (65 mph)
						WB off-ramp	450 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	18 (mainline speed down to 10 mph)	—	—
						EB on-ramp	480 (10 mph up to mainline speed)	24 (10 mph up to mainline speed)	30 (10 mph up to mainline speed)	—	—
						Base Line WB	951 (45 mph)	20 (45 mph)	10 (45 mph)	—	—
						Base Line EB	799 (45 mph)	16 (45 mph)	8 (45 mph)	—	—
			12/5/2012 9:50 a.m.	10:00	64.9	—	—	—	—	—	—

Receptor	Address	Land Uses/ Activity Category	Start Date/Time	Duration	L_{eq}	Direction	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles
ST-21	7550 Dunkirk Avenue, Highland	Single-Family Residential/B	1/31/2013 10:45 a.m.	10:00	59.6	EB SR-210 Ln1	750 (70 mph)	6 (70 mph)	54 (60 mph)	3 (70 mph)	24 (70 mph)
						EB SR-210 Ln2	750 (70 mph)	6 (70 mph)	54 (60 mph)	3 (70 mph)	24 (70 mph)
						WB SR-210 Ln1	723 (70 mph)	9 (70 mph)	48 (60 mph)	3 (70 mph)	3 (70 mph)
						WB SR-210 Ln1	723 (70 mph)	9 (70 mph)	48 (60 mph)	3 (70 mph)	3 (70 mph)
						WB off-ramp at Base Line	216 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	—	—
						EB on-ramp at Base Line	216 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	18 (10 mph up to mainline speed)	—	—
			1/31/2013 10:55 a.m.	10:00	60.3	—	—	—	—	—	—
ST-33	27615 Base Line Highland, CA 92346	Commercial/F	11/6/2014 10:20 a.m.	10:00	59.4	—	—	—	—	—	—
			11/6/2014 10:30 a.m.	10:00	60.1	EB SR-210 Ln1	780 (65 mph)	15 (65 mph)	48 (60 mph)	—	—
						EB SR-210 Ln2	780 (65 mph)	15 (65 mph)	48 (60 mph)	—	—
						WB SR-210 Ln1	864 (65 mph)	33 (65 mph)	18 (60 mph)	—	9 (65 mph)
						WB SR-210 Ln2	864 (65 mph)	33 (65 mph)	18 (60 mph)	—	9 (65 mph)
						WB off-ramp	438 (mainline speed down to 10 mph)	12 (mainline speed down to 10 mph)	6 (mainline speed down to 10 mph)	—	—
						EB on-ramp	402 (10 mph up to mainline speed)	12 (10 mph up to mainline speed)	6 (10 mph up to mainline speed)	—	—
						Base Line WB	588 (40 mph)	—	6 (40 mph)	12 (40 mph)	—
						Base Line EB	558 (40 mph)	18 (40 mph)	—	6 (40 mph)	—

Notes:
Refer to Figure 5-1 for measurement locations.
EB = eastbound; WB = westbound.

Figure 6-1 and Table 6-2 summarize the results of the LT-3 data.

Figure 6-1. Long-Term Monitoring at Location LT-3, December 4 to 5, 2012

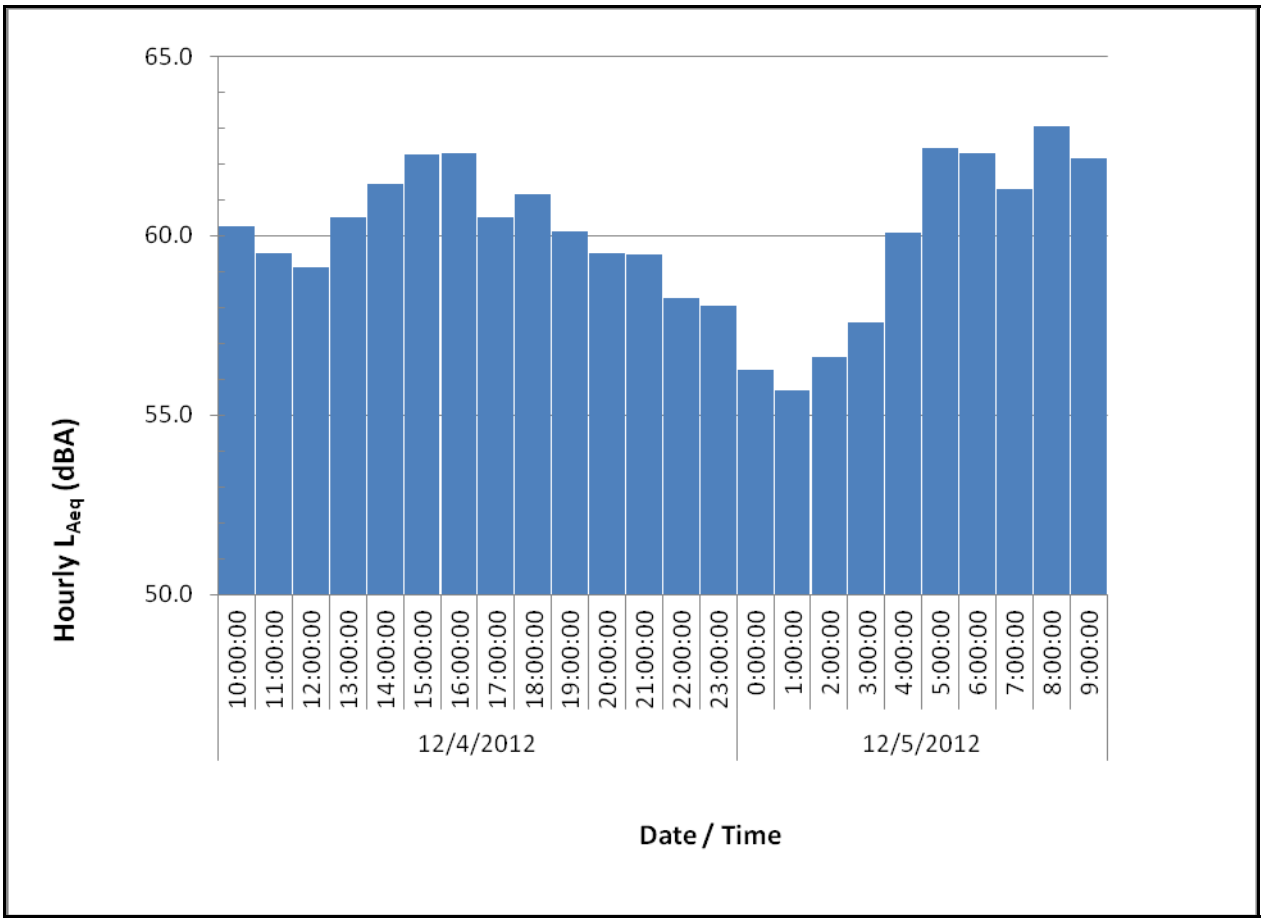


Table 6-2. Summary of Long-Term Monitoring at Location LT-3

Date	Time (hour beginning)	1-hour L_{eq} (dBA)	Difference from Worst Hour (dB)
December 4, 2012	10:00:00	60.3	-2.8
	11:00:00	59.5	-3.5
	12:00:00	59.1	-3.9
	13:00:00	60.5	-2.5
	14:00:00	61.4	-1.6
	15:00:00	62.3	-0.8
	16:00:00	62.3	-0.8
	17:00:00	60.5	-2.5
	18:00:00	61.1	-1.9
	19:00:00	60.1	-2.9
	20:00:00	59.5	-3.5
	21:00:00	59.5	-3.6
	22:00:00	58.3	-4.8
	23:00:00	58.1	-5.0
December 5, 2012	0:00:00	56.3	-6.8
	1:00:00	55.7	-7.4
	2:00:00	56.6	-6.4
	3:00:00	57.6	-5.5
	4:00:00	60.1	-3.0
	5:00:00	62.4	-0.6
	6:00:00	62.3	-0.7
	7:00:00	61.3	-1.8
	8:00:00	**63.0**	**0.0**
	9:00:00	62.1	-0.9
Maximum		63.0	
Minimum		55.7	

Note:
Worst noise hour is **bolded**.

6.2.3. Traffic Noise Model Calibration

TNM 2.5 was used to compare measured traffic noise levels with modeled noise levels at field measurement locations, using traffic count data collected at the time of the noise measurements. In cases where modeled noise level values differ from measured values by more than 3 dB, calibration factors (K-factors) are used to adjust predicted noise levels at the respective receiver locations as well as nearby receivers that are representative of a similar noise environment.

K-factors and comparisons between measured and modeled noise levels at each measurement location are listed in Table 6-3. Noise levels were in reasonably close agreement (within 3 dB) (i.e., comparison between measured and modeled values at all locations). Therefore, K-factors were not used in the analysis.

Table 6-3. Comparison of Measured and Modeled Worst-Noise-Hour Sound Levels

Measurement Location	Measured Existing Sound Level (dBA)	Modeled Existing Sound Level (dBA)	Measured Minus Modeled (dB)	K-Factor Used (dB)
ST-8	58.8	60.6[2]	-1.8	0.0
ST-9	57.7	58.4	- 0.7	0.0
ST-10	62.0	62.5	- 0.5	0.0
ST-11	64.4	63.4	1.0	0.0
ST-12	62.0	62.4	- 0.4	0.0
ST-13	64.5	62.4	2.1	0.0
ST-14	65.1	65.9	- 0.8	0.0
ST-21	59.6	61.0	- 1.4	0.0
ST-33	60.1	62.1	- 2.0	0.0

6.2.4. Existing Modeled Noise Levels

Predicted traffic noise levels are shown in Table B-1 of Appendix B. As shown in Table B-1, existing worst-noise-hour traffic noise levels range from 52 to 67 dBA L_{eq}(h). The maximum noise level, 67 dBA L_{eq}(h), is predicted to occur at an undeveloped area (Activity Category G). Under existing conditions, traffic noise levels do not approach or exceed the NAC at any of the receivers modeled in the TNM noise analysis for existing conditions.

[2] The differential between the modeled noise level and the measured noise level is likely due to the presence of a wooden fence which provided attenuation at the time of the measurement.

This page intentionally left blank.

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

7.1. Future Noise Environment and Impacts

Traffic noise modeling results for existing conditions and design-year conditions, with and without the project, are summarized in Table B-1 (see Appendix B). Predicted traffic noise levels under design-year 2040 Build conditions are compared with existing conditions and design-year 2040 No Build conditions. The comparison with existing conditions is included in the analysis to identify traffic noise impacts under 23 CFR 772. The comparison of No Build conditions indicates the direct effect of the project. Modeling results are rounded to the nearest decibel.

For the design year, traffic noise levels under the No Build and Build conditions are predicted to range from 54 to 68 dBA L_{eq}(h) under No Build conditions and 54 to 69 dBA L_{eq}(h) under Build conditions. Design year noise levels are not predicted to approach or exceed the NAC at any of receivers identified in this analysis. Residential (Activity Category B) land use areas north of Base Line have limited line of sight to SR-210 because of a significant amount of terrain shielding. For residential areas south of Base Line, existing noise walls, 10 feet in height, also provide a significant amount of acoustical shielding. These factors most likely result in an attenuation of traffic noise levels at receiver locations adjacent to SR-210.

Because traffic noise impacts are not predicted to occur at any areas of frequent human use in the project area, noise abatement was not considered for this project.

This page intentionally left blank.

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. Construction noise is regulated by Caltrans' provisions in Section 14-8.02, Noise Control, of the 2010 Standard Specifications.

Two types of short-term noise impacts would occur during project construction. The first type would be from construction crew commutes and the transport of construction equipment and materials to the project site, which would incrementally raise noise levels on access roads leading to the site. The pieces of heavy equipment for grading and construction activities would be moved on site, would remain for the duration of each construction phase, and would not add to the daily traffic volume in the project vicinity. A high single-event noise exposure potential, at a maximum level of 87 dBA L_{max} from trucks passing at 50 feet, would exist. However, the projected construction traffic would be minimal compared with existing traffic volumes on other affected streets, and the associated long-term noise level change would not be perceptible. Therefore, construction-related worker commutes and equipment transport noise impacts would be short term and would not be adverse.

The second type of short-term noise impact would be from construction activities. Construction is performed in distinct steps, each of which has its own mix of equipment and consequently its own noise characteristics. These various sequential phases would change the character of the noise generated and the noise levels along the project alignment as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table 8-1 lists typical construction equipment noise levels (L_{max}) recommended for noise impact assessments, based on a distance of 50 feet between the equipment and a noise receptor.

Typical noise levels at 50 feet from an active construction area are up to 91 dBA L_{max} during the noisiest construction phases. The site preparation phase, which includes grading and paving, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavation machinery such as backfillers, bulldozers, and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve one or two minutes of full-power operation followed by three or four minutes at lower power settings.

Table 8-1. Typical Construction Equipment Noise Levels

Type of Equipment	Range of Maximum Sound Levels (dBA L_{max} at 50 feet)	Suggested Maximum Sound Levels for Analysis (dBA L_{max} at 50 feet)
Pile Drivers	81 to 96	93
Rock Drills	83 to 99	96
Jackhammers	75 to 85	82
Pneumatic Tools	78 to 88	85
Pumps	74 to 84	80
Scrapers	83 to 91	87
Haul Trucks	83 to 94	88
Cranes	79 to 86	82
Portable Generators	71 to 87	80
Rollers	75 to 82	80
Dozers	77 to 90	85
Tractors	77 to 82	80
Front-end Loaders	77 to 90	86
Hydraulic Backhoe	81 to 90	86
Hydraulic Excavators	81 to 90	86
Graders	79 to 89	86
Air Compressors	76 to 89	86
Trucks	81 to 87	86

Notes:
Source: Bolt, Beranek & Newman 1987.
dBA = A-weighted decibels
L_{max} = maximum instantaneous noise level

Construction of the proposed project is expected to require the use of earthmovers, bulldozers, paving machines, water trucks, dump trucks, concrete trucks, rollers, and pickup trucks. Noise associated with the use of construction equipment is estimated to be between 79 and 89 dBA L_{max} at a distance of 50 feet from the active construction area for the grading phase. As seen in Table 8-1, the maximum noise level generated by each earthmover is assumed to be approximately 86 dBA L_{max} at 50 feet from the earthmover in operation. Each bulldozer would generate approximately 85 dBA L_{max} at 50 feet. The maximum noise level generated by water trucks and pickup trucks is approximately 86 dBA L_{max} at 50 feet from these vehicles. Each doubling of the sound source with equal strength increases the noise level by 3 dBA.

Each piece of construction equipment operates as an individual point source. The worst-case composite noise level at the nearest residence during this phase of construction would be 91 dBA L_{max} (at a distance of 50 feet from an active construction area).

In addition to the standard construction equipment, the project may require the use of pile drivers; however, the use of pile drivers is not anticipated at this time. As shown in Table 8-1, pile driving generates noise levels of up to 96 dBA L_{max} at 50 feet.

No adverse noise impacts from construction are anticipated because construction would be conducted in accordance with applicable local noise standards and Caltrans' provisions in Section 14-8.02, Noise Control, of the 2010 Standard Specifications and Special Provisions and applicable local noise standards.

Construction noise would be short term, intermittent, and overshadowed by local traffic noise. Furthermore, implementation of the following measure would further minimize temporary noise impacts from construction:

> As directed by Caltrans, the contractor will implement appropriate additional noise mitigation measures, which may include changing the location of stationary construction equipment, turning off idling equipment, rescheduling construction activity, notifying adjacent residents in advance of construction work, and installing acoustic barriers around stationary construction noise sources.

SSP-14-8.02 will be edited specifically for this project during the plans, specifications, and estimates phase. The content of SSP (14-8.02) is shown below or can be found at the following link: http://pd.dot.ca.gov/env/noise/html/noise_sp.htm.

SSP-14-8.02

Use with 2010 Standards.

Use for work in a residential or urban area (1) at night or (2) if night or Sunday noise restrictions exist.

14-1. NOISE CONTROL

1. General

This section applies to equipment on the project or associated with the project, including trucks, transit mixers, stationary equipment, and transient equipment.

2. Edit to include (1) specific local noise ordinances that the project manager has agreed to comply with or (2) work needing noise level restrictions that differ from those specified in Section 14. List exceptions in the table. Delete "except….table" and the table if exceptions are not needed. Delete paragraph 3.

The following are examples of work that exceed 86 dBA at 50 feet:

a. Removing concrete

b. Cold planing pavement
c. Grooving and grinding concrete pavement
d. Sawcutting PCC
e. Driving piles

Do not exceed 86 dBA L_{max} at 50 feet from the job site activities from _____ p.m. to _____ a.m. except you may perform the following activities during the hours and for the days shown in the following table:

Noise Restriction Exceptions

Activity	Hours		Days	
	From	To	From	Through

2. Use if night or Sunday noise restrictions exist. Delete par. 1.

Do not operate construction equipment or run the equipment engines from 7 p.m. to 7 a.m. or on Sundays except you may operate equipment within the project limits during these hours to:

1. Service traffic control facilities,
2. Service construction equipment, and
3. Use if a sound meter is required.

Noise Monitoring

Provide one Type 1 sound-level meter and one acoustic calibrator to be used by Caltrans until Contract acceptance. Provide training by a person trained in noise monitoring to one Caltrans employee designated by the Engineer. The sound-level meter must be calibrated and certified by the manufacturer or other independent acoustical laboratory before delivery to Caltrans. Provide annual recalibration by the manufacturer or other independent acoustical laboratory. The sound-level meter must be capable of taking measurements using the A-weighting network and the slow-response settings. The measurement microphone must be fitted with a windscreen. Caltrans returns the equipment to you at Contract acceptance. Work specified in this paragraph is paid for as noise monitoring.

4. Use if a sound meter is required.

The contract lump sum price paid for noise monitoring includes full compensation for furnishing all labor, material, tools, equipment, and incidentals and for doing all work involved in noise monitoring.

Chapter 9.

Peter Hardie. Sr. Noise Analyst, INCE Member. Over 10 years of experience. BA, Environmental Science, Rollins College, 1999. MESM, Environmental Science and Management, University of California, Santa Barbara, 2004.

Jason Volk. INCE and TRB Member. Over 15 years of experience BS Mechanical Engineering, NC State, Raleigh, 2000

David Buehler, P.E. Sr. Acoustical Engineer. Over 30 years of experience. BS, Civil Engineering, California State University, Sacramento, 1980. Board Certified Member, Institute of Noise Control Engineering, California Registered Professional Civil Engineer, No. C37936, 1983.

Brian Calvert. Sr. Transportation Planner. 20 years of experience. BA (cum laude), Geography and Regional Science, The George Washington University, Washington, D.C., 1993. MEP, Master of Environmental Planning, Arizona State University, Arizona, 2000.

This page intentionally left blank.

Chapter 10. References

Bolt, Beranek & Newman. 1987. *Noise Control for Buildings and Manufacturing Plants.*

California Department of Transportation. 2011. *Traffic Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects.* May. Sacramento, CA. Available: http://www.dot.ca.gov/hq/env/noise/pub/ca_tnap_may2011.pdf.

———. 2012. *Highway Design Manual*. Publications Unit.

———. 2013. *Technical Noise Supplement.* September. Sacramento, CA: Environmental Program, Noise, Air Quality, and Hazardous Waste Management Office. Available: http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf.

Federal Highway Administration (FHWA). 1998a. *FHWA Traffic Noise Model, Version 1.0: User's Guide.* Report No. FHWA-PD-96-009 and DOT-VNTSC-FHWA-98-1. January. Washington, D.C.

———. 1998b. *FHWA Traffic Noise Model, Version 1.0: Technical Manual.* Report No. FHWA-PD-96-010 and DOT-VNTSC-FHWA-98-2. February. Washington, D.C.

URS. 2014a. *Traffic Operations Analysis Report, State Route 210 (SR-210) at Base Line (PM R28.3/R30.3) in the City of Highland*. Prepared for San Bernardino Associated Governments, Santa Ana, CA. July.

URS. 2014b. *Traffic Operations Analysis Report for SR-210 Mixed Flow Lane Addition from Highland Avenue (PM R25.0) to San Bernardino Avenue (PM R33.2) in the County of San Bernardino*. Prepared for San Bernardino Associated Governments, Santa Ana, CA. February.

URS. 2015. SR-210 *Mixed Flow Lane Addition Noise Study Report (NSR) Supplemental HOV Traffic Data*. July. Santa Ana, CA.

This page intentionally left blank.

Appendix A Traffic Data

This appendix contains tables that present traffic data for existing conditions, design-year conditions without the project, and design-year conditions with the project.

This page intentionally left blank.

Table A-1 Existing Year 2013 Peak Hour Traffic Volumes

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Mainline (From Figure 3 of the SR-210 Mixed Flow Lanes TOAR)										
SR-210_EB Lane 1	EB North of the EB Base Line Off-Ramp	1	2,948	93.96%	1,309	3.02%	37	3.02%	14	65/65/55
SR-210_EB Lane 2-2		1			1,308		38		14	65/65/55
WB SR330 to EB SR210 Connector-2	WB SR-330 connector	1			153		14		61	45/45/45
SR-210_EB Lane 1-2	EB between EB Off-Ramp and EB On-Ramp	1	2,395	93.99%	1,125	3.01%	36	3.01%	36	65/65/55
SR-210_EB Lane 2-3		1			1,126		36		36	65/65/55
SR-210_EB Lane 1-4	EB South of EB On-Ramp	1	2,967	94.00%	1,395	3.00%	44	3.00%	44	65/65/55
SR-210_EB Lane 2-5		1			1,394		45		45	65/65/55
SR-210_WB LN 1	WB North of the WB Base Line On-Ramp	1	2,909	94.02%	1,202	2.99%	37	2.99%	11	65/65/55
SR-210_WB LN 2		1			1,200		38		12	65/65/55
WB SR210 to EB SR330 Connector	EB SR-330 connector	2			333		12		64	50/50/50
SR-210_WB LN 1-2	WB between WB Off-Ramp and WB On-Ramp	1	2,451	94.04%	1,153	2.98%	36	2.98%	36	65/65/55
SR-210_WB LN 2-2-2-2		1			1,152		37		37	65/65/55

Table A-1 Existing Year 2013 Peak Hour Traffic Volumes

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Mainline (From Figure 3 of the SR-210 Mixed Flow Lanes TOAR)										
SR-210_WB LN 1	WB South of WB Off-Ramp	1	3,038	94.01%	1,429	3.00%	45	3.00%	45	65/65/55
SR-210_WB LN 2		1			1,427		46		46	65/65/55

Table A-1 Existing Year 2013 Peak Hour Traffic Volumes

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Ramps (From Figure 2 of the TOAR SR-210 at Base Line)										
EB Offramp at Baseline-1	SR 210 EB Off-Ramp	1 - 3	553	93.85%	519	3.07%	17	3.07%	17	mainline speed down to 10 mph
EB Onramp at Baseline-2	SR 210 EB On-Ramp	2 - 1	572	94.06%	538	2.97%	17	2.97%	17	10mph up to mainline speed
WB Offramp at Baseline-2	SR 210 WB Off-Ramp	1 - 2	587	93.87%	551	3.07%	18	3.07%	18	mainline speed down to 10 mph
WB Onramp at Baseline	SR 210 WB On-Ramp	2 - 1	458	93.89%	430	3.06%	14	3.06%	14	10mph up to mainline speed
WB SR330 to EB SR210 Connector-2	WB SR-330 connector	1	228	67.11%	153	6.14%	14	26.75%	61	45/45/45
WB SR210 to EB SR330 Connector	EB SR-330 connector	2	409	81.42%	333	2.93%	12	15.65%	64	50/50/50

Table A-1 Existing Year 2013 Peak Hour Traffic Volumes

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Local Roadways (From Figure 2 of the TOAR SR-210 at Base Line)										
Baseline WB-1	East of Siene	2	811	97.04%	787	1.97%	16	0.99%	8	45/45/45
Baseline WB-1-2	Between Siene and the WB ramps	2	980	96.94%	950	2.04%	20	1.02%	10	45/45/45
Baseline WB-2	Between the WB and EB ramps	2	862	96.98%	836	1.97%	17	1.04%	9	45/45/45
Baseline WB-3	West of the EB ramps	2	731	96.99%	709	2.05%	15	0.96%	7	45/45/45
Baseline EB-3-2	East of Siene	2	1,018	97.05%	988	1.96%	20	0.98%	10	45/45/45
Baseline EB-3	Between Siene and the WB ramps	2	1,201	97.00%	1,165	2.00%	24	1.00%	12	45/45/45
Baseline EB-2	Between the WB and EB ramps	2	942	97.03%	914	2.02%	19	0.96%	9	45/45/45
Baseline EB-1	West of the EB ramps	2	827	96.98%	802	2.06%	17	0.97%	8	45/45/45
North Seine Avenue NB-2	North of La Praix	1	33	100.00%	33	0.00%	0	0.00%	0	25
North Seine Avenue SB	North of La Praix	1	21	100.00%	21	0.00%	0	0.00%	0	25
North Seine Avenue NB	North of Base Line	1	133	99.25%	132	0.75%	1	0.00%	0	25/25
North Seine Avenue SB-2-2	North of Base Line	1	121	99.17%	120	0.83%	1	0.00%	0	25/25

Table A-1 Existing Year 2013 Peak Hour Traffic Volumes

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Local Roadways (From Figure 2 of the TOAR SR-210 at Baseline and the MFLA Traffic Volume Memo)										
South Seine Avenue NB	South of Base Line	1	225	99.11%	223	0.89%	2	0.00%	0	25/25
South Seine Avenue SB	South of Base Line	1	227	99.12%	225	0.88%	2	0.00%	0	25/25
La PraixNB	West of Siene	1	100	99.00%	99	1.00%	1	0.00%	0	25/25
La Praix SB	West of Siene	1	100	99.00%	99	1.00%	1	0.00%	0	25/25

Table A-2 Design Year 2040 Peak Hour Traffic Volumes (No Build)

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Mainline (From SR-210 Mixed Flow Lanes TOAR Figure 11)										
EB Lane 1 SR-330	EB North of the Base Line EB Off-Ramp	1	4,570	94.00%	1,362	3.00%	42	3.00%	0	65/65
EB Lane 2 SR-330		1			1,338		42		23	65/65/55
SR-210_EB Lane _3		1			1,337		42		24	65/65/55
WB SR330 to EB SR210 Connector-2	WB SR-330 connector	1			259		11		90	45/45/45
EB Lane 1 Baseline	Base Line Off-Ramp to Base Line On-ramp	1	3,897	94.00%	1,260	3.00%	39	3.00%	0	65/65
EB Lane 2 Baseline		1			1,202		39		58	65/65/55
EB Lane 3 Baseline		1			1,201		39		59	65/65/55
EB Lane 1 Baseline	South Base Line On-ramp the end of the Baseline auxillary lane	1	4,589	93.99%	1,260	3.01%	39	3.01%	0	65/65
EB Lane 2 Baseline		1			1,202		39		58	65/65/55
EB Lane 3 Baseline		1			1,201		39		59	65/65/55
EB Aux at Baseline-In2-2		1			650		21		21	65/65/55

Table A-2 Design Year 2040 Peak Hour Traffic Volumes (No Build)

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Mainline (From SR-210 Mixed Flow Lanes TOAR Figure 11)										
EB Lane 1 Greenspot	South Greenspot Aux Lane to the start of Greenspot Off-Ramp	1	4,589	93.99%	1,234	3.01%	39	3.01%	0	65/65
EB Lane 2 Greenspot		1			1,178		38		57	65/65/55
EB Lane 3 Greenspot		1			1,177		38		58	65/65/55
EB Aux at Greenspot Dr		1			724		23		23	65/65/55
WB Lane 1 SR-330	WB North of the Base Line EB On-Ramp	1	5,026	93.99%	1,460	3.00%	46	3.00%	0	65/65
WB Lane 2 SR-330		1			1,438		45		22	65/65/55
WB Lane 3 SR-330		1			1,438		45		22	65/65/55
WB SR210 to EB SR330 Connector	EB SR-330 connector	2			388		15		107	50/50/50
WB Lane 1 Baseline	Between Baseline Off-Ramp and Base Line On-Ramp	1	4,285	93.98%	1,386	3.01%	43	3.01%	0	65/65
WB Lane 2 Baseline		1			1,321		43		64	65/65/55
WB Lane 3 Baseline 34'		1			1,320		43		65	65/65/55

Table A-2 Design Year 2040 Peak Hour Traffic Volumes (No Build)

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Mainline (From SR-210 Mixed Flow Lanes TOAR Figure 11)										
WB Lane 1 Baseline	Between Baseline Off-Ramp and Base Line Aux Lane	1	5,000	94.00%	1,386	3.00%	43	3.00%	0	65/65
WB Lane 2 Baseline		1			1,321		43		64	65/65/55
WB Lane 3 Baseline 34'		1			1,320		43		65	65/65/55
WB Aux at Baseline-2-2		1			673		21		21	65/65/55
WB Lane 1 Greenspot	Greenspot Aux Lane to the start of Greenspot On-Ramp	1	5,000	94.00%	1,464	3.00%	46	3.00%	0	65/65
WB Lane 2 Greenspot		1			1,397		45		68	65/65/55
WB Lane 3 Greenspot		1			1,397		45		68	65/65/55
WB Aux at Greenspot Dr-2		1			442		14		14	65/65/55

Table A-2 Design Year 2040 Peak Hour Traffic Volumes (No Build)										
TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Ramps (From Figure 4 of the TOAR SR-210 at Base Line) and SR-330 connector (Figure 11 of the TOAR SR-210 Mixed Flow Lanes)										
EB Offramp at Baseline	SR 210 EB Off-ramp to Base Line	1 - 3	673	94.06%	633	2.97%	20	2.97%	20	mainline speed down to 10 mph
EB Onramp at Baseline-2	SR 210 EB On-ramp from Base Line	2 - 1	692	93.93%	650	3.03%	21	3.03%	21	10 mph up to the meter then 0 up to mainline speed
WB Onramp at Baseline	SR 210 WB On-ramp from Base Line	1 - 2	741	94.06%	697	2.97%	22	2.97%	22	mainline speed down to 10 mph
WB Offramp at Baseline-2-2	SR 210 WB Off-ramp to Base Line	2 - 1	715	94.13%	673	2.94%	21	2.94%	21	10 mph up to the meter then 0 up to mainline speed

Table A-2 Design Year 2040 Peak Hour Traffic Volumes (No Build)										
TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Local Roadways (From Figure 4 of the TOAR SR-210 at Baseline)										
Baseline WB-1	East of Siene	2	1,051	96.96%	1,019	2.00%	21	1.05%	11	45/45/45
Baseline WB-1-2	Between Siene and the WB ramps	2	1,406	97.01%	1,364	1.99%	28	1.00%	14	45/45/45
Baseline WB-2	Between the WB ramps	2	1,138	97.01%	1,104	2.02%	23	0.97%	11	45/45/45
Baseline WB-3	West of the EB ramps	2	980	96.94%	950	2.04%	20	1.02%	10	45/45/45
Baseline EB-3-2	East of Siene	2	1,363	96.99%	1,322	1.98%	27	1.03%	14	45/45/45
Baseline EB-3	Between Siene and the WB ramps	2	1,539	97.01%	1,493	2.01%	31	0.97%	15	45/45/45
Baseline EB-2	Between the WB ramps	2	1,299	97.00%	1,260	2.00%	26	1.00%	13	45/45/45
Baseline EB-1	West of the EB ramps	2	1,160	96.98%	1,125	1.98%	23	1.03%	12	45/45/45
North Seine Avenue NB-2	North of La Praix	1	68	98.53%	67	1.47%	1	0.00%	0	25/25
North Seine Avenue SB	North of La Praix	1	78	98.72%	77	1.28%	1	0.00%	0	25/25
North Seine Avenue NB	North of Base Line	1	168	98.81%	166	1.19%	2	0.00%	0	25/25
North Seine Avenue SB-2-2	North of Base Line	1	178	98.88%	176	1.12%	2	0.00%	0	25/25

Table A-2 Design Year 2040 Peak Hour Traffic Volumes (No Build)										
TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Local Roadways (From Figure 4 of the TOAR SR-210 at Base Line and the MFLA Traffic Volume Memo)										
South Seine Avenue NB	South of Base Line	1	427	99.06%	423	0.94%	4	0.00%	0	25/25
South Seine Avenue SB	South of Base Line	1	258	98.84%	255	1.16%	3	0.00%	0	25/25
La PraixNB	West of Siene	1	100	99.00%	99	1.00%	1	0.00%	0	25/25
La Praix SB	West of Siene	1	100	99.00%	99	1.00%	1	0.00%	0	25/25

Table A-3 Design Year 2040 Peak Hour Traffic Volumes (Build)

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Mainline (From SR-210 Mixed Flow Lanes TOAR Figure 11)										
EB Lane 1 SR-330	EB North of the Base Line EB Off-Ramp	1	4,570	94.00%	1,362	3.00%	42	3.00%	0	65/65
EB Lane 2 SR-330		1			1,338		42		23	65/65/55
SR-210_EB Lane _3		1			1,337		42		24	65/65/55
WB SR330 to EB SR210 Connector-2	WB SR-330 connector	1			259		11		90	45/45/45
EB Lane 1 Baseline	Base Line Off-Ramp to Base Line On-ramp	1	3,897	94.00%	1,260	3.00%	39	3.00%	0	65/65
EB Lane 2 Baseline		1			1,202		39		58	65/65/55
EB Lane 3 Baseline		1			1,201		39		59	65/65/55
EB Lane 1 Baseline	South Base Line On-ramp the end of the Baseline auxillary lane	1	4,589	93.99%	1,260	3.01%	39	3.01%	0	65/65
EB Lane 2 Baseline		1			1,202		39		58	65/65/55
EB Lane 3 Baseline		1			1,201		39		59	65/65/55
EB Aux at Baseline-In2-2		1			650		21		21	65/65/55

Table A-3 Design Year 2040 Peak Hour Traffic Volumes (Build)

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Mainline (From SR-210 Mixed Flow Lanes TOAR Figure 11)										
EB Lane 1 Greenspot	South Greenspot Aux Lane to the start of Greenspot Off-Ramp	1	4,589	93.99%	1,234	3.01%	39	3.01%	0	65/65
EB Lane 2 Greenspot		1			1,178		38		57	65/65/55
EB Lane 3 Greenspot		1			1,177		38		58	65/65/55
EB Aux at Greenspot Dr		1			724		23		23	65/65/55
WB Lane 1 SR-330	WB North of the Base Line EB On-Ramp	1	5,026	93.99%	1,460	3.00%	46	3.00%	0	65/65
WB Lane 2 SR-330		1			1,438		45		22	65/65/55
WB Lane 3 SR-330		1			1,438		45		22	65/65/55
WB SR210 to EB SR330 Connector	EB SR-330 connector	2			388		15		107	50/50/50
WB Lane 1 Baseline	Between Baseline Off-Ramp and Base Line On-Ramp	1	5,026	93.99%	1,386	3.00%	43	3.00%	0	65/65
WB Lane 2 Baseline		1			1,321		43		64	65/65/55
WB Lane 3 Baseline 34'		1			1,320		43		65	65/65/55
WB SR-210 Aux LN	WB WR-210 Auxillary Lane	1			697		22		22	65/65/55

Table A-3 Design Year 2040 Peak Hour Traffic Volumes (Build)

TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Mainline (From SR-210 Mixed Flow Lanes TOAR Figure 11)										
WB Lane 1 Baseline	Between Baseline Off-Ramp and Base Line On-Ramp	1	4,285	93.98%	1,386	3.01%	43	3.01%	0	65/65
WB Lane 2 Baseline		1			1,321		43		64	65/65/55
WB Lane 3 Baseline 34'		1			1,320		43		65	65/65/55
WB Lane 1 Baseline	Between Baseline Off-Ramp and Base Line Aux Lane	1	5,000	94.00%	1,386	3.00%	43	3.00%	0	65/65
WB Lane 2 Baseline		1			1,321		43		64	65/65/55
WB Lane 3 Baseline 34'		1			1,320		43		65	65/65/55
WB Aux at Baseline-2-2		1			673		21		21	65/65/55
WB Lane 1 Greenspot	Greenspot Aux Lane to the start of Greenspot On-Ramp	1	5,000	94.00%	1,464	3.00%	46	3.00%	0	65/65
WB Lane 2 Greenspot		1			1,397		45		68	65/65/55
WB Lane 3 Greenspot		1			1,397		45		68	65/65/55
WB Aux at Greenspot Dr-2		1			442		14		14	65/65/55

Table A-3 Design Year 2040 Peak Hour Traffic Volumes (Build)										
TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Ramps (From Figure 4 of the TOAR SR-210 at Base Line) and SR-330 connector (Figure 11 of the TOAR SR-210 Mixed Flow Lanes)										
EB Offramp at Baseline	SR 210 EB Off-ramp to Base Line	1 - 3	673	94.06%	633	2.97%	20	2.97%	20	mainline speed down to 10 mph
EB Onramp at Baseline-2	SR 210 EB On-ramp from Base Line	3 - 1	692	93.93%	650	3.03%	21	3.03%	21	10 mph up to the meter then 0 up to mainline speed
WB Onramp at Baseline	SR 210 WB On-ramp from Base Line	3 - 1	741	94.06%	697	2.97%	22	2.97%	22	mainline speed down to 10 mph
WB Offramp at Baseline-2-2	SR 210 WB Off-ramp to Base Line	1 - 3	715	94.13%	673	2.94%	21	2.94%	21	10 mph up to the meter then 0 up to mainline speed

Table A-3 Design Year 2040 Peak Hour Traffic Volumes (Build)										
TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Local Roadways (From Figure 4 of the TOAR SR-210 at Baseline)										
Baseline WB-1	East of Siene	2	1,051	96.96%	1,019	2.00%	21	1.05%	11	45/45/45
Baseline WB-1-2	Between Siene and the WB ramps	2	1,406	97.01%	1,364	1.99%	28	1.00%	14	45/45/45
Baseline WB-2	Between the WB ramps	2	1,138	97.01%	1,104	2.02%	23	0.97%	11	45/45/45
Baseline WB-3	West of the EB ramps	2	980	96.94%	950	2.04%	20	1.02%	10	45/45/45
Baseline EB-3-2	East of Siene	2	1,363	96.99%	1,322	1.98%	27	1.03%	14	45/45/45
Baseline EB-3	Between Siene and the WB ramps	2	1,539	97.01%	1,493	2.01%	31	0.97%	15	45/45/45
Baseline EB-2	Between the WB ramps	2	1,299	97.00%	1,260	2.00%	26	1.00%	13	45/45/45
Baseline EB-1	West of the EB ramps	2	1,160	96.98%	1,125	1.98%	23	1.03%	12	45/45/45
North Seine Avenue NB-2	North of La Praix	1	68	98.53%	67	1.47%	1	0.00%	0	25/25
North Seine Avenue SB	North of La Praix	1	78	98.72%	77	1.28%	1	0.00%	0	25/25
North Seine Avenue NB	North of Base Line	1	168	98.81%	166	1.19%	2	0.00%	0	25/25
North Seine Avenue SB-2-2	North of Base Line	1	178	98.88%	176	1.12%	2	0.00%	0	25/25

Table A-3 Design Year 2040 Peak Hour Traffic Volumes (Build)										
TNM Roadway Name	Segment	Number of Lanes	Total Volume PM Peak Hour Volume	Auto *		Medium Trucks *		Heavy Trucks *		Speed
				%	Volume	%	Volume	%	Volume	(A/MT/HT)
Local Roadways (From Figure 4 of the TOAR SR-210 at Base Line and the MFLA Traffic Volume Memo)										
South Seine Avenue NB	South of Base Line	1	427	99.06%	423	0.94%	4	0.00%	0	25/25
South Seine Avenue SB	South of Base Line	1	258	98.84%	255	1.16%	3	0.00%	0	25/25
La PraixNB	West of Siene	1	100	99.00%	99	1.00%	1	0.00%	0	25/25
La Praix SB	West of Siene	1	100	99.00%	99	1.00%	1	0.00%	0	25/25

Appendix B Predicted Future Noise Levels

Table B-1 summarizes the traffic noise modeling results for existing and design-year conditions with and without the project.

This page intentionally left blank.

Receiver I.D.	Measurement Location	Land Use / Activity Category	Number of Dwelling Units or Equivalent	Address	Existing Noise Level $L_{eq}(h)$, dBA	Table B-1 Future Worst Hour Noise Levels (Traffic Noise Only) - $L_{eq}(h)$, dBA						
						Design Year 2040 Noise Level without Project, Leq(h), dBA	Design Year Noise Level with Project, Leq(h), dBA	Design Year 2040 Noise Level without Project minus Existing Conditions Leq(h), dBA	Design Year 2040 Noise Level with Project minus No Project Conditions Leq(h), dBA	Design Year 2040 Noise Level with Project minus Existing Conditions Leq(h), dBA	Activity Category (NAC)	Impact Type (None, or A/E)
M-1	--	Residential / B	5	7069 Cienega Drive, Highland	58	60	60	2	0	2	B (67)	NONE
M-2	--	Residential / B	5	7129 Cienega Drive, Highland	59	61	61	2	0	2	B (67)	NONE
M-3	--	Residential / B	1	27640 Villa Avenue, Highland	60	63	63	3	0	3	B (67)	NONE
M-4	--	Residential / B	2	27631 Villa Avenue, Highland	60	62	62	2	0	2	B (67)	NONE
M-5	ST-8	Residential / B	1	27631 Foster Avenua, Highland	62	64	64	2	0	2	B (67)	NONE
M-6	--	Undeveloped / G	--	--	65	66	66	1	0	1	G (--)	NONE
M-7	--	Residential / B	4	7145 La Praix Street, Highland	52	54	54	2	0	2	B (67)	NONE
M-8	--	Residential / B	3	7171 La Praix Street, Highland	53	55	56	2	1	3	B (67)	NONE
M-9	ST-10	Residential / B	3	7215 La Praix Street, Highland	62	64	64	2	0	2	B (67)	NONE
M10	--	Residential / B	1	7231 La Praix Street, Highland	58	60	61	2	1	3	B (67)	NONE
M-11	--	Undeveloped / G	--	--	66	67	67	1	0	1	G (--)	NONE
M-12	--	Place of Worship / C	--	27555 Church Avenue, Highland	58	59	59	1	0	1	C (67)	NONE
M-13	--	Residential / B	6	7361 Nye Drive, Highland	58	61	60	3	-1	2	B (67)	NONE

Receiver I.D.	Measurement Location	Land Use / Activity Category	Number of Dwelling Units or Equivalent	Address	Existing Noise Level $L_{eq}(h)$, dBA	Table B-1 Future Worst Hour Noise Levels (Traffic Noise Only) - $L_{eq}(h)$, dBA						
						Design Year 2040 Noise Level without Project, Leq(h), dBA	Design Year Noise Level with Project, Leq(h), dBA	Design Year 2040 Noise Level without Project minus Existing Conditions Leq(h), dBA	Design Year 2040 Noise Level with Project minus No Project Conditions Leq(h), dBA	Design Year 2040 Noise Level with Project minus Existing Conditions Leq(h), dBA	Activity Category (NAC)	Impact Type (None, or A/E)
M-14	--	Residential / B	5	7411 Nye Drive, Highland	60	61	62	1	1	2	B (67)	NONE
M-15	ST-13	Residential / B	4	27644 Norwood Court, Highland	62	64	64	2	0	2	B (67)	NONE
M-16	ST-11	Residential / B	6	27650 Temple Street, Highland	63	65	65	2	0	2	B (67)	NONE
M-17	ST-12	Park / C	--	27643 Pattee Court, Highland	61	63	63	2	0	2	C (67)	NONE
M-18	--	Residential / B	6	7717 Church Avenue, Highland	59	61	61	2	0	2	B (67)	NONE
M-19	--	Residential / B	6	7717 Church Avenue, Highland	61	63	63	2	0	2	B (67)	NONE
M-20	--	Residential / B	8	7717 Church Avenue, Highland	59	61	61	2	0	2	B (67)	NONE
M-21	ST-14	Commercial / F	6	7717 Church Avenue, Highland	67	68	69	1	1	2	F (--)	NONE
M-22	ST-9	Residential / B	--	27727 Baseline Street, Highland	59	61	61	2	0	2	B (67)	NONE
M-23	--	Residential / B	6	7374 Dunkirk Avenue, Highland	59	61	61	2	0	2	B (67)	NONE
M-24	ST-21	Residential / B	9	7458 Dunkirk Avenue, Highland	61	63	63	2	0	2	B (67)	NONE
M-25	--	Residential / B	5	7550 Dunkirk Avenue, Highland	61	63	63	2	0	2	B (67)	NONE
M-26	--	Residential / B	7	7590 Dunkirk Avenue, Highland	63	65	65	2	0	2	B (67)	NONE

Receiver I.D.	Measurement Location	Land Use / Activity Category	Number of Dwelling Units or Equivalent	Address	Existing Noise Level $L_{eq}(h)$, dBA	Table B-1 Future Worst Hour Noise Levels (Traffic Noise Only) - $L_{eq}(h)$, dBA						
						Design Year 2040 Noise Level without Project, Leq(h), dBA	Design Year Noise Level with Project, Leq(h), dBA	Design Year 2040 Noise Level without Project minus Existing Conditions Leq(h), dBA	Design Year 2040 Noise Level with Project minus No Project Conditions Leq(h), dBA	Design Year 2040 Noise Level with Project minus Existing Conditions Leq(h), dBA	Activity Category (NAC)	Impact Type (None, or A/E)
M-27	--	Residential / B	4	7660 Dunkirk Avenue, Highland	59	61	61	2	0	2	B (67)	NONE
M-28	ST-33	Commercial / F	3	7720Dunkirk Avenue, Highland	65	66	66	1	0	1	F (--)	NONE
M-28A	--	Commercial / E	--	Dunkirk Avenue, Highland	63	64	64	1	0	1	E (72)	NONE

Note: A/E= Future noise conditions approach or exceed the Noise Abatement Criteria.

Appendix C Supplemental Data

C-1 List of Field Instrumentation and Calibration Records

C-2 Field Data Sheets

C-3 Field Photos

C-4 TNM® Files: Input/Output Sheets and Model Files

(See included CD.)

This page intentionally left blank.

C-1 List of Field Instrumentation and Calibration Records

This page intentionally left blank.

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.27124

Instrument: **Sound Level Meter**
Model: **812**
Manufacturer: **Larson Davis**
Serial number: **0432**
Tested with: **Microphone 2559 s/n 2496**
Preamplifier PRM828 s/n 1368
Type (class): **1**

Customer: **ICF Jones & Stokes**
Tel/Fax: **949-333-6650 / -6601**

Date Calibrated: **9/7/2012** *Cal Due:*

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No
Calibration service: __ Basic _X_ Standard

Address: **1 Ada, Suite 100**
Irvine, CA 92618

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HM30-Thommen	Meteo Station	1040170/39633	Nov 29, 2011	ACR Env./ A2LA	Nov 29, 2012
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.6 °C	99.908 kPa	50.3 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	9/07/2012	Date	9/7/2012

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored Z:\Calibration Lab\SLM 2012\LD812_0432_M1.doc

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.27127

Instrument:	**Sound Level Meter**	*Date Calibrated:* **9/7/2012**	*Cal Due:*
Model:	**NL22**	*Status:*	**Received** / **Sent**
Manufacturer:	**Rion**	*In tolerance:*	**X** / **X**
Serial number:	**00773232**	*Out of tolerance:*	
Tested with:	**Microphone UC52 s/n 114862**	*See comments:*	
	Preamplifier NH21 s/n 24296	*Contains non-accredited tests:* __Yes _X_ No	
Type (class):	**2**	*Calibration service:* __ Basic _X_ Standard	
Customer:	**ICF Jones & Stokes**	*Address:*	**1 Ada, Suite 100**
Tel/Fax:	**949-333-6650 / -6601**		**Irvine, CA 92618**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HM30-Thommen	Meteo Station	1040170/39633	Nov 29, 2011	ACR Env./ A2LA	Nov 29, 2012
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Dec 13, 2011	Scantek, Inc./ NVLAP	Dec 13, 2012
4226-Brüel&Kjær	Multifunction calibrator	2305103	Jul 24, 2012	Scantek, Inc./ NVLAP	Jul 24, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.3 °C	99.88 kPa	56.9 %RH

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	9/07/2012	Date	9/7/2012

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored Z:\Calibration Lab\SLM 2012\RIONL22_00773232_M1.doc

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1 ACCREDITED
by NVLAP (an ILAC and APLAC signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.27126

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **9/7/2012** *Cal Due:*		
Model:	**CAL200**	*Status:*	**Received**	**Sent**
Manufacturer:	**Larson Davis**	*In tolerance:*	**X**	**X**
Serial number:	**6645**	*Out of tolerance:*		
Class (IEC 60942):	**1**	*See comments:*		
Barometer type:		*Contains non-accredited tests:* __Yes _X_ No		
Barometer s/n:				

Customer: **ICF Jones & Stokes**
Tel/Fax: **949-333-6650 / -6601**
Address: **1 Ada, Suite 100**
Irvine, CA 92618

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2012	Scantek, Inc./ NVLAP	Jul 2, 2013
DS-360-SRS	Function Generator	61646	Nov 16, 2011	ACR Env./ A2LA	Nov 16, 2013
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Dec 9, 2011	ACR Env. / A2LA	Dec 9, 2012
DPI 141-Druck	Pressure Indicator	790/00-04	Dec 13, 2010	ACR Env./ A2LA	Dec 13, 2012
HM30-Thommen	Meteo Station	1040170/39633	Nov 29, 2011	ACR Env./ A2LA	Nov 29, 2012
8903A-HP	Audio Analyzer	2514A05691	Dec 1, 2010	ACR Env./ A2LA	Dec 1, 2013
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	456005	Mar 23, 2012	Scantek, Inc. / NVLAP	Mar 23, 2013
1203-Norsonic	Preamplifier	14059	Jan 3, 2012	Scantek, Inc./ NVLAP	Jan 3, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	9/07/2012	Date	9/7/2012

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored as: Z:\Calibration Lab\Cal 2012\LDCAL200_6645_M1.doc

C-2 Field Data Sheets

This page intentionally left blank.

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **I-210 Widening (Baseline)** PROJ. #

SITE IDENTIFICATION: ST8 OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: 27631 FOSTER AVE, HIGHLANDS
START DATE / TIME: 11-15 12-4-12 END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 70 °F HUMIDITY: 64 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 2 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: RION NL21 TYPE: 1 (2) SERIAL #: 776887
CALIBRATOR: CAL 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114 dBA SPL POST-TEST dBA SPL WINDSCREEN ✓

SETTINGS: (A-WEIGHTED) (SLOW) FAST FRONTAL (RANDOM) (ANSI) OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
ST8:1	11:55	12:05	59.7	65.7	57.8	56.5	59.0	62.0			
ST8:2	12:05	12:15	58.8	64.3	57.6	55.7	58.5	60.7			

COMMENTS:

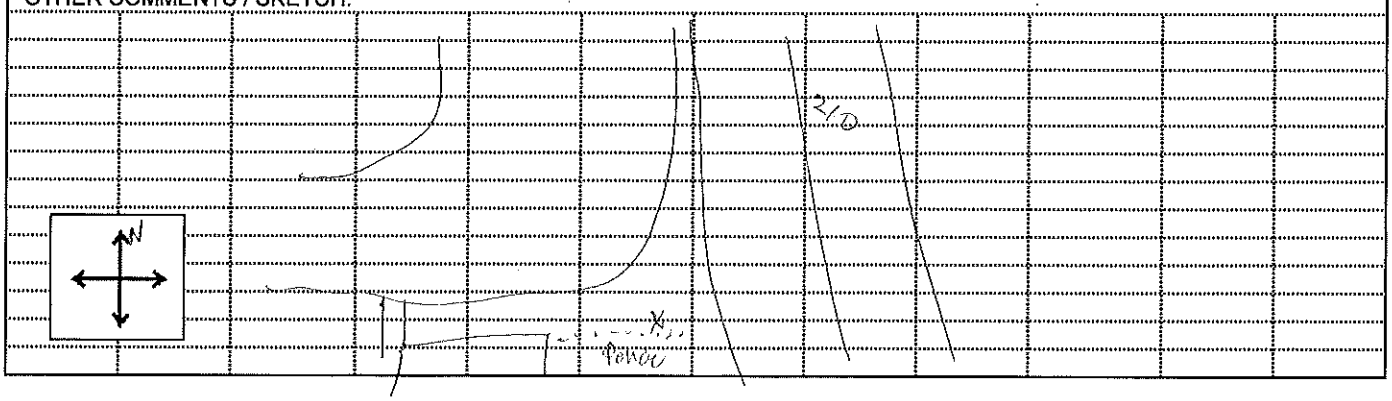
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: (TRAFFIC) AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN

	NB / EB	SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: (HARD) SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **I-210 Widening** PROJ. #

SITE IDENTIFICATION: ST-9
ADDRESS: 7374 DUNKIRK AVE
START DATE / TIME: 11:55 12-4-17
OBSERVER(S): Mike Greene/Peter Hardie
END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 72 °F HUMIDITY: 58 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LO812 TYPE: 1 2 SERIAL #: 0432
CALIBRATOR: CAL200 SERIAL #: ~~0449~~ 6605
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:
DOG BARK

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)
ST9	11:55	12:05	60.3	82.5	51.1	54.9	57.6	60.9		
	12:05	12:15	57.7	62.3	52.3	55.1	57.5	59.6		
	12:15	12:20	58.1	61.5	53.8	56.1	58.0	59.4		

COMMENTS: MOST CONSTANT NOISE IS I-210. HOUSE IS PROTECTED BY 12' WALL. THERE IS A DOG IN THE BACK YARD. IT BARKED TIMES DURING RUN 1 & SET LMAX

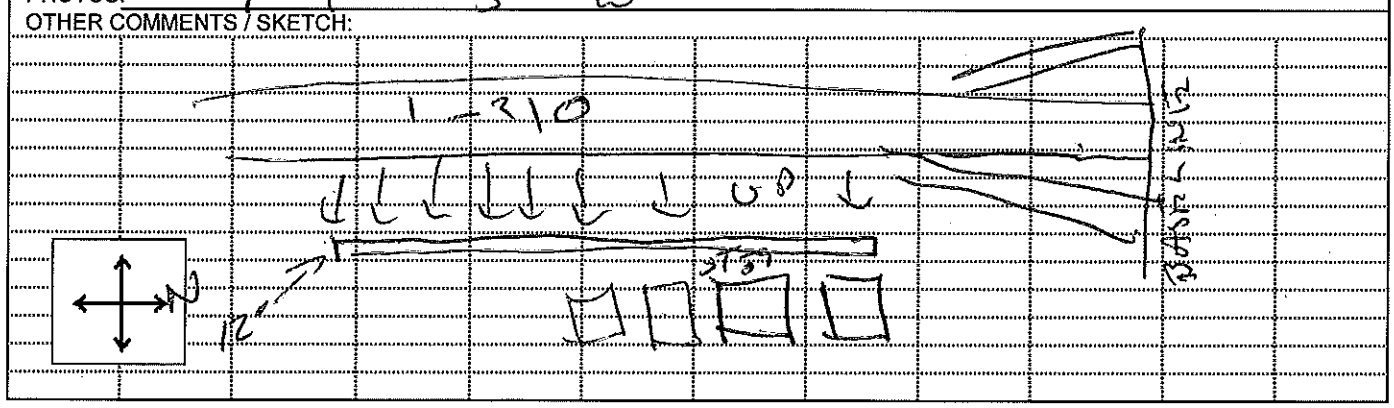
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN

	NB / EB	SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS: 9 10 5 W
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **I-210 Widening (Baseline)** PROJ. #

SITE IDENTIFICATION: ST 910 OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: 7215 LA PRAIX
START DATE / TIME: 2:35 12-4-12 END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 71 °F HUMIDITY: 58 %R.H. WIND: (CALM) LIGHT MODERATE VARIABLE
WINDSPEED: 0 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: (SUNNY) CLEAR (OVRCST) PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: Quest NL-21 TYPE: 1 (2) SERIAL #: 276887
CALIBRATOR: CALC 200 SERIAL #: 6641
CALIBRATION CHECK: PRE-TEST 114 dBA SPL POST-TEST dBA SPL WINDSCREEN ✓

SETTINGS: (A-WEIGHTED) (SLOW) FAST FRONTAL (RANDOM) (ANSI) OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)
ST9:1	2:35	2:35	62.0	69.3	56.9	59.5	61.6	63.6		
ST9:2	2:45	2:55	62.3	68.3	53.3	59.9	61.8	64.2		
10										

COMMENTS:

SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: -MIN

	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:						
MED. TRUCKS:						
HVY TRUCKS:						
BUSES:						
MOTORCYCLES:						

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:

7000 Prax Monterey Villas

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **I-210 Widening** PROJ. #

SITE IDENTIFICATION: ST-11 OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: 27650 TEMPLE ST
START DATE / TIME: 2:35 12-4-12 END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 73 °F HUMIDITY: 47 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 1-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 812 TYPE: 1 2 SERIAL #: 0432
CALIBRATOR: CAL200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)
ST-11	2:35	2:45	64.4	75.5	56.1	60.9	62.8	66.4		
	2:45	2:55	64.2	70.5	57.6	60.4	63.3	67.0		

COMMENTS: HOME IS @ NORTH END OF CALTRANS WALL
AN 8' WALL IS PROTECTING HOMES
TRUCKS MAJOR NOISE SOURCE. RESIDENTS COMPLAIN OF TRUCKS
USING JAKE BRAKES

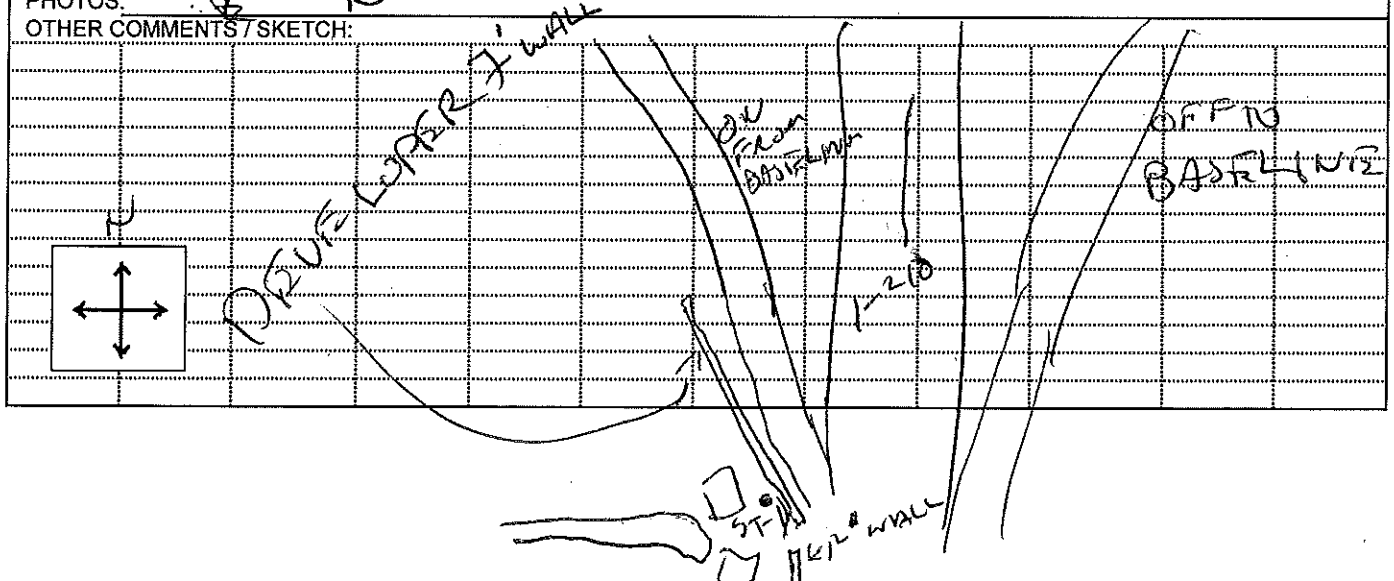
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: -MIN

	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:						
MED. TRUCKS:						
HVY TRUCKS:						
BUSES:						
MOTORCYCLES:						

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS: E N
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **I-210 Widening (Baseline)** PROJ. #

SITE IDENTIFICATION: ST12
ADDRESS: Thoroughbred Lane (The Highlands)
START DATE / TIME: 3:40
OBSERVER(S): Mike Greene/Peter Hardie
END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 8 °F HUMIDITY: 78 %R.H. WIND: **CALM LIGHT MODERATE VARIABLE**
WINDSPEED: 8 MPH DIR: **N NE E SE S SW W NW STEADY GUSTY**
SKY: **SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:**

ACOUSTIC MEASUREMENTS:
INSTRUMENT: R/LION NL-21 TYPE: 1 2 SERIAL #: 776857
CALIBRATOR: CL 200 SERIAL #: 6600
CALIBRATION CHECK: PRE-TEST 114.3 dBA SPL POST-TEST 114.8 dBA SPL WINDSCREEN 6

SETTINGS: **A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:**

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
ST12:1	3:40	3:50	62.0	68.9	56.8	59.5	61.8	63.4			
ST12:2	3:50	4:00	62.8	71.3	57.9	60.2	62.2	64.3			

COMMENTS:

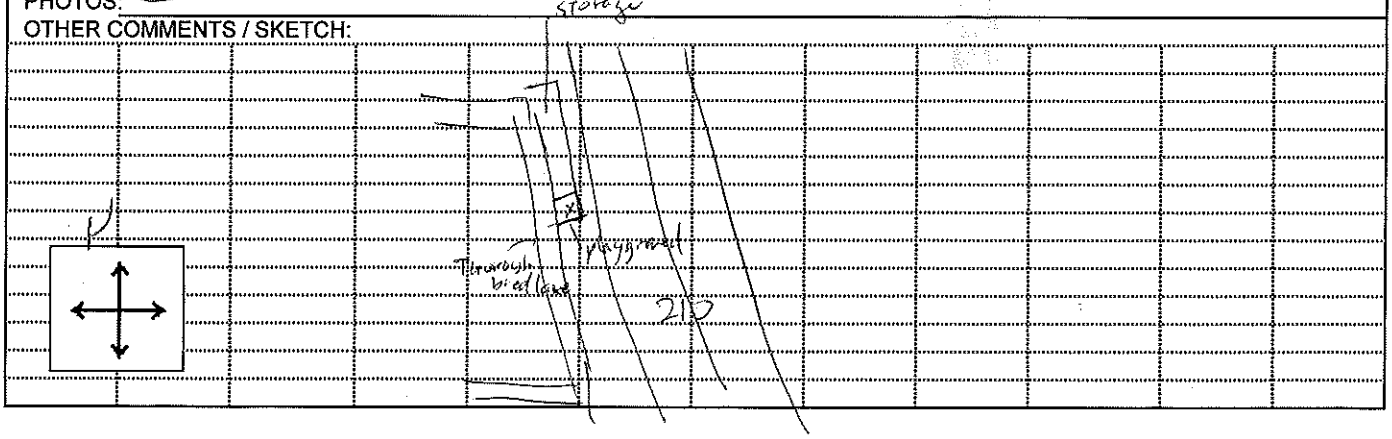
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: **TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:**
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN

	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:						
MED. TRUCKS:						
HVY TRUCKS:						
BUSES:						
MOTORCYCLES:						

SPEED ESTIMATED BY: **RADAR / DRIVING / OBSERVER**

OTHER SOURCES: **DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:**

DESCRIPTION / SKETCH:
TERRAIN: **HARD SOFT MIXED FLAT OTHER:**
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **I-210 Widening** PROJ. #

SITE IDENTIFICATION: 5-13 OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: 27644 NEY DR
START DATE / TIME: 3:40 12-4-12 END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 69 °F HUMIDITY: 36 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 0 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD812 TYPE 1 2 SERIAL #: 6432
CALIBRATOR: CAL200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)
5F13	3:40	3:50	64.5	69.3	58.9	61.9	64.4	66.0		
	3:50	4:00	64.6	71.8	58.1	61.8	64.1	66.4		

COMMENTS: HOME IS PROTECTED BY 8' DEVELOPER WALL ALONG PROPERTY LINE

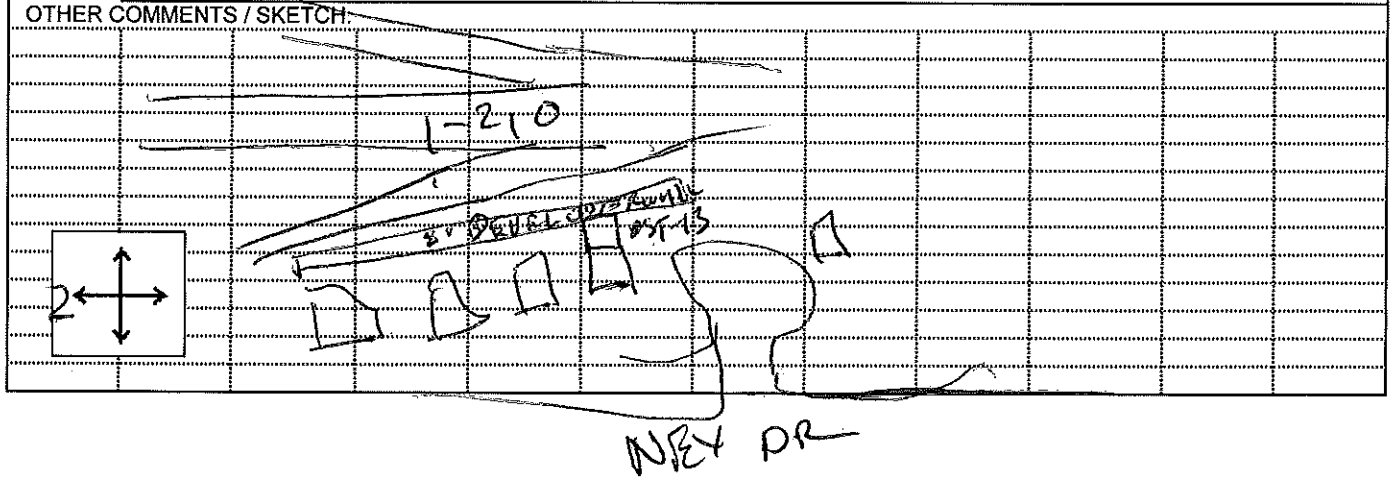
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN

	SPEED NB / EB	SPEED SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **I-210 Widening (Baseline)** PROJ. #

SITE IDENTIFICATION: ST-14 OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: ARCO ON CORNER OF BASELINE
START DATE / TIME: END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 64 °F HUMIDITY: 32 %R.H. WIND: **CALM LIGHT MODERATE VARIABLE**
WINDSPEED: 0 MPH DIR: **N NE E SE S SW W NW** **STEADY GUSTY**
SKY: **SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:**

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 812 TYPE: 1 2 SERIAL #: 0432
CALIBRATOR: CAL200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN ✓

SETTINGS: **A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:**

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)
ST-14	8:40	9:50	65.4	74.5	58.7	61.9	64.0	67.4		
	9:50	10:00	64.9	76.9	58.7	61.5	63.8	67.1		

COMMENTS: LOCATION IS RFP OF COMM ENV. THERE IS A 5' BLK WALL AT EDGE OF SHOULDER AND OFFRAMP. THE REAR CARS START ENGINES + STOPPING AT GAS PUMPS

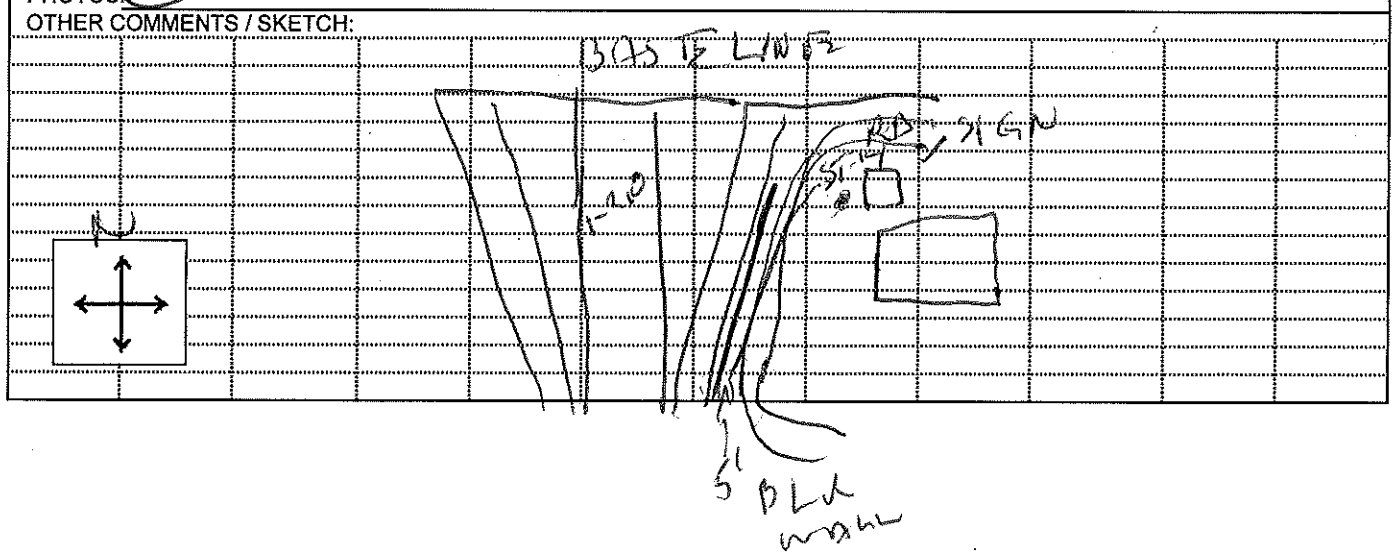
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: **TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:** MUSIC IN BKGRND FROM ARCO
ROADWAY TYPE:
TRAFFIC COUNT DURATION: 5 -MIN

	NB / EB	SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:	56	53						
MED. TRUCKS:	1	0						
HVY TRUCKS:	3	3						
BUSES:	1	1						
MOTORCYCLES:	0	1						

SPEED ESTIMATED BY: **RADAR / DRIVING / OBSERVER**

OTHER SOURCES: **DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:**

DESCRIPTION / SKETCH:
TERRAIN: **HARD SOFT MIXED FLAT OTHER:**
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **I-210 Widening** PROJ. #

SITE IDENTIFICATION: ST-21 OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: 7550 DUNKIRK
START DATE / TIME: 1-31-13 10:45 END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 72 °F HUMIDITY: 38 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 1-2 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 812 TYPE: 1 2 SERIAL #: 0432
CALIBRATOR: CAL 200 SERIAL #: 6645
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 113.9 dBA SPL WINDSCREEN ✓

SETTINGS: A WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)
ST-21	10:45	10:55	59.6	64.5	53.2	56.3	59.1	61.9		
	10:55	11:05	60.3	65.1	53.8	57.3	59.8	62.5		

COMMENTS: HOUSE IS SHIELDED BY A 10' WALL

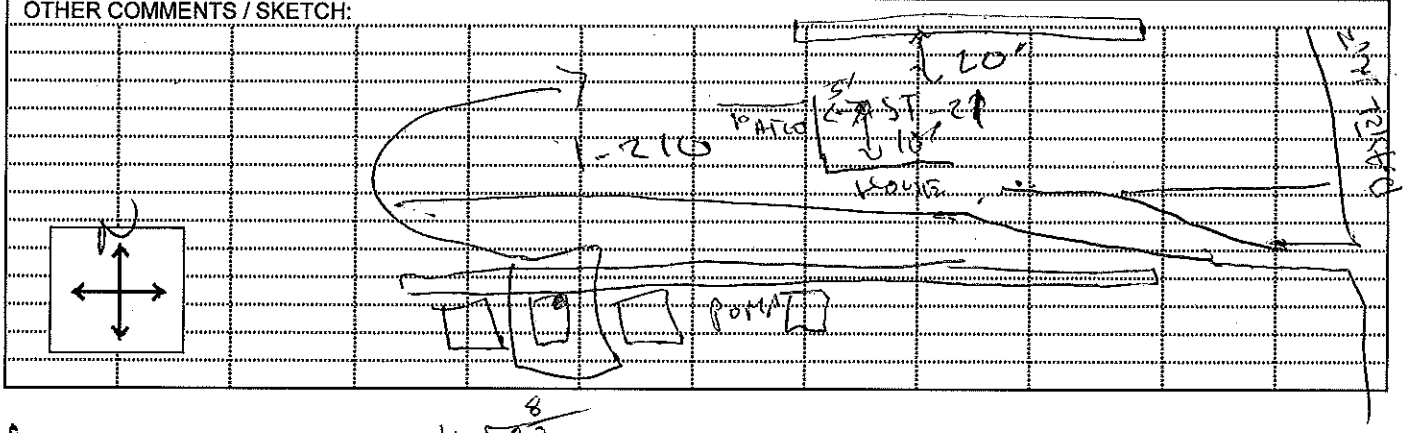
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN

	COUNT NB / EB	COUNT SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	#2 SPEED NB / EB	#2 SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS: 1 2 3 4 N E S W
OTHER COMMENTS / SKETCH:



6
15
90/12

1L 790 8

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: SR-210 PROJ. #

SITE IDENTIFICATION: ST-033 OBSERVER(S): Peter Hardie
ADDRESS: Starbucks 27615 Baseline
START DATE / TIME: 11/6 10:30 END DATE / TIME: 11/6 10:40

METEROLOGICAL CONDITIONS:
TEMP: 79 °F HUMIDITY: 13 %R.H. WIND: CALM (LIGHT) MODERATE VARIABLE
WINDSPEED: 1-3 MPH DIR: N NE E SE S (SW) W NW STEADY GUSTY
SKY: (SUNNY) (CLEAR) OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: LD 812 TYPE: (1) 2 SERIAL #: 0432
CALIBRATOR: LD CAL 200 SERIAL #:
CALIBRATION CHECK: PRE-TEST 114.2 dBA SPL POST-TEST 114.2 dBA SPL WINDSCREEN ✓

SETTINGS: (A-WEIGHTED) (SLOW) FAST FRONTAL (RANDOM) (ANSI) OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
1	10:20	10:30	59.4	70.3	51.3	54.7	58	61.8			
2	10:30	10:40	60.1	71.6	51.0	54.2	58.2	63.0			

COMMENTS: ~~Background~~

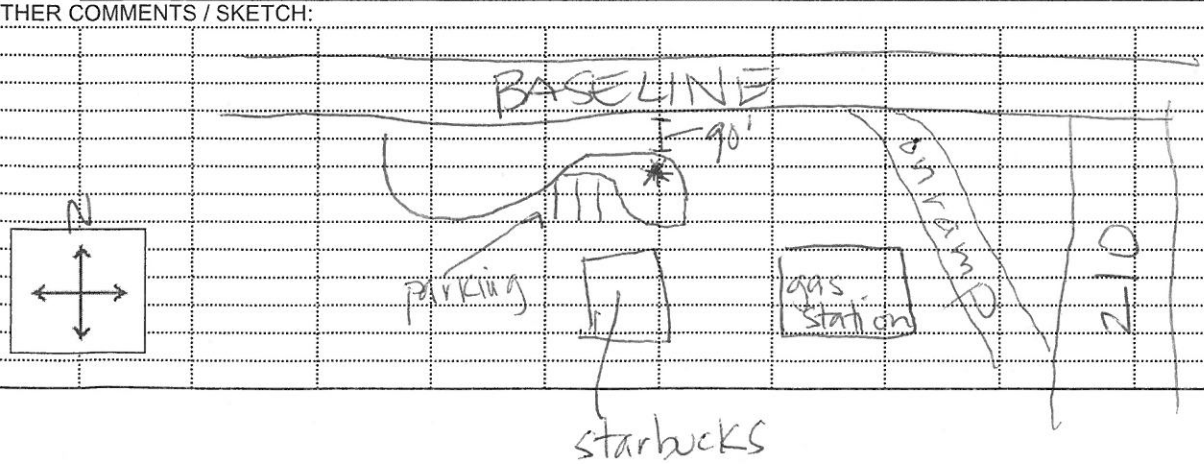
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: (TRAFFIC) AIRCRAFT RAIL INDUSTRIAL (AMBIENT) OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: -MIN

	SPEED NB / EB	SPEED SB / WB	SPEED NB / EB (onramp)	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB (onramp)
AUTOS:	92	84	74	69	93	98	67	
MED. TRUCKS:	3	1	4		3		2	
HVY TRUCKS:	2	1	1			1	1	
BUSES:	2	1			1	2		
MOTORCYCLES:		1						

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: (DIST. AIRCRAFT) / RUSTLING LEAVES / DIST. BARKING DOGS / (BIRDS) / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / (OTHER:)
people talking, music, car start-ups & door slams car wash

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



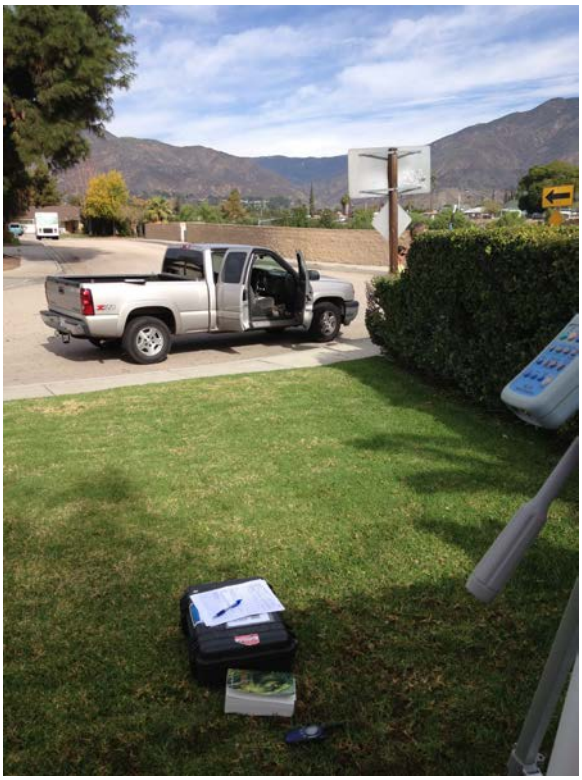
C-3 Field Photos

This page intentionally left blank.

Photograph A-5. LT-3 Looking East

Photograph A-6. LT-3 Looking North

597.12



Photograph A-27. ST-8 Looking North

Photograph A-28. ST-8 Looking East

597.12

Photograph A-29. ST-8 Looking South

Photograph A-30. ST-8 Looking West

597.12

Photograph A-31. ST-9 Looking South

Photograph A-32. ST-9 Looking West

597.12

Photograph A-33. ST-11 Looking East

Photograph A-34. ST-11 Looking North

597.12

Photograph A-35. ST-12 Looking East

Photograph A-36. ST-12 Looking North

597.12

Photograph A-37. ST-12 Looking South

Photograph A-38. ST-12 Looking West

597.12

Photograph A-39. ST-13 Looking East

Photograph A-40. ST-13 Looking North

597.12

Photograph A-41. ST-14 Looking North

Photograph A-42. ST-14 Looking West

597.12

Photograph A-59. ST-21 Looking North

Photograph A-60. ST-21 Looking East

597.12

Photograph A-61. ST-33 Looking South

Photograph A-62. ST-33 Looking East

Photograph A-63. ST-33 Looking North

C-4 TNM® Files: Input/Output Sheets and Model Files

(See included CD.)

This page intentionally left blank.

Appendix D Traffic Impact Analysis

See included CD.

This page intentionally left blank.